

Tracey L. Jones, M.A.
EDU 441 Methods and Materials of Instruction in Science
Winter 2004
Tuesdays: 4:30-6:30P
Section TG
Spring Break: March 1-7, 2004

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I. COURSE DESCRIPTIONS: METHODS AND MATERIALS OF INSTRUCTION FOR SCIENCE IN THE ELEMENTARY AND MIDDLE SCHOOLS

A laboratory, hands-on approach focusing on the methodologies as well as a review and analysis of current trends on elementary science and their integration into the curriculum.

II. FRAMEWORK OF COURSE-STRUCTURE OF COURSE, GUIDING PRINCIPLES

A. College of Education and Human Services

Conceptual Framework: Code of Ethics

1. Teacher as a scholar
2. Teacher as an inquiring educator
3. Teacher as a moral agent

B. Outcomes

1. Teacher as a scholar, theorist, and pedagogist
2. Teacher as a problem solver, inquirer, and
3. Teacher as an ethical professional, a collaborator, and advocate

C. Course Objectives

1. Develop and strengthen interest and ability to teach elementary and middle school science as integrated content. (B-1)
2. Develop an understanding of the goals and objectives of science education using the Michigan curriculum Framework. (B-1; B-2)
3. Develop classroom management strategies which facilitate program goals. (B-1; B-2)
4. Develop understanding of the basic content, processes, and attitudes of science education. (B-1)
5. Develop knowledge of current teaching method models and strategies through hands-on experience(s). (B-1; B-2; B-3)
6. Develop knowledge of assessing, evaluating, and reporting student achievement. (B-1; B-2)
7. Develop knowledge and understanding of the role of technology in science education. (B-1; B-2)
8. Develop knowledge and understanding of differentiated learning strategies. (B-1; B-2; B-3)
9. Acquire knowledge of planning and implementing collaborative inquiry, and project based learning. (B-1; B-2; B-3)
10. Acquire knowledge of historical and current factors which influence science education. (B-1; B-3)
11. Develop an understanding of the interconnectedness of all science among major unifying themes. (B-1; B-2; B-3)
12. Acquire knowledge of promoting and maintaining a safe science classroom. (B-1; B-2; B-3)

D. Assessment Procedures for Course Objectives

1. Observations: C-1 through C-8
2. Specific Course-Related Assignments and Presentations: C-1 through C-8
3. Integrated Lesson Plan and Presentation C-1 through C-8
4. Field Trip Lesson Plan and Presentation C1 through C-8
5. Collaborative Interdisciplinary Thematic Unit and Presentation C-1 through C-8
6. Resource file and Presentations: C-1; C-2; C-4; C-5; C-6; C-7; C-8
7. Participation in Class Discussions, Text Reading Assignments, Cooperative Learning Experiences C-1 through C-8
8. Midterm/Final C-1 through C-8**

III. CONTENT OF COURSE: SUBSTANTIVE AREAS COVERED BY THE COURSE

- A. Background Knowledge for Science Instruction
1. Historical Perspective of Science Education Reform
 2. Instructional Methods
 3. Role of Technology

- B. Guiding Standards for Science Education
 - 1. Definition of Science
 - 2. Curriculum Standards
 - 3. Differentiated Learning Strategies
 - 4. Scientific Literacy
 - 5. Inquiry-Based Instruction
- C. Cognitive Theories of Development
 - 1. Piaget
 - 2. Vygotsky
- D. Instruction and Assessment in a Standards-Based Science Classroom
 - 1. Instructional Planning
 - 2. Methods of Assessment and Rubrics
 - 3. Types of Assessment
 - 4. Exceptional Students
- E. Collaboration and Cooperation in the Science Classroom
 - 1. Define Collaborative Inquiry
 - 2. Real-World Connections through Inquiry
 - 3. Classroom Management
- F. Learning Strategies and Curriculum Integration
 - 1. Project Based Learning
 - 2. Design Based Learning
 - 3. Interdisciplinary Thematic Units
- G. Management of Materials and Resources
 - 1. Types and Acquisition of Resources
 - 2. Safety Precautions

