

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 <g.stillman@unimelb.edu.au>. The next Newsletter will be published in December, 2008. We are interested in your contributions to any of the current sections.

1. International Executive Committee

The current ICTMA Executive is as follows:

President

Prof Gabriele Kaiser (Germany)

Past Conference Organisers

Prof Chris Haines (UK) – Secretary

Prof Richard Lesh (USA)

Elected Members

Toshikazu Ikeda (Japan) – Registrar

Thomas Lingefjärd (Sweden)

Gloria Stillman (Australia) – Newsletter Editor

Co-opted Members

Jonei Barbosa (Brazil)

Katja Maaß (Germany)

Bhadra Tuladhar (Nepal)

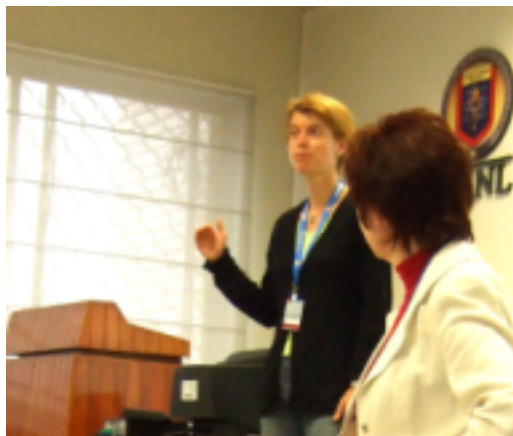
Jinxing Xie (China) – Webmaster & List Serve Moderator

2. ICME Activities

At ICME 11 in Monterrey, Mexico, in July, ICTMA members participated in many different activities as you can see below. There were, however, two sets of activities specifically related to ICTMA that they could attend: the Affiliated Study Group Sessions (ASG) sessions organised by Gabriele Kaiser and Topic Study Group 21 organised by Morten Blomhøj and Susanna Carreira which was about Mathematical Applications and Modelling in the Teaching and Learning of mathematics.



Björn Schwarz



Katja Maaß



Toshikazu Ikeda

2.1 Affiliated Study Group: ICTMA sessions

Two Affiliated Study Group sessions were organised by the President, Prof Gabriele Kaiser. The aim of the sessions was to present major modelling projects around the world and to show the innovative potential of these modelling projects under various perspectives in order to foster a discussion on possible future collaborations. The contributions at the first session focussed on teachers or future teachers, whilst the contributions at the second session focussed on students in school. Presentations included:

• **Gloria Stillman** (Australia) Teaching and learning to model – Results from the Competencies of Future Mathematics Teachers Project (CFMT)

•**Katja Maass** (Germany) LEMA - Learning and Education in and through Modelling and Applications – an international project

•**Morten Blomhøj** (Denmark) Developing mathematical modelling competency through problem-oriented project work – experiences from Roskilde University

•**Wolfgang Henn** (Germany), **Thomas Lingefjärd** (Sweden) Experiences from the European project Developing Quality in Mathematics Educations II (DQME II)

•**Jonei Barbosa** (Brazil) Teachers' pedagogic practices in Mathematical modelling

•**Richard Lesh** (USA) Model-eliciting activities in school and university

•**Toshikazu Ikeda** (Japan) Modelling in the revised courses of study in Japan

2.2 Topic Study Group 21: Mathematical Applications and Modelling in the Teaching and Learning of Mathematics

Topic Study Group 21 was organised by Morten Blomhøj of Roskilde University, Denmark and Susanna Carreira of Universidade do Algarve, Portugal. The presentations and discussions were organized according to the themes:

1. Conceptualisations of mathematical modeling in different theoretical frameworks and for different purposes
2. Cultural differences and the importance of international co-operation in research and development on the teaching and learning of mathematical modelling
3. Design of curricular experiments and didactical reflections on the teaching of mathematical modeling.

All papers presented orally and others accepted by the TSG21 team are published on the TSG21 website. For details visit: <http://tsg.icme11.org>.

3. Forthcoming ICTMA Conferences

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 14 in Hamburg in 2009 and ICTMA 15 in Melbourne in 2011.

