GEORGE MASON UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT
Secondary and Elementary Education Program
(SEED)

SEED 573-001: Teaching Science in the Secondary School 3 credits, Fall 2021
Face-to-face class - Mondays, 4:30 – 7:10 pm

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Prerequisites/Corequisites
Students must also complete 15 hours of field experience. It is recommended that students take Methods I in the same semester as they enroll in EDUC 672, Human Development.

University Catalog Course Description
Provides study of methods, materials, content, and organization of science programs. Emphasizes curriculum planning, current methodologies, safety, and trends in secondary schools.

Course Overview
EDCI 573 is the first course in a two-part sequence of science methods courses for pre-service and provisionally licensed science teachers seeking a secondary school teaching license in earth science, biology, chemistry, or physics. The course builds upon students' knowledge of their subject matter and previous education coursework to construct fundamental knowledge of science teaching and learning including standards-based curriculum design and research-based teaching strategies. The course focuses on developing inquiry-based lessons for students to investigate science and assessing student understanding of science and the nature of science. The teachers will plan lessons for students to learn science, implement lessons in a high school classroom, observe students learning, and evaluate their teaching and student outcomes.

Per state guidelines, you are required to complete 15 hours of fieldwork during this class. Please answer the survey set by Dr. Zenkov. If you have missed this survey, go to http://cehd.gmu.edu/endorse/ferf to sign up for your placement.

Course Delivery Method
EDCI 573 is designated as a lecture course; however, students are expected to come to class prepared and actively participate in discussions and other hands-on learning experiences.

Learner Outcomes/Objectives

Below is a list of the major course goals along with their corresponding objectives and assessments.

Goal 1: Build a learning theory and see the value in using it for developing and implementing lessons.

Objective	Assignment
Students will be able to explain why a student-centered approach to learning is effective	Research review
Students will be able to design lessons that clearly reflect their learning theory	Lesson plans

Goal 2: Do science to understand how science is done.

Objective	Assignment
Students will be able to design lessons in which students are actively engaged in hands-on science activities	Lesson plans
Students will be able to explain the epistemic features and unique characteristics of science (NOS)	Nature of science assignment

Goal 3: Recognize that inquiry learning using scientific practices has inherent risks that should be identified and addressed such that students learn to do science in an ethical and safe manner.

Objective	Assignment
Students will be able to describe the major safety and ethical concerns associated with conducting science in the classroom	Safety assignment
Students will be able to describe means to reduce the potential safety risks involved in conducting scientific investigations in the classroom while not compromising the benefit to students of conducting inquires	Safety assignment

Students will be able to design lessons that clearly indicate safety concerns, ways to reduce them, and what to do when accidents happen	Lesson plans

Goal 4: Develop an understanding of how inquiry can develop both scientific thinking and content knowledge.

Objective	Assignment
Students will be able to develop inquiry-based lessons that incorporate scientific practices and advance students' content knowledge	Lesson plans

Goal 5: Understand how to develop effective lessons and units with backwards design.

Objective	Assignment
Students will be able to use the basic organization of backwards design to develop a lesson plan	Lesson plans
Students will be able to write measureable objectives	Lesson plans
Students will be able to design teaching activities that support student achievement of measureable objectives	Lesson plans, microteaching
Students will be able to design assessments that evaluate student achievement of measureable objectives	Lesson plans, microteaching

Goal 6: Develop skills as reflective practitioners.

Objective	Assignment
Students will be able to effectively examine classrooms using their learning theory as a lens and student behavior, engagement, and learning (when possible) as evidence	Field experience paper
Students will be able to examine and use assessment data to reflect upon and improve their lessons	Microteaching

Professional Standards

The course focuses on the teaching of science as called for by the state and national science standards and as outlined by the National Council for Accreditation of Teacher Education (NCATE), the National Science Teachers Association (NSTA), and the Interstate New Teacher Assessment and Support Consortium (INTASC). EDCI 573 builds a repertoire of science teaching and assessment strategies to facilitate student learning.

