TSG Agenda

TSG __19__: ___ Mathematical literacy, numeracy and competency in mathematics education_____ (number and title)

Class: A____

**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: Tues , 13 July 14:30-16:30

1. Time: 14:40-15:10(including 5 min questions)

   Title of the Paper: *Mathematical Literacy:What, why and how*

   Author(s): Ross Turner

   Institution: Australian Council for Educational Research, Australia

   Short abstract of the paper (20 lines maximum):
   Mathematical literacy has been a topic of interest for many years. This paper recalls some considerations from TSG-6 (Mathematics Literacy) from ICME-12. It refreshes a definition of mathematical literacy, the reasons why it is and will continue to be important, and suggests some ways in which the literacy agenda might be advanced.

2. Time: 15:10-15:20

   Title of the Paper: *Elements and definitions of the core literacy of mathematics in primary school from an international perspective: based on nVivo 12.0 coding analysis*

   Author(s):**He Xuan**, Ma Yunpeng

   Institution(s) and Country/Region:

   Short abstract of the paper (20 lines maximum):
   With the help of NVivo 12.0, this article compares mathematics curriculum goals in the United States, United Kingdom, Australia, Japan and Singapore, the categories and hierarchical structure of the core literacy of mathematics in primary school are dissolved out in two dimensions: curriculum value orientation and connotation. Based on expert opinion surveys to preliminarily integrate the elements and definitions of core literacy of mathematics in primary school, and to propose the concept of affective literacy. Findings show that cognitive process orientation, humanistic conception orientation, and social reconstruction orientation are the fundamental curriculum value orientation of the framework and indicators for constructing the core literacy of primary school mathematics. The core literacy of mathematics in primary school are the comprehensive composition of functional literacy and affective literacy, including

reasoning ability, modeling consciousness, representability and communication, problem solving and mathematical attitudes. In the types and relationships of mathematical literacy in primary school, basic literacy is the premise, functional literacy is the core, and affective literacy is the driving force

3. Time: 15:20-15:30

   Title of the Paper: *Top-level design and systematic thinking for the cultivation of math competencies-case study and inspirations*

   Author(s) : Feng Ma

   Institution(s): Shanghai High School, Shanghai China

   Short abstract of the paper (20 lines maximum):

   Math competencies have been a hot topic of research for both high school teachers and college researchers for quite a long time. However, the research is not meant to be superficial and limited to shouting slogans. The IB math course, from its top-level designs to its implementations and assessments, is all about cultivation of students' competencies. Although cultivating talents is destined to be a long journey, the cultivation of competencies is a critical component of this process. All high school math curricula should be informed by the need for a comprehensive plan for the cultivation of competencies, and the IB program is a good example to learn from.

Questions: 15: 30-15:40

4. Time: 15:40-15:50

   Title of the Paper: *It is time pre-service teachers develop their numerate abilities to support their students numeracy learning*

   Author(s) : Kathy O'Sullivan

   Institution(s) EPI·STEM, School of Education, University of Limerick, Ireland

   Short abstract of the paper (20 lines maximum):

   Numeracy is a vital skill that all young people should acquire as part of their compulsory schooling. To ensure that all young people are numerate when they finish school, teachers must take responsibility for developing their students' numeracy skills. In the following paper, data from a study related to pre-service teachers' numeracy capabilities are reported. The sample for this study comprised of 204 students enrolled in post-graduate pre-service teacher education courses at three different universities in Ireland. While most participants recognised the importance of numeracy in everyday life, only a minority were able to complete all numeracy tasks that made up part of the survey.

5. Time: 15:50-16:00

   Title of the Paper: *Aspects of fair-minded critical thinking in mathematics education: based on the perspective of critical mathematics education*

   Author(s) : **Yuichiro Hattori**, Hiroto Fukuda

Institution: Kochi University, Okayama University of Science

Short abstract of the paper (20 lines maximum):

The purpose of this study is to identify the characteristics of critical thinking by students in lower secondary education while focusing on their sense of values regarding "fairness." In this study, a way of thinking, involving self-improvement, that reasonably evaluates one's own thinking and other people's thinking to reach a conclusion which persuades more people (Paul, 1995) is viewed as "fair-minded critical thinking." In addition, cases of classroom practice were examined from the viewpoint of critical mathematics education (Skovsmose, 1994). Among students in class, the study identified thinking for self-improvement that strengthens one's own grounds with mathematics and thinking in which one's conclusion is drawn from a chaotic pool of information and used to reach an agreement with other people. These examples of thinking carried out by students are characterized by actualization of a certain degree of "fair-minded critical thinking."

