George Mason University
College of Education and Human Development
Elementary Education

ELED 453, Section DL1
SCIENCE METHODS FOR THE ELEMENTARY CLASSROOM (3 credits)
Spring 2021 (January 25-April 25)
Mondays 10:30-1:10, Synchronous Online

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Prerequisites/Corequisites: Admission to the Elementary Education 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. Prerequisite(s): Admission to elementary education licensure program.

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 health-related 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 100% online using a **synchronous online** format via Blackboard Learning Management system (LMS) housed in the MyMason portal. You will log in to the Blackboard (Bb) course site using your Mason email name (everything before @masonlive.gmu.edu) and email password. The course site will be available on or before January 25, 2021. This course will use a combination of Blackboard Collaborate Ultra, Zoom, and Google Slides for synchronous online course delivery. Synchronous class sessions will include small/large group discussions and tasks, lecture, and student-led activities. A detailed schedule is included below.

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.

Please note: This course requires 15 hours of field observation. Additional details are in the "Assignments" section. These observations will be virtual/online in Spring 2021.

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

1. 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
2. To get a list of supported operating systems on different devices see: https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#tested-devices-and-operating-systems
3. Students must maintain consistent and reliable access to their GMU email and Blackboard accounts, as these are the official methods of communication for this course.
4. Students will need a headset microphone for use with Blackboard Collaborate Ultra or other required web conferencing tools.
5. 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.
6. 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
1. Course Week: Our course week will begin on the day that our synchronous meetings take place as indicated on the Schedule of Classes.
2. 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 4 times per week. In addition, students must log-in for all scheduled online synchronous meetings.

3. 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.
4. 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.
5. 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.
6. 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.
7. Instructor Support: Students may schedule a one-on-one meeting to discuss course requirements, content or other course-related issues. While we are unable to come to a Mason campus at this time, students 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.
8. Netiquette: The course environment is a collaborative space. Experience shows that even an innocent remark typed in the online environment can be misconstrued. Students must always re-read their responses carefully before posting them, so as others do not consider them as personal offenses. *Be positive in your approach with others and diplomatic in selecting your words*. Remember that you are not competing with classmates; rather, you are sharing information and learning from others. All faculty are similarly expected to be respectful in all communications.
9. Accommodations: Online learners who require effective accommodations to ensure accessibility must be registered with George Mason University Disability Services.

Learner Outcomes

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 physics 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 & READINGS

Everything You Need to Ace Science in One Big Fat Notebook (2016)
Workman Publishing
ISBN-10 : 0761160957
ISBN-13 : 978-0761160953

***Other required readings will be provided via Blackboard

COURSE ASSIGNMENTS AT A GLANCE

Assignment	Due Date	Total Points
Class Participation/Reading Completion/ Written Reflections	Ongoing; Reflections due by noon Friday of each week.	**30**
5E Mini-Unit Project (PBA*)	Due 4/5	**30**
Wonder Journal	Ongoing; Selection of entries Due 4/12	**10**
Topics and Tech Group Presentation	Varies: group sign-up	**10**
Field Observations	Due 4/19	**5**
Wonder: Self + World Investigation/Presentation	Due 4/26	**15**
	Total	**100**

*Designated performance-based assessment (PBA)

The grading scale for this course is as follows:

Grade	GRADING	Grade Points	Interpretation
A	**93-100**	**4.00**	**Represents mastery of the subject through effort beyond basic requirements**
A-	**90-92**	**3.67**	
B+	**87-89**	**3.33**	**Reflects an understanding of and the ability to apply theories and principles at a basic level**
B	**83-86**	**3.00**	
B-	**80-82**	**2.67**	
C+	**77-79**	**2.33**	**Denotes an unacceptable level of understanding and application of the basic elements of the course**
C	**73-76**	**2.00**	
C-*	**70-72**	**1.67**	
D	**60-69**	**1.00**	
F*	**<69**	**0.00**	

***Note: "C-" is not satisfactory for a licensure course; "F" does not meet requirements of the School of Education.**

ASSIGNMENT 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.** Credit will not be given for late assignments. All assignments must be submitted by the beginning of class (Eastern standard time) on the due date stated within the syllabus (see below) and should only be submitted via **Blackboard**. ***All assignments subject to change due to Covid-19 changes and restrictions.**

OTHER EXPECTATIONS: All written papers are **expected to be double-spaced, with 1" margins, and in 12-point font** (Times New Roman, Calibri, or Arial). **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. Graduate and professional writing can be difficult; 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 Elementary Education Program Handbook).

