

**MORAVIAN COLLEGE**  
**Education Department**

**EDU 228A - SCIENCE IN THE ELEMENTARY SCHOOL**  
**FALL 2009**

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Office hours: Monday 1:00 - 3:00 p.m.  
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and by appointment.

**Overview**

A course designed to help prospective teachers interpret children's science experiences and guide their development of scientific concepts. The course involves a study of science content material, modern elementary science curricula, and techniques that are helpful in the teaching of science in the elementary school. *Prerequisites:* F4 and QPA of at least 2.70.

**Course Objectives**

The student will be able to:

1. Appreciate the importance of science and of teaching science in elementary school.
2. Explain and apply the concepts and processes of earth, life, and physical science in elementary school curricula.
3. Apply teaching strategies that promote students' scientific inquiry, active involvement, and higher order thinking.
4. Demonstrate creating and teaching science lessons, including effective teaching methods, feedback, and appropriate resources/materials.

**Required Texts**

Victor, E., Kellough, R. D., & Tai, R. H. (2007). *Science K-8: An integrated approach* (11th ed.). Upper Saddle River, NJ: Merrill Prentice Hall.

Friedl, A. E., & Koontz, T. Y. (2005). *Teaching science to children: An inquiry approach* (6th ed.). Boston: McGraw Hill.

**Resources**

***Blackboard***

Important information about our class will be posted on our Blackboard site at <http://blackboard.moravian.edu>. Announcements will inform you of any changes. The Discussion Forum will enable us to exchange ideas, insights, and resources about various topics throughout the semester. Information about logging in and using the site will be given in class.

***Websites***

The Victor and Kellough text has a website at [www.prenhall.com/victor](http://www.prenhall.com/victor). The site has annotated links for web resources pertaining to science in the elementary school.

The Friedl and Koontz text has a website at [www.mhhe.com/friedl6e](http://www.mhhe.com/friedl6e). The site has chapter links and multiple-choice quizzes, and a glossary.

## Assignments

"Information is an undigested burden unless it is understood. It is knowledge only as its material is comprehended. And understanding, comprehension means that the various parts of the information are grasped in their relations to one another—a result that is attained only when acquisition is accompanied by constant reflection upon the meaning of what is studied" (Dewey, *How We Think*, 177).

### **Reading Assignments**

Reading assignments will include chapters in the texts and materials on reserve in Reeves Library. As part of each reading assignment, consider these questions and be prepared to discuss them in class:

- What is my understanding of the science concepts and processes?
- What is my understanding of the science teaching methods?

### **Written Assignments**

You will complete several kinds of written assignments. Written assignments may include use of outside texts and journals; these will serve to extend your understanding of teaching concepts and familiarize you with educational resources. Reading and written assignments are expected during the class session on the due date. It is within the instructor's purview to apply qualitative judgment in determining grades for an assignment or for a course. Detailed instructions for each assignment will be given separately.

Assignments should be professional in substance and appearance. All written work is to be prepared using a word processor and adhere to APA formatting guidelines. Hand-written papers will not be accepted. Quality writing is expected in your assignments. They should be well written, that is, they should have a logical sequence and structure, and they should have no errors in spelling or grammar. Papers should be double spaced with 1" margins on all sides of the paper. Use a standard font (e.g., Arial, Times). When your paper is finished, spell (and grammar) check it, then read it before submission. The presence of spelling and grammar errors will lower your grade. Assignments must be submitted in hard copy; assignments may not be submitted by email. When you use resources and references, identify them on a reference list at the end of your assignment.

**Classroom assignments.** There will be short assignments that you will complete individually or with your group, where you will be exploring content in various ways. They will require work during class and outside of class, and will involve presentation to and discussion with the class. All group members must be involved in researching, preparing, and presenting the assignments. These assignments will be graded as excellent (A), satisfactory (B), or unacceptable (F). To be excellent, the assignment must be complete, demonstrate effort, and be creative. Your presentation of the assignment to the class must be accurate and interesting.

**Piagetian interview.** You will interview a young elementary school child to gain insight into his/her scientific thought processes. You will tape record and transcribe the interview. You will analyze your interview in light of cognitive learning theories. You will submit the tape, transcript, and analysis. (Use a standard size recording tape.)

**Blackboard Discussion Forum.** The Discussion Forum is organized around the major science topics of the elementary curriculum. You will post three substantive questions/issues during the semester to the Discussion forum, and you will post substantive responses to three questions/issues posed by classmates. To receive full credit, you must complete at least three posts by October 7, and six posts by November 23.

