



The Hebrew University of Jerusalem

Syllabus

Learning Disabilities and Math: Theoretical and Aspect - 37814

Last update 03-09-2025

HU Credits: 2

Degree/Cycle: 2nd degree (Master)

Responsible Department: Education

Academic year: 0

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: Mt. Scopus

Course/Module Coordinator: Sarit Ashkenazi

Coordinator Email: sarit.ashkenazi@mail.huji.ac.il

Coordinator Office Hours: Sunday 10- 12.

Teaching Staff:

Prof. Sarit Ashkenazi

Course/Module description:

During the course, we will try to understand theories that explain the etiology of math difficulties. Later, we will learn about typical difficulties of children with developmental dyscalculia. Additionally, we will review the Israeli curriculum in math. We will then discuss intervention and treatment methods in developmental dyscalculia. We will conclude in study on math anxiety and the relation between math anxiety and math abilities.

Course/Module aims:

The course will study key issues in developmental dyscalculia. We will try to understand 1) the etiology of difficulties in basic numerical processing and arithmetic, with a review of normal development. 2) We will talk about basic numerical processing which is considered to be the building block of high arithmetic processing. 3) We will discuss abilities that support arithmetical processing such as working memory, language skills, semantic memory and executive functions and their impact on math difficulties. 4) We will create interactive discussion about the methods of diagnosis and treatment of developmental dyscalculia. 5) We will try to understand the underlying brain mechanisms that related to developmental dyscalculia 6) we will talk about math anxiety and the relationship between math anxiety and working memory abilities.

Learning outcomes - On successful completion of this module, students should be able to:

The learner will understand 4 different approaches to developmental dyscalculia

The learner will understand the difficulties in formal diagnosis of developmental dyscalculia in Israel

The learner will understand and experience two different diagnostic approaches

The learner will understand, experience, and have a deep understanding of the Israeli mathematical curriculum for elementary school.

Attendance requirements(%):

Teaching arrangement and method of instruction: Frontal teaching and student presentations.

Course/Module Content:

1. Development of arithmetical abilities
2. Development of basic numerical processing
3. Diagnosis of developmental dyscalculia
4. Developmental dyscalculia: models
5. The core deficit hypothesis
6. The deficit in the automatic connection between Arabic numeral and its internal magnitude.
7. Domain general deficits in developmental dyscalculia
8. Developmental heterogeneity
9. Typical deficits in developmental dyscalculia
10. Enumeration deficit in developmental dyscalculia
11. Abnormal distance effect in developmental dyscalculia
12. Interventions in developmental dyscalculia
13. Math anxiety

Required Reading:

Rivera, S. M., Reiss, A. L., Eckert, M. A., & Menon, V. (2005). Developmental changes in mental arithmetic: evidence for increased functional specialization in the left inferior parietal cortex. *Cereb Cortex*, 15(11), 1779-1790.

B. Butterworth Developmental dyscalculia J.I.D. Campbell (Ed.), *Handbook of Mathematical Cognition*, Psychology Press, New York (2005)

Wilson, A. J., & Dehaene, S. (2007). Number sense and developmental dyscalculia. In Donna Coch, Geraldine Dawson & Kurt W. Fischer (Eds.), *Human behavior, learning, and the developing brain: Atypical development*. (pp. 212-238): New York, NY, US: Guilford Press.

Noel, M. P., & Rousselle, L. (2011). Developmental changes in the profiles of dyscalculia: an explanation based on a double exact-and-approximate number representation model. [Perspective]. *Frontiers in Human Neuroscience*, 5. doi: 10.3389/fnhum.2011.00165

Geary, D. C. (2010). Mathematical disabilities: Reflections on cognitive, neuropsychological, and genetic components. *Learning and Individual Differences*,

20(2), 130-133. doi: 10.1016/j.lindif.2009.10.

von Aster, M., & Shalev, R. (2007). Number development and developmental dyscalculia. *Dev Med Child Neurol*, 49(11), 868-873. doi: DMCN868 [pii]

Temple, C. M., & Sherwood, S. (2002). Representation and retrieval of arithmetical facts: developmental difficulties. *Q J Exp Psychol A*, 55(3), 733-752. doi: 10.1080/02724980143000550

Schleifer, P., & Landerl, K. (2011). Subitizing and counting in typical and atypical development. *Developmental Science*, 14(2), 280-291

Mussolin, C., Mejias, S., & Noël, M. P. (2009). Symbolic and nonsymbolic number comparison in children with and without dyscalculia. *Cognition*, 115(1), 10-25. doi: 10.1016/j.cognition.2009.10.006

Kucian, K., Grond, U., Rotzer, S., Henzi, B., Schonmann, C., Plangger, F., et al. (2011). Mental number line training in children with developmental dyscalculia. *Neuroimage*.

Ashcraft M. H. & Moore, A. (2009). Mathematics Anxiety and the Affective Drop in Performance. *Journal of Psychoeducational Assessment*, 27, 197- 205.

Additional Reading Material:

Ansari, D., & Dhital, B. (2006). Age-related changes in the activation of the intraparietal sulcus during nonsymbolic magnitude processing: an event-related functional magnetic resonance imaging study. *J Cogn Neurosci*, 18(11), 1820-1828. doi: 10.1162/jocn.2006.18.11.1820

Cantlon, J. F., Brannon, E. M., Carter, E. J., & Pelphrey, K. A. (2006). Functional imaging of numerical processing in adults and 4-y-old children. *PLoS Biol*, 4(5), e125.

Menon, V. (2010). Developmental cognitive neuroscience of arithmetic: implications for learning and education. *ZDM*, 42(6), 515-525.

Butterworth, B., Varma, S., & Laurillard, D. (2011). Dyscalculia: from brain to education. *Science*, 332(6033), 1049-1053. doi: 332/6033/1049 [pii] 10.1126/science.1201536

Rousselle, L., & Noël, M. P. (2008). Mental Arithmetic in Children With Mathematics Learning Disabilities. *Journal of Learning Disabilities*, 41(6), 498-513. doi: 10.1177/0022219408315638

Ashkenazi, S., & Henik, A. (2010). A disassociation between physical and mental

number bisection in developmental dyscalculia. Neuropsychologia, 48(10), 2861-2868. doi: S0028-3932(10)00221-6 [pii]

Grading Scheme:

*Essay / Project / Final Assignment / Home Exam / Referat 60 %
Presentation / Poster Presentation / Lecture/ Seminar / Pro-seminar / Research proposal 40 %*

Additional information:

none