The pre-service and provisionally licensed teacher will:

- Build a repertoire of science teaching and assessment strategies by reading, writing, observing, participating in, and reflecting on the teaching and learning of science; RESEARCH-BASED PRACTICE; SPA STANDARDS 1, 3, 5, 6, 8, 10
- Develop strategies to help students become scientifically literate, think critically and creatively, understand the nature of science, and see the importance of science as a way of knowing; ETHICAL LEADERSHIP; INNOVATION; SPA STANDARDS 2, 3, 4
- Plan standards-based (local, state, and national) units of science study including daily lesson plans for students that reflect research in effective science teaching and learning;

RESEARCH-BASED PRACTICE; SPA STANDARD 5, 6, 8, 10

- Construct science lessons that include alignment of objectives, activities, and assessments that address the needs of a variety of student populations including English language learner, special needs students, and gifted and talented students; ETHICAL LEADERSHIP; SPA STANDARDS 8, 10
- Learn about science laboratory safety and plan teaching activities that highlight safety; ETHICAL LEADERSHIP; SPA STANDARD 9
- Work collaboratively with peers to teach and discuss science and science teaching. COLLABORATION; SPA STANDARD 10
- Incorporate environmental sustainability into teaching paradigms and into daily life. SOCIAL JUSTICE; SPA STANDARD 4

Required Electronic Texts

We will have required readings from an **NSTA class bundle**, consisting of various books and journals (and sometimes webinars) from the National Science Teacher Association (NSTA) – our national organizing body. The purchase of these electronic materials also gives you a membership to NSTA, which opens up a great deal of resources to you. We are doing this instead of having one book for two reasons:

1. NSTA is an important organization to know over the course of your career as a science teacher – they are a premiere organization in professional development- and you should get to know them and get involved as soon as possible
2. NSTA peer-reviews all of their work, so their professional development materials are the best available – and the biggest body of materials as well

We suggest you purchase the year-long course pack ($99) if you plan to take Methods 2 next semester, as that course also uses the course pack. If you want to purchase the course pack for just this semester it is ($79).

Below are instructions for your students to follow in purchasing the NSTA Learning Center (NSTA LC) subscription **AND** NSTA student membership class bundle.

IMPORTANT NOTE for STUDENTS:

Do not purchase an Individual NSTA Membership. Individual NSTA membership is sold online for $40, $60, $80 or $99 but this product is different from the NSTA Class Bundle for your course.

You must purchase the NSTA class bundle available ONLY at the web address provided below.

Dear Students: Follow the instructions below to create your NSTA account and purchase the Class Bundle:

(1) Go to the NSTA website to create your account: **https://my.nsta.org/preservice**

Note: *If you already have an account at NSTA you do not need to create a second account. Use your NSTA e-mail address & password or your last name (instead of e-mail) & ID number (instead of password) to login to the website. If you are unsure, please send a message to: (learningcenterhelp@nsta.org) for assistance.*

(2) After creating your account press "**Continue**" and on the next screen select your state, institution, professor, and course. At this time enter your "**Expected Graduation Date**."

(3) Click "**Continue**" and on the next screen use your credit card for payment. Your professor selected the price point ($99) for everyone in the class. (Note: you will also be using this service in SEED 673, so you will not need to purchase it again as long as you take 673 in the next semester.)

Next steps?

Become familiar with the NSTA website. Below is a list of things to try:

1. Visit your class landing page by clicking "Menu" and selecting "Cohorts."
2. Edit your profile – you will find it by clicking "Menu" and selecting "My Account."
3. Explore the "Discussion Forums" – they can be found by clicking "Menu" – make a post!

Note: *A limit for the number of fee-based e-book chapters that each student may add to their library for free has been set at 15.*

To get the readings for the class, search for the COLLECTION - GMU EDCI 473/573 Readings. I have set it as public, so you should all be able to have access to add this in one click. You may also find and save other items to your learning center account – most of the materials are free – including science objects and webinars.

Send your questions to: **learningcenterhelp@nsta.org**

This NSTA class bundle is separate from your Blackboard site, which is all of the assignments and other readings for the course.

Blackboard information

The online site for this course can be found at http://mymasonportal.gmu.edu. Students are expected to routinely check the online course portal for supplemental information, readings, and assignments.

