George Mason University
EDCI 553.001: SCIENCE METHODS FOR THE ELEMENTARY CLASSROOM (3)
Fall 2012 Intensive Program [EDCI553.001 CRN: 73235]

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Date/Time: **Mondays, 4:30-7:10pm**
Location: **Fairfax Campus, Rob A210**
Audience: **This course is only open to students in the Intensive Program of Elementary Education.**

I. Course Description

Develops skills and abilities in science teaching methods, applications of technology, safety practices, and creation of integrated science curricula. Examines science teaching based on contemporary theory, practice, and standards.
Prerequisite(s): Admission to elementary education licensure program.
Notes: Requires field experience in public schools.

II. Learning Outcomes

This course will enable students to:

A. Further develop your content knowledge base in science and health 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 and health 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, field site, and community resources
E. Examine science and health 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 and Health Standards of Learning
G. Develop an assessment tool for use in the science and health 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:
2.2 Science— Candidates know and understand fundamental concepts of physical, life, and earth/space sciences as delineated in the National Science Education Standards. Candidates can design and implement age-appropriate inquiry lessons to teach science, to
build student understanding of personal and social applications, and to convey the nature of science. (INTASC #1 Subject Matter Knowledge)

3.1 Integrating and applying knowledge for instruction— Candidates plan and implement instruction based on knowledge of students, learning theory, connection across the curriculum, curricular goals, and community. (INTASC #7 Planning)

3.4 Active engagement in learning— Candidates use their knowledge and understanding of individual and group motivation and behavior among students at the K-6 level to foster active engagement in learning, self- motivation, and positive social interaction and to create supportive learning environments. (INTASC #5 Management)

3.5 Communication to foster learning— Candidates use their knowledge and understanding of effective verbal, nonverbal, and media communication techniques to foster activity inquiry, collaboration, and supportive interaction in the elementary classroom. (INTASC #6 Communication)

5.2 Professional growth, reflection, and evaluation—Candidates are aware of and reflect on their practice in light of research on teaching, professional ethics, and resources available for professional learning; they continually evaluate the effects of their professional decisions and actions on students, families, and other professionals in the learning community and actively seek out opportunities to grow professionally. (INTASC #9 Reflection)

VA Health Education Standards of Learning:
Goal 1: Knowledge and Skills: Act with skill and reason to demonstrate an understanding of the concepts and behaviors that reduce health risks and enhance the health of self and others.

Goal 2: Information Access and Use: Demonstrate the ability to access, evaluate, and use health information, products and services that influence health and well-being in a positive manner.

Goal 3: Community Health and Wellness: Demonstrate the use of appropriate health practices and behaviors to promote a safe and healthy community when alone, with family, at school, and in other group settings.

Technology (ISTE NETS):
I. Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.

II. Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS•S.

III. Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.

IV. Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices.

V. Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.

Student Outcomes Referenced to Selected National Standards

Learning Outcomes	INTASC Principles	ACEI	VA Health	ISTE NETS
A	**1**	**2.2**	**1, 2, 3**	**I, II, III, IV, V**
B	**1, 2, 3, 4, 5, 6, 7, 8, 9**	**2.2, 3.1, 3.4, 3.5, 5.2**	**1, 2, 3**	**I, II, III, IV, V**
C	**2, 3, 6, 9**	**2.2, 3.5, 5.2**	**1, 2, 3**	**I, II, III, IV, V**
D	**4, 7, 10**	**2.2, 3.1**	**1, 2, 3**	**I, II, III, IV, V**
E	**2, 3, 4, 7, 9, 10**	**2.2, 3.1, 5.2**	**1, 2, 3**	**I, II, III, IV, V**
F	**1, 2, 3, 4, 5, 7, 9, 10**	**2.2, 3.1, 3.4, 5.2**	**1, 2, 3**	**I, II, III, IV, V**
G	**1, 7, 8, 9**	**2.2, 3.1**	**1, 2, 3**	**I, II, III, IV, V**

Key:
ISTE NETS = International Society for Technology in Education National Education Technology Standards 2010
INTASC = Interstate New Teacher Assessment and Support Consortium
ACEI = Association for Childhood Education International
VA Health = Virginia Health Education Standards

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).

