

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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Please send future contributions to the editor by email <gloria.stillman@acu.edu.au>. The next Newsletter will be published in June, 2011. We are interested in your contributions to any of the current or previously published 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)

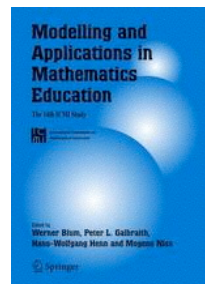
Jinxing Xie (China) – Webmaster & List Serve Moderator

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

It is over 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

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

The 15th ICTMA Conference - ICTMA15 - will be hosted by the Australian Catholic University, Melbourne. It is being organised by A/Prof 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 and informal reception.

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 – Prof Dr Gabriele Kaiser, A/Prof Peter Galbraith, Prof Lyn English are confirmed
- 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) 13-14 July

The following sub-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. 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. Over 25 abstracts have already been accepted. So far there have been some in most sub-themes but we need some focussing on the last one.

Accepted abstracts are available at www.ictma15.edu.au

Abstracts Due: April 30, 2010

Conference Paper (8 pp.) Due: June 21, 2010.

Conference venue and Excursion:

The conference will be held mainly at St Patrick's Campus of ACU (Melbourne). The campus is located in inner Melbourne. On Monday 18 July there will be an excursion during which we will visit ACU (Ballarat) for morning tea, a plenary followed by lunch with wine tasting and a visit to the Gold Museum and the Kirrit Barreet Aboriginal Art and Cultural Centre.

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 is AUD \$695 for academics with day registrations for school teachers possible (see website). The full fee includes conference dinner, excursion, morning and afternoon teas, lunches, the CD and the post conference book. **Registration is now open at www.ictma15.edu.au**

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\$45. 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 **visit www.ictma15.edu.au** or email the conference organisers: Gloria Stillman <gloria.stillman@acu.edu.au> and Jill Brown <jill.brown@acu.edu.au>

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 EIMI Study in Lisbon

The ICMI/CIAM study on Educational Interfaces between Mathematics and Industry [EIMI] was held in Lisbon, Portugal, October 11-15, 2010 after having to be rescheduled from April due to the grounding of airplanes in Europe by fears of the risks of volcanic ash to flight safety. The EIMI-Study was organized jointly by the International Commission on Mathematical Instruction (ICMI) and the International Council for Industrial and Applied Mathematics (CIAM). Gabriele Kaiser was part of the International Programme Committee and jointly co-chaired with Henk Van der Kooij Working Group 4 on Education in Schools. The pre-conference proceedings were published jointly by Centro Internacional de Matemática and COMAP in hardcopy and are also published electronically on the website. Several ICTMA members from several countries attended as well as Gloria Stillman and Gabriele Kaiser from the executive committee. It is anticipated that the post conference volume published by Springer will be available in 2011.

4.2 ICTMA 14 Book in Final Stages of Production

The post conference volume of ICTMA 14, *Trends in Teaching and Learning of Mathematical Modelling*, is in the hands of the publisher, Springer and you should have corrected your page proofs by now. Full conference registrants for the conference in Hamburg will receive a copy later in the year. The book starts with an introductory chapter by the editors, Gabriele Kaiser, Werner Blum, Rita Borromeo Ferri and Gloria Stillman, about trends in the teaching and learning of modelling. There are a further 67 chapters which are grouped into eight parts: (I) modelling from primary to upper secondary school: Findings of empirical research, (II) Looking deeper into modelling processes: Studies with a cognitive perspective, (III) Modelling in teacher education, (IV) Using technologies: New possible ways of learning and teaching modelling, (V) Modelling competency: learning, applying and developing competencies, (VI) Modelling in tertiary education, (VII) Modelling examples and modelling projects: Concrete cases, and (VIII) Theoretical and curricular reflections on modelling. The book is expected to be published well before ICTMA 15 in Melbourne.

