George Mason University
College of Education and Human Development
Elementary Education Program

ELED 553 Section 6K2
Science Methods for the Elementary Classroom (3 credits)
Spring 2023 (Jan. 9 – March 3)
Tuesdays Online Synchronous 5:00-7:10; Thursdays Online Asynchronous

Professor: Dr. Steph Dean
Office Hours: Zoom hours by appointment
Office Location: Thompson Hall Rm 1800
Phone: Cell provided in class
Email: sdean20@gmu.edu

COURSE DESCRIPTION

Prerequisites/Corequisites: Admission to the Elementary Education licensure program

University Catalog 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.

Expanded Course Description: The primary goals of this course are to provide you with practical experience, theoretical background, and pedagogical skills that will help you to be successful in your future career as a teacher. Two main themes run through the course: 1) inquiry-based pedagogy, and 2) science and health content. With respect to content, the course is intended to help develop your background knowledge with the goal of successful teaching in an elementary science context. This course will also consider the intersections of science, self, and society through an exploration of healthrelated content including human body systems, nutrition, emotional health, and identity.

A troubling concern we will address is that children often come to school with a keen interest in the world around them, but by the end of elementary school there is a noted waning of interest in science. This is at least partially attributed to the ways in which “school science” does not always emphasize the experiences of beauty, joy, liveliness, and meaningful learning that can come from engaging with science and connecting scientific understanding to the everyday experiences of children. Consequently, we will explicitly consider experiences involving wonder, actively building/creating new knowledge and the joy of discovery as opposed to the rote memorization of 'science facts.' For this reason, we will utilize inquiry and constructivist approaches to learning as a means of approaching science content that is too often presented as an exercise in the acquisition of vocabulary.

Another intention of this course is to illuminate and sometimes problematize circulating assumptions related to science. For example, opportunities will be provided for us to experience encounters together that make us wonder about the world, our relationship with it, and our role within it, as a part of the natural world – not just as observers and/or exploiters of it. Also, science will be presented in a realistic light where scientists are recognized as humans, living in a specific time, and in a specific place, struggling to better understand the world (just like the rest of us) as opposed to omnipotent, infallible heroes that society and textbooks sometimes portray.

Course Delivery Method

This course will be delivered online using both synchronous and asynchronous formats via Blackboard Learning Management System and Zoom platform. You will log in to the Blackboard course site *and* Zoom using your Mason net ID and password. Online synchronous via Zoom 40%, Online asynchronous 60%.

Under no circumstances, may candidates/students participate in online class sessions (either by phone or Internet) while operating motor vehicles. Further, as expected in a face-to-face class meeting, such online participation requires undivided attention to course content and communication.

Technical Requirements

To participate in this course, students will need to satisfy the following technical requirements:

- High-speed Internet access with standard up-to-date browsers. To get a list of Blackboard's supported browsers see: https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#supported-browsers
  To get a list of supported operation systems on different devices see: https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#tested-devices-and-operating-systems
- Students must maintain consistent and reliable access to their GMU email and Blackboard, as these are the official methods of communication for this course.
- Students may be asked to create logins and passwords on supplemental websites and/or to download trial software to their computer or tablet as part of course requirements.
- The following software plug-ins for PCs and Macs, respectively, are available for free download:
  - Adobe Acrobat Reader: https://get.adobe.com/reader/
  - Windows Media Player: https://support.microsoft.com/en-us/help/14209/get-windows-media-player
  - Apple Quick Time Player: www.apple.com/quicktime/download/

Expectations

- Course Week:
  Our course week will begin on Mondays at 12 am and will end on Sundays at 11:59 pm.
- Log-in Frequency:

Students must actively check the course Blackboard site and their GMU email for communications from the instructor, class discussions, and/or access to course materials at least 4 times per week.