14TH INTERNATIONAL CONFERENCE ON THE TEACHING OF MATHEMATICAL MODELLING AND APPLICATIONS (ICTMA14)
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The 14 th ICTMA Conference - ICTMA14 - will be held at the University of Hamburg and organised by the Faculty of Education, Working group on didactics of mathematics. It will be chaired by Professor Gabriele Kaiser. The conference is scheduled from

Monday, 27th July to Friday, 31st July 2009
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Academic programme:

A variety of activities is planned, covering plenary lectures, paper presentations and working groups. The following issues will be tackled:



- (i) Pedagogical issues, such as the understanding of modelling, promotion of modelling competencies, cognitive aspects;
- (ii) Assessment of modelling activities in school and universities;
- (iii) Connections to industrial or commercial practice, mathematics at the workplace;
- (iv) Influences of technology;
- (v) Cross-cultural aspects and international studies.

Conference venue:

The conference will take place in the building of the Faculty of Education at the university's Campus Von-Melle-Park. The Campus is situated near Lake Alster in the very heart of Hamburg.

Conference fee:

The conference fee will be approximately 400 € with a possible reduction for young researchers and will include various events, such as a guided city excursion, conference dinner, snacks and lunch and a hardcopy of the conference proceedings.

Social programme and accommodation:

There will be a strong social programme for participants, and a complementary programme for accompanying persons. Participants can also arrange pre- and post-conference tours to Germany's new capital Berlin.

A great variety of hotels and cheaper accommodation are in walking distance.

The City:

The "Freie und Hansestadt Hamburg", Germany's second biggest metropolis (1.8 million inhabitants) is a bustling, cosmopolitan port city. Hamburg is situated between the North Sea and the Baltic Sea and easily reachable by its internationally connected airport. The Lake Alster together with the Elbe river, numerous canals and parks adjoining them, have made Hamburg well-known as a "green" metropolis at the water's edge.

The University:

The University of Hamburg is a state university of the "Freie und Hansestadt Hamburg". Hamburg's view of itself as "gateway to the world" is reflected by the university's diversity of scientific areas and educational possibilities and thus it presents itself as "gateway to the world of knowledge". 38,700 students are inscribed at the University of Hamburg and 851 professors are engaged in teaching and research.

Transport

Hamburg is easily reachable by its internationally connected airport.

For further information, please email to the conference secretary Karen Stadlander:

stadlander@erzwiss.uni-hamburg.de

or see the website of Prof. Gabriele Kaiser: <http://www.erzwiss.uni-hamburg.de/Personal/Gkaiser/>

THE SECOND ANNOUNCEMENT IS EXPECTED TO BE AVAILABE AT THIS WEBSITE IN SEPTEMBER, 2008

4. Brief News Items

4.1 Galbraith Life Membership of MERGA

The annual dinner of the Mathematics Education Research Group of Australasia in Brisbane on June 30, 2008, was a memorable one for former ICTMA president, A/Prof Peter Galbraith. On that evening Peter was made a life member of MERGA for outstanding service to the association and the promotion of Australasian research and researchers internationally through organizations such as ICTMA. Several of Peter's former students were present to enjoy the occasion. Pictured (left to right) are Rhonda Farragher (ACU, Canberra), Linda Galligan and Pat Cretchley (University of Southern Queensland, Toowoomba), Gloria Stillman (University of Melbourne), Peter, Vince Geiger (ACU, Brisbane), Shelley Dole and Merrilyn Goos (University of Queensland).



4.2 High Interest in New Distance Education Course on Modelling in Brazil

On August 15, 2008 the first distance course in Brazil about Modeling for teachers and students from teacher's formation course began. This first course takes 40 hours to complete. Prof. Maria Salett Biembengut will evaluate and validate the course (including process, support material, etc). Two groups (about 40 students and with 2 professors from 2 Brazilian Universities) are participating in this experience. If the results are good, it is intended that the course be offered periodically (2 or 3 times a year): first to Brazilian teachers, then in Spanish and English to other countries. When the intention to offer this course was revealed, more than one thousand interested people (from Brazil and some countries in South America) contacted the organiser.

