TSG 25 The Role of History of Mathematics in Mathematics Education

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Aim

TSG 25 aims to provide a forum for participants to share their research interests and results, as well as their teaching ideas and classroom experience in connection with the integration of the History of Mathematics (HM) in Mathematics Education (ME). Special care is taken to present and promote ideas and research results of an as broad as possible international interest, while still focusing due attention to the national aspects of research and teaching experience in this area. Every effort will be made to allow researchers to present their work and to get fruitful feedback from the discussion, and at the same time to stimulate the interest of the newcomers by giving them the opportunity to get a broad overview on the state-of-the-art in this area.

The discussion within this TSG refers to all levels of education – from primary school, to tertiary education, including in-service teachers' training – preferably on work and conclusions based on actual classroom experiments and/or produced teaching and learning materials.

Rationale

Mathematics is a human intellectual enterprise with a long history and a vivid present. Thus, mathematical knowledge is determined, not only by the circumstances in which it becomes a deductively structured theory, but also by the procedure that originally led or may lead to it, and which is indispensable for its understanding. Therefore, learning mathematics includes not only the "polished products" of mathematical activity, but also the understanding of implicit motivations, the sense-making actions and the reflective processes of mathematicians, which aim to the construction of meaning; hence, teaching

mathematics should include giving students the opportunity to “do mathematics”. To put it differently, although the “polished products” of mathematics form that part of mathematical knowledge that is communicated, criticized (in order to be finally accepted or rejected), and serve as the basis for new work, the **process** of producing mathematical knowledge is equally important, especially from a didactical point of view. Therefore, perceiving mathematics both as a logically structured collection of intellectual products and as processes of knowledge production should be the core of the teaching of mathematics. At the same time, it should also be central to the image of mathematics communicated to the outside world

Along these lines, putting emphasis on integrating historical and epistemological issues in mathematics teaching and learning constitutes a possible natural way for exposing mathematics in the making that may lead to a better understanding of specific parts of mathematics and to a deeper awareness of what mathematics as a whole really is. This is important for ME, helping to realize that mathematics:

- is the result of contributions from many different cultures;
- has been in constant dialogue with other scientific disciplines, philosophy, the arts and technology;
- has undergone changes over time; there have been shifting views of what mathematics is; and
- has constituted a constant force for stimulating and supporting scientific, technical, artistic, and social development.

This helps to improve ME at all levels and at the same time to also realize that although mathematics is central to our modern society and a mathematically literate citizenry is essential to a country’s vitality, historical and epistemological issues of mathematics are equally important. The harmony of mathematics with other intellectual and cultural pursuits also makes the subject interesting, meaningful, and worthwhile. In this wider context, history and epistemology of mathematics have a yet more important role to play in providing a fuller education of the community: not being a natural science, but a formal science closer to logic - hence to philosophy - mathematics has the ability inherent in itself to bridge the humanities with the sciences. At a time when societies value and want young people educated in the sciences, and which simultaneously have a hard time finding out how to get people to “move” from humanistic studies to the sciences, integrating history and epistemology in ME can make the connection between sciences and humanities visible to students.

This is most important, especially today when there is much concern about the level of mathematics that students are learning and about their decreasing interest in mathematics, at a time when the need for both technical skills and a broader education is rising.

Focus

The programme of TSG 25 will be structured around the following main themes:

1. Theoretical and/or conceptual frameworks for integrating history in mathematics education;

2. History and epistemology implemented in mathematics education: Classroom experiments and teaching materials, considered from either the cognitive or/and affective points of view;
3. Surveys on the history of mathematics as it appears in curriculum and/or textbooks (including the history of mathematics in old mathematics textbooks);
4. Original sources in the classroom, and their educational effects;
5. History and epistemology as a tool for an interdisciplinary approach in the teaching and learning of mathematics and the sciences by unfolding their fruitful interrelations; and
6. Cultures and mathematics fruitfully interwoven.

Contributions

There will be the following types of contributions:

1. *Invited contributions* consisting of

(a) A full text possibly amended after eventual comments by Team Members;

(b) A 20-minute oral presentation based on the paper, followed by a 5-minute discussion.

