

SEMESTER AT SEA COURSE SYLLABUS

Discipline: Education

Fall 2008

SEMS 115-3: Introduction to Science Education

Lower Division

Faculty Name: Ed Sobey

Suggested Pre-requisites: Any science courses

COURSE DESCRIPTION

This class will engage future teachers in the best practices for teaching science at all levels. With some lecture and discussion, the class will focus on learning through doing and reflecting on the process and outcomes. Students will use inquiry methods and creative approaches to learning science. Physical sciences will be stresses, but some chemistry and biology will be included. Students will design, build, test, and improve hands-on models that meet specified criteria. Using the models, they will conduct experiments, collect and analyze data and report both what they learned and how the process worked. They will work in small teams and will create best practices class activities that they present. Students will have improved self confidence, experience, and motivation after taking this course.

COURSE OBJECTIVES

Students will learn how to engage learners in active learning using creative problem solving and design and build approaches. They will learn a wide variety of hands-on skills and will have the opportunity to practice their own activities with native audiences in port. Students will develop the self confidence needed to teach using open-ended approaches and their own interest in science will expand.

TOPICAL OUTLINE OF COURSE

See the following page for Chapter contents from *Science for Understanding: A Practical Guide for Middle and High School Teachers*

1. Immediate engagement in designing/building solutions. Assessment of knowledge and interest in learning methods of teaching science. Course will be outlined. Chapter 1.
2. Motion, forces and energy: gravity cars. Chapter 2. *Loco-motion* – Gravity cars
3. Forces, measurement and pressure: balloon cars. Chapter 3.
4. Electrical circuits: electric cars. Chapter 4. *Loco-motion* – Electric cars
5. Simple machines: belt drive. Chapter 5. *Loco-motion* – Belt drive
6. Teaching sound. Chapter 6.
7. Lift and flight: hand-o-copter. *Loco-motion* – Section 1.
8. Methods used in science museums: Cape Town MTN Science Centre
9. Measurement and graphing: rockets. *Loco-motion* – Section 3 – Through the Air
10. Rockets 2. Assignment: graphing data and writing summary of understanding
11. A look at the ocean: observations and understanding. Chapter 8.
12. Spin and angular momentum. *Loco-motion* – Section 2 - Tops
13. Energy stored in springs and rubber bands: Catapults and trebuchets. *Loco-motion* – Trebuchets and Catapults.
14. Boats: powered by gravity, balloons. *Loco-motion* – Section 4 – On the Water
15. Prepare student presentations for Ho Chi Minh teachers. Chapter 9.
16. Review presentations
17. Review visits to Hong Kong Science Center and Ocean World
18. Boats: powered by rubber bands *Loco-motion* – Section 4.
19. Boats: powered by electric motors *Loco-motion* – Section 4.
20. The Science of Toys. Chapter 7.
21. Chemical reactions: rockets. *Loco-motion* – Chemical mini-rockets
22. Biological sciences. Chapter 12.
23. Final examination

Text by Chapters: *Teaching Science for Understanding: A Practical Guide for Middle and High School Teachers*

1. Why Should We Teach Science For Understanding?
2. What Does It Mean To Understand Science?
3. Learning and Teaching for Understanding: Messages for Teachers (And Their Students).
4. Models of Teaching Science for Understanding through Inquiry.
5. Examining Food for Plants.
6. Teaching Strategies That Foster Understanding.
7. Why Is Formative Assessment Essential?
8. Criteria to Guide Planning and Teaching Science for Understanding.
9. A Plan For Planning: Using Criteria to Select Resources and Plan Instruction Using Modified Criteria to Select Instructional Materials.
10. Planning a Lesson Sequence on Newton's Second Law for Grade 8.
11. Planning a Lesson Sequence on Stoichiometry for High School Chemistry.
12. Planning a Lesson Sequence on Cells for High School Biology.
13. Planning a Lesson Sequence on Refraction for High School Physics.
14. Continuing Growth for You and Your Students

Students will also use the secondary text as a reference for the activities conducted in class.