IV. **DYNAMICS OF COURSE: COURSE CHALLENGES AND LIFE**

- A. Textbook: Sherman, Sharon J. (2003-04) Science and Science Teaching: Methods for Integrating Technology in Elementary and Middle Schools. Houghton Mifflin
- B. General Methodology
 - 1. Lecture
 - 2. Discussion
 - 3. Collaborative and Cooperative Learning Experiences(s)
 - 4. Student Presentations
 - 5. Demonstrations
 - 6. Relevant Videos
 - 7. Simulations
- C. Course Requirement(s)
 - 1. Integrated Lesson Plan and Presentation- **Due Date: February 10, 2004**
Design a lesson that demonstrates a relationship (interconnected knowledge) between 2-3 Subject areas; for example: science, mathematics, and language arts.
Basic Components of the lesson plan
 - 1. Concept Summary
 - 2. Learning Objectives/Pacing
 - 3. Process Skills/Key Vocabulary
 - 4. Materials and Equipment
 - 5. Anticipatory Set (e.g. , Focus Questions/Statement of Inquiry)
 - 6. Step-by-step procedures for lesson development
 - 7. Discussion Questions
 - 8. Instrument of Evaluation
 - 9. Rubric (based on Science Benchmarks)
 - 10. Conclusive evidence of curriculum integration
 - 11. Cite sources used for ideas
 - 2. Field Trip Mini-Unit Plan/Field Trip Experience – **Due Date: February 24, 2004**
Develop a science field trip plan which includes (3) lessons: the lesson held prior to the field

trip; the field trip lesson; and a follow-up extension lesson. Include the following in your lesson plan(s).

1. Concept Summary
2. Learning Objectives/Pacing
3. Process Skills/Key Vocabulary
4. Materials and Equipment
5. Anticipatory Set (e.g., Focus Questions/Statement of Inquiry)
6. Step-by-step procedures for lesson development
7. Discussion Questions
8. Instrument of Evaluation
9. Technology (web site, videos, software, etc.) for at least (1) lesson
10. Conclusive evidence of curriculum integration
11. Cite sources used for ideas
 - a) telephone number to the site
 - b) contact person for group tours
 - c) rationale for the field trip
 - d) target grade level(s)
 - e) relevant Michigan Curriculum Science Benchmark(s)

Presentation- **Due Date: February 24, 2004**

5-10 Minute hands-on presentation of lesson

3. Collaborative Interdisciplinary Thematic Unit- **Due Date: April 6, 2004**
Develop an interdisciplinary thematic unit utilizing the Hamm and Adams Approach
 - a) Unit should reflect a real-world concern or connection
 - b) The unit should address the following
 - overview of entire unit
 - collaborative planning
 - concepts or skills developed
 - assessment procedures (rubrics)
 - resources needed to conduct research
 - cross curricular planning
 - use of technology
 - timelines or pacing guidelines
 - materials/ equipment
 - cumulative or closure activity
 - bibliography

Presentation- **Due Date: April 6, 2004**

10-15 Minute hands-on presentation of unit

4. Science Activity Resource File/Presentation- **Due Date: 4/20/2004*****
Develop a Science Activity Resource File of 60 activities appropriate for use with elementary and middle school students. The activities should be distributed across the three science areas of (1) Life science, (2) Physical Science, (3) Earth Science.
Basic Components
 - 1) Table of contents
 - a) title of activity followed by the major concept
 - b) pagination of document
 - 2) Photocopies of activities
 - 3) Source and page number must be listed on the activity (highlighted)
 - 4) Science concept written or highlighted at the top of the page
 - 5) Highlight/label (2) process skills that can be developed or expanded through participation in the activity.
 - 6) Arrange activities in each of the areas from simple to more complex
 - 7) Technology resources for each science area (5 minimum)
 - 8) Full bibliography

Note: The Resource File will be evaluated by the number and range of resources used to develop the file.

