

The International Community of Teachers of Mathematical Modelling and Applications.

www.ictma.net

The Community, through its membership, research and other activities, is recognised as "The International Study Group for Mathematical Modelling and Applications (ICTMA)" by its affiliation to the International Commission on Mathematical Instruction (ICMI).

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Contents

1. International Executive Committee	2
2. Report from ICTMA 15 in Melbourne	2
3. Upcoming ICTMA Conference - ICTMA 16	4
4. ICME 12 in Seoul	5
5. Brief News Items	9
6. Recent Dissertations	11
7. Publications of Interest	13

Please send future contributions to the editor by email <gloria.stillman@acu.edu.au>. The next Newsletter will be published in December, 2013. We are interested in your contributions to any of the current sections including project reports.

1. International Executive Committee

Following the business meeting in Melbourne on July 19, 2011, the ICTMA Executive for 2011-2013 was confirmed as follows:

President

Associate Professor Gloria Stillman (Australia) – Newsletter Editor & Secretary

Past Conference Organisers

Rita Borrromeo Ferri (Germany)

Elected Members

Prof Toshikazu Ikeda (Japan) – Registrar

Prof Gabriele Kaiser (Germany)

Prof Jinxing Xie (China) – Webmaster & List Serve Moderator

Co-opted Members

Jonei Barbosa (Brazil)

Helen Doerr (USA)

Pauline Vos (Netherlands)

As Toshi Ikeda has now served two terms as an elected member on the International Executive Committee, he will be retiring as an elected member at the end of ICTMA 16. Nominations are now called for this vacancy on the committee. Nominations must be for eligible ICTMA members and both nominator and seconder need to also be eligible ICTMA members as defined in the constitution (Available on ICTMA website). Nominations should be sent to the Secretary in the first instance. Please include a one page description of the nominee's contribution to ICTMA or ICTMA related activities.

An election conducted by the Registrar will be held at the business meeting. Proxies must be delivered to the Chair of the business meeting at the start of the meeting. Members **not attending ICTMA 16** may obtain a postal voting ballot form from the ICTMA website. This form is to be returned to the secretary by 12 midnight on July 1 (Australian Eastern Standard Time) by post, fax or email.

2. Report from ICTMA 15

15TH INTERNATIONAL CONFERENCE ON THE TEACHING OF MATHEMATICAL MODELLING AND APPLICATIONS (ICTMA15)

Conference Theme: **Mathematical Modelling: Connecting to Practice – Teaching practice and the practice of applied mathematicians.**

The 15th ICTMA Conference (ICTMA15) was hosted by the Australian Catholic University, Melbourne in July 2011. It was organised by A/Prof Gloria Stillman (Chair and Program Convenor) and Jill Brown (Chair and General Convenor). The conference began on the afternoon of 14 July with 60 participants completing early registration and then enjoying an informal reception. Ninety-two participants had registered for the conference proper but not all had shown up at this point in the conference. A two day mathematical modelling challenge for primary and secondary school students preceded the conference (13-14 July). The Modelling challenge was generously supported by AB Paterson College, Texas Instruments and Macmillan. The Mathematical Modelling Challenge was successful with 65 students coming from Victoria and Queensland. Mentors were mainly from Queensland and several Singaporeans worked as the backup team with staff from ACU Melbourne.

The first full day of the conference began on July 15 with an official opening by the Victorian Minister for Education, the Hon. Martin Dixon. The conference brought together international experts in a

variety of fields as well as local and regional teachers, post-graduate students and academics. The Academic programme included:

- Plenaries by internationally acclaimed speakers – Prof Dr Gabriele Kaiser (Germany), Hon. Prof Peter Galbraith (Australia), Prof Lyn English (Australia), Prof Toshikazu Ikeda (Japan), and Prof Geoff Brookes (Australia)
- Paper Presentations [research, theory, & practice]
- Workshops
- 2 Symposia

