Ed 708/Psych 708: Cognition & Instruction in the Classroom [31277] (Fall 2019)

Kevin F. Miller

9/07/2019

E-mail: kevinmil@umich.edu
Office Hours: W 4-5 and by appointment (or stop in)
Office: 4116 School of Education Building, 610 E University

Web: umich.instructure.com/courses/142261
Class Hours: Monday, 9 a.m. - 12 p.m.
Class Room: 2228 School of Education Building

Course Description

The primary goal of the course is for students to become familiar with the theory and methods of cognitive psychology as they apply to learning and instruction. It is a core, survey course, so we will not go that deeply into any specific topic, but I hope that you will leave it familiar with the major issues in the field and how researchers address them. There is a definite âĂIJMichiganâĂİ slant to this course - with an emphasis on how issues related to learning play out in complex contexts such as classrooms.

The second goal of the course is for you to learn to critically read and discuss articles in the field of cognition and instruction. You will practice presenting empirical and theoretical articles, identifying important issues, and critically evaluating conclusions.

Finally, I hope that you get to know one another, learn from one another and come to appreciate the different disciplines and perspectives that are represented in the class. I look forward to getting to know you!

Class Format

This is a discussion-oriented seminar, and everyone will be expected to read the articles assigned before the class period and to actively participate in class discussion. The seminar will also include some brief lectures and student presentations at the end of the term.

Requirements & due dates

Reaction Papers (15% of grade)

In order to facilitate discussion, you should turn in a brief (equivalent of one page or less) set of comments on the reading as well as questions you would like to discuss in class, if any. The reactions and questions should be posted to the Canvas site by 9 p.m. every Sunday before the weekly meeting.

Reaction papers will be graded on a simple scale of 1-3, where "2" is a perfectably acceptable reaction paper, "3" is exceptional, and "1" represents something that could use improvement. Because there are only 14 weeks in the term (and 13 where you will be submitting a reaction paper) you will get 1 point each time you turn in a reaction paper, and if you have any that get a "3" at any point in the semester you will receive 2 bonus points. If there are any that I think are deficient (i.e., where you get a "1" I'll explain why and work with you on this).

The reaction papers are useful to me in that they can help me get a sense of where the class is confused or might have misconceptions, what topics are important to you, and generally get a sense of the sense you made of the readings.

Get out of jail free card - If you get busy with other work, you may skip one (and only one) reaction paper without impact on your course grade, but please still come to class.

Midterm exam. (30% of grade)

The course also includes one take-home midterm covering the core material in the first part of the course. The midterm will consist of a choice of 2 out of 4 short essay questions for you to respond to based on the readings and class discussions.

PLEX: Personal Learning Experiment. (15% of grade).

Sometime during the semester you should experiment with some kind of non-traditional learning opportunity. This could be a Coursera course, a Linkedin Learning, DataCamp, CourseKata, etc., or almost anything else (you may want to check in with me on what it is). Then you should post a discussion (probably about 2-3 pages unless you feel inspired) arranged around these three questions: 1) What did you decide to do and why did you pick it? 2) How did you go about learning and what did and didn't work for you? 3) What ideas in the course and or cognitive psychology generally help you interpret your experience?

You will also give a short presentation/demonstration of your PLEX in the meeting where we present research proposals.

Research Proposal (30% of grade)

You will team up with another person who comes from a different program or who has a different background/interests than you and identify a researchable topic or question of interest to you both. You will then write a research proposal, with an introduction, hypothesis, and describe a study that would address this question, as well as the kind of data you might collect and the significance of the study. Your team will turn in one paper.

Research Proposal Presentation (10% of grade)

Your team will present your proposal to the class and get feedback on the project

Important dates

This table lists the due dates for the various grade activities.

