TSG Agenda

TSG 47: Mathematics education in a multilingual environment

Class: __A__ (Class A for TSGs with odd numbers; Class B for TSGs with even numbers)

**Please prioritize the sessions in "core-time" (from 19:30-23:00, Beijing time, i.e. Session 2, 3 for Class A and session 1, 2 for Class B) as they are friendly to most of the time zones in the world.

Session 1 14:30-16:30 Beijing time, July 13th

Time: 14:30─14:45 WELCOME TO TSG 47, short presentation of the participants

1. Time: 14.45─15.00

   Title of the Paper: CODE-SWITCHING: PROPOSING LINGUISTIC RELATIVITY AS LENS IN MULTILINGUAL MATHEMATICS EDUCATION RESEARCH (8p)

   Author(s) HAO

   Ateneo de Manila University, Philippines

   Short abstract of the paper (20 lines maximum):

The present paper examines several studies conducted on code-switching in mathematics education across different geographical and cultural settings. While Moschkovich (2005) examined the sociolinguistic nature of code-switching through the conversations of Latino students in the US, Setati and Adler (2000) provided a sociopolitical understanding of the language situation in multilingual mathematics classroom in rural and urban South Africa. Meanwhile, Planas and Setati (2009) described the purposive nature of code-switching by South American immigrants in Catalonia, Spain. Lastly, Lim and Presmeg (2011) highlighted code-switching as an adaptive measure in response to a shift in language-in-education policies in Malaysia. Findings from the examined works reveal possible links to linguistic relativity --- the idea that language influences one's thought; particularly for multilingual speakers, several predictors and mediators have been proposed that suggest adaptation and possible effects on mathematical cognition. Thus, the paper proposes the consideration of linguistic relativity as lens for multilingual mathematics education research.

2. Time: 15.00─15.15

   Title of the Paper: **384** PRACTICES AND FUNCTIONS OF COLLOQUIAL ARABIC USE TO GENERALIZE PATTERNS IN MULTILINGUAL CLASSROOMS (8p)

   Author(s) Rabih El Mouhayar

   American University of Beirut

   Short abstract of the paper (20 lines maximum):

The purpose of this study is to investigate classroom teacher and student multilingual language practices and examine the functions of Lebanese dialect words (everyday spoken Arabic) that potentially influence levels of generalization in middle school algebra classrooms. Data came from ten videotaped sessions in two sections in grade seven. The videotaped sessions were subjected to transcription and in-depth analysis in the context of a research project that focuses on teaching pattern generalization in multilingual classrooms. A mixed quantitative-qualitative approach was adopted to analyze the data. Triadic dialogue was the dominant mode of interaction during classroom talk. The teacher's utterances were mostly of code-mixing type (involving English as a foreign language of instruction and Lebanese dialect as spoken local language) followed by English – only type and then Lebanese dialect - only type. In contrast, students' utterances were mostly English – only type followed by code-mixing type and then Lebanese dialect – only type. The teacher and students used Lebanese dialect words for different functions to elicit different levels of generalization

3. Time: 15.15─16:05
   Title of the Paper: LOCALISED INSTRUCTIONAL MATHEMATICS APPLICATION PROGRAMMES: PROVIDING ACCESS INTO MATHEMATICS IN MULTILINGUAL CLASSROOMS (4p)
   Author(s) KATABUA
   University of the Witwatersrand, Johannesburg, South Africa
   Abstract:
   Mathematics classrooms are characterized by various teaching aids including handheld devices that are often loaded with Mathematics Applications (App) so as to provide assistance in enhancing learners Mathematical understanding. However, the same App can be a hindrance if the Language of Learning and Teaching (LoLT) is not carefully considered in the App design stage. This study investigated possible language issues that might exist by focusing on a Mathematics Application called onebillion. Engelstroms (1999) Expansive Activity Model was the framework chosen for this study. Data collection included mapping the App to the curriculum documents, interviews with Grade 1 teachers and learners, and two classroom observations. The major findings from the study were that the App enabled learners to acquire new isiZulu mathematics register, the object of focus remained the Mathematics as the language issues were minor, and at times the learners outpaced the traditional classroom sequence and pacing. For future

research, we recommend that language studies be conducted (on the App) for different African languages and contexts, as language nuances are diverse for different African languages.

