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► **To cite this version:**

Renaud Chorlay, Kathy Clark, Katalin Gosztonyi, Snezana Lawrence. TWG12: History in mathematics education Introduction to the papers of TWG12. CERME 10, Feb 2017, Dublin, Ireland. hal-01938821

HAL Id: hal-01938821

<https://hal.science/hal-01938821>

Submitted on 28 Nov 2018

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TWG12: History in mathematics education

Introduction to the papers of TWG12: History in mathematics education

Renaud Chorlay¹; Kathy Clark²; Katalin Gosztonyi³; Snezana Lawrence⁴

¹Uni. Paris Diderot & ESPE de l'Académie de Paris, France; renaud.chorlay@espe-paris.fr

²Florida State University, USA

³Eötvös Loránd University, Budapest, Hungary

⁴Anglia Ruskin University, UK

History of mathematics in mathematics education continues to receive much attention. However, empirical research and coherent theoretical/conceptual frameworks within this area have emerged relatively recently. The purpose of this TWG is to provide a forum to approach mathematics education in connection with history and epistemology dedicated primarily to theory and research on all aspects of the role, effect, and efficacy of history and epistemology as elements in mathematics education.

TWG12 welcomes both empirical and theoretical research papers, and poster proposals related to one or more of the following issues:

1. Design and/or assessment of teaching/learning materials using the history of mathematics, preferably with conclusions based on empirical data; all levels can be considered, from early-age mathematics to tertiary education and teacher training.
2. Surveys on the existing uses of history or epistemology in curricula, textbooks, and/or classrooms in primary, secondary, and tertiary levels;
3. History of mathematics education;
4. Relationships between, on the one hand frameworks for and empirical studies on history in mathematics education and, on the other hand, theories, frameworks and studies in other parts of mathematics education research.

Even though the creation of this TWG is fairly recent – it started in CERME6 (2009) – it has deeper institutional roots within the maths education research community. Indeed, the *HPM* study-group (*History and Pedagogy of Mathematics*) was created at the 1972 ICME conference; it has been organizing satellite conferences to the ICME meetings since 1984, and has several active regional branches (HPM-Americas, European Summer Universities). In CERME10, 16 papers and 2 posters were presented in TWG12, for a total of 23 participants affiliated to this group, covering a large range of European countries (from Ireland to Russia) and beyond (Brazil, Mexico, the U.S.). A short survey showed this TWG attracts newcomers to the CERME community from the HPM community, since 9 participants were CERME first-timers, yet only two had never attended any HPM-related event.

Before going into any details, it should be stressed that this TWG has four general but distinctive features which give these meetings their specific flavour. Firstly, its topic lies at the intersection of

different fields of research – maths education research and history of mathematics – which requires versatility and methodological vigilance (Fried, 2001; Chorlay & Hosson, 2016). Secondly, the strength of the historical and the HPM community varies greatly among countries, and these meetings play a crucial role for researchers working in relative isolation, and with difficult access to resources in the field. Thirdly, the scope of TWG covers both history *in* mathematics education and history *of* mathematics education, which are two significantly different research topics (TSG 24 and 25 in ICME13); connecting the two lines of investigations is a constant challenge. Fourthly, since the topic of TWG12 is neither specific to one level of the educational system (from primary education to teacher-training) nor to any single mathematical topic (be it fraction concepts, algebra, proof, etc.), the work in TWG12 intersects that of most other TWGs. This time, intersection with TWG1 (Proof and argumentation), TWG18 (Teacher education), and TWG22 (Resources and task design) was significant. It should be noted that, for this edition, there was little intersection with what was covered in TWG8 (Affects and mathematical thinking), TWG10 (Diversity and maths education), in spite of the fact that it is not uncommon for outsiders of the HPM research community – among which most policy-makers and curriculum-designers – to ascribe such goals to the historical perspective in teaching.

These four features made this meeting not only useful but also challenging and exciting. As the final discussion made clear, the general feeling among the participants was that one of the main outcomes of this meeting is that we actually *learned* a lot from the one another, both from their papers and from the lively discussions. Let us now highlight some of the significant feature of the 2017 conference.

For quite some time it has been stressed that more attention should be paid to the actual effects of the use of historical sources, either in the classroom or in teacher training (Chorlay, 2016; Jankvist, 2009). This year, at least two papers contributed to this line of research. For example, the *Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources* (TRIUMPHS) project is a five-year project funded by the National Science Foundation in the United States, which will create and test 25 full-length Primary Source Projects (PSPs) and 30 one-day “mini-PSPs.” Each PSP is designed to cover its topic in about the same number of course days as mathematics classes would otherwise. With PSPs, rather than learning a set of ideas, definitions, and theorems from a modern textbook, students learn directly from the original work of mathematicians such as Leonhard Euler, Augustin-Louis Cauchy, or Georg Cantor. The project includes an extensive “research with evaluation” study, which will seek to address several evaluation and research questions and enable both formative and summative evaluation of the project activities. Data sources to inform the research are pre- and post-course surveys (of both students and instructors), post-PSP surveys, student interviews, student PSP work samples, video captures of selected classroom instruction and audio captures of selected small group student work, and instructor post-implementation reports. By the end of the project it is expected that some 50 instructors and over 1000 students will participate in undergraduate mathematics classrooms where PSPs are used.