Recommended Online Readings

- Achieve, (2013). Next Generation Science Standards (2013). Achieve, Inc. http://www.nextgenscience.org/next-generation-science-standards
- Commonwealth of Virginia (2010). *Standards of Learning for Virginia Public Schools.* Richmond, Virginia. http://www.doe.virginia.gov/testing/index.shtml
- Commonwealth of Virginia (2003). *Science Standards of Curriculum Framework Guides.* http://www.pen.k12.va.us/VDOE/Instruction/sol.html#science
- National Research Council (1996). *National science education standards*. Washington, DC: National Academy Press. http://www.nap.edu/openbook.php?record_id=4962
- American Association for the Advancement of Science (1993). *Benchmarks for Science Literacy.* http://www.project2061.org/publications/bsl/online/index.php
- McComas, W. F. (1998). *The principle elements of the nature of science: Dispelling the myths.* http://www.pestl.org/images/The_Myths_of_Science_Article_by_McComas.pdf
- Peters, E. E. (2006). *Why is teaching the nature of science so important?* http://www.auburn.edu/~cgs0013/Schnittka_timeline.pdf
- Dagher, Z. R. & Erduran, S. (2017). Abandoning patchwork approaches to nature of science in science education. Canadian Journal of Science, Mathematics, and Technology Education,

17(1), 46-52. http://dx.doi.org/10.1080/14926156.2016.1271923
- American Chemical Society (2007). *Educators & Students page.* http://www.chemistry.org/portal/a/c/s/1/educatorsandstudents.html
- American Chemical Society (2003). *Safety in Academic Chemistry Laboratories Accident Prevention for Faculty and Administrators*. (800 227-5558) Free single copies or online: https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/safety-in-academic-chemistry-laboratories-students.pdf
- U.S. Government Printing Office (2007). *Code of Federal Regulations.* https://www.govinfo.gov/content/pkg/CFR-2007-title45-vol1/pdf/CFR-2007-title45-vol1.pdf
- U.S. Department of Labor (2007). *Occupational Health and Safety Administration.* https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=news_releases&p_id=14123
- American National Standards Institute (2007). *American National Standards Institute Homepage.* http://www.ansi.org/
- Maryland Public Schools (2007). *Legal Aspects of Laboratory Safety.* http://mdk12.org/instruction/curriculum/science/safety/legal.html

Other Recommended Readings

- Barnekow, D. J. (1998). *Graphic organizers for science.* Portland, ME: J. Weston Walsh.
- Bybee, R. W., Powell, J. C., & Trowbridge, L. W. (2008). *Teaching secondary school science: Strategies for developing scientific literacy.* Upper Saddle River, NJ: Pearson.
- Cothron, J. H., Giese, R. N., Rezba, R. J. (2005). *Students and research*. Dubuque, Iowa: Kendall/Hunt.
- Froschauer, L., & Bigelow, M. L. (2012). *Rise and shine: A practical guide for the beginning science teacher*. Arlington, VA: NSTA Press.
- Hassard, J. (2005). *The art of teaching science: Inquiry and innovation in middle school and high school.* New York: Oxford University Press.
- Haysom, J., & Bowen, M. (2010). *Predict, observe, explain: Activities enhancing scientific understanding*. Arlington, VA: NSTA Press.
- Johnson, D. W. & Johnson R. T. (1999). *Learning together and alone: Cooperative, competitive, and individualistic learning.* Boston: Allyn and Bacon.
- Kagan, S. (1994). *Cooperative learning.* San Clemente, CA: Resources for Teachers, Inc.
- Keely, P. (2008). *Science formative assessment: 75 practical strategies for linking assessment, instruction, and learning.* Arlington, VA: National Science Teacher Association Press.
- National Research Council. (2005). *How students learn: Science in the classroom.* Washington, DC: The National Academies Press.
- O'Brien, T. (2010). *Brain-powered science: Teaching and learning with discrepant events*. Arlington, VA: NSTA Press.
- Pinto, L. E. (2013). *From discipline to culturally responsive engagement: 45 classroom management strategies*. Thousand Oaks, CA: Corwin Press.
- Ritchhart, R., Church, M. & Morrison, K. (2011). *Making thinking visible: How to promote engagement, understanding, and independence for all learners*. San Francisco: Jossey-Bass.

- Slavin, R. E. (1995). *Cooperative learning.* Boston: Allyn and Bacon.
- Wiggins, G. & McTighe, J. (1998). *Understanding by design.* Alexandria, VA: Association for Supervision and Curriculum Development.
- Wong, H. K., & Wong. R. T. (2009). *The first days of school: How to be an effective teacher (4th ed.)*. Mountain View, CA: Wong Publications.