4. Time: 16.05─16:20
   Title of the Paper: FOSTERING MATHEMATICS TEACHER DEVELOPMENT THROUGH EXPERIENTIAL LEARNING IN MULTILINGUAL COMMUNITIES (8p)
   Author(s) PAOLUCCI
   University of Florida, USA
   Short abstract of the paper (20 lines maximum):
   This paper presents an example of how design-based research is being used to better understand the challenges of helping pre-service teachers develop effective practices that engage and support the learning of students in multilingual mathematics classrooms. It examines the continued design and development of the International Mathematics Enrichment Project (IMEP), an experiential learning program for pre-service teachers in a multilingual community. It discusses result from the initial implementation of the IMEP model for community-based experiential learning, the refinement of this model, and implications of this work for mathematics teacher education research and practice.

5. Time: 16.20─16:30
   Title of the Paper: STUDY ON DIFFICULTIES OF MATH WORD PROBLEMS IN ENGLISH-INTERNATIONAL BACCALAUREATE IN JAPANESE HIGH SCHOOL (4p)
   Author(s) KIMURA
   Waseda University, Tokyo, JAPAN
   Short abstract of the paper (20 lines maximum):
   In Japan, the International Baccalaureate has become widespread due to globalization, and opportunities to learn mathematics in English are increasing. In this study, we focused on stumbling of students who have studied mathematics in English for five months at a public high school in Japan. First, not knowing the meaning of one word that is not directly related to the question affects to comprehend the whole text in the math word problems. Second, it has become clear that the mistakes in calculation may modify the correct reading to the wrong reading. Similar stumbling may be found in the mother

tongue, but word problems in languages other than the mother tongue are more likely to cause wrong modification in one's own English interpretation. It is important to clarify specific examples of problems related to mathematics learning in English and accumulate examples of how to deal with the problems in the future research.

Session 2 19:30-21:00 Beijing time, July 14th

6. Time: 19:30─20:00

   Title of the Paper: invited ACTIVATING MULTILINGUAL RESOURCES IN A SUPERDIVERSE COVARIATION CLASSROOM - A DESIGN RESEARCH STUDY (8p)

   Author(s) URIBE & PREDIGER

   TU Dortmund University, Germany

   Short abstract of the paper (20 lines maximum):

In this paper, we investigate how instructional approaches for activating multilingual resources can be transferred from classrooms with shared multi-/bilingualism to superdiverse classrooms with non-shared multilingualism. In a case study on covariation in Grade 7, we show that the design principles for language-responsive classrooms can also be applied in non-shared multilingual classrooms to create a translanguaging space. The qualitative analysis of a whole class discussion identifies benefits and limitations of this approach for unpacking compacted mathematical concepts. By this, we unfold the epistemic role of multilingual resources for conceptual understanding, but also show limitations when the teacher cannot fully exploit the potentials of a non-shared language expression.

7. Time: 20:00─20:10

   Title of the Paper: NON-SHARED LANGUAGE TRANSLANGUAGING IN MATH CLASS (4p)

   Author(s) RYAN

   Malmö Univ, Sweden

   Short abstract of the paper (20 lines maximum):

This study gives two empirical snapshots of how multilingual grade five students in a mathematics classroom in Sweden perform translanguaging. In the classroom there are no shared languages but the language of instruction, Swedish. Two performances were identified; an over-bridging act and an invitation into a shared translanguaging space.

8. Time: 20:10─20:25

   Title of the Paper: EXAMINING EQUITABLE PARTICIPATION AND POSITIONING IN MULTILINGUAL CLASSROOMS: TASKS, LANGUAGE(S), AND NORMS (8p)

Author(s) ZAHNER

San Diego State University, USA

Short abstract of the paper (20 lines maximum):

Participating in classrooms with mathematical discussions can have positive effects on student learning (O'Connor, Michaels, Chapin, & Harbaugh, 2017). However, in multilingual classrooms, patterns of student participation may be shaped by variation in students' language proficiencies, the design of instructional tasks, and socially negotiated norms for participation (Barwell, 2015; Pinnow & Chval; 2015). We use a positioning framework (Harré, 2015) to examine the case of one emergent multilingual student, Kristi, as she was positioned by others and positioned herself during a series of small group discussions in her 9th grade mathematics class. The interactions were documented as part of a design research effort focused on fostering mathematical discussions in multilingual secondary classrooms. We describe two cases of positioning: One case showing positioning that inhibited Kristi's participation in collective mathematical activity, and one case of positioning that invited Kristi's participation in discussion. We discuss how Kristi's positioning was shaped by task design, norms, and language(s) used in the interaction.