- Participation:
  Students are expected to actively engage in all course activities throughout the semester, which includes viewing all course materials, completing course activities and assignments, and participating in course discussions and group interactions.
- Technical Competence:
  Students are expected to demonstrate competence in the use of all course technology. Students who are struggling with technical components of the course are expected to seek assistance from the instructor and/or College or University technical services.
- Technical Issues:
  Students should anticipate some technical difficulties during the semester and should, therefore, budget their time accordingly. Late work will not be accepted based on individual technical issues.
- Workload:
  Please be aware that this course is not self-paced. Students are expected to meet *specific deadlines* and *due dates* listed in the **Class Schedule** section of this syllabus. It is the student's responsibility to keep track of the weekly course schedule of topics, readings, activities and assignments due.
- Instructor Support:
  Students may schedule a one-on-one meeting to discuss course requirements, content or other course-related issues. Those unable to come to a Mason campus can meet with the instructor via telephone or web conference. Students should email the instructor to schedule a one-on-one session, including their preferred meeting method and suggested dates/times.
- Netiquette:
  The course environment is a collaborative space meant to foster independent thought and critical analysis of complex ideas. Be open to the thoughts of others, particularly when they may be different from your own. Seek first to understand another's perspective from their point of view. Do not be afraid to ask one another difficult questions, but be positive in your approach and thoughtful with your words. Remember that you are not competing with classmates, but sharing information and learning from others. All faculty are similarly expected to be respectful in all communications.
- Accommodations:
  Online learners who require effective accommodations to insure accessibility must be registered with George Mason University Disability Services.

Learner Outcomes or Objectives

This course will enable students to:

A. Build a pedagogical content knowledge base in science and understand the systems of nature in Earth science, biology, chemistry and through inquiry-based investigation
B. Conceptualize core principles regarding the Nature of Science, i.e., how wonder, creativity experimentation, and evidence frame scientific thinking, as well as how theory is used in predicting and explaining phenomena.

C. Engage in and use scientific practices such as data collection, analysis, modeling, use of evidence, construction of explanations, reliability, self-checking, and identification of limitations to conduct research experiments.
D. Understand the historical development of scientific concepts and the social, cultural, and economic significance of science.
E. Understand and use knowledge, skills, and practices of the four core science disciplines of Earth science, biology, chemistry, and physics to develop lesson plans demonstrating inquiry-based principles in science and health education including the incorporation of technology
F. Demonstrate age-appropriate safety standards when designing hands-on classroom experiences
G. Examine science and health curricula and methods with respect to "Science for All" and standards documents at local, state, and national levels
H. Develop viable assessment tools for science and health contexts
I. Understand the relationship of science to math, the design process, and technology.
J. Understand, possess, and integrate the knowledge, skills, dispositions, and processes needed to support learners' achievement in an interdisciplinary manner in Virginia's Foundation Blocks for Early Learning: Comprehensive Standards for Four-Year-Olds and the Virginia Standards of Learning in English, mathematics, history and social science, science, and computer technology

Professional Standards
INTASC: *Interstate Teacher Assessment and Support Consortium*, Model Core Teaching Standards
Upon completion of this course, students will have met the following professional standards:

#4. Content Knowledge. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make the discipline accessible and meaningful for learners to assure mastery of the content.
#5. Application of Content. The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.
#6. Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.
#7. Planning for Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.
#8. Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

Technology (ISTE NETS): *International Society for Technology in Education / National Educational Technology Standards*

Standard 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.

REQUIRED TEXTS AND READINGS

All required readings will be provided via Blackboard

Suggested Text

Madanes, S. (2016). *Everything You Need to Ace Science in One Big Fat Notebook.* (Geisen, M., Ed.). Workman Publishing.

COURSE ASSIGNMENTS

All assignment sheets, templates, and rubrics will be available on Blackboard.

