EDHD 775 Spring 2019:
Human Development and Neuroscience
(Educational Neuroscience)

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Office hours: Tuesdays 12:30 pm-1:30pm or by appt.

Texts: Selected readings on elms.umd.edu

Course Description and Objectives:

Brain research and Education also known as Educational Neuroscience brings together individuals from diverse backgrounds, including cognitive brain scientists, learning scientists, medical and clinical practitioners, and those in educational policy and teaching. These different stakeholders (not just researchers) are joined in their mutual "two-way" communication, with a commitment (a) to solve prevailing problems in the lives of developing children, (b) to understand the human learning capabilities over the life span (both in brain and in behavior), and (c) to ground educational change in the highly principled application of research that employs both behavioral as well as a multitude of modern methodologies, especially brain imaging. This discipline provides the most relevant level of analysis for addressing today's core problems in education. Educational Neuroscience draws its empirical strength from its sister disciplines, Cognitive Neuroscience, Affective Neuroscience and Developmental Neuroscience, which combine decades of experimental advances from cognitive, perceptual, and developmental and social psychology with a variety of contemporary brain imaging technologies for exploring the neural basis of human knowledge over the life span.

This is an Introductory graduate Educational Neuroscience course in which we explore the neural basis of development and applications to education. This course will focus on core areas of Human Development including Cognition (Attention, Memory, and Executive Functions), Language (spoken, written, signed, monolingual and bilingual), Reading, Numeracy, Emotion, Social, as well as Genetic and Epigenetic mechanisms involved in development. The assumptions and Methods used in the field of Educational Neuroscience will be covered as well as the translation of research findings into real world applied and educational settings.

Course Goals:

By the end of this course, students should be able to:

- Understand theoretical perspectives in Educational Neuroscience, including their strengths and weaknesses.
- Recognize the importance of the interaction between children and their environment, and how core processes change with age and experience.
- Develop the ability to critically evaluate scientific research and interpret research findings.
- Explore implications for translational issues relating to education and public policy.

Evaluation & Course Grading:

1. **Preparation questions each class (10%)**
   Students are required asked to prepare questions on each of the articles (other than the ones they are presenting). These questionsare directed at fostering critiques and discussion of the strengths and weaknesses of the articles. Each student will submit three questions on Canvas by the Sunday before class.

2. **Presentation of a research article in class (30%)**
   Students will summarize and critique a particular article to the class Three students will present each week. Presentations for each class will be assigned across the group. You will not be required to "teach" the course, as all members of the group will be expected to participate. However, your role will be to direct the discussion to pertinent and interesting issues. Ideally, you should begin with a brief review of the papers and introduce questions for discussion (QALMRI guide from Stephen Kosslyn is a helpful guide for how to do this).You may also review comments on the Discussion Board to help structure your time. Powerpoint is discouraged, but two or three slides allowed to orient the class.

3. **Research Proposal Blitz presentations (10%)**
   In class presentations of your research proposal

4. **Final Research Proposal(35%)**
   The final examination conists of a 10 page grant proposal on a topic within Educational Neuroscience, following guidelines for a postdoctoral research proposal from NSF.

5. **In class Participation is a key part of the course (15%)**
   The final examination conists of a 10 page proposal on a topic within Educational Neuroscience.

University Policies and Resources

As a student, you have the responsibility to be familiar with and uphold the *Code of Academic Integrity* and the *Code of Conduct*, as well as for notifying your course instructors in a timely fashion regarding academic accommodations related to absences and accessibility as indicated below.

You also have the right to know the expectations set by University Policy. The University of Maryland values the diversity of its student body and is committed to providing a classroom atmosphere that encourages the equitable participation of all students.

University Policies outlined at this link are particularly relevant to your experience in academic courses: http://apps.gradschool.umd.edu/Catalog/policy.php?the-academic-

record. Topics that are addressed in these policies include academic integrity, student and instructor conduct, accessibility and accommodations, attendance and excused absences, grades and appeals, copyright and intellectual property.

Course Evaluations:
As a member of our academic community, you as a student have a number of important responsibilities. One of these responsibilities is to submit your course evaluations each term though CourseEvalUM in order to help faculty and administrators improve teaching and learning at Maryland. Please make a note now of the dates for *Fall 2010 (Tuesday, November 30 through Sunday, December 12)* and the link at which you can access the submission system (www.courseevalum.umd.edu). If you submitted all of your evaluations in the fall or are a new student, you can also access all posted results from Fall 2007 forward via Testudo under CourseEvalUM Reporting. To retain this access, you must submit all of your evaluations each semester. If you do not have access right now, you can gain it by submitting all of your Fall 2010 evaluations. More information is at: www.irpa.umd.edu/Assessment/CourseEval/stdt_faq.shtml.