**Identifying resources.** There are extensive resources available to support your mastery of content and method. During the semester, report on four references:

- one from a website relevant to a science topic in the elementary school
- one from a book suitable for use in an elementary science classroom
- one from the journal, *Science and Children* (actual paper journal available in Reeves Library)  
give title, author, year, volume, and page numbers
- one that is a current event related to a science topic for elementary school

You may describe these resources in your Blackboard posts or submit them as a document. In each case, cite the resource specifically and what within the resource was useful to you. To receive full credit, you must complete your resources by November 23.

**Examinations.** There will be three one-hour exams during the semester. Exams will include science content, science processes, and pedagogy concepts.

**Final project.** You will design a thematic unit plan focusing on a science topic. Select a science topic (theme) and list the science standards that the unit will address. Select the grade level. Design the curriculum for the unit, which must integrate literacy, social studies, mathematics, and music or art.

Write the detailed lesson plans for five science lessons, all of which include inquiry activities where students are actively involved. Give the science content for each lesson in a detailed outline form that demonstrates your understanding of the content. Label each lesson objective with its cognitive taxonomy level. All lessons must include an objective at the application level or higher. List the multiple intelligences and the science processes that are included, and explain each item on your list.

Describe how the other content areas will be included. Use the Science and Literacy Framework for planning the lesson that integrates literacy.

Lessons follow the Moravian College lesson plan format.

You may select any topic other than the specific ones you used for your microteaching and learning center. Note: This project is your final examination.

### **Teaching Assignments**

Teaching assignments should focus on a scientific concept and a scientific process. The objective of the lesson should require thinking above the knowledge level.

**Microteaching.** You will prepare lesson plans for and present two micro-teaching sessions to the class. This will give you an opportunity to implement the methods that you are learning. One lesson will be directed at K-4 grade students, and one at 5-6 grade students. Each lesson will focus on one of the major areas of science (physical, life, earth). One of the lessons should integrate a literature book (specific guidelines will be given for designing this lesson), and the second lesson should integrate another content area (e.g. mathematics, social studies, art, music). Students must be actively involved in both lessons, and one of the lessons should include a demonstration or experiment. Lessons will be 10 minutes in length.

The lesson plan must include the objective of the lesson. The cognitive level of the lesson (according to Bloom's taxonomy) must be indicated. In addition, indicate the Pennsylvania science standard addressed; identify it by number and write it out in words. At least one lesson should involve higher order thinking, at the application or analysis level, and may be constructivist in nature. Follow the Moravian College lesson plan format. Write out the procedure in outline or bulleted form.

Present your first microteaching lesson by October 28, and your second microteaching lesson by November 30.

**Learning center.** You will create a learning center that explores a science topic or concept and provides related science activities for students (you may select the grade level). The content will focus on a topic of science not used for your microteaching. The center should be complete with all materials and instructions and contain at least three activities. At least one activity must involve higher order thinking.

*Note:* There will be a sign-up sheet of topics within content areas for each teaching assignment.

### **Attendance and Class Participation**

Attendance in every class is expected. Arrive on time and remain for the entire class session. If you need to be absent, call to tell me the reason. If you do not notify me, your absence will be recorded as unexcused. Lateness or partial class attendance will count toward absence. Absence because of illness will be excused if you bring a note from a health professional. Each unexcused absence will lower your final grade.

A missed class cannot truly be made up because of the critical role that discussion plays in each class session. Even so, you are responsible for the missed work. If you are excused for a school related activity, a written response to the assigned readings must be submitted on or before the next regularly scheduled session. A missing or incomplete written response to readings following an absence will reduce the final grade.

Appropriate class participation includes several attributes. Be prepared for each class session by completing the assignments and considering ideas and questions that emerge from the assignments. During class, remain actively involved by paying attention and sharing your relevant and thoughtful responses and questions. Class participation on a regular basis is expected to ensure grasp of textual materials and important concepts. Participation will be assessed on evidence of your completion of the assigned work, the relevance and quality of responses, the questions and comments made during class sessions, and your voluntary contributions that enrich class discussions. Be present in class, and stay with the class. Inattention or focus on work unrelated to class activities is not acceptable. Side conversations disable your understanding of the lesson, distract classmates, and display disrespect to the speaker. Be sure your cell phone and laptop computer are turned off during class; you may not text, may not check email, and may not take phone calls during class. Lack of appropriate participation or inappropriate participation will lower your grade for each class session in which it occurs.