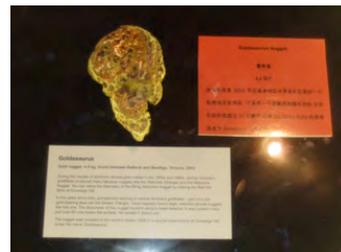
The following sub-themes focussed on:

- Modelling and applications in business, the environment, industry and the workplace
- Evaluation of effectiveness of such modelling
- Pedagogical issues for teaching and learning
- Applicability at different levels of schooling and in tertiary education
- Research into teaching and practice
- Innovative practices in research, teaching and practice
- Influences of technology
- Assessment in schools and universities

 <p>Winners at the Mathematical Modelling Challenge being presented with certificates by Akio Matsuzaki.</p>	 <p>Jayden Lillyst entertaining delegates at the conference dinner held at the Fairfield Boathouse.</p>	 <p>ICTMA visits the ACU Ballarat campus for Peter Galbraith Plenary then an excursion to the Gold Museum.</p>
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On Monday 18 July there was an excursion to Ballarat where participants were joined by several local mathematics educators at the Ballarat campus of ACU for a plenary lecture given by Peter Galbraith followed by lunch with wine tasting. A visit to the Gold Museum and a bus tour followed.

Originally abstracts were received from 29 countries. Not all were accepted even though authors were given several chances to revise proposals so they were likely to be of interest to participants. Participants came from 25 countries. Most participants were from Australia with 26 registered. There were large contingents from Germany, Japan and Singapore.

			
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One page abstracts for research, symposium papers and workshops were refereed. Prior to the conference a CD-ROM of conference proceedings consisting of delegates' 8 page papers was published. An edited book, *Teaching Mathematical Modelling: Connecting to Research and Practice* consisting of chapters based on selected, extended and revised papers is about to be published by Springer. There were potentially 77 chapters (66 regular papers + 5 plenaries + 6 symposia papers)

based on abstracts received but this has been reduced to 52 in the final book. All chapters were subject to a strict impartial and independent reviewing process by experts from all over the world.

3. Upcoming Conference – ICTMA 16

16TH INTERNATIONAL CONFERENCE ON THE TEACHING OF MATHEMATICAL MODELLING AND APPLICATIONS (ICTMA16)

Conference Theme: Mathematical Modelling: History and Future Perspectives

The 16th ICTMA Conference (ICTMA16) is being hosted by the Universidade Regional de Blumenau, Blumenau, Brazil. It is being organised by Maria Salett Biembengut. The conference is scheduled for 14-19 **July 2013**. *The conference brings together international experts in a variety of fields as well as local and regional teachers, post-graduate students and academics.* The Academic programme includes:



- Plenaries by internationally acclaimed speakers for various themes:
 - Ubi D'Ambrosio (Brazil), Mathematical modelling as a strategy for building up knowledge in different cultural environments
 - Henry Pollak (US), The place of mathematical modelling in the system of mathematics education: Perspectives and prospects
 - Mogens Niss (Denmark), Prescriptive models - Opportunities and challenges
 - Rodney Bazzanezi (Brazil)
 - Gabriele Kaiser (Germany) Modelling competencies -- Importance in the past debate and future perspectives
- Panel of Werner Blum (Germany) [Chair], Gloria Stillman (Australia), Helen Doerr (US) and discussant Jonas Bergman Årlebäck (Sweden) addressing the theme: *Mathematical modelling: History and future prospects.*
- Paper Presentations [research, theory, & practice]
- Mathfair
- Posters
- Symposia

Papers have been invited to address the following sub-themes:

- Modelling and applications with respect to environmental issues, health, industry, business, and the workplace
- Pedagogical issues for teaching and learning
- Applicability at different levels of schooling and in tertiary education
- Research into teaching and practice
- Innovative practices in research, teaching and practice
- Influences of technology
- Assessment in schools and universities

After the conference, paper presenters at the conference are invited to submit a book chapter by 15 September for a proposed book in the ICTMA series to be published by Springer in their series, *International Perspectives on the Teaching and Learning of Mathematical Modelling*. Gabriele Kaiser and Gloria Stillman are series editors. The editors for the book and its title will be announced at the ICTMA business meeting.