4.3 New Journal on Modelling

A new journal featuring mathematical modeling is to be launched this year in Brazil. It will be published through the Reference Center for Mathematical Modelling in Teaching (CREMM). The journal will be called the *Journal of Modelling and Mathematical Applications*. There will be 3 editions a year in March, July and November. The first editions will be on-line. Papers can be up to 15 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

5. Reports from Regional Areas

5.1 Modelling in the Revised Course of Study and National Achievement Tests in Japan

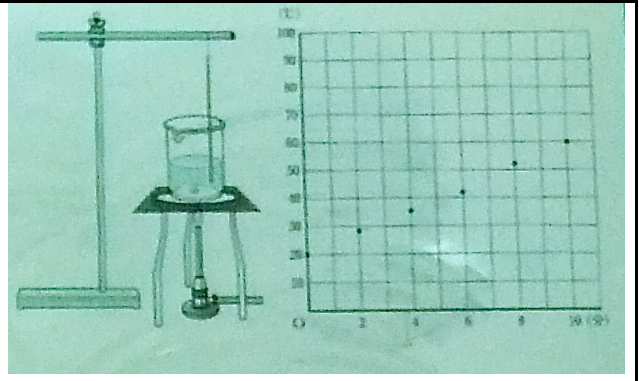
There are three types of mathematical activity in the Revised Course of Study for the junior high school in Japan: (1) generating mathematical knowledge such as concepts of numbers, geometrical figures, etc., (2) applying mathematics in real life situations, (3) communicating and explaining ideas logically by using mathematical representations. National Achievement Tests and Questionnaires for students are being conducted and administered by the Ministry of Education, Science, Sports and Culture in 2007, 2008 and 2009 to all students in Year 6 and Year 9. The test is in two parts with Part B being concerned with Applications. In Test B there are 6 problems concerning applications both in the Year 6 and Year 9 versions of the test. Questions are of two types: (1) those testing the ability of students to apply mathematical knowledge and skills in real life situations; and (2) those testing the

ability of students to execute, evaluate and modify a variety of plans to solve a given problem. In the first type, these involve the ability to mathematise real life situations, to select and use a variety of information and to interpret and represent mathematically. The first National Achievement Test was conducted on April 24, 2007. National results were released in November. The ranking of average scores among 47 prefectures was announced in newspapers. The committee in each prefecture had to make a report about their results. Detailed analyses were carried out.

An item on the Year 9 test assessing students' ability to mathematise real life situations was:

Students decided to analyze how the boiling temperature of water changes over time. By examining the relation between time and boiling temperature of water, they obtained the following points which they graphed, as shown in the figure.

Yoko considers that it is possible to regard this relation as a linear function. What are the characteristics of the graph that explain the reason why Yoko thought like this?



This item produced the worst result nationally on Test B in Year 9 ($N=1,077,209$) with only 32.1% of responses being correct compared to an average correct answer rate of 61.2%. Furthermore, 28.5% of students wrote nothing at all. Analysis of this item in Kanagawa Prefecture is informative. There were 30197 Year 9 students who sat test B in the Prefecture. The item was in the lowest 10% of correct answer response rates for the Prefecture. When incorrect responses were examined, 26.7% of the students wrote that the relation is proportional, 2% wrote that the formula is represented as $y = 4x + 20$, 30.9% wrote other answers but 41.5% wrote nothing.

When students were asked in the questionnaire: How often do you emphasise the relations between mathematics and real world situations the proportions for the Year 9 were: (i) often 7.3%, (2) Sometimes 47.2%, (3) not often 42.9%, and (4) not at all 2.6%. When the scores of students on the item above were matched to these options, the score of option (2) was significantly better than the scores of the other three options ($p < .05$). How can we interpret this result? One interpretation is that there should be balanced teaching between applications and modelling and “pure” mathematics. A second interpretation is that there should be more effective teaching of modelling.

Favourable effects of the NAT and Questionnaire in 2007 have been firstly, from the government's perspective, the stimulating of teachers' awareness of the need to emphasize “applications” and secondly from the teachers' perspective, acquiring the means of students' achievement regarding applications. However, two critiques have been the huge cost (7.7 billion yen or 46 Euro) and the lateness of the releasing of results which has not allowed teachers to take them into account before year end.

