MORAVIAN COLLEGE
EDUC 323 - Pre K-4 Instructional Strategies for Scientific Reasoning
FALL 2012

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Overview

This course will prepare pre-service educators to interpret early childhood students' science experiences and guide their understanding of scientific concepts. The course involves a study of science content material and early childhood science curricula that underpin the teaching of science in the early childhood classroom. Students will gain a solid understanding of scientific topics, while they are learning how to implement activities with children using constructivist, hands-on, inquiry-based methods. Preparation will include integration of literacy and mathematics as fundamentally related to successful science instruction. Prerequisites: F4 and QPA of at least 2.70; clearances for field experiences.

Essential Questions

1. Why is it essential to engage elementary students in scientific inquiry?
2. How can learning become more authentic by integrating science with other content areas?

Expected Student Outcomes (ESO)

ESO 1. You will appreciate the nature and importance of science, and of teaching science to Pre K-4 learners.
ESO 2. You will understand the concepts and processes of earth, life, and physical science in Pre K-4 curricula.
ESO 3. You will demonstrate planning science lessons, including effective teaching methods, selection of appropriate resources/materials/technology, and assessments that address state and national standards.
ESO 4. You will demonstrate teaching strategies that promote students' scientific inquiry, active involvement, and higher order thinking.
ESO 5. You will understand PA Science Standards
ESO 6. You will understand the National Science Education Standards (by the National Committee on Science Education Standards and the National Research Council).
ESO 7. You will understand strategies appropriate for differentiating instruction for Pre K-4 learners.
ESO 8. You will demonstrate integrating literacy, mathematics, social studies, art, and music within science lessons.
ESO 9. You will understand the nature and importance of environmental and ecological issues.
ESO 10. You will demonstrate class management and appropriate safety practices.

Required Texts

Victor, E., Kellough, R. D., & Tai, R. H. (2008). *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.

The Victor and Kellough text has a website at 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. The site has chapter links and multiple-choice quizzes, and a glossary.

Teaching Assignments and Classroom Activities

"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 additional relevant materials. 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?

Teaching Assignments

Teaching assignments focus on scientific concepts and scientific processes. Instructional strategies feature inquiry-based instruction. The objective of the lesson should require thinking above the knowledge level.

Discrepant events. You will participate in discrepant events so that you will be able to use them to arouse students' natural curiosity and develop their skills and knowledge in the sciences. Discrepant events will provide one method for examining students' preconceptions and reasoning patterns in order to establish prerequisite skills.

Experiments and demonstrations. As you participate in experiments, demonstrations, and subsequent discussions, you will appreciate the importance of engaging students in these learner centered activities to develop scientific reasoning and investigative strategies. Explicit rules and routines for class management will include methods for safety in the science classroom.

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.

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 Pre K-2 grade students, and one at 3-4 grade students. Each lesson will focus on one of the major areas of science (physical, life, earth). One of the lessons must integrate a literature book (specific guidelines will be given for designing this lesson), and the second lesson must 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.

When presenting your lesson, stay in your role throughout the lesson. (For example, do not talk to us as your classmates while it is in progress.) Speak with a vocabulary appropriate to the designated grade level, and prepare materials at that level as well. When you are the "students" for a lesson, stay in your role throughout the lesson. Do not attend to other activities, or have side conversations with classmates. There will be a sign-up sheet for microteaching lessons.

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 an area 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. There will be a sign-up sheet of topics for learning centers.

Written Assignments

There will be several kinds of written assignments. Written assignments may require use of outside texts and journals; these will serve to extend your understanding of teaching concepts and provide familiarity with educational resources.

Assignments should be professional in substance and appearance. All written work is to be prepared using a word processor. 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.

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 10, and six posts by November 19.

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 19.

Examinations. There will be two 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 a topic other than the specific ones you used for your microteaching and learning center. There will be a sign up sheet of topics for final projects. This project is your final examination.

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.

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 Elaine Mara, assistant director of learning services for academic and disability support at 1307 Main Street, or by calling 610-861-1510. Accommodations cannot be provided until authorization is received from the Academic Support Center.

Field Component

The purpose of the field experiences is to provide students with appropriate classroom experiences in a developmental and sequential manner. All field experiences are directly related to coursework and must be successfully completed to pass the education course. Students are required to follow all the procedures and guidelines as outlined in the field experience handbooks, and course syllabi. Failure to accurately report attendance and performance will be considered a violation of academic honesty policy and will result in appropriate sanctions as outlined in the Student Handbook. The Director of Field Experiences is responsible for securing all field placements. Students will be placed in field experiences only when all required clearances documents are current and indicate, “no record exists”. Students are also required to have a negative result on a current tuberculosis test.

You must be enrolled in EDUC 358.2, Pre-Student Teaching Field Experience at the same time you are taking EDUC 323. A separate syllabus will be distributed in EDUC 358.2 for your requirements in the field. Much of the material we will discuss in EDUC 323 you will be expected to transfer into your pre-student teaching experience. You will be expected to fulfill all the requirements and submit evidence of your performance in a portfolio. In addition your cooperating teacher will complete an evaluation of your competency in accordance with the Pennsylvania School Code Chapter 354. Your College instructor will visit you weekly to monitor your progress. You will keep a daily attendance sheet - you are required to complete a minimum of 75 hours during this experience - and submit that as evidence of your attendance at the conclusion of the experience. Due to holidays in the public schools, you will need to find additional hours to make sure you meet the minimum hours requirement. This experience is expected to totally prepare you for student teaching. You should expect to go beyond the requirements and prove your dedication and work ethic. Students who fall short of the expectations will not be approved for student teaching without completing further successful fieldwork.

Course Evaluation

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. 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

Week starting	Assignment due
8/27	Introduction Friedl - Ch. 1, 2
9/3	Universe Victor - Ch. 2, 9 Friedl - Ch. 14 (through p. 274) no class 9/3 for Labor Day
9/10	Earth Victor - Ch. 10
9/17	Universe and Earth Friedl - Ch. 11 (through p. 215), 15 (p. 274 - end) no class 9/17
9/24	Water, Weather, Climate Victor - Ch. 3, 11
10/1	Water, Weather, Climate Friedl - Ch. 12, 16 Exam on 10/3
10/8	Plants Victor - Ch. 12 Friedl - Ch. 18 no class 10/8 for Fall Break
10/15	Animals Victor - Ch. 14 Friedl - Ch. 19 no class 10/15
10/22	Plants and Animals Victor - Ch. 5
10/29	Human Body Victor - Ch. 15 Friedl - Ch. 19
11/5	Human Body and Genetics Victor - Ch. 7 Exam on 11/7
11/12	Matter and Energy Victor - Ch. 16 Friedl - Ch. 3, 4
11/19	Friction and Machines Victor - Ch. 17 Friedl - Ch. 5 no class 11/23 Thanksgiving Recess
11/26	Sound and Light Victor - Ch. 19 Friedl - Ch. 8
12/3	Learning Centers Conclusion

Environmental issues and Diverse learners methodology are integrated into the topics throughout the semester.

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