

**The International Community of Teachers of Mathematical Modelling and Applications.**

www.ictma15.edu.au

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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, 2016. We are interested in your contributions to any of the current sections as well as project reports and modelling problems.

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**Website**

Owing to government action beyond our control the ICTMA website was removed. Jill Brown is in the process of restoring links and files that were on the previous website so if any of these files which are currently showing as broken links were contributed by you could you please send to [jill.brown@acu.edu.au](mailto:jill.brown@acu.edu.au) The site is currently working through the former site for ICTMA15. Please note the URL above.

## 1. International Executive Committee

Following the business meeting of ICTMA members held at ICTMA 17 in Nottingham, England, on July 24, 2015, the ICTMA Executive for 2015-2017 was confirmed as follows:

### President

A/Prof Gloria Stillman (Australia) – **Newsletter Editor** [Email: [gloria.stillman@acu.edu.au](mailto:gloria.stillman@acu.edu.au)]

### Elected Members

Dr Jill Brown (Australia) – **Secretary, Webmaster & List Serve Moderator** [Email: [Jill.Brown@acu.edu.au](mailto:Jill.Brown@acu.edu.au)]

A/Prof Susana Carreira (Portugal) – [Email: [scarrei@ualg.pt](mailto:scarrei@ualg.pt)]

Prof Dr Gabriele Kaiser (Germany) [Email: [gabriele.kaiser@uni-hamburg.de](mailto:gabriele.kaiser@uni-hamburg.de)]

### Co-opted Members

A/Prof Angeles Dominguez (Mexico) [Email: [angeles.dominguez@itesm.mx](mailto:angeles.dominguez@itesm.mx)]

Prof Toshikazu Ikeda (Japan) – **Registrar** [Email: [ikeda@ynu.ac.jp](mailto:ikeda@ynu.ac.jp)]

Prof Jinxing Xie (China) [Email: [jxie@math.tsinghua.edu.cn](mailto:jxie@math.tsinghua.edu.cn)]

### Conference Organisers

Prof Maria Salett Biembengut (Brazil) [Email: [mariasalett@gmail.com](mailto:mariasalett@gmail.com)]

A/Prof Geoff Wake (UK) [Email: [Geoffrey.Wake@nottingham.ac.uk](mailto:Geoffrey.Wake@nottingham.ac.uk)]

Dr Helena Wessels (South Africa) [Email: [hwessels@sun.ac.za](mailto:hwessels@sun.ac.za)]

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## 2. Forthcoming Conference – ICTMA 18

**18<sup>TH</sup> INTERNATIONAL CONFERENCE ON THE TEACHING OF MATHEMATICAL MODELLING AND APPLICATIONS (ICTMA18) 23-28 JULY, 2017**

**Theme: Mathematical Modelling and Sense Making**

The Research Unit for Mathematics Education at the University of Stellenbosch (RUMEUS), Stellenbosch, South Africa, supported by the Mathematics and Mathematics Education bodies in South Africa (SANCIMU, SAMF, SAMS and AMESA), has been selected to host the next International Conference for the Teaching of Mathematics and Applications (ICTMA 18) from 23-28 July 2017. The Steering Committee consists of members of RUMEUS, that is Dr Helena Wessels (Member and Conference Chair, ICTMA18), Prof Dirk Wessels (Director), Dr Erna Lampen, and Dr Faaiz Gierdien, as well as Prof Mdu Ndlovu and Mr Cerenus Pfeiffer from the Centre for Pedagogy (SUNCEP) as members.



Dr Helena Wessels, Chair  
ICTMA18

### Change of Venue

The conference venue is the Education Building at Stellenbosch University in Stellenbosch (about 35 km from the airport). We will be able to have lunch and refreshment breaks in the building. If the weather is not favourable, a minibus will be organized to pick up and drop off delegates from their hotels or guest houses. There is unfortunately no cheap accommodation available in the university residences as it is not vacation time. Delegates should thus book accommodation in town. The town's business centre is only 25 minutes from Cape Town's International Airport. Shuttles and taxis provide international visitors with a service between the town centre and the airport.

