

INDRUM2020 Editorial

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INDRUM2020 was the third 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 two very successful conferences in 2016 (Montpellier, France) and 2018 (Kristiansand, Norway), the INDRUM Network Scientific Committee (INSC) decided in Kristiansand to pursue the cycle of biennial conferences with a third INDRUM conference to be held on March 27-29 2020 in Bizerte, Tunisia, in association with a side event in honour of Viviane Durand-Guerrier, the INDRUM Network coordinator, for her retirement. This decision followed the application of Tunisia to host the next INDRUM, through the voice of its INSC members, and also considered Viviane Durand-Guerrier's scientific involvement in the development of the Tunisian community of didactics of mathematics.

The INSC nominated in Kristiansand the INDRUM2020 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 Thomas Hausberger (Montpellier, France) Chair; Marianna Bosch (Barcelona, Spain) Co-chair; Faïza Chellougui (Bizerte, Tunisia); Viviane Durand-Guerrier (Montpellier, France); Imène Ghedamsi (Tunis, Tunisia); Simon Goodchild (Kristiansand, Norway); Reinhard Hochmuth (Hannover, Germany); Elena Nardi (Norwich, United Kingdom); Chris Rasmussen (San Diego, United States); María Trigueros (Mexico City, Mexico). The LOC was composed of Faïza Chellougui (Bizerte, Tunisia) Chair; Rahim Kouki (Tunis, Tunisia) Co-chair; Mahdi Abdeljaouad (Tunis, Tunisia); Sonia Ben Nejma (Bizerte, Tunisia); Béchir Dali (Bizerte, Tunisia); Viviane Durand-Guerrier (Montpellier, France); Imène Ghedamsi (Tunis, Tunisia); Inès Jendoubi (Tunis, Tunisia); Faten Khalloufi (Bizerte, Tunisia); Mahel Mosbah (Tunis, Tunisia).

The first announcement, published in February 2019, communicated the structure of the conference. Similarly, to the two previous INDRUM conferences, themes to be addressed at INDRUM2020 covered teacher and student practices and the teaching and learning of specific mathematical topics at undergraduate and post-graduate level as well as across disciplines. Accepted scientific contributions were to be discussed in four thematic working groups (4h each) after their presentation in two sessions of short communications in parallel (2h). The programme also comprised a poster exhibition

and, as a new feature, a workshop for early-career researchers. Last but not least, we were delighted to announce that Carl Winsløw (University of Copenhagen, Denmark) had accepted to give the plenary lecture and that an expert panel discussion on tertiary education in the “digital age” was in preparation. Although the primary language of the conference was English, the linguistic characteristics of the host country were considered, similarly to previous INDRUM conferences. Therefore, authors were offered the possibility to write and present a paper in French or Arabic provided the presenter considered how to address the conference audience in its linguistic diversity through slides or a handout in English. Besides, INDRUM2020 was the third INDRUM conference to be accepted as a Topic Conference by the European Society for Research in Mathematics Education (ERME).

The second announcement was published at the end of April 2019, with further details for the submission. A list of 15 keywords was provided to authors as a means to classify their submission (using two keywords from the list and three optional other keywords) and also to help in the subsequent process of paper allocation to different working groups after the review process.

In response to the call, 47 papers and 4 posters were received. The review process was organised by the chair and co-chair, following principles that were discussed among the IPC. Each paper was thus reviewed by a member of the INSC and by an author of another submission; posters were reviewed by the chair and co-chair. Final decisions in situations where both reviewers had diverging opinions were taken after discussion among the IPC. At the end of the reviewing process, 44 papers and 3 posters were accepted for presentation at the conference. Authors of rejected papers that fell in 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 5 in total.

Given the number of accepted contributions and the keywords provided by authors, it was deemed possible and relevant to organise four 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 among INSC members was made by taking into consideration the representation of geographical diversity, gender balance, and the involvement of colleagues who have not yet 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 early March 2020 with the following list of groups and names of co-leaders:

TWG1 – Calculus and Analysis: Laura Branchetti (Italy) & María Trigueiros (Mexico)

TWG2 – Mathematics for engineers, Mathematical Modelling, Mathematics and other disciplines: Berta Barquero (Spain) & Nicolas Grenier-Boley (France)

TWG3 – Number Theory, Algebra, Discrete Mathematics, Logic: Viviane Durand-Guerrier (France) & Rolf Biehler (Germany)