CLASS POLICIES
Academic integrity: The University of Maryland, College Park has a student-administered Honor Code and Honor Pledge. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.studenthonorcouncil.umd.edu/whatis.html. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. The code prohibits students from cheating, fabrication, facilitating academic dishonesty, and plagiarism. Instances of this include submitting someone else's work as your own, submitting your own work completed for another class without permission, or failing to properly cite information other than your own (found in journals, books, online, or otherwise). Any form of academic dishonesty will not be tolerated, and any sign of academic dishonesty will be reported to the appropriate University officials.

Special needs: If you have a registered disability that will require accommodation, please see the instructor so necessary arrangements can be made. If you have a disability and have not yet registered with the University, please contact Disability Support Services in the Shoemaker Building (301.314.7682, or 301.405.7683 TTD) as soon as possible.

Religious observances: The University of Maryland policy on religious observances states that students not be penalized in any way for participation in religious observances. Students shall be allowed, whenever possible, to make up academic assignments that are missed due to such absences. However, the must contact the instructor before the absence with a written notification of the projected absence, and arrangements will be made for make-up work or examinations.

Course evaluations: As a member of our academic community, students have a number of important responsibilities. One of these responsibilities is to submit course evaluations each term though CourseEvalUM in order to help faculty and administrators improve teaching and learning at Maryland. All information submitted to CourseEvalUM is confidential. Campus will notify you when CourseEvalUM is open for you to complete your evaluations for fall semester courses. Please go directly to the website (www.courseevalum.umd.edu) to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

Late Assignments: All assignments are expected on the day indicated in this syllabus.

Spring 2019; EDHD755 Topics &Readings

assignment received after the due date will automatically receive a 5% lower grade for

Week 1, January 29: University closed due to inclement weather

Wek 2 February 5,Introduction to the Course: overview & Content, Assignments and grading + Introductions

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Week 3, Feb 12, Assumptions, Topics & Controversies

Bruer, J. T. (1997). Education and the brain: a bridge too far. Educational Researchers, 26, 1-13.

Petitto, L. A., & Dunbar, K. N. (2004). New findings from educational neuroscience on bilingual brains, scientific brains and the educated mind. http://petitto.gallaudet.edu/%7Edunbarlab/pubpdfs/pettitodunbarIP.pdf

Bruer, J. T. (2016). Where is Educatiomal Neuroscience? Educational Neuroscience 1, 1-12. DOI: 10.1177/2377616115618036

McCandliss, B.D. Educational neuroscience: The early years. Proc Natl Acad Sci. 2010, 107(18): 8049–8050. doi: 10.1073/pnas.1003431107.

Week 4 Feb 19 Neurology Neuroscience Neuroimaging Methods

Morita, T., Asada, M., & Naito, E. (2016). Contribution of Neuroimaging Studies to Understanding Development of Human Cognitive Brain Functions. Frontiers in human neuroscience, 10, 464. doi:10.3389/fnhum.2016.00464

Aguirre, G. (2014). "Functional Neuroimaging: Technical, Logical, and Social lPerspectives,"InterpretingNeuroimages:AnIntroductiontotheTechnology and Its Limits, a special report, Hastings Center Report 45, 2, S8- S18.

Falk, E. B., Hyde, L. W., Mitchell, C., Faul, J., Gonzalez, R., Heitzeg, M. M., ... Schulenberg, J. (2013). What is a representative brain? Neuroscience meets population science. Proceedings of the National Academy of Sciences of the United States of America, 110(44), 17615-17622. https://doi.org/10.1073/pnas.1310134110

Week 5, Feb 26: The development of the brain and Sensitive Periods

Knudson, E.I. (2004) Sensitive Periods in the development of Brain and Behavior. Journal of Cognitive Neuroscience 16:8, pp. 1412–1425

Dehaene-Lambertz, G., & Spelke, E. S. (2015). The infancy of the human brain. Neuron, 88(1), 93-109.

Ellis, C.T., & Turk Browne(2018) Infant fMRI: A Model System for Cognitive Neuroscience. Trends in Cognitive Sciences,22, 375-387.

Week 6, Feb 26: Memory and Human development

Paz-Alonso P.A., Ghetti S, Matlen BJ, Anderson MC, Bunge SA. (2009) Memory suppression is an active process that improves over childhood. Frontiers in Human Neuroscience

Riggins, T., Miller, N. C., Bauer, P. J., Georgieff, M. K., & Nelson, C. A. (2009). Electrophysiological indices of memory for temporal order in early childhood: Implications for the development of recollection. Developmental Science, 12(2), 209-219.

Bick, J. Zenah, C.H., Fox, N.J. & Nelson, C.A. (2018) Memory and Executive Functioning in 12-Year-Old Children With a History of Institutional Rearing. Child Development, 89, 495-508

Week 7. March 5 Being and Becoming Bilingual

Kovelman, I., Baker, S., & Petitto, L.A. (2008). Age of bilingual language exposure as a new window into bilingual reading development. Bilingualism: Language and Cognition, 11(2), pages 203-223.

