THE 26TH ICMI STUDY: ADVANCES IN GEOMETRY EDUCATION

ANNOUNCEMENT OF THE DISCUSSION DOCUMENT

OVERVIEW OF THE STUDY

This document is a short version of the Discussion Document announcing the 26th Study to be conducted by the International Commission on Mathematical Instruction (ICMI). This ICMI Study addresses the advancements and current challenges in the teaching and learning of geometry, with particular attention to how the landscape has changed in the past three decades, since the 9th ICMI Study on "Perspectives on the Teaching of Geometry for the 21st Century" (Mammana & Villani, 1998). The complete Discussion Document can be found in the ICMI web page (https://www.mathunion.org/icmi/activities/icmi-studies/ongoing-icmi-studies).

The primary aims of the Study are to: (1) report the state of the field of mathematics education in the area of geometry education with respect to theory, research, practice, and policy; and (2) suggest new directions of research that consider contextual, cultural, national, and political dimensions of practice. It considers the large body of existing theory and research, socio-cultural diversity, cultural differences in curricular, and institutional constraints, as well as progress the field. The following specific goals for geometry education guide this ICMI Study, to be developed by participants through the course of the ICMI Study:

- Bring together an expert reference group to analyze the state-of-the-art of research and practice in geometry education in order to contribute to better understanding of the challenges that geometry education faces in diverse contexts.

- Bring together communities of international scholars, with diverse representation within the ICMI community, and across regions and nationalities, to address research and practices in geometry education, ultimately resulting in the production of an ICMI Study volume.

- Emphasize the role of geometry as a facilitator of advances in logical reasoning, strategic thinking, and understanding of hierarchical relationships between mathematical (geometrical) objects.

- Analyze the influence of affective components of teaching and learning such as confidence, motivation, anxiety, efficacy, and others, on teachers' decisions and methodological choices and on students' behavior and related learning results.

- Facilitate advances in multi- and inter-disciplinary approaches (including cooperation with other bodies and scientific communities) to research and development in geometry education.

- Explore the role of Geometry as an arena or lever for developing children's and adolescents' mathematical creativity and flexible thinking by means of conjecturing, problem posing, and proving theorems.
- Disseminate scholarship in mathematics education —research, practices, methodologies, theories, findings and results, curricula design, etc.— in geometry teaching and learning.
- Identify and anticipate new research and development possibilities, challenges, and questions related to geometry education and research in geometry education.
- Produce sets of recommendations on effective resources for researchers, teachers, teacher educators, policy makers, curriculum developers, analysts, and the broad range of practitioners in mathematics and mathematics education.
- Act as an instigator of new research and innovation to be produced in the future.
- Promote and assist in the discussion of geometry education and related research in action at local and international levels.

The activity of the Study is organized around four focused topics, aimed to provide complementary perspectives and approaches to the teaching and learning of geometry. Contributions to the topics will be organized around sets of specific sub-topics, each sub-topics focusing on a specific issue and stating a set of questions aimed to lead discussions. The four topics and their sub-topics are:

Topic A. Theoretical perspectives

Sub-topic A1: Teaching and learning of proof in geometrical contexts

Sub-topic A2: The role of external visual inputs in geometric reasoning

Sub-topic A3: Spatial reasoning interventions and transfer to geometry

Topic B. Curricular and methodological approaches

Sub-topic B1: Geometric thinking across age levels (from preschool to higher education)

Sub-topic B2: Individual differences, including students with learning difficulties or mathematical giftedness

Sub-topic B3: Influence on the curriculum of different cultural and political traditions and contexts around the world

Sub-topic B4: Professional training and development in geometry education (pre-service and in-service)

Topic C. Resources for teaching and learning geometry

Sub-topic C1: Digital technologies in learning and teaching geometry

Sub-topic C2: Manipulatives and visual tools in teaching and learning geometry

Sub-topic C3: Learning geometry with resource constraints

Topic D. Multidisciplinary perspectives

Sub-topic D1: Connections between geometry and professional contexts

Sub-topic D2: Ethnomathematics and indigenous ways of understanding geometry

Sub-topic D3: Contributions of psychology and neuroscience to research in mathematics education focusing on geometry

THE ICMI STUDY CONFERENCE

The ICMI Studies are a major activity of ICMI. Their global aims are to contribute to a better understanding of the challenges faced by mathematics education in our multidisciplinary and culturally diverse world and to collaborate in advancing to their resolution. More information can be found in the ICMI web page (https://www.mathunion.org/icmi/activities/icmi-studies-activities).

