ICMI Column

Jean-Luc Dorier (Université de Genève, Switzerland)

The 2017 Felix Klein and Hans Freudenthal Awards

The ICMI is proud to announce the seventh recipients of the *Klein and Freudenthal Awards.*

The *Felix Klein and Hans Freudenthal Awards*, presented in each of the odd-numbered years since 2003, are two prizes created by the ICMI for recognising outstanding achievement in mathematics education research. They respectively honour a lifetime achievement (*Felix Klein Award*, named after the first president of the ICMI – 1908 until 1920) and a major cumulative programme of research (*Hans Freudenthal Award*, named after the eighth president of the ICMI – 1967 until 1970). By paying tribute to outstanding scholarship in mathematics education, these awards serve not only to encourage the efforts of others but also to contribute to the development of high standards for the field through the public recognition of exemplars. Each award consists of a medal and a certificate, accompanied by a citation. They have a character similar to that of an honorary university degree. At the International Congress on Mathematical Education (ICME), the awardees are honoured during the opening ceremony. Furthermore, the awardees are invited to present special lectures (ICMI Award Lectures) at the congress. The *Felix Klein and Hans Freudenthal Awards* are selected by an anonymous award committee of distinguished international scholars. The jury for the 2017 awards was chaired by Professor Anna Sfard, Haifa University, Israel.

We give some key biographical elements below; full citations of the work of the two 2017 medallists can be found at: https://www.mathunion.org/icmi/awards/icmi-awards.

The following table gives a list of all the previous awardees since the creation of the medals in 2003:

	Felix Klein Award	*Hans Freudenthal Award*
2003	Guy Brousseau	Celia Hoyles
2005	Ubiratan d'Ambrosio	Paul Cobb
2007	Jeremy Kilpatrick	Anna Sfard
2009	Gilah Leder	Yves Chevallard
2011	Alan Schoenfeld	Luis Radford
2013	Michèle Artigue	Frederick Leung
2015	Alan Bishop	Jill Adler

Deborah Loewenberg Ball, William H. Payne Collegiate Professor in Education and an Arthur F. Thurnau Professor in the University of Michigan, USA receives the 2017 Felix Klein Award.

The *Felix Klein Award 2017* is awarded to **Professor Deborah Loewenberg Ball** in recognition of her outstanding contributions and her leadership role in deepening our understanding of the complexities of teaching mathematics and in improving the practice of teaching and of teacher education. These achievements are grounded in Deborah Ball's firm belief that research and the practice of teaching are co-constitutive and must always be developed in tandem. Early in her life, Deborah Ball, at that time an exceptionally talented elementary school mathematics teacher, set out to investigate what was involved in the work of teaching children mathematics "for understanding". Her intention was to uncover the work in order to support the learning of teaching practice. Ever since then, her ambition has been to contribute in a substantial way to the project of improving ways in which mathematics teachers support their students' learning. This goal gave rise to two lines of work, both of them combining research with development in the domain of teacher education. The first strand, in which the research element came first, has been generating studies revolving around the question of what mathematical knowledge is required for teaching learners. In the second line of work, related to the practice of education in a more immediate way, the development of innovative teacher preparation programmes has been combined with research, through which Deborah Ball has been trying to gain a better grasp of the moment-to-moment dilemmas with which teachers grapple in the classroom.

The first of these pursuits gave rise to the theory of MKT, Mathematical Knowledge for Teaching, the kind of knowledge that requires competence in both everyday and academic mathematical discourses but is not identical to either. In her multiple studies, Deborah Ball and her colleagues have been able to identify many unique features of MKT and then to corroborate the conjecture about a correlation between teachers' competence in this special brand of mathematics and the achievements of their students.

The second, newer strand of Deborah Ball's work is focused on *TeachingWorks*, a national organisation she established at the University of Michigan to help in improving teachers' preparation and to define "a profes-

sional threshold for entry to teaching". The mission of the institute is to identify "high-leverage" teaching practices, that is, those recurring elements of teachers' classroom activities that are central to what Deborah Ball terms "the work of teaching".