Course Performance Evaluation

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

Assignments

Findings from science education research shows that frequent assessment of small amounts of material is most effective for learning science. Therefore, in this class formal and informal assessment will be continuously provided on assignments and class activities. Assessment is a two-way communication loop that informs both learning and teaching. All written assignments must be submitted through Blackboard or VIA as indicated. General formatting includes 1" margins, double-spacing, and Times New Roman (or equivalent) font.

Assignment	Points	Due Date
Research Review	10	September 13
Nature of Science Assignment	10	October 4
Lesson Critique and Revision	20	October 18
Safety Assignment	10	November 22
Original Lesson (Draft Due November 15)	20	December 6
Microteaching and Reflection	20	December 6
Field Experience Paper	10	December 6
Professionalism	10	All Classes
TOTAL	110	

PLEASE USE THE ASSIGNMENT INSTRUCTIONS THAT ARE POSTED ON BLACKBOARD – THE INSTRUCTIONS GIVEN ON THE SYLLABUS ARE FOR DESCRIPTIVE PURPOSES ONLY

Nature of Science Assignment:

For this assignment, you will provide a 1 to 2 page written reflection highlighting how your experiences have assisted you in addressing the following 4 areas:

- Understand research and can successfully design, conduct, report, and evaluate investigations in science
- Understand and can successfully use mathematics to process and report data and solve problems in their field(s) of licensure
- Understand the philosophical tenets, assumptions, goals, and values that distinguish science from technology and from other ways of knowing the world
- Understand the processes, tenets, and assumptions of multiple methods of inquiry

Research Review:

For this assignment, identify three peer-reviewed research articles related to student-centered

and inquiry-based science teaching. Relevant articles can be found via Google Scholar (http://scholar.google.com) and/or the Mason library search engine (http://library.gmu.edu). You will then write a review of the articles, including (1) a description of the research questions, participants, methodology, and measures, (2) a synopsis of the findings, and (3) a discussion of how the findings can/should influence your classroom practice. Be sure to provide APA citations for each article. Submit the assignment via Blackboard.

Lesson Critique and Revision:
Many of your best lessons will come from colleagues, websites, or other resources. However, it is critical that you customize these activities to your own style, purpose, students, and – most importantly – teaching philosophy. For this assignment, you will find a lesson plan from your licensure area, critique it with the provided form, and then improve it to more closely align with best practices. Submit the original and revised lessons as well as the critique form via Blackboard.

Safety Assignment:
A safety plan is necessary for the health and safety of your students and yourself, as well as for legal reasons. For this assignment, you will design a science safety plan, which will include (1) a list of safety rules/procedures relevant to your subject area, (2) a one-page (front and back, if necessary) safety contract that must be signed and dated by parents and students, (3) an evaluation of a science lesson for safety issues, (4) an engaging, safety-related assignment that teaches students the importance of safety, and (5) active maintenance of safety equipment in the classroom. The rubric can be found at the end of the syllabus.

Lesson Plan:
It is important that teacher candidates demonstrate their ability to design an effective lesson plan with specific, performance-based learning objectives that meet the learning needs of their students. Lesson planning can be guided by four basic questions: (adapted from Spencer, 2003, p. 251).

1. Who am I teaching? The number of learners, their academic level and prior knowledge.
2. What am I teaching? The content or subject, the type of learning (knowledge, skills, behaviors).
3. How will I teach it? Teaching models, learning strategies, length of time available, materials, technology resources, differentiation/modifications, etc.
4. How will I know if the students understand? Informal and formal assessments, formative and summative, higher order questioning techniques, feedback from learners, etc.

You might also want to ask:

- What do students know already?
- Where have students come from and what are they going on to next?
- How can I build in sufficient flexibility cope with emergent needs?

A lesson plan must be developed for each teaching session. During the internship and when teaching new content or grade levels, your lesson plans will be detailed. As you gain pedagogical content knowledge and are proficient, your lesson planning becomes less detailed. Part of the

planning process includes considering the following tasks:

- list content and key concepts, (research more if needed)
- define your aims and identify specific learning outcomes or objectives
- create assessments that are aligned to your specific objectives
- think about the structure of the lesson, pacing, and transitions
- identify adaptations/modifications/extensions needed to meet student needs
- determine "best practice" and learning strategies aligned to the learning outcomes
- identify learning resources and support materials

For this assignment, you will write an original lesson that aligns with best practices. The lesson should be designed for 90 minutes of instruction and use the provided lesson plan template. Submit all files via VIA. The detailed instructions and rubric can be found at the end of the syllabus.

