Instructor
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A little about me: I taught middle and high school students for 9 years in L.A. and outside of Chicago. Then I did graduate work at the University of Georgia; Les Steffe was my dissertation advisor. I have taught doctoral courses on mathematical learning at Portland State University and here at IU. I love thinking about students’ mathematical thinking and learning and how to orchestrate it, and I look forward to working on that with all of you this term!

Class Time and Location
Mondays, 4:30 – 7:15 pm, Wright 3017

Office Hours
I will hold office hours on Mondays and Wednesdays from 1:00 – 2:00 pm, or by appointment. Feel free to email or stop by my office at any time; if I can’t talk right then we can arrange for another time.

Required Texts

Supplementary Texts

There will also be many other required readings (journal articles and book chapters) posted to Oncourse.

Electronic Conference and Mail
I will post assignments, questions about the readings, and other important information regularly to Oncourse. We will also utilize the Forum feature of Oncourse to prepare for and debrief readings and class discussions. Please submit all assignments electronically using Oncourse. You are expected to check Oncourse and e-mail regularly.

Important Dates (note that most due dates are tentative)

<table>
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<tr>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
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<tbody>
<tr>
<td>9 First class meeting</td>
<td>27 Short paper due</td>
<td>12 Spring Break — no class</td>
<td>2 Submit final paper topic</td>
<td>1 Final paper &amp; presentation due</td>
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<td>16 MLK Day — no class</td>
<td>26 Pair presentations begin (run for 4 weeks)</td>
<td>22 NCTM — no class</td>
<td>30 Final paper presentations begin</td>
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Course Overview and Goals

This course focuses on helping you develop your understanding of mathematical learning, as well as research on mathematical learning. In doing so, the goal is to balance breadth with depth. What that means is that we will aim to investigate common approaches to characterizing and understanding learning in mathematics education (e.g., behaviorism, constructivism, situated learning). However, to characterize and understand learning requires going deeply into a particular theory. In just one course we won’t have time to go to the same level of depth with all of the approaches that we will investigate. Your pair presentations on theories of learning outside of constructivism will allow us to achieve greater breadth, and your final course papers are one way to visit (or revisit) a particular theory in more depth, if that is of interest to you.

The approach that we will spend the most time on is constructivism. However, this is not a course to “convert” you to being a constructivist, whatever that may mean to you now or 15 weeks from now. This IS a course in which you will grapple with significant issues regarding what it means to learn and know mathematics, and to do research on learning and knowing mathematics.

Throughout this course, you are expected to deeply examine your ideas about the nature of mathematics and of what it means to learn and know mathematics. This process includes making explicit how you regard others in mathematical interactions, what you take to be mathematical knowledge, and how you might assess and account for changes in someone’s mathematical knowledge. The bulk of the course will consist of readings and discussions, and we will also examine data excerpts in the context of the readings. This course is not a course on teaching mathematics, but we will necessarily be considering the role of teaching in understanding learning, since learning and the orchestration of learning (teaching) are very closely linked!

We will explore and discuss questions such as: Is “five” in nature? What does it mean to know a particular area of mathematics—for example, to know fractions? How does someone go from a state of “lesser” knowledge to a state of “greater” knowledge—for example, from knowing “just” whole number multiplication in particular way to knowing fraction multiplication in a particular way? What is the role of interaction with other people in mathematical learning? What is the role of socio-historical context in understanding mathematical learning? What knowledge is required of a researcher to account for someone’s mathematical learning? What does it mean to understand another’s mathematical activity?

Developing your ideas about learning in mathematics education involves the following sub-goals. In my experience, progress toward all of the sub-goals evolves through reading, discussing, questioning, interacting with children, writing, exploring, revising, feeling frustrated (at times), feeling stumped (at times), having breakthroughs (at times), and then reading and discussing and questioning and interacting and writing and exploring and revising some more… The sub-goals include:

- To develop an internally consistent orientation to how you regard mathematical knowing and learning.
- To develop an internally consistent orientation to how you regard learners and interaction in mathematical contexts.
- To explore your developing ideas about doing research in mathematics education, which includes considering what kinds of contributions you aim to make to the field.