Requirement	Distributed	Due	% of Final Grade
Reaction comments	—-	Every Sunday by 9 p.m.	15% (in aggregate)
Midterm	10/21	11/10 at 11:30 p.m.	30%
PLEX	—-	12/1 at 11:30 p.m.	15%
Research Proposal (group)	—-	12/15 at 11:30 p.m.	30%
Res. Prop. Presentation	——	12/9	10%

Course Policies

Academic Dishonesty Policy

I encourage you to work together with your colleagues and discuss your ideas both in and out of class. But it's important that you be clear where your ideas from. Failing to cite ideas, words, and phrases that come from other sources is something the University and the broader academic community take seriously, so please let me know if you have any questions and, when in doubt, cite.

Disabilities Policy

The University of Michigan is committed to providing equal opportunity for participation in all programs, services and activities, and I am committed to this, too. There is a formal process for getting accommodations that I encourage you to follow if it would be useful to you. Request for accommodations by persons with disabilities may be made by contacting the Services for Students with Disabilities (SSD) Office located at G664 Haven Hall. The SSD phone number is 734-763-3000. Once your eligibility for accommodation has been determined, you will be issued a verified individual services accommodation (VISA) form. Please present this form to me at the beginning of the term, or at least two weeks prior to needing the accommodation (test, project, etc. . .).

Please also read the next two sections. . .

Student Mental Health and Wellbeing

The University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at (734) 764-8312 and https://caps.umich.edu/ during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult University Health Service (UHS) at (734) 764-8320 and https://www.uhs.umich.edu/mentalhealthsvcs, or for alcohol or drug concerns, see https://www.uhs.umich.edu/aodresources.

Additional resources include:

- The UM Department of Psychiatry outpatient clinic (734) 764-0231
- The UM Psychiatric crisis emergency services (734) 936-5900.
- The UM Psychological clinic (734) 764-3471.

- The UM Addiction Treatment Services (800) 525-5188.
- Wolverine Support Network (student-led) www.umichwsn.org
- A more comprehensive list of resources can be found at this website:

https://lsa.umich.edu/psych/undergraduates/student-resources.html

For a complete listing of other mental health resources available on and off-campus, visit http://umich.edu/~mhealth/.

Let me know if problems arise

In addition to the formal disabilities and wellbeing policies, I recognize that the demands of life and graduate school are challenging to everyone. So if anything comes up that might interfere with your ability to perform assignments or get the most from this class, please let me know. Many of us want to solve problems on our own, and I respect that, but the University has a great deal of resources that can help when problems come up, and it's always easier the earlier you start.

Week 01, 09/09: Setting the context

This is a fascinating time to be thinking about the cognitive processes that make teaching and learning possible. Societal and technological changes both offer new ways of presenting information while also presenting challenges for the sustained attention that learning requires. My goal for this course is that you will leave with a set of ideas and analytical frameworks that will help you to think about thinking and learning in the domains that you're already interested in, and be able to contribute to ensuring that new ways of teaching and learning actually lead to more effective learning.

In today's class, we will consider three related topics.

- *How do you think the contexts of teaching and learning will change between your own experience and that of students now starting elementary school? What implications do these changes have for both the challenges students will face and the opportunities they have to become well-educated?*
- *What is the nature of cognitive science research?*
- *What kinds of problems can we solve through cognitive science research? How? This simple question is both more contentious and more interesting than it might appear.*

We will be discussing the ideas in these papers as part of this discussion:

Newell, A. (1973). You can't play 20 questions with nature and win. In W. G. Chase (Ed.), Visual information processing (pp. 281-308). New York: Academic Press.

Dunbar, K. (1995). How scientists really reason: Scientific reasoning in real-world laboratories. In R.J. Sternberg, & J. Davidson (Eds.). Mechanisms of insight. Cambridge MA: MIT press. pp 365-395.

Rowley, S. J., & Camacho, T. C. (2015). Increasing diversity in cognitive developmental research: Issues and solutions. Journal of Cognition and Development, 16(5), 683-692.

Gawande, A. (2013, July 29). Slow ideas: Some innovations spread fast. How do you speed the ones that don't? New Yorker.

