

Leveraging Mathematical Modeling for Action and Education Toward Social Justice

May 12–16, 2025, at CMO-BIRS in Oaxaca City, México.

In response to the evolving landscape of mathematics education to incorporate social justice principles, this workshop will examine key topics such as ethno-modeling, equity-centered education and AI, culturally sustainable math modeling perspectives, migrant identity and mathematical knowledge, and the impact of mathematical modeling in the health system. This international workshop will nurture interdisciplinary collaboration between mathematicians, industry experts, community members, and mathematics educators to tackle mathematical modeling and social justice themes at all educational levels.

- We invite you to join the keynote sessions and working groups virtually throughout the week. We will have bilingual subtitled sessions in Spanish and English.
- Times are based on Oaxaca City local time (MT US/Can). If you are joining from another time zone, please adjust accordingly: add 1 hour for Central Time (US/Can), 2 hours for Eastern Time, and 3 hours for Atlantic Time.

| Speaker(s) | Title | Date and Time |
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| <u>Dr. Milton Rosa and Dr. Daniel Orey</u> Universidade Federal de Ouro Preto, Brasil (Spanish, subtitles in English) | <i>Decolonizing Reflections on the Connection between Ethnomathematics and Modeling through Ethnomodelling</i> | Monday May 12 10:30 to 11:45 Oaxaca City Local Time |
| <u>Dr. Hyunyi Jung</u> Texas A&M University (English, subtitles in Spanish) | <i>Culturally Sustaining Mathematical Modeling: Its Conceptualizations and Implementations</i> | Tuesday May 13 9:00 to 10:15 Oaxaca City Local Time |
| <u>Dr. Magda Pando</u> Southern Methodist University (Spanish, subtitles in English) | <i>Language, Mathematics, and GenAI: Multilingual and Multimodal Pathways in Equity-Centered Education</i> | Tuesday May 13 13:15 to 14:30 Oaxaca City Local Time |
| <u>Dra. Diana Solares</u> Universidad Autónoma de Querétaro (Spanish, subtitles in English) | <i>Mathematical Knowledge Outside of School in Low-Schooled Adults: The Case of Migrant Farmworkers</i> | Wednesday May 14 9:00 to 10:15 Oaxaca City Local Time |
| <u>Dr. Anthony Ware</u> University of Calgary (English, subtitles in Spanish) | <i>Modelling the impact of the Health Impact Fund</i> | Thursday May 15 9:00 to 10:15 Oaxaca City Local Time |

If you want to participate and interact via Zoom pre-register here:



<https://forms.office.com/r/PxNAJtVDC5?origin=IprLink>

All workshop will be transmitted using BIRS official website:



<https://www.birs.ca/events/2025/5-day-workshops/25w5498>

Keynotes



Dr. Milton Rosa

Universidade Federal de Ouro Preto

Decolonizing Reflections on the Connection between Ethnomathematics and Modeling through Ethnomodelling

Monday May 12

10:30 to 11:45

Oaxaca City Local Time

Abstract: A dilemma in mathematics education is related to its overwhelming bias against a local/cultural mathematical orientation in most research paradigms. A search for innovative methodologies found in ethnomodelling is necessary to record historical forms of mathematical ideas, procedures, and practices developed to be used in diverse cultural contexts. Ethnomodelling is not an attempt to replace global school/academic mathematics, however, at the same time, it is necessary to acknowledge the existence of local mathematical knowledge as well as its dialogical approach. The decolonization process triggered by ethnomodelling is insubordinate, creative, subversive, and responsible because it evokes a disturbance that causes a review of rules and regulations in the mathematical modelling process, which seeks for social justice and total peace.



Dr. Hyunyi Jung

Texas A&M University

Culturally Sustaining Mathematical Modeling: Its Conceptualizations and Implementations

Tuesday May 13

9:00 to 10:15

Oaxaca City Local Time

Abstract: In this keynote presentation, I will share the conceptualization and implementation of culturally sustaining mathematical modeling. Although relevant theories and research emphasize the importance of culturally sustaining pedagogy and mathematical modeling, its practice is minimally evidenced across multiple states in the U.S. Furthermore, in this rapidly changing world, both the culture of teaching and research in mathematical modeling continue to evolve to meet the diverse needs of students, their teachers, and their surrounding environments. Building on prior research and practices, I will discuss how the conceptualization of culturally sustaining mathematical modeling has influenced its application locally and share lessons learned from its implementations. The key principles underlying these equitable modeling practices may provide insights for future research and teaching that serve marginalized populations in multiple dimensions.

Keynotes



Dr. Magda Pando

Language, Mathematics, and GenAI: Multilingual and Multimodal Pathways in Equity-Centered Education

Tuesday May 13

13:15 to 14:30

Oaxaca City Local Time

Southern Methodist University

Abstract: This keynote explores the dynamic intersection of language, mathematics, and artificial intelligence (AI) through the lens of culturally and linguistically diverse learners. This presentation highlights the challenges and opportunities multilingual students face in mathematics education from the perspective of immigrant families. It delves into the role of multilingualism and multimodality, emphasizing how diverse linguistic resources enrich mathematical understanding. The theoretical framing integrates language, mathematical, and AI frameworks, focusing on Systemic Functional Linguistics and Social Semiotic Theory to unpack the complex relationships between language, meaning-making, and content learning. Additionally, the session examines the transformative potential of generative AI (GenAI) in supporting equitable educational practices.



Dr. Diana Solares Universidad
Autónoma de Querétaro

Mathematical Knowledge Outside of School in Low-Schooled Adults: The Case of Migrant Farmworkers

Wednesday May 14

9:00 to 10:15

Oaxaca City Local Time

Abstract: This presentation will describe and analyze the mathematical knowledge of women with little or no formal education. These women are part of families working in Mexico's agricultural fields, which often requires them to migrate. Part of the research was conducted in a farming field in northern Mexico. In contrast, the other part occurred in Oaxaca, one of the many Indigenous communities from which these families migrated. The study is based on the recognition that people develop certain mathematical knowledge according to the specific needs of their lives. This study describes the methodological procedure to identify such knowledge, drawing on theories of mathematics didactics and the perspective of *numeracy practices*. Finally, we will discuss the findings' implications in a perspective that considers educational events' social, cultural, and economic aspects.

Keynotes



Modelling the impact of the Health Impact Fund

Thursday May 15
9:00 to 10:15
Oaxaca City Local Time

Dr. Anthony Ware
University of Calgary

Abstract: The problem of properly aligning incentives with societal goals appears in many settings. In the case of the pharmaceutical industry, innovation is expensive, and is typically rewarded by granting patents that ensure exclusivity in the market, enabling companies to set prices at a level determined by their goal of recouping costs and, beyond that, maximising profits. Several proposals have been made for alternative systems for incentivising innovation. The Health Impact Fund (HIF) proposed by Hollis et. al. (2008) is one example. The basic principle of the HIF is that companies receive a reward from the fund in proportion to the measured health impact of the use of their product, which is sold to the consumer at cost. Thus, the more widespread the uptake, the greater the reward. We present some mathematical modelling of some particular implementations of the HIF framework and use these models to examine the potential impact and alignment with societal goals.