

SME 601 syllabus  
Summer 2003

**Course Title: Science Education in Contemporary Perspective**

Course Credit: 3

Course Description: Focuses on current reform in science education and the supporting learning theories, instructional methodologies, and assessment practices.

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**Course Goals and Objectives:**

The current reform in science education has provided a new challenge in designing curricula, using appropriate teaching methodologies and assessment to measure student learning. The goals of this course are to present contemporary perspectives in science education and to find solutions to the problems in the classroom from the reform initiatives. The course objectives are:

1. To understand the current reform movements in science education
2. To examine the basic documents used in the reform such as the National Science Education Standards and the Benchmarks for Science Literacy.
3. To comprehend the influence of learning theories to science education in curriculum, instruction and assessment
4. To analyze various instructional methods in science and justify their use in the classroom.
5. To examine the theoretical basis used by the reform documents in view of the learning theories and emerging pedagogy in science.
6. To develop a metacognitive understanding of pedagogical content knowledge as applied to specific teaching topics in science disciplines.
7. To explain and evaluate the paradigm shift in assessment of student learning.
8. To analyze the various professional development programs in order to familiarize teachers about the reform to standards-based science education

**Course Activities:**

The graduate students will be engaged in several activities that will develop their leadership and ability to critically evaluate the contemporary state of science education. At the end of the course, graduate students should be able to formulate a reasoned opinion about the various initiatives related to the reform movement. The activities to achieve these goals are:

1. Graduate students will lead discussions on assigned topics.
2. Participate in group work on selected case studies.
3. Class presentations on assigned instructional methods.
4. Review of selected research articles in peer-reviewed journals.
5. Interaction with guest speaker(s).
6. Two exams

**Readings**

Textbook:

Teaching Science for Understanding: A Human Constructivist View by Joel J. Mintzes, James H. Wandersee, and Joseph D. Novak. 1998. Academic Press

References:

Piaget's Theory of Cognitive and Affective Development 5<sup>th</sup> edition 1996 by Barry J. Wadsworth, Longman Publishers USA.

National Research Council. 1996. National Science Education Standards. Washington D.C. National Academy Press

American Association for the Advancement of Science. 1993. Benchmarks for Science Literacy. New York. Oxford University Press.

No Child Left Behind Act. (Graduate Students will search the Internet)

Selected articles from refereed journals.

**ADA Statement:**

If a student has a disability that qualifies under the Americans with Disabilities Act and requires accommodations, he/she should contact the Office for Disability Accommodations for information on appropriate policies and procedures. Box 8586; Tel (601) 266-5024; TTY (601) 266-6837; Fax (601) 266-6035.

**Schedule based on 5 week session, Tuesday and Thursday from 1-5 p.m.**

Week 1 May 27

Orientation to the course  
 Overview or review of the NSES, Benchmarks (historical and product)  
 Overview of the No Child Left Behind Act (NCLB)  
 View and discuss videotape on "A Private Universe"  
 How People Learn by Bransford (Introduction to Chapters 4 and 5)  
     Chapter 4 How Children Learn  
     Chapter 5 Mind and Brain  
 Learning Theories introduction (what and why)  
 Behaviorism to cognitive learning theories

Assignment:

1. Read Chapters 1 and 2 from textbook  
     Discussion leader for Chapter 1 \_\_\_\_\_  
     Discussion leader for Chapter 2 \_\_\_\_\_
2. Discuss assigned topics from How People Learn  
     Discussion leader for Chapter 4 \_\_\_\_\_  
     Discussion leader for Chapter 5. \_\_\_\_\_

3. Assignments on cognitive learning theories  
 Discovery Learning by Jerome Bruner Leader \_\_\_\_\_  
 Meaningful Learning by David Ausubel Leader: \_\_\_\_\_  
 Theory of Cognitive Development by Jean Piaget Leader: \_\_\_\_\_  
 Zone of Proxima Development by Lev Vygotsky Leader: \_\_\_\_\_  
 Multiple Intelligences by Howard Gardner Leader: \_\_\_\_\_

Week 1 May 29

Discussion of textbook

Chapter 1

Chapter 2

Discussion from "How People Learn"

Chapter 4

Chapter 5

Presentation of research on cognitive learning theories:

Bruner

Ausubel

Piaget

Vygotsky

Gardner

Assignment:

From textbook, Chapter 3 Discussion leader \_\_\_\_\_

Week 2 June 3

Learning and Memory: Knowledge from Neuroscience Research by Dr. Yuan

Luo, Department of Biological Sciences

Chapter 5 from "How People Learn"

Information Processing Model and Metacognition RVHairston

Behaviorism vs. Cognitive Learning Theories RVHairston

Presentations on Cognitive Learning Theories

Jerome Bruner

David Ausubel

Assignment:

From textbook Chapter 4. Discussion leader: \_\_\_\_\_

Demonstration teaching of:

Inquiry teaching using the learning cycle in a science topic of your choice

Distinguish between open inquiry, guided inquiry

Demonstration by

Student # 1 \_\_\_\_\_

Student #2 \_\_\_\_\_

Student #3. \_\_\_\_\_

Student #4 \_\_\_\_\_

Student #5 \_\_\_\_\_

Student #6 \_\_\_\_\_

Student #7 \_\_\_\_\_  
 Student #8. \_\_\_\_\_  
 Student #9 \_\_\_\_\_

Use the abbreviated lesson plan provided by your instructor to prepare for the demonstration teaching. Prepare for teaching of 15-17 minutes. Be sure to identify the instructional method(s) that you would like to demonstrate. You can use any topic in your field of specialization.

These demonstration teachings will be analyzed as to instructional methods used, application of the parameters of inquiry, and student evaluation. The perspectives used in the National Science Education Standards and the Benchmarks will be used.

#### Week 2 June 5

Continue and finish presentations of Cognitive Learning Theories

Jean Piaget

Lev Vygotsky

Howard Gardner

Discussion on Chapter 3

Introduction to Instructional methodologies

R.V. Hairston

The Science of Science Teaching

Learning by Inquiry

The Learning Cycle (3 phases and 5 Es)

Demonstration teaching of Students 1 and 2

Assignment:

Read Textbook Chapters 5 and 6

Chapter 5 Discussion Leader: \_\_\_\_\_

Chapter 6 Discussion leader \_\_\_\_\_

#### Week 3 June 10

Continue Demonstration Teaching of students 3 to 9.

Assignment:

From the following journals pick out at least five titles of research on conceptual change. Choose one and write a critique on it based on the criteria to be provided by instructor. The journals are:

Journal of Research in Science Education

Science Education

International Journal of Science education

Journal of Biological Education

Journal of Chemical Education

Week 3 June 12 Mid-summer exam

Discussion on Chapter 4, 5, 6 from textbook

Concept Maps and Vee Diagrams

Pedagogical Content Knowledge by RVHairston

Assignment:

1. Prepare to discuss the following topics as it relates to contemporary science education
  1. Multicultural Science Education  
Discussion leader: \_\_\_\_\_
  2. Teaching Science to students with disability  
Discussion leader: \_\_\_\_\_
2. Search the Internet for at least five sites dedicated to science teaching. Make an annotated list of those sites and be prepared to share them to your classmates. Prepare a clean copy of your annotation that can be copied at the Center for distribution.
3. Bring samples of assessment tools (test, quizzes, performance-based assessment, portfolio, rubrics, etc) Use Thomas Angelo's Classroom Assessment book

Week 4 June 17

Class discussion on critique of conceptual change research. Instructor will moderate.

A paradigm shift on assessment: NSES and Benchmarks by RVHairston

An examination of assessment tools used by graduate students in class

Assignment:

1. Read Chapters 7,8,9 from textbook  
Chapter 7 Discussion leader \_\_\_\_\_  
Chapter 8 Discussion Leader \_\_\_\_\_  
Chapter 9 Discussion Leader \_\_\_\_\_

Week 4 June 19

Continue discussion on Assessment

Controversial topics to develop critical thinking by Dr. Peter Butko,

Department of Chemistry and Biochemistry

Discussion on Multicultural Science Education

Discussion on Teaching Science to Students with Disability

Discuss Chapter 7 and 8

Week 5 June 24 LAST Day to meet for the S session

Discussion on Chapter 10, 11 and Epilogue

Discussion on "A new paradigm on professional development" moderated by RVHairston

Sharing session on Internet web sites  
Synthesis of the course: From standards to reality  
Final Exam

END