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## Visas

Visas are issued by the South African missions abroad and must be affixed in the applicant's passport before departing for South Africa. Visas are not issued on arrival at South African ports on entry. Many nationalities do not require a visa to enter South Africa, it is best to check with your travel agents if this is enquired. For detailed information, please visit:

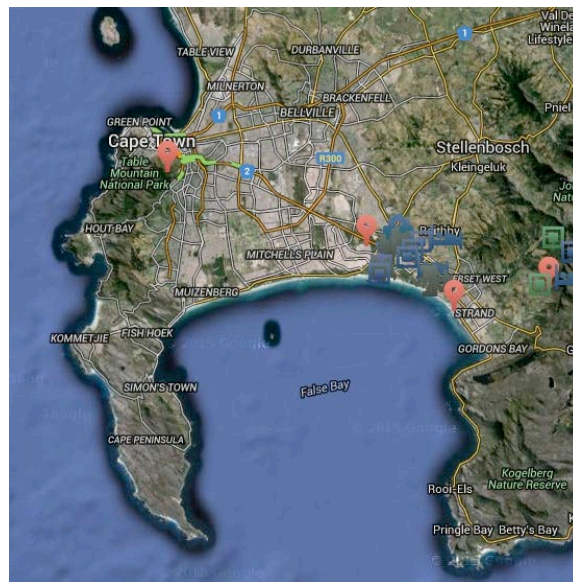
[http://www.services.gov.za/services/content/Home/ServicesforForeignNationals/Temporaryresidence/Applicationforavisa/en\\_ZA](http://www.services.gov.za/services/content/Home/ServicesforForeignNationals/Temporaryresidence/Applicationforavisa/en_ZA)

## Currency

The Rand is the official currency of South Africa.

## Travel

Cape Town International Airport is served by more than 20 international airlines on a weekly basis, linking the destination to global hubs like Frankfurt, Amsterdam, Dubai, Singapore and London (and a wide variety of other connections via Johannesburg). The city is an overnight flight from any European destination.



## Further Information

For further information contact the conference chair, Dr Helena Wessels <[hwessels@sun.ac.za](mailto:hwessels@sun.ac.za)>

## Local Organising Committee Members



Prof Dirk Wessels



Dr Erna Lampen



Dr Faaiz Gierdien



Prof Mdu Ndlovu



Mr Cerenus Pfeiffer

*Helena Wessels*

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### 3. Report from Chair – ICTMA 17

#### 17<sup>TH</sup> INTERNATIONAL CONFERENCE ON THE TEACHING OF MATHEMATICAL MODELLING AND APPLICATIONS (ICTMA18) 2017

##### Theme: Mathematical Modelling and Sense Making

The University of Nottingham hosted the 17<sup>th</sup> biennial conference of ICTMA between the 19<sup>th</sup> and 24<sup>th</sup> July. It brought together approximately 150 researchers in education from across the world, resulting in over 100 presentations of their work. Modelling and applications are clearly of increasing importance in mathematics curricula across the world with almost 30 countries being represented at the conference – we found out more about this from the plenary panel members on the final day of the conference (see below).