Description of Course Assignments

1. **Active Participation** (40 points): Prepare for each class by thoroughly reading articles and by completing writing assignments on time; actively contribute to class discussions by being both a good talker and a good listener. *If you have not done so already in your graduate program, I highly recommend starting and faithfully keeping an Endnote (or other bibliographic) file of all readings. You should expect to read chapters and articles more than once in preparing them for class. You should also expect to submit questions for discussion for one class reading (you can work with a partner on this task), and participate once each week in forum discussions through Oncourse (for a minimum of 10 postings during the term).*
2. **Short Paper** (24 points): I will assign a short paper (4-5 pages max) relatively early in the term (see calendar on page 1 for planned due dates). This assignment will be one of the following: an analysis of a reading; an interpretation of a data excerpt; a discussion of and reflection on an issue or question based on our readings and discussion. This assignment is intended to be useful to you as you grapple with ideas, and useful for me in getting to know your thinking, your interests, and your writing. The following rubric gives you a sense of areas that I will attend to in reading and commenting on your paper.

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<th>Weak</th>
<th>Avg.</th>
<th>Good</th>
<th>Strong</th>
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<tr>
<td>Quality and accuracy of connection to ideas from N716</td>
<td>1-2</td>
<td>3-4</td>
<td>5-6</td>
<td>7-8</td>
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<td>Depth of analysis/interpretation of ideas</td>
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<td>Quality of writing and paper preparation</td>
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<td><strong>TOTAL</strong></td>
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3. **Pair Presentations on Other Learning Theories** (50 points): During weeks 10-13 I will ask you and a partner to make a presentation on a theory of learning other than Piagetian or Vygotskian constructivism. Some theories to consider are: Behaviorism, Gestalt Theory, Enactivism, and Situative Learning. Some authors to consider reading (respectively) are Edward Thorndike and E. R. Guthrie; William Brownell and Max Wertheimer; Jean Lave and Etienne Wenger; Tom Kieren, Brent Davis, and Elaine Simmt. Other theorists on learning in mathematics education include Richard Skemp and Jerome Bruner. More information and an evaluation rubric will be distributed later in the term. You should plan a 30-minute presentation on highlights of your selected theory of learning, followed by a 30-minute group activity to develop and discuss main points of the theory. As a class, we will all do at least one reading for each presentation.

4. **Final Paper and Presentation** (80 points): Your final paper should (1) focus on developing your understanding of and ability to characterize mathematical learning, as well as theories of mathematical learning; and (2) help you define and explore your interests in mathematics education—that is, the paper should be something you find useful in your work during your program and potentially beyond. You should expect to do some extra reading for this paper to deepen your understanding of issues discussed in the course and/or to broaden your understanding. For example, you could explore a theory of learning that we have not discussed, extending your assignment in #3 above; you could compare and contrast two theories of learning; you could delve deeper into a theory we have discussed by examining a couple of other studies and/or data. By April 2, each student should select a topic of interest and submit a paragraph about it (send this via email). Develop the topic in about 15 pages, double-spaced, and prepare a 20-minute presentation of the topic for the class (to be given during exam week). The presentation should be modeled on professional presentations that you may have already given, or will give in the future, at academic conferences (e.g., the annual conference of the Psychology of Mathematics Education-North America [PME-NA], the research pre-session of the National Council of Teachers of Mathematics [NCTM], etc.). Details about this assignment, including topic suggestions and evaluation criteria, will be discussed during the term.