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 http://oai.gmu.edu/the-mason-honor-code/).
- 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 or https://cehd.gmu.edu/aero/tk20. Questions or concerns regarding use of Blackboard should be directed to http://coursessupport.gmu.edu/.

- The Writing Center 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/).

- The 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/).

- The Student Support & Advocacy Center staff helps students develop and maintain healthy lifestyles through confidential one-on-one support as well as through interactive programs and resources. Some of the topics they address are healthy relationships, stress management, nutrition, sexual assault, drug and alcohol use, and sexual health (see http://ssac.gmu.edu/). Students in need of these services may contact the office by phone at 703-993-3686. Concerned students, faculty and staff may also make a referral to express concern for the safety or well-being of a Mason student or the community by going to http://ssac.gmu.edu/make-a-referral/.

- 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 http://cehd.gmu.edu/.
For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See **http://gse.gmu.edu/**]
http://cehd.gmu.edu/values/

EMERGENCY PROCEDURES
You are encouraged to sign up for emergency alerts by visiting the website https://alert.gmu.edu. There are emergency posters in each classroom explaining what to do in the event of crises. Further information about emergency procedures exists on http://gmu.edu/service/cert

PROPOSED SPRING 2021 CLASS SCHEDULE
TENTATIVE CLASS SCHEDULE

*Faculty reserve the right to alter the schedule as necessary with notification to students.

Session	Topic/Learning Experiences	Readings & Assignments
Spring	**Mondays, 10:30 AM – 1:10 PM**	
Day 1 Monday, **January 25** 10:30 am- 1:10 pm Synchonous, Online	**Overview: Science, Society, Children, the Natural World, and You** • Who are you? What is your current relationship status with science? • The Nature of Science (NOS): What is science? • What are the goals of science? Science education? • Science and children • Who are we as a class? An Ecology/Ecological Framework; a meta-inquiry • Connections to equity, diversity, and social justice • Course Overview	Bring a journal/composition notebook
Day 2 Monday, **February 1** 10:30 am- 1:10 pm Synchonous, Online	**Inquiry, Wonder, Teacher Control, and Student Autonomy** **Pedagogy** • Inquiry and the 5E Framework • Connecting Inquiry and Wonder • NGSS Practices • ABC's of psychological/learning needs: connections to inquiry and wonder **Content** • Ecology and place: kinds, relationships, roles, needs: an ongoing class inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 1/29 *Have available 1st wonder journal entry to discuss *Bring Materials for Day 2: access to favorite photo of yourself, access to two photos from your local environment *Course Readings Due: Reeves (2009) Teacher control/student autonomy
Day 3 Monday, **February 8** 10:30 am- 1:10 pm Synchonous, Online	**The Five Es: Engage, Explore, Explain, Extend, Evaluate** **Pedagogy:** • In depth exploration of the 5Es **Content** • Physical Science: Mystery of the cans, aluminum foil/water explorations, sink and float • Ecology: ongoing inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 2/5 *Bring wonder journal; be prepared to discuss *Bring Materials for Day 3: small sink and float objects, aluminum foil, pennies, tub of water

