

**George Mason University**  
**College of Education and Human Development**  
**Early Childhood Education**

ECED 516.001 Science for Diverse Young Learners  
3 Credits, Spring 2018  
Mondays/ 4:30 – 7:10 pm  
Thompson Hall L028, Fairfax Campus

**Faculty**

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**Prerequisites/Corequisites**

Recommended prerequisite: ECED 403 or ECED 503

**University Catalog Course Description**

Examines ways to foster development of science in preschool to third-grade children. Covers construction of science lessons and hands-on experiences that promote learning in children with diverse abilities and cultural and linguistic backgrounds. Offered by Graduate School of Education. May not be repeated for credit.

**Course Overview**

Not applicable

**Course Delivery Method**

This course will be delivered using a lecture and discussion format.

**Learner Outcomes or Objectives**

This course is designed to enable students to do the following:

1. Develop an understanding of the changing focus in both curricula and pedagogy at the early childhood level and implications for science instruction.
2. Develop strategies to help young children become scientifically literate, think critically and creatively, and to see the relationships between science and other content areas.
3. Identify the skills necessary to utilize a variety of methods in teaching science to young children.
4. Demonstrate an ability to select, modify, and present instructional strategies to engage young learners in science.
5. Develop science activities for young children using the scientific process with an emphasis on describing, analyzing, and quantitatively presenting findings.
6. Construct science experiences in an environment that promotes equity and responds to cultural, linguistic, and ability diversity.
7. Use state and local curriculum standards for science and national-level science standards to plan instruction.
8. Describe the role of family and community knowledge, experience, and resources in planning and implementing science content in the curriculum.

9. Use a variety of sources for ideas and materials useful in teaching science when planning instruction.
10. Integrate science objectives into planning and implementing an integrated project.
11. Develop authentic assessment strategies to describe young children's understanding of science concepts.
12. Reflect on one's own use of inquiry strategies in facilitating children's learning of science concepts.

**Professional Standards** (Council for Exceptional Children and National Association for the Education of Young Children)

Upon completion of this course, students will have met the following professional standards:  
Not applicable

**Required Texts**

- American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: Author.
- Peters, J. M., & Stout, D. L. (2011). *Science in elementary education: Methods, concepts, and inquiries* (11th ed.). Boston: Pearson. ISBN: 9780135031506
- Shillady, A. (Ed.) (2013). *Spotlight on young children: Exploring science*. Washington, DC: National Association for the Education of Young Children. ISBN: 9781928896944

**Required Online Documents**

- Achieve Inc. (2013). *Next generation science standards*. Washington, DC: Author.  
<https://www.nextgenscience.org/search-standards>
- Virginia Department of Education. (2010). Science standards of learning.  
[http://www.doe.virginia.gov/testing/sol/standards\\_docs/science/index.shtml](http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml)
- Virginia Department of Education. (2010). Science curriculum framework.  
[http://www.doe.virginia.gov/testing/sol/standards\\_docs/science/index.shtml](http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml)
- Virginia Department of Education. (2013). Virginia foundation blocks for early learning: Comprehensive standards for four-year-olds.  
[http://www.doe.virginia.gov/instruction/early\\_childhood/](http://www.doe.virginia.gov/instruction/early_childhood/)

**Course Performance Evaluation**

Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard, Tk20, hard copy).

<b>Assignments</b>	<b>Due Dates</b>	<b>Points</b>
Attendance and Participation	Ongoing	<b>15</b>
Personal Journal Part 1 Part 2	January 29 May 14	<b>20</b>
Science Activity Share	Variable	<b>20</b>
Enriching Science Inquiry with Literature	February 19	<b>5</b>
5E/PBL Lesson Plan	March 19	<b>15</b>
Science Lesson Implementation and Reflection Part 1 Part 2	April 9 May 7	<b>25</b>
<b>TOTAL</b>		<b>100</b>

- **Assignments and/or Examinations**

**Personal Journal (Part 1=10 points; Part 2=10 points)**

Part 1: To initiate class experiences, students will write a critical reflection on their personal experiences as a learner of math (2 pages). They will use the following prompts to help guide their reflection process.

- Begin with your earliest memories (give examples) and reflect until the present as a graduate student in a teacher preparation program.
- Reflect on your experiences in school, out of school, in the context of your family, etc.
- How do you see yourself as a math learner?
- Why do you think you feel that way?
- How do you think these experiences will shape you as a teacher of math? In other words, what positive impacts or challenges on your teaching practice do you foresee from your prior experiences or self-conception?

Part 2: In conclusion of the course, students will revisit their initial thoughts in their first journal entry and reflect on how their thoughts and/or self-conception have changed, if at all (2 pages). They will use the following prompts to help guide their reflection process.

