ICTMA Newsletter

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).

Editor	*President*
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Contents

Please send future contributions to the editor by email <gloria.stillman@acu.edu.au>. The next Newsletter will be published in December, 2010. We are interested in your contributions to any of the current sections including project reports.

1. International Executive Committee

Following the business meeting in Hamburg on July 30, 2009, the ICTMA Executive for 2009-2011 was confirmed as follows:

President
  Prof Gabriele Kaiser (Germany)
Past Conference Organisers
  Richard Lesh (USA)
  Rita Borromeo Ferri (Germany)
Elected Members
  Toshikazu Ikeda (Japan) – Registrar
  Thomas Lingefjärd (Sweden)
  Gloria Stillman (Australia) – Newsletter Editor & Secretary
Co-opted Members
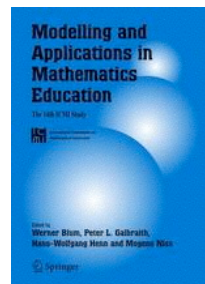 Jonei Barbosa (Brazil)
  Katja Maaß (Germany)
  Jinxing Xie (China) – Webmaster & List Serve Moderator

2. ICMI Study 14 on Applications and Modelling in Mathematics Education

It is three years now since the Study Volume to ICMI Study 14 on Applications and Modelling in Mathematics Education was published:

W. Blum, P. Galbraith, H.-W. Henn & M. Niss (Eds). (2007). *Modelling and Applications in Mathematics Education*. New York: Springer

In order to estimate the impact of this book on the scientific community, the editors have some questions for the ICTMA Community for which they would appreciate your responses:

1) Which reviews of this book in scientific journals, teacher journals etc. do you know of?

2) Have you drawn on material from the book in your own work, and if yes, which specific parts/chapters of the book have been most relevant to your activity?

3) Have you cited the book in recent papers?

4) Can you estimate the influence of the book or of certain parts/chapters on the discussion on modelling and applications in your country or internationally during the last three years (since the book was published)?

5) What are, in your opinion, the most important parts/chapters of the book?

6) What (if anything) do you think is missing in the book?

7) If the book were to be written today, which aspects would, in your view, be written differently (compared to four years ago when the book was completed or six years ago when the book was conceived), and which new aspects should be included?

Your answers will be most appreciated. Please write to Werner Blum: blum@mathematik.uni-kassel.de and send also a copy to Peter Galbraith: p.galbraith@uq.edu.au Hans-Wolfgang Henn: wolfgang.henn@mathematik.uni-dortmund.de Mogens Niss: mn@ruc.dk

Werner Blum

The 15th ICTMA Conference - ICTMA15 - will be hosted by the Australian Catholic University, Melbourne. It is being organised by Dr Gloria Stillman (Chair and Program Convenor) and Jill Brown (Chair and General Convenor). The conference is scheduled for 14-19 July 2011. For international registrants 14 July will be an early registration only.

The ICTMA group has held biennial meetings since 1983. This conference series provides a forum for discussing all aspects of teaching applications and mathematical modelling in all areas and at all levels of mathematics education – from primary to secondary schools, at colleges and universities. The next two ICTMA Biennial conferences will be ICTMA 15 in Melbourne, Australia in 2011 and ICTMA 16 in Blumenau, Brazil in 2013.

Conference Theme:

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

This conference brings together international experts in a variety of fields as well as local and regional teachers, post-graduate students and academics.

Academic programme includes:

- Plenaries by internationally acclaimed speakers
- Paper Presentations [research, theory, & practice]
- Workshops
- Symposium & Poster Sessions for tertiary students - pre-service teachers, post-graduate students in maths education & mathematical modelling
- Modelling Challenge for school students (primary & secondary)

The following themes will be the focus:

- 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

Papers:

One page abstracts for research papers and workshops will be refereed. A CD-ROM of conference proceedings will be published prior to the conference consisting of delegates' 8 page papers for those who wish to use this process. Authors are encouraged to bring paper copies of their papers for distribution. As is ICTMA practice, an edited commercial publisher book consisting of chapters based on selected, extended and revised papers which are fully peer reviewed will be published after the conference in the ICTMA series. Submission date of post-conference chapters to be advised.