Toshikazu Ikeda

6. Project Reports

6.1 LEMA – Learning and Education in and through Modelling and Applications

Increasingly there has been pressure from authorities in Europe to make mathematics more useful, and connected with real life partly as a reaction to less than impressive PISA results. However, all over Europe, modelling is neglected in day-to-day teaching. There are a variety of reasons for this situation but one is that teachers have no experience in teaching modelling. There was thus a need for teacher training courses in modelling. The LEMA project was then conceived as a means of meeting this need. This trans-European project sponsored by the European Union is developing a major teacher training initiative to support teachers to use mathematical modelling and applications in their

classrooms. The first pilot courses take place in all partner nations (Germany, France, Spain, UK, Hungary, Poland and Cyprus) in 2008.

The target groups are in-service and pre-service teachers at the primary and secondary school level and teacher educators or trainers. There is an internet site. Visit: <http://lema-project.org/> Expected outputs include a DVD of course materials. There is also accompanying research being done.

Involvement in a cooperative project with several internal partners offers both positive aspects and challenges. Such cooperations involve insights into various cultural aspects resulting in a better understanding of different cultures. For example, LEMA has led to participants gaining more insight into organisational frameworks of schools and of professional development in partner countries. This has also meant that partners have had to learn about different theoretical frameworks underpinning schooling, modelling and professional development in the different countries with resulting broader perspectives on theories. School visits have been useful in allowing insights into different ways of teaching. The project has meant that new friendships have been made and the team has contributed to tackling European problems on a European level. At the same time, the cooperation has led to several challenges that have had to be overcome. The different cultural backgrounds of partners have meant that different ways of talking to each other have had to be established. Different curricula place different emphases on modelling. Modelling is seen as content to be taught in Germany and the United Kingdom. In Spain modeling is seen as a tool to make mathematics useful outside of school. In France and Hungary it is either not present or there is little integration of modelling into schooling. Added to this is the changing of curricula with respect to their focus on modelling. The different organisational frameworks of schools and different models of professional development in various countries impact on the expected product of the project as do different theoretical backgrounds especially those associated with modelling. Language also presents challenges as the materials are in English and even when similar words are used their meanings can be interpreted quite differently. Partners in different countries also place different emphases on design and research.

Research Publication from project:

Garcia, F. J., Maass, L., & Wake, G. (2007). Theory meets practice: Working pragmatically within different cultures and traditions. Paper presented at the *Thirteenth International Conference on The Teaching of Mathematical Modelling and Applications* held at Bloomington, IN, USA.

6.2 CFMT – Competencies of Future Mathematics Teachers

The overall aim of this project is to evaluate the professional competencies of pre-service secondary mathematics teachers in universities in Australia, Hong Kong, China and Germany in the frame of ongoing international studies on the efficiency of various teacher education systems (e.g., the Teacher Education and Development Study: Learning to Teach Mathematics – TEDS-M, see www.iea.nl/teds-m-html). These large scale studies focus on what can be learnt by using mainly multiple choice items and a few open questions. In contrast, CFMT uses detailed in-depth studies of pedagogical content knowledge (Shulman, 1986, 1987) for teaching mathematics to students in Years 8 -10 as the central component of the professional competencies of these pre-service teachers. In addition, it is investigating the relation of this pedagogical content knowledge to beliefs about mathematics and teaching mathematics. Pehkonen and Törner's (2004) cognitive notion of beliefs as "mental constructs that represent the codification of people's experiences and understandings" (p. 22), as well as Gates' (2006) proposal that the sources of mathematics teachers' beliefs are ideological and discursive rather than cognitive, will be used to evaluate the data from different viewpoints. The pedagogical content knowledge investigated is limited at the present to that for the teaching of (a) mathematical modelling and applications of mathematics in real world examples (including being able to cater for diversity in both language background and mathematical ability of students) and (b) argumentation and proof in algebra and geometry.