Assignment	**Due Date**	**Total Points**
Course engagement and participation	Ongoing	50 points (5 per session)
Wonder Journal	Ongoing Selection of entries due Feb 19 by 11:59 pm	10
Science Lesson Analysis	Feb. 12 by 11:59 pm	10
5E Lesson Project (PBA*)	March 5 by 11:59 pm	30

* Designated performance-based assessment (PBA)

1. Participation [Course goals: A-F] 50%

Success in the course is predicated on being an active participant in the learning process. To this end, there will be a number of Bb discussion board assignments, online activities, and readings over the duration of the course that will also be included in your overall participation. My expectation is that active and engaged students stand the most to gain from the approaches we will use in class. Consequently, you are expected to be present, actively involve yourself in class activities, and treat classmates with respect. The hope is to create a joyful context where laughing, lively discussion, raising questions and engaging with your group members are the norm.

I fully expect that each participant will attend every online synchronous class and communicate ahead of time if that is going to be impacted. <u>There is also a professional expectation that students will not work on other classroom projects, browse the web or send/check text messages during our virtual Zoom class time.</u>

2. Wonder Journal [Course outcomes: A & B] 10%

Think about the science that you see in the everyday. Ask yourself questions, feel the movements and forces while you drive, look at the sky, watch your pet, engage with another human, think about your place in this world, go for a long walk, and just think...no phone, no worries, just get lost in

your thoughts. Over the course of our few weeks together use a composition book/journal to make note of various things that you observe in the natural world around you and list, sketch, question, observe and record those things that capture your attention and imagination. These wonderings about the natural world are just that: what do you see, feel, and think about those things that fascinate and/or confuse you, questions or thoughts that move into and out of your mind. There may be elements from the assigned readings that trigger your thinking or it might be watching the clouds move while walking your dog. The inspiration doesn't matter, but we will engage deeply with those thoughts we usually discard because we live our lives in a hurry. We will intentionally slow down and use old technology (paper and pencil) to engage with our wonders.
There are no real rules here. Well, I lied, there are two rules: 1) you will need to complete at least 8 dated entries total is fine); 2) we will turn in our journals at some point near the end of the semester. Your wonders are yours and unique to how you envision the world around you. "Dance like nobody is watching" while you build your entries.

3. Science Lesson Analysis [Course outcomes: B, G, J] 10%

Being able to evaluate science lessons is an important skill for educators. There are many resources online that may or may not be well-designed for classroom use in a way that is authentic and inquiry-based. This assignment's goal is to give you practice finding and analyzing a science lesson regarding it's appropriateness and alignment with Virginia's SOLs. You will write a 2-3 page analysis using some guiding questions (found on Bb) to consider the usefulness of your chosen lesson.

4. Inquiry-Based Lesson Project (PBA)

[Course goals: A-F] 30%

The goal of this project is construct and teach an inquiry-based lesson sequence within your own classroom. We will design this work around the 5E model of lesson planning. The group of lessons will entail building a detailed and well-supported narrative description for the approach that will be employed. The five-E sequence (generally taught over three to five class sessions) will build science content understanding in engaging and dynamic ways for students within your field site and provide some key theoretical and research-based support for the content, approach and activities constructed. Be sure that your lesson plans can illustrate the following three aspects of teaching: introducing new content, hands-on assignments, and assessment of student learning. These activities should focus on the essential science concepts and connections, assess higher order thinking skills that target all learners. More information regarding the 5E lesson project will be posted on Bb, including detailed instructions and a rubric.

The grading scale for this course is as follows:

Grade	GRADING	Grade Points	Interpretation
A	94-100	4.00	Represents mastery of the subject through effort beyond basic requirements.
A-	90-93	3.67	
B+	85-89	3.33	Reflects an understanding of and the ability to apply theories and principles at a basic level
B	80-84	3.00	
C*	70-79	2.00	Denotes an unacceptable level of understanding and application of the basic elements of the course
F*	<69	0.00	

Note: "C" is not satisfactory for a licensure course

"F" does not meet requirements of the School of Education

WORK TIMELINESS EXPECTATIONS

It is expected that all class assignments will be submitted on time. Therefore, all assignments are to be completed by the date listed in the syllabus. Written work will not be accepted after the due date unless prior arrangements have been made with the instructor. All assignments must be submitted by 11:59 pm (Eastern standard time) on the due date stated within the syllabus and should be submitted via Blackboard.

