Working Group: Mathematics Education and Society
Rome Conference Abstracts

Ole Skovsmose
Critique, uncertainty, and possibility
Abstract: The notion of critique includes a diversity of philosophic roots, and it has been elaborated in different theoretical contexts. This diversity has also influenced the formulation of critical mathematics education. However, we have to consider what it means for the formulation of critique, of critical education and of critical mathematic education to move into what has been referred to as the post-modern condition. I will outline some notions which I find important for the clarification of the notions of critique and of critical mathematics education for the future. In particular, want to relate critique to the notions of uncertainty and possibility. Furthermore, I will present categories of critical mathematics education with reference to examples of educational practices from Third World contexts. Mathematics and mathematic education operates in a complex variety of socio-politics contexts. Mathematics makes part of everyday practices, professional contexts, and technological enterprises. It operates as part of a world-wide distributed technical rationality. Mathematics education makes part of intricate processes of inclusion and exclusion, of distributing competencies, and of labeling students according to certain procedures of testing. Mathematics education helps to establish citizenship, critical or not, and to establish professionalism, critical or not, within a huge variety of domains. Both mathematics and mathematics education operate on market conditions in a globalised economy, where globalization is accompanied by processes of ghettoizing. On the background of such observations, I want to formulate a critical mathematics education for the future.

Dave Wagner
Positioning theory and intercultural conversations about mathematics
There are multiple actors involved in any research situation. It is never straightforward to understand how they relate to each other in the development of mathematical ideas. To better understand the interpersonal relationships and multiple contexts relevant to ethnomathematics and other mathematics education research relating to culture, I use Harré and van Langenhove's (1999) positioning theory, which says that people position themselves and others using language acts that evoke storylines known to the participants. A distinction of their approach is that they favour interpretation that considers only the interactions of the immediate participants in a conversation over interpretation that focuses on the influence of discourse systems. Such discourse systems are solely experienced locally through the medium of individuals in interactions. I use three interrelated examples to demonstrate the interpretive potential of Harré and van Langenhove's approach and to gain insight into ethnomathematical research.

First, drawing on the early stages of ethnomathematical research in Aboriginal communities on Canada's east coast, I identify connections with colonialist storylines and knowledge transmission metaphors especially related to the senses of audience felt by research participants and by students. Second, amidst a substantial attempt to invoke more respectful storylines in this research and its engagement with the same communities, I identify storylines with distributed agency. This new set of relationships that formed around a contest called 'Show me your math' presents challenges for reporting research. Third, resulting from preliminary dissemination of the second stage of the research, I identify storylines in the education community that

connect to the mathematical problem solving genre. These storylines raise concerns about the representation of communities and about structures of authority.

Colonialist storylines seem inevitable in this community that experiences the fallout of colonialism daily. Though respectful research and dissemination is challenging in such an environment, it can improve intercultural understandings.

Tony Cotton
Relationships to mathematics, relationships to learning mathematics.

Research in mathematics education is surely conducted for the benefit of teachers and the children they work with. Yet so often the voices of these key beneficiaries are marginalised within research to play the roles of clipped commentators allowed in only so long as they offer sound bites that sit neatly in the researcher's preferred story. If we are to find ways of making research more democratic we need to find ways of stepping out of this mould. Framed as research is in its own culture of regulative practices, the social specificity of research make any claims it might proffer to a wider truth seem somewhat problematic. Indeed such claims to truth may in themselves become oppressive leaving the researchers to sulk about their own complicity. The purpose of research might be viewed alternatively, however, as being about opening spaces that allow us all to think about how our worlds may be changed. This chapter will examine ways in which researchers can work with pupils and teachers to develop an authentic "voice" that speaks to researchers, academics, administrators, and those who have responsibility in policy formation. By privileging experience over theory as a basis for understanding space is made for marginalized or "silenced" groups to be heard. Using innovative and collaborative methods the research explores the relationships of groups of learners in schools in the UK to both mathematics and the learning of mathematics. It suggests that students may become disaffected as learners of mathematics as their self images become disconnected from their images of what it is to learn mathematics.

Gelsa Knijnik
"Regimes of truth" on adult peasant mathematics education:: An ethnomathematics study
This paper presents the results of a three-year study whose main goal was to analyze "regimes of truth" on adult Brazilian peasant mathematics education. More specifically, it aims at discussing the conditions of possibility (the social, political and cultural context) for the emergence of statements about adult Brazilian peasant mathematics education, how such statements circulate in peasant pedagogical culture, and their effects of truth on school mathematics processes.

