

TSG Agenda

TSG_56__ : __Philosophy of Mathematics Education

Class: _B

Session 1 Tuesday, July 13, 2021

Time: 19:30-19:40 UTC+8

Chair Introduction

Time: 19:40-19:50 UTC+8

Introduction of the members of the TSG 56

Time: 19:50-20:20 UTC+8

Title of the Paper: Mathematics and Ethics

Author(s): Ole Scovsmose

professor emeritus at Aalborg University, Denmark, and
volunteer at Universidade Estadual Paulista (UNESP), Brazil.

Short abstract of the paper (20 lines maximum):

Abstract: From an educational and a philosophical point of view, it is important to address the social, political, economic, and ideological powers that might be acted out through mathematics. I will do so by exploring mathematics brought in action, and in this way relate mathematics and ethic.

As any action, so also mathematics brought in action can have any kind of qualities by being: accurate, dubious, expensive, risky, disastrous, benevolent, cynical, useful, etc. There does not exist a unique and attractive quality of mathematics-based actions due to the fact that they are mathematics based. This observation applies to any kind of mathematics: school mathematics, engineering mathematics, applied mathematics, pure mathematics, street mathematics, and any version of ethnomathematics.

Mathematical brought in action calls for profound critical reflections. This constitutes an ethical challenge related to mathematics. When ignored, mathematical research and mathematical study programmes at universities and faculties might bring about a banality of mathematical expertise. The ethical challenge also brings about a demand for school mathematics that, if the challenge is ignored, might tend to lead students into a general admiration of mathematics and its applications.

Discussion 20:20- 20:30 UTC+8

Time: 20:30—20:40 UTC+8

Title of the Paper: Philosophy, Rigor and Axiomatics in Mathematics: Intimately Related Or Imposed?

Author: Min Bahadur Shrestha

Tribhuvan University, Nepal

Short abstract of the paper (20 lines maximum):

One of the main tendency of mathematical development in 19th and 20th centuries seems to be on rigor and formalization. Rigor and formalization took place on axiomatic basis leading to more abstraction. Euclidean type of an axiomatic model became a model of mathematics even for constructively developed analysis. Even though rigor and axiomatic method are different and it is not necessary for rigor to be based on axiomatic method, in practice, rigor and axiomatics have been the requirement for valid mathematics. Some explain it as mathematical necessity and some relate it more as the result of philosophical underpinnings. Such situation motivated me to examine how philosophy, rigor and axiomatic are related. It seems that philosophy has distant but determining impression on the nature of mathematical knowledge, but rigor and axiomatics seems to be more internal to mathematics. For wider basis, such issue needs to be considered going beyond western mathematical traditions.

1. Time: 20:40- 20:50 UTC+8

Title of the paper:

Imagination in the Philosophy of Mathematics and its Implication for Mathematics Education

Author: Yenealem Ayalew

The philosophy of Mathematics education is inclusively concerned with the essence of mathematics (Ernest, 2018). In this regard, the argument on whether mathematics is invented or discovered has been a topic of discussion for many scholars in the field. On the other hand, the construct “imagination” has a lot to reveal on the matter which in turn implies for the learning of Mathematics. Thus, “imagination” would be a sub-topic under Mathematics Education.

Discussion: 20:50-21:00

Session 2 Friday, July 16

Time: 21:30-21:45 UTC+8

Title of the paper: Towards A philosophy of algorithms as an element of Mathematics Education

Author(s): Regina D. Möller; Peter Collignon

Humboldt University of Berlin; University of Erfurt

Short abstract of the paper (20 lines maximum):

Algorithms are one of the fundamental mathematical ideas structuring the content of math classes throughout the school years. In the last 30 years their roles and their importance for mathematics education have undergone substantial changes. These changes give cause to reflect upon this emerging phenomenon. They also ask for analyzing the need in actual math classes as response to everyday life experiences. From a philosophical point of view, new questions arise that can be considered within the framework of (post-)modernism and within a constructivist approach.

Time: 21:45-21:55 UTC+8

Title of the Paper: Appropriation mediates between social and individual aspects of mathematics education

Author(s): Mitsuru Matsushima

Kagawa University, Japan

Short abstract of the paper (20 lines maximum):

A few studies on appropriation in mathematics education research clarified, its two features: dynamic composition and mutual composition. A structural model of social constructivism based on a socio-cultural approach in mathematics education was also proposed by embedding the learning community and an interlocutor into the model. From the discussion of this model, five appropriation stages were identified. The result of analysis revealed that a gap in appropriation could occur during the process, and that gap could become the source of creativity. In addition to that, the essence of deepening and developing mathematical learning through dialogue was also revealed.