Deborah Ball has been an elementary classroom teacher before and during her studies at Michigan State University, which she completed in 1988 with a PhD in mathematics education. Upon graduation, she joined Michigan State University and, in 1996, she was recruited to the University of Michigan to develop the mathematics education group. She has been teaching at the University of Michigan ever since and also spent over a decade serving as Dean of the School of Education there. She has played multiple leadership roles, not only within the community of mathematics education but also within that of education at large, and not only within the United States but internationally. With more than 30 years of outstanding achievements in mathematics education research and development, Deborah Ball is a most distinguished member of the mathematics education community and a highly deserving recipient of the 2017 Felix Klein Award.

The *Hans Freudenthal Award 2017* is awarded to **Professor Terezinha Nunes** for her outstanding contribution to our understanding of mathematical thinking, its origins and development. For more than 35 years now, she has been researching children's mathematical learning taking place in formal and informal settings. The results of her numerous, exemplarily designed studies combine into an insightful, consistent and comprehensive story of the emergence and evolution of mathematical thinking. This constantly developing account has been inspiring the work of mathematics education researchers and informing mathematics teachers' practices all over the world. It has had a major impact on both what we know about children's learning of mathematics and on how we know and think about it.

Terezinha Nunes' research has been immensely innovative and influential from its earliest stages. In one of her first studies, she documented the mathematical skills of young Brazilian street vendors, who, although almost unschooled and incapable of executing paper-and-pencil arithmetic tasks, proved impressively proficient in complex money transactions. Her later research on the development of mathematical thinking, conducted in Brazil and the UK, spans multiple mathematical topics, from additive and multiplicative reasoning to fractions, variables, randomness and probability. She has studied children's logical reasoning and its role in the learning

Terezinha Nunes, Professor Emeritus of Educational Studies at the University of Oxford, UK receives the 2017 Hans Freudenthal Award.

of mathematics, as well as problem solving and the way mathematics is being used in science.

While forging her stories on children's thinking about numbers, Terezinha Nunes has been transforming her own thinking as a researcher. She has come a long way from being a traditionally trained clinical psychologist, with research firmly grounded in Piaget's ideas about human development, to being inspired by cultural psychology and the work of Vygotsky and his followers to at least the same extent. Her tendency for bridging apparent opposites and bringing aspects that are separate together also finds its expression in her attempts to improve the practice of teaching mathematics.

Terezinha Nunes began her studies in psychology in her native Brazil and earned her Master's and PhD degrees at City University of New York (1975 and 1976 respectively). She began her academic career in Brazil at the Federal University of Minas Gerais and the University of Pernambuco. Later, she moved to the United Kingdom, where she taught at the Institute of Education, University of London, Oxford Brookes University and, since 2005, the University of Oxford. She is now a professor emerita at the University of Oxford and a fellow of Harris Manchester College, Oxford. Throughout her career, she has completed tens if not hundreds of studies, most of which were conducted in Brazil and in the UK. An exceptionally prolific writer, she has authored or co-authored more than a dozen books and almost 200 journal papers, book chapters and encyclopedia entries in English and Portuguese. An ardent team player and highly appreciated teacher, Terezinha Nunes has been an inspiration to her colleagues and to her many students. As an outstanding researcher driven by an insatiable passion for knowing and one who has made a paramount contribution to mathematics education and is likely to continue adding substantial insights for years to come, Terezinha Nunes is an eminently deserving recipient of the Hans Freudenthal Award for 2017.

Discussion Document ICMI Study 24

School mathematics curriculum reforms: Challenges, changes and opportunities

Co-Chairs: Yoshinori Shimizu (Japan, yshimizu@human. tsukuba.ac.jp) & Renuka Vithal (South Africa, vithalukzn@gmail.com)

Read the full discussion document at: http://www. human.tsukuba.ac.jp/~icmi24/discussiondocument.

