ERME Column

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ERME topic conferences

European Society for Research in Mathematics Education (ERME) Topic Conferences (ETC) are organised on a specific research theme or themes related to the work of thematic working groups at CERME conferences. Their aim is to extend the work of the group or groups in specific directions, with clear value to the mathematics education research community. We report herein on a recent ETC.

INDRUM – International Network for Didactic Research in University Mathematics

As reported in the March 2020 issue, the Third Conference of the International Network for Didactic Research in University Mathematics (INDRUM 2020) was initially planned to take place in Bizerte (Tunisia), 27–29 March 2020. Due to the coronavirus pandemic, it was postponed to 17–19 September 2020, also in Bizerte. Finally, given the exceptional situation due to Covid-19, and the uncertainty about travelling, INDRUM 2020 was held in the form of an online conference, on 12–19 September 2020.

INDRUM 2020 is an ERME Topic Conference which falls within the activities of the research project INDRUM. Initiated by an international team of researchers in didactics of mathematics, this project aims to contribute to the development of research in didactics of mathematics at all levels and contexts of tertiary education, with a particular concern for the development of new researchers in the field and for dialogue with mathematicians.

Despite the adverse conditions, this conference attracted 189 registered participants from 33 countries, 4 continents, with time zones spanning from UTC-9 to UTC+9. There were 4 parallel thematic working groups, in which a total of 44 research papers and 5 posters were accepted for presentation and discussion. One of the thematic working groups was devoted to calculus and analysis; another was dedicated to modelling and the role of mathematics in other disciplines (for instance, engineering); a third was dedicated to number theory, algebra, discrete mathematics and logic; and a fourth was devoted to students' and teachers' practices. There was also a plenary panel concerning tertiary education in the digital age, which is the focus of this column.

INDRUM panels

As INDRUM activities aim to not only be of interest to researchers in didactics of mathematics, all INDRUM panels to date (in 2016, 2018, 2020) have not addressed very specific issues, but rather a broad range of themes that involve mathematicians as well as educators. Thus, the INDRUM 2016 panel, chaired by Marianna Bosch, was about the current state of interactions between mathematicians and research in mathematics education [1], and the INDRUM 2018 panel, chaired by Carl Winsløw, was about education and professional development of university mathematics teachers [2].

Introducing the INDRUM 2020 panel: Tertiary education in the digital age

Pedro Nicolás Zaragoza chaired the panel, and the panellists were Yael Fleischmann from the Norwegian University of Science and Technology; Ghislaine Gueudet from the University of Brest, France; and Said Hadjerrouit from the University of Agder, Norway.

Digital resources provide both teachers and students with a whole world of possibilities, and their potential is difficult to overestimate. Actually, the presentation of the panel started out by emphasising that, without digital information and communication technologies (ICT), not only would teaching have been impossible in many countries in recent months, but also the INDRUM conference itself could not have taken place.

Many issues arise concerning the use of digital resources in the teaching of mathematics at tertiary level. To begin with, the question of what can be considered a digital resource is interesting in itself, as different theories in didactics provide alternative conceptualisations of this notion, emphasising different possible roles played by these resources and depending on the kind of instruction these theories are interested in. Gueudet addressed this question, in connection with the recent evolution of mathematics education research in the study of digital resources and their use at university. Also, she wondered about which aspects of digital resources and their use are specific to tertiary level. Related to this, Fleischmann and Hadjerrouit considered the question of whether the instruction of some topics in mathematics can be improved thanks to digital means, and connected this to the question of whether digital resources are possibly more relevant to tertiary education than they are to secondary education. In his contribution, Hadjerrouit also addressed the problem of analysing the idea of digital resource, both from the technological point of view and from the didactic perspective of mathematics education. He also considered the relevance of digital means for tertiary education, and its reliance on many factors (intended educational ends, expertise of users, blending with other means, etc.). The idea that digital tools can be useful for some student-centred didactic paradigms was also tackled in Hadjerrouit's contribution.

Finally, the three panellists shared some insights regarding the impact of the Covid-19 crisis on teaching practices. For instance, the need to use unfamiliar digital

resources to provide online or blended learning, the corresponding changes in teaching strategies, their effect on students' learning and consequences for the assessment of the course.

There are many issues that remain to be studied regarding the potential of digital resources and their possible use, depending on a given didactic paradigm, which are interesting for both researchers and practitioners in mathematics education. This panel served as a useful step in this direction.

ERME Thematic Working Groups

The European Society for Research in Mathematics Education (ERME), holds a bi-yearly conference (CERME), in which research is presented and discussed in Thematic Working Groups (TWG). The initiative of introducing the working groups, which we began in the September 2017 issue, will continue in the following issue of the newsletter.

References

[1] Bardini, C., Bosch, M., Hochmuth, R., Rasmussen, C., and Trigeros, M., Current interactions between mathematicians and research in mathematics education, *Proceedings of the First Conference of the International Network for Didactic Research in University Mathematics* (INDRUM 2016, 31 March–2 April 2016), University of Montpellier and INDRUM, Montpellier (France), eds. E. Nardi, C. Winsløw and T. Hausberger, pp. 29–31.

[2] Biehler, R., Jaworski, B., Rønning, F., Wawro, M., and Winsløw, C., Education and professional development of University Mathematics Teachers, *Proceedings of the Second Conference of the International Network for Didactic Research in University Mathematics* (INDRUM 2018, 5–7 April 2018), University of Agder and INDRUM, Kristiansand (Norway), eds. V. Durand-Guerrier, R. Hochmuth, S. Goodchild and N. M. Hogstad, pp. 12–13.

Pedro Nicolás Zaragoza is an associate professor at the University of Murcia's Faculty of Education. His research concerns both mathematics – primarily Homological Algebra and Representation Theory – and mathematics education – from the framework of the Anthropological Theory of the Didactic, with a special interest in the role played by reasoning in the genesis and development of mathematical knowledge.

Jason Cooper is an associate staff scientist at the Weizmann Institute's Department of Science Teaching. His research concerns various aspects of teacher knowledge, including roles of advanced mathematical knowledge in teaching mathematics and contributions of research mathematicians to the professional development of mathematics teachers.