

## **DRAFT**

### CHAPTER 15:

## DIVERSITY IN MATHEMATICS EDUCATION: SOCIAL AND CULTURAL CHALLENGES

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### **Abstract**

*In this chapter we review and reflect on the development of research presented at the CERME working group “Diversity and mathematics education”. Following on a brief background and history of the emergence of the TWG on social and cultural diversities in CERME 3, the review is organized around three main foci. First the different meanings attached to diversity in mathematics education are examined. Next, we critically analyze how different diversities have been theorized and empirically addressed. Finally, looking towards the future, we claim that re-conceptualizing diversity could be useful not only for “those that are diverse”, but for mathematics education in general.*

### **1. The background for the emergence of TWG on social and cultural diversities**

In this chapter, we review and reflect on the development of research presented at the CERME working group “Diversity and mathematics education”. This group first met in CERME3 (2003, Bellaria, Italy) under the name *Teaching and Learning Mathematics in Multicultural Classrooms*.

The centrality of culture in the doing, thinking, learning and teaching of mathematics being an important aspect was already discussed by many scholars in their first CERME meeting in 1997, Osnabrueck, Germany. Browsing the proceedings shows many references that consider several aspects related to culture, from mathematics as a cultural product (Arzarello et al., 1999), to mathematical learning as being co-constructed by culture, and to the culture of mathematical classrooms (e.g.

Krummheuer, 1999). This clearly signaled a direction of theoretical and empirical work that explored the cultural foundations of mathematical education.

It is also noticeable that, in his key note address in CERME 1, Jeremy Kilpatrick stated that “*we need to carry into our discussions of how different people coming from different cultures do different mathematics and different research*”. Kilpatrick’s statement points out an aspect of emerging research that was much needed, as the increased multi-cultural and multi-lingual composition of many classrooms in many countries was becoming visible.

Two years later, in CERME 2, the challenges associated with multi-cultural, multi-ethnic, multi-lingual aspects of mathematics education were addressed in several papers. For example, Krummheuer (2002) discussed the challenges in relation to both theory and methods:

“Historically speaking we are in a phase of rapid and on-going change in culturally defined patterns of interpretation. With regard to the persons involved these changes continually lead to new ways of interpretation and patterns of action which therefore cannot sufficiently be logically deduced from already existing theories. The further multicultural differentiation of our societies plays an important role at this point. With regard to the everyday classroom situation with a multi-ethnic student population this leads to an almost complete loss of stable, prognostically applicable patterns of interpretation during the course of the lesson” (p.342)

Bishop, Clarkson and FitzSimons (2001) also contributed to the discussion stressing the importance of values at personal, institutional, social and cultural level stating that “at the cultural level, the very sources of knowledge, beliefs, and language, influence our values in mathematics education. Further, different cultures develop different values”. (p. 370).

Around the same time, the sudden increase in levels of migration in many European countries contributed to the visibility of the cultural, ethnic and linguistic diversities in mathematics classrooms, and a number of research projects focusing on these issues emerged (for example, Favilli, Oliveras and Cesar’s research in Italy, Spain and Portugal, Gorgorió’s research in Barcelona, Alrø, Skovsmose and Valero’s in

Denmark). This provided the impetus for the foundation of the TWG “Teaching and Learning Mathematics in Multicultural Classrooms” to become a forum for European researchers involved with the topic area to share, discuss and reflect on the challenges and types of research being carried out.

One of the key aspects discussed in the TWG in CERME 3 was the realisation that in many European countries teachers could expect to work with students from ethnic, linguistic, and cultural groups distinct from their own. Cultural, linguistic, political, and social issues in uses, learning and teaching of mathematics often seen as distant, and may be relevant for “exotic” cultures, the culture of others, become central to many European classrooms. This was reflected in papers presented from several European countries, such as Denmark (Alrø, Skovsmose & Valero, 2003), Holland (Elbers & de Haan, 2003), Italy, Spain and Portugal (Favilli, Oliveras & César, 2003), and Germany (Kaiser, 2003). Another key aspect noted was that “multicultural classrooms” did not cover the breath of the research being conducted that included other settings and the transitions between those (e.g. the school and educational policies, the home mathematical practices, etc.). This resulted in a change of the title to “multicultural settings” (CERME 4 and 5, see Abreu et al., 2005). At CERME 5 the name of the group was discussed again, and agreed that calling it “Cultural Diversity and Mathematics Education” would correspond better to the scope of the group, as it would include multicultural issues, but also other forms of diversity.