		*Course Readings Due: Skim through all 5E Examples readings. Choose <u>two</u> to read in depth/be an expert on.
Day 4 Monday, **February 15** 10:30 am-1:10 pm Synchonous, Online	**Planning and Assessing Inquiry** **Pedagogy** • Planning for Inquiry • Assessment for Inquiry: Formative, Summative • Student journals/notebooks **Content** • Physical science/Chemistry: matter, movement, and balance/homeostasis. • Life Science: Connections to the human body science/health • Ecology: ongoing inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 2/12 *Bring wonder journal. Have completed at least 2 entries. *Ecology inquiry materials: TBD *Course Readings Due: Mason & Bohl, 2017: on science notebooks; Baxter & Banko (2018) on children's science drawings
Day 5 Monday, **February 22** 10:30 am-1:10 pm Synchonous, Online	**Equity, Diversity, and Social Justice in Science Ed** **Pedagogy:** • Welcoming, supporting, and integrating diverse sense-making repertoires • Whose science? Who's asking? **Content** • Science practices: NGSS and Virginia SOLs • Health: Identity and Emotions • Ecology: ongoing inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 2/19 *Bring wonder journal *Ecology inquiry materials: TBD *Course Reading Due: Bang, et al (2017): Toward More Equitable Learning in Science
Day 6 Monday, **March 1** 10:30 am-1:10 pm Synchonous, Online	**Integrated Approaches to STEM** **Pedagogy** • Science/STEM across the curriculum • Technology teaching tools: Topics and Teach Group #1 and #2 • Collaborative planning: Work on Mini-Units (PBA) **Content** • The human body: cells, tissues, organs, systems	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 2/26 *Bring wonder journal; have completed at least 4 entries. *Ecology inquiry materials: TBD *Bring ideas for unit topics *Topics and Tech Groups #1

	• Health: Nutrition • Ecology: ongoing inquiry	and #2 Present *Course Reading Due: Everything you Need to Know Text: pp. 373-432
Day 7 Monday, **March 8** 10:30 am-1:10 pm Synchonous, Online	**The Materiality of Science** **Pedagogy:** • Curating rich, material environments for encounters • Taking your class outside **Content:** • Physical science/Life Science: sound and hearing, light and sight. Attuning to the senses. • Place-based environmental learning • Ecology: ongoing inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 3/5 *Bring wonder journals *Ecology inquiry materials: TBD *Bring draft of unit to work on *Topics and Tech Groups #3 and #4 Present Course Reading Due: Everything you Need to Know Text: pp.143-158
Day 8 Monday, **March 15** 10:30 am-1:10 pm Synchonous, Online	**Unit Planning Workshop** • Conferencing with peers and instructor **Pedagogy** • Topics and Tech Groups #5 and #6 Present **Content** • Earth science: The Sun, Earth, Moon System • Ecology: ongoing inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 3/12 *Bring wonder journals – have at least 6 entries completed *Ecology inquiry materials: TBD *Topics and Tech Groups #5 and #6 Present *Course Reading Due: Everything you Need to Know Text: pp.197-208
Day 9 Monday, **March 22** 10:30 am-1:10 pm	**Unit Planning Workshop** • Conferencing with peers and instructor **Pedagogy** • Topics and Tech Group #7 Present	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 3/19 *Bring wonder journals *Ecology inquiry materials:

Synchonous, Online	**Content** • Chemistry: the basics • Ecology: ongoing inquiry	TBD *Topics and Tech Groups #7 Presents *Course Reading Due: Everything you Need to Know Text: pp. 59-83
Day 10 Monday, **March 29** 10:30 am-1:10 pm Synchonous, Online	**Unit Planning Workshop** • Conferencing with peers and instructor **Content** • Big themes of science: movement, waves, balance, emergence, vitality • Ecology: ongoing inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 3/26 *Bring wonder journals (at least 8 entries completed) *Ecology inquiry materials: TBD
Day 11 Monday, **April 5** 10:30 am-1:10 pm Synchonous, Online	**It's a Wonder-full Life** **Pedagogy** • Wonder, science, and education • Wonder: Self + World Project Planning **Content:** • Health: identity constructions • Ecology: ongoing inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 4/2 *Bring wonder journals *Ecology inquiry materials: TBD **5E Mini-Unit Project due on Blackboard before class.**
Day 12 Monday, **April 12** 10:30 am-1:10 pm Synchonous, Online	**Project Based Learning in Science** **Pedagogy:** • Big projects/Project-based learning • Examples: Human Body Expo, community projects **Content:** • Health: nutrition • Ecology: ongoing inquiry	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 4/9 **Wonder Journals due** – upload a selection to Blackboard
Day 13 Monday, **April 19** 10:30 am-	**Science and the Big Questions** **Pedagogy:** • Ecology inquiry conference: sharing findings with peers	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 4/16