- *What is the contribution you intend to make in your career?*

We will discuss this in class, but I'd also like you to post as your first posting for this class a short discussion of what as of now you hope to contribute in your career and how you might go about doing so.

Before posting, I'd like you to read the 4 papers which we will discuss in class, which may help you in thinking about this admittedly big question.

Week 02, 09/16: Attention in an Age of Distractions

This week we will discuss working memory and attention, which are two of the most important concepts that cognitive psychology has to contribute to understanding teaching and learning. We will also discuss a very specific and current challenge teachers and students face - the diffusion of attention made possible by the proliferation of laptops and cellphones - and consider the implications of these technologies for teaching and learning.

- *To help ground the discussion, we will begin with a very specific issue - the way in which mobile technology affects what goes on in classrooms. I will ask you to read a web posting and two articles that focus on the deleterious effects of laptops on learning. This is not to argue that the effects of such devices are only or even mostly deleterious, but rather that these effects need to be considered.*

Shirky, C. (2014). Why I Just Asked My Students To Put Their Laptops Away. https://medium.com/@cshirky/why-i-just-asked-my-students-to-put-their-laptops-away-7f5f7c50f368

Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. Computers & Education, 62, 24-31.

Ravizza, S. M., Uitvlugt, M. G., & Fenn, K. M. (2017). Logged in and zoned out: How laptop internet use relates to classroom learning. Psychological science, 28(2), 171-180.

Mueller, P. A., & Oppenheimer, D. M. (2014). The Pen Is Mightier Than the Keyboard Advantages of Longhand Over Laptop Note Taking. Psychological science, 0956797614524581.

- *Next we will discuss some theoretical papers that will give you some background for thinking about the broader question of how working memory and attention affect teaching and learning.*

Wilson, T. D., Reinhard, D. A., Westgate, E. C., Gilbert, D. T., Ellerbeck, N., Hahn, C., et al. (2014). Just think: The challenges of the disengaged mind. Science, 345(6192), 75-77. doi:10.1126/science.1250830

Jonides, J. (1995). Working memory and thinking. In E. E. Smith & D.N. Osherson (Eds) Thinking. Cambridge, MA: MIT Press.

Sweller, J., van Merrienboer, J. J. G, & Paas, F. G. W. C. (1998). Cognitive architecture and instructional design. Educational Psychology Review; 10, 251-296.

- *After reading these papers, please include any questions you would like us to be sure to discuss in class in your reaction post.*

Week 03, 09/23: Expertise & deliberate practice

One area where cognitive psychology has had perhaps the most impact on education is in thinking about the nature of expertise and how it develops. The "10,000 hour rule" of expertise was popularized by Malcolm Gladwell and remains both popular and controversial. The concept of deliberate practice is often misused in teacher education circles, but it remains a fundamental idea.

This has been an important area of research for more than 30 years now, so it's worth considering what if anything has changed across that period.

- *We will begin by reading three papers that lay out basic ideas about what expertise is and how it develops*

Ericsson, K. A. (2006). The influence of experience and deliberate practice on the development of superior expert performance. In K. A. Ericsson, N. Charness, P. J. Feltovich, & Robert R. Hoffman (Eds.), The Cambridge handbook of expertise and expert performance (pp. 685- 705). Cambridge, UK: Cambridge University Press

Alexander, P. A. (2003). The development of expertise: The journey from acclimation to proficiency. Educational Researcher, 32, 10-14.

Hatano, G. & Inagaki, K. (1986). Two courses of expertise. In H. W. Stevenson & H. Azuma (Eds.), Child development and education in Japan (pp. 262-272). New York: Freeman.