The key note plenary presentations as always were thought provoking and stimulating with a focus on the development of modelling in the curriculum in Japan (Keiichi Nishimura), the development of ICTMA over the years (David Burghes – the grandfather of ICTMA), mathematical modelling as a professional activity (Peter Frejd) and the design of materials to support modelling (Malcolm Swan and Hugh Burkhardt). A plenary panel also explored the nature of modelling across the world with contributions from Pauline Voss (Norway and the Netherlands), Vince Geiger (Australia), Helena Wessels (South Africa), Ángeles Domínguez (Mexico and Brazil) and Helen Doerr (U.S.A). These focal points of the conference provided much to think about – as did the contributions from the many delegates throughout the week of the conference. The plenary presentations are all available to download at the conference website: <http://www.nottingham.ac.uk/conference/fac-socsci/ictma-17/index.aspx>



*Conference participants at ICTMA-17 in Nottingham, July 2015*

Of course the conference social programme is an important feature and this was hugely successful in Nottingham with delegates starting the conference at a wonderful reception in an English walled garden serenaded by a string quartet playing music from the countries represented at the conference. The conference excursion was to one of the most wonderful stately homes in England where delegates had time to explore the house and gardens situated in one of England's beautiful National parks, the Peak District. The following evening the conference dinner was also held at a country house and as usual ICTMA delegates enjoyed a few hours of uninhibited dancing!



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On the Thursday of the conference the conference organisers invited teachers from local schools who work with researchers in the Centre for Research in Mathematics Education at Nottingham to attend as well as colleagues from a number of UK curriculum development projects. Dominic Hudson who is Head of Mathematics at a local school writes:

"I was fortunate enough to attend ICTMA at Nottingham with two other colleagues who work as teachers of mathematics. The event came at the end of a very long and gruelling academic year, yet all of us commented on how energising it was to attend an event where the sole purpose was to improve and develop students' learning of mathematics. Too often, courses attended by teachers are spent on tactics and tricks regarding how best to play within the current system to maximise students' examination results. This event was primarily concerned with student learning and ensuring their diets are varied and prepare them for both examinations and life beyond compulsory education."

It was also refreshing to hear that many of the issues facing a teacher of mathematics in the UK are not unique and are the same all over the world. One of the other teachers who attended the day was quoted as saying "every maths teacher should go and attend this event." When pushed on why, she said it really made her think and question her everyday practice.

The team who organised the conference in Nottingham would like to express how much they appreciated all of the positive feedback they received and how much they enjoyed hosting the ICTMA family. It was great to see so much energy and enthusiasm not only in the dancing but also during the sessions of the conference. The ICTMA really is a great community to be part of and we all look forward to meeting old and new friends in South Africa in 2017.



ICTMA17 – Plenary session



ICTMA17 – Dancing!

*Geoff Wake*

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#### 4. Bids to hold Upcoming Conference – ICTMA 19

### 19<sup>TH</sup> INTERNATIONAL CONFERENCE ON THE TEACHING OF MATHEMATICAL MODELLING AND APPLICATIONS (ICTMA19) 2019

Any groups considering hosting ICTMA 19 in 2019 are invited to send a written Expression of Interest to the President who will then send details of the requirements for a full bid. Full bids to host the conference in the form of a bidding book and supporting letters will be due in June 2017. It is best though to start working well before this to make a comprehensive proposal.

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## 5. Brief News Items

### 5.1 Modelling in Sciences and Math in Primary Education

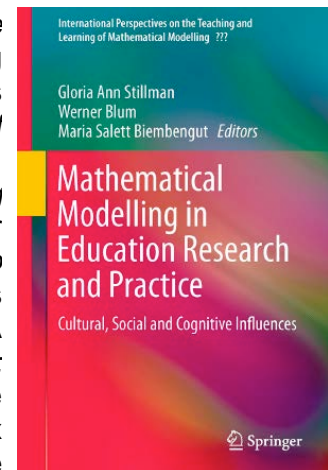
The 'movement' for Modelling in Mathematics Education in Brazil had its beginnings in the 1970's. In the four decades since, the community of followers has become significant. It contributes to the expansive number of studies/publications as well as to the National Education Documents. Notwithstanding, mathematics learning still remains 'fragile'. Among the possible reasons, in the beginning of the 1990's, I assumed that such 'fragility' would arise in the last years of primary education. To test such an assumption, I developed a preliminary Modelling project during one school year. One thousand and sixty students and their respective teachers participated in the project. Results turned out to be so impressive that I decided to continue the project and improve it, and applied to several groups of students from first, second, third and fourth years. Such a rewarding 'experience' motivates me to present it in a book in 2016: *Modelling in Sciences and Math in Primary Education*.