9. Time: 20:25─20:40

   Title of the Paper: THE IMPORTANCE OF STUDENTS' FIRST LANGUAGE AS A SENSE-MAKING RESOURCE IN MULTILINGUAL MATHEMATICS CLASSROOMS (8p)

   Author(s) ROBERTSON

   Rhodes University, South Africa

   Short abstract of the paper (20 lines maximum):

In this paper I argue that the choice of English as the main language medium for South Africa's mathematics classrooms is a significant contributory factor in our students' poor performance on national and international benchmarking assessments. Given that English is the first language for less than one-tenth of South Africa's population, its use represents a profoundly inequitable reduction in a majority of the country's students' access to their first language as an important resource for mathematical sense-making. I use insights from a case study of two South African grade 4 mathematics classrooms to argue for more systematic inclusion of students' L1s in multilingual mathematics classroom contexts.

10. Time: 20:40─20:50

    Title of the Paper: EXPLORING THE ENABLEMENT OF MATHEMATICAL PROFICIENCY IN GRADE FOUR ENGLISH SECOND LANGUAGE MATHEMATICS CLASSROOMS (4p)

    Author(s) TSHABALALA

    Gauteng department of education, Johannesburg, South Africa

Short abstract of the paper (20 lines maximum):

This study explored how the teachers enabled mathematical proficiency in grade four English second language learners. The study is informed by the social constructivists theory of learning, which recognises the role of the knowledgeable other in the construction of knowledge. This framework is supported by Kilpatricks four of the five strands of mathematical proficiency This was a qualitative study focussing on two grade four teachers from two different primary schools in the informal settlements. At school A the language of learning and teaching from grade one to grade three was isiZulu, isiXhosa and Setswana and changed to English in grade four. At school B the language of learning and teaching was English right from grade one. What transpired in the lesson shows that language of learning and teaching does affect the smooth transition from grade three to grade four. Whatever language the teachers are using, when teaching mathematics, they should focus on the enablement of mathematical proficiency and they should also ensure that learners are exposed to formal mathematical language at an early age using different language practices.

11. Time: 20:50─21:00

Title of the Paper: WEBQUESTS IN CONTENT AND LANGUAGE INTEGRATED LEARNING CLASSES ON PRIMARY LEVEL (4p)

Author(s) Baschek

Justus Liebig University, DE

Short abstract of the paper (20 lines maximum):

In a research project of Information and Communication Technology (ICT) usage in bilingual settings, pupils were observed by video recording while working with bilingual PrimarWebQuests. In this paper it will be explained what Content and Language Integrated Learning (CLIL) means in a European context and to which components it is necessary to pay attention while planning CLIL lessons. The fitting of CLIL and ICT will be described to outline its potentials. The combination is achieved in the approach of bilingual PrimarWebQuests. This is an adaption of the idea about WebQuests by Dodge and March (1995). The basic idea of this approach and its implementation in bilingual settings will be defined. Afterwards, the framework of the pilot study and its results will be described. Following the conclusion, aims and different methods of further investigation can be discussed.

Session 3 21:30-23:00 Beijing time, July 17th

12. Time: 21:30─21:55

Title of the paper: invited LANGUAGE POSITIVE CLASSROOMS: AN EXAMPLE (8p)

Author(s) Barwell

University of Ottawa, Canada

Short abstract of the paper (20 lines maximum):

Much recent research on language diversity in mathematics classrooms has, in recent years, identified different teaching practices and other aspects of classroom life that seem to contribute to learners' successful or productive participation. My own contribution to this work includes a theorization of the sources of meaning that contribute to learners' participation in mathematics, and an empirical account of socialization practices found in four second language mathematics classrooms in Canada. In this paper, I present an overview of this latter work, focusing on the practices I found that characterised 'language positive classrooms'. I illustrate what a language positive classroom is like with reference to a geometry lesson taught in a class for recent immigrants to Quebec, Canada, in which French was the language of instruction and a new language for the learners.

13. Time: 21:55─22:05

Title of the Paper: IMPLEMENTING TRANSLANGUAGING AS PEDAGOGY IN MATHEMATICS CLASSROOMS A DILEMMA (4p)

Author(s) SVENSSON KÄLLBERG

Malmö University, Sweden

Short abstract of the paper (20 lines maximum):

In this paper purposefully, selected excerpts from interviews with a mathematics teacher are analyzed with the endeavor to explore what constitutes a possible dilemma when implementing translanguaging as pedagogy in mathematics classrooms. Through the analysis two competing pedagogic discourses emerge; a traditional mathematics discourse and a translanguaging discourse, perceived as separate by the teacher, creating a dilemma. A conclusion is that to create a one new whole (García & Wei, 2014) not only the principles of translanguaging and the adding of those need to be considered when implementing translanguaging as pedagogy, also the mathematics pedagogic discourses must be acknowledged and considered.