Board of Education, Commonwealth of Virginia. (2010). *Standards of learning for Virginia Public Schools*. Available online: http://www.doe.virginia.gov/testing/sol/standards_docs/science/2010/complete/stds_all_science.doc PRINT INTRO and K-6 SCIENCE SOLS.

Board of Education, Commonwealth of Virginia. (2010). *Science standards of learning curriculum framework*. Available online: http://www.doe.virginia.gov/testing/sol/standards_docs/science/review.shtml DO NOT PRINT.

National Research Council (1996). *National science education standards.* Washington, DC: National Academy Press. Available Online: http://www.nap.edu/readingroom/books/nses DO NOT PRINT.

One* of these two texts:

Bass, J., Contant, T., & Carin, A. (2009). *Teaching science as inquiry, 11th edition*. Upper Saddle River, NJ: Pearson. OTHER EDITIONS ARE FINE.

Bass, J., Carin, A., & Contant, T. (2009). *Methods for teaching science as inquiry, 10th edition*. Upper Saddle River, NJ: Pearson. OTHER EDITIONS ARE FINE.

***Please note that the first option is more expensive, but contains lots of activity examples of science activities in the appendix. The second text is cheaper, but lacks the appendix of examples – I can't say the additional cost is worth it since there are so many science activities online and in other resources, so I've asked the bookstore to supply the second text.**

VI. Course Requirements

Student Products Referenced to Learning Outcomes and Selected National Standards

Products	Learning Outcomes	INTASC Principles	ACEI	VA Health	ISTE NETS
Inquiry-Based Unit Project	A, B, C, D, E, G	1, 5, 6, 7, 9	2.2, 3.1, 3.4, 3.5, 5.2	1, 2, 3	I, II, III, V
Investigation Project	A, C, D, E	1, 2	2.2, 3.4	1, 2, 3	I, V
Science Journal	A, C, D, E	1, 2, 3, 10	2.2, 5.2	1, 2, 3	I, II, V
Annotated Bibliography Project	D, F	1, 2, 3	2.2, 3.1	1, 2, 3	I, V
Technology Project	A, B, D	1, 2, 4, 7, 8	2.2, 3.1	na	I, II, III, V

1. Inquiry-Based Unit Project (INDIVIDUAL) 30%

Develop the detailed lesson plans for a two week integrated unit. Use the lesson plan format located in your program 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 theme of your unit. 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 your EDCI 553 class, you will teach 5-7 minutes of a lesson plan from your unit (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.

As your Performance-Based Assessment for EDCI 553, the following chart can be used to track your mastery of competencies as documented by your work on this assignment:

Standard	Rubric Item (must earn at least a 2 for all items to enter "MET" in your chart)
INTASC 1. Content (ACEI 2.2)	I, J, L, M
INSTASC 2. Development	Not Applicable
INTASC 3. Diversity	Not Applicable
INTASC 4. Instruction	Not Applicable
INTASC 5. Management (ACEI 3.4)	H, K, S, T
INTASC 6. Communication (ACEI 3.5)	N, O, P, R
INTASC 7. Planning (ACEI 3.1)	A, B, C, D, E, F
INTASC 8. Assessment	Not Applicable
INTASC 9. Reflection (ACEI 5.2)	G, Q, U
INTASC 10. Community	Not Applicable

2. Investigation Project (COMBINATION OF GROUP AND INDIVIDUAL) 15%

The academic year provides opportunity for you to observe science instruction in elementary schools. Additionally, you will participate in our in-class investigation experiences in EDCI 553 and submit an experiment report based on the experience. Additionally, for one elementary grade level, answer the following questions:

- What are the investigative skills that students are to learn during your selected grade level according to the grade level's science SOLs?
- How are each of these particular skills used during the design, performance, and/or reporting of a controlled experiment?
- According to local curriculum information you are able to find online or through other resources for that grade level, describe the opportunities students have to learn and practice these skills during the school year.
- To what extent did you observe children learning and practicing these skills? A. Describe what you saw OR

B. Describe opportunities in which the instruction you observed could be modified to enhance students' learning of investigative skills described in the grade level's SOLs or local curriculum guide.