## **2. Meanings attached to diversity in mathematics education**

In the social sciences it is acknowledged that the challenges that social and cultural diversity poses to education have many facets, and have been studied from different approaches (Abreu, 2014, De Haan & Elbers, 2008). Conceptions of the role of the social and the cultural in processes of learning inform these different approaches, and consequently the different meanings of diversity explored in research. This is also the case in mathematics learning and education.

Thus, since the beginning of the group discussions it was clear that, despite cultural diversity being of interest to all the members of the group, the meanings attached to it were multiple, sometimes explicitly stated and other times implicit in the foci, goals and methods of the research developed

Key meanings of diversity that reflect patterns on the research presented in CERME include:

- i. Cultural, ethnic, social and linguistic background of school students and their school experiences
  - a. Increased levels of students with an immigrant background in schools, and classrooms that changed from mono to multi-cultural, multi-ethnic, and multi-linguistic composition of the classroom population.
  - b. Differences in school level of performance of students from non-mainstream ethnic and cultural backgrounds (e.g. some groups performing significantly lower than majority group as shown in Education statistics in several countries).
  - c. Other forms of student diversities examined students' gender, level of achievement in school mathematics, like and dislike of school mathematics.
- ii. Perspectives and experiences of diversity
  - a. Teachers' perspectives
  - b. Parents' perspectives
  - c. School / Institutional perspectives
  - d. Policy perspectives
- iii. Discourses of diversity
  - a. Diversity as a problem
  - b. Diversity as a resource

A working definition of DIVERSITY that includes these aspects was introduced by Valero, Crafter, Gellert, Gorgorió & Pais (CERME 7, 2011), and further elaborated by Boistrup, Meaney, Mesquita & Straehler-Pohl (CERME 9, 2015).

In their definition of diversity, they included:

- i. *Diversity of people*, of students, teachers, parents, and many other participants in mathematics education – such as gender, ethnicity, culture, language, social and socio-economic status, disability, qualification, life opportunities, aspirations, and career possibilities, etc. – that shape their acting, interacting, valuing and identities.

- ii. *Diversity of contexts* where policies informing mathematical education are formed, and of sites where mathematics education takes place, and the differences in the organization and structure of practice in such contexts – schools, homes, workplaces, etc.
- iii. *Diversity and possibilities of practice*, due to the concrete situations of mathematics education in which the multiple diversities mentioned above intersect, posing challenges to actual learning and teaching practices, as well as to their improvement.
- iv. *Diversity and research*, including empirical or theoretical ways in which diversity is researched, and the relationships between who is doing the research and who is being researched, posing methodological issues of an ethical nature.

This definition of diversity thus includes both considerations around theoretical approaches to diversity – What is diversity in the context of mathematics education and mathematics education research? –, and around the engagement with diversity in educational practice and research – What are the challenges and possibilities emerging from increasing levels of diversity? –. This is an interesting development, and to reflect on the implications of this thinking we can, for example, look at analysis of diversity as a “relational” and “multilayered” phenomena, which can be studied from different angles (Abreu, 2014; Cobb & Hodge, 2002; De Haan & Elbers, 2008) and from a dialogical social psychological perspective (see for example, Howarth & Andreouli, 2015).

Another key observation is, that despite the multiple sources and perspectives in the study of diversity the work addressed, the TWG is united in rejecting views and practices of “diversity as a problem” or “diversity as a deficit”, and developing ways of addressing diversity as a resource. The focus on addressing diversity as a resource takes many forms in the group’s research. For example, some studies examine the discourses of diversity embedded in practices and policies of schooling, some studies examine subjective views and experiences of diversity by learners, teachers and parents, and some studies examine possibilities of new school practices that draw on diversity as a resource.

### **3. How different diversities have been theorized and empirically addressed**

The multiplicity of understandings of diversity also impacts on the way it has been theorized and analyzed by TWG participants, leading to a collection of papers that is more similar to a patchwork than to a single united piece. It is not only that diversity is polyhedral on itself, but that it also can be seen from different perspectives that make visible a particular face: such as the cultural, the social, the political, and the linguistic.