Microteaching and Reflection:

Research shows that the most effective teachers inform their practice by analyzing and reflecting on their teaching. Toward the end of the semester, you will teach a 30-minute lesson that you have designed with your partner(s). After teaching, you will submit a reflection about the experience via Blackboard.

Prior to the day of the lesson:

1. Identify any resources you need to teach your lesson and put in a request for what you cannot obtain to determine if it is available. Please do this at least two (2) weeks prior to the day you teach to ensure materials will be available.

Day of the lesson:

2. Give a one-minute overview in which you will describe to the class the setting of this lesson (subject, grade level, standards, and objectives).
3. For the remainder of the time, you will engage your classmates in an **inquiry lesson** that teaches both specific science concepts and nature of science ideas.
4. Be sure to conduct a **formative assessment** so you have data to determine whether or not students achieve the objectives.

After the lesson:

5. Examine the formative assessments, summarizing the results and determining from this data whether the objectives were achieved.
6. <u>Write a 5-page paper that examines what happened during your lesson</u>, focusing on how the activities might have influenced student learning (positively and negatively). The paper should be organized as follows:
   a. Identify the assessments used during lesson to evaluate the lesson objectives. Describe the results of the assessments of these objectives (e.g., percentage of the students achieved each objective).
   b. Examine the lesson in detail to determine what happened in the classroom that might have influenced the results of the assessments and what could be done to improve student achievement. Where/how could students think more deeply about the objective?

Where/how could they be more explicit (either as a class or individually) about what they had learned before the assessment? Further, you should conduct a critical review of the assessment as to whether it is a valid measure of the lesson objectives. Use evidence from assessments to draw your conclusions about your lesson.

c. Examine the specific actions you undertook as a teacher (mannerisms, answering questions, etc.) and categorize these into those actions that might help with student learning and those that might hinder student learning. In each category, explain how it might influence student learning.

Field Experience Project:

The purpose of the field experience is to provide you with the opportunity to (1) connect the goals of the course, science education theories, and research findings to classroom/school practice, (2) be exposed to a variety of classroom/school communities, and (3) promote critical, self-reflection about your future teaching practice.

In this course you will spend 15 hours in area classroom(s) with teachers instructing subject(s) and grade level(s) for which you are being licensed. Many of these hours will be spent observing these teachers' instruction, but you will also be expected to engage with students individually, in small groups, and in whole groups, as your mentor teacher determines. As part of this experience, you will be reflecting on how teachers design instruction to meet the needs of students and you will consider suggestions as to how you might do things similarly and/or differently.

You should spend a *minimum* of 5 days observing teachers, with each day being a *maximum* of 3 hours. The purpose of the field experience is to provide you with the opportunity to (1) connect the goals of your methods I class, education theories relevant to your subject matter, and concepts and research findings related to classroom/school practice, (2) study and begin to develop your pedagogical practices in a variety of classroom/school communities, and (3) promote critical, self-reflection about your current and future teaching practices.

Your **Clinical Experience Summary Project** should address all of the elements described on the **Clinical Experience Observation Protocol and Critical Incidents Reflection** Form:

1. your class's demographics
2. your classroom's layout and the teacher and student movements and interactions it enables or inhibits
3. your observations regarding your mentor teacher's and classroom's:
    a. teaching processes and practices
    b. student-teacher interactions
    c. student-student interactions
    d. teaching and learning with technology
    e. interactions with students with special needs
    f. interactions with diverse populations (e.g., ELLs or underrepresented racial/ethnic minority students)
4. critical teaching/learning incidents
5. burning issues/questions
6. "best practice" teaching tips

Consider your Protocol and Reflection Forms as well as any other relevant data you collected and prepare your Clinical Experience Summary and Analysis Project. This report will be submitted through Blackboard and consists of 4-5 page description and analysis of what you have learned. Be sure to reflect on the intersections and tensions between what you have encountered in our Methods I class, our course readings and activities, your own school experiences in similar classes, and your clinical experience observations. Finally, detail implications of this clinical experience, what you observed, and your analyses for your future teaching practices.