- Based on your response to the fourth bullet, A. What were the safety hazards involved and how did you see the teacher prevent them? OR B. What would be the safety hazards involved and how could you prevent them?
- For the science investigation in EDCI 553 that you wrote an experiment report on, what are the safety hazards involved and what could you do to prevent them?

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

3. Science Journal (GROUP) 20%

Complete a journal documenting your participation during EDCI 553 class in eight inquiry-based activities and two visits you make to science-related community resource sites (total of 10 entries). For all activities and community visits, identify one standard from the K-6 science Virginia SOLs and its corresponding standard from the *National Science Education Standards* that could serve as the science content focus of the activity/visit. For each activity and visit, illustrate your **knowledge and understanding** of the content of this science standard through a mode of your choice (examples include: bulleted list, poetry, concept map, sheet you design for students with answer key, skit, story, diagram, model, child's work). For all activities, identify and explain how the activity relates to an aspect of the nature of science that are identified in class and how you could make this aspect of the nature of science explicit to elementary children via this activity/visit. Include documentation of your participation in each activity/visit (copy of handouts and any notes you took). **Upon conclusion of this assignment, your ten entries should include all eight areas of science: physics, chemistry, biology, health, meteorology, geology, oceanography, and space sciences.** Detailed project descriptions and rubric expectations (including length of journal entries) can be found on Blackboard in the "Assignments" section.

4. Annotated Bibliography Project (INDIVIDUAL) 15%

Select one SOL for a particular grade level. For the SOL you selected, find one example of a developmentally-appropriate book to use during the teaching of that particular topic/theme. For the 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 or cross-cutting concept in science:
i. Your description of how the content of the book relates to the nature of science:
j. Your name:

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

5. Technology Assignment (GROUP) 20%

Explore the probeware provided in class. Select one piece of technology that you wish to learn more about. In this project you will:

- Select a released SOL science test item (Grade 3, 5, or 8) that you feel the technology could prepare students to accurately answer.
- Identify a science SOL aligned with the test item.
- In one MSWord document, create a 5-E learning cycle that targets the standard, utilizes your selected technology, and incorporates the released item in the "evaluation" phase.
- Share your 5-E cycle in class via the computer projector, demonstrate how the technology works with volunteers from your audience, and go over the released item with your audience.

Detailed project descriptions and rubric expectations 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. *With exception of the PBA, projects may be resubmitted based on instructor feedback and resubmitted once for re-scoring. Project grade of A+ is indicative of performance consistent with "exceeds expectations" for all rows of project's scoring rubric. Project grade of A is indicative of performance consistent with "meets expectations" for all rows of project's scoring rubric. Project grade of B is indicative of performance consistent with no less than 80% of rows in the scoring rubric scored as at least"meets expectations." Please note that you may be required to resubmit projects.* 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

