MAE 311: INTRODUCTION TO METHODS OF TEACHING SECONDARY SCHOOL MATHEMATICS

FALL 2006, TUESDAY 2:20- 5:00

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PURPOSE: This course will center on aspects of constructivist teaching and learning mathematics, the NCTM principles and standards, and the New York State standards for school mathematics. Emphasis will be placed on observations of middle- and high-school mathematics classrooms, individual reflection based on those observations, and group collaborative analyses of selected cases representing teaching/learning situations. It is expected that by the end of the semester you will have experienced at least the beginning of a community of inquiry within this class, and will recognize different dimensions of its dynamics. The purpose of the course is to enable you, through a process of individual and group inquiry, to enrich your theoretical and practical understanding of the knowledge, skills, and dispositions necessary for inquiry-based mathematics teaching and learning.

REQUIRED TEXTS:

*Reading List. D*esignated readings will be distributed by the instructor a week prior the specific session.

Boaler, J., & Humphreys, C. (2005). *Connecting mathematical ideas*. Portsmouth, NH: Heinemann.

NCTM. (2000). *Principles and standards for school mathematics*. Reston, VA: NCTM.

PREREQUISITE: Enrollment in the secondary teacher preparation program in mathematics.

REQUIREMENTS:

1. **ATTEND CLASS AND PARTICIPATE.** This course is designed to be interactive and collaborative, and requires each member's presence and participation for complete success. More than two absences constitute grounds for grade reduction.

2. COMPLETE READINGS prior to the session for which they are assigned. Bring them to class, as we will be using the texts and regularly referring to them.

3. MAINTAIN A READING JOURNAL, in which you react specifically to the readings, and --if relevant to the readings—to the concepts and themes which emerge in class. One typewritten page (double spaced) minimum, to be handed in weekly, **and in collected form (a total of 13 response-papers) at the end of the semester.**

4. COMPILE AN OBSERVATION JOURNAL, which will consist of 9 entries, each of which will represent weekly observations of 4 classrooms (2 middle- school, and 2 high- school classes). Each entry is to be handed in weekly, starting the week of 10/2 and ending the week of 12/4.

5. FINAL PAPER OR PROJECT (4-5 pages): An essay that centers on your philosophy of teaching mathematics or the role of the mathematics teacher in the teaching and learning process.

6. SELF-EVALUATION: Hand in an in-depth self- and course-evaluation at the end of the semester, 2 typewritten pages minimum, organized according to the criteria enumerated below. The self-evaluation should be comprehensive, honest, not afraid of self-criticism, include a description of how one's understanding might have changed as a result of the course, and of how one's future goals might have been modified by the experience.

All written work should be typewritten, double-spaced, and saved on disk.

EVALUATION:

You will conduct your own final evaluation and suggest your own final grade, based on the reading journal, observation journal, final paper, and class participation, **which includes attendance,** based on the criteria for each which follows. I will either agree with your evaluation, or modify it upward or downward. Some of the reasons for modifying it downward might be: more than two absences; leaving class early without explanation; final packet of work is not complete; submitted work which instructor doesn't consider to meet the minimum criteria of the course and/or the Teacher Preparation Program; no detailed, in-depth self-evaluation at the end of course.

READING JOURNAL:
Weekly submission

Direct, detailed references to readings and classroom discussions.
The primacy of the text as interlocutor
Clarity and entailment of arguments
Level of engagement with material and with class themes

OBSERVATION JOURNAL:
Description of each site and subjects
Clear definition of the phenomenon to be observed and its operationalization
Appropriate selection of research instruments for data collection
Systematic execution of the data collection process
Brief summary
Cross-sectional comparison among the four classroom sites
Conclusion

PAPER/PROJECT:
Clear focus on critical thinking
Incorporation of ideas and information from class texts and discussions
Appropriate research method and accuracy of analysis (project)
Clarity

CLASS PARTICIPATION:
Participation as evidenced by regular attendance
Verbal and/or attentional participation
Use of critical thinking skills and dispositions in discussions, e.g. active listening, raising questions, seeking clarification, summarizing, offering counterarguments, questioning assumptions, offering hypotheses, etc.
Evidence of developing community-building skills
Ability to work in groups

READING ASSIGNMENTS:

I. THINKING

Dewey, J. (1910). What is thinking? In J. Dewey, How we think. Buffalo, NY: Prometheus Books.

Lipman, M. (2003). Thinking in community. In M. Lipman, *Thinking in education* (pp. 83-104). Cambridge, UK: Cambridge University Press.

II. INQUIRY/COMMUNITY OF INQUIRY

Sharp, A., & Splitter, L. (1995). The dynamics of the inquiring community. In A. Sharp & L. Splitter, *Teaching for better thinking* (pp. 32- 63). Melbourne: ACER.

