



UNIVERSITY OF
WESTERN MACEDONIA

Fifth ETM Symposium Mathematical Working Spaces

Second Call

Dates: From July 18 to 22, 2016

Place: University of Western Macedonia, Florina, Greece

Languages of the Symposium: English, French, Spanish and Greek

Organizing Institution: Pedagogical Faculty of Florina, University of Western Macedonia

Internet Site: <http://etm5.web.uowm.gr/en/>

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General overview of the fifth MWS Symposium

The first two meetings were initially dedicated to the study, development and possible uses of the concept of Mathematical Working Spaces (ETM, Espace de Travail Mathématique, in French) in mathematics education. Within ETM3 and ETM4, the focus was on the foundational component of these meetings: the mathematical work. This evolution has deepened and diversified the approaches to the subject. In particular, the semiotic, cognitive and instrumental dimensions, as elements of the MWS, were the subject of specific contributions. Similarly, the institutional and social dimensions of mathematical work are now integrated in all three working topics.

Following ETM4, one of the main objectives of the fifth ETM meeting is to strengthen the community of education researchers interested in MWS. The development of the MWS model as a methodological and a theoretical framework remains a central concern, including also the study of its effective uses to various areas of research in mathematics education.

Organization of the Symposium

The Symposium will last five days and is mainly trilingual (English, Spanish, French) as in the previous ETM meetings. Each oral presentation will be done in one of these three main languages and based on a slideshow written in one of the other two languages or in Greek. For a better understanding, a Greek speaker of the organization will be present at each session of the symposium.

The meeting will be organized around three main topics (see the description below) and each contribution should deal with one of these topics. Each theme of the conference will be introduced by a plenary presentation recalling, in particular, the achievements of previous symposia.

The number of participants is limited to 60 and the duration of the event should allow each participant to consider all the themes (the committees will be careful to balance the themes evenly).

At the beginning of ETM5, there will be a specific work on the ETM model, in addition to the work within the three themes:

- A conference by Alain Kuzniak on the ETM model, with a specification to analysis and geometry,
- A workshop, in two sessions, on geometry, by Annette Braconne-Michoux, Carolina Henríquez et Paraskevi Michael Chrysanthou,
- A workshop, in two sessions, on analysis, by Elizabeth Montoya and Laurent Vivier.



Topic 1 – The mathematical work and Mathematical Working Spaces

Alain KUZNIAK, Athanasios GAGATSI, Elizabeth MONTOYA DELGADILLO and Denis TANGUAY

The purpose of Topic 1 is, on one hand, to delve deeper into the theoretical and methodological model defined by Mathematical Working Spaces, and on the other hand to show how it can be put to use through possible specific usages and case studies.

The previous symposia have highlighted the diversity of the mathematical subjects addressed, leaning on the MWS model: probability, synthetic and analytic (coordinate) geometries, functions, algorithmic, numbers... This diversity confirmed the necessity of having to consider mathematical working spaces specific to delineated mathematical fields, and raise the issue of their definition and their articulation. So, how to better depict the dynamic aspects and nature of mathematical work with the help of the model, for instance by making its use easier in describing the tasks and the mathematical situations that give rise to a change of fields.

It will also be about exploring how the MWS model, conceived as a space of circulations between the poles in the epistemological and cognitive planes, may contribute to enable the implementation and the fine tuning of already constructed tasks, but also the elaboration and 'calibration' of new teaching situations, or of situations still to be experimented.

Moreover, the importance allotted in the model to the interdependence of the three geneses – semiotic, instrumental and discursive – calls for descriptions and characterizations of each, but also for accounts of their interweaving.

The contributions to the topic may lean on case studies taken from teaching experiments in specific fields (geometry, calculus or analysis, probability, etc.), or also on modelling activities resorting to the interaction between real world situations and mathematical models.

See also synthesis of Theme 1 in the Proceedings of ETM 4 symposium, <http://www.mat.ucm.es/imi/ETM4/ETM4libro-final.pdf>, pages 27-32.



Topic 2 - Specific tools and signs in the mathematical work

Philippe R. RICHARD, Jean-Philippe DROUHARD, Jean-Baptiste LAGRANGE and Tomás RECIO

This topic focuses on the use of technological tools and signs that are considered vehicles of knowledge in order to see how they affect mathematical work. We may set a double question in relation to their impact.

The first one is about the potential of technological environments in transforming the mathematical work of the student. As a key elements of the mathematical work space, not only the interaction between signs and tools offer an extraordinary case study, but also the link of signs and tools with the discursive genesis.