The venue for the conference is the hall of Himmelblau Palace Hotel, located at Avenue 7 de Setembro nº 1415 downtown, Blumenau city. Most international flights arrive first in Guarulhos - São Paulo (SP), which is far from Blumenau (SC) 700 km, or Rio de Janeiro. International participants arriving by air can travel to Navegantes Airport 50 km from Blumenau where the airlines GOL, TAM and AZUL provide a shuttle bus to Blumenau or Florianópolis Airport 150km from Blumenau. There are no direct shuttle buses from Florianópolis. Any conference participants travelling to Florianópolis Airport need to contact the organisers, Maria Salett or Emilia, to ensure they are provided with bus transport to Blumenau.

An excursion is planned to Unipraias Park which is located in the trendy beach of Balneário Camboriú. There is a cable car ride with panoramic views and stops at Mata Atlântica Station where you can take a ride in zip lines, canopy tours and Youhoo! (mountain sled). Another option is to alight at Laranjeiras station which has a beach of clear waters and numerous dining options.

The actual program for the conference is scheduled to be available on June 30. The registration fee is USD 500 up to June 30.

For further information, please **visit** www.furb.br/cremm/ictma or email the conference organisers: Maria Salett Biembengut <mariasalett@gmail.com> and Emilia Melo Viera <cremm@furb.br>

4. ICME 2012 in Seoul

4.1 The Congress

Worldwide trends in mathematics education research and practice at all levels: Improving the quality and professionalism of mathematics education through international cooperation, research, and exemplary cases.

ICME-12 brought together researchers, teacher educators, practising teachers, mathematicians, and others interested in the field of mathematics education from all over the world to discuss the state of the art of research and practice in mathematics education. It was held in Seoul, Korea from July 8-15, 2012 at the COEX Center. The congress is held under the auspices of ICMI (International Commission on Mathematical Instruction). A meeting of the General Assembly of ICMI precedes the conference. As ICTMA is one of the affiliated study groups of ICMI, the president presented a four yearly report at this meeting which was held on July 8.



The Congress serves two major functions. It provides a scholarly opportunity for discussion, debate, and the presentation of new research and theory and is, at the same time, a meeting place for the international community of mathematics education: mathematicians, teachers, policy-makers, resource producers and distributors, as well as mathematics educators and researchers.

“The scholarly aspect of ICME is represented by the Plenary Lectures, Survey Teams, Regular Lectures and Topic Study Groups, and other forums” says conference Chair Sung Je Cho, a Professor at the Department of Mathematics Education at Seoul National University. “Inclusiveness within ICME is obtained in many forms. Everyone who wishes to attend is welcome, and all who wish to present are given some opportunity to do so. A solidarity fund assists delegates from non-affluent countries to attend the conference.”

The need for improving quality, equity and access to mathematics education is undisputed in the knowledge-based societies of the 21st century. Mathematical thinking and knowledge play a key role in providing tools for understanding science, engineering, technology and economics and are essential in public decision-making and for participation in our societies.

As well as forums on mathematics education at each level, and key contemporary issues such as technology in mathematics education and teacher education, the conference covered topics such as teaching and learning of statistics, cultural issues, gender and mathematics education, language and communication, modelling, applications, geometric thinking and reasoning, socio-economic influence on students' achievement, mathematics education in and for work, curriculum development, assessment and testing. Recent ICMI Study volumes that present the contemporary state of the art on particular topics were also launched.

The programme included plenary sessions, presentations of survey teams, topic study groups, regular lectures, discussion groups, poster sessions, workshops, sharing experience groups, national presentations, affiliated study groups, exhibitions, as well as various social events. One of the plenary lectures was given by Werner Blum (Germany) whilst Gloria Stillman (Australia) and Rita Borromeo Ferri (Germany) gave regular lectures. Jinxing Xie (China) was a member of the ICME survey team on “Key Mathematical Concepts in the Transition from Secondary to University”, one of the five Survey Teams which reported to the Congress. Topic Study Group 17 chaired by Toshi Ikeda (Japan) and Jill Brown (Australia) assisted by Jussara de Loiola Araújo (Brazil) and Nicholas Mousoulides (Cyprus) was highly successful. Affiliated Study Group sessions were organized by the president.