### *Theorizing diversity*

When the group started, the theorizing was dominated by theoretical approaches drawing on Cultural Nature of Mathematics (Bishop, 1988), Cultural Psychology (Cole, 1996), Critical Mathematical Education (Skovsmose, 2014) and Ethnomathematics, D'Ambrosio (1985). As any of these approaches was already too broad on itself while, at the same time, the number of researchers working in the area in Europe was relatively small, at times it was difficult to foster productive dialogue within the group.

However, over time, it was apparent the group interest in understanding key processes in the learning and teaching in the context of diversity. These include for example interest in understanding identities (e.g. Abreu, 2006; Black, Solomon, & Radovic, 2015; Stentoft, 2007; Williams et al., 2007), agency (e.g. Andersson & Norén, 2011), social representations of mathematical knowledge (e.g. Abreu & Gorgorió, 2007; Gorgorió & Prat, 2011), cultural representations of mathematical knowledge (e.g. Crafter, 2009, Mukhopadhyay, & Greer, 2015), discourses of diversity (Alrø, Skovsmose, & Valero, 2005; César & Favilli, 2005; Montecino & Valero, 2015), home and school mathematical practices (Abreu, César, Gorgorió, & Valero, 2005). Transitions between mathematical practices (e.g. Abreu, Crafter, Gorgorió & Prat, 2013), etc.

The focus on the processes brings some unity to a group that is truly multi-disciplinary, and benefits from drawing on and developing a sophisticated theoretical understanding in the field of mathematics education and social sciences. Focusing especially in the last CERMEs, see for example CERME 7, 8 and 9, we notice that the theorizing has drawn on:

- i. *Socio-cultural psychology* – Socio-cultural theories of learning and development evolving from Vygotsky and European social representations' theory is one

family of theoretical approaches informing many studies (i.e., Abreu & Gorgorió, 2007; Crafter & Abreu, 2011; Newton & Abreu, 2011). These also include cultural historical activity theory (CHAT) which is one strand of sociocultural theory that has evolved from the work of Vygotsky (i.e. Gebremichael, Goodchild, & Nygaard, 2011), Dialogical self (Abreu, Crafter & Gorgorió, 2013; Newton & Abreu, 2013), Dialogue – Bakhtin’s ideas of dialogism (Rangnes, 2011).

- ii. *Discursive and Sociological approaches* – The notion of Discourse from sociology has been adopted to explore the social construction of what counts as mathematical knowledge, identity positioning, and issues of equity. For example, Lange & Meaney (2011) examined “Becoming disadvantaged: public discourse around national testing”. Gellert and Straehler-Pohl (2011) draw on Bernstein’s (1999) differences between horizontal and vertical discourse, where the concepts of discourse and knowledge are closely interrelated. Turvill (2015) uses Bourdieu’s notions of social and cultural capital.
- iii. *Culture and mathematics education* – Notions from Ethnomathematics (e.g. Stathopoulou, François & Moreira, 2011; Mukhopadhyay & Greer, 2015), and critical mathematics education (e.g. Alrø, Skovsmose & Valero, 2003 and 2005; Hauge et al. 2015) were concerned with the sociopolitical dimension of mathematics education that also informs many studies. Some of the participants based their research within one of these two approaches (e.g., Domite & Pais, 2009), and some sought for an articulation between the two (e.g., François, 2009).

### *Researching diversity*

Similarly, and for the same reasons, the ways diversities have been empirically addressed are multiple. The foci of these studies were varied including classrooms, schools, communities, institutions and countries. In these settings learners, teachers, parents, and professionals have been researched, being the interest coming to know more about how the diversities play in the construction of mathematical learning, teaching, practices and uses.

The way the questions posed were researched was essentially through qualitative and interpretive frameworks. In many studies the approach is described as qualitative and the focus being on interpretation. Other studies clearly situate their approaches within social sciences traditions, including:

- i. *Ethnographic approaches* – Ethnography is a popular approach that reflects the shared interest of the group on research that fundamentally aims to uncover the meanings and experiences of diversity located in socio-cultural contexts. As a methodological approach developed by anthropologists as a means to understand and describe “other cultures”, it was then adopted by sociologists to investigate “other” cultures within western societies and by social and cultural psychologists to investigate the role of culture and social contexts on psychological functioning. In this way, it is an approach that has been combined with different theoretical approaches (see for example TWG10 CERME 7 papers by Andersson; Crafter; Diez-Palomar & Ortin; Stathopoulou, François & Moreira, and TWG10 CERME 9 papers by Albanese & Perales; Bagger; Para-Sanchez; and Radovic et.al).
- ii. *Discursive approaches* - Interest in discursive approaches has been increasing in recent years and reflects an interest in a methodological stance that uncovers the social and political constructions of what counts as appropriate mathematical practices, issues of inclusion and exclusion, and processes of identity development and positioning (see for example, papers presented in TWG10 CERME 7 by Andersson & Noren; Gellert, & Straehler-Pohl; Lange & Meaney and the papers presented at CERME 9 by Bagger; Radovic et al. and Montecino & Valero)
- iii. *Dialogical and narrative approaches* – These approaches are emerging from an interest in understanding the way the person (student, teacher, parent) develops their participation in mathematical practices, and examining the dialogues between identity positions (associated with different times past, present and future identities; different settings, such as home and school; or different roles, such as teacher and parent). See for example, the papers presented at CERME7 by Abreu, Crafter, Gorgorió, & Prat; and Newton & Abreu).



Within the research approaches strategies to collect data included a variety of methods, such as observations, interviews, questionnaires, and narratives. The review of methods clearly shows a lack of longitudinal studies (a few exceptions are Bagger, 2015; and Williams et al., 2007) as well as surveys. This confirms the fact that the methods and strategies used not only reflect a particular interpretation of diversity, but also construct a meaning for it. Moreover, it gives a clear image of how funding (or the lack of it) affects certain research domains.

#### **4. Looking towards the future**

Overall, this review shows that, in the superficial level, there were times when the research presented gave the impression of a “collection of papers that is more similar to a patchwork than to a single united piece”. In fact, the difficulty in establishing coherence between the papers presented in the group was noted in several of the coordinators’ reports. This retrospective review, however, reveals that, in a deeper level, the research shared common interests that, in fact, reflect directions in the theorizing of mathematics learning as a human activity and socio-cultural practice located in historical and political contexts. Borrowing from the overview presented by Abreu and Crafter (2016) on directions on research in and out-of-school mathematics, we suggest that three specific turns they identified also unite the research of diversity in mathematics learning and education presented at CERME.

The first turn focused on establishing the cultural nature of mathematics knowledge and learning, and it was informed both by ethnomathematics and socio-cultural approaches to mathematical cognition. This resulted in an emphasis on understanding DIFFERENCES in mathematical practices, such as differences between in school and out-of-school mathematics, and the situated nature of mathematical cognition. One key contribution of this turn was to acknowledge DIVERSITY as part of both psychological functioning and of an account of uses and learning of mathematics as socio-culturally and politically located in the context of specific practices. Evidence from research showed DISCONTINUITY in the way a person learned or expressed competence in school and out of school practices, thus “competence in one practice did not predict

performance in the other practice. This applied in both directions. One could be competent in out-of-school mathematics, and also having difficulties at school. In the same vein, one could be competent in school mathematics and not perform well in out-of-school mathematics” (Abreu & Crafter, 2016, p. xxx). This evidence was crucial to inform the initial studies when the work focused on multicultural classrooms, and attempted to explore reasons for barriers in learning experienced by students of immigrant backgrounds without attributing these to any form of individual deficit.

Having achieved a sophisticated understanding of the cultural diversity of mathematical knowledge, the researchers turned their attention to the social aspects of learning. This marks the second turn in the research, and is revealed in a focus on the role of the social, such as social interactions, social representations, and social institutions. This added focus moved the understanding of constructions and experiences of diversity forward. Theoretically, this turn resulted in an interest in sociological and socio-psychological perspectives. Thus, as shown in many of the papers presented in the group, social valorizations and social representations of what counts as school mathematics, embedded in dominant institutional discourses and in practices, may play a key role in the way diversity is experienced. In particular, this turn resulted in exploring the process of mathematical learning in terms of participation in mathematical practices, which involved both the psychological re-construction of forms of mathematical knowledge and skills (cultural tools), and in terms of constructions of identities. A key insight from considering the social is the realization of the possibilities of forms of participation that construct diversities as a resource, and enable experiences of CONTINUITY, bridging, dialogue and negotiation between practices and identities.

The conceptual clarity achieved with the examination of the roles played by the cultural and the social opened the path to a third turn in researching DIVERSITY in mathematics education. This third turn focuses on the person as a participant in multiple mathematical practices (Abreu & Crafter, 2016). This research is interested in exploring trajectories of participation, mediating roles of identities, interacting in cultural contact zones. This includes participation across practices that co-exist on time (e.g. home-school) and over time (school-university, moving countries). Emerging research within this focus includes for example Abreu et al. (2013), Black et al. (2015), Rodovic et al. (2015).

