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## INDRUM2022 Editorial

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INDRUM2022 was the fourth conference of the International Network for Didactic Research in University Mathematics. Initiated by an international team of researchers in didactics of mathematics in 2014, INDRUM aims at contributing to the development of research in didactics of mathematics at all levels of tertiary education, with a particular concern for the development of new researchers in the field and the dialogue with mathematicians. After three very successful conferences in 2016 (Montpellier, France), 2018 (Kristiansand, Norway), and 2020 (Bizerte, Tunisia, online) the INDRUM Network Scientific Committee (INSC) decided to continue the cycle of biennial conferences with a fourth INDRUM conference to be held in Hannover, Germany, on October 19<sup>th</sup>-22<sup>nd</sup> 2022.

The INSC nominated the INDRUM2022 International Programme Committee (IPC) and the Local Organising Committee (LOC), with an intersection to facilitate the coordination of both committees. The IPC was composed of María Trigueros (Ciudad de México, México) Chair; Berta Barquero (Barcelona, Spain) Co-chair; Rolf Biehler (Paderborn, Germany); Marianna Bosch (Barcelona, Spain); Laura Branchetti (Milan, Italy); Viviane Durand-Guerrier (Montpellier, France); Alejandro González-Martín (Montreal, Canada); Thomas Hausberger (Montpellier, France); Reinhard Hochmuth (Hannover, Germany); Barbara Jaworsky (Loughborough, United Kingdom); Rafael Martínez-Planell (Mayagüez, Puerto Rico); Chris Rasmussen (San Diego, United States). The LOC was composed of Reinhard Hochmuth (Hannover, Germany) Chair; Christine Bessenrodt (Hannover), Rolf Biehler (Paderborn), Andreas Eichler (Kassel), Sarah Khellaf (Hannover), Michael Liebendörfer (Paderborn), Jana Peters (Hannover), Johanna Ruge (Hannover), Hanh Vothi (Hannover) and Johannes Wildt (Bielefeld).

The first announcement, published in September 2021, communicated the structure of the conference. Similarly to the two previous INDRUM conferences, themes to be addressed at INDRUM2022 covered teacher and student practices and the teaching and learning of specific mathematical topics at undergraduate and postgraduate level, as well as across disciplines. Accepted scientific contributions were to be discussed in four to six thematic working groups (six hours each) after their presentation in two parallel sessions of short communications (two sessions of 1h 30min). The programme also included a poster exhibition and a workshop for early-career researchers. It was announced that Andreas Eichler (University of Kassel, Germany) had accepted to give

the plenary lecture and that an expert panel discussion on tertiary education on “Innovation in teaching at the university based on research in mathematics education” chaired by Rafael Martínez-Planell (Universidad de Puerto Rico at Mayagüez) was in preparation. Although the primary language of the conference was English, the linguistic characteristics of the host country were considered, as in previous INDRUM conferences. Therefore, authors were offered the opportunity to write and present a paper in German, provided that the presenter considered how to address the conference audience in its linguistic diversity through slides or a handout in English. Besides, INDRUM2022 was the fourth INDRUM conference to be accepted as a Topic Conference by the European Society for Research in Mathematics Education (ERME).

The second announcement was published in October 2021 with further details on the submission. Authors were provided with a list of 15 keywords or topics as a means to classify their submission (using two keywords from the list and three optional additional keywords) and also to help us in the subsequent process of allocating papers to different working groups after the review process.

In response to the call, 76 papers and 20 posters were received. The review process was organised by the chair and co-chair according to principles that were discussed among the IPC. Thus, each paper was reviewed by a member of the INSC and by an author of another paper; posters were reviewed by the chair or the co-chair and by an author of another poster. Final decisions, in cases where both reviewers had diverging opinions, were made after discussion among the IPC. At the end of the reviewing process, 56 papers and 20 posters were accepted for presentation at the conference. Authors of rejected papers that fell within the scope of the conference were offered the opportunity to resubmit their contribution as a poster. This last step increased the number of accepted posters to 39 in total.

Given the number of accepted contributions and the keywords provided by the authors, it was considered possible and appropriate to organise six balanced thematic working groups (TWG). The allocation of papers and posters was proposed by the chair and co-chair, and approved by the IPC. The appointment of TWG co-leaders from among the INSC members was made with a view to geographical diversity, gender balance, and the involvement of colleagues who had not previously or recently served as leaders. We were grateful that the appointed INSC members were able to accept our invitation.

