Topic Study Group 53

Equity in Mathematics Education

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1. Themes and Description

The Topic Study Group TSG-53 on Equity in Mathematics Education built on the longstanding practice that ICME had of addressing social justice concerns in mathematics Education. Themes such as gender, disability, indigenous mathematical knowledge, socioeconomic class, culture and language figure consistently and over the years in the activities of ICME and in 2016, ICME-13 introduced a Topic Study Group TSG (33) on Equity (including gender). TSG-33 already acknowledged the need to go beyond gender as a binary and the need to address disability.

1.1. Aim of the TSG

In its description, TSG-53 brought in caste, religion, and race in addition to socioeconomic status, culture, region, ethnicity, physical and mental disablement as factors that contribute to exclusion in mathematics education, noting that these forms of exclusion are historical, structural, as well as interpersonal and individual and they have lasting consequences for the students in accessing higher education and in pursuing mathematics. Instead of making unqualified declarations such as 'mathematics for all', the TSG acknowledged the need for a nuanced understanding that every student should have the opportunity to learn mathematics to the extent they feel it is desirable or appropriate for them, both from the perspective of fairness in mathematics education and from the fact that mathematics plays a central role in the geopolitical and globalized technocentric world in which we are living. Moreover, it also acknowledged the need for the realization that the equity question is integrally linked to a critical understanding of mathematics education that is prevalent in schools across the world and a movement towards a more just and humanizing mathematics education for the learner.

TSG-53 sought to foreground the following concerns and questions.

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1) What are the experiences of religious, racial and ethnic minorities and those from marginalized castes in learning mathematics? How do class, caste, race, culture and ethnicity operate to shape opportunities for the learners in the classroom?
2) How do factors such as migration for labour, continued conflict, repeated natural calamities and so on impact teaching and learning of mathematics? What systemic measures (if any) have been evolved to address these issues?
3) How do we address language diversity in mathematics classrooms? Given that English is emerging as the language of power and possibilities and it is the medium instruction in large number of schools in urban locations, what are the challenges involved in teaching and learning mathematics in a language that is not the home language for the teacher as well as the students?
4) How does family and community membership affect mathematics learning and teaching? In what ways can we leverage children's lived experiences and funds of knowledge as resources for learning and teaching mathematics?
5) What do we know about the experiences of students who are placed in the intersection of several categories? More specifically what does mean to be an African American girl, a rural poor boy, an emerging bilingual immigrant child seeking asylum in a different county, a migrant laborer's child living in a multilingual urban slum, a tribal, Dalit or a transgender student from a low/ middle income family and so on in the context of teaching and learning mathematics?
6) How do teacher education programs acknowledge the existing research on equity issues and introduce measures to address the issues in the preservice and in service training programmes?
7) What are some of the new theoretical frameworks evolved to understand the complex contexts in which mathematics education takes place and how we can transform mathematics education to be more humanizing and just spaces to learn and teach mathematics?

1.2. A brief account of the response to the call for submissions

In response to the call, TSG-53 received a fair number of submissions which together addressed the concerns we foregrounded in the call for submissions, except the second one about the impact of labor migration, conflict and natural calamities on the children's education, in particular their mathematics education. However, the complications created by the COVID-19 pandemic and the online mode of the conference made a difference to what finally could be realized.

2. Program Overview

We, the TSG-53 team members decided that we will have a few invited presentations and arrived at a consensus on the names of the scholars we would invite. We decided to invite Luz Valoyes Chavez from Catholoc University of Temuco, Luis Leyva from Vanderbilt University, and Charalou Stathopoulou from University of Thessaly.

Stathopoulou wanted to present an invited paper jointly with Peter Applebaum from Arcadia University which we accepted. Including the invited papers, a total of 36 papers were submitted in response to the call for submission from TSG-53. Of these, leaving out the three invited papers, 32 were accepted to be presented as either long oral presentation or a short oral presentation or as a poster. However, as the Congress was going to be held only in the online mode because of COVID-19 pandemic, several authors were not able to participate. This was mainly because most of the participants did not receive financial support from their respective universities for online conferences; and they were eligible to get the Solidarity Funds from ICME. Indeed, this was also the case for one of the invited speakers. As a result, only 20 papers were presented. Of the 20 papers presented, 3 were invited papers, 9 were long oral presentations and 8 were short oral presentations. One of the invited papers could not be presented in person as the speaker did not receive financial assistance to attend the conference from any source. Given the importance of the theme, we got the speaker to record the presentation and send, which we played. Apart from these there were 3 submissions accepted as poster presentations.