Time: 21:55-22:05 UTC+8

Title of the Paper: Philosophical Inquiry for critical Mathematics Education

Author(s): Nadia Kennedy

CUNY, NYC

Short abstract of the paper: *This paper argues that critical mathematics education requires reflective knowledge, which lies outside of mathematical and technological knowledge, and which can be generated through philosophical inquiry in the classroom. Philosophical inquiry can provide “thinking tools” for questioning, challenging and critiquing implicit assumptions and misconceptions and for the reconstruction of concepts. As such, it can offer a space for critical reflection on mathematics, for the development of an epistemological approach that encourages an enriched, overarching view of mathematics and its connections to the other school disciplines, society and self. It also offers space for the deconstruction and reconstruction of beliefs about mathematics as a form of knowledge, about the social value of mathematical practice, and beliefs about oneself as a mathematics learner/thinker.*

Time: 22:15-22:30 UTC+8

Title of the Paper: Towards Critical Mathematics

Author(s): Theodore Savich

Indiana University, USA

Short abstract of the paper (20 lines maximum): *The goal of this paper is to express necessary conditions for arithmetic based on Brandom's inferentialism (2000a) and analytic pragmatism (2008) and to situate the explicated critical arithmetic as it relates to other projects in critical mathematics education. Discussion of the substitution licenses of singular terms leads to a re-interpretation of Von Neumann ordinals. Necessary conditions for arithmetic are expressed as material inferential rules using a normative vocabulary of commitments and entitlements. The broad implications that this reconceptualization of the "mathematics" side of "mathematics education" could have for equitable curriculum, teaching, and learning are discussed.*

Time: 22:30-22:40 UTC+8

Title of the Paper: Recognizing Mathematical Anthropocentrism

Author(s): Thomas Ricks

Louisiana State University, USA

Short abstract of the paper (20 lines maximum): *Mathematics education manifests mathematical anthropocentric perspectives that are inaccurate in lieu of many scientific findings about the mathematical abilities of many non-human entities, significantly limiting what counts as legitimate mathematics, and hence the work of mathematics education. I suggest benefits post-anthropocentrism might hold for mathematics education.*

Time: 22:40-22:50 UTC+8

Title of the paper: Curriculum system of the philosophy of mathematics education for normal students

Author: **YanYaqiang** XueSuyue MaJunfeng

School of Mathematical Sciences, Soochow University

The teachers of mathematics education in China have gradually demonstrated the need for the systematic theory about mathematics education. However, the philosophy of mathematics education is biased towards the academic level, and there are few "readable materials" for direct application in practice. This paper prepares a curriculum system for the philosophy of mathematics education for normal students. The purpose is to stimulate the discussion of the philosophy of mathematics education among the (future) mathematics teachers for practical guidance, to implant the necessary "genetic genes" for the benign development of mathematics education.

Discussion: Time 22:20-23:00

Session 3 Saturday, July 17

Time 14:30-14:45 UTC+8

Title of the Paper: Research procedures to understand algebraic structures: hermeneutic approach.

Author(s): **Maria Bicudo**

São Paulo State University, Rio Claro Campus – São Paulo - Brazil

Verilda Speridião Kluth

Federal University of Sao Paulo - São Paulo - Brazil

Short abstract of the paper (20 lines maximum): *The authors question how hermetic texts in mathematics, history, and philosophy of mathematics, specifically those referring to abstract algebra, can be open to the understanding of researchers, teachers and students who are intentionally willing to understand them. This discussion suggests that the openness may happen through hermeneutic procedures. These procedures, in the wake of Gadamerian thinking, take the dialectic of the process of formulating the question and pursuing possible ways of answering it, entering into the intricacies of the historicity of knowledge constitution based on the Husserlian perspective and on the production of algebra itself, in order to explain a methodology of research. They advance by bringing a hermeneutic study on algebraic structures, explaining the research methodology that aimed at the formation of the ideality of algebraic structures and their maturation in the living present: as notions of algebraic structures, as object of study and as subject of algebra.*

Time: 14:45-15:00 UTC+8

Title of the Paper: 2+2=4? Mathematics Lost between two pitfalls of essentialism and Alternative Truths.

