



Course title¹	Mathematical thinking and problem solving
Level²	<u>BA/BSc</u> <u>MA/MSc</u> Doctoral
Duration	2 weeks
Department / Group / Center³	
Institute	
Faculty	Faculty of Primary and Preschool Education
Duration	2 weeks
Course Leader⁴	
Title	Prof. Dr.
Name	Csaba Csíkos
Academic rank	Professor
Administrative rank in university management⁵	Vice-Dean
Email⁶	csikos.csaba@tok.elte.hu
Phone	
Course Coordinator⁷	
Title	
Name	
Position	
E-mail	
Phone	



Short description (100-150 words)⁸

This course has three parts integrated under the umbrella of mathematical thinking and problems solving embracing three topics on fostering children's mathematical thinking. Diagnosing and remedying difficulties with arithmetic; using visualization tools for counting and word problem solving; and using games and puzzles for motivating students and develop their problem solving skills. All three topics require active learning engagement, since participants can try and discuss the methods and tools they are acquainted with. The course can be useful to both elementary and secondary teachers, and to all being interested in understanding and developing mathematical thinking of 4 to 14 year-old students.

Short description (2-3 sentence for promotion purpose)

This course has three parts integrated under the umbrella of mathematical thinking and problems solving embracing three topics on fostering children's mathematical thinking. Diagnosing and remedying difficulties with arithmetic; using visualization tools for counting and word problem solving; and using games and puzzles for motivating students and develop their problem solving skills. Understanding "rational errors" in counting, knowing your own mental number line and applying magic mathematical tricks to enhance motivation are all part of this course.

Structure of the course

Pedagogical investigation of dyscalculia (15 hours)

Pedagogical investigation of dyscalculia is a method of investigation which explores the mathematical and cognitive abilities of children by creating individual performance profiles, leaning on the latest research on neuropsychology, along with neuro- and special pedagogy.

It increasingly focuses on acquired basic cognitions, abilities, skills, cognitive processes, behaviour, motivation and the changes concerning these. We are ready to present the test and the practical techniques of the test to you.

The role of visualization in mathematical thinking and problem solving (15 hours)

Verbalizers and two types of visualizers: the role of cognitive style in problem solving. How to develop children's word problem solving skills by means of drawings? How does the mental number line develop at the of 5 to 10? What kinds of drawings should be used to facilitate problem solving in the textbooks and during math classes?

Mathematical games, tricks and wizards (10 hours)

Participants will be introduced to math-based games and puzzles that develop the thinking of children ages 4-10. We show how the teacher leads the lesson in the role of the magician. The magic wand, dice, cards, and other tools will help us with this. The presentations of the activities is followed by their methodological analysis. The presented activities cover the areas of number concept, counting, probability, and geometry.



Literature

Csíkos, C., Szitányi, J., & Kelemen, R. (2012). The effects of using drawings in developing young children's mathematical word problem solving: A design experiment with third-grade Hungarian students. *Educational studies in mathematics*, 81(1), 47-65.

Hegarty, M., Mayer, R. E., & Monk, C. A. (1995). Comprehension of arithmetic word problems: A comparison of successful and unsuccessful problem solvers. *Journal of educational psychology*, 87(1), 18.

Kozhevnikov, M., Hegarty, M., & Mayer, R. E. (2002). Revising the visualizer-verbalizer dimension: Evidence for two types of visualizers. *Cognition and instruction*, 20(1), 47-77.

Svraka, T. ; Dékány, J. ; Polgárdi, V. ; Ádám, Sz. (2018). Pedagogical Assessment of Dyscalculia. ÉVKÖNYV - ÚJVIDÉKI TUDOMÁNYEGYETEM MAGYAR TANNYELVŰ TANÍTÓKÉPZŐ KAR (2011-) XIII. évf. : 1. szám pp. 156-167. , 12 p.
<https://www.magister.uns.ac.rs/files/kiadvanyok/evkonyv/Evkonyv2018.pdf>

Szűcs, D., & Mammarella, I. C. (2020). *Educational Practice Series 31. Math Anxiety*. [on-line available: [31_math_anxiety_web.pdf \(unesco.org\)](#)]

Target group⁹

Pre-service and in-service elementary teachers and lower secondary mathematics teachers

List of lecturers (name + affiliation)¹⁰

Prof. Dr. Csaba Csíkos, Department of Mathematics, Faculty of Primary and Pre-School Education

Dr. Judit Szitányi, Department of Mathematics, Faculty of Primary and Pre-School Education

Bernadett Svraka, Department of Education, Faculty of Primary and Pre-School Education

¹ A kurzust ezen a címen fogjuk meghirdetni. Javasoljuk, hogy a célközönség érdeklődését felkeltő címet/alcímet fogalmazzanak meg.

² Melyik képzési szinthez feleltethető meg a kurzus? Szintén fontos lesz a promotálásban.

³ A kurzust meghirdető szervezeti egység.

⁴ Szakmai vezető. A kurzus szakmai összeállításáért (tanmenet, tananyag, oktatók stb.) felel.



⁵ Például tanszékvezető, dékán.

⁶ Az emailcímet és telefonszámot csak a belső egyeztetésekhez kérjük. Hirdetéskor, kifelé nem lesz publikálva.

⁷ Esetleges adminisztratív kérdésekben nem feltétlenül a szakmai vezetőt keresnénk majd.

⁸ A honlapra kitesszük majd.

⁹ Szükséges-e a kurzuson való részvételhez, hogy valamely területen legyen előképzettsége a hallgatónak?

¹⁰ A kurzus oktatásához bevonni tervezett oktatók.