2.1. Format of the presentations

TSG-53 had a total of six and half hours (390 minutes) spread across 4 days. On the first days we had 120 minutes and on the remaining three days we had 90 minutes each. As we were informed that more participants would be able to participate in the time zone in which the 90 minutes presentations were scheduled, we decided to allocate one invited talk to each of the three days of 90 minutes.

The time allocation for the presentations is given in Tab. 1 below:

Tab. 1. Time allocation for the presentations

Type of Presentation	Time for presentation	Time for discussion
Invites Talks (IT)	25 minutes	15 minutes
Long Oral Presentations (LO)	12 minutes	8 minutes
Short Oral Presentations (SO)	5 minutes	4 minutes

To the extent possible we tried to group presentations sharing the same or similar themes together. But this was not always possible. We also grouped a few short orals together and took the questions for them at the end to optimize available time for discussion.

2.2. Major themes, participants, and the presentations

The submission and the final set of presentations remained faithful to the central concerns of the TSG. The following Tab. 2 gives the title and authors of the presentation just to indicate the diversity of issues raised in the topic study group.

Tab. 2. The list of papers presented

Paper and author(s)	
[1]	A framework for detailing White heteropatriarchy in mathematics education. ***Luis Leyva*** (USA). (IT)
[2]	Chavez cultural power and the fabrication of race difference in the mathematics classroom. ***Luz Valoyes-Chavez*** (Chile). (IT)
[3]	Challenging the abyssal line between Roma and non-Roma in and out of the (mathematics) classroom through common spaces. ***Charoula Stathopoulo*** *and Peter Applebaum* (Greece). (IT)
[4]	Education equity in Honk-Kong: factors that contribute to Hong Kong students' performance in trends in international mathematics and science study (TIMSS) 2015. ***Frederick Koon Shing Leung*** (Hong Kong SAR, China). (LO)
[5]	Critical mathematics teacher noticing: exploring pre-service teachers' noticing of power, privilege, and identity using online video. ***Theodore Chao****, Melissa Adams-Corral, Youmna Deiri, and Joanne Vakil* (USA). (LO)
[6]	Questioning the idea of inclusion of blind mathematics learners in India using the social model of disability. ***Rossi D'Souza*** (India). (LO)
[7]	Disentangled narratives: exploring lecturers and students gendered discourses in an engineering faculty. ***Darinka Radovic*** (Chile). (LO)
[8]	Gender issues and consequences for undergraduate mathematics women students. ***Weverton Ataide Pinheiro*** *and Vanessa Franco Neto* (Brazil). (LO)
[9]	History of whose mathematics for teaching: raising the caste question in mathematics education in India. ***Jayasree Subramanian*** (India). (LO)
[10]	From invisible to domestic gender in mathematics textbooks in India. ***Kishor Darak*** (India). (LO)
[11]	Teaching practices in diverse mathematics classrooms of the republic of Cyprus: equitable or not? ***Constantinos Xenofontos*** (UK). (LO)
[12]	Microexclusions as a challenge to dialogue among deaf and hearing students. ***Amanda Queiroz Moura*** (Austria). (LO)
[13]	Gender differences in student-student interactions. ***Desiree Ippolito****, Weverton Ataide Pinheiro, and Jinqing Liu* (USA). (SO)
[14]	Socioeconomic differences delimited by gender: students' perceptions about mathematics in Mexican Schools. ***Itzel H. Armenta*** (Mexico). (SO)
[15]	Gender differences on specific issue: the case of misconceptions in operating with percentage. ***Chiara Giberti*** (Italy). (SO)
[16]	Support for students with mathematics learning dis/abilities on bridging programmes in New Zealand universities. ***Phil Kane*** (New Zealand). (SO)
[17]	Coping with the challenges while promoting social justice in mathematics classroom. ***Ram Krishna Panthi*** (Nepal). (SO)
[18]	Adapting tasks between including and excluding students. ***Nina Ines Bohlmann****, Ralf Benölken, and Timo Dexel* (Germany). (SO)
[19]	Children, dialogue and mathematics education. ***Ana Carolina Faustino*** (Brazil). (SO)
[20]	Teacher candidates' perspectives of means to facilitate equitable learning opportunities during a high school mathematics methods course. *Ruthmae Sears, Marilyn Strutchensy, Brian Lawler, Lakesia Dupree,* ***Caree Pinder****, and Cynthia Castro-Minnehan* (The Bahamas). (SO)
[21]	How to increase girls' sustaining interest, performance and career choices in mathematics: a high-quality project-based learning approach. ***Lorraine Minette Howard*** (USA). (Poster)
[22]	Rural elementary students' mathematics academic performance in china: what are the influencing factors? ***Xiangyi Kong*** (China). (Poster)
[23]	Theoretical framework of gendered mathematical identity. ***Yuriko Kimura*** (Japan). (Poster)