III. COGNITIVE DEVELOPMENT AND LEARNING

Bjorklund, D. (1995). Piaget's theory. In D. Bjorklund, *Children's thinking* (pp. 55-94). Boston: Brooks.

Vygotsky, L. (1978). Interaction between learning and development. In L. Vygotsky, *Mind in society* (pp.79-91). Cambridge: Harvard University Press.

IV. GOALS OF MATHEMATICS EDUCATION

Ernest, P. (2002). *Why teach mathematics?* Retrieved from http://www.ex.ac.uk/~why.htm

Polya, G. (1969). *The goals of mathematical education*. Retrieved from

V. MOTIVATION AND AFFECT

Schoenfeld, A. (1988). When good teaching leads to bad results: The disaster of "well-taught" mathematics courses. *Educational Psychologist*, 23(2), 145-166.

Middleton, J., & Spanias, P. (1999). Motivation for achievement in mathematics: Findings, generalizations, and criticisms of the research. *Journal for Research in Mathematics Education*, 30(1), 65-88.

Boaler, J., & Humphreys, C., Chapter 2

VI. FORMAL AND INFORMAL MATHEMATICS/REASONING

Schoenfeld, A. (1991). On mathematics as sense-making: An informal attack on the unfortunate divorce of formal and informal mathematics. In J.Voss, D. Perkins, & J. Segal (Eds.), *Informal reasoning and education* (pp. 311-343). Hillsdale, NJ: Lawrence Erlbaum.

Cannon, D., & Weinstein, M. (1993). Reasoning skills: An overview. In M. Lipman, (Ed.), *Thinking, children and education* (pp. 598-604). Dubuque, IA: Kendall/Hunt.

VII. CONNECTIONS

Skemp, R. (1976). Relational understanding and instrumental understanding. *Mathematics Teaching*, 77, 20-26.

Torrence, E. (October, 2003). Learning to think: An American third grader discovers mathematics in Holland. *Teaching Children Mathematics*, 90-93.

Boaler, J., & Humphreys, C., Chapter 3

VIII. COMMUNICATION

Skemp, R. (1983). The silent music of mathematics. *Mathematics Teaching*, 102(58), 287-288.

Lafortune, L., Daniel, M.-F., & Sykes, P. (1996). Community of inquiry in mathematics for higher education. *Analytic Teaching*, 16(2), 156-164.

IX. PROBLEM SOLVING

Merseth, K. (1993). How old is the shepherd? An essay about mathematics education. *Phi Delta Kappan*, 74(7), 548-555.

Schoenfeld, A. (1989). What's all the fuss about metacognition? In A. H. Schoenfeld (Ed.), *Cognitive science and mathematics education* (pp.189-215). Hillsdale, NJ: Erlbaum.

Boaler, J., & Humphreys, C., Chapter 4

X. PROOF

Dreyfus, T. (1999). Why Johnny can't prove. *Educational Studies in Mathematics*. 38, 85-109.

Hanna, G. (2000). Proof, explanation and exploration: An overview. *Educational Studies in Mathematics,* 44(1/2), 5-22).

Boaler, J., & Humphreys, C., Chapter 5

XI. CLASSROOM CULTURE

Lampert, M. (1990). When the problem is not the question and the solution is not the answer: Mathematical knowing and teaching. *American Educational Research Journal,* 27(1), 29-63.

Bauersfeld, H. (1992). Classroom cultures from social constructivist's perspective. *Educational Studies in Mathematics*, 23, 467-481.

Boaler, J., & Humphreys, C., Chapter 7

XII. THE ROLE OF THE MATHEMATICS TEACHER/FACILITATOR

Fraivillig, J., Murphy, L., & Fuson, K. (1999). Advancing children's mathematical thinking in everyday mathematical classroom. *Journal for Research in Mathematics Education*, 30(2), 148-170.

Clarke, D. (1997). The changing role of the mathematics teacher. *Journal for Research in Mathematics Education*, 28(3), 278-308.

Boaler, J., & Humphreys, C., Chapter 8

XIII. RECONSTRUCTING MATHEMATICS PEDAGOGY

Simon, M. (1995). Reconstructing mathematical pedagogy from a constructivist perspective. *Journal for Research in Mathematics Education*, 26(2), 114-145.

Goos, M. (2004). Learning mathematics in a classroom community of inquiry. *Journal for Research in Mathematics Education*, 35(4), 258-291.

Boaler, J., & Humphreys, C., Chapter 9

XIV. NCTM PRINCIPLES AND STANDARDS AND NY STATE STANDARDS FOR SCHOOL MATHEMATICS

Note: This syllabus is subject to change during the semester.