Author(s): David Kolosche

University of Klagenfurt, Austria

Short abstract of the paper (20 lines maximum):

This essay problematises the epistemological status of mathematical knowledge. It is based on the observation that essentialist epistemologies provide no solid basis while relativist epistemologies have not yet convincingly succeeded to explain the objectivity of mathematical knowledge. I will start with two examples from popular media which illustrate that awareness for the problem discussed here has already reached the interested public. I will shortly address popular answers to the problem, only to refute them. I will end the essay by some discussions which stay close to the example of $2+2=4$, ending with the presentation of possible directions for further understanding and research.

Time: 15:00-15:15 UTC+8

Title of the Paper: Does Constructivism Tell Us How to Teach?

Author(s): **Bronislaw Czarnocha**, William Baker

Hostos Community College, CUNY, NYC:

Short abstract of the paper (20 lines maximum):

The addressed question from the interface between theory and teaching practice of constructivism is discussed at the background of whereabouts of the Common Core (CCSS-M) constructivist-based mathematics curriculum. It concerns the formulation of constructivist methodology of teaching, whose existence is called in doubts by US constructivist researchers who formed the basics of the approach of the constructivist philosophy into education. The presentation argues that the research tool, constructivist teaching experiment does define the constructivist teaching methodology and through mathematics teaching-research, it can be introduced into mathematics classroom at large. The conference presentation will address socially based reasons for the professed absence of constructivist teaching methodology and it will address critically the method of 'scripted lessons' as the substitution for teaching methodology- the two themes absent from the proposal below due to lack of space.

Discussion 15:15-15:25

Time: 15:25-15:40 UTC+8

Title of the Paper: Teachers Epistemology on the Origin of Mathematical Knowledge

Author(s): **Karla Sepúlveda Obrequé**

Centro de Investigación Escolar y Desarrollo - Catholic University of Temuco, Chile

Javier Lezama Andalón

Instituto Politécnico Nacional - México

Short abstract of the paper (20 lines maximum):

This research sought to understand the origin attributed by teachers to mathematical knowledge. The theoretical framework guiding this research is the Socioepistemological theory of Educational Mathematics which accepts mathematics as a human activity that is resignified and reconstructed in specific contexts. This qualitative research forms a heuristic case and uses Grounded Theory as an information processing technique. The results showed most teachers understand mathematics as a priori knowledge, assigning to human action the role of discovering, interpreting or formalizing it.

Time: 15:40-15:55 UTC+8

Title of the Paper: Mathematical Education, Body and Digital Games: Play the Ball in This Way so That it Goes, it Goes Further Than the Floor

Author(s): **Maurício Rosa**, Danyal Farsani, Caroline Antunes da Silva

Federal University of Rio Grande do Sul (Brazil), University of Chile (Chile), Federal University of Rio Grande do Sul (Brazil)

Short abstract of the paper (20 lines maximum):

This article investigates the perception of students in the first year of high school in relation to their own body language, while mathematically they conjecture a way to improve their performance in an electronic bowling game, which uses body sensors for own actions of the game. Interactions were performed by a group of four students from a public school in Brazil, in order to perform mathematical activities with the Sports game on Xbox One with Kinect. Mathematically, the students discussed issues related to angulation, velocity, position relative to an axis and correlated to their digital being (game avatar) controlled by their biological body. In this sense, we are drawing up on embodied cognition articulated with the conceptions of perception and body-proper arising from the phenomenological view discussed by Merleau-Ponty. We understand that students' perception is shown by the acts of being-with, thinking-with and knowing-doing-mathematically-with-Digital-Technologies.

Time: 15:55-16:05 UTC+8

Title of the Paper: Internet, Teaching Mathematics: Weaving the Web

Author(s): Marli Regina dos Santos

Federal University of Ouro Preto, Minas Gerais, Brazil

Short abstract of the paper (20 lines maximum):

This paper reflects on the possibilities which the Internet opens to the teaching and learning of Mathematics. A glimpse on the interactions and the possible horizons in the field of Education that this environment provides. We propose a theoretical and philosophical reflection on the nature of the cyberspace in this context and we explore the process of creating resources and spaces for the teaching and learning of Mathematics on the Internet by educators who are engaged in this endeavor, highlighting intricate relationships in the pedagogical practice of the discipline.

Discussion/ Conclusion of the TSG 56

Time 16:05 – 16:30