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# An introduction to TWG 12: History in mathematics education

Antonio M. Oller-Marcén<sup>1</sup>, Olivera Đokić<sup>2</sup>, Tanja Hamann<sup>3</sup>, Jenneke Krüger<sup>4</sup> and Bjørn Smestad<sup>5</sup>

<sup>1</sup>University of Zaragoza, Spain; [oller@unizar.es](mailto:oller@unizar.es)

<sup>2</sup>University of Belgrade, Serbia

<sup>3</sup>University of Hildesheim, Germany

<sup>4</sup>University of Utrecht, the Netherlands

<sup>5</sup>Volda University College and OsloMet, Norway

## Introduction

The name of this thematic working group is deceptively short. The statement “history in mathematics education” encapsulates at least two different, but possibly complementary, research fields. First, we have the research about history *of* mathematics education, which is a field whose object of study is the history of teaching and learning mathematics. Second, we have the research about history *in* mathematics education, which mostly focuses on the possibility of integrating or using history of mathematics in teaching in different contexts. It is interesting to point out that the origins of both fields of study are to be found in the middle of the 19th century, but their extensive development is quite recent. When talking about history of mathematics education, Schubring (2014, p. 3) states that it “constitutes a field, on one hand, with a considerable tradition and, on the other hand, with only recent rapid developments”. These words apply, in fact, to both approaches.

This duality is clearly found in the list of possible topics that was provided in the call for papers:

1. Design of teaching/learning materials using history of mathematics, preferably with conclusions based on empirical data.
2. Research on the existing or possible uses of history or epistemology in curricula, textbooks, and/or classrooms practice.
3. Research on history of mathematics education and/or the relevance of mathematics education in society at the time.
4. Connections and interplay between mathematics education and history of mathematics: theoretical and methodological issues.

In the context of CERME, this thematic working group is present since CERME6, which took place in Lyon in 2009. Jankvist and Van Maanen (2018) give an overview of the work carried out between CERME6 and CERME9, and they provide a list of themes which is worth comparing with the one above. Ten years after its creation, the relevance of this working group was acknowledged by ERME and one of the plenary lectures from CERME11 in Utrecht was titled “History and pedagogy of mathematics in mathematics education: History of the field, the potential of current examples, and directions for the future” (Clark, 2019).

Table 1 shows the evolution of the number of works published in the proceedings since 2009. After a short decline (we must recall that CERME12 was an online event), we expect to go back to the steady increase in the number of published contributions of the first editions.

CERME6	CERME7	CERME8	CERME9	CERME10	CERME11	CERME12	CERME13
13	14	15	16	18	15	13	16

**Table 1: Evolution over time of TWG12 papers**

## Overview of the papers presented in Budapest

Sixteen papers were presented during the conference, two of them in the form of a workshop (see below). In Table 2 we provide their distribution according to the four topics described in the call for papers. In black their primary topic, and in red their secondary topic (if applicable).

Pres. author	Topic 1	Topic 2	Topic 3	Topic 4	Pres. author	Topic 1	Topic 2	Topic 3	Topic 4
Cibien	X				O'Brien			X	X
Cunha		X		X	Oller-Marcén	X			X
De Bock			X		Opsal			X	
Đokić		X		X	Piña-Aguirre			X	X
Espín-Buendía			X		Segev			X	
Goemans			X		Shokrani			X	X
Hamann			X		Thomsen	X			X
Krüger			X		Watford	X			X

**Table 2: Distribution of papers among the topics from the call for papers**

This classification according to the topics from the call for papers can be further refined so that we can give a more concrete description of some of the papers. Among the papers devoted to the history of mathematics education, we find four papers (those presented by Goemans, Hamann, Krüger, and Segev) that are devoted to the analysis of historical teaching materials (videos in the case of Goemans, textbooks in the other three). We can also identify two papers dealing with some historical aspects of curricular reforms (specifically modern mathematics): The paper presented by De Bock on the role of psychologists, and the paper presented by Opsal on the impact of modern mathematics on Norwegian compulsory exams. Another two papers (presented by Espín-Buendía, and Shokrani) analyse the contributions made to certain aspects of mathematics education by individual authors. Finally, the paper presented by O'Brien researches on the history of the construct 'numeracy'.