- *Then we'll read a recent paper that questions the sufficiency of practice for the development of expertise, and a response to this critique.*

Macnamara, B. N., Hambrick, D. Z., & Oswald, F. L. (2014). Deliberate Practice and Performance in Music, Games, Sports, Education, and Professions: A Meta-Analysis. Psychological Science, 25(8), 1608-1618. doi:10.1177/0956797614535810

Ericsson, K. A. (2016). Summing up hours of any type of practice versus identifying optimal practice activities: Commentary on Macnamara, Moreau, & Hambrick (2016). Perspectives on Psychological Science, 11(3), 351-354. Chicago

Macnamara, B. N., Hambrick, D. Z., & Moreau, D. (2016). How important is deliberate practice? Reply to Ericsson (2016). Perspectives on Psychological Science, 11(3), 355-358.

- *Finally, we'll apply these ideas to teachers and teaching.*

Stigler, J. W., & Miller, K. F. (2018). Expertise and expert performance in teaching. In K. A. Ericsson, R. R. Hoffman, A. Kozbelt, & A. M. Williams (Ed.), Cambridge handbook on expertise and expert performance (pp. 431-452). NY: Cambridge University.

Week 04, 09/30: The role of cognitive psychology in education

This week we look at different aspects or perspectives on the relation between cognitive psychology and education. After you go through the set of readings, I would like to know what your

stance is on what cognitive psychology has to contribute to education, and what consideration of educational questions has to contribute to psychology.

- *We begin with a good historical overview on how educational concerns have been viewed by psychologists, which I think provides a good perspective on considering where this relationship is now, and where it ought to be:*

Berliner, D. C. (1993). The 100-Year Journey of Educational Psychology: From Interest, to Disdain, to Respect for Practice. In T. K. Fagan & G. R. Vanden-Bos (Eds.), Exploring Applied Psychology: Origins and Critical Analyses. Washington, D.C.: American Psychological Association.

- *Next we will read some excerpts from Vygotsky, who provides a specific and very influential perspective on these questions:*

Vygotsky, L. S. (1978). Mind in society. Cambridge, MA: Harvard. (selections)

- *Then we will read 4 papers that provide in my view some of the best examples of what cognitive thinking about education and development can be:*

Bjorklund, D. F. (1997). The role of immaturity in human development. Psychological Bulletin, 122, 153-169.

Siegler, R. S. (2016). Continuity and change in the field of cognitive development and in the perspectives of one cognitive developmentalist. Child Development Perspectives, 10(2), 128-133.

Fiorella, L., & Mayer, R. E. (2016). Eight ways to promote generative learning. Educational Psychology Review, 28(4), 717-741.

Chi, M. T., Kang, S., & Yaghmourian, D. L. (2017). Why students learn more from dialogue-than monologue-videos: Analyses of peer interactions. Journal of the Learning Sciences, 26(1), 10-50.

Week 05, 10/07: Some controversies about learning

This week we get into some of the major questions about how people learn that have characterized education and psychology, particularly what ideas about the constructive nature of learning imply about the best ways to go about teaching and what knowledge and beliefs about the brain can tell us about how to teach and learn.

- *We'll begin with a discussion of urban legends in education. How many of these do you recognize, or believe?*

Kirschner, P. A., & van Merrienboer, J. J. (2013). Do Learners Really Know Best? Urban Legends in Education. Educational Psychologist, 48,3: 1169-183. doi:10.1080/00461520.2013.804395

- *Then we'll shift to what's been characterized as "neuromyths" - ideas about learning that are attributed to the brain, beginning with a paper that's 20 years old and that started some of the critical look at the brain and education.*

Bruer, J. T. (1997). Education and the Brain: A Bridge Too Far. Educational Researcher, 26(8), 4-16. http://doi.org/10.2307/1176301?ref=search-gateway:9e7f99b4a96ffbbda877c582569e6e7c

Howard-Jones, P. A. (2014). Neuroscience and education: myths and messages. Nature Reviews Neuroscience, 15(12), 817-824. http://doi.org/10.1038/nrn3817

Macdonald, K., Germine, L., Anderson, A., Christodoulou, J., & McGrath, L. M. (2017). Dispelling the myth: Training in education or neuroscience decreases but does not eliminate beliefs in neuromyths. Frontiers in psychology, 8, 1314. Chicago

- *The final topic will be learning styles and/or personalized learning, which has become very popular with those who'd like to use technology to promote education*

Willingham, D. T., Hughes, E. M., & Dobolyi, D. G. (2015). The scientific status of learning styles theories. Teaching of Psychology, 42(3), 266-271

Waterhouse, L. (2006). Inadequate evidence for multiple intelligences, Mozart effect, and emotional intelligence theories. Educational psychologist, 41(4), 247-255.