Note: Be sure to provide the Methods I Clinical Experience Introductory Letter to your mentor teacher, and discuss expectation for hours, Observation Protocol elements, Reflection Form content, and this Summary and Analysis Project with your mentor teacher early in your clinical experience.

Professionalism:
Learning depends on the active engagement of the participant and frequent checking by the instructor as to the progress of the learner. Your classmates depend on your comments to extend their learning. Preparation, attendance, and participation are necessary for each class.

Other Requirements

Every student registered for any Secondary Education course with a required VIA performance-based assessment (designated as such in the syllabus) must submit this/these assessment(s) (**Original Lesson Plan** assignments) to VIA through ***'Assessments'*** in Blackboard (regardless of whether a course is an elective, a one-time course or part of an undergraduate minor). Failure to submit the assessment(s) to VIA (through Blackboard) will result in the course instructor reporting the course grade as Incomplete (IN). Unless this grade is changed upon completion of the required VIA submission, the IN will convert to an F nine weeks into the following semester.

Grading

High quality work and participation is expected on all assignments and in class. Attendance at all classes for the entire class is a course expectation. For each unexcused absence, the course grade will be reduced by 5% points. All assignments are graded and are due at the beginning of class on the day they are due. Late assignments will automatically receive a ten percent grade reduction (one full letter grade lower).

A = 95-100%;
A- = 90-94%;
B+ = 87-89%;
B = 83-86%;
B- = 80-82%;
C = 70-79%;
F = Below 70%

If circumstances warrant, a written contract (there is a form that CEHD provides) for an incomplete must be provided to the instructor for approval prior to the course final examination date. Requests are accepted at the instructor's discretion, provided your reasons are justified and that 80% of your work has already been completed. Your written request should be regarded as a contract between you and the instructor and must specify the date for completion of work. This date must be at least two weeks prior to the university deadline for changing incompletes to letter grades.

Professional Dispositions

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

Class Schedule
Faculty reserves the right to alter the schedule, as necessary, with notification to students.

Date	Topic(s)	Recommended Reading Due	Assignment Due
Aug 23	Intro to Course Why teach science? Social Justice	Look over the Blackboard Website	
Aug 30	Nature of science	*NSTA class bundle* – ▪ Teaching and Assessing the Nature of Science (Clough) ▪ Using Metacognition to Develop Understanding of the Role of Evidence in Science (Peters-Burton)	
Sept 6 – No Class – Labor Day Holiday			
Sept 13	Conceptual Modeling	*NSTA class bundle* – ▪ Conceptualizing Moon Phases (Wilcox & Kruse) ES ▪ Models that Matter (Hitt & Townsend) CHEM ▪ Modeling Natural Selection (Bogiages & Lotter) BIO ▪ Reasoning from Models (Demir, Wade-Jaimes & Qureshi) PHY ▪	Research Review
Sept 20	Conceptual Modeling and Argumentation in Science	*NSTA class bundle* – ▪ A Scaffolding Suite to Support Evidence-Based Modeling and Argumentation (Reinhart, Duncan, & Chinn) ▪ Promoting and supporting scientific argumentation in the classroom—The evaluate-alternatives instructional model (Sampson & Grooms) ▪ Inquiry, Argumentation, and the Phases of the Moon (Hall & Sampson)	
Sept 27	Lesson Plans, Lesson Objectives and Backwards Design	*NSTA class bundle* – ▪ A Backward Approach to Inquiry (Hendrickson) ▪ Understanding by Design meets Integrated Science (Want & Allen)	