Heather Mendick
Embodying mathematics
(with Marie-Pierre Moreau and Debbie Epstein)
Many people have mapped the boundaries of the 'social turn' in mathematics education. Like some researchers we do not want to push back the boundaries and so claim more territory for the social, instead we explore what sets these bounds and imagine mathematics learning as *always already* social. We will draw on the *Mathematical Images and Identities* study (ESRC funded: RES-000-23-1454). We carried out 27 group interviews with 15-16-year-old pupils and undergraduates in mathematics and humanities. Their talk about themselves and others as learners of

mathematics is characterised by oppositions, for example between: mathematics students and mathematicians, 'normal' mathematicians and 'real' mathematicians, people with natural ability and those who can't get it, and so on. Further, these labels as 'mathematically able' or as 'mathematician' attach to some bodies and not others, in complex ways. Participants' strong default image of a mathematician is of a white, middle-class man, and is associated with markings onto and into the body including states of clothing, posture and mental health. However, alongside this, Indian and Chinese pupils are inscribed as naturally and remarkably able, in a process of Othering that parallels orientalist discourses. It is apparent that particular mathematical stories stick to some bodies and slide off others. In this paper we will argue that this close connection between mathematical identities and physicality 'naturalises' relationships with mathematics and acts to foreclose social understandings. We will draw on Butler's (1993, 2004) ideas of subjection to provide an alternative framework for understanding how bodies can be recognised and lived as mathematical.

Jo Boaler, Sussex University, UK.
Relational Equity.

Equity is a concept that is often measured in terms of test scores, with educators looking for equal test scores among students of different cultural groups, social classes or sexes. As an alternative I will discuss the idea of 'relational equity', a term I use to describe equitable *relations* in classrooms; relations that include students treating each other with respect and responsibility. This concept will be illustrated through the results of a 4-year study of different mathematics teaching approaches, conducted in 3 Californian high schools. In one of the schools – a low-income, ethnically diverse, urban high school – students achieved at higher levels, learned good behavior, and learned to respect students from different cultural groups, social classes, ability levels, and sexes. In addition, differences in attainment between different cultural groups were eliminated in some cases and reduced in all others. 'Relational equity' was promoted through a multidimensional approach that nurtured social and intellectual commitment, communication, responsibility, and respect.

Peter Gates, Nottingham University, UK
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Many studies of children's experiences in school show that the degree of a child's academic success is a product of many factors, the majority of which are beyond the control and, sometimes, the knowledge of the classroom teacher. Through case studies of two children near the beginning of their secondary school education this study explores some of the factors which influence pupil success at school. It examines the influence on mathematics attainment of home and family background including the effects of the family socio-economic status and linguistic background. Bourdieu's concept of cultural capital is used to frame the analysis. The paper also examines the environment in which the pupils learn. The effect of these influences is analysed in the context of the pupils' learning of school mathematics and examines the children's mathematical learning trajectories and reflects on how what they achieve in the future will, in all likelihood, be shaped by their social background and how compatible this is with the current educational climate. The strength of this paper is in its articulation of the effects of class upon the lives of pupils.

Bill Atweh, Edith Cowan University, Australia
Understanding and Practicing Social Justice in Mathematics Education

There is a long tradition of concerns about and practice of social justice in mathematics education. The acknowledgement that mathematics is a critical school subject for educational progression, employment and active citizenship has lead to concerns about the welfare of students who are not participating and/or achieving well in it due to social backgrounds factors. Research and programs have been developed to deal with the needs of students from different genders, ethnic, cultural and social groups including Indigenous students, or with a range of disabilities. More recently new agendas such as the 'gifted and talented' and 'what about the boys' were constructed in social justice terms leading to a debate about the nature and meaning of social justice claims. This paper argues that, in spite of the long history of research and practice, social justice remains undertheorised in mathematics education. I will demonstrate some tensions between different possible understandings and practices of social justice and how they may lead into results contrary to what is intended. Theoretically, I will base my argument on the writings of Nancy Fraser. The theoretical discussion will be illustrated by a discussion of the views of mathematics educators from around the globe on international collaborations between industrialised and less industrialised countries obtained from a study on internationalisation and globalisation in mathematics education conducted in Asia Pacific Region.

Candia Morgan, Institute of Education, University of London, United Kingdom
Researching innovation in curriculum and pedagogy from a critical perspective

Studies of innovation or reform in education tend to be carried out from an evaluation perspective, asking the question 'to what extent have the principles of the desired changes been implemented?'. When the answer to this question is (as it is in most cases) 'only partially' or 'in a distorted form', there is an associated tendency to explain this in terms that suggest teacher deficit, often related to their pedagogic subject knowledge or mismatch between their beliefs and reform principles. Explanations of the specific forms of implementation of the intended curriculum are thus located in individual teachers. Similarly, studies of teacher development and changes in pedagogy, though frequently undertaken from a 'communities of practice' perspective, generally do not look beyond the characteristics of the teachers and groups of teachers involved and of the development programmes in which they are engaged. I shall argue for the value of a Critical Discourse Analytic approach in researching innovation and discuss some examples of analyses of curriculum and pedagogy. This approach takes into account the social and cultural contexts in which innovation takes place and which structure the ways in which teachers and students may make sense of proposed changes in curriculum and pedagogy. By combining analysis of the structure of the context, including the possibility of multiple competing discourses, with detailed attention to texts produced by different participants in the educational system, it is possible to identify positions made available for teachers (and for students) and to consider implications for their identities and for the ways they may interpret and implement changes.