ICME 13 will be held in Hamburg, Germany, in 2016.

4.2 Report from TSG17: Mathematical applications and modelling in the teaching and learning of mathematics

TSG 17 was co-chaired by Jill Brown of Australian Catholic University (Melbourne) and Toshi Ikeda of Yokohama National University, Japan. Team Members were Sung Sook Kim, Pai Chai University, Korea, Nicholas Mousoulides, University of Nicosia, Cyprus, and Jussara de Loiola Araújo, UFMG, Brazil.

Applications and modelling have been an important theme in mathematics education during the last 40 years; in particular, through ICME regular working/topic groups and lectures on applications and modelling, and our series of ICTMA conferences, held biennially since 1983. The mathematics education community was invited to submit proposals addressing one of six themes and related issues. Focus could be at any level of education including teacher education and the work of mathematicians in the field. It is not surprising therefore that this TSG attracted much attention, with 44 papers submitted. Papers were reviewed by two reviewers. Thirty-six papers were accepted for presentation, from 17 countries (Australia, Austria, Brazil, China, Cyprus, Germany, Israel, Japan, Korea, Mexico, Portugal, Singapore, South Africa, Sweden, Switzerland, UK, USA) and include several teacher authors. Also 24 posters from 10 countries were presented. Given the large number of papers, two concurrent sessions were held with participants together initially and for the final discussion. In the following only presenting authors are named.

4.2.1 Goals and Curriculum

Paraic Treacy presented *The role of mathematical applications in the integration of mathematics and science*, using the authentic integration triangle to argue how secondary students in Ireland can be supported to apply their mathematical knowledge to authentic tasks particularly in science contexts. Karen Norwood discussed *Mathematics instruction using decision science and engineering tools (MINDSET): A multi-step problem solving and modelling course for high school students*. She reported on the development and implementation of a year long US curriculum using a problem solving modelling approach. Xiaoli Lu presented a *Comparative study on mathematics applications in mathematics textbooks* where selected current texts from China and the US were scrutinised for mathematical applications. They report 'most examples in textbooks are traditional mathematical problems without real world contexts'. Jean-Luc Dorier's report on *Modelling: a federating theme in the new curriculum for mathematics and sciences in Geneva compulsory education (age 4-15)* outlined a new curriculum with modelling as a central theme. However, the definition of modelling was modified from that of Niss, Blum and Galbraith (2007); so rather than modelling involving the extra-mathematical and mathematical domains, although two domains are required, the real world is not an essential one of these.



Jussara Araujo presented *Critical construction of mathematical models: An experience on the division of financial resources*, reporting on graduate mathematics education students engagement in a critical mathematical modelling task where 'fair criteria' had to be determined to allocate money. The task raised awareness amongst the participants of the importance of modelling. Jung-Ha An reported on *Developing mathematical modelling curriculum using difference equations*. Examples were shown to demonstrate the use of difference equations in the modelling process in a general mathematics education course. Also at tertiary, *Mathematical experiments: A new-designed course for non-mathematical undergraduates in Chinese universities* was the focus of Jinxing Xie who shared experiences in designing and teaching courses, for non-mathematics students, on applied mathematics through experiments, modelling and software use.

4.2.2 Teaching Material, Pedagogy, and Technology

Nicholas Mousoulides presented *Modelling as a bridge between real world problems and school mathematics at the primary level*. He argued for a modelling approach, using engineering MEAs, as a rich source of situations that build on and extend students' existing mathematical learning. Takashi Kawakami presented *Necessity for modelling teaching corresponding to diversities: Experimental lessons based on dual modelling cycle framework for the 5th grade pupils*. He reported on a teaching experiment with students working on two related tasks. Focussed on teachers of Year 8-9 students, Janeen Lamb presented *Planning for building models of situations: What is involved?* Data from 8 participants in a project aimed at enhancing teachers' instructional practices were analysed. After completing a modelling activity using an applet, teachers planned how to implement the task in their classrooms. Two studies focused on Year 12 Japanese students: Masahiro Takizawa presented *Colors and Mathematics*, illustrating how the colour of an image can be used to teach functions and transformations, by adopting a modelling approach. The paper presents a teaching experiment with Year 12 students, using the 'Colors' software. Tetsushi Kawasaki presented *A study of mathematical modelling on Year 12 students' function education*, reporting the use of modelling in promoting the

teaching and learning of two variable functions. The author reports results of a teaching experiment with 15 students.