14. Time: 22:05─22:15

    Title of the Paper: TOWARDS A FRAMEWORK FOR UNDERSTANDING THE CHOICE AND USE OF EXAMPLES IN TEACHER EDUCATION MULTILINGUAL MATHEMATICS CLASSROOMS (4p)

    Author(s) ESSIEN

    University of Witwatersrand; Johannesburg, South Africa

    Short abstract of the paper (20 lines maximum):

    Examples that teachers choose and use are fundamental to what mathematics is taught and learned and what opportunities for learning are created. In this paper, I bring together three frameworks which have been used separately by researchers. The emergent framework consists of a three-pronged approach to understanding the exemplifying practices within teacher education (TE). It consists of an amalgam of variation theory (Marton & Booth, 1997), Mortimer and Scotts (2003) notion of meaning making as a dialogic process, and the notion of interacting identities within teacher education (Essien, 2014). I argue that while variation theory provides perspective into the choice of examples by the teacher educator, Mortimer and Scotts framework provides a tool for how language is used to engage with these examples in practice, and finally the framework on interacting identities provides perspective on how the different interacting identities in TE are (co-)constructed. I show how these three frameworks work together in examining the choice and use of examples in mathematics TE classrooms.

15. Time: 22:15─22:30

    Title of the Paper: IMPACT OF AN ONLINE COURSE OF TEACHING MATHEMATICS TO EMERGENT BILINGUALS ON TEACHER PERSPECTIVES (8p)

    Author(s) I

    Iowa state University, USA

    Short abstract of the paper (20 lines maximum):

    Many teacher preparation programs have limited specialized coursework focused on teaching culturally and linguistically diverse students. In this study, we examine the beliefs of preservice and in-service teachers enrolled in an online teacher preparation course focused on teaching mathematics to Emergent Bilinguals. Using the Culturally Responsive Mathematics Teaching tool, we analyzed teachers responses in five domains:

cognitive demand, mathematical discourse, power and participation, academic language support, and cultural/community-based funds of knowledge. The results indicate that the majority of the teachers positively changed their beliefs on effective mathematics teaching practices for Emergent Bilinguals after participating in the online course. The online space provided an opportunity for the teachers to openly and honestly share their beliefs without the fear of sounding or being viewed as politically incorrect.

16. Time: 22:30─22:40
    Title of the Paper: LANGUAGE-RELATED BARRIERS TO MATHEMATICS LEARNING: AN ALTERNATIVE DIAGNOSIS (4p)
    Author(s) YEE LAI
    University of Technology Sydney, Australia
    Short abstract of the paper (20 lines maximum):
    The aim of this study was to profile the visual perception of Chinese-speaking children diagnosed with dyslexia residing in Hong Kong. The results suggest that visual perceptual profiles of Chinese- speaking children with dyslexia were significantly inferior to those without dyslexia. We consider the implications for their mathematics learning in multicultural, English-speaking classrooms.

17. Time: 22:40─22:50
    Title of the Paper: THE PROBLEMS OF BILINGUAL MATHEMATICAL LEARNERS WHEN USING MATHEMATICS IN ARABIC (4p)
    Author(s) MOHAMED
    Beni-Suief University, Egypt
    Short abstract of the paper (20 lines maximum):
    The native language in Egypt is Arabic, but there are some schools that taught mathematics in English. So, this research aimed to determination the problems facing pupils who are studying math in English when they dealing with math in Arabic in their life. The results showed their problems in numbers and its operations. The reasons for these problems were analyzed. Some recommendations and suggestions have been made to deal with or prevent the occurrence of these problems in the future.

18. Time: 22:50─23:00

Title of the Paper: 17. Time: 22:40─22:50

Title of the Paper: A STUDENT MAY SPEAK WITH AN ACCENT, BUT NO STUDENT THINKS WITH AN ACCENT IN MATHEMATICS (4p)

Author(s) ZOLLMAN

Indiana University Southeast, USA

Short abstract of the paper (20 lines maximum): (4p)

Learning environments in many global educational contexts are becoming increasingly linguistically and culturally diverse. The purpose of this paper is to connect the theoretical research in language acquisition with the practical situation of teaching mathematics to emergent language learning students (students still learning the language of instruction.) We develop these connections into research-based practices for teaching mathematics in a multilingual classroom.

Two posters:

SOCIAL AND LINGUISTIC SEMIOTICS OF MATHEMATICS IN PUBLIC SCHOOLS
Author(s) Pugalee & Raja

MINORITY STUDENTS SOLVE TEXT TASKS
Author(s) Aaseth

Note:

Class A:

- Session 1: 14:30-16:30 Beijing time, July 13th
- Session 2: 19:30-21:00 Beijing time, July 14th
- Session 3: 21:30-23:00 Beijing time, July 17th