

## MTE 598: Research in Undergraduate Mathematics Education II

**Time and location:** Tuesdays, 4:00-7:00 p.m., PSA-839

**Instructor:** Prof. Luis Saldanha

**Office Hours:** Tuesdays 1-3 p.m. However, feel free to make an appointment. The best way to contact me is by email, at [Luis.Saldanh@asu.edu](mailto:Luis.Saldanh@asu.edu). My cell phone is 503-940-9019 if you do not get an email reply.

### Materials:

- Carlson, M. P. & Rasmussen, C. (2008). *Making the connection: Research and practice in undergraduate mathematics*. Washington, DC: Mathematical Association of America.
- Glasersfeld, E. v. (1995). *Radical constructivism: A way of knowing and learning*. London: Falmer Press.
- John Dewey, *How We Think*.  
([www.brocku.ca/MeadProject/Dewey/Dewey\\_1910a/Dewey\\_1910\\_toc.html](http://www.brocku.ca/MeadProject/Dewey/Dewey_1910a/Dewey_1910_toc.html))
- Assorted articles and artifacts made available by the instructor.

### Syllabus

RUME II is a continuation of RUME I and will entail a similar interrelated strand of activities:

- (1) Directed readings and critical discussions and analyses of research on, or pertinent to, mathematics learning and instruction;
- (2) Analyses of existing empirical data—in the form of videotaped classroom/interview excerpts—drawn from recent research projects in mathematics education;
- (3) Analysis and synthesis of a constrained but representative body of research literature appropriate to the interests of participants.

The goals of this seminar are in concert with those of RUME I: it is intended that you develop your ability to read, discuss, criticize, and draw practical conclusions from research in mathematics education, all with the overarching aim of broadening your perspective on areas of past and current mathematics education research. However, RUME II will build on its prerequisite in a subtle but important way: there will be an increased emphasis and focus on theory in mathematics education research—a consideration of various types of theories, their meanings, and the roles they may play in the research endeavor. Additionally, there will be more readings pertaining specifically to mathematics learning at the post-secondary school level.

### Evaluation

Participants must satisfactorily engage in and complete all seminar activities in order to receive a passing grade in the course.

Activity (1) will also entail periodic written summaries of selected readings (weight = 40%). A submission schedule for these summaries will be determined and shared with participants. Following the

practice in RUME I, we will continue posting questions on a web-based course forum in preparation for our seminar discussions. Each week selected participants will lead the discussion on assigned readings and must post a couple of discussion questions no later than Tuesday morning.

Activity (2) will count as a minor project for the course (weight = 25%); this will entail joint analyses of the empirical data and the sharing of written drafts (of analyses) among participants. Activity (3) will constitute the major project (weight = 35%); this activity is intended to support participants in realizing a central expectation of first year doctoral students, as stated in the mathematics education PhD program description: “to submit research ideas and self-evaluation”.

There will be a written final exam entailing essay responses to a set of questions based on the course readings, ideas, and discussions thereof. Although this exam will carry a relatively small weight in the course evaluation (consider it as a culmination of Activity (1)), it will constitute Part 2 of the mathematics education qualifying exam required of the PhD program.

Participants are encouraged to consult regularly with the instructor, who is prepared to work closely with them and provide timely feedback and advice on matters pertaining to the seminar and related activities.

## Readings

Carlson, M. P. & Rasmussen, C. (2008). *Making the connection: Research and practice in undergraduate mathematics*. Washington, DC: Mathematical Association of America.

Cobb, P. (2007). Putting philosophy to work: Coping with multiple theoretical perspectives. In F. Lester, (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 3-38). Charlotte, NC: Information Age Publishing.

Cobb, P., & Yackel, E. (1996). Constructivist, emergent, and sociocultural perspectives in the context of developmental research. *Educational Psychologist*, 31(3/4), 175–190.

John Dewey, *How We Think*.

([www.brocku.ca/MeadProject/Dewey/Dewey\\_1910a/Dewey\\_1910\\_toc.html](http://www.brocku.ca/MeadProject/Dewey/Dewey_1910a/Dewey_1910_toc.html))

Glaserfeld, E. v. (1995). *Radical constructivism: A way of knowing and learning*. London: Falmer Press.

Harel, G. & Brown, S. (2008). Understanding mathematical induction ... In M. P. Carlson & C. Rasmussen (Eds.), *Making the connection: Research and practice in undergraduate mathematics* (pp. ). Washington, DC: Mathematical Association of America.

Larsen, S. & Zandieh, M. (2008). Proofs and refutations in the undergraduate mathematics classroom. *Educational Studies in Mathematics*, 67, 205-216.

Nickerson, S. & Bowers, J. (2008). Examining interaction patterns in college-level mathematics classes: A case study. In M. Carlson & C. Rasmussen, (Eds.), *Making the connection: Research and teaching in undergraduate mathematics education* (pp. 179-189). Washington, DC: MAA.

Oehrtman, M. (2008). Layers of Abstraction: Theory and Design for the Instruction of Limit Concepts. In M. Carlson & C. Rasmussen (Eds.), *Making the Connection: Research and Practice in Undergraduate Mathematics, MAA Notes Volume 73* (pp. 65-80). Washington, DC: Mathematical Association of America.

Roh K. H. (2008). Students' images and their understanding of definitions of the limit of a sequence. *Educational Studies in Mathematics*, 69, 217–233.

Saldanha, L. & Thompson, P. (2007). Exploring Connections between Sampling Distributions and Statistical Inference: an Analysis of Students' Engagement and Thinking in the Context of Instruction Involving Repeated Sampling, *International Electronic Journal of Mathematics Education*, 2(3). <http://www.iejme.com>

Silver, E. A. & Herbst, P. G. (2007). Theory in mathematics education scholarship. In F. Lester, (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 39-67). Charlotte, NC: Information Age Publishing.

Stephan, M., & Rasmussen, C. (2002). Classroom mathematical practices in differential equations. *Journal of Mathematical Behavior*, 21, 459-490.

Thompson, P. W. (1994). [The development of the concept of speed and its relationship to concepts of rate](#). In G. Harel & J. Confrey (Eds.), *The development of multiplicative reasoning in the learning of mathematics* (pp. 179-234). Albany, NY: SUNY Press.

Trigueros, M. & Jacobs, S. (2008). On developing a rich conception of variable. In M. Carlson & C. Rasmussen (Eds.), *Making the connection: Research and teaching in undergraduate mathematics education* (pp. 3-13). Washington, DC: MAA.

van de Sande, C. & Leinhardt, G. (2007). Online tutoring in the calculus: Beyond the limit of the limit. *Éducation & Didactique*, 1(2), 117-160.

Weber, K. & Larsen, S. (2008). Teaching and learning group theory. In M. P. Carlson & C. Rasmussen (Eds.) *Making the connection: Research and practice in undergraduate mathematics* (pp. ). Washington, DC: Mathematical Association of America.

Zazkis, R. (2008). Divisibility... In M. P. Carlson & C. Rasmussen (Eds.), *Making the connection: Research and practice in undergraduate mathematics* (pp. ). Washington, DC: Mathematical Association of America.