George Mason University

EDCI 553: SCIENCE METHODS FOR THE ELEMENTARY CLASSROOM (2)
Summer and Fall 2005

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Fall Office Hours: Tuesday 3:00-5:00 PM
Fall Class Meets: Tuesdays 9:00-12:00 PM
A412 Robinson Hall
Summer Class Meets: May 30, June 1 & 8 (9:30 – 2:15 PM)

I. Course Description
Helps students develop skills and abilities in science teaching methods, applications of technology, safety practices, and the creation of integrated science curricula. Examines science teaching based on contemporary theory, practice, and standards. Field experience in public schools is required. Prerequisite: Admission to the Full-time Elementary Education Licensure Program

II. Learning Outcomes
This course will enable students to:
A. Further develop your content knowledge base in science through a hands-on, inquiry-based approach that includes investigative problem-solving
B. Develop a series of interdisciplinary lesson plans utilizing a variety of science education materials and technology resources
C. Predict safety issues when preparing for a hands-on classroom experience
D. Collect a variety of materials for future use in your classroom via the course, PDS, and community resources
E. Examine science curricula and methods with respect to “Science for All” and standards documents at local, state, and national levels
F. Develop an annotated bibliography of resources aligned with Virginia’s Science Standards of Learning
G. Develop an assessment tool for use in the science classroom

III. Relationship to Program Goals and Professional Organizations
INTASC:

#1. The teacher understands the central concepts, tools of inquiry, and structures of the discipline he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.

#2. The teacher understands how children learn and develop, and can provide learning opportunities that support a child’s intellectual, social, and personal development.

#3. The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.

#4. The teacher understands and uses a variety of instructional strategies to encourage students’ development of critical thinking, problem solving, and performance skills.

#5. The teacher uses and understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

#6. The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement, in learning, and self-motivation.

#7. The teacher plans instruction based upon knowledge of subject matter, students, the community and curriculum goals.

#8. The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.
#9. The teacher is a reflective practitioner who continually evaluates the effects of his or her choices and actions on others and who actively seeks out opportunities to grow professionally.

#10. The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support student’s learning and well-being.

ACEI:

2c. Candidates know, understand, and use fundamental concepts in the subject matter of science—including physical, life, and earth and space sciences—as well as concepts in science and technology, science in personal and social perspectives, the history and nature of science, the unifying concepts of science, and the inquiry processes scientists use in discovery of new knowledge to build a base for scientific and technological literacy.

Technology (ISTE NETS):

I. Teachers demonstrate a sound understanding of technology operations and concepts.

II. Teachers plan and design effective learning environments and experiences supported by technology.

III. Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.

V. Teachers use technology to enhance their productivity and professional practice.

Student Outcomes Referenced to Selected National Standards

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>INTASC Principles</th>
<th>ACEI</th>
<th>ISTE NETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>2c</td>
<td>I, V</td>
</tr>
<tr>
<td>B</td>
<td>1, 2, 3, 4, 5, 6, 7, 8, 9</td>
<td>2c</td>
<td>I, II, III, V</td>
</tr>
<tr>
<td>C</td>
<td>2, 3, 6, 9</td>
<td>2c</td>
<td>I, V</td>
</tr>
<tr>
<td>D</td>
<td>4, 7, 10</td>
<td>2c</td>
<td>I, V</td>
</tr>
<tr>
<td>E</td>
<td>2, 3, 4, 7, 9, 10</td>
<td>2c</td>
<td>I, V</td>
</tr>
<tr>
<td>F</td>
<td>1, 2, 3, 4, 5, 7, 9, 10</td>
<td>2c</td>
<td>I, V</td>
</tr>
<tr>
<td>G</td>
<td>1, 7, 8, 9</td>
<td>2c</td>
<td>I, V</td>
</tr>
</tbody>
</table>

Key:

ISTE NETS = International Society for Technology in Education National Education Technology Standards 2000

INTASC = Interstate New Teacher Assessment and Support Consortium

ACEI = Association for Childhood Education International

IV. Nature of Course Delivery

Science is everywhere around us. Turning on our lights at night, baking a cake, throwing a basketball while expecting someone to catch it, and taking care of our bodies are just a few examples of how we use concepts in science on a daily basis. Research on student learning and motivation shows that effective teaching is grounded in students’ prior experiences and provides ample opportunities for students to explore more of their natural world in a social context. Through these opportunities, students gain new conceptual knowledge and skills while increasing their overall interest in the science discipline. In this course you will be exposed to a variety of content, curricula, and methods designed to shape your future teaching practices so that your future students will be motivated learners in your classroom.