Call for papers: 20 September 2011; Those requiring visas for entry to Australia will need to have their abstracts in by January 31, 2011, so invitational letters can be sent by February 21, 2011. If this is not early enough you will need to give full details to the conference organisers.

Final Deadline Abstracts: April 23, 2011 Notification: 15 May, 2011; Optional Conference Paper (8 pp.) to be included on CD due: June 21, 2011.

Confirmed Plenary Speakers:

Prof Dr Gabrielle Kaiser, University of Hamburg, Germany

Adjunct Prof Peter Galbraith, University of Queensland, Australia (Ken Houston Honorary Lecture)

Conference venue:

The conference will be held mainly at St Patrick's Campus of ACU (Melbourne). The campus is located in inner Melbourne. The possibility of a visit to ACU (Ballarat) for a plenary followed by a visit to the highly acclaimed Sovereign Hill, Ballarat, tourist attraction is being investigated by the organisers.

The University:

Australian Catholic University commenced operation in 1991 after the amalgamation of four Catholic institutions of higher education. ACU has an enrolment of 19000 students nationally with 1200 staff on 6 campuses in several Australian states. In Victoria there is a metropolitan campus in Melbourne and a regional campus at Ballarat. Melbourne (St Patrick's) campus is close to the Central Business District. It can be easily reached by tram and bus. It is close to the well known restaurant area in Brunswick Street, Fitzroy. ACU is a public university funded by the Australian Government.

Conference fee:

The conference fee will be approximately AUD 650 (400 €) with day registrations for teachers possible. Depending on sponsorship limited reductions for post-graduate students may be available. The full fee includes conference dinner, excursion, morning and afternoon teas, lunches, the CD and the post conference book.

Accommodation:

There is a range of accommodation available ranging from superior hotels such as the Metropole, Windsor and Hyatt, budget hotels such as the Ibis, and backpacker and student accommodation. These are all easily accessible to ACU (Melbourne) by tram or walking.

The City:

Melbourne is the capital city of the state of Victoria and the second most populated city in Australia. The population of Greater Melbourne and the Melbourne city is approaching 4 million. Melbourne was established in 1835 around the estuary of the Yarra River. It is situated on Port Phillip Bay. It is renowned for its shopping, good food and wine, galleries and theatres.

Transport

Melbourne is easily reachable by its internationally connected airport, Tullamarine. A taxi fare to the inner city would cost approximately AUD$40. However, there are cheaper methods of transport to the city heart where you will most likely be staying such as Jetbus Airport Shuttle (book on-line) and Skybus which drop passengers off at particular hotels and motels. There is also a public transport Metlink bus to the city. Rental cars are available at the airport. If you wish to use a limousine you need to book these ahead of time and you will be met by the driver as you clear customs. Australia has very strict customs laws so please declare anything you bring in and you will have fewer hassles.

For further information, please email the conference organisers: Gloria Stillman <gloria.stillman@acu.edu.au> and Jill Brown <jill.brown@acu.edu.au> or visit http://dlibrary.acu.edu.au/staffhome/jibrown/ICTMA.html

Australian Conferences in July: Mathematics Education Research Group of Australasia (MERGA) and Australian Association of Mathematics Teachers (AAMT) will hold a combined conference at Alice Springs in early July 2011. Visit www.merga.net.au and www.ammt.edu.au for further details.

4. Brief News Items

4.1 First Issue of New Journal on Modelling

A new journal featuring mathematical modelling began publication in 2009 with its first issue going on-line in December. The journal is published through the Reference Center for Mathematical Modelling in Teachng (CREMM), University of Blumenau, Brazil. The journal is called the *Journal of Modelling and Mathematical Applications*. There are expected to be 3 editions a year in March, July and November. The first editions will be on-line. Papers can be up to 35 pages; space 1.5, Times New Roman; A4. Contributions can be: original research papers, review articles, short communications, or book reviews. Papers will be refereed and the journal has an international editorial board. Submissions can be sent by e-mail to: cremm@furb.br or to: salett@furb.br The journal website is proxy.furb.br/ojs/index.php/journal. See the Recent Publications of Interest section of this Newsletter for citations of published articles.
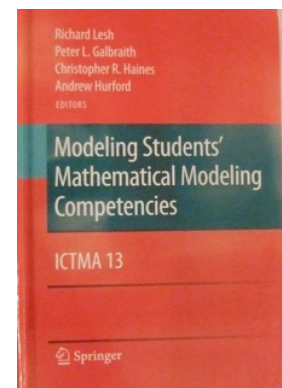
Maria Salett Biembengut