Kovelman, I., Salah-Ud-Din, M., Berens, M., & Petitto, L. A. (2015). “One glove does not fit all” in bilingual reading acquisition: Using the age of first bilingual language exposure to understand optimal contexts for reading success. Cogent Education, 2(1),1006504. doi:10.1080/2331186X.2015.1006504

The "Perceptual Wedge" hypothesis as the basis for bilingual babies' phonetic processing advantage: New insights from fNIRS brain imaging. Brain Lang. 2012 May; 121(2): 130–143. doi: 10.1016/j.bandl.2011.05.003

Week 8, March 12 Dyslexia & Reading

Norton, E., Beach, Gabrielli J. (2015). Neurobiology of Dyslexia. Current Opinion in Neurobiology. 30:73–78

Kershner, J.R. (2019) .Neurobiological systems in Dyslexia. Trends in Neuroscience and Education, 14, 11-24.

Zuk et al (2018). Neural correlates of phonological processing: Disrupted in children with dyslexia and enhanced in musically trained children. Developmental Cognitive Neuroscience 34 (2018) 82–91

Spring Break, March 17-March 24

Week 9: March 26 Numeracy & Dyscalculia

Reid, K. (2016). Counting on it: Early numeracy development and the preschool child. In Changing Minds: Discussions in neuroscience, psychology and education Australian Council for Educational Research

Merkley, R. & Ansari, D. (2016) Why numerical symbols count in the development of mathematical skills: evidence from brain and behaviour. Current Opinion in Behavioral Sciences, 10, 14-20.

Butterworth, B. (2018). Low Numeracy from Brain to Education. Butterworth B. (2018) Low Numeracy: From Brain to Education. In: Bartolini Bussi M., Sun X. (eds) Building the Foundation: Whole Numbers in the Primary Grades. New ICMI Study Series.

Week 10, March 26 Executive functions & ADHD

Diamond, A. (2016). Why assessing and improving executive functions early in life is critical. In P. McCardle, L. Freund, & J. A. Griffin (Eds.), Executive Function in Preschool-age Children: Integrating Measurement, Neurodevelopment and Translational Research, (pp. 11-43). Washington, DC: American Psychological Association. doi:110.13140/RG.2.1.2644.6483

Reynolds, G. D. & Romano, A.C. (2016). The Development of Attention Systems and Working Memory in Infancy. Fronteirs in Systems Neuroscuence. 10: 15. Mar 3. doi: 10.3389/fnsys.2016.00015

Baroni, A. & Castellanos, X. F. (2015). Neuroanatomic and cognitive abnormalities in attention-deficit/hyperactivity disorder in the era of 'high definition' neuroimaging. Current Opinion in Neurobiology, 30:1–8

Week 11, April 2 The HPA Axis Stress, Poverty

Sattler, K., & Gershoff, E. (2019). Thresholds of resilience and within-and cross-domain academic achievement amongchildren in poverty Early Childhood Research Quarterly, 46, 87–96

Blair, C., & Raver, C. (2016). Poverty, Stress, and Brain Development: New Directions for Prevention and Intervention. Academic Pediatrics, 16:S30–S36.

Mackey, A.P., Finn, A.S., Leonard, J.A., Jacoby-Senghor, D.S., West, M.R., Gabrieli, C.F., & Gabrieli, J.D. (2015). Neuroanatomical correlates of the income-achievement gap. Psychological Science, 26(6), 925-933.

Week 12 April 9 Social and affective Neuroscience in childhood and adolescence

Pagliaccio, D., Luby, J. L., Bogdan, R., Agrawal, A., Gaffrey, M. S., Belden, A. C., . . .Barch, D. M. (2015). Amygdala functional connectivity, HPA axis genetic variation, and life stress in children and relations to anxiety and emotion regulation. Journal of Abnormal Psychology, 124, 817–833.

Tamnes, C.K. et al. (2018). Social Perspective Taking Is Associated With Self-Reported Prosocial Behavior and Regional Cortical Thickness Across Adolescence . Developmental Psychology 54(9) DOI: 10.1037/dev0000541

Reading 3 To be announed.

Week 13, April 23 Development of Higher level Thinking & Reasoning

Larsen, B.,& Luna, B. (2018). Adolescence as a neurobiological critical period for the development of higher-order cognition. 94, 179-195.

Mackey, A.P. Singley, A.T. & Bunge, S.A. (2013).Intensive reasoning training alters patterns of brain connectivity at rest. Journal of Neurosci.ence 2013 33(11): 4796–4803.

Ray-Bauer, & Booth, A. (2019). Exploring potential cognitive foundations of scientific literacy in preschoolers: Causal reasoning and executive function. Early Childhood Research Quarterly, 46, 275-284

Week 14 April 30 Proposal Blitz brief presentations

Week 15, May 7 Proposal Blitz brief presentations

Week 16. May 14, Putting it all together: Evaluating the place of Educational Neuroscience in Contemporary education. Are we there yet and where are we going?