You can expect to work 6-9 hours per week outside of class preparing for this class.

Students who wish to request accommodations in this class for a disability should contact Mr. Joseph Kempfer, Assistant Director of Learning Services for Disability Support, 1307 Main Street (ext. 1510). Accommodations cannot be provided until authorization is received from the office of Learning Services.

### **Grading**

Each assignment will be graded based on specific criteria that are stated in the syllabus and are presented during the discussion of each assignment. Please note that unless a mutually agreeable revised due date is negotiated with the instructor, any late assignment will lose five percentage points for each day it is late, and any assignment not submitted within two weeks of the due date will receive a "0." It is within the instructor's purview to apply qualitative judgment in determining grades for an assignment or for a course.

Assignment of grades will follow these Moravian College Catalog definitions, quoted here:

- A, A-: These grades indicate achievement of the highest caliber. They involve expectations of independent work, original thinking, and the ability to acquire and use knowledge effectively.
- B+, B, B-: These grades indicate higher than average achievement. Evidence of independent work and original thinking is expected.
- C+, C, C-: These grades are given when the student has devoted a reasonable amount of time, effort, and attention to the work of the course and has satisfied the following criteria: familiarity with the content of the course, familiarity with the methods of study of the course, and active participation in the work of the class.
- D+, D, D-: These grades indicate unsatisfactory work, below the standard expected by the College, in which one or more important aspects falls below the average expected of students for graduation.
- F: This indicates failure.

Classroom Assignments	15%
Microteaching lessons	20%
Learning Center	10%
Piagetian Interview	10%
Blackboard	10%
Examinations	20%
Final Project	15%

The Moravian College policy on academic honesty will be followed.

Collaboration with peers can be valuable in enabling your understanding of various aspects of your work. However, the work you submit must be the result of your individual effort, apart from the collaborative process. You may use paper and on-line resources as you develop your work. Here, too, the work you submit must be the result of your individual effort, apart from the resources. In all cases, cite the sources that you used, and take care to avoid plagiarism. Note that academic dishonesty will result in a zero for the assignment and notification of the Academic Dean, in accordance with Moravian College policy.

## Course Outline

### **I. Introduction**

Concepts of effective teaching

### **II. The Nature of Science**

Science as a process of inquiry  
Scientific processes

### **III. Science Content**

Physical Science  
Life Science  
Earth/Space Science  
Environmental and Ethical Issues  
NSTA and Pennsylvania Science Standards

### **IV. Science Pedagogy**

Objectives, Standards, and Lesson Plans  
Inquiry, Cooperative Learning, and Problem Based Learning  
Constructivist approach  
Questioning and feedback  
Higher order thinking skills  
Class management and safety  
Assessing student performance by various means  
Integrating the curriculum  
Adapting to needs and individual differences of students  
Problem posing, problem solving, peer persuasion

### **V. Resources**

Curriculum projects  
Models  
Instructional technology - computer, Internet sites  
Current events

## Course Schedule

8/31	Introduction
due:	Friedl - Ch. 1, 2
9/7	Universe
due:	Victor - Ch. 2, 9 Friedl - Ch. 14 (through p. 274) no class 9/7 for Labor Day
9/14	Earth
due:	Victor - Ch. 10
9/21	Universe and Earth
due:	Friedl - Ch. 11 (through p. 215), 15 (p. 274 - end)
9/28	Water, Weather, Climate
due:	Victor - Ch. 3, 11 Exam on 9/28
10/5	Water, Weather, Climate
due:	Friedl - Ch. 12, 16
10/12	Plants
due:	Victor - Ch. 12 Friedl - Ch. 18 no class 10/12 for Fall Recess
10/19	Animals
due:	Victor - Ch. 14 Friedl - Ch. 19 Piagetian interview on 10/19
10/26	Plants and Animals
due:	Victor - Ch. 5
11/2	Human Body
due:	Victor - Ch. 15 Friedl - Ch. 19 Exam on 11/2
11/9	Human Body and Genetics
due:	Victor - Ch. 7
11/16	Matter and Energy
due:	Victor - Ch. 16 Friedl - Ch. 3, 4
11/23	Friction and Machines
due:	Victor - Ch. 17 Friedl - Ch. 5
11/30	Sound and Light
due:	Victor - Ch. 19 Friedl - Ch. 8 Exam on 11/30
12/7	Conclusion
	Learning Centers on 12/7 Environmental Issues content and Diverse Learners methodology are integrated into the topics.

Note: This schedule is tentative and will be modified as necessary.