Gardner, H., & Moran, S. (2006). The science of multiple intelligences theory: A response to Lynn Waterhouse. Educational psychologist, 41(4), 227-232.

Week 06, 10/14: Fall Break – No class today

Week 07, 10/21: Memory & Testing

Everyone hates testing, but there is pretty good evidence that it promotes learning. This week we will look at what we know about how to promote student learning, with a focus on learning information (as opposed to skills, attitudes, etc.)

- *This week we will begin with two articles by the same authors on the role of testing in promoting learning. I thought it might be interesting for you to look at how the same ideas are presented in two different journals.*

Roediger, H.L. & Karpicke, J.D. (2006a). The power of testing memory: Basic research and implications for educational practice. Perspectives on Psychological Science, 1, 181-210.

Karpicke, J. D., & Roediger, H. L. (2008). The critical importance of retrieval for learning. Science, 319, 966-968. http://www.sciencemag.org/cgi/reprint/319/5865/966.pdf.

- *Next we'll consider a more general review of what we know about promoting learning. Pay attention to the criteria used to assess the techniques as well as the results of the review.*

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: promising directions from cognitive and educational psychology. Psychological Science in the Public Interest, 14(1), 4-58. doi:10.1177/1529100612453266

- *Finally, we will discuss a Practice Guide developed by IES to promote some of the ideas discussed here. Of course it's much earlier than the Dunlosky et al. review, but, taking that into account, consider the extent to which you judge this to be successful at translating these ideas into versions that would be useful and classrooms and usable by teachers.*

Pashler, H., Bain, P. M., Bottge, B. A., Graesser, A., Koedinger, K., McDaniel, M., Metcalfe, J. (2007). Organizing Instruction and study to improve student learning. IES Practice Guide.

Week 08, 10/28: Intelligence & Change over time

This week we'll consider intelligence - what it is, how it is assessed, how it seems to be changing over time and what this all means for education.

- *We'll begin with a review of the idea and measurement of intelligence, and then a paper discussing what it means for learning.*

Sternberg, R. J. (2012). Intelligence. Wiley Interdisciplinary Reviews: Cognitive Science, 3(5), 501-511. http://doi.org/10.1002/wcs.1193

- *Next we will look at a very specific and fascinating phenomenon in this area - the Flynn effect, and discuss what it might mean for education and the future.*

Flynn, J. R. (1987). Massive IQ gains in 14 nations: What IQ tests really measure. Psychological Bulletin, 101(2), 171.

Williams, R. L. (2013). Overview of the Flynn effect. Intelligence, 41(6), 753-764. http://doi.org/10.1016/j.intell.2013.04.010

Bratsberg, B., & Rogeberg, O. (2018). Flynn effect and its reversal are both environmentally caused. Proceedings of the National Academy of Sciences, 115(26), 6674-6678. Chicago

Meisenberg, G., & Woodley, M. A. (2013). Are cognitive differences between countries diminishing? Evidence from TIMSS and PISA. Intelligence, 41(6), 808-816. http://doi.org/10.1016/j.intell.2013.03.009

Week 09, 11/04: What can large-scale studies tell us about teaching and learning in classrooms?

A very useful and interesting resource for educators is the existence of large-scale cooperative studies comparing the education of students in different countries. We will discuss the major efforts in this area as well as looking at some diverse examples of researchers trying to draw conclusions from this work.

As you read the papers, I hope you will look for examples of both 1) useful insights that come from this enormous effort, and 2) dangerous or potentially dangerous conclusions that flow from this work.

