

**SIMON FRASER UNIVERSITY**  
**EDUCATION 476-4 (E2.00)**  
**DESIGNS FOR LEARNING: SCIENCE**  
**(Cat. #28936)**

Regular Summer Semester 1994  
(May 2 - July 29)  
Monday, 17:30-21:20  
Location: MPX 7500F

Instructor: Michael Roth  
Office: MPX 8547  
Phone: 291-3046

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**PREREQUISITE:**

EDUC 401/402 (Although not prerequisite, it is of advantage to have completed EDUC 405. At the beginning of the course, students are expected to be familiar with the use of SFU's electronic mail system, to have their accounts activated, and to have their passwords.)

**COURSE RATIONALE**

Give a man 5 fish, and he has to eat for 3 days. Teach him fishing, and he will eat the rest of his life. (Chinese saying).

Practices like teaching cannot be taught. Anything which can be taught is not worth the while. (Carl Rogers)

Following the two leitmotifs, this course was designed to provide a framework for making sense of classroom events, curriculum, and instruction in secondary school science; it provides an introduction to thinking about learning and teaching and the practical skills required to do the job. Thus, this course was designed for students to develop the tools to become reflective science teachers who can adapt their practice according to the needs of the situation. The philosophical position taken is constructivism. This course was not designed to provide a limited number of tricks. Science teaching is much too complex, there are too many subjects, topics, and grade levels to satisfy each and everyone.

**OUTLINE OF TOPICS**

(This outline is not exhaustive and may include some topics which will not be covered. Additional topics may be added at the discretion of the instructor.)

1. What is the nature of scientific knowledge? What is science? How is scientific knowledge constructed?
2. Problem solving. Open-inquiry laboratory activities. What is the scientific method? Does it exist? What does this mean for teaching?
3. Students' views of scientific concepts.
4. Analyzing and improving science teaching.
5. The integration of science, mathematics, and technology (computers and others).
6. Collaborative concept mapping.
7. Vee-mapping.
8. Teacher learning and change.
9. Reflective practice in science teaching.

(see over)

**TEXT**

Tobin, K. (1992). (Ed.). The Practice of Constructivism in Science Education. Washington, DC: AAAS Press. ISBN 0-87168-516-7

**REQUIRED READINGS (to be provided during the first class)**

Roth, W.M. (1993). Metaphors and conversational analysis as tools in reflection on teaching practice: Two perspectives on teacher-student interactions in open-inquiry science. Science Education, *77*, 351-373.

Roth, W.M. (1993). Constructing knowledge from science laboratory activities, in Biddle & Clarke (Eds.), Teaching critical thinking: Reports from across the curriculum (238-253). Englewood Cliffs, CA: Prentice Hall.

Roth, W.M. (1993). Problem-centred learning or the integration of mathematics and science in a constructivist laboratory: A case study. School Science and Mathematics, *93*, 113-122.

Roth, W.M. & Bowen, G.M. (1993). An investigation of problem solving in the context of a grade 8 open-inquiry science program. Journal for the Learning Sciences, *3*, 165-204.

Roth, W.M. & Roychoudhury, A. (1992). The social construction of scientific concepts or the concept map as conscription device and tool for social thinking in high school science. Science Education, *76*, 531-557.

**COURSE REQUIREMENTS**

Students are expected to read the complete textbook and all readings (a timeline will be presented on the first day of class). Some of the chapters will be discussed in class. Specifically, students are to:

- 1) submit brief reports (200-250 words) on readings/chapters by using electronic mail (5 reports at 10 points each).
- 2) present a classroom activity suitable for teaching secondary students (teaching technique, demonstration, student activity) based on the constructivist perspectives discussed in class. A handout has to be submitted and made available to all students which outlines the rationale (including how this activity meets constructivist perspectives on teaching and learning), procedures (detailed enough for another person to teach the lesson), evaluation techniques, etc. Each student has to bring a videotape so that his/her presentation can be taped. (40 points)
- 3) critically analyze the videotaped presentation and submit (by electronic mail) an essay on reflective practice in science teaching (about 1500 words). (50 points)

94-100% = A+	67-69% = C+
87-93% = A	63-66% = C
80-86% = A-	60-62% = C-
77-79% = B+	50-59% = C
73-76% = B	0-50% = F
70-72% = B-	