If you are unable to complete an assignment due to an emergency or difficult circumstance, communication must be made with the instructor via email or in person. In situations that are deemed an emergency or a difficult circumstance, I will work with you to set a new submission date that will not be considered late.

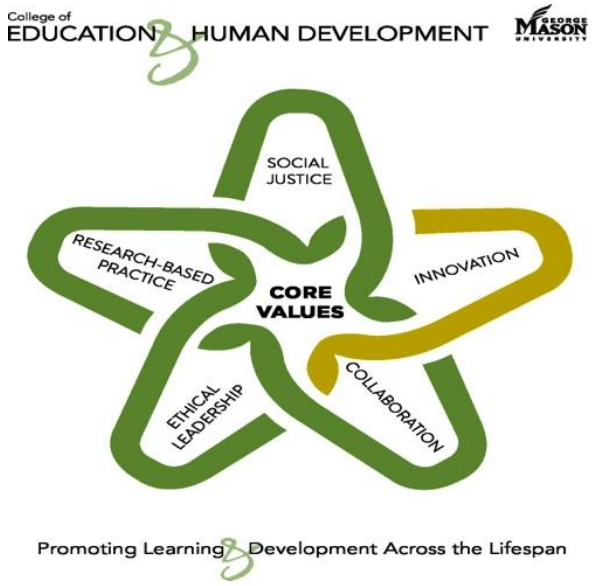
OTHER EXPECTATIONS

All written papers are **expected to be double-spaced, with 1" margins, and in 12-point font** (Times New Roman). **APA format is expected**. If you do not have a 7th Edition APA manual, the OWL at Purdue is an excellent resource:
http://owl.english.purdue.edu/owl/resource/560/01/

*Please Note: The GMU Writing Center offers online support via email. They will provide feedback on your writing within one hour. I encourage you to take advantage of this service.
http://writingcenter.gmu.edu/?page_id=177

Professional Dispositions
Students are expected to exhibit professional behaviors and dispositions at all times (see https://cehd.gmu.edu/students/polices-procedures/).

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 https://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 https://ds.gmu.edu/).
- Students must silence all sound emitting devices during class unless otherwise authorized by the instructor.

Campus Resources

- Support for submission of assignments to VIA should be directed to viahelp@gmu.edu or https://cehd.gmu.edu/aero/assessments. Questions or concerns regarding use of Blackboard should be directed to https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/.

- For information on student support resources on campus, see https://ctfe.gmu.edu/teaching/student-support-resources-on-campus

Notice of mandatory reporting of sexual assault, interpersonal violence, and stalking:

As a faculty member, I am designated as a "Responsible Employee," and must report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per University Policy 1202. If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-380-1434 or Counseling and Psychological Services (CAPS) at 703-993-2380. You may also seek assistance from Mason's Title IX Coordinator by calling 703-993-8730, or emailing titleix@gmu.edu.

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

PROPOSED SPRING 2023 CLASS SCHEDULE

*Faculty reserves the right to alter the schedule as necessary, with notifications to students

Session	Topic/Learning Experiences	Readings & Assignments
NATURE OF SCIENCE		
Session 1 *Synchronous* Jan 10	**Science and You** • What does it mean to be a scientist? • What does it mean to be a science teacher? • What are the goals of science education?	None
Session 2 *Asynchronous* Jan 12	**Children, Science, and the Natural World** • How can understanding the nature of science (NOS) impact perspections of science education?	Skim the Q3 Teacher Guide for your grade level Q3 *Teacher Background Information* for your grade level
THE POWER OF INQUIRY		
Session 3 *Synchronous* Jan 17	**Inquiry and Student-Led Learning** • What does it mean to approach science teaching from an inquiry-based perspective? • How is a teacher's role similar or different to a student's role within the elementary science classroom?	Choose 2 *Capitalizing on Curiosity* *Inspired Inquiry* *Wonder-Full Thinking*
Session 4 *Asynchronous* Jan 19	**Wonder** • What is the place of wonder within science inquiry? • How can we foster wonder-filled classrooms? Content Physical Science – force & motion, energy	PDF infographics on physical science Part I