- *The first two papers provide an overview of PISA and its uses.*

Niss, M., Emanuelsson, J., & Nyström, P. (2012). Methods for studying mathematics teaching and learning internationally. In Third international handbook of mathematics education (pp. 975-1008). Springer, New York, NY.

Niemann, D., Martens, K., & Teltemann, J. (2017). PISA and its consequences: Shaping education policies through international comparisons. European Journal of Education, 52(2), 175-183.

- *The next paper provides a particular US-centric perspective on what this means for education, while the fourth paper tries to draw conclusions about teaching from these datasets.*

Loveless, T. (2013). The 2013 Brown Center Report on American Education: How Well Are American Students Learning? With sections on the latest international tests, tracking and ability grouping, and advanced math in 8th grade. Washington, D.C.: Brookings Institution.

Akiba, M., LeTendre, G. K., & Scribner, J. P. (2007). Teacher Quality, Opportunity Gap, and National Achievement in 46 Countries. Educational Researcher, 36(7), 369-387. doi:10.3102/0013189X07308739

- *The Hiebert and Stigler paper looks at ways that some of these comparative data could be used to actually improve classroom practice.*

Hiebert, J., & Stigler, J. W. (2000). A Proposal for Improving Classroom Teaching: Lessons from the TIMSS Video Study. The Elementary School Journal, 101(1), 3-20.

- *The last two papers provide an economist's perspective on why schooling is important, and may spark some discussion of how economists differ from educators and psychologists in the way they think about some of these issues.*

Hanushek, E. A., & Woessmann, L. (2012). Do better schools lead to more growth? Cognitive skills, economic outcomes, and causation. Journal of Economic Growth, 17(4), 267-321. http://doi.org/10.1007/s10887-012-9081-x

Watanabe, R., & Ischinger, B. (2009). Equally prepared for life? How 15-year-old boys and girls perform in school. Paris: OECD Publishing. http://www.oecd.org/pisa/pisaproducts/42843625.pdf

For reference only:

Mullis, I. V. S., Martin, M. O., Foy, P., & Arora, A. (2012). TIMSS 2011 International Results in Mathematics. Chestnut Hill, MA: Boston College.

Week 10, 11/11: Cultural perspectives

Because education is far too important to leave entirely in the hands of young children, cultures go to great efforts to ensure that children acquire the skills, concepts, and traits believed to be essential for success in school and beyond. In other words, education is a quintessentially cultural activity.

Yet "culture" is used by two groups of researchers in education, who often don't talk to each other. One group is primarily concerned with variation within a society - how different subgroups approach the idea of socialization differently from each other, and what that means for children's successful interaction with schools. The other is concerned with differences across countries, and how different values are reflected in different institutions and different educational practices.

We will discuss some of each approach this week, and hope to keep the focus on the *processes* by which culture is made manifest in children's lives.

- *We will begin with the classic issue of stereotype threat, with a paper that may already be familiar to you:*

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. American Psychologist, 52(6), 613-629.

- *Next we'll look at some very interesting recent research that suggests that a standard theory of self-control may be a matter of belief:*

Friese, M., Loschelder, D. D., Gieseler, K., Frankenbach, J., & Inzlicht, M. (2019). Is ego depletion real? An analysis of arguments. Personality and Social Psychology Review, 23(2), 107-131.

Hagger, M. S., Chatzisarantis, N. L., Alberts, H., Anggono, C. O., Batailler, C., Birt, A. R., ... & Calvillo, D. P. (2016). A multilab preregistered replication of the ego-depletion effect. Perspectives on Psychological Science, 11(4), 546-573.

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego Depletion -Is It All in Your Head? Psychological Science, 21(11), 1686-1693.