Oct 4	Formative Assessment	*NSTA class bundle* – ▪ Formative Assessment Guideposts (Ayala) ▪ Formative Assessment Probes (Keeley, Eberle, & Farrin) ▪ Using Graphic Organizers as Formative Assessment (Strubel) ▪ Assessing Scientific Inquiry (Peters)	NOS Assignment
Oct 12 – Monday classes meet on Tuesday	Summative Assessment	*NSTA class bundle* – ▪ The ABCs of Assessment (Wright) ▪ Reaching the Zone of Optimal Learning: The Alignment of Curriculum, Instruction, and Assessment (Farenga,. Joyce, & Ness) ▪ Reforming Cookbook Labs (Peters)	
Oct 18	Managing the Inquiry Classroom	*NSTA class bundle* – ▪ Maximizing Student Time on Task (Peters) ▪ Managing Group Work (McGlynn & Kelly)	Lesson Critique and Revision
Oct 25	Safety	*NSTA class bundle* – ▪ Safer Science: NSTA Portal to Science Safety (Roy) Lab safety: More than Just Goggles	
• **Nov 1 and 8 –Work on Lesson plans – no class**			
Nov 15	Peer Review of Lesson		Original Lesson Draft
November 22	Microteaching		• Safety Assignment
November 29	Microteaching		
Dec 6	No CLASS – Remaining assignments due		• Microteaching Reflection • Clinical Experience Paper • Final Lesson Plan

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 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/VIA. 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

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/ .

Lesson Plan Template

Section 1. Classroom Context

Grade level: **Number of students:**
Content Area: **Name of Unit:**
Lesson planned for ____ minutes
Circle when this lesson occurs in the unit: _ beginning middle __end

Narrative including any additional contextual information that will impact planning:

Section 2. Planning for Instruction

Performance-based Objective(s)

National content standards and VA Standards of Learning (SOL)/Career- and College- Ready Standard

Lesson Rationale: What research base did you use to make instructional decisions? Why have you selected these objectives and these specific strategies?

Differentiation and Accommodations

Materials/Technology

Section 3. Instruction and Assessment

Instruction Context: Describe purpose of the lesson.

Lesson Procedures: Detail the sequence of the lesson, including the Opening/Strategies/Assessments/Closure activities. Note: The reader should be able to teach the lesson from this plan.

LESSON PLAN MUST BE A 5E LESSON FOR SCIENCE EDUCATION

Engage:

Explore:

Explain:

Elaborate:

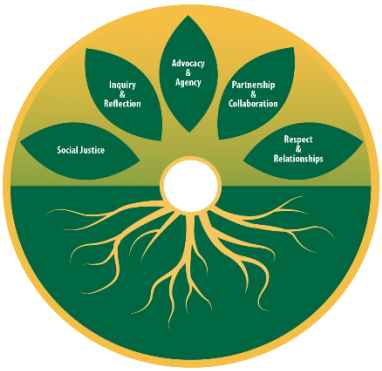
Evaluate:

Assessments: Include explanation of assessment choices (formal/informal and formative/summative assessments) and alignment of assessments to lesson objectives.

Section 4. Reflection: Impact on Student Learning

Narrative reflection on the lesson and the impact on student learning. Include any changes you would make to the lesson based upon your reflection.

The Secondary Education (SEED) Program "Seeds"



As illustrated by the model above, the SEED program is guided by five "Seeds" or principles that students are expected to understand and learn to apply in their teaching and professional lives: Social Justice, Inquiry and Reflection, Advocacy and Agency, Partnership and Collaboration, and Respect and Relationship. SEED students address each Seed in a developmental fashion, twice during their licensure program and once again during the master's teacher research capstone experience:

- Each Seed is introduced and students demonstrate initial understandings and consider initial applications to teaching of the Seeds (as determined by the program and course instructor) during one of the five pre-licensure courses ("Foundations," Methods I, Human Development, Methods II, Content Literacy)
- All five Seeds are revisited and students demonstrate deeper conceptual understandings of and identify applications to their teaching of the Seeds (in a manner they determine) during internship and internship seminar
- All five Seeds are explored more deeply, and students demonstrate mastery understandings of, applications to their teaching and teaching inquiries (via their teacher research Methodologies), and future integrations of the Seeds into their teaching and teaching inquiries (via their teacher research Discussions)

