Syllabus 2017-2018

Course Information

Title	GDP2 - Education, cognition, and the brain
UE	UE83
Year	2017-2018
Language	English
Level	Advanced - M2
Credits	6 ECTS
Classes/ hours	14 classes X 3H = 42H (including final evaluation)
Prerequisites	A strong interest for interdisciplinary and applicative research in cognitive science
Requirements	Class attendance is mandatory
Location	Ens Salle Ribot rdc 29, rue d'Ulm 75005 Paris
Days and hours	1st semester Thursday – 17h00-20h00 05/10/2017 to 26/01/2018
Instructors	Daniel Andler, SND, Groupe Compas daniel.andler@ens.fr Office location: IEC, rue d'Ulm 75005 Roberto Casati, CNRS Research Director, and Directeur d'Etudes, EHESS, Institut Jean Nicod, EHESS, ENS, CNRS casati@ehess.fr

	Office location: Institut Jean Nicod 29, rue d'Ulm 75005 Office hours: generally on Tuesday morning + on appointment. Elena Pasquinelli, PhD, Fondation La main à la pate Institut Jean Nicod (Associate member) elena.pasquinelli@gmail.com Office location: Fondation La Main à la pâte – 43, rue de Rennes 75006 Paris

Overview

This course explores the impact of cognitive studies on education. It proposes a cognitive approach to the understanding of educational issues, such as learning, learning difficulties, teaching, education technologies.

It introduces the research on the learning mechanisms and their neural underpinning, literacy, numeracy, learning disabilities and difficulties. It analyses the use of evidence in the shaping of educational interventions.

It examines general problems raised by applied research in science.

Education can be considered as an exemplary case study for reflecting on the opportunities, limits, conditions and issues of the translation of basic research into practical applications. Education is also an ideal arena for ecological studies in cognitive science, and an opportunity for broadening the view of basic research.

Objectives

Students will learn to identify potential epistemological, ethical and pragmatic issues arising from the encounter between education and the study of the mind and brain.

- They will develop their own reflection for addressing ethical and epistemological issues arising from the application of cognitive sciences to domains of social interest
- They will enhance their critical thinking and communication skills by analyzing ongoing debates (mandatory readings) and presenting their reflections during class discussions.
- They will learn about recent developments in cognitive sciences with potential applications to education and other domains of social interest.

Course mechanics

ATTENDANCE

Class attendance is mandatory. Students are expected to attend no less than 80% of the classes in order to validate their course.

Each class is divided into two parts, both mandatory: 2 hours are dedicated to the interactive lecture. Teachers will discuss student's questions (see below) and present contents related to the topic. The final hour is dedicated to a synthesis of the major concepts discussed. In small groups, students write short paragraphs summarizing their understanding of the course. Together, they produce a conceptual map that represents a synthesis of the course.

WEEKLY ASSIGNMENTS AND FINAL PRODUCTIONS

Preparatory work is assigned before each class. Students post their assignments at the latest ***24 hours before the corresponding class*** (English and French accepted). ***Late submissions will not be taken into account***.

At the end of the course, a ***workshop on open issues takes place, organized by the students, and to which all the students participate***. Each student prepares a written work. The written work is sent to the instructors 2 weeks before the workshop and orally presented to the rest of the class during the workshop.

Tools

Blog: https://gdp217.blogspot.fr/ Students will post their weekly homework in a form of a comment about the assigned reading, not exceeding 1000 characters including spaces. Comments should be in no later than 24 hours before class. Late comments will not taken into account.

Course assessment

The final grade is expressed in X/20. The students' progression in the objectives stated above and participation to the course is assessed through the evaluation of 2 kinds of productions:

1. **Preparatory work for each class (readings + questions)**
2. **Written work for the workshop and and its oral presentation (8000 characters MAX). Examples will be provided**

Productions that not received in due time ARE NOT EVALUATED.

Useful Readings (can be taken at any moment of the course)

- Dunlosky, J.D., 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.*
- IES Education research (2007). Organizing instruction and study to improve students' learning. NCER 2007-2004, US Department of education. http://ies.ed.gov/ncee/wwc/pdf/practice_guides/20072004.pdf
- Roediger, H. et al. (2014). Make if stick: the science of successful learning. Belknap Press.