- *Finally, we'll look at measurement of self regulation among young children, and look at some differences among Chinese and American children:*

McClelland, M. M., & Cameron, C. E. (2011). Self-Regulation in Early Childhood: Improving Conceptual Clarity and Developing Ecologically Valid Measures. Child Development Perspectives, 6(2), 136-142. doi:10.1111/j. 1750-8606.2011.00191.x

Lan, X., Ponitz, C. C., Miller, K. F., Li, S., Cortina, K., Perry, M., & Fang, G. (2009). Keeping their attention: Classroom practices associated with behavioral engagement in first grade mathematics classes in China and the United States. Early Childhood Research Quarterly, 24(2), 198-211. doi: 10.1016/j.ecresq. 2009.03.002

Li, J., Fung, H., Bakeman, R., Rae, K., & Wei, W. (2014). How European American and Taiwanese Mothers Talk to Their Children About Learning. Child Development, 85(3), 1206-1221. http://doi.org/10.1111/cdev.12172

Week 11, 11/18: Learning to read - from phonemes to narratives

The ability to read is what most clearly makes one an educated person. But reading can mean different things in different contexts and the nature of reading and its acquisition remains surprisingly controversial.

- *We will begin with a paper that provides a general overview of reading and a cognitive psychological perspective on how to promote it:*

Rayner, K., Foorman, B. R., Perfetti, C. A., Pesetsky, D., & Seidenberg, M. S. (2001). How Psychological Science Informs the Teaching of Reading. Psychological Science in the Public Interest, 2(2), 31-74.

- *Next we'll look at three papers that focus on how the kind of reading system your culture uses affects the nature of reading acquisition:*

Ziegler, J. C., & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory. Psychological Bulletin, 131, 3-29.

Feng, G., Miller, K., & Shu, H. (2009). Orthography and the Development of Reading Processes: An Eye-Movement Study of Chinese and English. Child development, 80(3), 720-735.

Yu, L., & Reichle, E. D. (2017). Chinese versus English: Insights on Cognition during Reading. Trends in Cognitive Sciences, 0(0). http://doi.org/10.1016/j.tics.2017.06.004

- *Next, we'll look at a paper that uses a very interesting approach to separate out developmental from instructional factors:*

Morrison, F. J., Connor, C. M., & Hindman, A. (2009). Early schooling and growth of literacy in the transition to school. In D. Aram & O. Korat (Eds.), Literacy Development and Enhancement Across Orthographies and Cultures (pp. 153-164). Boston, MA: Springer US. doi:10.1007/978-1-4419-0834-6_11

- *Then, we'll look at some ideas about what this all means for teaching children to read*

Willingham, D. T. (2015). Moving Educational Psychology Into the Home: The Case of Reading. Mind, Brain, and Education, 9(2), 107-111. http://doi.org/10.1111/mbe.12079

Castles, A., Rastle, K., & Nation, K. (2018). Ending the reading wars: Reading acquisition from novice to expert. Psychological Science in the Public Interest, 19(1), 5-51.

- *Finally, we will begin by considering a very influential model of how we learn from text:*

Kintsch, W. (1986). Learning from Text. Cognition and Instruction, 3(2), 87-108.

Week 12, 11/25: Mathematics

This week we begin with some general ideas about what mathematics is that children might learn it. Mathematics differs from literacy in the extent to which children are able to figure it out on their own as well as the extent to which it's emphasized in different cultures.

Siegler, R. S., & Lortie-Forgues, H. (2014). An Integrative Theory of Numerical Development. Child Development Perspectives, 8(3), n/a-n/a. doi:10.1111/cdep.12077

Feigenson, L., Libertus, M. E., & Halberda, J. (2013). Links Between the Intuitive Sense of Number and Formal Mathematics Ability. Child Development Perspectives, 7(2), 74-79. http://doi.org/10.1111/cdep.12019

Rittle-Johnson, B., Schneider, M., & Star, J. R. (2016). Not a One-Way Street: Bidirectional Relations Between Procedural and Conceptual Knowledge of Mathematics. Educational Psychology Review, 1-11. http://doi.org/10.1007/s10648-015-9302-x

