Learning and Cognitive Development
Monsoon 2017
Coordinator: Sanjay Chandrasekharan
Tutors: Deborah Dutta, Durgaprasad Karnam

Credits: *4*
Duration: *16 weeks (18 August to 27 November); Saturday class will make up for any holidays*
Time and Location: *Monday 2-4 PM, Friday, 2-4 PM; Room 102, Main Building, HBCSE*
Important date: *Final paper due on December 15*

This is a survey course, seeking to provide a brief overview of three topics. First, a historical overview of the main theories of learning is provided. Secondly, it will provide a summary outline of experimental and theoretical work in cognitive development, focusing on topics related to education. Finally, the learning sciences approach to education is examined in detail.

Learning Objectives: The course seeks to establish basic concepts that will help the student in understanding how the rich and complex literature in developmental psychology and learning sciences relate to education. A second objective is developing the skills to ask critical questions about this research, particularly its application/relevance to education. A final objective will be gaining familiarity with some of the empirical methods, data analysis approaches, and argument structures used in the study of cognition, development and learning.

Reading Material
The course requires extensive reading (30-40 pages a week), based on the books below.

1. **Learning Theories Section**: Hergenhahn, B.R. & Olson, M.H. *An introduction to theories of learning*. Prentice Hall India.
2. **Cognitive Development Section**: Flavell, J.H., Miller, P.H. & Miller, S.A. *Cognitive Development*. Prentice Hall, New Jersey.
3. **Learning Sciences Section**: *How people learn: Brain, mind, experience, and school,* Expanded edition. National Academies Press.

All readings will be provided as pdf files. The title for each week in the course plan below indicates the topic covered in that week.

Class Structure
The class will be participant-driven and discussion-based. Each week's readings would be presented by a team of two participants, possibly in two sections, and they will lead the discussion. This cycle will continue throughout the course. All participants are requested to read the text beforehand, so that there is a common base to discuss and critically analyse the issues raised by the papers.

All participants have to turn in a "Comments and Queries" (C&Q) document on Monday to the TA, focusing on the week's readings and focus questions. See Note 1 below for guidelines on what is expected in this document. The Comments and Queries could also be used to frame the discussion in the class. Participants who are presenting the material in a given week need not submit this document for that week, but generating these would be useful in guiding the discussion. The TA will provide feedback on your C&Q documents and the presentations. See Note 2 for guidelines on presentations. You will work with the TAs to develop a concept map of the reading, integrating the various concepts

covered in the reading, to generate a big picture. This activity will be done in class, for the modules where it is possible. The map will be built on the whiteboard by teams, and this activity will contribute to your class participation grades.

Assessment

Students taking the course for credit will be graded on the basis of two submissions. A final term paper (50%), the Comments and Queries document, Class Presentations and Class Participation (50%). Each C&Q/Class-Presentation carries 5 marks. Your C&Qs and Class Presentations together should total a minimum of 10 submissions.

The final term paper should preferably connect the student's interest in education with one of the topics covered in the course. A rough outline of the term paper should be submitted by November 15, and a clear outline (argument structure) of the paper developed in discussion with the instructor. See Note 3 on what is expected for the term paper.

Course Plan

Session	Date	Topic	Reference Chapter/ Paper
0	Aug 18	Introductions, scheduling	
1,2	Aug 21, 25	What is Learning? Approaches to Study of Learning . Early Notions of Learning	*H&O Chapter 1, 2 and 3*
3,4	Aug 28, Sept 1	Piaget	*H&O Chapter 11*
5,6	Sept 4, 8	Tolman	*H&O Chapter 12*
7,8	Sept 6, 9	Bandura	*H&O Chapter 13*
9,10	Sept 11, 15	Vygotsky	*Mind and Society Chapter 1,2,3,*
11,12	Sept 18, 22	Vygotsky	*Mind and Society Chapter 6,7*
13,14	Sept 25, 29	Bruner	*Folk Pedagogy Models of Learning, History of Learning Theories, Growth of Mind*
Break	**Oct 2,6**	**Dussehra & Muharram**	
15,16	Oct 9,13	Representation and concepts	*F, M & M, chapter 4,*
17,18	Oct 16,20	Reasoning and Problem Solving	*F, M & M, chapter 5*
19,20	Oct 23,27	Learning: From Speculation to Science	*Bransford, Brown, Cocking*
20,21	Oct 30, Nov 3	How Experts Differ from Novices Learning and Transfer	*Bransford, Brown, Cocking*
22,23	Nov 6, 10	How Children Learn Mind and Brain	*Bransford, Brown, Cocking*
24,25	Nov 13, 17	The Design of Learning Environments Effective Teaching: Examples in History, Mathematics, and Science	*Bransford, Brown, Cocking*
25,26	Nov 20, 24	Teacher Learning Technology to Support Learning of Sciences	*Bransford, Brown, Cocking*
27	Nov 27	Conclusions Next Steps for Research	*Bransford, Brown, Cocking*