4.2 EIMI Study

Unfortunately the ICMI/ICIAM study on Educational Interfaces between Mathematics and Industry [EIMI] that was to be held in Lisbon, Portugal, in April had to to be rescheduled to October 11-15, 2010 due to the grounding of airplanes in Europe by fears of the risks of volcanic ash to flight safety. The EIMI-Study is organized jointly by the International Commission on Mathematical Instruction (ICMI) and the International Council for Industrial and Applied Mathematics (ICIAM). Gabriele Kaiser is part of the International Programme Committee and is jointly co-chairing with Henk Van der Kooij Working Group 4 on Education in Schools. The pre-conference proceedings have been published jointly by Centro Internacional de Matemática and COMAP.

4.3 ICTMA 13 Book Published

The post conference volume of ICTMA 13 is now available from the publisher, Springer. Full conference registrants for the conference in Bloomington will receive a copy. The book starts with an introduction by Gabriele Kaiser about ICTMA and the teaching of modelling and applications. There are a further 52 chapters which are grouped into two overarching parts: (I) the nature of models and modelling and (II) modelling in school classrooms. The first part is divided into six sections: (1) What are models? (2) Where are models and modelers found? (3) What do modeling processes look like? (4) What creates "The need for modeling"? (5) How do models develop? (6) How is modelling different from solving? The second part is divided into five sections: (1) How can students recognize the need for modelling? (2) How do cassroom modelling communities develop? (3) How do teachers develop models of modelling? (4) How do new technologies influence modelling in school? (5) What is the history of modelling in schools?
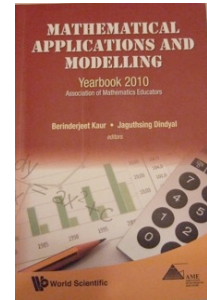
"The theme of ICTMA-13 was *modeling students' modeling competencies*; and, in many of the research methodologies that are described throughout this book, students develop models to describe or design 'real life' artefacts or tools; teachers develop models to describe students' modeling competencies – or to design productive learning environments; and, researchers develop models of interactions among students, teachers, and learning environments." (p. 5)

Please draw this book to the attention of your librarian and research students.

4.4 AME Yearbook 2010 on Applications and Modelling

The Association of Mathematics Educators has brought out its second yearbook. The 2010 year book is on Mathematical Applications and Modelling and is available from the publishers, World Scientific, Singapore, in both hardcopy and soft copy. The revised mathematics syllabuses in Singapore have recently "placed emphasis on reasoning, communications and connections; applications and modelling in addition to heuristics and thinking skills as processes that should pervade the implementation of the mathematics curriculum" (Kaur & Dindyal, pp. 5-6). The book is edited by Berinderjeet Kaur and Jaguthsing Dindyal. There are several chapters by ICTMA members such as Gabriele Kaiser, Gloria Stillman and Dawn Ng and others that could be of interest to ICTMA members. Several of these are mentioned in the Publications of Interest section of this newsletter.

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5. Reports from Regional Areas

