**INDRUM2022**
**Fourth conference of the**
**International Network for Didactic Research in University Mathematics (INDRUM)**
**October 19–22, 2022, Hannover (Germany)**

**Third announcement** https://indrum2022.sciencesconf.org

INDRUM 2022 is an ERME Topic Conference: http://erme.site/topic-conferences/

We are pleased to announce INDRUM 2022, the fourth conference of the International Network for Didactic Research in University Mathematics, to be held on October 19–22 in Hannover (Germany). This Conference falls within the activities of INDRUM (acronym for International Network for Didactic Research in University Mathematics), initiated by an international team of researchers in didactics of mathematics and aiming to contribute 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 for dialogue with mathematicians. The themes to be addressed at INDRUM 2022 cover teacher and student practices and the teaching and learning of specific mathematical topics at undergraduate and post-graduate level as well as across disciplines. The target audience of this conference is researchers in didactics of mathematics, mathematicians as well as teachers and researchers who are interested in these issues. The programme of the conference comprises a plenary lecture by Andreas Eichler (University Kassel, Germany); an expert panel discussion on "Teaching innovations in higher education based on mathematics education research" (Rafael Martínez-Planell, chair); six thematic working groups (TWG) with short communications in parallel (two sessions of 2h) and TWGs discussion sessions (4h); a poster exhibition and a workshop for early-career researchers. The main language of the conference is English. There is the possibility to present a paper in German provided the presenter considers how to address the conference audience in its linguistic diversity through slides or a handout in English. Pre-conference proceedings will be distributed to registered participants through the website. The final version of the proceedings will be posted on the open archive HAL (https://hal.archives-ouvertes.fr/INDRUM).

## Scientific programme

*Workshop for early-career researchers* – Coordinators: Elena Nardi (United Kingdom), Megan Wawro (United States). Wednesday, October 19th 15:00-18:30
*Plenary talk*: Teaching and learning networks in university programs including mathematics courses – connecting universities digitally, Andreas Eichler (University Kassel, Germany). Thursday, October 20th 10:30-12:00
*Presentation of TWG and overview on the posters.* Thursday, October 20th 12:00-12:30
*Plenary panel*: Innovation in teaching at the university based on research in mathematics education. Chair: Rafael Martínez-Planell (Universidad de Puerto Rico en Mayagüez). Friday, October 21st 16:30-18:30

*Thematic working groups (TWGs)*
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)

## International Programme Committee

*Chair*: María Trigueros (México)
*Co-chair*: Berta Barquero (Spain)
*Members*: Rolf Biehler (Germany), Marianna Bosch (Spain), Laura Branchetti (Italy), Viviane Durand-Guerrier (France), Alejandro González-Martín (Canada), Thomas Hausberger (France), Reinhard Hochmuth (Germany), Barbara Jaworski (United Kingdom), Rafael Martínez-Planell (Puerto Rico), Chris Rasmussen (United States)

## Local Organising Committee

*Chair*: Reinhard Hochmuth (Hannover, Germany)
*Members*: Christine Bessenrodt (Hannover), Rolf Biehler (Paderborn), Andreas Eichler (Kassel), Sarah Khellaf (Hannover), Michael Liebendörfer (Paderborn), Jana Peters (Hannover), Johanna Ruge (Hannover), Hanh Vothi (Hannover), Johannes Wildt (Bielefeld)

# INDRUM2022 Timetable

| Wednesday, October 19th 2022 | | |
|---|---|---|
| 15:00 – 16:30 | Workshop for INDRUM early career researchers – Session 1 | |
| 16:30 – 17:00 | *Coffee-break* | |
| 17:00 – 18:30 | Workshop for INDRUM early career researchers – Session 2 | |
| The number of participants in the early career researchers' workshop is limited to 40. Participants might pre-register to the workshop at the following link: https://forms.gle/BFQMXBZ8SBDQ4wBv6 | | |
| **Thursday, October 20th 2022** | | |
| 8:30 – 12:00 | Registration | |
| 9:30 – 10:00 | Opening ceremony | |
| 10:00 – 10:30 | *Coffee-break* | |
| 10:30 – 12:00 | Plenary lecture: *Developing digital networks for learning and teaching mathematics in introductory courses.* Andreas Eichler (Univ. Kassel) | |
| 12:00 – 12:30 | TWG introduction | |
| 12:30 – 14:00 | *Lunch* | |
| 14:00 – 16:00 | Parallel Presentations TWGs – Session 1 | TWGs rooms |
| 16:00 – 16:30 | *Coffee-break* | |
| 16:30 – 18:00 | Thematic Working Groups Session 1 – Discussion | TWGs rooms |
| The programme of the special event in honour of the 60th birthday of R. Hochmuth is planned on Thursday, October 20th, from 18:15h to 20:30h. All INDRUM 2022 participants are invited to attend the reception and planned activities. | | |
| **Friday, October 21st 2022** | | |
| 9:00 – 11:00 | Parallel Presentations TWGs – Session 2 | TWG rooms |
| 11:00 – 11:30 | *Coffee-break* | |
| 11:30 – 13:00 | Thematic Working Groups Session 2 – Discussion | TWG rooms |
| 13:00 – 14:30* | *Lunch* | |
| 14:00* – 15:15 | Poster session [The walls for the posters have the following dimensions (width x height) 114 x 140 cm. A DIN A0 poster in portrait format will fit well. Posters must be printed and brought along]. | |
| 15:15 – 16:15 | Thematic Working Groups Session 3 – Discussion | |
| 16:15 – 16:30 | *Coffee-Break* | |
| 16:30 – 18:30 | Plenary Panel: *Innovation in teaching at university based on research in mathematics education* (Rafael Martínez-Planell, chair) | |
| 20:00 | *Gala Dinner* | |
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| **Saturday, October 22nd 2022** | | |
| 9:00 – 11:00 | Thematic Working Groups Session 4 – Preparation of the plenary report | TWG rooms |
| 11:00 – 11:30 | *Coffee-break* | |
| 11:30 – 12:45 | Plenary TWGs presentation | |
| 12:45 – 13:00 | Closing ceremony of INDRUM 2022 | |
| 13:00 – 14:30 | *Farewell lunch* | |