FIELD COMPONENT

Each student is required to complete three practica (two of which are Faculty Directed and one is Independent). Students are required to maintain a log of their experiences and to write a comprehensive summary paper.

An Independent Practicum may be developed as part of a regularly-offered SAD trip, or it may stand alone. To organize an Independent Practicum, a student or small team of students must meet with the faculty member prior to undertaking the work.

Each FDP will include a demonstration of engaging learners in science activities without lecturing. Students are to conduct demonstrations and short workshops.

Visits to informal learning centers can generate reports on the methods used to engage visitors, their apparent success (measured), and summary of exhibit experiences. Specific suggestions are:

- Comparing the methods used in three or more science centers, museums, or aquariums/zoos
- Comparing methods used in public and private schools
- Measuring the effectiveness of exhibits and demonstrations at science museums, zoos, etc.

The paper should summarize what they did, describe the environment of the venue, and identify the local participants (teachers, students with approximate ages, general public) and their reaction to the other presentations/ activities. It should also list the materials used and give a summary of what changes they would recommend for doing the activity again. The critical questions are: What did the participants learn and did they leave more or less interested in learning science?

SOUTH AFRICA: MTN Science Centre (IND)
INDIA: School visits and presentations. (FDP)
MALAYSIA: Penang Butterfly Farm (IND); International School of Penang (FDP)
CHINA: Hong Kong Science Museum (IND) Shanghai Science and Technology Museum (IND)
<http://210.22.96.87/english/index.htm>
Ocean World: Aquarium (IND)

METHODS OF EVALUATION

Students will work in teams or individually to prepare two presentations. One is a demonstration of a scientific principle and the other is a hands-on activity. Their classmates will evaluate each presentation and award points based on their view of its effectiveness; this will constitute 25% of the grade for the presentation. The instructor will contribute 75% of the field component grade based on the elements of effectiveness, creativity, engagement, accuracy, and relevancy. The presentations will constitute 50% of the grade, the remainder performance on class activities and quizzes.

Grades will consist of:

Field Component (outlined above)	50%
Class participation (success in meeting design challenges)	30%
Final exam and quizzes	20%

REQUIRED TEXTBOOKS

Teaching Science for Understanding: A Practical Guide for Middle and High School Teachers

(Paperback) by James J. Gallagher

Prentice Hall (March 31, 2006)

ISBN-10: 0131144251

ISBN-13: 978-0131144255

Cost \$33

Loco-motion: physics models for the classroom. Ed Sobey

Publisher: Zephyr Press (August 1, 2005)

ISBN-10: 1569761930

ISBN-13: 978-1569761939

\$24.95

RESERVE LIBRARY LIST

1. *The Unschooled Mind: How Children Think and How Schools Should Teach* (Paperback)

by Howard Gardner

Basic Books (May 1993)

ISBN-10: 0465088961 ISBN-13: 978-0465088966

\$19.95

2. *Design as a Catalyst for Learning.* Meredith Davis, Peter Hawley, Bernard McMullan & Gertrude Spilka. ASCD 1997.

ISBN-10: 0871202840 ISBN-13: 978-0871202840

\$129

3. *Inventing Toys – Kids Having Fun Learning Science.* Ed Sobey. Zephyr, 2001.

Publisher: Zephyr Press (December 1, 2001)

ISBN-10: 1569761248 ISBN-13: 978-1569761243

\$24.95

4. *Rocket-powered Science.* Ed Sobey. GoodYear Books, 2005

Good Year Books (January 12, 2006)

Language: English

ISBN-10: 1596470550 ISBN-13: 978-1596470552

\$14.95

5. *Young Inventors* (Paperback) by Edwin J. C. Sobey
Publisher: Good Year Books (February 1, 1999)
ISBN-10: 067357735X ISBN-13: 978-0673577351
\$13.95

ADDITIONAL RESOURCES

Do you anticipate that students will be expected to locate and employ resources beyond required texts, reserve library reading and intranet resources? If yes, please identify these resources.

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