5.1 AB Paterson College Mathematical Modelling Forum and Challenge in Australia

November 2009 saw the sixth annual Mathematical Modelling Challenge for primary and secondary school students held on the Gold Coast, Queensland. The Challenge has been held annually at Griffith University, Gold Coast Campus since it was begun in 2004 by Trevor Redmond, AB Paterson College. The Challenge has been sponsored annually by the College, Griffith University, Texas Instruments and various other orgainisations and businesses. Students in Years 4-11 come from all over south east Queensland to participate in the two day Challenge. In the senior part of the Challenge students worked in groups on a modelling problem of their own choice such as the effects of melting ice caps on rising sea levels, the cost effectiveness of renewable energy options, or the modelling of world records in track events whereas in other age groups students worked on a set task such as investigating the veracity of a video from the internet showing a person sliding down a ramp before becoming air-borne and then landing in a small pool. At the end of the two day Challenge each group presented a poster of their investigation and solution. Academics, some of whom are ICTMA members, from universities in Singapaore, Queensland and Victoria and teachers from AB Paterson College and pre-service teachers worked as mentors facilitating the groups for the two days. A highlight this year was the participation of several students from two schools in Singapore, Raffles Girls' School and Ngee Ann Secondary College. The Singaporean students and students from AB Paterson also participated in a Modelling Forum in the lead up to the annual Challenge. During this forum students collected data from various rides at Dream World using digital cameras and data loggers. They then analysed the data to answer questions they had posed.

5.2 Mathematical Modelling Activities in China Universities

5.2.1. Mathematical Modelling Courses

Currently, mathematical modeling courses are offered in about one thousand universities in different forms, which are more than half of all the universities in China. In the last decade, more than 110 Chinese textbooks on mathematical modelling were published, which are suitable to be used in courses for universities of different levels and students from different majors. In these textbooks, various industry problems are modeled as mathematical problems which can be solved with the students' knowledge learnt from their fundamental mathematics courses. Most of the university students, no matter which majors they enrol in, can receive some training in mathematical modelling. Furthermore, more than 200 universities have their own students' societies on mathematical modelling, and the societies are very active in the campuses for organizing extra-curricular mathematical modelling activities by the students themselves.

5.2.2. The CCTMMA Conference

In order to train teachers qualified for mathematical modelling courses and exchange teaching experiences among these teachers, the China Conference on the Teaching of Mathematical Modeling and Application (CCTMMA) has been organized every two or three years since 1986. In 1990, CSIAM (China Society for Industrial and Applied Mathematics) was founded, and within it a sub-society of mathematical modeling was established. CCTMMA is co-sponsored by this sub-society and the educational committee of CSIAM since 1991. They have become powerful players in motivating and organizing the teaching of mathematical modeling. In 2009, more than six hundred teachers from over 200 universities participated in the 11th CCTMMA, which was more than thirty times the twenty participants in the first CCTMMA of 1986.

5.2.3. The CUMCM Contest

CSIAM has being organizing the China Undergraduate Mathematical Contest in Modelling (CUMCM) every year since 1992. In this three-day long (72 hours) contest, teams of up to three undergraduates students will investigate, model, and submit a solution to one of two modeling problems, which simulate real-word problems in engineering, management, etc. During the contest, teams are permitted to reference any data source they wish, but they must cite all sources. Failure to credit a source will result in a team being disqualified from the competition.

In 2009, there was participation by 15042 teams from 1137 institutions in the contest, representing almost all of the most prominent institutions and more than 50% of all institutions in China. It is also interesting that more than 80% of the participants are engineering, economics, management, and even social science and humanities majors, other than mathematics majors one might expect. More details about CUMCM can be found from the Web site http://www.mcm.edu.cn (including all the contest problems used in previous years in English). Teams from other countries are welcome to join the contest.

Jingxing Xie

5.3 Mathematical Modelling Outreach and Lee Peng Yee Symposium 2010 in Singapore

The Mathematics and Mathematics Education Academic Group at the National Institute of Education (NIE) organised two consecutive events as part of NIE's celebration of 60 years of teacher education in Singapore: a ***Mathematical Modelling Outreach 2009*** (MMO) from 1 to 3 Jun 2010 and the second ***Lee Peng Yee Symposium*** (LPYS) on 4 Jun 2010**. Mathematical modelling is the newest focus in the Singapore Mathematics Curriculum, and there is current interest in the use of various forms of open-ended activities and contextualised tasks in our mathematics classrooms. A main objective of MMO and LPYS was to introduce the potentials of mathematical modelling as an exciting learning activity to inculcate mathematical thinking, communication and reasoning among primary and secondary students in Singapore schools.

Gabriele Kaiser with Lee Peng Yee, Lee Ngan Hoe with Toshi Ikeda and Gloria Stillman with Dawn Ng at MMO on 1 June.