Questions: 16:00-16:10

6. Time: 16:10-16:30 (including 5 min questions)

Title of the Paper: *How teachers generate ideas for classroom numeracy tasks*

Author(s): Vince Geiger

Institution(s): Institute for Learning Sciences and Teacher Education, Australia

Short abstract of the paper:

Numeracy, or mathematical literacy as it is sometimes known internationally, is the capacity to use mathematics to solve problems in real-world contexts related to personal, civic and workplace life. Being numerate is essential for financial security, social well-being and the international economic competitiveness of nations. This paper is concerned with how teachers design tasks that promote students' numeracy capability through a cross-curriculum approach. This requires that teachers have the capability to generate ideas that serve as the basis for the design of numeracy tasks. Three different approaches to developing numeracy tasks are identified through the re-examination of previously published studies – (1) taking advantage of incidental events; (2) bringing together elements of curriculum from different learning areas; and (3) archiving ideas. Each of these categories are illustrated through short vignettes drawn from authentic classroom practice

Session 2: Wed , 12 July 19:30-21:00 (UTC+8)

1. Time: 19:30-20:00 (including 5 min questions)

Title of the Paper: *Common European Numeracy Framework- A multifaceted perspective on Numeracy*

Authors : **Kees Hoogland**, Javier Díez-Palomar, Niamh O'Meara

Institution(s): HU University of Applied Sciences Utrecht, University of Barcelona, University of Limerick

Short abstract of the paper (20 lines maximum):

In 2018 educational institutes from four countries within the European Union started to develop a Common European Numeracy Framework (CENF) for adult learning. This development is based on an extensive literature review and a broad European Numeracy Survey and further builds on work done in PIAAC and her predecessors. The project includes the piloting of a set of professional development modules based on the newly developed framework. In this paper we present some preliminary findings. Most numeracy frameworks consist of lists of content topics. We found it necessary to include in the framework also meta-cognitive aspects, psychological and sociological facets, and power-related factors, which influence the quality of numerate behavior of adults. This constitutes numeracy as a social practice and acknowledges the fact that human numerate behavior is multifaceted.

2. Time: 20:00-20:10

Title of the Paper: *Pre-service teachers' experiences with the Australian national numeracy test*

Author(s) : **Jennifer Hall**; Anna Podorova

Institution: Monash University

Short abstract of the paper (20 lines maximum):

The Literacy and Numeracy Test for Initial Teacher Education (LANTITE) was introduced in 2016 to improve teacher quality in Australia by ensuring that initial teacher education students are in the top 30% of the population with respect to their personal literacy and numeracy. To address the lack of empirical research on the LANTITE, we conducted a study at a large Australian university to explore pre-service teachers' experiences with this high-stakes, mandatory test. Here, we discuss pre-service teachers' experiences with the numeracy component of the LANTITE, reported through an anonymous online questionnaire (n = 458). From our analysis, we found connections between test preparation and students' perceptions of the test, as well as differences by demographic groups

3. Time: 20:10-20:20

Title of the Paper: *Mathematical literacy in pre-service teacher-designed mathematics picture books*

Author(s): **Zetra Hainul Putra**, Gustimal Witri, Syahrilfuddin

Institution(s): Department of Elementary Teacher Education, Faculty of Education and Teacher Training, University of Riau, Indonesia

Short abstract of the paper (20 lines maximum):

Mathematical literacy is a key point of the Program for International Student Assessment (PISA) study, and indeed it becomes a concern for some studies in many countries. This study aims at investigating mathematics literacy presented in mathematics picture books, and it focuses on mathematical contexts and contents presented in thirteen pre-service teacher-designed mathematics picture books. The findings show that personal is the most favourable contents, while quantity and change and relationships are mostly contexts chosen by the pre-service teachers in their designed mathematics picture books.