1:10 pm Synchonous, Online	• Nature of Science review • What needs more emphasis? **Content:** • Systems integration – pulling it all together; unanswered questions • What needs more emphasis?	**Field Observations Due**
Day 14 Monday, **April 25** 10:30 am-1:10 pm Synchonous, Online	**Pedagogy + Content** Presentations of Wonder: Self + World projects	*Class Reflection due to Blackboard (Tools: Journals) by noon on Friday 4/9 **Wonder: Self + World Investigation/Presentation uploaded to Blackboard by Sunday, April 18th, 3pm**

COURSE ASSIGNMENTS/ASSESSMENTS

1. Class Participation, Reading Completion, and Written Reflections 30%

Your success in this course is predicated on being an active participant: being fully present (in body and mind), completing the readings, engaging with your classmates in the discussions and activities, and writing thoughtful and detailed reflections after each class.

It is expected that you will attend every class from beginning to end. If circumstances arise where this expectation is impacted, it is up to you to notify the instructor in advance, and to take full responsibility for what was missed. A class reflection (see below) will still be expected based on the class happenings and the readings. Further, there is a professional expectation that students will not work on other classroom projects, browse the web or send/check text messages during our class time.

You will write a 500+ word reflection after each class period based on what we did together that day: A prompt will be provided by 3:00 pm in the afternoon after each class. These informal writings will be used by the instructor as a formative assessment (e.g. an exit ticket), and will demonstrate how you are engaging with the material: incorporating readings, our discussions and activities, your fieldwork, etc. These will be completed using the journals tool in Bb. Your reflection should…

1. be completed no later than midnight each Friday the week that the class took place.
2. be brief (but no less than 500 words), yet thoughtful, and demonstrate deep reflection on and integration of your learning

2. Wonder Journal 10%

This project is about tracking your engagement in/with the science of the everyday; about the self + world. Notice your surroundings. Feel the movements and forces while you walk, drive, or ride your bike. Look at the sky, feel the sun on your face, watch your pet, communicate with another human, pay attention to the plants and wildlife in your neighborhood. Listen to birdsong. Count crows. Visit a body

of water. Smell the rain, the soil, the flowers. Notice the play of light and shadows. Pay attention to the wind. Collect and look closely at rocks. Consider the physics of a Frisbee game. Visit with a mountain. Hang out with a tree. Go for a long walk and just wonder...no phone, no worries; just get lost in your thoughts (or non-thoughts: bodily sensations). What do you notice? What do you wonder? What do you feel?

Over the course of the semester, use a composition book/journal to create some journal entries about these experiences AND also try using a digital notebook of some kind (we will use both and compare them) to create others entries.

The basic idea is to document the various things that catch your attention: what you feel/observe/notice in and about the natural world. You may also choose to write about the science activities we do during class. The assignment is to write about, sketch, photograph, question, observe and record those things that capture your attention and imagination. These wonderings about the natural world (and our science activities) are just that…whatever you see, feel and think about those things that fascinate and/or confuse you, pique your interest: questions, thoughts, sensations that move into and out of your mind and/or body.

There are not many rules…just two:

1. Complete at least 10 entries in total (more is fine): at least 5 handwritten in a notebook, and at least 5 digital (e.g. Google doc, blog, etc.);
2. You will choose from and turn in a selection of journal entries (# TBD) on Monday, April 12

Important note: Your wonders are yours and unique to how you engage with the world around you, therefore **there is no wrong way** to do these entries - as long as it is clear you put thought and effort into them.

3. Topics-n-Tech Group Presentations 10%

There are so many cool technology tools out there (and new ones popping up all the time) that might be used to help *Engage* your students, help *Explain* a concept, or help *Evaluate* learning. In small groups you will choose a science topic (from our content text) and research a technology tool (choose one from our long list on Blackboard or another you find on your own) in order to create an interactive presentation for the rest of the class that helps us to 1) understand that content better, and 2) learn how to use the cool tech tool. There will be a sign-up sheet for different dates you might present throughout the course.