The Mathematical Modelling Outreach took place at River Valley High School. The event began with an opening speech by Associate Professor Ang Keng Cheng of NIE and this was followed by a plenary address by Professor Gabriele Kaiser of Hamburg University, Germany. During the Mathematical Modelling Outreach, student groups (ages 10-11 and 13-14) worked with their mentors (NIE staff and pre-service teachers) on modelling tasks. Tasks included flight punctuality at airports and designing a four person tent. Students came from 29 invited Singaporean schools, AB Paterson College (Australia) and Stanford International School (a primary school from Bandung, Indonesia). Accompanying teachers attended a series of workshops on modelling coordinated by Lee Ngan Hoe and Dawn Ng with input from international researchers. The week culminated in the second Lee Peng Yee Symposium where part of the day was allocated for poster presentations of students' work from the MMO. Keynote speeches during the Symposium provided practical suggestions to teachers on how to infuse modelling tasks into their day-to-day teaching activities. Keynotes were given by Professor Lyn English (Australia), Associate Professor Gloria Stillman (Australia) and Associate Professor Ang Keng Cheng (Singapore). There was also an international panel discussion chaired by Professor Gabriele Kaiser. The Symposium was attended by international academics, officials from the Singapore Ministry of Education, staff from NIE and school representatives. Professor Lee Peng Yee, in whose honour the symposium was held, gave the closing address.
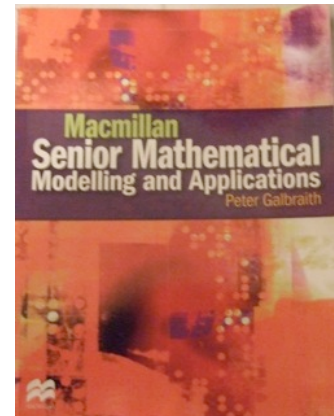
Dawn Ng

6. Reviews of Teaching Materials

In this section we hope to review books or other media that provide materials or resources for teaching with applications and modelling. Please send in short pieces for the benefit of other members and new converts to modelling and applications from whom we receive many enquiries.

Review of Macmillan Senior Mathematical Modelling and Applications by Peter Galbraith. Published by Macmillan, Melbourne, 2009, vvii + 185 pp.

This is a photocopiable resource for teachers comprising 20 modelling and application tasks providing real-life contexts for students to explore. Each task is presented in the format of background information to act as a stimulus, several open problems, structured questions for those not so willing or able to take an open modelling approach followed by teacher notes. Possible solutions are then provided. A table at the beginning of the book links the tasks to various senior courses (Years 11 and 12) and areas of study. The book thus complements the textbook series published by Macmillan for the Victorian curriculum but the content and approaches are suitable for similar content in other curricula. Tasks include blood alcohol level, product coding, water level in dams, energy balance in various foods, heptathlon, club fundraising, climate change and oil pipe lines and storage. Solutions shown range from simple algebraic models to those involving calculus as well as geometrical, probalistic and trigonometric models.

As it is expected that teachers will photocopy it the price is rather high at AUD 99.99 (Australian Recommended Price). This is unfortunate as this is too prohibitive a price for it to be a recommended purchase for pre-service teachers although perhaps competitive as a single resource for a mathematics department.

7. Recent Dissertations

Okur, S. (2008). *Students' strategies, episodes and metacognitions in the context of PISA 2003 mathematical literacy items*. **Unpublished MSc thesis in Secondary Science and Mathematics Education. Middle East Technical University. Supervisor: Assist. Prof Dr Ayhan Kürsat Erbas.**

The purpose of this study was to investigate the problem solving strategies, problem solving episodes, and metacognition of five Turkish students just graduated from elementary school and explore the interplay of these factors on their problem solving success in mathematics. The research data was collected by clinical interviews and a self monitoring questionnaire followed by the interviews. Ten mathematical problems that participant students had worked on were selected among the released mathematical literacy items used in Programme for International Student Assessment (PISA) 2003.

The problem solving strategies used by participants were coded according to the descriptions given by Posamentier and Krulik (1999). The cognitive-metacognitive problem solving framework developed by Artzt and Armour-Thomas (1992) has been used to observe the problem solving episodes of the participants. The coding system developed by Pappas et al. (2003) has been utilized to examine the major components of metacognition (mistake recognition, adaptability, awareness and expression of thought) of the participants. The self-monitoring questionnaire responses were analyzed to cross check the results obtained from the clinical interviews.