4.3 ICME Survey Team Transitions

Our webmaster and executive member Prof Jinxing Xie is 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 will report to the ICME-2012 conference in Korea. Here the transition topic is narrowed down so that "The idea is to concentrate on mathematical 'problems' rather than psychological (or sociological)" ones, which means that the team looks at epistemological and cognitive issues related to the mathematics rather than cultural, institutional, social, psychological issues, etc. Thus, they are concerned with ONLY the mathematical thinking and concepts in transition from school to university (tertiary), not with any other aspects of transition. Of course this may consider related teaching approaches, but not any social or cultural or other aspects unless they are directly relevant. The Survey Teams are entrusted to carry out a survey of the latest developments regarding a certain theme or issue of Mathematics Education, which the IPC considers especially important for the ICMI community. Emphasis is placed on pinpointing new knowledge, new perspectives, significant realizations and emerging challenges. The work of the team is presented in a lecture at the congress. Survey Teams ensure that the participants to the Congress are made aware of recent developments in the field on crucial issues in a rather comprehensive and synthetic way, paying specific attention to the evolution since the time of the previous ICME.

Jinxing Xie's task within the survey team is related to the topic of transition in "modelling, applications, applied mathematics" which fully corresponds to the interest of our ICTMA. Although there are many studies on this topic for both the secondary and tertiary levels, knowledge of any literature focusing on the "transition" from the secondary and tertiary levels in this topic is scarce. If you know of any related literature (or the journals or websites), please contact Jinxing. Any other suggestions are also welcome. Email: jxie@math.tsinghua.edu.cn

4.4 Teaching Award




Dr Rita Borrromeo Ferri has won a teaching award for 3000 EUR at the University of Hamburg from the Faculty of Education, Psychology and Human Movement. The award was for a modelling seminar that Rita taught. The name of the modeling seminar was “Mathematical modelling – theoretical background, development of modelling problems, analysis and approaches for the teaching and learning.”

5. Reports from Regional Areas

5.1 AB Paterson College Mathematical Modelling Forum and Challenge in Australia

The seventh annual Mathematical Modelling Challenge for primary and secondary school students was held on the Gold Coast, Queensland, in November 2010. The Challenge has been held annually at Griffith University, Gold Coast Campus since it was begun in 2004 by Trevor Redmond of AB Paterson College. The Challenge has been sponsored annually by the College, Griffith University, Texas Instruments and various other organisations and businesses. Over 340 students in Years 4-11 come from all over south east Queensland and from overseas 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 modelling three action movie stunts to see if they were authentic. Younger students worked in groups on se tasks such as the Yowie Foot Print, The Best Paper Plane, modelling of a Helium Balloon large enough to lift a giant mascot for a football team above a local stadium and the best rotor for a wind powered windmill. 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 Singapore, Queensland and Victoria and teachers from AB Paterson College worked as mentors facilitating the groups for the two days.

Following the success of last year’s inaugural Modelling Forum for teachers and students, the Challenge was preceded by a three day forum. This involved 11 teachers and 64 students from three Singaporean schools, Raffles Girls’ School, Dunman High School and Ngee Ann Secondary College and teachers and students from AB Paterson College as well as a student from Varsity College. 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. Both teachers and students listened to several talks and participated in workshops on modelling by a variety of speakers including several well known ICTMA speakers Dick Lesh, Peter Galbraith, Gloria Stillman and Jill Brown.

		
<p>Prof Dick Lesh presenting to Singaporean teachers at the Modelling Forum.</p>	<p>Modelling one of the rides at Dreamworld</p>	<p>Modelling the peeling of a pineapple to remove the “eyes”.</p>

6. Recent Dissertations

Bergman Ärlebäck, J. (2010). *Mathematical modelling in the upper secondary mathematical curriculum in Sweden: A curricula and design study.* Linköping Studies in Science and Technology Dissertation, No. 1289, Linköping University Institute of Technology.

The aim of this thesis was to investigate and enhance our understanding of the notions of mathematical models and modelling at the Swedish upper secondary school level. The focus was on how mathematical models and modelling are viewed by the different actors in the school system, and what characterises the collaborative process of a didactician and a group of teachers engaged in designing and developing, implementing and evaluating teaching modules (so called modelling modules) exposing students to mathematical modelling in line with the present mathematics curriculum. The thesis consists of five papers and reports, along with a summary introduction, addressing both theoretical and empirical aspects of mathematical modelling.

The thesis uses both qualitative and quantitative methods and draws partly on design-based research methodology and cultural-historical activity theory (CHAT). The results of the thesis are presented using the structure of the three curriculum levels of the intended, potentially implemented, and attained curriculum respectively.