4. Time: 20:20- 20:30

Title of the Paper: *identifying 9th grade students' errors in solving a mathematical literacy problem*

Author(s): Maryam Mohsenpour, Mahbobeh Rohanifar and Zahra Gooya

Institution(s) Alzahra university, Alzahra university and Shahid Beheshti university

Country/Region:

Short abstract of the paper (20 lines maximum):

The purpose of the research was to identify the errors of students at the end of the ninth grade in solving the problems of mathematics literacy. This research was carried out with a qualitative approach. Nine students at the beginning of the 10th grade were selected in terms of their voluntary willingness to cooperate in the academic year 1397-98. In this research students answered to a unit derived from the test designed by Mohsenpour & et al. (2015). After performing and implementing it, the content of the interview text analyzed. The findings indicate that the most commonly errors ,were the lack of precise reading of mathematics questions, incorporating a cultural framework into the problem-solving process ,inability to apply a mathematical model to a real life model and the lack of understanding some words that have a mathematical meaning

5. Time: 20:30-20:40

Title of the Paper: A new model design to improve mathematical literacy: A dual focus teaching model

Author(s): **Cigdem Arslan**, Murat Altun, Tugce Kozaklı-Ulger, Isıl Bozkurt, Recai Akkaya, Furkan Demir, Zeynep Ozaydin, Burcu Karaduman,

Institution(s): Bursa Uludag University, Harran University , Bolu Abant Baysal University, Dumlupınar University, Turkey

Short abstract of the paper (20 lines maximum):

In this study, a new teaching model for mathematics teaching, called Dual Focused Teaching Model, is introduced. This teaching model aims to educate individuals who have high mathematical literacy in accordance with learning theories in mathematics teaching. In the first focus of the model, there are activities in which concepts and generalizations are acquired, skills are developed, and students share their responsibilities in their own learning. The second focus is the stage in which the acquired concepts and generalizations are reinforced and applications are made. At this focus, there are mathematical literacy questions and practices in which knowledge is transformed into skills. The common point of both focuses is that the studies are carried out with the active participation of the students through activities. The dual-focused teaching model was introduced to middle school mathematics teachers within the scope of a project supported by TUBITAK (The Scientific and Technological Research Council of Turkey), lesson modules suitable for the model were prepared and applications continue with students.

6. Time: 20:40-20:50

Title of the Paper: *Unpacking some challenges of learning mathematical literacy in South Africa*

Author: Sarah Bansilal

Institution(s) : University of KwaZulu-Natal, South Africa

Short abstract of the paper (20 lines maximum):

The subject Mathematical Literacy (ML) was introduced in 2006 in South Africa to cater for learners who were not studying any mathematics in their last three years of schooling. It is hoped that he subject will help these learners to make better informed decisions in real life situations which utilize numerical, statistical or spatial information. An important research area concerns the learning and assessment of the subject. In this paper, I elaborate on a framework in an attempt to try and disentangle the differences in the demands of assessments in mathematics and that of ML.

Questions: 20:50-21:00

Session 3: Sat, 12 July 21:30-23:00 (UTC+8) 90 min

1. Time: 21:30-21:45

   Title of the Paper: *Designing Pisa-like mathematics task using Asian games context*

   Author(s) : **Ratu Ilma Indra Putri**, Zulkardi

   Institution: Universitas Sriwijaya, Palembang, Indonesia

   Short abstract of the paper (20 lines maximum):

   This study aimed to produce a set of valid and practice of PISA-like mathematics tasks using Asian Games context to support students learning. Design research and lesson study were used as the method both during the design and implementation stages. Target users are 15th years old middle schools students from PMRI pilot schools in Palembang. Results show that a set of PISA-like problems on uncertainty and data content are valid, practical, and had a potential effect. Students were doing mathematics in a collaborative, and the learning process becomes meaningful and easily.