The main products of an ICMI Study are a conference and a volume of the ICMI Studies Series. The Study Conference is aimed to gather together leading scholars and practitioners specialized in the field of inquiry of the Study, for them to engage in a productive interaction and collaboration to advance in the knowledge of the topics of the Study. In the conference, substantial time will be allocated for collective work and discussion on significant problems within the four topics and the related sub-topics.

The conference will be organized around working groups on the sub-topics presented above. The working groups will meet in parallel during the conference. It is the work of these groups that is captured as chapters in the ICMI Study volume. Contributions are encouraged that are analytical and innovative rather than solely descriptive in nature.

An electronic volume of the Conference proceedings will be made available prior to the conference on the conference website and later the ICMI website. It will contain all the accepted papers as reviewed papers, so they can be cited as a refereed (peer-reviewed) publication with an ISBN number, and will be published online only.

As is the usual practice for ICMI studies, participation in the Study Conference is by invitation only. Proposed papers will be reviewed, and a selection made according to the quality of the contribution, the potential to contribute to the advancement of the Study, with explicit links to the sub-topics proposed in the Discussion Document, and the need to ensure diversity among the perspectives and representation. The number of invited participants is limited to approximately 100 delegates.

Call For Contributions

The International Program Committee for the 26th ICMI Study invites submissions of contributions of several kinds, which include research, theoretical, and innovation papers on the

four study topics. Authors must select one topic and one of the sub-topics listed below each topic, to which their paper must be submitted. To ensure a rich and varied discussion, participation from countries with different economic capacity and different social, political, or cultural heritage and practices is encouraged. Papers have to be written in English (the language of the Study Conference) according to the template instructions, with a maximum of 8 pages.

Location and dates

The Study Conference will take place at the University of Reims Champagne Ardenne – INSPE - Reims, France (http://www.univ-reims.fr/inspe/).

Dates[1]: from Tuesday April 23 to Friday April 26, 2024.

Deadlines

Submissions must be made online no later than *September 15, 2023*, but earlier if possible. Papers will be reviewed and decisions made about invitations to the conference. Notification of decisions will be sent to the corresponding/main author from *November 16, 2023.*

Summary of dates:

a. Deadline for proposals (paper submission): September 15, 2023
b. Invitations to participate mailed: from November 16, 2023
c. Registration: opens on November 16, 2023, and closes on March 1, 2024
d. Proceedings published online: March 31, 2024
e. Conference Opening: Tuesday April 23, 2024

Information about the program, venue, registration, visa application, costs, travel, accommodation, and other issues will be available in due time on the 26th ICMI Study Conference website (https://icmistudy26.sciencesconf.org/).

<div align="center">

THE ICMI STUDY VOLUME

</div>

The main product of any ICMI Study is an edited volume published by Springer as part of the New ICMI Studies Series. It is expected that the structure of the volume will follow the organization and topics set out in the Discussion Document, although some changes might be introduced as a consequence of the discussions raised during the conference. The chapters in the volume will collectively and consensually integrate the outcomes of the discussions of the parallel working groups at the conference, informed by the papers presented. It must be

---

1 Note: For our Jewish community members, we understand that the timing of the conference over Passover brings about some challenges. Please be assured that the organizing committee will make appropriate arrangements for those who require Kosher for Passover food. Furthermore, we will work with the local Jewish Cultural and Social Association of Reims to ensure all those who need a place for Seder will have somewhere to go.

appreciated that there is no guarantee that any of the papers accepted in the Study conference proceedings will appear in the volume. Furthermore, chapters in the volume may be an amalgamation of several presented papers.

MEMBERS OF THE INTERNATIONAL PROGRAM COMMITTEE

Co-chairs

Angel Gutiérrez (Spain, angel.gutierrez@uv.es)

Thomas Lowrie (Australia, thomas.lowrie@canberra.edu.au)

IPC Members

Cathy Bruce (Canada, cathybruce@trentu.ca)

Fabien Emprin (France, fabien.emprin@univ-reims.fr)

Keith Jones (United Kingdom, jones.keith2013@gmail.com)

Roza Leikin (Israel, rozal@edu.haifa.ac.il)

Lisnet Mwadzaangati (Malawi, lmwadzaangati@unima.ac.mw)

Oi-Lam Ng (Hong Kong SAR, oilamn@cuhk.edu.hk)

Yukari Okamoto (United States, yukariokamoto@ucsb.edu)

Milton Rosa (Brazil, milton.rosa@ufop.edu.br)

Manuel Santos-Trigo (Mexico, msantos@cinvestav.mx)

Ex-officio members

Frederick K.S. Leung (ICMI President, Hong Kong SAR, icmi.president@mathunion.org)

Jean-Luc Dorier (ICMI General-Secretary, Switzerland, icmi.secretary.general@mathunion.org)