Further research on the effects of increased conceptual knowledge and skills shows that education is a tool of empowerment. The aim of this course is to provide you with numerous experiences in science teaching to empower you as you strive to become an effective elementary classroom teacher. As you utilize experiences gained in this course while continuing in your life-long learning and development of your teaching practices, you will become more and more capable of providing experiences in your classroom that, in turn, will empower your own students to make informed decisions, seek new opportunities, and continue in their progress as life-long learners.
V. Required Texts & Readings


Course readings and related materials (handouts and e-reserves as necessary).

VI. Course Requirements

### Student Products Referenced to Learning Outcomes and Selected National Standards

<table>
<thead>
<tr>
<th>Products</th>
<th>Learning Outcomes</th>
<th>INTASC Principles</th>
<th>ACEI</th>
<th>ISTE NETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation Project</td>
<td>A, C, D, E</td>
<td>1, 2</td>
<td>2c</td>
<td>I, V</td>
</tr>
<tr>
<td>Community Resources Project</td>
<td>D, E</td>
<td>2, 3, 4, 5, 6, 7, 10</td>
<td>2c</td>
<td>I, II, V</td>
</tr>
<tr>
<td>Inquiry-Based Activity Journal</td>
<td>A, C, D, E</td>
<td>1, 2, 3</td>
<td>2c</td>
<td>I, II, V</td>
</tr>
<tr>
<td>Unit Project and micro-teaching</td>
<td>A, B, C, D, E, G</td>
<td>1, 2, 3, 4, 5, 6, 7, 9</td>
<td>2c, 3a, 4</td>
<td>I, II, III, V</td>
</tr>
<tr>
<td>Annotated Bibliography Project</td>
<td>D, F</td>
<td>1, 2, 3</td>
<td>2c</td>
<td>I, V</td>
</tr>
</tbody>
</table>

1. **Investigation Project** 10%

Participate in our in-class investigation experience and submit an experiment report based on the experience. Additionally, analyze your particular grade level’s SOLs in terms of the expectations for experiment reports by answering the following questions:

- What are the investigative skills that students are to learn during your selected grade level?
- How are each of these particular skills used during a controlled experiment?
- According to your clinical faculty member, describe the opportunities students have to learn and practice these skills during the school year.
- For this particular investigation, what are the safety hazards involved and what would you do to prevent them?

Detailed project descriptions and rubric expectations (including length of essays) can be found on Blackboard in the “Assignments” section.

2. **Community Resources Project** 20%

Research a community resource such as a museum or other informal science education setting that your school currently uses to teach science concepts and select one community resource which you would like to explore further. In this project, you will develop a description of available resources from your selected museum or informal science education setting that will be useful to teachers (for example, the resource’s education program for teachers, education program for students, particular exhibits, particular materials). Additionally, you will identify three activities, techniques, methods, resources, or content from this community resource that you intend to incorporate into your teaching. Justify your response for each item including mention of specific SOLs as well as reference to class readings. Lastly, you will reflect on the museum or other informal science education setting in terms of:

- Science as a human endeavor
- The nature of science
• The history of science
• The relationship of the science content provided by the museum or informal science education setting to the lives, interests, and needs of elementary students

Detailed project descriptions and rubric expectations (including length of essays) can be found on Blackboard in the “Assignments” section.

3. **Inquiry-Based Activity Journal** 20%

   Complete a journal documenting your participation during EDCI 553 class in three inquiry-based activities aligned with three different topics in your selected grade level’s science SOLs that also illustrates your **knowledge and understanding** of the inquiry-processes scientists use in the discovery of new knowledge. Develop teacher notes on content related to the activity to illustrate your **knowledge and understanding** of fundamental concepts in the subject matter of physical, life, earth, and space sciences. Finally, for each of your three activities develop/modify a student sheet that you would use to structure your particular students’ completion of the activity to support science learning. Detailed project descriptions and rubric expectations (including length of journal entries) can be found on Blackboard in the “Assignments” section.

4. **Unit Project and micro-teaching** 40%

   Building on the Integrated Unit completed as a part of course requirements for EDCI 554, develop the detailed lesson plans for your two week integrated unit that includes the content areas of social studies and science. Use the lesson plan format located in your PDS manual. You will also need to develop the student sheets and any other supporting materials needed for each of your lesson plans. Do not use student sheets “as is” because you will need to tailor these to fit the needs of your particular students you are teaching this semester. Additionally, you will complete either a NEW webpage or powerpoint presentation to be used during the unit and a culminating assessment of student learning for your unit. Detailed project descriptions and rubric expectations can be found on Blackboard in the “Assignments” section. You will need to self-score each part of your unit using the rubric expectations when you submit your work.