TWG4 – Students’ and teachers’ practices: Irene Biza (United Kingdom) & Imène Ghedamsi (Tunisia)

The names of the panel chair and panellists, appointed by the IPC among conference participants in view of their expertise in the topic of the panel, were also communicated in the third announcement. Pedro Nicolas (Universidad de Murcia, Spain) accepted to chair the panel on tertiary education in the digital age, with Yael Fleischmann (Norwegian University of Science and Technology, Norway), Ghislaine Gueudet (Université de Brest, France) and Said Hadjerrouit (University of Agder, Norway) as speakers. Finally, Elena Nardi (University of East Anglia, United Kingdom) and Carl Winsløw (University of Copenhagen, Denmark) prepared a promising workshop about “starting to write journal articles” for INDRUM early career researchers around two papers published in the INDRUM2016 Special Issue of the International Journal for Research in Undergraduate Mathematics (IJRUME) for which they served as guest-editors. The purpose of the workshop was to share experiences and trigger discussion on what constituted the challenges – and ways to overcome these – of preparing a manuscript for submission to a mathematics education research journal, with a special focus on university mathematics education.

The third announcement included the conference timetable and the conference pre-proceedings. In parallel, the LOC was getting ready to welcome delegates in Bizerte, Tunisia. What happened afterwards was quite unprecedented and led to numerous meetings of the IPC and LOC to take what seemed the best solutions to preserve the spirit of INDRUM in the context of the covid-19 pandemic that much impacted scientific activity and human lives in general.

With the hope that sanitary conditions would allow the conference to be held in the near future, INDRUM2020 was thus first postponed to September 17-19, 2020. In view of the dynamic of the pandemic, it later became apparent that travel restrictions would make it impossible for numerous delegates to attend. A fourth announcement was then published in April 2020 to spread the news that INDRUM2020 will still be held, in the form of an online conference, in the middle of September (12-19). The decision to run INDRUM2020 online was not an easy one as so much effort was invested by the organising committee in Tunisia in preparing to welcome the delegates in Bizerte. We adjust the dates and timetable to take into consideration other academic duties and the delegates’ time-zones. In particular, TWG sessions were reduced in comparison with the initial schedule, and the training session for early career researchers was removed. We could then fit the conference in eight days with sessions of no more than two hours per day. We also welcomed newcomers to the online conference, which was accessible upon free registration online.

INDRUM2020 thus took place as a conference in the cyberspace, virtually from Bizerte. 186 delegates from 36 countries (Table 1), going from time zone UTC-9 to UTC+9, registered to the online conference. Up to 120 participants attended the plenary sessions, and an average of 30 participants was present during the TWG discussion sessions. The opening and closing ceremonies were lively thanks to the work of the

Table 1. Participants and countries

COUNTRY	Participants
Andorra	1
Argentina	2
Belgium	5
Brazil	4
Cameroun	1
Canada	3
Chile	5
Colombia	1
Croatia	4
Denmark	1
Etiopia	1
Finland	4
France	40
Germany	12
Greece	1
Indonesia	1
Ireland	4
Israel	3
Italy	5
Japan	5
Lebanon	1
Malta	1
Marroco	1
Mexico	12
New Zeland	1
Norway	8
Peru	5
Portugal	2
Puerto Rico	1
Spain	16
Sweden	1
Switzerland	1
The Netherlands	1
Tunisia	19
UK	4
US	9
186	

LOC who gave delegates a flavour of Tunisia through a slideshow of beautiful landscapes and Tunisian music. Although scientific exchange online cannot reach the quality level of interactions in presence, feedback from delegates and from TWG co-leaders allowed us to conclude that the chosen format of the online conference, the richness of contents that were discussed and the reliability of the video-conference platform made INDRUM2020 a fruitful and enjoyable experience for most participants.

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

Very special thanks are due to the LOC, chaired by Faiza Chellougui, for their tireless work of many months to organise the conference and cope with the unexpected difficulties. We are also grateful for the support offered by Baptiste Chapuisat (IMAG, University of Montpellier) to solve technical aspects of the video-conference system, and to the whole “Tech-team” composed of colleagues from Barcelona and Montpellier who worked in the background to assist in case of technical difficulties. Finally, we are indebted to the University of Montpellier for offering us to use the video-conference license purchased on an institutional basis to provide online courses and webinars for academic activities in the covid-19 context. In these conditions and with the work of all the colleagues who worked unstintingly before, during and after the conference to ensure that participants had a smooth, productive and enjoyable experience, INDRUM2020 was again a success despite of the exceptional circumstances.