Issic Leung presented *The effect of changing dimensions in illustrative examples in enhancing the modelling process*, arguing for a greater emphasis on illustrative examples (e.g., a sketch or diagram). Making greater sense of what is represented should subsequently support mathematical modelling. Also taking a theoretical stance, Vince Geiger presented, *On considering alternative frameworks for examining modelling and application activity: The role of texts and digital tools in the process of mathematical modelling*, discussing several modelling cycles and frameworks used in either engaging in modelling or by researchers in the field. He argued that models for teaching and learning can be applied to modelling situations. His focus was on the interplay between task, teacher, students and tools.

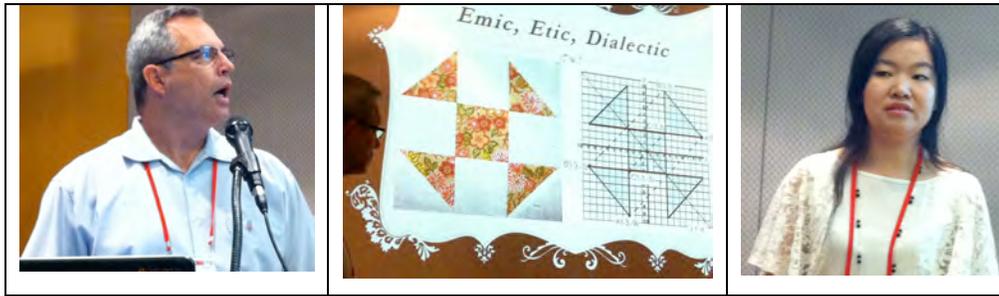
4.2.3 Experimental Research

Irit Peled presented *More than modelling skills: a task sequence that also promotes children's meta knowledge of modelling*, reporting on the development of meta-knowledge of modelling by Year 5-6 students as they worked on 10 tasks. Meta-knowledge included different ways of mathematising a given problem and hence different models for a single situation can be used appropriately. Focused on Year 5 students Maïke Hagena and Rita Borromeo Ferri presented, *How do measurement sense and modelling competency influence each other? An intervention study about German middle class students dealing with length and weight*. Susanne Grunewald presented *Acquirement of modelling competencies: First results of an empirical comparison of the effectiveness of two approaches to the development of (metacognitive) modelling competencies of students*, reporting use of modelling activities in measurement contexts with Year 8 students. Stanislaw Schukajlow and Andre Krug presented *Treating multiple solutions in the classroom and their influence on students' achievements and the affect—The preliminary results of the quasi-empirical study*, comparing Year 9 students' work on 'Pythagoras tasks' where no assumptions were required to those where different assumptions and hence multiple solutions were possible, hypothesising the latter leads to better achievement (modelling and intra-mathematical).



Jin Hyeong Park reported on *Conceptual understanding of mathematical knowledge through mathematical modelling in a spreadsheet environment*. Park sees modelling as representing real phenomena mathematically in order to understand the real world reporting a case study of 15 gifted Year 8 students engaged in an Iced Coffee Task. Findings included development of conceptual calculus understanding and ability to mathematise from their models back to the real world. Also focussing on spreadsheet use, Manfred Borovcnik reported *Applications of probability: The Limerick experiments* that is, responses of probability workshop participants (in-service secondary teachers), arguing that probability is best taught from a modelling and applications perspective, particularly where technology is used. Here any situation in a classroom is considered as being 'real world'.