Schedule

October 5

(A short introduction and description of course mechanics)

D. Andler, R. Casati, E. Pasquinelli - Cognitive studies meet education: Introduction

Objectives

- Introducing and mapping the field of mind, brain and education,

- Drawing the perimeter of the field, briefly retracing the history of the encounter between mind-brain studies and education, presenting different positions and the actors of the field, including neuroeducation and evolutionary approaches to the understanding of education

- Presenting the approaches of evidence-based education and translational research, as well as the specificity of the cognitive approach to the understanding of educational issues

Homework (after the course):

- **Make a list of educational topics, issues, questions, for which cognitive science research can be relevant. Send your list to the instructors 24h before class 2.**

G. Borst – The executive brain

Objectives

The scope of the lesson is to introduce students to executive functions, and in particular to

- inhibitory control,
- its neural underpinnings at the level of the prefrontal cortex
- its role in typical school tasks, such as reading, mathematics, and reasoning.
- The executive ability remains critical throughout the whole life and even adults may sometimes need "prefrontal pedagogy" in order to learn inhibiting intuitive heuristics (or biases) in deductive reasoning tasks.

Homework (in preparation for the course): Send 1 question for each of the 2 mandatory readings

1. Houdé, O., & Borst, G. (2014). Measuring inhibitory control in children and adults: brain imaging and mental chronometry. Frontiers in Psychology, 5, 616. doi:10.3389/fpsyg.2014.00616

2. Borst, G.*, Cachia, A.*, Vidal., J., Simon, G., Fischer, C., Pineau, A., Poirel, N., Mangin, J.-F., & Houdé, O. (2014). Folding of the anterior cingulate cortex partially explains inhibitory control during childhood: A longitudinal study. Developmental Cognitive Neuroscience, 9, 126-135.

October 12

F. Ramus – Nature and nurture in education

Objectives

The course aims at introducing the nature/nurture debate

- the genetic influences on cognitive abilities,
- the brain is plastic: so what?
- the interactions between genetic and environmental factors in respect to major cognitive abilities
- neurogenetics and education: ethical and theoretical issues.

Homework (in preparation for the course): Send 1 question for each of the 2 mandatory readings

1. Shakeshaft NG, Trzaskowski M, McMillan A, Rimfeld K, Krapohl E, et al. (2013) Strong Genetic Influence on a UK Nationwide Test of Educational Achievement at the End of Compulsory Education at Age 16. PLoS ONE 8(12): e80341. doi: 10.1371/journal.pone.0080341
2. Chapter 1 *Genetics, school, and learning* of the following: Asbury, K. & Plomin, R. (2013). *G is for Genes: The impact of genetics on education and achievement*. Wiley-Blackwell

October 19

Alice Latimier: Use of an e-learning platform to test suggested improvements in learning

Objectives

The course aims at introducing evidence based education

- What the literature tells us about the best learning strategies ?
- How could we use the data from the literature to create better learning environment ?

- Didask : an e-learning platform to test new research questions in cognitive psychology

Homework (in preparation for the course): Send 1 question for each of the 2 mandatory readings

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: 4–58.

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. NCER 2007-2004.
National Center for Education Research. Consulté à l'adresse http://eric.ed.gov/?id=ED498555.

October 26

Marc Gurgand: — Social experiments in education

Objectives

The course aims at discussing how experimental evidence can be used to assess educational policy

- Educational interventions in ecological environments
- Methodology and practice of social experiment
- Exemples: class size, track choice, early childhood interventions, boarding schools.

Homework

1. Alan B. Krueger (1999), « Experimental Estimates of Education Production Functions », *The Quarterly Journal of Economics*, vol. 113, n° 2.

2. James Heckman, Rodrigo Pinto and Peter Savelyev (2013), « Understanding the Mechanisms Through Which an Influential Early Childhood Program Boosted Adult Outcomes », *American Economic Review*, vol. 103, n°6.

November 9

V. Izard: How can basic research in mathematical cognition help education?

Objectives

The course will introduce basic research questions and findings on the development of numeric cognition, and discuss how these findings may help advance the field of mathematics education.