The book will contain two parts. In the first, *The essence of knowing*, I present considerations about: (1) the cognitive process based on Neuroscience and Cognitive Psychology findings; and (2) some propositions for primary education. Departing from these considerations, I prescribe a Modelling method to teach the sciences and mathematics in an integrated way. In the second part, *The essence of doings*, I present six 'Modelling proposals' step-by-step so that teachers can develop Modelling in a way that students learn the content and do research in an integrated way. Such proposals are part of the projects I developed. From these, three proposals are related to classical models that were adapted with appropriate language for children (for instance, models from Isaac Newton, Pierre F. Verhulst, and August F. Möbius). I expect that Primary Education teachers can achieve good results with the suggestions.

Maria Salett Biembengut

### 5.2 BookMetrix Data for Springer Books in ICTMA Series

Books in the Springer/ICTMA series, *International Perspectives on the Teaching and Learning of Mathematical Modelling*, show very strong impact worldwide as indicated by their Bookmetrix data which tracks scholarly activity of published books. *Trends in Teaching and Learning of Mathematical Modelling* (68 chapters) published in 2011 has 57,441 chapter downloads. *Modelling Students' Mathematical Modeling Competencies* (53 chapters), re-published in 2013, has 38,140 chapter downloads whilst *Teaching Mathematical Modelling: Connecting to Research and Practice* (52 chapters), published late the same year, has 47,466 combined chapter downloads. The latest volume in the ICTMA series, *Mathematical Modelling in Education Research and Practice: Cultural, Social and Cognitive Influences* (50 chapters) published in the second half of 2015 has 6,520 combined chapter downloads. Bookmetrix data are available from [www.bookmetrix.com](http://www.bookmetrix.com) or the publisher's website where the panel on the right hand side has a section called Book Metrics.



### 5.3 TSG at ICME 13 in Hamburg in July

ICME-13 brings together researchers, teacher educators, practising teachers, mathematicians, and others interested in the field of mathematics education from all over the world to discuss the state of the art of research and practice in mathematics education. It will be held in Hamburg, Germany, from July 8-31, 2016 at the Congress Center Hamburg near Dammtor Station, and the University of Hamburg's main building and campus. The congress is held every four years under the auspices of ICMI (International Commission on Mathematical Instruction).

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TSG21 at ICME 13 will focus on Mathematical Applications and Modelling in the Teaching and Learning of Mathematics. The TSG will function as a Mini-Symposium, which displays the state-of-the-art-discussion bringing in renowned experts and allowing new scholars to enter the scene. After the conference, the co-chairs will be seeking a special issue of a journal for a selection of the papers. The co-chairs are:

Jussara Araújo (Federal University of Minas Gerais, Brazil), email: [jussara@mat.ufmg.br](mailto:jussara@mat.ufmg.br)  
Gloria Stillman (Australian Catholic University, Australia), email: [gloria.stillman@ac.edu.au](mailto:gloria.stillman@ac.edu.au)

The team members are:

Toshikazu Ikeda (Yokohama National University, Japan), email: [toshi@ynu.ac.jp](mailto:toshi@ynu.ac.jp)  
Morten Blomhøj (Roskilde University, Denmark), email: [blomhoej@ruc.dk](mailto:blomhoej@ruc.dk)  
Dominik Leiss (Leuphana University Lüneburg, Germany), email: [leiss@leuphana.de](mailto:leiss@leuphana.de)

IPC liaison person: Georg Ekol (Kyambogo University, Uganda), email: [gle1@sfu.ca](mailto:gle1@sfu.ca)

The TSG received 78 submissions via Conftool in the period 1 September to 1 October. From the papers submitted, the co-chairs and team members selected 16 papers to be presented at the regular sessions of the TSG. The authors of these papers have been notified and asked to extend the paper to 8 pages; the extended paper is then due 28th February 2016. There will be an informal review on the quality of the extended papers until the 31st March 2016, with a chance to revise. All final papers should be submitted to ICME-13 ([assistance.icme13@uni-hamburg.de](mailto:assistance.icme13@uni-hamburg.de)) by 1st May 2016.