The problem solving behaviors of the participants observed in the study confirmed their academic success levels. The study confirmed that problem solving success is too complex to be clarified by a unique property or a behaviour of the problem solver. Problem solving requires overcoming various obstacles to reach a successful result. Hence, not only should the students have the required mathematical knowledge and a good repertoire of different problem solving strategies, but also they should know when and how to use those strategies. In addition, they could monitor and regulate their problem solving processes using their metacognitive skills. So mathematics teachers should provide problems that require different problem solving strategies and encourage the students to explore new strategies, to take risks in trying to discuss failures and successes with peers and the teacher

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8. Recent Publications of Interest

András, S. & Szilágyi, J. (2010). Modelling drug administration regimes for asthma: a Romanian experience. *Teaching Mathematics and its Applications, 29*(1), 1-13. doi:10.1093/teamat/hrp017

Anderson, J. (2010). Collaborative problem solving as modelling in the primary years of schooling. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 78-93). Singapore: World Scientific.

Araújo, J.L. (2010). Brazilian research on modelling in mathematics education. *ZDM—The International Journal on Mathematics Education, 42*(3), 337-348. DOI: 10.1007/s11858-010-0238-9

Balakrishnan, G., Yen, P. Y., & Goh, E. (2010). Mathematical modelling in the singapore secondary school mathematics curriculum. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 112-128). Singapore: World Scientific.

Bevilácqua, L., Brandão, A. J. V., & Bassanezi, R.C. (2009). A mathematical approach to the Plato's problem. *Journal of Mathematical Modelling and Application, 1*(1), 2-17.

Blum, W., & Borromeo Ferri, R. (2009). Mathematical modelling: Can it be taught and learnt? *Journal of Mathematical Modelling and Application, 1*(1), 45-58.

Borromeo Ferri, R., (2010). On the influence of mathematical thinking styles on learners' modeling behavior. *Journal for Didactics of Mathematics, 31*(1), 99-118.

Camarena, G. P. (2009). Mathematical modelling and knowledge transference. *Journal of Mathematical Modelling and Application, 1*(1), 18-36.

Clarke, D., & Roche, A. (2009). Opportunities and challenges for teachers and students provided by tasks built around "real" contexts. In R. Hunter, B. Bricknell & T. Burgess (Eds.), *Crossing divides*, Proceedings of the 32nd annual conference of the Mathematics Education Research Group of Australasia (MERGA) (pp. 722-726). Adelaide: MERGA. [Available from: www.merga.net.au]

Chan, C.M.E. (2010). Mathematical modelling in a PBL setting for pupils: Features and task design. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 112-128). Singapore: World Scientific.

D'Ambrosio, U. (2009). Mathematical modelling: Cognitive, pedagogical, historical and political dimensions. *Journal of Mathematical Modelling and Application, 1*(1), 89-98.

Dindyal, J. (2010). Word problems and modelling in primary school mathematics. In B. Kaur & J. Dindyal (Eds.), Mathematical applications and Modelling: Yearbok 2010 Association of Mathematics Educators (pp. 94-111). Singapore: World Scientific.

Föerster, F., & Kaiser, G. (2010). The cable drum—description of a challenging mathematical modelling example and a few experiences. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and Modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 276-299). Singapore: World Scientific.

Heck, A. (2009). Bringing reality into the classroom. *Teaching Mathematics and its Applications, 28*(4), 164-179. doi:10.1093/teamat/hrp025.

Technology offers ample opportunities to bring reality into the classroom. Students and teachers nowadays have many tools to work in an authentic way with real data in mathematics and science education. However, much research and development are still needed to create a consistent learning trajectory out of the many exciting single activities. Some examples are presented, in particular with regard to video and image analysis, modelling and simulation. In addition, authentic research projects of secondary school students are discussed.

Kaiser, G., Lederich, & Rau, V. (2010). Theoretical approaches and examples for modelling in mathematics education. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and Modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 219-246). Singapore: World Scientific.