Paola Valero, Aalborg University, Denmark
In between reality and utopia: A socio-political research agenda for mathematics education in situations of conflict and poverty

Mathematics education researchers move between utopia and reality, and researchers need to take a serious consideration of the vast majority of the world classrooms if we are to contribute with better utopias. Unfortunately, mathematics education research, in general, has been operating in a reality that is far from being the reality of most classrooms in the world. As Ole Skovsmose, in his lecture at ICME 10 pointed out: *"While about 10 % of the world's population of children comes from what have been nominated as the 'developed world', the vast majority of research in mathematics education seems to take the teaching-learning conditions of this minority as representative."* A socio-political approach in mathematics education could develop a research agenda interested in generating knowledge about the mathematics learning and teaching in classrooms in situations of poverty and conflict. My paper and presentation will be an attempt to delineate the elements of such research agenda. Through the discussion of the elements and characteristics of the research agenda some of the key questions to the group will be addressed.

João Filipe Matos and Madalena Santos, Technology Mathematics and Society Learning Research Group, Centre for Research in Education - University of Lisbon
Recognizing and validating mathematical competences among the population: political and ethical dimensions

The background where the research project occurs is running is a society where more and more academic diplomas are valued for a number of reasons although they don't constitute a pass to employment. The European policy regarding the valuing of acquired competences in the work place give birth to complex implementations of schemes and frameworks in order to make easy and straightforward the task of recognition and validation. However, in the field it seems clear that the only reference that people have is the school and we see a phenomenon of taking the process of recognition from an academic framework. Research in mathematics education can contribute to help understanding how people organize their mathematical knowledge. For a number of years, both cultural studies and studies in the tradition of etnomathematics provided accounts of the particular ways people organize, adapt and build up mathematical structures and forms of thought in order to make sense of everyday activities. Now, the educational systems in Europe face the challenge of recognizing, validating, and certifying mathematical (and more general) competences in people such as Simone. This is a challenge to education – and in particular to mathematics and science and technology education – as millions of people in Europe who didn't follow the regular compulsory schooling (but who want to acquire the certification of the basic or secondary studies, valuing their personal and professional experience) are potential candidates.

Merrilyn Goos, The University of Queensland, Australia
Critique and transformation in researcher-teacher relationships in mathematics education

University-based mathematics educators typically rely on gaining access to teachers and students in schools or teacher education settings in order to conduct their research. In these circumstances, Breen (2003) has observed that it is more common for mathematics teachers (or teacher education students) to be co-opted into the research agenda of the university academic than for genuine researcher-teacher collaboration to be realised. This paper examines spaces for critique and transformation in such relationships, drawing on examples from three of my own research projects. The first project highlights the development and gradual transformation of a long term collaborative relationship between the university-based researcher and school teacher who carried out classroom research together. The second project, a longitudinal study of the transition from pre-service to beginning teaching, required the researcher-as-teacher-educator to develop a critical stance within teacher education practice while negotiating changing relationships with the research participants. The third project was commissioned by the government to support implementation of a new mathematics curriculum by working with teachers to expand their pedagogical and assessment repertoires. Taken together, these projects generate questions about the role of mathematics education research with respect to critique and transformation of the researcher and the researched.

Robyn Zevenbergen, Griffith University, Australia
Tensions, contentions and connections in learning mathematics for students of significantly diverse backgrounds

As a nation, Australia performed well in the PISA study but in terms of equity, it was one of the poorest performing countries where there were considerable differences among performance for students from socially, culturally and geographically diverse communities. The figures are particularly disconcerting for Indigenous students who live in remote communities. Despite considerable funds being allocated to this issue, and some overall improvement on test scores, the gap between Indigenous students and non-Indigenous students has continued over time and is exacerbated the longer students remain in school. This paper explores the contentions and connections between the culture that students bring to school, the synergies of these cultures with school mathematics and the tensions between the western mathematics found in school practices and the mathematical knowledge of the students.

Tansy Hardy: Sheffield Hallam University, UK
Subjectivity as a tool to explore relationships to learning and teaching mathematics
My contribution will explore what is often named 'identity' in the context of pres-service teachers. The research project that I draw on used data and reflections from an analysis of teacher guidance video material together with extracts from interviews with practicing and pre-service student teachers to explore the discursive practices of teachers and learners in mathematics classrooms and the effects of this teaching on learners' identifications. For this presentation I focus on pre- service teachers' descriptions of their relation to learning mathematics. These students are in a 'double' positioning in relation to mathematics. They are involved in forming their

mathematics teaching practices and they are also learning/ re-encountering mathematics as a subject. For them mathematics is both a subject to learn and a subject to teach. Their relationships to mathematics are particularly relevant to the work of this symposium as they are formatted in socially and politically charged contexts. I will work with the notion of 'subjectivity' as a theoretical frame to open up restricted understandings of the experience of many learners and teachers (Henriques et al. 1984). This framing presents identification not as state but a process through which learners are constituted and through which, in often implicit ways, they constitute themselves. My analysis aims to capture ambiguities caught up in this process of identity formation, where identity is constantly rearranged in relation to others and subject knowledge. Through this I aim to generate some new understandings of the students' learning experiences and their articulations of these lived experiences.