The results of case studies concerning the pedagogical content knowledge of pre-service teachers of particular universities in the various countries are being interpreted in order to identify misconceptions, weaknesses or strengths of the various groups of pre-service teachers experiencing different teacher

education models. In addition, demographical data of pre-service teachers and the nature of their university courses taken (both in discipline and teaching studies) are being evaluated in order to relate the professional competencies of pre-service teachers to their opportunities to learn. Several papers dealing with outcomes of the project in addition to those below are about to appear in a forthcoming issue of *ZDM-The International Journal of Mathematics Education*.

Selected Research Publications from project:

- Brown, J., Stillman, G., Schwarz, B., & Kaiser, G. – The case of mathematical proof in lower secondary school: Knowledge and competencies of pre-service teachers. In M. Goos, K. Makar & R. Brown (Eds.), *Navigating currents and charting directions*. Proceedings of the 31st annual conference of the Mathematics Education Research Group of Australasia (MERGA), Brisbane, (Vol. 1, pp. 85-91). Adelaide: MERGA.
- Kaiser, G., Schwarz, B., & Krackowitz, S. (2007). The role of beliefs on future teachers' professional knowledge. In B. Sriraman (Ed.), *The Montana Mathematics Enthusiast, Monograph 3, Festschrift in Honor of Günter Törner's 60th Birthday* (pp. 99-116). Information Age.
- Kaiser, G., Schwarz, B., & Tiedemann, S. (2007): Future teacher's professional knowledge on modelling. *Proceedings of the 13th Conference on the Teaching of Mathematical Modelling and Applications* held at Bloomington, ID, USA. Available at: <http://site.educ.indiana.edu/Papers/tabid/5320/Default.aspx>
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7. Recent Dissertations

Hendricks, C. (2006). Learners' motivations for preferred contexts in mathematical literacy. MEd Thesis. University of the Western Cape. Supervisor: Prof. Cyril Julie.

The National Curriculum Statement introduced mathematical literacy into South Africa officially in 2006. Learners in general perform poorly in mathematics in South Africa but there is strong belief that learners should graduate from schools sufficiently literate to deal with the mathematical issues they will encounter in out-of-school situations. Based on this, this study is an investigation of the contexts, which grades 8 – 10 learners would prefer to engage with mathematics. The aim of this study was thus to investigate mathematical literacy in relation to learners' motivations for the contexts they would prefer to deal with in mathematical literacy. The emphasis of the study is to concentrate on learner's written motivations for mathematical contexts. Data were collected using a questionnaire that deals with contexts for mathematics. A sample of 120 learners in grades 8 to 10 were randomly selected from a bigger sample of 1077 learners of previously disadvantaged schools in the Western Cape and the motivations this sample of learners provided were qualitatively analysed. An important finding of this study is that learners provide reasonably strong motivations for wanting to study mathematics and mathematically-related careers at higher education institutions as well as for technology, sport and culture. The researcher suggests that mathematics educators and policy makers pay attention to the contexts preferred by learners to further stimulate learners' interest in mathematics.

Lebeta, TV. (2006). An investigation into pre-service teachers' mathematical behaviour in an application and modelling context. Phd Thesis. University of the Western Cape. Supervisors: Prof. Cyril Julie, Prof. Trygve Breiteig, and Associate Prof. Ole Einar Torkildsen.

The main purpose of this study was to inquire, from a didactical perspective, into the question of teaching mathematics for mathematical literacy in secondary and high schools in the district of Maseru, Lesotho. In the study, mathematical literacy and didactical practices relating to mathematics are viewed as related variables that directly impact upon each other. In order to appropriately place the concept of didactical practices in school mathematics education, the study engages support from literature to explore a range of related areas in mathematics education and in mathematical literacy. These areas include, amongst other factors, aspects such as: the position of mathematics in education, the role, meaning and neighbours of mathematics education, and the psychological theories and philosophies that influence trends in didactical practices related to mathematics.

In the study, mathematical literacy itself is defined from different perspectives. In the light of these definitions, the study views mathematical literacy as the individual's aggregate of mathematical skills and knowledge that empowers the individual to participate meaningfully and make well-founded mathematical judgements in a society that is imbued with technology.