Kaiser, G. & Schwarz, B. (2010). Authentic modelling problems in mathematics education—Examples and experience. *Journal for Didactics of Mathematics, 31*(1), 51-76.

Kaur, B., & Dindyal, J. (2010). A prelude to mathematical applications and modelling in Singapore schools. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and Modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 3-17). Singapore: World Scientific.

Kissane, B. (2010). Using ICT in applications of secondary schoolmathematics. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and Modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 178-198). Singapore: World Scientific.

Leiss, D., Schukajlow, S., Blum, W., Messner, R., & Pekrun, R. (2010). The role of th situation model in mathematical modelling—Task analyses, student competencies, and teacher interventions. *Journal for Didactics of Mathematics, 31*(1), 119-142.

Lesh, R., Galbraith, P. L., Haines, C. R. & Hurford, A. (Eds.). (2010). *Modeling students' mathematical modeling competencies: ICTMA13*. New York: Springer.

Ludwig, M. & Xu, B. (2010). A comparative study of modelling competencies among Chinese and German students. *Journal for Didactics of Mathematics, 31*(1), 77-97.

Heilio, M. (2009). Mathematics for society, industry and innovation. *Journal of Mathematical Modelling and Application, 1*(1), 37-44.

Ng, K. E. D. (2010). Initial experiences of primary school teachers with mathematical modelling. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and Modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 129-148). Singapore: World Scientific.

Ng, K. E. D., & Stillman, G. (2009). Patterns of thinking skills application during collaborative work in a longitudinal mathematically-based interdisciplinary project. In Cheah, U. H,, Wahyudi, Devadason, R. P., Ng, K. T., Preechaporn, W., & Aligaen, J. C. (Eds.), *Proceedings of the Third International Conference on Science and Mathematics Education (CoSMEd)*(pp. 320-328). Penang, Malayasia: SEAMEO Regional Centre for education inScience and Mathematics.

Oldknow, A. (2009). Their world, our world--bridging the divide. *Teaching Mathematics and its Applications, 28*(4), 180-195. doi:10.1093/teamat/hrp027.

Students worldwide are gaining access to powerful computing devices and services. They are learning from each other how to find and share information, how to carry out useful tasks such as editing images and video, and where to find the best entertainment. Classrooms, especially in the UK, are changing to make better access to computer technology for teachers to use in presenting information to students. The term 'digital divide' was used to distinguish between students who did and did not have access to information and communication technology (ICT). Now there is an increasing digital divide between the ways students use ICT for themselves, and that which they experience at school. This article considers how that divide may be narrowed by involving students more centrally in their own learning. It is illustrated by material from recent school-based projects including examples of ICT-based activities used to help make mathematics more exciting, relevant and challenging to young learners—and also to develop its cross-curricular use in science, technology, engineering and mathematics.

Palm, T., & Nyström, P. (2009). Gender aspects of sense making in word problem solving. *Journal of Mathematical Modelling and Application, 1*(1), 59-76.

Pierce, R., & Stacey, K. (2009). Researching principles of lesson design to realize the pedagogical opportunities of mathematics analysis software. *Teaching Mathematics and its Applications, 28*(4), 228-233. doi:10.1093/teamat/hrp023.

Taking advantage of pedagogical opportunities afforded by new technology requires appropriately designed lessons. This article reports on the use of 'lesson study' to research principles for the design of a lesson aiming to take advantage of multiple representations. The lesson, for year 10 students who had personal access to TI-Nspire, focused on quadratic functions. Following observation of nine different classes and teachers, four key principles emerged: focus on the main goal for that lesson (despite the possibilities offered by having many representations available); identify different purposes for using different representations to maintain engagement; establish naming protocols for variables that are treated differently when working with pen and paper and within a machine; and reduce any sources of cognitive load that are not essential.

Pournara, C. (2009). Spreadsheets as a transparent resource for learning the mathematics of annuities. *For the Learning of Mathematics, 29*(3), 49-52.

Stillman, G. (2010). Implementing applications and modeling in secondary school: Issues for teaching and learning. In B. Kaur & J. Dindyal (Eds.), *Mathematical applications and Modelling: Yearbok 2010 Association of Mathematics Educators* (pp. 300-322). Singapore: World Scientific.

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