- What have you learned in the course?
- Do you view yourself as a math learner differently than you did before?
- Is there a concept you learned in the course that really stuck out for you? (Include references to course readings, as necessary.)
- Is there a particular reading, handout, or material from class that you found particularly helpful or eye-opening? (Include references to course readings, as necessary.)
- Articulate the kind of early childhood mathematics teacher you plan to be. Will something you learned in the course be included in your guiding principles?

**Science Activity Share (20 points)**

Students will choose a science content area listed on the class schedule on the syllabus during the first class session in which to present an activity. Three students will sign up per content area: one person will focus on preK, one on K-grade 1, and one on grades 2-3. Individual students will prepare a lesson plan using the template provided and lead an informative and interactive center on their science content area to a small group of classmates. During the center, each student will include the following:

- An overview of the topic, including the key ideas or content and the importance of the topic to students' science learning.
- An overview of relevant state and national content standards at the appropriate grade level(s), noting consistencies (or inconsistencies, if the case may be).
- Modeling of how to engage in the activity. The student will then oversee classmates engaging in the activity by assisting and answering questions. Students will bring or borrow from the instructor all appropriate materials for the activity.
- Preparation for how to adapt the center activity for a range of learners should be evident.
- A list of at least three resources related to teaching the topic that could include children's literature, websites, manipulatives or materials, or other teacher resources (at least one must be a relevant developmentally appropriate picture book and one must be an article from a practitioner journal on the topic).
- All share materials (lesson plan, resources) will be posted on Blackboard under Discussion Board before the presentation.

### **Enriching Science Inquiry With Literature: A Focus on Reading and Writing (5 points)**

Students will identify a focused science concept area and compile a chart of at least 10 literature resources, including fiction, non-fiction, digital, and non-digital forms, that promote children's engagement in the science concept. The chart will provide a brief summary of the text, identify possible literacy experience(s) for the resource (e.g., read aloud, guided reading, exploration center, research text, independent reading, as a resource to promote writing, etc.), and identify possible 5E entry points for the resource (i.e., engage, explore, explain, elaborate, evaluate).

### **5E/PBL Lesson Planning (15 points)**

Students will use both an **inquiry-based** (5E model) and a **problem-based** approach to develop a detailed 5E lesson plan for one of the following science areas: physical science, life science, earth/space science, or engineering. Students will integrate questioning, curiosity, and active engagement, with real materials in the lesson whenever possible. They will use the lesson plan format provided by the instructor. In addition, students will develop the student sheets and any other supporting materials needed for their lesson. Students will create an assessment of student learning for their lesson and a rubric for the assessment.

### **Science Lesson Implementation and Reflection (25 points)**

In two-person partnerships, students will choose a developmentally appropriate science lesson from either the VA Department of Education or *Picture-Perfect Science Lessons* series (NSTA Press). They will implement the lesson during one of two "Afternoons of STEM Learning" at the Mason Child Development Center (CDC) to multiple groups of preschool children, making necessary modifications and taking reflective notes. Students will bring any necessary materials for the lesson. Students will visit the CDC two consecutive times. One partner will teach the lesson while the other partner takes anecdotal notes during the lesson iterations; the next week the partners will switch roles. Students will submit a written reflection in two parts.

- Part 1—Planning the Lesson (15 points). The first part of the reflection will be due before the experience and will include how the lesson was selected and how the student prepared to implement the lesson. Preparation of all of the necessary materials for the lesson so the student was prepared to implement the lesson upon arrival at the CDC on the assigned day will be assessed in this part. (1-2 pages)
- Part 2—Reflecting on the Lesson (10 points). The second part will be due after the experience and will include how the lesson went (what went well, what could have been done differently/better for next time), key learnings, and "aha" moments. Students will reflect on both teacher learning (themselves) and student learning during the lesson. Students will provide specific linkages to course readings. Partners will submit reflections independently. (2 pages)

- **Other Requirements**

### **Attendance, Participation & Professional Dispositions (15 points)**

Because active participation and engagement are imperative for optimal learning, preparation for and participation in in-class activities will be evaluated based on the following criteria:

- Students attend class, arrive on time, and stay for the entire class period. (It is your responsibility to attend all class sessions. You are held accountable for all information from each class session, whether you are present or not. A make-up assignment will be required in the case of an absence. Reasons for any absence must be reported to the instructor in writing.)

- Students complete readings and prepare for class activities prior to class as is evidenced by their ability to discuss and write about the concepts presented and examined in the texts as well as participate fully in related activities.
- Students are actively involved in in-class and online learning experiences as is evidenced by (a) participating in all activities, (b) engaging in small and large group discussions, (c) completing written work related to the activities, and (d) supporting the participation and learning of classmates.
- Students show evidence of critical reflective thinking through in-class and online discussions, activities, and written reflections.
- Professional dispositions are to be displayed at all times while interacting with the instructor and other students. **Cell phones are not to be used during class. Laptops are to be used for instructional purposes only.**

**Note:** To determine whether the campus is closed due to inclement weather, call 703-993-1000 or go to [www.gmu.edu](http://www.gmu.edu).