Note 1: Comments & Queries

1) A summary of the papers is not expected. If summarising helps you in understanding the material, you should still do it. But don't submit this summary, keep that part as a separate file, and refer to the summaries when you run into problems or get stuck while conceptualizing/writing your final paper/proposal/thesis.

2) Queries with the following structure are not useful: "how can we use (say) mental imagery for education/design"? There is no clear answer to this question, because it is too general. It would be better if you turn such questions into something like: "in math/science education, there is this problem of XYZ, and the author's ideas seem to imply that strategy ABC would be useful/would not work, is this right?" or something along these lines. To do this, you will have to do some focused thinking about the author's ideas, and apply it to a problem you are familiar with. If you have a question like this, other people can contribute to the discussion, and maybe even help you solve a problem.

3) Comments along the lines of "this view is interesting", "the author has done a good job" etc. are not useful. Comments should show close engagement with the ideas in the papers. So something like "the author's position seems to contradict/support the position of (another) author X in the following way" or "the data seems to be showing X, but it does not seem to support the author's claims" or "the author argues for X, but it has the following implication, which is undesirable" etc.

4) Before writing your C&Q, try to think a little more deeply about the implications of the ideas presented by the authors, and also try to connect their ideas with other things you have read, in the class or outside. This would help you come up with C&Qs that are closer to the description above.

Note 2: Presentations

All presentations should follow the structure below:

1) What are the major findings/claims reported in the section?
2) What designs/data/arguments support these findings/claims?
3) How well does the design/data/argument support the findings/claims? What are the main problems?
4) What would be other better ways to support the findings/claims?
5) What implications/connections could follow from the findings/claims, particularly for education?
6) Any details you would like to highlight.

Using 1 slide for each of these questions would be the ideal format. Aim for a 15 minute presentation for each paper. Presentations for each day can be up to 30 minutes in total.

Note 3: Term Papers

The following points should be kept in mind while picking your topic for the term paper, and during writing of the paper.

1) The paper should be around 15-25 pages, single space. Why is this an important point? Because you should choose a topic that *requires* that much space for discussion. If you choose a very broad topic,

you will not be able to do justice to it in this amount of space. If you choose a very narrow topic, you will not have enough things to say to fill that amount of space. The size of the paper is a good way to "scope" your topic.

2) The paper should have an argument. That is, it should have some clearly articulated premises, and a conclusion that follow from these, preferably with some discussion of data/results that support the conclusion. For instance, you can argue that neuroscience research is irrelevant for science education. Or you can argue that imagery research can inform physics learning. But you should give reasons for why you think this is the case. The requirement for an argument means the paper cannot be a literature review, a discussion of a new approach to science education, or an evaluation of a new technology. The argument structure makes the term paper similar to a miniature thesis, or a journal paper. If you write a few of these during your course work, you will be able to deal better with your research proposal and thesis.

*3) **The process of writing** the paper should make you think. This is sort of implicit in the previous point, as you cannot develop an argument without thinking. However, in academic writing, particularly in humanities and social sciences, apart from the thinking you do to develop the argument, you also think *through writing*. This involves being able to see counter examples and counter arguments as you develop your argument in text, and then finding ways of countering them. This process can take a life of its own, and might lead you into many tangents that prevent you from developing your core thesis, so part of the skill here is learning how to do this in a controlled fashion.*

4) Ideally, you should pick a topic that is related to a possible thesis topic you have in mind. This way, you can reuse the thinking you do for the term paper while developing your research proposal.

5) The paper should have an abstract (~150 words) that summarises its key points.

6)The term paper is due on December 15th midnight. This is a hard deadline, as I have to turn in the marks by the date specified by TIFR.

7) Two alternatives to term papers could be: 1)Developing and executing a new experiment, to test a new hypothesis; 2) Reviewing a book. Texts based on these would also need to follow the above structure. Further, you need to discuss ideas for these with the instructor beforehand, to develop a clear structure of what you will be doing.

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