MathEd 603: Theories of Learning in Mathematics Education
Fall 2013

Professor: Dr. Joanne Lobato, Professor, Dept. of Mathematics and Statistics,
Meeting Time: Thursdays 5:30 – 8:15 pm, EBA-260
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Email: jlobato@mail.sdsu.edu
Office Hours: By appointment, held at my office in the Center for Research in Mathematics and Science Education (CRMSE).

Directions to CRMSE: Heading north on College Ave., go right on Alvarado Road (just before Highway 8). The first office building you come to is 6475 Alvarado Road. You’ll see a sign for a Medical Center. Park in the main lot. Go into the building on your right – the one with the café. My office is upstairs and to the right, in Suite 206, Room 42.

Prerequisites: Consent of instructor
Course materials: Readings, homework assignments, and project materials will be available on Blackboard (by noon Wednesday each week). To access Blackboard, go to www.sdsu.edu. Select Current Students. Under SDSU Online, select Blackboard Courses. Once you are in blackboard, select the “user login” button on the far left of the screen. You can use your Red ID number as your username to log in. Your password is the password associated with your Red ID. Readings and assignments will be posted under Course Documents

Course Description

The primary objective of this course is to introduce you to a number of major learning theories that have guided mathematics education over the past fifty years:

- Behaviorism
- Radical Constructivism
- Information Processing
- Situated Cognition
- Vygotsky’s socio-historical perspective
- Emergent Perspective
- Embodied Cognition

This course is also an introduction to research on the learning of mathematics and science. It is intended for students who are currently working on a master’s degree in mathematics education (MATs) or a Ph.D. in mathematics and science education (MSED). If you decide to undertake any research on the learning mathematics, the course...
readings and discussions will assist you in formulating and carrying out this research. The course is also designed to help you understand how people learn mathematics and to understand how the lens you wear as a researcher affects what you see in an investigation of learning.

We will often consider the pragmatic implications of these theoretical perspectives. For example, how do we organize instruction if we take a constructivist perspective? What are the implications for assessment? What is the nature of the mathematical goals that we hold for students if we take a particular theoretical perspective? However, this is not a teaching methods course. The goal is to introduce you to the concerns and perspectives of researchers. Although you may find this course dramatically influences your thinking as a teacher and thus be very practical, this potential benefit will come through challenging your underlying perspectives and ideas, not by being presented with activities to try in your classroom.

Many of you likely have an interest in secondary school or collegiate mathematics teaching. However, to develop as potential researchers, it is critical to examine learning across K-14 levels. Thus, we will read papers ranging across the elementary, middle school and high school levels, as well as lower division undergraduate education.

The attached outline of class readings and discussions gives an indication of the sequence and manner in which these topics will be addressed. The course will be run as a seminar, in which you, the students, will be responsible for careful preparation of the assigned readings and will participate in class discussions.

**Course Requirements**

**Evaluation** (approximate)

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<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Details</th>
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<tbody>
<tr>
<td>Weekly Written Assignments</td>
<td>38%</td>
<td>(13 @ 14 pts each)</td>
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<td>- Research Assignments</td>
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<td>- Practical Explorations</td>
<td>16%</td>
<td>(11 @ 7 pts each)</td>
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<tr>
<td>Mini Presentations</td>
<td>10%</td>
<td>(3 @ 14 pts each)</td>
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<tr>
<td>Midterm</td>
<td>16%</td>
<td>(1 @ 80 pts)</td>
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<tr>
<td>Final</td>
<td>21%</td>
<td>(1 @ 100 pts)</td>
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**Research Assignments.** Prior to class each week, students are expected to read and process an assigned research article (or 2 shorter related articles or 1 article and a short video) and prepare written responses to focus questions. These assignments will be graded for depth of understanding of the ideas in the articles, thoughtfulness, strength of argument, coherence, and completeness. Students are also expected to develop in their writing skills over the semester and will be held to a higher standard of writing as the semester proceeds. These assignments are due **via email by 5 pm** the Thursday after the assignment was made. We will not meet Thursday Nov. 28 (Thanksgiving) but there will be two research assignments (and no practical exploration) due Dec 5 (to be completed over the 2 week period).
Practical Explorations. Each week (except for the assignments due Dec 5, because of Thanksgiving), students will complete a practical exploration of the learning theory constructs addressed in the assigned research article. This may involve watching a video online and responding to it, interviewing a student, creating an example from mathematics or from other facets of life, responding to a particular piece of student reasoning, and so on. This written report is also due via email by 5 pm on the Thursday after the assignment was made. However, credit will be assigned primarily based on completeness and thoroughness of participation. These assignments will form the basis for a class activity the following week. Students should also bring whatever materials they need to class to discuss their thinking on the practical assignments with class members.