INTENSIVE PROGRAM - FALL 2012 CALENDAR

Session	**Topic/Learning Experiences**	**Readings & Assignments**
FALL	**Mondays, 4:30 PM – 7:10 PM**	
Monday, Aug 27	--Investigation: Mealworms and poetry --Discussion: How are the mealworm activities aligned with the Virginia science SOLs? (Introduce science SOLs and curriculum framework website) --Discussion: Investigation at the elementary level, National Science Standards, Community resources – How does science relate to the real world? (Introduce Science Journal)	**--Bring Science SOLs to every class**
Monday, Sept 10	--Discussion: Safety --Discussion: Nature of Science --Investigation: Cornstarch putty --Discussion: Parts of controlled experiment (Introduce Investigation Project) --Investigation continued: Group experiment	--Chapter 1 (Children, Science, and Inquiry: Some Preliminary Questions) --Chapter 2 (Processes and Strategies for Inquiry) --Chapter 5 (Planning and Managing Inquiry Instruction)
Monday, Sept 17	--Share: Findings from group experiments --Discussion: Poetry and the nature of science (Article distributed during last class) --Discussion: Learning cycles in science --Discussion: Learning cycles in science and the role of children's literature (Introduce Annotated Bibliography Project)	***--Investigation Project due*** --Read article "Poetry in Two Voices: Poetry and the Nature of Science" --Chapter 4 (Teaching Science for Understanding: The 5-E Model...)
Monday, Sept 24	--Share: Findings from Annotated Bibliography Project (bring your children's book to class to share) --Discussion: Why hands-on? Why inquiry-based? --Discussion: Unifying principles in science --Investigation: Technology and science (probes) --Investigation: Mentos (if time)	***--Annotated Bibliography Project due electronically (bring your children's book to class today)*** --Chapter 8 (Technology Tools & Resources for Inquiry Science)
Monday, Oct 1	--Share: Technology Project --Discussion: Strategies for integrated curriculum planning (Problem-based, project-based, and Jacobs model) --Discussion: Weather Tamers (Article distributed during last class) --Population Connection website (http://www.populationconnection.org) as example of integrated social studies and science instruction (Introduce Inquiry-Based Unit Project) --Work on units and plan for micro-teaching	***--Technology Project due*** --Read article "Weather Tamers" --View Population Connection website during class --Chapter 9 (Connecting Science With Other Subjects)
Tuesday, Oct 8	Visit to science-related community resource (Class will not meet on campus)	--Chapter 3 (Learning Science with Understanding)

Monday, Oct 15	--Video: Differentiation --Discussion: Differentiation in science --Discussion: Guiding questions --Work on units and plan for micro-teaching	--Chapter 10 (Science for All Learners) --Chapter 7 (Effective Questioning)
Monday, Oct 22	--Peer feedback: One lesson plan from unit --Discussion: Questioning strategies --Discussion: Assessment in Science	**--Bring one lesson plan from your unit for peer feedback** --Chapter 6 (Assessing Sci…)
Monday, Oct 29	--Peer feedback: Culminating assessment --Micro-teaching:	**--Bring your culminating assessment from your unit for peer feedback**
Thursday through Saturday, Nov 10-12	Virginia Association of Science Teachers Professional Development Institute (Roanoke, Virginia); see http://www.vast.org for registration details	--Science teaching strategies shared by teachers, agencies, science resource companies --Exhibit hall of resources
Monday, Nov 5	--Micro-teaching: --Discussion: The practicalities of science in the classroom	**--Bring your culminating assessment from your unit for peer feedback**
Monday, Nov 12	--Micro-teaching: --Discussion: The practicalities of science in the classroom	
Monday, Nov 19	--Micro-teaching: --Discussion: The practicalities of science in the classroom	
Monday, Nov 26	Visit to science-related community resource (Class will not meet on campus)	--Chapter 3 (Learning Science with Understanding)
Monday, Dec 3	--Micro-teaching: --Course evaluations	***--Micro-teaching completed*** ***--Science Journal due***
Monday, Dec 10	University Reading Day – No scheduled class meeting according to university policy	
Monday, Dec 17	Individual Progress Meetings and/or Make-Up Date	***--Unit Project due at end of class via email only***

George Mason University Policies and Resources for Students

a. Academic integrity (honor code, plagiarism) – Students must adhere to guidelines of the George Mason University Honor Code [See http://academicintegrity.gmu.edu/honorcode/].

b. Mason Email – Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, division, and program will be sent to students solely through their Mason email account. Students must follow the university policy for Responsible Use of Computing [See http://universitypolicy.gmu.edu/1301ge.html].

c. Counseling and Psychological Services – The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops, and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu/].

d. Office of Disability Services – Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor in writing at the beginning of the semester http://ods.gmu.edu/].

e. Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.

f. The Writing Center (Optional Resource) – The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See http://writingcenter.gmu.edu/].

g. University Libraries (Optional Resource) – The George Mason University Libraries provide numerous services, research tools, and help with using the library resources [See http://library.gmu.edu/].

Core Values Commitment: The College of Education and Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles.

GSE website: www.gse.gmu