Summer School for Mathematics Education  
Monday 17 August – Thursday 27 August 2020 

Utrecht University

Aim of the course: Bringing participants up-to-date in design and research in the field of mathematics education. Topics will include: curriculum development, revealing and building on talents of students, classroom experiments, context and tools for modelling, assessment, and the use of technology for teaching and learning mathematics.

Target audience: Master’s students and PhD students in mathematics education and the education and learning sciences with a strong interest in mathematics education, early childhood and kindergarten teachers, primary and secondary school teachers, teacher educators, curriculum and assessment developers, and researchers. Proficiency in English will be essential for a fruitful participation in the Summer School.

Program

Lectures, workshops, reflections etc. are from Monday until Friday between 09:00 - 17:00. In general, each day provides a program from 9 am to 3 pm followed by group work from 3 pm until 5 pm. At the last day of the summer school groups present their results of the group work in a poster gallery.

During the weekend there are no classes, but activities organized by the central organization of the Summer School.

All classes are in the Buys Ballot building, Princetonplein 5, 3584CC Utrecht, except the opening, which will take place in the Koningsbergerbuilding (Budapestlaan 4 a-b, 3584 CD Utrecht)

Monday 17 August – Opening day, introduction to RME and the content of the summer school

Since the 1960s, the theory of Realistic Mathematics Education (RME) has been developed in the Netherlands, and at the Freudenthal Institute in particular. Since that time, RME has become widespread, but was also subject to criticism. You will be introduced to some key ideas in RME, such as mathematization, guided reinvention, didactical phenomenology, and the use of contexts.

Tuesday 18 August – Modelling

Students pass various levels of understanding when learning mathematics: from informal context-related solutions, through creating various levels of shortcuts and schematizations, to acquiring insight into how concepts and strategies are related. Models are important for bridging the gap between the informal, context-related mathematics and the more formal mathematics. Today you will become familiar with the notion of didactical models, the shift from model-of to model-for and emergent modelling. While learning mathematics, students also learn how to model situations mathematically. You will also work on large open ended modeling tasks to be completed by teams of students, which can be used to assess modeling skills.

Wednesday 19 August - Algebra and Geometry

Today the focus is on two key domains in mathematics. Students in secondary schools need to master algebraic skills. To do so, they need to practice a lot, but practice without understanding isn't very effective. A proper balance is needed to make algebra meaningful. Moreover connections with the world of number and geometry support meaningful algebra. In the geometry session you will experience how the Dutch geometry curriculum changed focus from abstract manipulations to grasping space.
### Thursday 20 August – Optional topics
The topics of today are dependent of guests presenting and of participants who also like to contribute to the program.

### Friday 21 August – Assessment
A modelling- and application-oriented curriculum has implications for assessment. Opportunities and challenges for (national) assessment are discussed. Furthermore, we will address ways for formative assessment and the use of ICT in assessment and in providing feedback.

### Monday 24 August – Innovative learning environments
Today we address recent perspectives on the concept of learning (e.g. embodied cognition), new aims of mathematics education (e.g. computational thinking and 21\textsuperscript{st} C skills), and the use of ICT in learning mathematics.

### Tuesday 25 August – RME in practice and in textbooks

### Wednesday 26 August - Inquiry Based Learning, diversity and intercultural learning
Inquiry-based learning (IBL) aims to develop and foster inquiring minds and attitudes that are vital for students being able to face and manage uncertain futures. Fundamentally, IBL is based on students adopting an active, questioning approach. Of course you need ‘basic skills’ in the area of mathematics and science, but it is important that students also learn to use those basic skills in new situations. You will practice with one example from IBL in order to get an idea what this means for both students and teachers. Relations and differences between IBL and RME will be discussed. In addition you will focus on the potential of IBL to take the opportunity of diverse and multi-cultural classrooms with a specific focus on the important role of language in the teaching and learning of mathematics.

### Thursday 27 August - Closing day – and presentations by participants

### Note:
When you leave your room, please hand in your keys on Friday before 11:00 AM at the Freudenthal Institute. If you want to drop off your luggage for the day, bring it to the Freudenthal Institute; you can store it there at a safe place.