Follow-up

The INDRUM2020 closing ceremony was the occasion to report on the strengthening of the INDRUM Network with the enrolment of new colleagues to increase the geographical representation of the INSC and the creation of an INDRUM Network Coordination Group (INCG) to supervise the development of the network. It is now confirmed that ten colleagues from nine countries have joined the INSC to reach a total of 41 members. The INCG (an evolving group) is composed of 8 members: the three previous and the current IPC Chairs and co-Chairs. The composition of the INSC and INCG is published on the INDRUM website hosted by the open archive HAL where all INDRUM proceedings are posted: <https://hal.archives-ouvertes.fr/INDRUM>.

The forthcoming availability (on April 13, 2021) of the so-called (first) “INDRUM ERME book” was also announced. Edited by Viviane Durand-Guerrier, Reinhard Hochmuth, Elena Nardi and Carl Winsløw, this volume entitled “Research and Development in University Mathematics Education: Overview Produced by the International Network for Research in Didactics of University Mathematics” provides a state-of-the-art synthesis of University Mathematics Education research as exemplified by the works presented and discussed at INDRUM2016 and 2018. A big thanks and congratulation to Viviane Durand-Guerrier who managed the project and to the whole group of editors.

Following this publication and the previous INDRUM2016 Special Issue in IJRUME, we are now delighted to announce that authors of an accepted contribution (paper or poster) in the INDRUM2020 proceedings will be offered the opportunity to publish an expanded, updated or reworked version of their contribution to match the requirements of the following two journals in the context of production of two separate and complementary special issues:

(1) an IJMEST (International Journal of Mathematical Education in Science and Technology) Special Issue guest-edited by the INDRUM2020 chair and co-Chair. We are very grateful to the IJMEST editor-in-chief Colin Foster and associate editor Greg Oates for initiating such a fruitful and promising cooperation with INDRUM for the diffusion of university mathematics education research. This journal will therefore be able to gather both DELTA (series of biennial southern hemisphere symposia on the teaching and learning of undergraduate mathematics and statistics) and INDRUM research papers. We will invite papers of 15-20 pages, written in English, with an aim to publishing approximately ten papers among the best research represented in the INDRUM2020 Proceedings. While aiming at reflecting the thematic richness of the INDRUM2020 programme, we will not commit to a strict representation of the conference structure. We particularly welcome proposals that elaborate and expand the INDRUM2020 submissions’ content substantially.

(2) an EpiDEMES (*Épjournal de Didactique et Epistémologie des Mathématiques pour l’Enseignement Supérieur*) Special Issue. This open-access peer-reviewed online journal, founded in 2019, welcomes articles written either in English or French to the

attention of practitioners. It aims at providing a database for the initial and in-service training of higher-education teachers. This second call will therefore complement the first call and highlight the “interface” character of the journal between the community of mathematics education researchers and the community of mathematicians interested in issues related to teaching mathematics in higher education. We warmly thank the editors-in-chief Nicolas Grenier-Boley and Hussein Sabra for engaging this promising collaboration with INDRUM for the dissemination of practice-based INDRUM research.

The deadlines for both Special Issues will be as follows: March 31, 2021: deadline to submit papers; June 15, 2021: decision letters sent to authors; September 1, 2021: deadline for revised manuscripts; October 15, 2021: final decisions. The target is to have both volumes produced in 2021. The official calls for contributions will be sent soon to the authors of INDRUM2020 accepted contributions through the INDRUM mailing list, separately for both projects. We would therefore advise authors who wish to prepare a proposal to select between both options by considering how their INDRUM2020 contribution may best reach the goals above to the best of its potential.

Finally, we are delighted to spread the news that INDRUM2022 will be held in Germany, near Hanover, on a date to be confirmed closer to the time between mid-September and mid-October. The final dates will be decided in June 2021. The local chair is Reinhard Hochmuth, with María Trigueros (Mexico) as chair of the IPC and Berta Barquero (Spain) as co-chair. The INDRUM2022 website <https://indrum2022.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 content will encourage you to consider joining or continuing to be part of the ambitious and stimulating INDRUM enterprise!