2. *Submitted contributions* consisting of

(a) A maximum 4-page paper to be peer reviewed using the usual international standards by two independent reviewers appointed by the Organizing Team (either belonging to, or external to it);

(b) An oral presentation based on the submitting paper; more specifically:

(b1) The Organizing Team will select a small number of papers out of those accepted after the reviewers' recommendations, for a 20-minute oral presentation followed by a 5-minute discussion, in which the presenter is expected to reveal and emphasize the main points of his/her work, leaving enough time for the audience to respond and discuss. After the completion of the reviewing process, authors of these selected papers will have the opportunity to extend their original paper to a maximum of 8 pages, if they wish to do so.

Alternatively, author(s) may decide to make available to the TSG participants additional material (in the form of supplementary text(s), material easily accessible on the web, or any other kind of resources related to their work) well in advance, and to give only a 10-minute oral presentation, devoting another 10 minutes to get feedback from the audience, or to discuss feedback gained from TSG participants before ICME 13.

(b_2) Based on the outcome of the reviewing process the Organizing Team may suggest that all the other submitted papers, are either accepted for *poster presentation* (see below), or for a 10-minute *oral communication* followed by a 5-minute discussion. If necessary, these oral communications will take place in parallel 60-minute sessions, in addition to the four 90-minute regular sessions assigned to each TSG. Authors are encouraged to provide additional material as described in case (b_1) above, to stimulate response from TSG participants, either before ICME 13, or during the conference activities.

(c) A 1-page paper for a poster presentation, to be peer reviewed using

the usual international standards. Accepted posters will be displayed in one of the four evening sessions that have been scheduled for that purpose by the ICME 13 Organizers (see the *2nd Announcement*, pp. 29-30).

Papers of invited contributions and accepted papers for paper or poster presentation, as well as any additional material as outlined above, will be made available from the ICME 13 website at the particular webpage assigned to this TSG and will be accessible to all participants who have registered for TSG 25 (see the *2nd Announcement*, p. 31) In this way, registered participants will have the opportunity to view it, think about it, and possibly respond to authors and the Organizing Team.

Time schedule

As announced, each TSG is allocated 360 minutes, divided into four 90-minute sessions (see the *2nd Announcement*, pp. 29-30).

(a) It is expected that there will be maximum six (6) invited contributions, each one focusing on at least one of the six themes of TSG 25.

(b) **Proposals** for paper and poster presentations will be **submitted** via the **ICME 13 website** from **September 1 to October 1, 2015**, using ***Conftool*** and the template that is available at http://icme13.org/proposals_and_paper_submission

Important note: There is a **different** submission period for **posters**, in case the authors do **not** apply for the solidarity fund; namely from **January 1 to January 31, 2016** (see the *2nd Announcement*, pp. 31-32).

Because of the restricted period of submission, and in order to make possible for the Organizing Team **to assist in the submission process** more effectively, **authors are strongly encouraged** to **send** their **paper submission** to the **co-chairs** of the TSG 25 as soon as possible, even **earlier than September 1, 2015** and in any case **before** submitting it via the ICME 13 website.

(c) Accepted contributions will be presented as detailed in §IV.2 above. Depending on the total number of accepted proposals, each session will end with an overall follow-up discussion on the presentations given, not exceeding 15 minutes.

(d) At the opening session, a 10-minute presentation is scheduled, to give the opportunity to the Organizing Team to inform participants on the aim, the structure and technical details of the TSG sessions.

(e) Finally, there will be a 20-minute discussion in the closing session to summarize the main points made in this TSG, to comment on establishing collaborations among participants and possible research perspectives in the near future, as well as to encourage critical evaluation of the work done in this TSG and improvement suggestions for the next ICME.

Material

Given the strict time schedule, the time available for each contribution cannot exceed 20 minutes (see §IV *Contributions* above). Therefore, an important feature to help prospective participants to better understand each contribution will be the availability of additional material that will supplement and complement each presentation, in addition to the submitted text. The Organizing Team welcomes and strongly advises contributors to provide such additional material (like written documents/papers closely related to the authors' work, links to relevant web sites etc; see also §IV.2 above) in order to stimulate interest in their work, help participants grasp better its content, and, hopefully, make easier constructive feedback, to the benefit of both the contributors and the other participants. They are also encouraged to make available hard copies of selected material to be distributed to participants at the time of the TSG sessions, but this is left to the initiative and responsibility of each presenter.

Important: For more details on the complete scientific programme of ICME 13 and its structure and time-schedule, as well as on practical details, the registration process, the venue and social events, please visit the official ICME 13 website at http://www.icme13.org/ and especially the *2nd Announcement* at http://www.icme13.org/files/2nd_announcement.pdf