Finally, looking towards the future, and considering that it is “us” that construct “the others” as diverse, we will claim that re-conceptualizing diversity could be useful not only for “those that are diverse”, but for mathematics education in general. In our attempt to re-conceptualize diversity we will look at developments outside research in mathematics education, in particular, and consider new developments in socio-cultural psychological theorizing.

In terms of an agenda for future we want to hear how the participants in CERME Dublin envisage the future of research on diversity (To be drafted)... Though we think that collaborative research of a wider dimension will provide new insights. We think in this wider dimension, for example, in terms of comparative case studies across countries, and in terms of longitudinal studies. This combined will help to understand the impact of the diversity of educational contexts, and trajectories of development over time... This is particularly useful when considering new migrants, as the process of development takes shape over time.

## 5. References (to be completed ... and edited)

Abreu, G. (2006). Cultural identities in the multiethnic mathematical classroom. In M. Bosch (Ed.) *Proceedings of the fourth congress of the European society for research in mathematics educatio*, (pp. 1131-1140). FUNDEMI IQS–Universitat Ramon Llull, Barcelona, Spain.

Abreu, G. de, Crafter, S., Gorgorió, N. & Prat, M. (2013). Understanding immigrant students’ transitions as mathematical learners from a dialogical self-perspective. B. Ubuz, Ç. Haser and M. A. (eds.) *Proceedings of the 8th Congress of the European Society for Research in Mathematics Education*. (pp. 1648- 1655). Ankara, Turkey: Middle East Technical University.

Abreu, G. & Crafter, S. (2016). ‘Mathematics Learning In and Out of School: Towards Continuity or Discontinuity?’ In L. English and D. Kirshner (eds.), *Handbook of International Research in Mathematics Education*, (pp. 395-415), 3rd Edition, Taylor & Francis, New York and London: Routledge.

Abreu, G. & Gorgorió, N. (2007). Social representations and multicultural mathematics teaching and learning. In D. Pitta-Pantazi and G. (Eds.) Philippou *Proceedings of the*

*fourth congress of the European society for research in mathematics education*, (p. 1159). Department of Education. University of Cyprus.

Abreu, G., César, M., Gorgorió, N. & Valero, P. (2005). Issues and challenges in researching mathematics education in multicultural settings. In M. Bosch (Ed.) *Proceedings of the fourth congress of the European society for research in mathematics education*, (pp. 1125), FUNDEMI IQS–Universitat Ramon Llull, Barcelona, Spain.

Alrø, H., Skovsmose, O. & Valero, P. (2003). Communication, conflict, and mathematics education in the multicultural classroom. In M.A. Mariotti et al. (eds.) *Proceedings of the third Congress of the European Society for Research in Mathematics Education*. Retrieved on 01-12-2017 from <http://www.dm.unipi.it/~didattica/CERME3/proceedings>

Alrø, H., Skovsmose, O., & Valero, P. (2005). Culture, diversity and conflict in landscapes of mathematics learning. In M. Bosch (Ed.) *Proceedings of the fourth congress of the European society for research in mathematics education*, (pp. 1141-1152), FUNDEMI IQS–Universitat Ramon Llull, Barcelona, Spain.

Andersson, A. & Norén, E. (2011). Agency in mathematics education. In M. Pytlak, T. Rowland and E. Swoboda (Eds.) *Proceedings of the 7th Congress of the European Society for Research in Mathematics Education*. (pp. 1389-1398). Rzeszów, Poland: University of Rzeszów.

Arzarello, F., Dorier, J-L., Hebeker, L. & Turnau, S. (1999). Mathematics as a cultural product. Ich bin europäisch. In Schwank, I., Krainer, K., Goffree, F. & Berger, P. (Eds.). *European Research in Mathematics Education: Proceedings of the First Conference of the European Society for Research in Mathematics Education*. (pp. 70-77).

Bagger, A. (2015). Pressures and positions of need during the Swedish third-grade National Test in Mathematics. In K. Krainer; N. Vondrova. (Eds.) *Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education*. (pp.1558- 1563). Prague, Czech Republic.