The results show that since 1965 and to the present day, gradually more and more explicit emphasis has been put on mathematical models and modelling in the syllabuses at this school level. However, no explicit definitions of these notions are provided but described only implicitly, opening up for a diversity of interpretations.

From the collaborative work case study it is concluded that the participating teachers could not express a clear conception of the notions mathematical models or modelling, that the designing process often was restrained by constraints originating from the local school context, and that working with modelling highlights many systemic tensions in the established school practice. In addition, meta-results in the form of suggestions of how to resolve different kinds of tensions in order to improve the study design are reported.

In a questionnaire study with 381 participating students it was concluded that only one out of four students stated that they had heard about or used mathematical models or modelling in their education before, and the expressed overall attitudes towards working with mathematical modelling as represented in the test items were negative. Students' modelling proficiency was positively affected by the students' grade, last taken mathematics course, and if they thought the problems in the tests were easy or interesting. In addition empirical findings indicate that so-called realistic Fermi problems given to students working in groups inherently evoke modelling activities.

Biccard, P. (2010). *An Investigation into the development of mathematical modelling competencies of Grade 7 learners.* Unpublished Masters thesis in Master of Education, Stellenbosch University. Supervisor: Prof. D C J Wessels.

Mathematical modelling is becoming a popular teaching and learning approach in mathematics education. There is however a need within the modelling domain to identify exactly what modelling competencies are and how these competencies develop. This study examined how mathematical modelling competencies develop in Grade 7 students working in groups.

Modelling is placed in the field of mathematics teaching and learning as a significant means of learning mathematics. Modelling competencies were identified and characterised from existing literature and explored through empirical generation and collection of data. The study is qualitative in nature and uses a mixed approach of design research and some aspects of grounded theory. Students' progress through a modelling program is documented while the modelling competencies of students stereotyped as weak and strong were also investigated. The findings firmly support earlier research that competencies do develop in students who are exposed to modelling. A comprehensive picture of the modelling situation is presented since this study merges competencies from other studies into a detailed analysis of the modelling situation - it presents an authentic modelling situation of students working in groups and furthers the discussion on modelling competencies.

The analysis of the data suggests that the development of modelling competencies is complex and interrelated but that competencies do develop progressively in groups involved in modelling tasks. Recommendations for additional studies include studies of a longer duration and a full investigation into the link between modelling and language ability.

Borromeo-Ferri, R. (2010). *Ways to the "inner-world" of modelling: cognitive analysis of modelling processes in mathematics lessons* (published in German under the title: *Wege zur Innenwelt des Mathematischen Modellierens* 187 pages (Vieweg+Teubner).

Analyzing modelling processes with a cognitive/psychological perspective is much neglected in the national and international discussion on mathematical modelling. This book reports a study which had as the goal to investigate grade 10 pupils' and teachers' cognitive processes during modelling activities in mathematics lessons. The first part of the book deals with the theoretical background concerning the state of analysing cognitive processes while modelling in several studies and concerning several perspectives and modelling cycles. Further more the theory of mathematical thinking styles is explained and connected with modelling. In the second part of the book the methodology and methods of the study are presented. The results of the study are formulated in the third part of the study. One central result was the reconstruction of individual modelling routes of pupils during group work. These routes are described in detail and the influence of the mathematical thinking styles of pupils on these modelling routes is shown. Furthermore the development of "micro-modelling-cycles" in connection with the structure of several modelling problems is demonstrated. Also different types of teacher-behaviour could be reconstructed during modelling lessons. Consequences for teaching and learning are presented in the fourth part of the book.

Yildirim, T. P. (2010). *Understanding the modeling skill shift in engineering: The impact of self-efficacy, epistemology and metacognition*. Unpublished PhD thesis, University of Pittsburgh.