   During the semester in your PDS, teach a lesson from your unit to your students that includes a hands-on science experience. In addition to having your clinical faculty member complete an evaluation form for you, you will also need to complete a reflection on the experience. During your EDCI 553 class, you will teach 10-12 minutes of the same lesson plan (the hands-on science portion of the lesson) and will be evaluated by the course instructor via the evaluation form. Detailed descriptions of the micro-teaching task and a copy of the reflection guidelines and evaluation form can be found on Blackboard in the “Assignments” section.

5. **Annotated Bibliography Project** 10%

   Select three SOLs for a particular grade level. For each SOL you selected, find one example of a developmentally-appropriate book to use during the teaching of that particular topic/theme. For each book you select, you will need to provide the following information:
   a. Topic and SOL:
   b. APA citation:
   c. Summary of the book:
   d. Summary of the science concepts addressed via the book including your assessment of its accuracy using a reputable science content resource text (cite your resource):
   e. Your ideas about HOW the book can be used in the classroom to teach the science concepts:
   f. One example of an anticipated naïve theory or misconception of students regarding these science concepts that the book might propagate:
   g. Your strategy for how to prevent this:
   h. Your description of how the content of the book relates to a unifying principle in science:
   i. Your estimate of grade levels for which the book is developmentally-appropriate for read aloud AND for individual reading:
   j. Your name:

   Detailed project descriptions and rubric expectations (including length of essays) can be found on Blackboard in the “Assignments” section.
Special Note for All Projects:

Descriptions of expectations for each project can be found in course documents on Blackboard in “Assignments.” Project work will be evaluated according to rubric expectations. All products must be submitted in word-processed format on paper or electronically by email. Projects may be resubmitted based on instructor feedback and resubmitted once for re-scoring. Correct grammar and mechanics are expected of graduate students; work submitted with numerous errors may be returned to the student for editing before grading. APA style is required. All work must be submitted on the date due by 11:59PM unless prior arrangements are made with the instructor. The faculty coordinates due dates, so extensions should only be requested when absolutely necessary. Work that is submitted late without consulting the instructor will have points subtracted.