Didactical practices and the nature of mathematics that are purported to inculcate mathematical literacy in learners are discussed, in the study, to serve as a premise on which the teaching of mathematics, for mathematical literacy in secondary and high schools in the district of Maseru, is investigated.

The investigation itself seeks to establish the current didactical practices relating to mathematics, which are employed in secondary and high schools in the district of Maseru, Lesotho, and to determine the extent to which these didactical practices correspond to and correlate with indicators of teaching mathematics for mathematical literacy. The study further examines whether the nature (content, objectives, and recommended didactical practices relating to mathematics) of the mathematics curriculum offered in the district of Maseru, concurs with that recommended in literature on teaching mathematics for mathematical literacy.

In conclusion, the investigations of the study culminate in assessing which didactical practices relating to mathematics still need to be improved, embraced, or redefined.

Mavugara-Shava, F. M. (2005). Teaching for mathematical literacy in secondary and high schools In Lesotho: A didactic perspective. PhD Thesis The University of the Free State. Bloemfontein. Supervisor: Prof. Dr. G. F. du Toit

The main purpose of this study is to inquire, from a didactical perspective, into the question of teaching mathematics for mathematical literacy in secondary and high schools in the district of Maseru, Lesotho. In the study, mathematical literacy and didactical practices relating to mathematics are viewed as related variables that directly impact upon each other. In order to appropriately place the concept of didactical practices in school mathematics education, the study engages support from literature to explore a range of related areas in mathematics education and in mathematical literacy. These areas include, amongst other factors, aspects such as: the position of mathematics in education, the role, meaning and neighbours of mathematics education, and the psychological theories and philosophies that influence trends in didactical practices related to mathematics.

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In conclusion, the investigations of the study culminate in assessing which didactical practices relating to mathematics still need to be improved, embraced, or redefined. Recommendations based on the findings of the study include: the use of open-ended problem solving techniques, real-life problem investigations, and the use of projects as a didactical approach. Other recommendations are: themes across the school curriculum should be unified, real-life data should be used in statistics and

probability, and mathematics problems should encompass actual, real-life problems rather than contrived problems related to real life situations.

Rodriguez Gallegos, R. (2007). Differential equations as a tool for mathematical modelling in Physics and Mathematics classes: A study of textbooks and modelling processes of high-school senior students. PhD Thesis. Joseph Fourier University, Grenoble I, France. Supervisor: Prof. Collette Laborde.

This study deals with the learning and teaching of modeling in classes of Physics and Mathematics at the last year of high-school, in France. The new syllabi that started out in 2002 for these two classes, emphasise the role of mathematics as a tool for modeling in other sciences. The analysis of textbooks that are usually used in Physics and Mathematics classes allowed us to characterise the proposed modelling process to be taught at this school level. These analyses revealed the transposition process of the “modeling process” as achieved by experts into a different process adapted for school. The setting up of an experimental situation including some unusual tasks (out of the scope of the usual didactic contract) for students at the last year of high school, allows us to identify the influence of the *praxeologies* existing at these classes onto students solving problems. But this situation also gave evidence of the role of the “pseudo concrete” model of the initial real situation and of the physical model constructed by the students upon the modelling approach. The influence of external interventions to help students overcome their difficulties, or the role of some feedback of one task onto another one, are also addressed and discussed. The type of modelling that is finally taught (“taught” knowledge) in classes of Physics and Mathematics presents an important gap with respect to the modelling process as practised by experts (“wise” knowledge). Some of the difficulties linked to the setting up of this transposition process are analysed in the present study.