4. Inquiry-Based Mini-Unit Project (PBA) 30%

The goal of this project is to construct (and teach a portion of) an inquiry-based unit appropriate for the context of your field site. You will design this unit based on the 5E model of inquiry lesson planning. The unit will entail writing a detailed and well-supported written description of the pedagogical approach that will be employed. The five-E sequence will be designed to develop science content understanding in engaging and dynamic ways for students, and this plan will provide some key

theoretical and research-based support for the content, approach, and activities in the unit. Note: You will record yourself teaching one of these lessons in your field site in order to receive feedback from peers and instructor.

The unit will be comprised of the following components and scored via the rubric provided at the end of the syllabus.

All unit plans will include:

A. Overview

Theme/Topic:

Give insight into the overall content concepts and provide an overarching description of the unit and goals. Consider it akin to the "movie trailer" of the unit where you set the stage and excite the reader for what lies ahead.

Teacher Background knowledge:

This section highlights the content knowledge that teachers should be familiar with. This can/should include some resources and/or sources…also list some common misconceptions (or naïve conceptions) children and adults may hold concerning the topic.

Description of Students:

Provide brief overview, describing the audience for which the unit is designed.

B. Curriculum Design and Assessment Synthesis

Learning Theory/Teaching and Assessment discussion (two pages)

This section serves as a description of your understanding of the learning theory and rationale of your unit based on what you have learned from the course readings. The goal is to synthesize the readings and your understanding for processes related to inquiry models and pedagogy. *Must include references in support of your claims for your approach*

C. Detailed Lesson Plans

The unit will follow the 5 E model and as such your lessons should span the 5E process. These will generally be one E per lesson and would require 5 detailed lessons for the unit (*See Bb site for lesson template*). The unit should include a final assessment that would evaluate whether your students achieved the objectives at the end of the unit. This final assessment should include the questions/tasks the students are required to do and indicate what objectives are being assessed and how they are being assessed. For instance, posters, investigations, debates, etc. should align with original unit objectives.

D. Assessment

Your assessment efforts across your unit should include diagnostic, formative and summative assessments that are directly linked to your unit goals and daily objectives. These approaches should work to innovatively engage children in meaningful approaches that also comprise the spirit of inquiry and investigation as depicted in the readings.

E. Support Materials *(all materials for the daily lesson plans)*

For the daily lesson plans, you will develop all support materials that the teacher and students will use. For teaching and learning activities **include each sheet of paper distributed to the students to carry out the daily lesson plans - laboratory experiments, activities, worksheets, instructions, assessments, rubrics, etc.** Attach these to the appropriate lesson plan. **Other teaching aids** (ie. instructions for teacher demo or photos of experiment set up, etc.) used during the unit should also be included. Be sure that your unit plan 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, and target different learning styles. Checking for understanding should be included daily. Include diagnostic, formative, and summative assessment. Your 'evaluation' portion of the unit should **include major assessment instruments and grading criteria for the unit**.

F. References Cited section

5. Field Observations 5%

This assignment involves formally documenting your observations during your field hours. Field hours may include a combination of videos and online observations in Spring 2021. Using a guiding observation document (available via Blackboard), you will make observations and relevant connections between course readings, activities, and our class discussions based on what you are seeing (or perhaps not yet seeing) in your field experiences.

6. Wonder Self + World Investigation/Presentation 15%

The goal of this project is to pursue a science idea/topic that you find interesting, learn more about it, and share what you've learned with the rest of us. As a culmination of your journey with wonder (in combination of an exploration of yourself in relation to science) this semester, you will choose a topic from your wonder journal (or a new and different wonder(ing) and follow this wonder(ing) wherever it might lead you…

This project will take the form of a digital presentation (2-3 slides) that will highlight:

a) the wonder(ing) itself and its relationship to you/your interests/your environment/community
b) the information you identified to make more sense of the topic (diagrams, sketches, experiments, observations, notes, photographs, etc.)
c) a diagram/wonder road map – how did your exploration with wonder unfold?
d) identify key scientific concepts related to this topic (definitions, models, connections to other scientific areas, etc.),
e) list further questions you have and any hypotheses related to this exploration,
f) explain how you might design an experiment or further exploration process from here
g) explain how this project connects with the Nature of Science (NOS) and/or the NGSS science practices

h) how, if at all, you feel this project affected you, your relationship to science, your thoughts/feelings about teaching science
i) any ideas you have for incorporating wonder (not necessarily *this wonder*) into your future teaching.