A focus of engineering education is to prepare future engineers with problem solving, design and modeling skills. In engineering education, the former two skill areas have received copious attention making their way into the ABET criteria. Modelling, a representation containing the essential structure of an event in the real world, is a fundamental function of engineering, and an important academic skill that students develop during their undergraduate education. Yet the modeling process remains under-investigated, particularly in engineering, even though there is an increasing emphasis on modelling in engineering schools (Frey, 2003). Research on modelling requires multiple perspectives, that of cognition, affect, and knowledge expansion. In this dissertation, the relationship between engineering modeling skill and students' cognitive backgrounds including self-efficacy, epistemic beliefs and metacognition is investigated using model-eliciting activities (MEAs). The impact of each cognitive construct on change in modeling skills was measured using a growth curve model at the sophomore level, and ordinary least squares regression at the senior level. Findings suggest that self-efficacy, through its direct and indirect (moderation or interaction term with time) impact, influences the growth of modelling abilities of an engineering student. When sophomore and senior modelling abilities are compared, the difference can be explained by varying self-efficacy levels. Epistemology influences modeling skill development such that the more sophisticated the student beliefs are, the higher the level of modelling ability students can attain, after controlling for the effects of conceptual learning, gender and GPA. This suggests that development of modelling ability may be constrained by the naiveté of one's personal epistemology. Finally, metacognition, or 'thinking about thinking', has an impact on the development of modelling strategies of students, when the impacts of four metacognitive dimensions are considered: awareness, planning, cognitive strategy and self-checking. Students who are better at self-checking show higher growth in their modelling abilities over the course of a year, compared to students who are less proficient at self-checking. The growth is moderated by the cognitive strategy and planning skills of the student. Therefore, inherent metacognitive abilities of students can positively affect the growth of modelling ability.