School mathematical reforms have taken place in many countries around the world in the recent past. Although contexts vary significantly, much could be learnt from deeper and more substantial reflections and research about different aspects of these reforms.

Reforms have been large-scale, involving education systems as a whole, at a national, state, district or regional level, in which mathematical curricula, standards and frameworks have been developed and implemented. Changes have taken place at all levels of mathematics in

the school educational system from pre-primary through to senior secondary level.

School mathematics reforms are often conducted with changes in all aspects of the curriculum: mathematics content, pedagogy, teaching and learning resources (e.g. texts and technologies), and assessment and examinations.

This ICMI study topic invokes not only questions about changes in curriculum design but – with force – questions about the implementation of these changes across an educational system. A curriculum reform will be influential or have impact insofar as it can be implemented and sustained. What has functioned (or not) at the time of implementing a curricular change? What are the limitations? How have resources (e.g. textbooks and technology) influenced the reforms and their enactment? How must large-scale teacher preparation be conducted to achieve the reform goals? How do diverse social, economic, cultural and national contexts condition the nature and extent of curricular reforms, especially teacher expectation, attitudes and beliefs, and the social and cultural backgrounds of students? How are assessments of students' learning influential in curriculum reforms? An ICMI Study offers an opportunity to provide a synthesis and meta-analysis of different aspects of school mathematics reforms historically, geographically and globally.

The overarching question of this ICMI Study is: to explore the school mathematics curriculum reforms that have been or are taking place, especially at a meta, macro or system level; and to learn about the many different aspects of mathematics curriculum reforms from past experiences, to specify the current status and issues in reforms worldwide, and to identify possible directions for the future of school mathematics.

The following five themes are selected for the study to address the research questions.

A. Learning from the past: driving forces and barriers shaping mathematics curriculum reforms.
B. Analysing school mathematics curriculum reforms for coherence and relevance.
C. Implementation of reformed mathematics curricula within and across different contexts and traditions.
D. Globalisation and internationalisation, and their impacts on mathematics curriculum reforms.
E. Agents and processes of curriculum design, development and reforms in school mathematics.

Each of these selected themes is aligned with a group of specific questions to be addressed in the study.

ICMI Study 24 on school mathematics curriculum reforms is planned to provide a platform for teachers, teacher educators, researchers and policymakers around the world to share research, practices, projects and analyses. Although these reports will form part of the programme, substantial time will also be allocated for collective work on significant problems in the topic, which will eventually form parts of a study volume. As in every ICMI Study, ICMI Study 24 is built around an international study conference and directed toward the preparation of a published volume.

The study conference will take place in the Tsukuba International Congress Center, Tsukuba, Japan, and will be hosted by the University of Tsukuba. The conference will take place 26-30 November 2018, with an opening reception on the evening of Sunday 25 November 2018.

As is usual practice for ICMI Studies, participation in the study conference will be by invitation only for the main/corresponding authors of the submitted contributions that are accepted.

The International Programme Committee for ICMI Study 24 invites submissions of contributions of several kinds, including: research papers related to school mathematics curriculum reform issues; theoretical, cultural, historical and epistemological essays (with deep connection to curriculum reforms); discussion and position papers analysing curriculum policy and practice issues; synthesis and meta-analysis reports on empirical studies; reviews of curriculum reform efforts, especially at macro levels; and papers on comparative studies in curriculum reform initiatives.

30 April 2018: Submissions must be made online no later than 30 April 2018 but earlier if possible.
30 June 2018: Papers will be reviewed, decisions will be made about invitations to the conference and notifications of these decisions will be sent to the corresponding/main authors by the end of June.

Information about registration, visa applications, costs and details of accommodation can be found on the ICMI Study 24 website: http://www.human.tsukuba.ac.jp/~icmi24/.

Members of the International Programme Committee

The members of the International Programme Committee are:

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