The second question arises from the consideration of epistemological background present in ETM. It consists of studying how the tools and the semiotic systems (particularly in the case of technological environments) affect the construction of the student's own knowledge, guiding his mathematical work. This may involve, for example, both the nature of mathematical objects that the student constructs, the proofs that are mathematically acceptable and the role of the steps of the investigation.

See also Synthesis of Theme 2 in the Proceedings of ETM 4 symposium, <http://www.mat.ucm.es/imi/ETM4/ETM4libro-final.pdf>, pages 207-216.

Topic 3 - Genesis and development of mathematical work: the role of teacher, trainer and interactions

Inés M^a GÓMEZ-CHACÓN, José CARRILLO YÁÑEZ, Iliada ELIA and Asuman OKTAÇ

This third topic will advance on the reflection of the teachers role and the interactions when forming a consistent but also efficient ETM, already initiated in the Symposium ETM4. How to manage the interactions around the mathematical work in the classroom? This area will develop the analysis of these interactions and the construction of mathematical thinking from a holistic viewpoint that takes into account different interrelated dimensions (cognitive, educational, technical, affective, cultural). Specifically we will discuss what the purpose of teacher training and the trainers is during the development process. In the class, the interaction between the teacher and the students' work leads to a dynamic equilibrium of ETM. Naturally, the proposed studies within this theme may suggest other ways to describe the process of genesis involving the students and the teachers. In particular, it will be focused on the process of interaction between teacher knowledge and the various areas of mathematical work. How teacher knowledge influences the formation of mathematical working spaces.

See also Synthesis of Theme 3 in the Proceedings of ETM 4 symposium, <http://www.mat.ucm.es/imi/ETM4/ETM4libro-final.pdf>, pages 407-412.



Call for Papers and Proceedings

The contribution proposals, oral and posters, will be evaluated by the Scientific Committee on the basis of a short summary (one or two pages).

Oral contributions must then be submitted and should deal with one of the three main topics addressed by the Symposium, which shall be explicitly identified. Their maximum lengths will not exceed 30 000 characters (without spaces).

All remaining contributions will be pre-published online and be available at the Symposium. Posters sent on time will be also published.

As a result of the meeting, some contributions will be revised by the authors so that they can be submitted for publication within a book or an international journal.

Important dates

- Submission of a one-page abstract before **31th October 2015**.
- Notification of the review by the Scientific Committee before **1st December 2015**.
- Submission of the entire contributions before **29th February 2016**.
- Registration to the Symposium: **30th April 2016**.
- The Symposium will take place from **18th to 22th July 2016**.
- Submission of the papers for publication before **1st October 2016**.

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ETM Meetings

ETM Meetings are organized into working groups based on the contributions proposed by participants. The form of the Symposium allows an interesting exchange of ideas amongst participants and encourages the development of a scientific community with common interests. ETM meetings have an international dimension (Argentina, Canada, Chile, Cyprus, France, Greece, Mexico, Spain, etc.) and a multilingual participation (English, Spanish, French).

The first ETM meeting took place in October 24-25, 2009 in Nicosia (Cyprus). Communications of this first meeting were published in the book: Gagatsis, A., Kuzniak, A., Deliyianni, E., & Vivier, L. (eds, 2009). *Cyprus and France, Research in Mathematics Education*, Lefkosia.

The second meeting was held in October 22-23, 2010 in Paris, for the first time in the form of a symposium. The papers presented in this symposium were published after being reviewed in the journal *Annales de Didactique et de Sciences Cognitives*. (Vol. 16 and 17, http://www.irem.univ-paris-diderot.fr/articles/annaes_de_didactique_et_de_sciences_cognitives).

The third edition of ETM was held in Montreal in October 22-23-24, 2012. Proceedings are available online (<http://turing.scedu.umontreal.ca/etm/documents/Actes-ETM3.pdf>). Papers in this symposium have been reviewed in an editorial process for publication in a special issue of the journal RELIME, *El trabajo matemático – puntos de vista y perspectivas*, volume 17(4), I and II, online at <http://www.clame.org.mx/relime.htm>.

The meeting ETM4 took place from June 30 to July 4, 2014 in El Escorial, in the prestigious summer programs supported by the Universidad Complutense de Madrid. Proceedings are online at <http://www.mat.ucm.es/imi/ETM4/ETM4libro-final.pdf>. An editorial process is in progress in journals ZDM and BOLEMA.