Mini Presentations. Each student will make 3 presentations in class during the semester, consisting of a response to a question from the written assignment and sometimes an additional task provided by the professor. For each mini-presentation, you are required to create a handout for the class. Mini-presentations will be graded based on the clarity and coherence of the presentation, the ability to keep to the time constraint, moderation of the discussion, understanding of the presented ideas, and organization and quality of the handout.

Exams. There will be two exams—a mid-term and a final exam. Both will be written take-home exams. The format of each exam will be similar to an MATS comprehensive exam question for master’s students and will be similar to an essay from the MSED second year exam for doctoral students. We will not have a required class meeting during the scheduled final exam time (Dec. 12, 7-9 pm), but there will be an optional question and answer session. Take home finals will be due via email by midnight of the last day of finals (Dec. 18).

Grades will be based on the following grading scale:

- A 93%-100%
- A- 90-92%
- B+ 88-89%
- B 83%-87%
- B- 80%-82%
- C+ 78-79%
- C 73%-77%
- C- 70%-72%
- F Below 70%

Attendance & Participation

- Attendance is mandatory. Your class grade will be deducted 1/2 of one letter grade for every absence. The only exception is for a documented short-term illness or a documented family emergency. In these cases, it is your responsibility to provide me with the documentation. For absences due to long-term, chronic illnesses (such as cancer treatments, anxiety disorders, or depression) or other disabilities (such as visual limitations, hearing and communication impairments, learning disabilities and
limitations in mobility), see the section below on Accommodations for Students with Disabilities.

- **No late assignments will be accepted**, except in the case of a documented short-term illness or serious documented family emergency (in which case, the new deadline needs to be negotiated with the professor). If you miss class for an undocumented reason, it is your responsibility to email the assignment to me by the beginning of class. Students are responsible for all missed materials handed out in class.

- **Participation.** Tardiness is not tolerated and can adversely affect your grade. We will begin promptly at 5:30 p.m. You are expected to participate in discussion on the readings in the usual manner of research seminars. Up to one letter grade will be deducted for poor participation.

- **Accommodations for Students with Disabilities.** Students who need accommodation of their disabilities should contact me privately, to discuss specific accommodations for which they have received authorization. If you need accommodation due to a disability, but have not registered with Student Disability Services at 619-594-6473 (Calpulli Center, Suite 3101), please do so before making an appointment to see me. Students who have registered with SDS will have information printed on SDS letterhead that specifies the specific authorized academic accommodations that the student is entitled to. All such accommodations are made *prior* to the specified events (such as receiving an accommodation of additional time for an assignment or project).

**Code of Academic Conduct on Examinations and Assignments**

The SDSU Senate has established standards and sanctions regarding plagiarism, in accordance with Title 5 of The California Code of Regulations. Plagiarism is defined as the “act of incorporating ideas, words, or specific substance of another, whether purchased, borrowed, or otherwise obtained, and submitting same to the University as one’s own work to fulfill academic requirements without giving credit to the appropriate source.” It can include “omitting quotation marks when quoting directly from another, whether it be a paragraph, sentence, or part.” For details, see [www-rohan.sdsu.edu/dept/senate/policy/pfacademics.html](http://www-rohan.sdsu.edu/dept/senate/policy/pfacademics.html). This does not mean that your written assignments for this class should consist of a series of quotations and citations. I want you to paraphrase the readings from the class by processing the ideas and putting them in your own words. Quotations can be very powerful, but you should use them judiciously so that they don’t lose their power.