***Plenary Lecture*: Teaching and learning networks in university programs including mathematics courses – connecting universities digitally**
Andreas Eichler (University Kassel, Germany)

Abstract: In recent years, digital tools have been increasingly developed aiming to improve the teaching and learning of university mathematics, in particular through a stronger focus on the heterogeneity of students, on different learning speeds or on individual feedback. For example, learning videos offer great potential for learning mathematics. Audience response systems can increase interaction in lectures and thus help to activate students, but also align teachers with the current needs of students in a lecture. STACK tasks enable the randomization of tasks (e.g., by varying numbers or functions) and - through the integration of a computer algebra system- provide individual feedback (which is based on the construction of feedback trees). However, although the mentioned digital elements potentially facilitate the teaching and learning of mathematics, there are challenges in embedding digital elements in coherent teaching concepts that are developed across universities and in which students and teachers of different faculties could be actively involved. To meet these challenges, the main aim of the project LLV.HD: "Teaching and learning networks in university programs including mathematics courses – connecting universities digitally" is to develop networks with different meanings: A *digital network* refers to the development of a coherent system of digital elements. A *network of university teachers of different faculties* means developing digital elements that are not specific to only one of these teacher's courses. A *network of mathematicians and math educators* means combining innovative and at least sometimes evidence-based teaching approaches with the demands of a university course in mathematics. A network *of mathematics teachers in different study programmes* means developing digital elements that could be common for different study programmes. Thus, on the one side the aim of LLV.HD is to develop digital elements that are intended to facilitate mathematics teaching and learning in different universities and study programmes; on the other side, they are developed to fit the needs of the specific courses, teachers and students of the different universities. In the talk, I outline the main goals of the project and challenges of developing the mentioned networks. Further, examples of digital elements are presented such as digital tasks, quizzes or video tutorials –as the digital network is the most central of all different networks. Additionally, considerations about a theoretical basis for these elements are determined. Finally, the results of interviews with university teachers and students regarding their expectations and requests towards the project are discussed.

***Plenary Panel*: Teaching innovations in higher education based on mathematics education research**

Max Hoffmann (Paderborn University, Germany)
Avenilde Romo Vázquez (Cinvestav, México)
Ignasi Florensa (Escola Universitària Salesiana de Sarrià, Univ. Autònoma de Barcelona, Spain)
Michelle Zandieh (Arizona State University, U.S.A.)
Chair: Rafael Martínez-Planell (Universidad de Puerto Rico en Mayagüez)

Abstract: Panel members will present a variety of innovative projects that deal with different important issues in mathematics education, represent different ways of viewing inquiry-based mathematics education, and are at different stages of development and implementation. We will start with a presentation of a geometry capstone course for student teachers designed to help address Klein's second discontinuity problem, that is, the perception of pre-college teachers that the advanced mathematics courses they took at the university are of little use in the practice of their profession. Then the study and research paths (SRP) will be presented. This is the proposal from the Anthropological Theory of the Didactic (ATD) to foment a move from the paradigm of visiting works to that of questioning the world. This will be followed by a discussion of an online course for in-service teachers, designed to help these teachers experience, adapt, and class-test a modelling intervention, as well as reflect on institutional issues that might constrain the future application of modelling in their teaching. The panel will end with a discussion of a project based on the idea of guided reinvention, to design and study the implementation of inquiry-oriented linear algebra.

**A Workshop for INDRUM early-career researchers: Starting to write journal articles**
Elena Nardi (University of East Anglia, UK)
Megan Wawro (Virginia Tech, United States)

Abstract: In this workshop, we will set out from our recollections of the work we have each put towards producing a paper, either emerging from our own doctoral work or from co-authoring a paper with a doctoral student. We aim to trigger discussion on what constitutes the challenges – and ways to overcome these – of preparing a manuscript for submission to a peer-reviewed mathematics education research journal. Participants are kindly asked to prepare for this workshop according to the brief guidelines given on the conference website (direct link: https://indrum2022.sciencesconf.org/resource/page/id/5, or click on "Workshop for INDRUM early-career researchers" on the left banner of the website). It is important to consider that the number of participants in this workshop is limited to 40 participants, so you may register at https://forms.gle/BFQMXBZ8SBDQ4wBv6.

**Important notice:** Due to the Covid-19 pandemic, we ask participants to inform themselves about the requirements of the host country. Information can be found at Corona regulations Lower Saxony: https://www.niedersachsen-tourism.com/coronavirus-information