

Topic Study Group No. 25: The Role of History of Mathematics in Mathematics Education

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Aim

TSG 25 aimed 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 was taken to present and promote ideas and research results of international interest while still paying due attention to the national aspects of research and teaching experience in this area. Effort was also made to allow researchers to present their work with enough time left to get fruitful feedback from the discussion. This stimulated the interest of all participants and especially the newcomers by giving them the opportunity to get a broad overview on the state of the art in this area.

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Rationale, Focus, Main Themes

The fruitful and harmonious interplay among history, education, and mathematics as three different but complementary dimensions constitutes what is potentially interesting, stimulating, and beneficial for teaching and learning both mathematics as a subject and about mathematics.

History points to the non-absolute nature of human knowledge: What is acceptable as knowledge is “time dependent” (historicity is a basic characteristic) and is potentially subject to change.

Education stresses the fact that humans are different in several respects depending on age, social conditions, cultural tradition, individual characteristics, etc., and in this way helps to understand these differences and become more tolerant.

Mathematics above all sciences emphasizes most the need for logical/rational/intellectual rigor and consistency in our endeavour to understand the world around us (both its mental and empirical aspects).

Along these lines, contributions to this TSG, explicitly or implicitly attempted to illuminate and provide insights on the following general questions:

- Which history is suitable, pertinent, and relevant to ME?
- Which role can HM play in ME?
- To what extent has HM been integrated in ME (curricula, textbooks, educational aids/resource material, and teacher education)?
- How can this role be evaluated and assessed and to what extent does it contribute to the teaching and learning of mathematics?

The TSG also focused on one or more of the following main themes announced in advance:

1. Theoretical and/or conceptual frameworks for integrating history in ME.
2. History and epistemology implemented in ME, considered from either (a) cognitive or/and affective points of view, including classroom experiments at school and university and teacher pre- and in-service education or (b) teaching material, including textbooks and resource material of any kind.
3. Surveys on (a) research on the HM in ME and (b) the HM as it appears in curriculum and/or 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.
6. Cultures and mathematics fruitfully interwoven.

Programme

Originally, 44 contributions were submitted, of which six were withdrawn. The reviewing process resulted in the remaining 38 contributions, coming from 17 countries on four continents, being distributed as follows: (i) 16 were presented in the four 90-min. regular sessions, allocating a 20-min. time slot for each (a 15-min. presentation followed by a 5-min. discussion); (ii) 17 were presented in the two 90-min. and the two 60-min. oral communication sessions, allocating a 15-min. time slot for each (a 10-min. presentation followed by a 5-min discussion); and (iii) 4 were presented in the poster sessions scheduled for all TSGs. There was a final summary at the closing session.

The TSG 25 sessions were attended by about 50 participants, at least half of whom were newcomers to this TSG. To help participants get a sufficiently clear and comprehensive overview of the research domain covered by the TSG's main themes, its Organizing Team conducted a pre-conference survey on the developments in this domain since 2000, the year of publication of a corresponding comprehensive ICMI study (Fauvel & van Maanen, 2000). This survey, which is available online,¹ was communicated to all contributors in this TSG well before ICME-13 as a useful tool to anyone with interest in this domain show wanted to become informed on the main issues and have a concise guide to the work done in this area. Moreover, participants had been invited to stay in contact with the Organizing Team in order to help keep this document continuously updated by making comments, pointing out omissions, and especially providing further bibliographical references.

Summary of the Presentations

Seen as a whole, research communicated during the TSG regular oral communication or poster sessions had the following two general characteristics:

- (i) It covered *all levels of education*; from primary school to tertiary education, with special focus on pre- and in-service teacher education.
- (ii) Most of the contributions in one form or another referred to and/or were based on *empirical research* in order to support, illuminate, clarify, or evaluate key issues, main questions, or conjectured theses raised by the authors or in the literature on the basis of historical-epistemological or didactical-cognitive arguments.

More specifically, each contribution's main focus and content fell in one of the five areas as detailed below, though, of course, these areas are closely interrelated:

¹<http://www.clab.edc.uoc.gr/HPM/HPMinME-TopicalStudy-18-2-16-NewsletterVersion.pdf>.

- I. Theoretical and/or conceptual frameworks for integrating history and epistemology of mathematics in ME in connection with relevant empirical/experimental evidence (three regular presentations and the oral communications)
- II. Empirical investigations on implementing history and epistemology in ME considered either from a cognitive or an affective perspective (four regular presentations and four oral communications)
- III. Original historical sources (of any type, not only written documents) in teaching and learning of and about mathematics (two regular presentations, two oral communication, and one poster presentation)
- IV. Design of courses and/or didactical material and its implementation and evaluation (including textbooks and resources) (four regular presentations, six oral communications, and two poster presentations)
- V. Interdisciplinary teaching and socio-cultural aspects in the context of empirical investigations (three regular presentations, two oral communications, and one poster presentation)

Items (i) and (ii) above and their more detailed descriptions in Items I–V reflect key issues that were stressed quite early² and still remain central to the research in this area and the implementation of its results in educational practice, namely:

- To put emphasis on *pre- and in-service teacher education* as a necessary prerequisite for the integration of the history and epistemology in ME to be possible at all;
- To design, produce, make available, and disseminate a variety of *didactical material* in the form of anthologies of original sources, annotated bibliographies, descriptions of teaching sequences/modules as sources of inspiration and/or as generic examples for classroom implementation, educational aids of various types, appropriate websites, etc.;
- To systematically perform carefully designed and applied *empirical research* in order to examine in detail and evaluate convincingly the effectiveness of the integration of the history and epistemology in ME on improving the teaching and learning of mathematics as well as students' and teachers' awareness of mathematics as a discipline and their disposition towards it; and
- To acquire a deeper understanding of theoretical ideas put forward in integrating history and epistemology in ME and to carefully develop them into coherent *theoretical frameworks* and *methodological schemes* that will serve as a foundation for further research and applications.

It is hoped that the work done before, during, and after this TSG or based on it and still in progress will contribute to these key issues.

²At least since the influential ICMI study by Fauvel and van Maanen (2000).

Reference

Fauvel, J. G., & van Maanen, J. (Eds.). (2000). *History in mathematics education: The ICMI study, new ICMI study series* (Vol. 6). Dordrecht: Kluwer.

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