CRAFTING MEANINGFUL SCIENCE LESSONS		
Session 5 *Synchronous* Jan 24	**5Es Part I** • What are the 5Es and how can they be used to craft inquiry-based lessons? • What are other ways to structure science learning?	*Using the 5Es to Teach Seasonal Change* AND *How Plants Gain Weight*
Session 6 *Asynchronous* Jan 26	**5 Es Part II** • How do we effectively sequence and plan lessons using Backward Design? • How does NGSS compare with VA SOLs? <u>Content</u> Physical Science – matter, chemical reactions, solutions	PDF infographics on physical science Part II
SCIENCE PRACTICES		
Session 7 *Synchronous* Jan 31	**Observations and Inferences** • How do we support students to *do what scientists do*? • How can we cultivate the habit of observation and encourage meaningful inferences?	*Reinvigorating Science Journals* AND *Inference or Observation?*
Session 8 *Asynchronous* Feb 2	**Demonstrations, Experiments, Models, and Explorations** • What are different ways to promote student engagement within the science practices? <u>Content</u> Earth Science – outer space	PDF infographics on earth science Part I
CONCEPTUAL THINKING		
Session 9 *Synchronous* Feb 7	**Cross-Cutting Concepts (CCCs)** • How do we support students to *think like scientists think?* • How does conceptual thinking extend within and across disciplines?	*Integrating Cross-Cutting Concepts into Science Instruction* AND *No Time for Science*

Session 10 *Asynchronous* Feb 9	**Contextualized Science** • How can we contextualize science (place-based education, project-based learning, STEM, field study, etc.) Content Earth Science – earth, weather, and atmosphere	PDF infographics on earth science Part II **Science Lesson Analysis Due** by Feb 12 at 11:59 pm
WORKSHOP AND STUDENT ASSESSMENT		
Session 11 *Synchronous* Feb 14	**Zoom Workshop** • [lesson planning]	*5 characteristics of an effective science teacher*
Session 12 *Asynchronous* Feb 16	**Assessing for Learning** • How and why we do we assess student scientists? Content Life Science – cells and classificiation; plants and animals	PDF infographics on life science Part I **Wonder Journal Due** by Feb 19 at 11:59 pm
SUPPORTING STUDENT SCIENTISTS		
Session 13 *Synchronous* Feb 22	**Meeting the Needs of Diverse Learners** • How do we teach so that *each* and *every* student can learn? • What are helpful strategies for differentiation within the elementary science classroom?	Choose 2 *Different Strokes for Different Folks* *Inclusion of Native Culture During Science Instruction* *Draw a Scientist* Optional (2 pages) *Inclusive Strategies for the Science Classroom*
Session 14 *Asynchronous* Feb 24	**Diversity, Equity, and Inclusion** • How can we work towards inclusive excellence within science education? • What are implications and applications for culturally responsive pedagogy? Content Life Science – human body and systems (health)	Skim the Health Pacing Guide for your grade level. Choose 2 hyperlinked activities/lessons to read.

Session 15 *Synchronous* Feb 28	**Other Issues in Science Education** • What are other issues that are important to address within the science classroom (routines/procedures, read alouds, technology, class management, etc.)	TBD *Science Read Alouds* (skim)
Session 16 *Asynchronous* March 2	**Reflection and Next Steps** • Where do we go from here?	Skim the Q4 Teacher Guide for your grade level Q4 *Teacher Background Information* for your grade level **5E Science Lessons Due** by March 5 at 11:59 pm