The third announcement was published in September 2022 with the following list of groups (TWG) and names of co-leaders:

TWG1: *Transition to, across and from university mathematics*. Chairs: Thomas Hausberger (France), Heidi Strømskag (Norway)

TWG2: *Teaching and learning of analysis and calculus*. Chairs: Erik Hanke (Germany), Rafael Martínez-Planell (Puerto Rico)

TWG3: *Teaching and learning of linear and abstract algebra, logic, reasoning and proof*. Chairs: Viviane Durand-Guerrier (France), Melih Turgut (Turkey-Norway)

TWG4: *Teaching and learning of mathematics for engineers, and other disciplines*. Chairs: Ignasi Florensa (Spain), Ghislaine Gueudet (France),

TWG5: *Teacher education in university*. Chairs: Marianna Bosch (Spain), Carl Winsløw (Denmark)

TWG6: *Students' practices and assessment*. Chairs: Nicolas Grenier-Boley (France), Frank Feudel (Germany)

The third announcement also included the names of the panel chair and panelists, who were appointed by the IPC from among the conference participants on the basis of their expertise in the topic of the panel. Rafael Martinez-Planell (Universidad de Puerto Rico in Mayagüez, Puerto Rico) accepted to chair the panel on “Innovation in teaching at the university based on research in mathematics education” with Ignasi Florensa (Universidad Salesiana de Sarrià-Universitat de Barcelona, Spain), Max Hoffmann (Paderborn University, Germany), Avenilde Romo (CINVESTAV, México) and Michelle Zandieh (University of Arizona, USA) as speakers. Finally, Elena Nardi (University of East Anglia, United Kingdom) and Megan Wawro (Virginia Tech, USA) prepared a workshop for INDRUM early career researchers on “Starting to write journal articles” for INDRUM early career researchers based on two of their published papers. The purpose of the workshop was to share experiences and stimulate discussion on what constituted the challenges –and ways to overcome them– of preparing a manuscript for submission to a mathematics education research journal, with a particular focus on university mathematics education.

Table 1. Participants and countries

Country	Participants
Canada	4
Croatia	6
Denmark	2
Finland	3
France	12
Germany	39
Greece	2
Hungary	1
Italy	6
Israel	4
Japan	6
Mexico	3
Norway	6
Puerto Rico	1
Spain	7
Sweden	5
The Netherlands	4
Tunisia	1
United Kingdom	2
United States	4

The third announcement included the conference timetable and the conference pre-proceedings. In parallel, the LOC was getting ready to welcome delegates in Hannover, Germany.

118 participants from 20 countries registered for the INDRUM2022 conference (see Table 1). The opening and closing sessions were lively thanks to the work of the LOC. Work in the TWG was also lively with interesting exchanges and interaction between delegates. The TWG’s leaders encouraged rich interaction among participants. They also prepared a summary which was presented at the closing session.

Papers and posters appear in these Proceedings in a version chosen by the participants, following the optional possibility to upload a final version of their paper.

Last but not least, we would like to thank the IPC, chaired by Maria Trigueros and Berta Barquero, and the LOC, chaired

by Reinhard Hochmuth and his entire team (especially Mrs. Krampe), for their tireless work over many months to organise the conference. We are also grateful for the support provided by Jana Peters for her work on both the pre-proceedings and these proceedings. Many thanks to all TWG co-leaders for your support and help in making INDRUM2022 a fruitful and enjoyable experience for the participants.

## **FOLLOW-UP**

The INDRUM2022 closing ceremony was the occasion to announce some additional interesting news. We are delighted to announce that authors of an accepted contribution (paper or poster) in the INDRUM2022 proceedings will be offered the opportunity to publish an expanded, updated or reworked version of their contribution to match the requirements of a special issue in IJMEST (International Journal of Mathematical Education in Science and Technology) Special Issue guest-edited by the INDRUM2022 Chair, co-Chair and LOC Chair. We invite papers of 15-20 pages, written in English, with the aim of publishing approximately ten papers among the best research represented in the INDRUM2022 Proceedings. While we aim to reflect the thematic richness of the INDRUM2022 programme, we will not commit to a strict representation of the conference structure. We particularly welcome proposals that substantially elaborate and expand the content of the INDRUM2022 submissions.

The deadlines for this Special Issues have been fixed as follows: April 23<sup>rd</sup>, 2023: deadline to submit papers; July 28<sup>th</sup>, 2023: decision letters sent to authors; September 29<sup>th</sup>, 2023: deadline for revised manuscripts; December 5<sup>th</sup>, 2023: final decisions and February 2024 Publication. The official call for contributions has been sent to the authors of INDRUM2022 accepted contributions through the INDRUM mailing list. The Call for papers is available at the INDRUM2022 webpage (<https://indrum2022.sciencesconf.org/>); as well as in the IJMEST website: [https://bit.ly/INDRUM2022\\_Conference](https://bit.ly/INDRUM2022_Conference).

Finally, we are delighted to spread the news that INDRUM2024 will be held in Barcelona, Spain in June 2024 from 10<sup>th</sup> to 14<sup>th</sup> June 2024. The final dates will be decided in September 2023. The local Chair is Ignasi Florensa, with Alejandro González Martín (Canada) as Chair of the IPC and Ghislaine Guedet (France) as co-Chair. The INDRUM2024 website <https://indrum2024.sciencesconf.org/>, which is currently under construction, will open with updated information as soon as possible.

We now invite you to carry on reading this volume and we hope that the promise of its contents will encourage you to consider joining or continuing to be part of the ambitious and stimulating INDRUM network.