We now turn to the papers dealing with aspects of using history in teaching. Two papers, presented by Cibien and Thomsen respectively, explore the interplay between digital technologies (the software GeoGebra in particular) and the reading of original sources. Furthermore, different possible uses of original sources are also explored in two more papers: The one presented by Oller-Marcén in the

context of teacher training, and the one presented by Watford by mathematics majors. Finally, with respect to the papers with a methodological and theoretical orientation, we find the papers presented by Cunha and Đokić that study some psychological or pedagogical aspects related to the use of history of mathematics, while the paper presented by Piña-Aguirre explores the origins of a mathematical result from the field of complex analysis through the notion of confrontation.

We will close this section by mentioning the relation of some of these papers with other TWGs. The strength of this relation varies among the papers. In some contributions, the relation exists but it is weak. In this way, the paper presented by Segev about fractions in Hebrew mathematical text could be of interest to TWG2 (Arithmetic and Number Systems), or the paper presented by Hamann about an adaptation of Euclid's Elements without proofs could be of interest for TWG4 (Geometry Teaching and Learning). In both cases, however, the relation would be merely circumstantial. In other cases, the situation is very different. For example, the paper presented by Oller-Marcén describing an experiment using professional pedagogical journals as a tool in a context of teacher training using the MTSK model would be of interest in TWG20 (Mathematics Teacher Knowledge, Beliefs and Identity), and the papers presented by Cibien and Thomsen exploring the reading of original sources using GeoGebra are strongly related to TWG16 (Learning Mathematics with Technology and Other Resources). As a final example, we can mention that the papers about modern mathematics (presented by De Bock and Opsal) could be of potential interest to TWG23 (Implementation of Research Findings in Mathematics Education). In any case, we recommend keeping the mind open when reading the papers that follow this introduction, always trying to find the rich potential connections with other research areas within mathematics education.

## **The workshops**

Two of the papers were presented in the form of 50 minutes workshops. The papers that were adapted to be presented in this form were the paper by Opsal and Smestad "Euclid must go! Norwegian compulsory school exams 1962-1979", and the paper by Cibien, Del Zozzo and Rogora "The use of GeoGebra for exploring some constructions of Euclid, Archimedes and Apollonius". In the first workshop, the participants had to analyse two of the problems proposed in the exams, one in the style of New Math and one in the "usual" style. In this way, they gained deeper insight into the paper itself. In the second workshop the participants played a double role. On one hand, they acted as students solving the historical geometry tasks with the aid of GeoGebra. On the other hand, they had to reflect about the expected behaviour of the actual students, and the research implications. All the participants expressed their satisfaction with these hands-on activities, and we will consider the possibility to implement more of them in upcoming editions of the conference.

## **Group discussions and future work**

One of the pillars of CERME is formed by the rich debates that take place during the conference, both as a result of the paper presentations and during longer sessions specifically devoted to the discussion of transversal topics arising from the papers themselves and from more or less informal conversations. Here is a list of some of the questions and topics that were addressed during the discussions:

- Can history of mathematics make visible the links between mathematics and other disciplines?
- Could history of mathematics education be of use for present day development of curricula?

- Need for more international collaborations in history of/in mathematics education.
- Development of a possible research agenda for the group.

We do not have the space to report on the different ideas that arose during these discussions. However, let us highlight the fact that the first two points above show that research on the field of history of mathematics education can provide insight and inform about problems from the present. In the first case, we think that history of mathematics can help to make more visible relations between mathematics and other “unexpected” disciplines such as geography, religion, or arts. Moreover, it can also provide examples of situations in which mathematics was influenced by other disciplines rather than the other way around. In the second case, it is necessary to know how previous reforms took place in order to be aware of lessons learned or of missed opportunities. At a more microscopic level, history can be useful to suggest pedagogical approaches and to incorporate an indispensable sociocultural view of mathematics.

The final two points allowed us to discuss future research relevant for this TWG. Some manageable and interesting research topics, with potential for international collaboration, arising from the group discussion were: history of teacher training, journals for teachers and/or students, and program innovations and the reactions on those. There are other promising topics (but more complex or extensive), such as the comparison of historical textbooks. These ideas, together with other lines such as the historical research of gender issues, or a revision and reconceptualization of the term “original sources” (Arnal-Bailera & Oller-Marcén, 2020) will serve as the master lines for the upcoming years.

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