Presentation- **Due Date: April 20, 2004**

3-5 Minute presentation of your favorite lesson

5. Article Critique- **Due Date: January 13, 2004, and January 20, 2004**
 -major issues raised by the article
 -applicability to the field and the rationale for your position
 (factual/experiential)
 -critique the research process
 -direction for future research
 -implication to the field
 -be scholarly in content and form
 -attach a copy of the article to the paper
6. Technology Critique(s)- **Due Date: January 27, 2004**
 Rate (5) Technology Resources (Video, Software, Web Sites) from 1 to 10,
 with 10 being the highest rating. The critique should discuss the following:
 -Science Content (Benchmarks)
 -User Friendliness
 -Science Process Skills Addressed
 -Age/Developmental Appropriateness
 -instructional approach
 etc., **(1 page each)**
8. Class Participation, Attendance and Punctuation
- D. Evaluation
1. Integrated Lesson Plan – 10%
 2. Field Trip Unit Plan – 10%
 3. Interdisciplinary Thematic Unit – 20%
 4. Resource File – 20%
 5. Article Critique – 10%
 6. Technology Critiques – 10%
 7. Class Assignments, Class Participation, Text Readings – 10%
 8. Attendance and Punctuality – 10%
- E. Please note
 All assignments must be typed. Late assignments will result in a C or below for that assignment. Papers and presentations may be submitted only once. No assignments may be done over. Papers are due during the first fifteen minutes (15) of class, otherwise the assignment will be considered late. Exams may be taken on the dates given only. There will be no “make-up” exams. Attendance will be taken and will be a consideration in the course grade. The use of plagiarism will result in an F in the course and/or dismissal from the university (see below).

Plagiarism

Among the most serious academic offenses is plagiarism, submitting the words or style or another author or source without acknowledgement or formal documentation. Plagiarism occurs when specific phrases or entire passages, whether a sentence, paragraph, or longer excerpt, are incorporated into one’s own writing without quotation marks or documentation. One also plagiarizes by paraphrasing the work of another, that is, retaining another writer’s ideas and structure without documentation.

Students are advised to always set off another writer’s exact words by quotation marks, with appropriate references. Students avoid plagiarism by concentrating on their own words and ideas, and fully crediting others’ work and ideas when they find their way into writing. When in doubt cite the source.

Student who purchase essays from other students or agencies or who copy from another or from prohibited sources, commit the most serious type of academic dishonesty. The consequences of plagiarism, or any act of academic dishonesty, may range from failure in a course to dismissal from the University. (Prof. Richard Kowalczyk & William Lowe).

F. Student Support Services

1. Assistance in the area of writing may be obtained through Student Support Service:

- Student Support
- (313) 993-1143
- Student Union Basement

2. Computer Lab facilities may be obtained at:

- Computer Lab
- (313) 993-1122
- Briggs 310

Food for Thought

A teacher affects eternity; he can never tell where his influence stops” – Henry Brooks Adams

Bibliography

- Activities Integrating Mathematics and Science (AIMS), 1989
- Barman, Charles R., & Kotar, Michael. (1989) *The Learning Cycle*. Science and Children.
- Brooks, Jacqueline G. & Brooks, Martin G. (1993) The Case for Constructivist Classrooms. Alexandria: Association for Supervision and Curriculum Development
- Gambini, J. (2002). *Considerations in Teaching/Learning & Differentiated Learning*
- Georg, Miriam. (1997) Purposeful Learning through Multiple Intelligences. California: Performance Learning Systems, Inc.
- Hackett, Jay K. (1991) *Constructivism: Hands On, Minds On*. McMillan/McGraw-Hill School Division
- Mastny, A. & Kahn, S. & Sherman, S. (1992) Science TEAMS: Environmental Science and Cooperative Learning. New Brunswick, N.J. University Press.
- Michigan Essentials Goals and Objectives for Science Education, 1991
- Michigan Curriculum Framework Science Benchmarks, Approved Summer 2000
- Moyer, Richard (1995) *Assessing Science Assessment*. Science Matters
- Moyer, Richard (1995) *Constructivism*. University of Michigan
- National Educational Technology Standards, ISTE. <http://cnets.iste.org/currstands/cstands-netss.html>
- Sherman, J. Sharon. (2000) Science and Science Teaching: Science is Something You Can Do. Houghton Mifflin Co.
- Victor, E. & Kellough, R.D. (2000) Science for the Elementary and Middle School. New Jersey: Prentice-Hall Inc.
- Wolfinger, Donna M. (1984) *Teaching Science in the Elementary School*. Boston: Little Brown and Company.