The 23 presentations — 20 papers and 3 posters — came from as many as 14 countries which in itself is remarkable, though there were visible absences — there was no submission from any of the countries from Africa for example. The list of

countries consists of Bahamas, Brazil, Chile, China (including Hong Kong SAR), Germany, Greece, India, Italy, Japan, Mexico, Nepal, New Zealand, United Kingdom, and United States.

Gender, race, caste, ethnicity, disability, and sexual orientation figured as a common thread running through the presentations. Most of the presentations were very nuanced, brought in fresh perspectives, introduced new theoretical frameworks and raised important questions. In that sense and in terms of the range and the complexity of the themes addressed, it can be said that the TSG realized a significant part of what it set to realize.

However online conference posed several challenges, one major difficulty being not all the papers that were accepted for presentation could be presented. We missed out on 9 more presentations. Many of the authors could not participate because their institution refused to pay the registration fee for attending an online conference, nor did the speakers get fee waiver from ICME. Another difficulty was the difference in the time zone which limited the number of people who were present in each session and contributed to the discussions. Face to face conferences not only bring everyone together at one place, but they also allow for more participations in the discussions and often these discussions continue even after the presentations for the day is over. Online conference deprived us of the opportunities for such interactions.

3. Future Directions and Suggestions

TSG-53 built on what had been achieved with regards to addressing equity issues in ICME, brought in new perspectives and questions. However, there are several more issues that need to be studied and understood and here is a short list of some of them.

a) Even though TSG-53 complexified gender by engaging with heteropatriarchy and with the concerns of gender queer learners, not all presentations looked at gender beyond the binary. This poses the following challenge to us: Can we, as a community of mathematics education researchers, accommodate research that continue to see gender as a binary? We need more studies to understand how young learners who do not identify with the gender assigned to them at birth, learners who identify as gender queer or as transgender persons, cope with (or fail to cope with) mathematics in school.

b) The COVID-19 pandemic and the lockdown has had a devastating effect on the education of learners belonging to socio-economic margins as well as those who live in remote areas with limited or no access to technology. Learners who are socio economically privileged, have had access to technology and parental support at home too have encountered serious shortcomings with online education. The impact of lockdown and online education on mathematics education for diverse learners and the measures taken by the state and voluntary organizations to address these need to be studied.

c) The consequence of migration for work, increasing urbanization, living in regions that face continued conflict, repeated natural calamities etc on education and on mathematics education in particular, need to be studied and reported. One way to ensure that some of these figure in the Topic Study Group on Equity would be to identify scholars working on these themes and invite them to present a paper in the upcoming TSG on equity.

d) Equity can be explored in relation to several social issues (e.g. social class, race, caste, gender, ethnicity, disability etc.). More intersectional research is needed for understanding how various social issues interact with each other, and how these interactions impact mathematics education.

e) There is a lack of studies approaching issues of equity from cross-national/cross-cultural comparative perspectives. Collaborations between researchers, teachers, policymakers etc. working in different educational settings could shed more light on the cultural specificities of educational policies and practices.