Newcombe, N. S., Levine, S. C., & Mix, K. S. (2015). Thinking about quantity: the intertwined development of spatial and numerical cognition. Wiley Interdisciplinary Reviews: Cognitive Science, 6(6), 491-505. http://doi.org/10.1002/wcs.1369

- *Next we look at the specific but important issue of symbolic representations that attempt to communicate mathematical ideas.*

Uttal, D. H., O'Doherty, K., Newland, R., Hand, L. L., & DeLoache, J. (2009). Dual Representation and the Linking of Concrete and Symbolic Representations. Child Development Perspectives, 3(3), 156-159. http://doi.org/10.1111/j.1750-8606.2009.00097.x

Koedinger, K. R., Alibali, M. W., & Nathan, M. J. (2008). Trade-offs between grounded and abstract representations: Evidence from algebra problem solving. Cognitive Science, 32, 366-397.

- *Finally, we look at two studies that look for prediction of achievement in mathematics over time.*

Geary, D. C. (2011). Cognitive predictors of achievement growth in mathematics: A 5-year longitudinal study. Developmental Psychology, 47(6), 1539-1552. http://doi.org/10.1037/a0025510

Siegler, R. S., Duncan, G. J., Davis Kean, P. E., Duckworth, K., Claessens, A., Engel, M., et al. (2012). Early predictors of high school mathematics achievement. Psychological Science, 23(7), 691-697. http://doi.org/10.1177/0956797612440101

Week 13, 12/02: Scientific Reasoning and Science Knowledge

The domain of science is an important one where the interaction of knowledge and general reasoning comes into particular focus. Given enough time and the scientific method, you could in theory generate all of scientific knowledge. Yet this is clearly not how we learned most of we know about the world. Schools have to make decisions about the relative importance of knowing how to do science and knowing facts about the real world, and this is a conflict that doesn't have a simple answer.

- *The first papers look at some features of human reasoning relevant to learning science.*

Kuhn, D. (2012). The development of causal reasoning. Wiley Interdisciplinary Reviews: Cognitive Science, 3(3), 327-335. http://doi.org/10.1002/wcs.1160

Stanovich, K. E., West, R. F., & Toplak, M. E. (2013). Myside Bias, Rational Thinking, and Intelligence. Current Directions in Psychological Science, 22(4), 259-264. http://doi.org/10.1177/0963721413480174

- *Next I'd like you to watch two videos about efforts to reform science/social science education and consider the differences between them*

The first is about Man: A Course of Study (55 minutes): https://www.nfb.ca/film/through_these_eyes/

The second concerns the Big History Project (16 minutes):

https://www.youtube.com/watch?v=wFgDFlwchgk

- *The next set of papers looks at different approaches to and challenges for improving scientific reasoning.*

Lehman, D. R., Lempert, R. O., & Nisbett, R. E. (1988). The effects of graduate training on reasoning: Formal discipline and thinking about everyday-life events. American Psychologist, 43(6), 431.

Klahr, D., Zimmerman, C., & Jirout, J. (2011). Educational interventions to advance children's scientific thinking. Science, 333(6045), 971-975. http://doi.org/10.1126/science.1204528

Bismack, A. S., Arias, A. M., Davis, E. A., & Palincsar, A. S. (2014). Connecting Curriculum Materials and Teachers: Elementary Science Teachers- Enactment of a Reform-Based Curricular Unit. Journal of Science Teacher Education, 25(4), 489-512. http://doi.org/10.1007/s10972-013-9372-x

Schell, J., & Mazur, E. (2015). Flipping the Chemistry Classroom with Peer Instruction. Chemistry Education (pp. 319-344). Weinheim, Germany: Wiley-VCH Verlag GmbH & Co. KGaA. http://doi.org/10.1002/9783527679300.ch13

Setren, E., Greenberg, K., Moore, O., & Yankovich, M. (2019). Effects of the Flipped Classroom: Evidence from a Randomized Trial.

Week 14, 12/09: Presentations of research proposals