On a smaller scale, Arreti Panaoura studies the manifold difficulties faced by an “ordinary” teacher attempting to use a textbook activity on Egyptian multiplication. It raises many questions for our research community to investigate further: as to the level and nature – mathematical, didactical,

historical – of expertise required from the teacher; as to our (as researchers and teacher-trainers) criteria for assessing such teaching sessions; as to the relevant theoretical frameworks for the description and analysis of teacher-practice (in particular the use of pedagogical documents). Along with these questions, it shows the importance of leaving our comfort-zone, a zone in which the teaching sessions are implemented by the researcher who designed them or by teachers with a significant experience in the field.

As is customary in HPM-related meetings, a large number of papers carry out detailed content analysis. Let us restrict ourselves to those dealing with numbers and early-algebra: Antonio Oller-Marcén and Vicente Meavilla describe forms of argumentation about equations of the $ax^n = bx^m$ type in a 16th century Spanish treatise, and endeavour to make sense of what we would consider to be errors or flaws; Chorlay studies arguments justifying the rule for fraction multiplication in a Chinese treatise from the Han dynasty and compares them with arguments found in today’s textbooks; Maria Sanz and Bernardo Gómez devise a structural classification of sharing problems on the basis of a large historical sample, and complement this classification by showing the variety of methods – both arithmetic and algebraic – for solving them. Coming from a perspective of history of education, Rui Candeias discusses in details a pedagogical approach to operation on decimals, in a context which combines proportionality and magnitudes. Although this line of investigation may seem to be very content-oriented, its connections to didactical questions – be they theoretical or more applied – are manifold. First, it is hardly necessary to say that content-analysis is a central part of *a priori* analysis, and that – on a par with a purely mathematical analysis – investigations into the history of mathematical knowledge and mathematical practices provide key background data. Second, the work presented in some of papers is explicitly described as a first phase in a larger research project focusing either on learners (Sanz-Gómez) or teachers (Chorlay). Third, the content-analyses presented in these papers contribute to the general theoretical discussion on some important didactical concepts, such as “epistemological obstacle” (Oller-Marcèn) or “generic example” (Chorlay).

As far as history of education is concerned, let us highlight the contribution of Katalin Gostonyi. Her comparative study of the works of mathematics educators T. Varga (in Hungary) and G. Brousseau (in France) shed light on the origins of theoretical frameworks which are still very much alive in mathematics education research.

Finally, the paper of Liz de Freitas contributes to the ongoing work in the HPM community from a new perspective. Being a philosopher of mathematics, she draws on both her personal research – in the continental tradition of the philosophy of mathematics and mathematical practice – and her experience in the training of maths teachers to suggest a large number of research questions which are relevant for the historian and the maths education researcher alike. Here, we briefly mention two such issues which we feel would be worth investigating further. A first series of questions bears on diagrams: the way they are drawn and read; their cognitive impact and their epistemological significance; the historical evolution of the meta-rules governing the use of diagrams, in themselves and in their relations to other elements of mathematical texts. A second series of questions bears on the image of mathematics maths teachers have, its impact on their teaching, and the way teacher-training modules may impact this image. Investigating this second series of questions could bridge the gap between the maths education community and the science education community, a

community in which research on the Nature of Science (NOS) is a central research topic (see for instance Abd-El-Khalick, 2013).

References

- Abd-El-Khalick, F. (2013). Teaching *with* and *about* nature of science, and science teacher knowledge domain. *Science & Education, 22*(9), 2087–2107.
- Chorlay, R., & de Hosson, C. (2016). History of science, epistemology, and mathematics education research. In B. Hodgson, A. Kuzniak, & J.-B. Lagrange (Eds.), *The didactics of mathematics: Approaches and issues. A homage to Michèle Artigue* (pp. 155–189). Basel Switzerland: Springer International Publishing.
- Chorlay, R. (2016). Historical sources in the classroom and their educational effects. In L. Radford, F. Furinghetti, & T. Hausberger (Eds.), *Proceedings of the 2016 ICME Satellite Meeting of the International Study Group on the Relations Between History and Pedagogy of Mathematics (HPM 2016, 18-22 July 2016)* (pp. 5–23). Montpellier, France: IREM de Montpellier.
- Fried, M. (2001). Can mathematics education and history of mathematics coexist? *Science & Education, 10*(4), 391–408.
- Jankvist, U. (2009). A categorization of the “whys” and “hows” of using history in mathematics education. *Educational Studies in Mathematics, 71*(3), 235–261.