### Written Assignments

Assignments are due on the assigned day. Extensions for assignments must be requested in writing *before* the assignment is due. Extensions only will be granted for extenuating circumstances. Grade point deductions will be taken for every additional day an assignment is late. All formal written assignments will be evaluated for content and presentation. The American Psychological Association, Sixth Edition (APA) style will be followed for all written work. All written work unless otherwise noted must be completed on a word processor and should be proofread carefully. (Use spell check!) If students are not confident of their own ability to catch errors, they should have another person proofread their work. When in doubt, they should check the APA manual. Portions of the APA manual appear at the Style Manuals link on the Mason library website at <http://infoguides.gmu.edu/content.php?pid=39979>. Students may consult the Writing Center for additional writing support.

Students will do the following:

1. Present ideas in a clear, concise, and organized manner. (Avoid wordiness and redundancy.)
2. Develop points coherently, definitively, and thoroughly.
3. Refer to appropriate authorities, studies, and examples to document where appropriate. (Avoid meaningless generalizations, unwarranted assumptions, and unsupported opinions.)
4. Use correct capitalization, punctuation, spelling, and grammar.
5. Type the paper with double spacing, indented paragraphs, 1-inch margins all around, and 12-point Times New Roman font.

- **Grading**

A = 95-100    A- = 90-94    B+ = 87-89    B = 80-86    C = 70-79    F = < 70

Incomplete (IN): This grade may be given to students who are passing a course but who may be unable to complete scheduled coursework for a cause beyond reasonable control.

All CEHD undergraduate and graduate students are held to the university grading policies as described in the Academic Policies section of the current catalog, which can be accessed at <http://catalog.gmu.edu>. Those students enrolled in a CEHD Licensure Graduate Certificate program, however, must earn a B- or better in all licensure coursework. A degree-seeking graduate student will be dismissed after accumulating grades of F in two courses or 9 credits of unsatisfactory grades

(C or F) in graduate courses. A 3.0 grade point average is required for completion of the graduate degree.

### Professional Dispositions

Students are expected to exhibit professional behaviors and dispositions at all times. See <https://cehd.gmu.edu/students/policies-procedures/>.

### Class Schedule

<b>Date</b>	<b>Topics</b>	<b>Readings &amp; Assignments</b>
Jan 22	Inquiring Minds in the Classroom Inquiry, Nature of Science	Peters & Stout (2011) Chapter 1 Spotlight: Science, p. 2-10
Jan 29	Discovering Science Through Inquiry Constructivist Approach to Teaching Relevant Learning Theories/Theorists 5E Model	Peters & Stout (2011) Chapter 2 Spotlight: Science, p. 41-47 <u>On Blackboard:</u> <i>Piaget Information</i> <i>Vygotsky Information</i> <i>Multiple Intelligences</i> <i>Bloom's Taxonomy</i> <b>Due – Personal Journal-Part 1</b>
Feb 5	Planning for Inquiry, Backwards Design, Problem-Based Learning (PBL) Approach Introduction to Science Standards (National Standards, VA SOLs) Integrating Science With Other Content Areas (e.g., Literacy, Math)	Peters & Stout (2011) Chapter 3 Spotlight: Science, p. 72-73 48-54, 68-71 <u>On Blackboard:</u> <i>Weather Tamers</i> <i>Modeling Problem-Based Instruction</i>
Feb 12	Inquiry and Assessment Introduction to <i>Picture-Perfect Science Lessons</i> Series (NSTA Press)	Peters & Stout (2011) Chapter 4 Spotlight: Science, p. 48-54, 68- 71 <u>On Blackboard:</u> <i>Performance-Based Assessments in Science</i>
Feb 19	Inquiry and Science as Practice Promoting Scientific Skills: Observing, Classifying, Measuring, Communicating, Inferring, Predicting, and Experimenting	Peters & Stout (2011) Chapter 5  <b>Due – Enriching Science Inquiry with Literature</b>
Feb 26	Inquiry Experiences for <i>All</i> Children Celebrating Diversity  <b>Science Activity Share EXAMPLE (Instructor Led)</b>	Peters & Stout (2011) Chapter 6 Spotlight: Science 61-67 <u>On Blackboard:</u> <i>Science Success for Students with Special Needs</i>
Mar 5	Physical Science Inquiry Unit • Light, Energy, Matter, Sound  <b>Science Activity Share – Physical Science I</b>	Peters & Stout (2011) Inquiry Unit 1, pp. 180-252 Spotlight: Science, p. 29-35
Mar 12	<b>No Class – Spring Break</b>	
Mar 19	Physical Science Inquiry Unit • Magnetism, Electricity, Simple Machines	Peters & Stout (2011) Inquiry Unit 1, pp. 253-325