Bishop, A. J., Clarkson, P., FitzSimons, G. & Seah, W. T. (2001). Studying values in mathematics education: Aspects of the VAMP Project. In J. Novotná (Ed.) *Proceedings*

*of the Second Congress of the European Society for Research in Mathematics Education.* (pp. 368-376). Czech Republic Charles University, Faculty of Education.

Bishop, A. (1988) *Mathematical enculturation: a cultural perspective on mathematics education.* Kluwer, Dordrecht

Black, L., Solomon, Y. & Radovic, D. (2015, February). Mathematics as caring: The role of others' in a mathematical identity. In K. Krainer; N. Vondrova. (Eds.) *Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education.* (pp. 1564-1570). Prague, Czech Republic.

Boistrup, L. B., Meaney, T., Mesquita, M. & Straehler-Pohl, H. (2015, February). Introduction to the papers of TWG10: Diversity and mathematics education—social, cultural and political challenges. In K. Krainer; N. Vondrova. (Eds.) *Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education.* (pp. 1534-1537). Prague, Czech Republic.

César, M., & Favilli, F. (2005). Diversity seen through teachers' eyes: discourses about multicultural classes. In M. Bosch (Ed.) *Proceedings of the fourth congress of the European society for research in mathematics education*, (pp. 1153-1164), FUNDEMI IQS—Universitat Ramon Llull, Barcelona, Spain.

Cobb, P. & Hodge, L. L. (2002) A relational perspective on issues of cultural diversity and equity as they play out in the mathematics classroom. *Mathematical Thinking and Learning*, 4, pp. 249–284.

Cole, M. (1996). *Cultural psychology.* The Belknap Press of Harvard University Press, Cambridge, MA

Crafter, S. (2009). Parental resources for understanding mathematical achievement in multiethnic settings. *CERME 6—WORKING GROUP 8*, 1453.

Crafter, S. & Abreu, G. de (2011). Teachers discussions about parental use of implicit and explicit mathematics in the home. In: Seventh Conference of the European Society for Research in Mathematics Education, 9-11 February 2011, Rzeszow, Poland.

[http://www.cerme7.univ.rzeszow.pl/WG/10/CERME7\\_WG10\\_Crafter.pdf](http://www.cerme7.univ.rzeszow.pl/WG/10/CERME7_WG10_Crafter.pdf)

- D'Ambrosio, U. (1985). *Socio-cultural basis for mathematics education*. Campinas, Brasil: Unicamp.
- De Haan, M., & Elbers, E. (2008). Diversity in the construction of modes of collaboration in multiethnic classrooms. In B. van Oers, W. Wardekker, E. Elbers, & R. van der Veer (Eds.) *The transformation of learning: advances in cultural-historical activity* (pp. 219–241). Cambridge: Cambridge University Press.
- Domite, M., & Pais, A. S. (2009). UNDERSTANDING ETHNOMATHEMATICS FROM ITS CRITICISMS AND CONTRADICTIONS 2. *CERME 6–WORKING GROUP 8*, 1473.
- Elbers, E. & de Haan, M. (xxxx). The construction of word meaning in a multicultural classroom. Talk and collaboration during mathematics lessons. In Proceedings of CERME 3, pp xxx.
- Elbers, E., & de Haan, M. (2005). The construction of word meaning in a multicultural classroom. Mediation tools in peer collaboration during mathematics lessons. *European Journal of Psychology of Education*, 20(1), 45–59. (Draft version presented at CERME 3).
- Favilli, F., Oliveras, M. L. & César, M. (xxxx) Maths teachers in multicultural classes: finding from a southern European project. In Proceedings of CERME 3, pp xxx.
- François, Karen. "The role of ethnomathematics within mathematics education." *CERME 6–WORKING GROUP 8* (2009): 1517.
- Gebremichael, A. T., Goodchild, S., & Nygaard, O. (2011, February). Students perceptions about the relevance of mathematics in an Ethiopian preparatory school. In *The Seventh Congress of the European Society for Research in Mathematics Education, Rzeszow, Poland* (pp. 9-13).
- Gellert, U., & Straehler-Pohl, H. (2011). Differential Access to vertical discourse-managing diversity in a secondary mathematics classroom.

Gorgorió, N., & Prat, M. (2011). Mathematics teachers' social representations and identities made available to immigrant students. In *Conference Proceedings of the 7th CERME, Rzeszów, Poland*.

Howarth, C., & Andreouli, E. (2015). "Nobody Wants to Be an Outsider": From Diversity Management to Diversity Engagement. *Political Psychology*.

