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Meeting the challenges of teaching mathematics in higher education today

Nicolas Grenier-Boley, Hussein Sabra

Chief Editors of ÉpiDEMES

Among the research in Mathematics Education devoted to higher education, two types of initiatives can be distinguished: those promoting the development of research results and those promoting reflections on mathematics teaching. In both cases, mathematics educators and Mathematics researchers have played – sometimes jointly – a leading role. The creation of the journal ÉpiDEMES (Epijournal de Didactique et Epistémologie des Mathématiques pour l'Enseignement Supérieur in French) is positioned in the continuity of these efforts.

The purpose of the journal ÉpiDEMES is to promote the dissemination of research results to practitioners, i.e. higher education mathematics teachers in all their diversity. It publishes articles written in French or in English, and aims to provide a database for thinking about the training of university mathematics teachers. This is indeed a major challenge today, in order to enrich the current training offered in higher education by explicitly considering the specificities of Mathematics in higher education and the phenomena related to its teaching and learning.

Research in Mathematics Education related to higher education – including the transition issues from secondary to higher education – has been conducted worldwide since the 1970s. The related research work has been developed, based on collective initiatives and has been supported by networks, organizations, scientific associations and research structures. At international level, the International Commission on Mathematical Instruction (ICMI) organizes ICME congresses with a regular working group on University Mathematics Education. The European society for Research in Mathematics Education (ERME) within the scientific congresses that it organizes (CERME), has created, since 2011, a working group entitled “University Mathematics Education”, taking over from the group of work from previous editions entitled “Advanced mathematics thinking”. From 2014, new interrelated structural initiatives have been put in place, the emergence of the International Network for Didactic Research in University Mathematics (INDRUM) supported by ERME and the creation in France of the network “Didactics and Epistemology of Mathematics, links with Computer Science and Physics, in Higher Education” (called DEMIPS in French) supported by the National Center for Scientific Research. The decision to organize the first conference of the INDRUM network at the University of Montpellier in March 2016 was a result of this crossing of networks.

As we can see from this historical description, all of these networks and structures constitute communicating vessels, they mutually feed each other. Currently, some of the above-mentioned research networks have reached a degree of maturity which is manifested in particular by the emergence of new research directions, the spin-off of new groups, a strengthening of international collaborations, and the production of robust academic results. The creation of the ÉpiDEMES journal is part of this dynamic.

The ÉpiDEMES journal aims to become a space for supporting institutional development with regard to the training of higher education teachers. The journal particularly wishes to address a main need felt by higher education teachers, namely elements of reflection for thinking about the

teaching of mathematics while taking into consideration its didactic and epistemological characteristics. The *ÉpiDEMES* journal should allow the triggering of a dynamic for, on the one hand, to lead joint reflections to ensure an initial transposition of research results for practitioners and on the other hand, bring out new research questions from the actual practices of higher education teachers.

We hope to emphasize the “interface” character of the journal *ÉpiDEMES* which constitutes one of its original features in the landscape of research in Mathematics Education dedicated to higher education. Our objective is that it plays the role of an interface between the world of research and the world of teaching, but also between researchers in Mathematics Education and mathematicians who are interested in the teaching and learning of mathematics in all their diversity.

This special issue is closely related to the editorial policy of the journal. The articles in this issue present important contributions and results in different areas of Mathematics Education dedicated to higher education, in different mathematical domains, and present illustrative examples of the results of this research. Their authors are teacher-researchers and/or practitioners who are experts in the said areas. A summary article concludes the issue by highlighting the links and complementarities between the contributions.

To build this special issue, we have considered a certain number of criteria allowing us to illustrate the editorial line of the journal. We have considered:

- a diversity of theoretical approaches in Mathematics Education that is presented – as far as possible – in a way adapted to the readership of the journal;
- the participation of researchers working in different countries (in France, in Europe, and internationally);
- contributions co-authored by mathematicians and mathematics educators.

In addition to an introductory article that presents an overview on the development of research on University Mathematics Education, this special issue includes the six articles in the following themes:

- the transition from high school to university from the lens of research in Mathematics Education (Gueudet & Vandebrouck; Bloch & Gibel);
- devices for accompanying the learning of university mathematics (Lawson, Grove & Croft);
- the processes of teaching and learning concepts related to a mathematical domain (Trigueros & Martínez-Planell);
- teaching mathematics to non-specialists (Markulin, Bosch, Florensa & Montañola);
- the development of proof skills and the role of logic and language in teaching and learning mathematics (Mesnil & Durand-Guerrier).

The article by Artigue & Nardi which concludes this issue describes the organization of the volume, specifying the articulation or complementarity of the different articles, while positioning them in the international landscape of research in Mathematics Education, and underlining important issues of the journal for practitioners of mathematics education in higher education. Many themes that do not appear elsewhere this issue. Therefore, Artigue & Nardi recall the themes to be developed as well as raising certain issues to be addressed.

Finally, we would like to thank the authors of the articles for their patience during the interactions throughout the review process and the final editing work for this first issue of ÉpiDEMES.