All papers evaluated positively will be uploaded to a protected part of the ICME website especially assigned to the TSG. Papers not accepted for presentation in TSG regular sessions can be presented as oral contributions associated with each TSG but programmed outside TSG regular timeslots. Please visit our TSG on the ICME 13 website at [www.icme13.org](http://www.icme13.org) for updates.

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## 6. Recent Dissertations

**Chih-Hung Chen (2015). Effects of a Collaborative Mobile Role-Playing Game on Students' Learning Effectiveness and Behaviors. PhD doctoral dissertation. Graduate Institute of Applied Science and Technology, Taiwan. Advisor: Gwo-Jen Hwang.**

Previous research has illustrated that the process of acquiring knowledge may not be successful without the support of real contexts. While participating in an activity or a task in a real environment, individuals can meaningfully connect their prior knowledge with the real-world scenarios. Meanwhile, collaborative learning is an effective strategy for assisting students in conducting ubiquitous learning activities. Collaborative learning, which has been referred to as a form of peer interaction, is designed to assist students in collaboratively solving authentic problems. A well-designed collaborative learning activity can contribute to students' learning effectiveness; however, without participants' engagement, not all the effects of the collaborative activities are always as good as could be expected. In this study, a collaborative mobile role-playing game was developed to improve students' learning effectiveness in a ubiquitous learning activity. An experiment was conducted on an elementary school nature science course to assess the effects of the proposed approach on students' learning achievement, motivation, core competence and flow. Moreover, the students' learning patterns and interactions were analyzed via quantitative content analysis and lag-sequential analysis. The experimental results indicate that the collaborative mobile role-playing game benefited the students' learning achievement, intrinsic learning motivation, collective efficacy and flow; moreover, the students' perceptions of their collaboration, communication, problem solving and critical thinking competence were significantly promoted as well. Furthermore, it was found that the collaborative mobile role-playing game stimulated the participants to actively engage in field observation, comparison and data searching in the collaborative ubiquitous learning activity.

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## 7. Recent Publications of Interest

