



# Mathematics education: an increasingly necessary international collaboration!

**Luc Trouche**, Emeritus professor, French Institute of Education, Ecole Normale Supérieure de Lyon, France, June 15th 2021

Thanks to Edwige Godlewski, the president of CFEM, for her invitation to write this editorial, which will appear at the time of the [ICME-14 congress](#) in Shanghai.

I write it as the former president of the CFEM - before Edwige's mandate -, as a member of the program committee of this congress, and also as a researcher engaged for more than ten years in the collaboration with the Chinese community of mathematics education, more widely involved in international collaborations, convinced even more of the need for these interactions during, and after, this period of pandemic.

I participated with a great interest in the [ICME-14 program committee](#), chaired by Prof. Wang Jianpan. This was an opportunity to interact with mathematics educators from all continents, and to participate in the construction of a program representative of this diversity. The French-speaking community has its place there, with the opening conference proposed by Cédric Villani, a presentation (by the CFEM) of mathematics education in France, some invited lectures, and responsibilities in managing different TSG. The preparation for this congress also took place in a period marked by the pandemic, and I had the chance to participate in the SPICE working group (for Sub-committee of the IPC on the Pandemic and ICME-14), reflecting to the necessary taking into account, by the congress itself, its organization and its content, of this pandemic. This working group, composed of Jill Adler (South Africa), Anjum Halai (Pakistan), Xu Binyan (China) and myself, after having taken the measure, thanks to the variety of its points of view, of the consequences of the pandemic in terms of exacerbation of inequalities in education, made a set of proposals to the program committee. Among these, one in particular was selected: the organization of a panel, chaired by Michèle Artigue, the former president of ICMI, and Ingrid Daubechies, the former president of IMU, entitled "[Pandemic times: Challenges, responsibilities and roles for mathematics and mathematics education communities](#)". But undoubtedly all the scientific activities of ICME-14 will be marked by the pandemic.

There was, for me, a natural connection between preparing for ICME-14 and my interactions with the Chinese mathematics education community. Indeed, it is in particular with professors Xu Binyan and Bao Jiansheng, who are the co-chairs of the local organizing committee of the congress, that I have interacted for ten years. This interaction originated in the development of a teaching and research cooperation, within the framework of the [JORISS platform](#) between the East China Normal University of Shanghai, which also hosts the congress, and the ENS de Lyon. This cooperation has made it possible to enrich French research programs by not only adding a comparative component, for example the [MATRITT program](#) (Mathematics Teachers Resources in a Time of Transitions), but also and above all, within the framework of jointly supervised theses, to continue working on sensitive and specific questions on which the teaching cultures of the two countries, France and China, differ greatly: the collective work of teachers ([thesis of Wang Chongyang](#)), the orchestration of situations integrating dynamic geometry software ([thesis by Zhu Fangchun](#)), the coordination of perception and logical reasoning in 3D geometry situations (ongoing thesis by [Shao Mingyu](#)) or teachers practicing the variation of mathematics exercises (ongoing thesis by [Zhang Luxizi](#)). On the French side, these theses were supervised by Sophie Soury-Lavergne, Jana Trgalova and me, on the Chinese side by Xu Binyan and Bao Jiansheng. These joint supervisions have allowed the development, on both sides, of a shared knowledge of teaching cultures and theoretical frameworks of reference, with doctoral students involved in the follow-up of both Chinese and French teachers.

A distinct feature of mathematics education culture in China is the special relationship between mathematics teachers and research on mathematics education: in all schools, there exist Mathematics Teaching Research Groups (Pepin, Xu, Trouche, & Wang, 2017), which bring together all the teachers in this discipline, and allow them to reflect on the problems encountered and proper corresponding solutions. The teachers therefore have both the teaching mission and a collective study of the teaching. Mathematics researchers and teachers therefore share a common interest in better understanding the processes of mathematical learning and teaching as well as the conditions for improving the teaching quality. The theses defended in this field bear the mark of this particular culture. We find also elements of this culture in the teams that bring together teachers and researchers, in France, within the IREM (Institute for Research on Mathematics Education), but these teams often bring together pioneer teachers, and have no direct link with affiliated schools. More recently, projects have been developed at the level of schools and their environment, "[mathematics laboratories](#)", places for the exchange of practices, disciplinary and didactic reflections, teacher education, resources design, experimentation for mathematics teachers in coordination with other disciplines. I hope that ICME-14 will allow the development of new research collaborations between France and China to develop synergies between these complementary teaching cultures (Wang 2019).

These collaborations, as well as collaborations with other teams (e.g. with Senegal - Sokhna 2006, or with Brazil - Iglori 2021), also provided a fertile soil for developing a new approach to the work of mathematics teachers, based on studying their interactions with the resources that constitute the matter of their teaching. This new approach, the Documentational Approach to Didactics (DAD) was introduced in 2008 in [an article written with Ghislaine Gueudet](#). This approach entered the Encyclopedia of Mathematics Education in 2020 (Trouche, Gueudet & Pepin 2020). The desire to enrich this framework in confronting it to different research cultures at an international level led to the [DAD-Multilingual project](#) proposing a reflection on the translation processes from English into 14 languages (see for example [the Chinese translation](#)). This reflection has highlighted the need to rethink, in order to better ground them, essential concepts such as those of resources, or of mathematics teaching situations. A [communication to the recent PME-NA congress](#) in Mexico provided an update on the outcomes of this project. Extensions are also underway, with the preparation of a special issue (to be published in 2023), for the journal ZDM Mathematics Education, coordinated by Jill Adler, Janine Remillard and me, entitled "Conceptualizing teachers' interactions with resources in crossing languages and cultures ". This reflection, focused on teachers' resources, echoes a larger research program, the international Lexicon project (Mesiti et al. 2021), studying how different communities, speaking different languages, use different naming systems to describe events, actions and interactions occurring in math classrooms.

I retain from these experiences the conviction of the interest, and the necessity, of taking into account our linguistic and cultural diversity in order to better understand what it is to learn and make people learn mathematics. This need, in "ordinary" times, is even stronger in these times of health, social and educational crises, which have seen inequalities of all kinds widen (Trouche 2021). The responsibilities of education and science, and mathematics education, are very great today to make possible an intelligibility of health, economical, or migratory, crises and their modeling, to accept as enrichment the free confrontation of arguments and the search for shared solutions.

Congresses like ICME-14, and the organizations that support them, ICMI at the international level, the CFEM in France, are invaluable frameworks, that allowing the crossing of cultures of teaching and research in mathematics. The latest [ICMI study](#), focused on teacher collaboration, also highlighted the fruitful nature of these collaborations. Other frameworks exist, e.g.: at European level, the [CERME congress](#), which will meet in February 2022 in Bozen-Bolzano or the [Francophone Mathematical Space](#) which will meet in December 2022 in Benin.

After the time of confinement, it will be the time for encounters and projects to face the challenges of the world, of course hand by hand.

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