8. Recent Publications of Interest

- Brown, K. (2008a). Employing mathematical modelling to respond to indigenous students' needs for contextualised mathematics experiences. In M. Goos, R. Brown & K. Makar (Eds.), *Proceedings of the 31st annual conference of the Mathematics Education Research Group of Australasia*, Brisbane (Vol. 1, pp. 93-99). Adelaide, Australia: MERGA.
- Blum, W. (2008). Opportunities and problems for 'Quality mathematics teaching' —the SINUS and DISUM projects. In M. Niss & E. Emborg (Eds.) *Proceedings of the 10th International Congress on Mathematics Education*, 4-1 July, 2004. [CD]
- Chan, C. H. E. (2008). Mathematical modelling experiences in mathematical development in children. *Thinking Classroom*, 9(2). Available from: http://ct_net.net/ct_tcp [in English and Russian.]
- Christensen, O. R. (2008). Closing the gap between formalism and application--PBL and mathematical skills in engineering. *Teaching Mathematics and Its Applications*, 27(3), 131-139.
- Davis, J. D. (2007). Real-world contexts, multiple representations, student-invented terminology, and Y-intercept. *Mathematical Thinking and Learning*, 9(4), 387-418.
- English, L. (2008a). Interdisciplinary problem solving: A focus on engineering experiences. In M. Goos, R. Brown & K. Makar (Eds.), *Proceedings of the 31st annual conference of the Mathematics Education Research Group of Australasia*, Brisbane (Vol. 1, pp. 187-193). Adelaide, Australia: MERGA.
- English, L. D. (2008b). Mathematical modeling: Linking mathematics, science, and the arts in the elementary curriculum. In B. Sriraman, C. Michelsen, A. Beckmann, & V. Freiman (Eds.), *Proceedings of The Second International Symposium on Mathematics and its Connections to the Arts and Sciences (MACAS2)*, pp. 5-36). University of Southern Denmark Press.
- Galbraith, P. (2008). Applications and modelling in mathematics education: Progress to date—so much more to do. In M. Niss & E. Emborg (Eds.) *Proceedings of the 10th International Congress on Mathematics Education*, 4-1 July, 2004. [CD]
- Geiger, V., Faragher, R., Redmond T., & Lowe, J. (2008). CAS enabled devices as provocative agents in the process of mathematical modelling. In M. Goos, R. Brown & K. Makar (Eds.), *Proceedings of the 31st annual conference of the Mathematics Education Research Group of Australasia*, Brisbane (Vol. 1, pp. 219-226). Adelaide, Australia: MERGA.
- Güven, B. (2008). Using dynamic geometry software to convey real-world situations into the classroom: The experience of student mathematics teachers with a minimum network problem. *Teaching Mathematics and its Applications*, 27(1) 24-37.
- Halverscheid, S. (2008). Building a local conceptual framework for epistemic actions in a modelling environment with experiments. *ZDM-The International Journal of Mathematics Education*, 40(2), 225-234.
- Hjalmarson, M. A. (2007). Engineering students designing a statistical procedure for quantifying variability. *Journal of Mathematical Behavior*, 26(2), 178-188.

- Klymchuk, S., Zverkova, T., Gruenwald, N., & Sauerbier, G. (2008). Increasing engineering students' awareness to environment through innovative teaching of mathematical modelling. *Teaching Mathematics and its Applications*, 27(3), 123-130.
- Jakobsson-Åhl, T. (2008). Word problems in upper secondary algebra in Sweden over the years 1960-2000. *Nordic Studies in Mathematics Education*, 13(1), 7-28.
- Lesh, R., Caylor, E., & Gupta, S. (2007). Data modelling and the infrastructural nature of conceptual tools. *International Journal of Computers for Mathematical Learning*, 12(3), 231-254.
- Lesh, R., Middleton, J. A., Caylor, E., & Gupta, S. (2008). A science need: Designing tasks to engage students in modelling complex data. *Educational Studies in Mathematics*, 68(2), 113-130.
- Llinares, S., & Roig, A. I. (2008). Secondary school students' construction and use of mathematical models in solving word problems. *International Journal of Science and Mathematics Education*, 6(3), 505-532.
- Mosvold, R. (2008). Real-life connections in Japan and the Netherlands: National teaching patterns and cultural beliefs. *International Journal for Mathematics Teaching and Learning*, July. 18pp. [Online only: <http://www.cimt.plymouth.ac.uk/journal/>]
- Stillman, G., Brown, J., & Galbraith, P. (2008). Research into the teaching and learning of applications and modelling in Australasia. In H. Forgasz et al. (Eds.), *Research in mathematics education in Australasia* (pp. 141-164). Rotterdam, The Netherlands: Sense.
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