Xueying Ji presented *A quasi-experimental study of high school students' mathematics modelling competence*, reporting modelling competence of Year 10-11 students in China. She found students did not realise the importance of validating their results or critically assessing their models. Milton Rosa presented *Ethnomodelling: A research concept on mathematical modelling*, arguing the application of techniques in ethnomathematics along with the tools of modelling allows us to see a different reality. Further, research should be from an etic and an emic perspective.



4.2.4 Assessment, Teacher Education, and Obstacles

Peter Frejd presented *Alternative modes of modelling assessment: A literature review*, reporting different assessment methods (i.e., written tests, projects) and viewpoints (atomic or holistic). Xenia-Rosemarie Reit and Matthias Ludwig's paper, *A cross-section study about modelling task solutions*, reported a study where 337 solutions to the *Restraining a tennis racket task* were analysed. Differences were found in terms of approach taken and progress on the solution path. Michael Besser reported on *Competency-oriented written feedback in every-day mathematics teaching: How to report on students' solutions of modelling tasks and how to assess the quality of these reports?* This study looked at teacher feedback in the context of technical and modelling tasks, considering strengths/weaknesses of specialised written competency based feedback.

In pre-service teacher education, Thomas Lingefjord presented *Learning mathematics through mathematical modelling*, arguing that by developing modelling tasks and then engaging in teaching scenarios conceptual understanding occurs. In addition, students came to understand that technology changes what is possible in developing such tasks. Kaino Luckson presented *The nature of modelling activities and abilities of undergraduate students: some reflections on students' mathematics portfolios*, focusing on modelling tasks undertaken by pre-service teacher education students via distance education. Dawn Ng presented, *Activating teacher critical moments through reflection on mathematical modelling facilitation* highlighting the teacher's role particularly their interpretation of student ideas and interventions. The interplay between listening and questioning was critical. Also focused on the role of the teacher were Peter Stender with *Modelling in mathematics education development of forms of intervention and their placement in the teacher education* and Dominik Leiss, *Adaptive teacher interventions in mathematical modelling*. Both reported studies where the balance between student autonomy and teacher interventions was critical.

4.2.5 A final word

There are many interpretations of the terms *mathematical modelling* and *applications*. Whilst diversity is desirable, a common basis for our interpretations is helpful. TSG discussion contributes to a shared understanding and the majority of teachers and researchers, see the *real world* as a critical and essential component of modelling and applications. Following Niss et al. (2007), both mathematical modelling and applications are seen as connecting the mathematical world and the real world. These two worlds are distinct, with the latter "describing the world outside mathematics" (p. 3). It is also important to distinguish between modelling and applications. The former begins in the real world and requires a modeller to translate the problem situation into a mathematical situation. In an application, this mathematising has already been done for the solver who works in the mathematical world.

Reference

Niss, M., Blum, W. & Galbraith, P. (2007). Introduction. In W. Blum, P. Galbraith, P., H.-W. Henn & M. Niss (Eds.), *Modelling and applications in mathematics education—The 14th ICMI study* (pp. 4-32). New York: Springer.

Jill Brown and Toshikazu Ikeda

5. Brief News Items

5.1 Springer Series

The Springer series on *International Perspectives on the Teaching and Learning of Mathematical Modelling* now includes the first ICTMA volume printed by Springer, the book arising from ICTMA 13. The forthcoming volume from ICTMA 15 will mean there are now three volumes in the series. This book series publishes various books from different theoretical perspectives around the world focusing on Teaching and Learning of Mathematical modeling in schooling and at the tertiary level. The editors invite book proposals that the authors believe meet these intentions.

5.2 ICTMA Members receive MERGA Career Research Medal

Former ICTMA president, Professor Peter Galbraith, and ICTMA member, Professor Lyn English, have been honoured by the Mathematics Education Research Group of Australasia for their distinguished research careers including their research on teaching modelling. In 2011 Peter received the MERGA Career Research Medal (MCRM) at the annual conference in Alice Springs. In 2012 Lyn received the medal at the annual conference in Singapore.



Peter Galbraith accepting the MCRM for 2011 in Alice Springs.