ASSESSMENT RUBRICS:

PBA TASK: Science Unit Rubric (30% of total grade)

Assessment Summary: The project is meant to facilitate your understanding of the design and teaching of an inquiry-based science unit. This will require research into both inquiry-based lesson planning and science content. The goal is bring powerful learning theory to life in classrooms and design science experiences that both excite and engage elementary children.

Description and standard addressed	**Exceeds Expectations – 4**	**Meets Expectations – 3**	**Does Not Meet Expectations – 2**	**Does Not Meet Expectations – 1**
A. Overview (Background; content and context description) INTASC: #4, 5, 7; (5 pts)	Gives excellent insight into key content ideas, provides powerful description of unit goals. Excellent listing and engagement with the content background teachers would need to know to carry out lesson goals. Excellent description of school and students that the unit is designed for.	Gives insight into the content and includes several key content ideas. Lists and engages the content background teachers would need to know to carry out lesson goals. Provides a solid description for the school and students that the unit is designed for.	Does not provide insight into the content and/or include several key content ideas. Does not completely provide the content background for teachers. Does not provide a detailed description of the school and students.	Missing
B. Curriculum Design and Assessment discussion (Theoretical background) (10 pts) INTASC: #8, 6	Utilizes inquiry-based lesson model (5Es), clearly describes pedagogical process that embodies inquiry. Uses a myriad of excellent and well-respected sources properly referenced within narrative descriptions. Describes diagnostic, formative and summative approaches throughout the unit.	Utilizes inquiry-based lesson model (5Es), clearly describes pedagogical process that embodies inquiry. Uses dependable sources that are properly referenced within narrative descriptions. Describes diagnostic, formative and summative approaches throughout the unit.	Does not provide complete descriptions and/or theoretical background; and/or is not self-explanatory. Does not utilize reputable sources within narrative descriptions and/or more needed clarity within narrative. Does not include all three types of assessment.	Missing

C. Detailed Lesson plans (Lesson Framework, pedagogical process & procedure) INTASC: #5, 7, 8 (12 pts)	Standards, objectives and lesson activities all seamlessly align and support one another. Utilizes inquiry-based lesson model (5Es), clearly describes pedagogical process that embodies inquiry. Clearly described, highly usable and innovative ideas with original elements; addresses issues of safety	There exists alignment between standards and objectives, and they support lesson approach. Utilizes inquiry-based lesson model (5Es), clearly describes pedagogical process that embodies inquiry. Effectively describes, usable and effective ideas; addresses issues of safety	Standards, objectives and activities not clearly aligned or appropriate for the lesson. Difficult to use; does not have complete components; and/or is not self-explanatory. Does not address safety.	No consistent format nor serious professional commitment to student needs.
D. Assessment INTASC: #6 (5 pts)	Innovative, well-supported assessment strategies clearly linked to objectives; demonstrates all stated objectives, copies of assessments included. Includes diagnostic, formative, and summative approaches throughout the unit.	Assessment clearly linked to objectives; demonstrates nearly all stated objectives, copies of written assessments are attached. Includes diagnostic, formative, and summative approaches throughout the unit.	Assessment is not clearly linked to objectives; demonstrates some stated objectives, and/or copies of written assessments are not attached. Does not provide differing types of assessment strategies.	Missing
E. Support materials INTASC: #4, 5, 8 (5 pts)	Innovative materials used throughout that incorporate engaging, developmentally appropriate and scientifically accurate approaches; multiple connections are made to students' everyday lives and are accessible.	Some innovative materials used throughout that incorporate engaging, developmentally appropriate and scientifically accurate approaches. These approaches make attempts to connect to students' everyday lives.	Lacks innovation and does not include activities that support inquiry. Activities might contain some scientific inconsistencies; little effort to connect to students everyday lives.	Missing
F. References cited. (3 pts)	Uses well-respected sources properly referenced with no errors.	Uses well-respected sources properly referenced, but with a few small errors.	Mistakes in formatting and does not utilize well-respected reference materials.	Missing