

**SIMON FRASER UNIVERSITY
SUMMER SEMESTER 2009**

**EDUC 484-4
SPECIAL TOPICS: Rethinking Scientific Misconceptions
(D100)**

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Thursday 1:30-5:20 Surrey Campus Room 5100

PREREQUISITE: EDUC 401/402

Course Description:

This course is designed for teachers of all levels: elementary teachers who integrate the study of the living and physical world into their classroom; middle-school teachers who teach integrated or dedicated science classes; and high school teachers who teach in a particular science domain.

Scientific misconceptions, also known as “naïve conceptions” or “intuitive science” are persistent and stubborn student ideas that differ from those accepted by the scientific community. Most scientific misconceptions are developed and reinforced through students’ regular interactions with the everyday world and are actually quite predictable (e.g. the common but mistaken idea that force causes motion). To be effective in changing students’ ideas, instruction needs to specifically draw out and address students’ scientific misconceptions.

The course offers an introduction to scientific misconceptions on two levels. First, we will learn about a selection of common misconceptions that students generally have when they enter the classroom. These will be grouped as ideas related to the physical world (physics and earth science), ideas related to materials and their properties (chemistry), and ideas related to the living world (biology and environmental science), though of course they are interrelated. By coming to understand the origins of these misconceptions and how they affect students’ thinking, we will be better prepared to recognize and address them in the classroom. Second, we will learn about different ways to help students change these ideas. Here we will look at activities that create cognitive conflict, techniques for transforming existing ideas, tools for making student thinking explicit and the use of models and simulations. We will also discuss how to select an appropriate strategy to address a particular misconception.

Learning Outcomes:

In this course you will:

1. Become familiar with common misconceptions that students have about the living, physical and mathematical world.
2. Develop an understanding of the mathematical and conceptual causes of scientific misconceptions and how they affect students’ thinking.
3. Work with numerical and graphical representations of the scientific concepts underlying common misconceptions.
4. Compare different perspectives on how to help students change their scientific misconceptions.
5. Design questions to reveal young learners’ misconceptions

Course Assignments and Evaluation:

- Homework assignments (30%)

- Misconceptions quiz (30%)
- Individual misconception project (30%)
- Class participation (10%)

Readings:

There is one (short) required book. Photocopies of other required readings will be distributed in class and a reading fee charged. Students should make payment for readings by cheque payable to Simon Fraser University.

Required Books:

Stavy, R. & Tirosh, D. (2000). How students (mis-)understand science and mathematics. New York, NY: Teachers College Press. (ISBN-10: 0807739588. ISBN-13: 978-0807739587.)