- Albarracín, L., & Gorgorió, N. (2015). A brief guide to modeling in secondary school: Estimating big numbers. *Teaching Mathematics and Its Applications*, 34(4), 223-228.
- Bicard, P., & Wessels, D. (2015). Student mathematical activity as a springboard to developing teacher didactic practices: Original research. *Pythagoras*, 36(2), 1-9. DOI: <http://dx.doi.org/10.4102/pythagoras.v36i2.294>
- Brady, C., & Lesh, R. (2015). A models and modeling approach to risk and uncertainty. *The Mathematics Enthusiast*, 12(1-3), 184-202.
- English, L.D., & Gainsburg, J. (2016). Problem solving in a 21<sup>st</sup>-century mathematics curriculum. In L. D. English & D. Kirshner (Eds.), *Handbook of international research in mathematics education* (3<sup>rd</sup> ed.) (pp. 313-335). New York: Routledge
- Frejd, P., & Bergsten, C. (2016). Mathematical modeling as a professional task. *Educational Studies in Mathematics*, 91, 11-35.
- Gaston, J.L., & Lawrence, B.A. (2015). Supporting teachers' learning about mathematical modeling. *Journal of Mathematics Research*, 7(4), 1-11.
- Hidroğlu, Ç. N., & Güzel, E. B. (2015). Metacognitive structures occurring in mathematical modeling within a technology enhanced environment. *Turkish Journal of Computer and Mathematics*, 6(2), 179-208.
- Jong, J-P., Chiu, M-H., & Chung, S-L. (2015). The use of modeling-based text to improve students' modeling competencies. *Science Education*, 99(5), 986-1018.
- le Roux, K., & Adler, J. (2016). A critical discourse analysis of practical problems in a foundation mathematics course at a South African university. *Educational Studies in Mathematics*, 91(2), 227-246.
- Mascia, M.L., Agus, M., Fastame, M.C., & Addis, A. (2016). Enhancement in mathematical abilities – a systems approach. In G. Minati, M.R. Abram, & E. Pessa (Eds.), *Towards a post-Bertalanffy systemics* (pp. 243-249). Cham, Switzerland: Springer.
- Meyer, D. (2015). Missing the promise of mathematical modeling. *Mathematics Teacher*, 108(8), 578-583.
- Reit, X-R. (2015). Thought structures of modeling task solutions and their connection to the level of difficulty. *Procedia—Social and Behavioral Sciences*, 191, 2661-2666.
- Rosa, M., & Orey, D.C. (2015). A trivium curriculum for mathematics based on literacy, matheracy, and technoracy: An ethnomathematics perspective. *ZDM Mathematics Education*, 47(4), 587-598.
- Schukajlow, S., Kolter, J., & Blum, W. (2015). Scaffolding mathematical modeling with a solution path. *ZDM Mathematics Education*, 47(7), 1241-1254.
- Shahbari, J.A., & Peled, I. (2015). Using modeling tasks to facilitate the development of percentages. *Canadian Journal of Science, Mathematics and Technology Education*. DOI: 10.1080/14926156.2015.1093201
- Shahbari, J.A., & Tabach, M. (2015). Developing modeling lenses among practicing teachers. *International Journal of Mathematical Education in Science and Technology* DOI: 10.1080/0020739x.2015.1106015
- Silva, K.A.P., & Almeida, L. M. W. (2015). Meanings routes in activities of mathematical modeling: a look on the interpretants. *Bolema: Boletim de Educação Matemática*, 2015
- Sokolowski, A. (2015). The effects of mathematical modelling on students' meta-analysis of research. *The IAFOR Journal of Education*, 3(1), 93-114.
- Stalvey, H.E., & Vidakovic, D. (2015). Students' reasoning about relationships between variables in a real-world problem. *The Journal of Mathematical Behavior*, 40, 192-210.
- Stender, P., & Kaiser, G. (2015). Scaffolding in complex modeling situations. *ZDM Mathematics Education*, 47(7), 1255-1267.
- Stohlmann, M., Maiorca, C., & Olson, T.A. (2015). Preservice secondary teachers' conceptions from a mathematical modeling activity and connections to the Common Core State Standards. *The Mathematics Educator*, 24(1), 21-43. 2015.
- Tomaz V.S., & David, M.M. (2015). How students' everyday situations modify classroom mathematical activity: The case of water consumption. *Journal for Research in Mathematics Education*, 46(4), 378-422.
- Tropper, N., Leiss, D., & Hänze, M. (2015). Teachers' temporary support and worked out examples as elements of scaffolding in mathematical modeling. *ZDM Mathematics Education*, 47(7), 1225-1240.
- Wijaya, A., van den Heuvel-Panhuizen, M., & Doorman, M. (2015). Teachers' teaching practices and beliefs regarding context-based tasks and their relation with students' difficulties in solving these tasks. *Mathematics Education Research Journal*, 27(4), 637-662.
- Yoon, C., & Miskell, T. (2016). Visualising cubic reasoning with semiotic resources and modeling cycles. In A. Sâenz-Ludlow & G. Kadunz (Eds.), *Semiotics as a tool for learning mathematics* (pp. 89-109). Rotterdam, The Netherlands: Sense.
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