VII. Course Schedule

<table>
<thead>
<tr>
<th>Session</th>
<th>Topic/Learning Experiences</th>
<th>Readings &amp; Assignments</th>
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<tbody>
<tr>
<td>SUMMER</td>
<td>9:30 AM – 2:15 PM</td>
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</table>
| Wednesday, May 25 | --Discussion: Syllabus  
--Investigation: Mealworms and Poetry  
--Discussion: Investigation at the elementary level  
--Discussion: SOLs in science (bring to every class)  
--Complete information sheet and submit by email |                                                             |
| Wednesday, June 1 | --Investigation: Mealworms and Poetry  
--Discussion: Safety  
--Investigation: Cornstarch Putty  
--Discussion (cont’d): Investigation at the elementary level and the National Science Standards  
--Share: findings from Investigation Project | --Investigation Project due |
| Wednesday, June 8 | --Investigation: Ice Cream  
--Discussion: Learning Cycles in Science  
--Discussion: Community Resources  
--Discussion: Science Curriculum Frameworks (bring to every class) | --Read chapter 1 of textbook  
--Bring Science SOLs and Science Curriculum Frameworks to every class |
| FALL          | 9:00 AM – 12:00 PM                                                                         |                                                             |
| Tuesday, Aug 30 | No Class in Morning                                                                       | --Read chapter 1 of textbook  
--Bring Science SOLs and Science Curriculum Frameworks to every class |
| Tuesday, Sept. 13 | --Investigation: TBD  
--Discussion: Syllabus and Welcome Back!  
--Discussion: Review of Learning Cycles in Science  
--Discussion: What is science?  
--Discussion: Why hands-on? Why inquiry-based?  
--Discussion: Community resources: How does science relate to the real world?  
--Discussion: Strategies for locating text resources  
--Discussion: Unifying principles in science | --Read chapter 2 and 4 of textbook |
| Tuesday, Sept. 27 | --Share: findings from Community Resources Project  
--Discussion: Integration of Science and Other Content Areas  
--Video: Differentiation  
--Discussion: Differentiation in Science  
--Discussion: Guiding Questions | --Community Resources Project due  
--Read chapters 6, 8, and 9 of textbook |
<table>
<thead>
<tr>
<th>Date</th>
<th>Discussion</th>
<th>Assignment</th>
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<tbody>
<tr>
<td>Tuesday, Oct. 11</td>
<td>--Discussion: Assessment in Science</td>
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<tr>
<td>Tuesday, Oct. 18</td>
<td>--Discussion: Technology and Science</td>
<td>--Annotated Bibliography Project due (bring your books to class today)</td>
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<td></td>
<td>--Discussion: Safety</td>
<td>--Read chapters 3, 6 and 10 of textbook</td>
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<tr>
<td></td>
<td>--Share: findings from Annotated Bibliography Project (bring your actual books to class to share)</td>
<td></td>
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<tr>
<td></td>
<td>--Micro-teaching:</td>
<td></td>
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<td>Tuesday, Nov. 1</td>
<td>--Micro-teaching:</td>
<td>--Bring one lesson plan from your integrated unit to class today for peer feedback</td>
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<td>--Peer feedback: One lesson plan from integrated unit</td>
<td>--Read chapter 5 of textbook</td>
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<td>--Discussion: Gems from Chapter 5</td>
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<td>Tuesday, Nov. 15</td>
<td>--Micro-teaching:</td>
<td>--Bring one Inquiry-Based Journal entry to class today for peer feedback</td>
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<td></td>
<td>--Peer feedback: One inquiry-based journal entry</td>
<td>--Bring your culminating assessment and one lesson plan from your integrated unit to class today for peer feedback</td>
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<td></td>
<td>--Peer feedback: Culminating assessment</td>
<td>--Read chapter 7 of textbook</td>
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<td></td>
<td>--Peer feedback: One lesson plan from integrated unit</td>
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<td></td>
<td>--Gems from Chapter 7</td>
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<tr>
<td>Tuesday, Nov. 29</td>
<td>--Micro-teaching:</td>
<td>--Unit Project due and micro-teaching completed by this date</td>
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<td></td>
<td>--Share: Findings from Unit Project and Micro-Teaching</td>
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<td></td>
<td>--Discussion: The nature of science</td>
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<td></td>
<td>--Share: Findings from Inquiry-Based Journal</td>
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<tr>
<td>Tuesday Dec. 13</td>
<td>--Discussion: The practicalities of science in the elementary classroom</td>
<td>--Inquiry-Based Journal due</td>
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<tr>
<td></td>
<td>--Discussion: The nature of science</td>
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<tr>
<td></td>
<td>--Share: Findings from Inquiry-Based Journal</td>
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<td></td>
<td>--Course Evaluations and data collection</td>
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</tbody>
</table>
VIII. UNIVERSITY POLICIES

The university has a policy that requests students to turn off pagers and cell phones before class begins.

The Graduate School of Education (GSE) expects that all students abide by the following:

HONOR CODE
To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of George Mason University and with the desire for greater academic and personal achievement, George Mason University has set forth a code of honor that includes policies on cheating and attempted cheating, plagiarism, lying and stealing. Students must follow the guidelines of the University Honor Code. See http://www.gmu.edu/catalog/apolicies/#TOC_H12 for the full honor code.

INDIVIDUALS WITH DISABILITIES POLICY
The university is committed to complying with the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 by providing reasonable accommodations for applicants for admission, students, applicants for employment, employees, and visitors who are disabled. Students with disabilities who seek accommodations in a course must be registered with the GMU Disability Resource Center (DRC) and inform the instructor, in writing, at the beginning of the semester. See www.gmu.edu/student/drc or call 703-993-2474 to access the DRC.

ATTENDANCE POLICY
Students are expected to attend the class periods of the courses for which they register. Although absence alone is not a reason for lowering a grade, students are not relieved of the obligation to fulfill course assignments, including those that can only be fulfilled in class. Students who fail to participate (because of absences) in a course in which participation is a factor in evaluation, or students who miss an exam without an excuse, may be penalized according to the weighted value of the missed work as stated in the course syllabus (GMU University Catalog, pg. 32).

PROFESSIONAL BEHAVIOR & DISPOSITIONS
Students are expected to exhibit professional behavior and dispositions. See www.gse.gmu.edu for a listing of these dispositions.

Students must agree to abide by the university policy for Responsible Use of Computing. See http://mail.gmu.edu and click on Responsible Use of Computing at the bottom of the screen.

Approved March 2004