- Scope and limitations of children's early numeric representations,
- How children's spontaneous intuitions of numbers are involved when they study mathematics,
- Cultural variations in number concepts and their acquisition.

Homework (in preparation for the course): Read the mandatory reading and (1) send any clarification question you may have (2) Reflect on the question : how can findings from basic research like those described in this reading help advance the field of mathematics education? Max 200 words, bullet points are fine.

Reference: Piazza, M., 2010, Neurocognitive start-up tools for symbolic number representations. TICS 14, 12, 542-551.

November 16

Roberto Casati: Good design in education

Objectives

Discussing the role of "smart objects" and graphic representations in facilitating learning, thinking, memorizing

- low tech vs high-tech solutions that do not address real problems
- how to favor conceptual change through education

Homework (in preparation for the course): Send 1 question for each of the 2 mandatory readings

1. Vosniadou, S. & Brewer, W.F. (1992). Mental models of the earth: A study of conceptual change in childhood. Cognitive Psychology, 24, 535-585.
2. Siegal, M., Nobes, G., Panagiotaki, G. (2011). Children's knowledge of the Earth. Nature Geoscience. 4, 1-3.

November 23

Cassandra Potier-Watkins: Games for learning (reading and writing)

Objectives

Discuss digital technologies for education, by focusing on the real case of a product under Evidence based education has become a popular topic in educational reform around the world, but it is a big leap from reports on what works to providing scalable solutions on the ground. This course is to introduce the class to several large-scale studies in education currently underway.

- Developing an evidence based educational method
- Using parametric tests to research unanswered questions as secondary questions within the larger study
- The nuts and bolts of working business partners, school académies, teachers, families and students
- Kalulu- Our entry in the Xprize Learning Prize competition for education

Homework (in preparation for the course): Send 1 question for each of the 2 mandatory readings

1. Schacter, J., & Jo, B. (2016). Improving low-income preschoolers mathematics achievement with Math Shelf, a preschool tablet computer curriculum. *Computers in Human Behavior*, *55*, 223-229.
2. http://www.forbes.com/sites/tobyshapshak/2016/04/29/using-tablets-in-rural-africa-xprize-hopes-to-inspire-education/#21334f7e50e5

November 30

Elena Pasquinelli: Neuromyths & other limits in the application of neuro and cognitive science to education

Objectives

Discussing ethical and epistemological issues raised by the encounter between cognitive science and education, namely:

- the neuroscientific literacy of teachers
- neuromyths, why they do exist and persist

Homework (in preparation for the course): Send 1 question for each of the 3 mandatory readings

1. Dekker, S.J., Lee, N.C., Howard-Jones, P. & Jolles, J. (2012). Neuromyths in education: Prevalence and predictors of misconceptions among teachers. Frontiers in Psychology, 3, 1-8. 10.3389/fpsyg.2012.00429
2. Willingham, D. (2009). Three problems in the marriage of neuroscience and education. *Cortex* (Elsevier Science) 45 (4): 544–545.

December 07

D. Andler – Cognitive science, education, real life: can they truly connect?

Objectives

The basic rationale of bringing cognitive science to bear on education is that education is mostly a matter of learning, while learning is a psychological-cum-neuronal process, so that the science in charge of psychological-cum-neuronal mechanisms, viz. cognitive science, cannot fail to be of critical relevance to education. Now this raises a series of conceptual issues that the students will be invited to debate.

Homework (in preparation for the course): Send 1 question for each of the 3 mandatory readings

1. Brabeck, M. (2008). Putting Clinical Findings to Work in the Classroom, Education Week, May 21, 2008
2. De Corte, E. (2010). Historical developments in the understanding of learning, chap. 2 of H. Dumont et al. (eds.), The Nature of Learning: Using Research to Inspire Practice, OECD Publishing, (pp 41-57 only are required reading)
3. Hruby, G.G. (2012). Three requirements for justifying an educational neuroscience. British Journal of Educational Psychology, 82, 1–23

Dec 14, 2017 – Students' Workshop

Dec 21, 2017 – Students' Workshop

January (TBA), 2018 – Conclusions and evaluations