Kaiser, G. (xxxx) Learning mathematics within the context of linguistic and cultural diversity - an empirical study. In *Proceedings of CERME 3*, pp xxx.

Kilpatrick, J. (1999). Ich bin europäisch. In Schwank, I., Krainer, K., Goffree, F., & Berger, P. (Eds.). *European Research in Mathematics Education: Proceedings of the First Conference of the European Society for Research in Mathematics Education*.(pp. 49-66).

Kjellrun Hiis Hauge, Maria Astad Sørngård, Tor Inge Vetthe, Terje Andr'e Bringeland, Andreas Austlid Hagen, et al.. Critical reflections on temperature change. Konrad Krainer; Nad'a Vondrova'. CERME 9 - Ninth Congress of the European Society for Research in Mathematics Education, Feb 2015, Prague, Czech Republic. pp.1577-1583, *Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education*. <hal-01287867>

Krummheuer, G. (2002) "The comparative analysis in interpretative classroom research in mathematics education." *CERME2: European Research in Mathematics Education II* (pp. 339-346).

Lange, T., & Meaney, T. (2011, February). Becoming disadvantaged: Public discourse around national testing. In *Congress of the European Society for Research in Mathematics Education* (pp. 9-13).

Montecino, A., & Valero, P. (2015, February). Statements and discourses about the mathematics teacher. The research subjectivation. In *CERME 9-Ninth Congress of the European Society for Research in Mathematics Education* (pp. 1617-1623).

Mukhopadhyay, S., & Greer, B. (2015, February). Cultural responsiveness and its role in humanizing mathematics education. In *CERME 9-Ninth Congress of the European Society for Research in Mathematics Education* (pp. 1624-1629).

Newton, R. and Abreu, G de. (2011) Parent-child interactions on primary school-related mathematics. Proceedings of the Seventh Congress of the European Society for Research in Mathematics Education, University of Rzeszów, Poland, 9-13 February 2011. [http://www.cerme7.univ.rzeszow.pl/WG/10/CERME7\\_WG10\\_Newton.pdf](http://www.cerme7.univ.rzeszow.pl/WG/10/CERME7_WG10_Newton.pdf)

Newton, R., & Abreu, G. de (2013) The dialogical mathematical 'self'. CERME 8. Feb 2013, Antalya, Turkey

Pais, A., Crafter, S., Straehler-Pohl, H., & Mesquita, M. (2013). Introduction to the papers and posters of WG10: Cultural diversity and mathematics education. In B. Ubuz, Ç. Haser, & M. A. Mariotti (Eds.), Proceedings of the Eighth Congress of the European society for Research in Mathematics Education (pp. 1820–1824). Antalya, Turkey: Middle East Technical University, Ankara

Rangnes, T. E. (2011). Moving between school and company. In *The Seventh Congress of the European Society for Research in Mathematics Education*.

Skovsmose, Ole. *Critical mathematics education*. Springer Netherlands, 2014.

Stathopoulou, C., François, K., & Moreira, D.,(2011) ETHNOMATHEMATICS IN EUROPEAN CONTEXT *The Seventh Congress of the European Society for Research in Mathematics Education*.

Stentoft, D. (2007). Multiple identities in the mathematics classroom: A theoretical perspective. In *Proceedings of the Fifth Congress of the European Society of Research in Mathematics Education* (pp. 1597-1606).

Turvill, R. (2015) . Number sense as a sorting mechanism in primary mathematics education. Konrad Krainer; Nad'a Vondrova'. CERME 9 - Ninth Congress of the European Society for Research in Mathematics Education, Feb 2015, Prague, Czech Republic. pp.1658-1663, Pro- ceedings of the Ninth Congress of the European Society for Research in Mathematics Education.

Valero, P., Crafter, S., Gellert, U., & Gorgorió, N. (2011). Introduction to the papers of WG 10: Discussing diversity in mathematics education from social, cultural and



political perspectives. In M. Pytlak, T. Rowland, & E. Swoboda (Eds.), *Proceedings of the Seventh Congress of the European Society for Research in Mathematics Education* (pp. 1386–1388). Rzeszów, Poland: University of Rzeszów.

Williams, J. , Black, L., Hernandez-Martinez, P., Davis, P., Hutcheson, G., Nicholson, S., & Wake, G. (2007). Storying mathematical identities with cultural models. *WORKING GROUP 10 Mathematics education in multicultural settings*, 1607.