	<b>Science Activity Share – Physical Science II</b>	<b>Due – 5E/PBL Lesson Plan</b>
Mar 26	<p>Life science Inquiry Unit</p> <ul style="list-style-type: none"> <li>Plants, Animals (Vertebrates), Molds, &amp; Fungi</li> </ul> <p><b>Science Activity Share – Life Science</b></p>	<p>Peters &amp; Stout (2011) Inquiry Unit 2, pp. 328-383 Spotlight: Science, p. 11-16, 23-28</p> <p><u>On Blackboard:</u> <i>Blending In-Using an Adaptation Activity to Integrate Math and Science</i></p>
Apr 2	<p><b>No Face-to-Face Class – Alternative Online Format</b></p> <p>Life Science Inquiry Unit</p> <ul style="list-style-type: none"> <li>Animals (Invertebrates), Habitat, Human Body (Systems and Nutrition)</li> </ul> <p>Interactive Science Notebooks, Environmental Education</p>	<p>Peters &amp; Stout (2011) Inquiry Unit 2, pp. 384-427 Spotlight: Science, p. 36-40</p> <p><u>On Blackboard:</u> <i>Science Journals in the Preschool Classroom Teaching with Play-An Introduction to Environmental Stewardship for Preschoolers</i></p>
Apr 9	<p>Earth and Space Science Inquiry Unit</p> <ul style="list-style-type: none"> <li>Earth’s Surface, Soil, Earthquakes, Rocks, Water</li> </ul> <p><b>Science Activity Share – Earth and Space Science I</b></p>	<p>Peters &amp; Stout (2011) Inquiry Unit 3, pp. 430-471 Spotlight: Science, p. 61-67</p> <p><b>Due – Science Lesson Reflection (Part 1)</b></p>
Apr 16	<p>Earth and Space Science Inquiry Unit</p> <ul style="list-style-type: none"> <li>Air, Weather, Times, Seasons, Moon, Earth and Sun Orbits, Solar System and Beyond</li> </ul> <p>Technology in Early Childhood Science</p> <p><b>Science Activity Share – Earth and Space Science II</b></p>	<p>Peters &amp; Stout (2011) Inquiry Unit 3, pp. 472-514 Spotlight: Science, p. 17-22</p> <p><u>On Blackboard:</u> <i>Representation of the Moon in Children’s Literature Meaningful Technology Integration in Early Childhood</i></p>
Apr 23	<p>The “E” in STEM – Engineering Using Community Resources &amp; Field Trips to Enhance Science Instruction</p> <p><b>Science Activity Share – Engineering</b></p> <p><i>CDC Visit #1 – Science Lesson Implementation 4:30-5:30 pm</i></p>	<p>Spotlight: Science, p. 55-60</p> <p><u>On Blackboard:</u> <i>They Can’t Spell Engineering but They Can Do It Young Learners at a Natural History Museum</i></p>
Apr 30	<p>Science Inquiry Invitations for Family Explorations (Home-School Connections) Self-Reflections on Filling the Role of Science Teacher for Diverse Young Learners</p> <p><i>CDC Visit #2 – Science Lesson Implementation 4:30-5:30 pm</i></p>	

May 7	<b>No Class – Reading Day</b>	<b>Due – Science Lesson Reflection (Part 2)</b>
May 14	<b>No Class – Finals Week</b>	<b>Due – Personal Journal-Part 2</b>

Note: Faculty reserves the right to alter the schedule as necessary, with notification to students.

### **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: <http://cehd.gmu.edu/values/>.

### **GMU Policies and Resources for Students**

#### *Policies*

- Students must adhere to the guidelines of the Mason Honor Code (see <https://catalog.gmu.edu/policies/honor-code-system/>).
- Students must follow the university policy for Responsible Use of Computing (see <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- Students are responsible for the content of university communications sent to their Mason email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students **solely** through their Mason email account.
- Students with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see <http://ods.gmu.edu/>).
- Students must follow the university policy stating that all sound emitting devices shall be silenced during class unless otherwise authorized by the instructor.

#### *Campus Resources*

- Support for submission of assignments to Tk20 should be directed to [tk20help@gmu.edu](mailto:tk20help@gmu.edu) or <https://cehd.gmu.edu/aero/tk20>. Questions or concerns regarding use of Blackboard should be directed to <http://coursessupport.gmu.edu/>.
- For information on student support resources on campus, see <https://ctfe.gmu.edu/teaching/student-support-resources-on-campus>.

**For additional information on the College of Education and Human Development, please visit our website: <https://cehd.gmu.edu/students/>.**