**Calculation of Final Grades**

As outlined above, the points for the course total to 200 points as follows:

- Forum postings: 3 pts each, x 10 = 30 pts
- Discussion questions (once per term): 10 pts
- Short paper: 24 pts
- Pair Presentations on Another Theory of Learning: 50 pts
- Final course paper and presentation: 86 pts

Course grades are assigned on a typical 90-80-70-60% scale except that the cut-off for an A is 95%. Cut-offs for “+” grades are at 87-77-67%, and cut-offs for “-” grades below A- are at 83-73-63%.
## Tentative Reading List and Schedule

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<tr>
<th>Date</th>
<th>Reading due</th>
<th>Broad Topic</th>
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<tr>
<td>Feb 6</td>
<td>Von G, ch. 5 Vygotsky, chs. 1 (all, pp. 1-11) &amp; 5, parts I-III, pp. 96-110 Continue with Steffe (1994), focusing one how reflection and abstraction are involved in Brenda's and Jason’s activity, as well as on what the tacitly nested and explicitly nested number sequences are about.</td>
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<td>Feb 13</td>
<td>Von G, ch. 6 Vygotsky, ch. 6, parts I and II, pp. 146-174 Vygotsky-Piaget timeline</td>
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<td>Mar 12</td>
<td>SPRING BREAK</td>
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Policies

- Attendance (including promptness) and Participation: Attendance and active participation are essential in this discussion-based class, both for you to learn and so that others may benefit from your input. The ideas and concepts we work on cannot easily be built up through someone else’s class notes. If circumstances arise that cause you to miss class, you will be responsible for making up all work missed during your absence and for all announcements made in class. Most likely this will mean completing an extra assignment. Absences and tardiness may affect your grade and, more importantly, your understanding.

- If you do miss a class meeting: (1) Talk in detail with at least one classmate about what we did during class. Preferably talk with two classmates, so you get more than one perspective. (2) Check Oncourse for all new postings, emails, etc. You are responsible for any and all information that occurred during your absence.

- Religious Holidays: The policy at Indiana University is that instructors must reasonably accommodate students who want to observe their religious holidays at times when academic requirements conflict with those observances. If a conflict with a religious observance exists, a student must make a request to the instructor for a reasonable accommodation for that observance by the end of the second week of the course. Any relevant change to the course calendar affords a new opportunity to make such a request in a timely manner. The request is to be made in writing on a standardized form available at this website: http://www.indiana.edu/~vpfaa/welcome/forms.shtml#Forms (scroll down).

- Academic Misconduct: All university policies concerning academic misconduct will be strictly followed and can be found at http://studentaffairs.iub.edu/ethics/. In particular, it is my obligation to report any academic misconduct at the university level. Good information about plagiarism can be found at http://education.indiana.edu/~frick/plagiarism/. It is your responsibility to be familiar with these policies.

- Policy on Late Assignments: I expect that assignments will be turned in by the announced due dates and times. Assignments are to be submitted online using Oncourse, unless otherwise noted. I will accept assignments after the due date, but your grade will decrease by up to 10% of the allocated points for each day the assignment is late.

- Policy on Computer Accidents: Please make sure you save your work frequently and keep backup copies of your files. Computer accidents, while very unfortunate, are not an acceptable excuse to avoid penalties for late work.
• **Cell phones:** Please turn cell phones off during class. If you have an unusual circumstance, please inform me.

**Some On-Line Resources**

Constructivist Foundations: [http://www.univie.ac.at/constructivism/journal/](http://www.univie.ac.at/constructivism/journal/)


Ernst von Glasersfeld on youtube: [http://www.youtube.com/watch?v=zTsY3TosVX0](http://www.youtube.com/watch?v=zTsY3TosVX0)  
[http://www.youtube.com/watch?v=YozoZxblQx8](http://www.youtube.com/watch?v=YozoZxblQx8) (this one is about constructivism and teaching)

Piaget’s 1962 comments on Vygotsky’s criticism of Piaget’s work:  
[http://www.marxists.org/archive/vygotsky/works/comment/piaget.htm](http://www.marxists.org/archive/vygotsky/works/comment/piaget.htm)


…let’s compile some more…