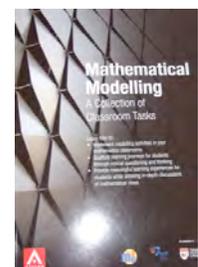
Lyn English with the MERGA President, Merrilyn Goos, and Vice President (Research), Gloria Stillman.

5.3 ICTMA 15 Book in Final Stages of Production

The post conference volume of ICTMA 15, *Mathematical Modelling: Connecting to Research and Practice*, is being published by Springer and full registrants at ICTMA 15 in Melbourne should receive a copy. Authors receive a complimentary copy from Springer. The book starts with an introductory chapter by the editors, Gloria Stillman, Gabriele Kaiser, Werner Blum, and Jill Brown about the impact of globalization on connections in teaching and research practices in the teaching of mathematical modeling. There are a further 51 chapters which are grouped into seven parts: (I) Innovative practices in modelling education research and teaching, (II) Research into, or evaluation of, teaching practice, (III) pedagogical issues for teaching and learning, (IV) Influences of technologies, (V) Assessment in schools, (VI) Applicability at different levels of schooling, vocational education, and in tertiary education, (VII) Modelling and applications in business and the lived environment.

5.4 MMO Modelling Task Book Now Available

A collection of 8 classroom tasks has recently been published by Alston. The modeling tasks are for primary and secondary levels and the book includes suggested facilitation for group activities. The tasks and facilitation structure were trialed during the Mathematical Modelling Outreach event organised by the Mathematics and Mathematics Education Academic group at National Institute of Education, Singapore, in June 2010. Teachers can download the task sheets (without teachers' notes) for their students from www.myalston.com or www.alstonpublishinghouse.com



5.4 Teaching Award

Mark Schofield of Edge Hill University, UK, had a pleasant surprise awaiting him on his return home from ICTMA 15. Mark has won a National Teaching Fellowship. Well done, Mark!

5.5 International Journal of Applications of Fuzzy Sets on General State Spaces

ISSN 0976-4784. Web site: <http://ijafs.yolasite.com> 2 issues in a year (June and December)

The **International Journal of Applications of Fuzzy Sets on General State Spaces (IJAFS)** is a double-blind, peer-reviewed journal devoted to publication of original research results on a wide specter of problems in Fuzzy Sets, Fuzzy Systems and Fuzzy Logic (for more details on the areas of interest see "Aims and Scope"). The Journal will also publish critical survey articles, comprehensive review articles giving details of research progress made during the last three decades in a particular area, book reviews, dissertations' abstracts etc. We would like to invite you to submit manuscripts of your original papers (up to 25 pages) for possible publication in IJAFS. Authors are requested to submit their papers electronically to both mvosk@hol.gr and ijafs.editor@gmail.com. Please use PDF or Word files only. For more details about submission see "Instructions to the authors"

Aims and scope: The notion of fuzzy sets was introduced by Zadeh in 1965 (Information and Control, 8, 338-353) in response to have a mathematical representation of situations in everyday life in which definitions have not clear boundaries (e.g. high mountains, good players, tall people, etc). Since then the relevant theory was expanded rapidly, to cover almost all sectors of human activities. Today one can see fuzzy sets theory both as a formal theory which embraced classical mathematical areas such as algebra, graph theory, topology, etc and as a powerful modelling tool that can cope with a large function of uncertainties in real life situations.

IJAFS is a new high quality international academic journal devoted to publication of original research results on a wide specter of problems in Fuzzy Sets, Fuzzy Systems and Fuzzy Logic with emphasis on applications to all sectors of human activities including (but not limited to) applications of Fuzzy Sets on Algebra, Graph Theory and Discrete Mathematics in general, Geometry, Topology, Education, Natural, Life and Social Sciences, Design Sciences, Management and Economics, Information Theory, Decision Analysis, Engineering, Materials' Technology, Medicine and other Health Sciences, Systems Science, Telecommunications, Traffic and Aircraft Control, Robotics, Computer Science and Expert Systems, Learning Theories, Problem Solving and Modeling, Artificial Intelligence, Pattern Recognition and Clustering, etc. Theoretical contributions on Fuzzy Sets formal theory with promising applicable character are also welcome.