7. Recent Publications of Interest

- Ang, K-C. (2010). Mathematical modelling in the Singapore curriculum: Opportunities and challenges. In A. Araújo, A. Fernandes, A. Azevedo, & J. F. Rodrigues (Eds.), *EIMI 2010 Conference Educational interfaces between mathematics and industry proceedings* (pp.53-62). Lisbon & Bedford, MA: CIM. Portugal & COMAP.
- Bergman Årlebäck, J., & Frejd, P. (2010). First results from a study investigating Swedish upper secondary students' mathematical modelling competencies. In A. Araújo, A. Fernandes, A. Azevedo, & J. F. Rodrigues (Eds.), *EIMI 2010 Conference Educational interfaces between mathematics and industry proceedings* (pp.63-75). Lisbon & Bedford, MA: CIM. Portugal & COMAP.
- Biembengut, M. S., & Hein, N. (2010). Mathematical modelling in industrial engineering: A isolated activity does not change a educational structure. In A. Araújo, A. Fernandes, A. Azevedo, & J. F. Rodrigues (Eds.), *EIMI 2010 Conference Educational interfaces between mathematics and industry proceedings* (pp.97-106). Lisbon & Bedford, MA: CIM. Portugal & COMAP.
- Chinnappan, M. (2010). Cognitive load and modelling of an algebra problem. *Mathematics Education Research Journal*, 22(2), 8-23.
- English, L. (2010). Young children's early modelling with data. *Mathematics Education Research Journal*, 22(2), 24-47.
- Frankenstein, M. (2010). Developing a critical mathematical numeracy through real real-life word problems In U. Gellert, E. Jablonka, & C. Morgan (Eds.), *Proceedings of the sixth international Mathematics Education and Society conference* (2nd ed.) (Vol.1, pp. 248-258). Berlin: Free Univerisity of Berlin.
- Geiger, V., Faragher, R., & Goos, M. (2010). CAS-enabled technologies as 'Agents Provocateurs' in teaching and learning mathematical modelling in secondary school classrooms. *Mathematics Education Research Journal*, 22(2), 48-68.
- Gustafsson, L., & Mouwitz, L. (2010). Mathematical modelling and tacit rationality—two intertwining kinds of professional knowledge. In A. Araújo, A. Fernandes, A. Azevedo, & J. F. Rodrigues (Eds.), *EIMI 2010 Conference Educational interfaces between mathematics and industry proceedings* (pp.253-268). Lisbon & Bedford, MA: CIM. Portugal & COMAP.
- Houston, K., Maher, G., Wood, L., Petocz, P., Reid, A., Harding, A., Engelbrecht, J., & Smith, G. (2010). Is there life after modelling? Students conceptions of mathematics. *Mathematics Education Research Journal*, 22(2), 69-80.
- Jablonka, E., & Gellert, U. (2011). Equity concerns about mathematical modelling. In B. Atweh, M. Graven, W. Secada, & P. Valero (Eds.), *Mapping equity and quality in mathematics education* (pp. 223-236). New York: Springer.
- Kaland, C., Kaiser, G., Ortleib, C. P., & Struckmeier, J. (2010). Authentic modelling problems in mathematics education. In A. Araújo, A. Fernandes, A. Azevedo, & J. F. Rodrigues (Eds.), *EIMI 2010 Conference Educational interfaces between mathematics and industry proceedings* (pp.321-332). Lisbon & Bedford, MA: CIM. Portugal & COMAP.
- Kim, S. H., & Kim, S. (2010). The effects of mathematical modelling on creative production ability and self-directed learning attitude. *Asia Pacific Education Review*, 11(2), 109-120. doi:10.1007/s12564-009-9052-x
- Klymchuk, S., Zverkova, T., Gruenwald, N., & Sauerbier, G. (2010). University students' difficulties in solving applications problems in Calculus: Student perspectives. *Mathematics Education Research Journal*, 22(2), 81-91.
- Koh Noi Keng & Low, H.W. (2010). Learning mathematics concepts through authentic learning. In L. Sparrow, B. Kissane, & C. Hurst (Eds.), *Shaping the future of mathematics education*, Proceedings of the thirty-third annual conference of the Mathematics Education Research Group of Australasia (Vol. 1, pp. 305-311). Freemantle, WA: MERGA. [Available from www.merga.net.au]
- Lingefjård, T., & Meier, S. (2010). Teachers as managers of the modelling process. *Mathematics Education Research Journal*, 22(2), 92-107.
- Maaß, K. (2010). Classification scheme for modelling tasks. *Journal for Didactics of Mathematics*, 31(2), 285-311.
- Maaß, K., & Mischo, C. (2011). Implementing modelling into day-to-day teaching practice—The project STRATUM and its framework. *Journal for Didactics of Mathematics*, 32(1), 103-131.
- Matsuzaki, A. (2010). Mathematical modelling in making linkages or mechanics: Using LEGO located in elementary mechatronics tools. In A. Araújo, A. Fernandes, A. Azevedo, & J. F. Rodrigues (Eds.), *EIMI 2010 Conference Educational interfaces between mathematics and industry proceedings* (pp.1-10). Lisbon & Bedford, MA: CIM. Portugal & COMAP.
- Peled, I. (2010). (Fish) food fo thought: Authority shifts in the interaction between mathematics and reality. *Mathematics Education Research Journal*, 22(2), 108-120
- Perrenet, J., & Adan, I. (2010). The academic merits of modelling in higher mathematics education. *Mathematics Education Research Journal*, 22(2), 121-140.
- Redmond, T., Sheehy, J., & Brown, R. (2010). Exploring the relationship between mathematical modelling and classroom discourse. In L. Sparrow, B. Kissane, & C. Hurst (Eds.), *Shaping the future of mathematics education*, Proceedings of the thirty-third annual conference of the Mathematics Education Research Group of Australasia (Vol. 2, pp. 485-492). Freemantle, WA: MERGA. [Available from www.merga.net.au]
- Stillman, G., & Ng, D. (2010). The other side of the coin—Attempts to embed authentic real world tasks in the secondary curriculum. In A. Araújo, A. Fernandes, A. Azevedo, & J. F. Rodrigues (Eds.), *EIMI 2010 Conference Educational interfaces between mathematics and industry proceedings* (pp. 491-500). Lisbon & Bedford, MA: CIM. Portugal & COMAP.
- Teodoro, V.D., & Neves, R.G. (2011). Mathematical modelling in science and mathematics education. *Computer Physics Communications*, 182(1), 8-10.

- Widjaja, W. (2010). Modelling the cooling of coffee: Insights from a preliminary study in Indonesia. In L. Sparrow, B. Kissane, & C. Hurst (Eds.), *Shaping the future of mathematics education*, Proceedings of the thirty-third annual conference of the Mathematics Education Research Group of Australasia (Vol. 2, pp. 626-632). Freemantle, WA: MERGA. [Available from www.merga.net.au]
- Xie, J. (2010). Mathematical modelling courses and related activities in China universities. In A. Araújo, A. Fernandes, A. Azevedo, & J. F. Rodrigues (Eds.), *EIMI 2010 Conference Educational interfaces between mathematics and industry proceedings* (pp.597-606). Lisbon & Bedford, MA: CIM. Portugal & COMAP.
- Yoon, C., Dreyfus, T., & Thomas, M. (2010). How high is the tramping track? Mathematizing and applying in a Calculus model-eliciting activity. *Mathematics Education Research Journal*, 22(2), 141-157.
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