2. Time: 21:45-22:00

   Title of the Paper: *Assessing Pisa-like tasks considering levels of context use for mathematical problem*

   Author(s) : **Ahmad Wachidul Kohar**, Tatag Yuli Eko Siswono, Dayat Hidayat

   Institution: Universitas Negeri Surabaya, Universitas Negeri Surabaya, Universitas Negeri Surabaya, Indonesia

   Short abstract of the paper (20 lines maximum):

   This paper aims to present the level of context embedded in mathematical tasks taken from context-based tasks developed by novice Indonesian PISA-like task designers. Data were collected from 130 PISA-like items designed by student teachers, graduate students, and the authors within some developmental research. The analytical framework used in this study follows the revised classification of levels of context use developed by Salgado (2016). The classification consists of two criteria, i.e. formulation and interpretation, in which the first use and second use of context are emphasised in the tasks to reflect an increasing use of context from the lowest level to the highest level of context. Results point out that 29.23% of them were identified to use zero-order use of context, while the remaining are identified to have first-order (64.61%) and second-order use of context (6.15%). Some examples of this finding are presented to indicate the feature of each category. To suggest, PISA-like task designers need to challenge themselves in considering the constraints of assumptions in the information provided in the tasks, varying contexts, as well as meeting the complexity of the language use

Questions: 22:00- 22:10

3. Time: 22:10-22:20

   Title of the Paper: *Financial numeracy practices in secondary school: A study with mathematics teachers from Quebec, Canada*

Author(s): **AS Cavalcante**, A Savard

Institution: McGill University

Short abstract of the paper (20 lines maximum):

In this communication, we mobilize the concept of financial numeracy to understand the practices of secondary mathematics teachers. Financial numeracy refers mathematical practices of everyday life situations that involve the realm of finance. Overall, our results show that the teachers' incorporation of financial numeracy seems be mostly related to personal finance, not touching on issues of citizenship or social justice. We notice that they currently incorporate financial numeracy practices in the realms of consumption, investment/savings and debt/borrowing in their mathematics classes. They connect these practices with certain mathematics concepts related to arithmetic, functions and financial mathematics.

4. Time: 22:20- 22:30

Title of the Paper: *A semantic network analysis of information literacy in school mathematics in Korea*

Author(s) : **Eun Hyun Kim,** Rae Young Kim

Institution: The graduate school of EWHA Womans university, EWHA Womans University

Short abstract of the paper (20 lines maximum):

There have been conducted studies about Information Literacy (IL) with considerable interest from many organizations and countries and their concerns increase to incorporate IL into education. The 2015 revised national curriculum in Korea adopted information processing as an ability to cultivate and set it as one of the key competencies and mathematical competencies. This study analyzed thirty mathematics teacher's guidebooks for elementary and middle school instruction using semantic network analysis to see how information literacy was interpreted. The result shows that IL was related to understand problems and focus on a series of activities such as drawing graphs and making expressions at elementary school level. Meanwhile, IL for middle schools was related to use technology tools and focus on activities with implementation of software programs. This implies that IL is interpreted and used differently by school levels. It can be related to students' developmental levels or content-specific pedagogy. However, considering curriculum coherence and sequential integration, we argue that it is necessary to scrutinize IL across school levels in sophisticated and integrative ways.

5. Time: 22:30-22:40

Title of the Paper: Mathematical Literacy in Norway

Author: Oda Heidi Bolstad

Institution: Volda University College, Norway

Short abstract of the paper (20 lines maximum):

This paper describes how mathematical literacy is treated in Norway. The focus is particularly on curriculum documents. However, conceptual challenges are also outlined. The curriculum definitions and conceptual challenges affect the understanding of, and the teaching and learning for, mathematical literacy in Norway.

6. Time: 22:40-22:50

Title of the Paper: Merging the classroom to practice: Enhancing mathematical literacy through the artifacts.

Author: Luckson Muganyizi Kaino

Institution: Josiah Kibira University College, Tumaini University, TANZANIA

Short abstract of the paper (20 lines maximum):

This paper discusses the ethno-mathematics teaching approach of relating mathematics taught in the classroom to the mathematics practiced outside the classroom i.e. the mathematics encountered and practiced in real life. It explores the use of indigenous materials and their integration into mathematics teaching in efforts to improve mathematical literacy on the content taught. The topics involving patterns in the determination of mathematical rules and principles are illustrated to create a dialogue discussion among researchers for a deeper understanding of mathematical literacy in the chosen topics at the Junior Secondary school level. The argument put across in this paper is not on what can be identified in the environment but on how it can be used to make students more mathematically literate for better understanding mathematics. The premise of the paper is that a thorough understanding of what is learnt in the classroom and the ability to relate this to the environment living in, makes the student mathematically literate on the material learnt.

Questions: 22:50-23:00