Indexing and Abstracting: The *IJAFS* will be abstracted and indexed in Mathematical Reviews, MathSciNet, Zentralblatt MATH and EBSCO databases

Michael Voskoglou <mvosk@hol.gr>

7. Recent Dissertations

Almuna Salgado, F. J. (2010). *Investigating the effect of item-context on students' performance on mathematics items.* Masters Coursework thesis, Melbourne Graduate School of Education, The University of Melbourne.

The current research in mathematics education recommends to measure how well students are able to apply their knowledge and mathematical skills and use them to solve problems in a real-life context but an increasing body of research has been ambivalent about the effects of contextualising mathematical tasks on students' performance. Thus, the present piece of research aims to investigate the effect of an alteration of item-context on students' performance, if any, on mathematics items. Items with the same mathematical core whilst varying in objective figurative context are used in this study. The study will also examine to what extent the nature of demand of the item-context may affect students' performance. A mixed method approach is used due to the character of the research aims. In this study significant differences were not found in students' performance when they solved items across altered contexts; but evidence indicated that students' performance on items required the second-order use of context may be more influenced by the alteration of context. The results of this

research give some insight into how the second-order use of context may influence students' performance on mathematics items. This outcome enhances the understanding of contextualised mathematical assessment and provides a foundation for future research into contextualised mathematical tasks.

Drakes, C.I. (2012). *Mathematical modeling: from novice to expert*. PhD, Simon Fraser University, Supervisors: JF Williams and Peter Liljedahl

This study strives to understand how mathematical modelling is perceived by novice, intermediate and expert modellers, through comparing and contrasting their understanding and habits of modelling. The study adopted a qualitative methodology based on observations, interviews and surveys of 78 participants. This included 14 experts who are professors, 11 intermediates consisting of graduate students and post-doctoral fellows, and 53 undergraduates or novices. The study incorporated interviews of the professors and the post-graduate participants, while questionnaires were utilized to understand the perspective of the undergraduate students. The study revealed that the majority of expert participants see modelling as a collaborative effort. There is a dichotomy among them regarding whether mathematical modelling is the setting up of a mathematical model alone, which is deemed an art, or if it includes the solving of the model, which is more a science. These differences have implications on how modelling is taught and how novices and intermediates in turn will view the modelling process. Experts also vary in their opinion on whether models must be verifiable or not. One key feature of the experts approach is that they begin by assuming that they do not understand the question asked and work to ensure that they do. This is despite their superior ability to solve problems. Intermediate participants were more forth-coming with their emotions on modelling than experts; they cited research as opposed to collaboration as their primary means of dealing with barriers arising during the modelling process, and gave credit to intuition as a skill needed for solving - something not mentioned among the experts. Novices were the most descriptive about their feelings when modelling. They conveyed a tendency to be more passive when encountering barriers, waiting for help or giving up as opposed to actively working through the problems. Many of our results, including those mentioned above, have implications for the teaching of effective mathematical modelling.

Oswalt, S. (2012). *Mathematical modeling in the high school classroom*. Master of Natural Sciences, Louisiana State University and Mechanical College

Mathematical modeling is the procedure whereby students apply concepts learned in class to new and unfamiliar situations. A modelling task is a mathematically-rich problem that engages students in mathematical thinking, drawing on their previously learned knowledge and supporting their understanding of the mathematical concepts currently being covered. Modelling requires students to assign meaning to the mathematical concepts and to extend the concepts beyond rote learning. In order for students to be successful in a classroom that is centered around the idea of mathematical modelling, the students must be taught how to collaborate with other students, persevere through challenging problems, and become aware of their own thinking.

In this thesis the focus is on a professional development workshop designed to train high school teachers on how to successfully use mathematical modeling in their classroom by providing teachers with compelling reasons why changes are necessary, steps on how to make the necessary changes, and good examples of problems to be used in class.

8. Recent Publications of Interest

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