Course	Seed/Definition	Key Assignment Description
"Foundations of Secondary Education"	**"Advocacy and Agency"** The SEED program educates teachers to develop a commitment to advocating for and developing agency in every young person. Teachers' advocacy activities begin with pedagogical interactions and extend into school and community contexts. Similarly, teachers' consideration of youths' agency begins with enabling them to act independently and make choices in their own best interests—in the classroom and beyond.	**Multi-Genre Blog** The multi-genre blog is a collection of self-contained artifacts, representing multiple genres, united by a common theme. Each piece included in the collection must represent an aspect of the teacher candidate's teaching philosophy, and be drawn from their research, clinical and life experience, and class discussions. The blog must demonstrate the teacher candidate's understanding of why and how they will advocate for their students' well-being and success and help their students develop greater agency in school and beyond.
Methods I	**"Social Justice"** The SEED program educates teachers to develop a commitment to social justice. Such a commitment encompasses the belief that all members of our school, university, and broader communities can contribute to disrupting inequitable interactions, practices, and structures, with a focus on enhancing each individual's opportunity to learn and succeed.	**Lesson Plan** Using a provided format, the lesson plan must include objectives, standards, instructional plans, assessments, classroom layout(s), a teacher script, and all materials that would be given to students as part of the lesson. The lesson must demonstrate the teacher candidate's ability integrate justice concepts/content into their

	Social justice is also closely aligned with "equity," which involves the implementation of anti-oppressive and antiracist interactions, practices, and structures that ensure that every individual has an unbiased, impartial, responsive, and appropriately-scaffolded opportunity for academic and professional success. recognize and critique social inequities,	instruction.
"Human Development and Learning"	**"Relationships with and Respect for Youth"** The SEED program educates teachers to develop relationships with and respect for youths. When a school culture promotes respect, support for students' identities, senses of belonging, and tolerance, students are able to work as active participants in the classroom and the community. Secondary teachers who create a welcoming environment in their classrooms; who strive to know and honor students' backgrounds, preferences, and perspectives; who build relationships with young people based on trust and mutual understanding; and who connect curriculum to students' cultures hold key to effective instruction. Their instruction will contribute to developing unique individuals who will be able to connect their life experiences to learning.	**Case Study/Student Application Project** The case study/student application project is a summative assessment of the teacher candidate's ability to use psychological theory to analyze problems in a classroom and practice approaches a thoughtful, ethically principled teacher would use to solve problems. The case study/student applicant project must demonstrate the teacher candidate's understanding of how and why teachers can use psychological theories and principles to develop relationships with and demonstrate respect for youths, with an ultimate goal of enhancing adolescents' school and life success.
Methods II	**Inquiry and Reflection** The SEED program educates teachers who appreciate and know how to ask questions about their practices and who are critically reflective of their pedagogies, empowered by evidence. The ability to inquire and reflect on one's teaching practice is foundational to educators' ongoing and self-directed professional growth across their professional lifespans. Educators who can inquire into and consistently implement effective instructional practices–and who can critically reflect on and evaluate their pedagogies--will be the most responsive teachers and will best inspire students to learn.	**Unit Plan/Lesson Implementation** Teacher candidates will use the "backwards design" process to develop a plan for teaching a unit which actively involves students in meaningful learning; individualizes learning to accommodate the strengths and needs of students; and provides authentic assessments. Unit plans will include objectives, a calendar, and an outline of each day in the unit. One lesson of the unit must be taught/co-taught in the teacher candidate's clinical experience classroom, and the unit plan and lesson implementation must demonstrate the candidate's understanding of how and why teachers use inquiry and reflection to improve their pedagogical practices and enhance student learning.
Content Literacy	**"Collaboration and Partnership"** The SEED program educates teachers who value collaborative engagement in learning and teaching and supporting collaboration through different forms of partnership. Collaboration takes on many forms, including collaboration amongst teacher candidates and their peers, course instructors and faculty advisors, mentor teachers in schools, their students and their students' families and caregivers, and amongst	**Disciplinary Literacy Inquiry Project** Teacher candidates complete an inquiry into methods of supporting students' comprehension in their respective content areas. Using resources from class and peer-reviewed articles, candidates develop an understanding of how to guide and deepen students' comprehension, addressing questions including "Why is it important to be literate in our respective subject areas?".

	experts in their fields of teaching. These collaborations occur through a shared understanding of partnership. By spanning multiple boundaries, the SEED program supports partnerships with local schools and their divisions, with state and national professional associations, and with international experiences in other countries.	The inquiry project must demonstrate the candidate's understanding of how why teachers collaborate with other education professionals, students, families and caregivers and others to support students' subject area comprehension and literacy learning.
Internship and Internship Seminar	**All SEED Seeds: Applications to Teaching** All five Seeds are revisited and students demonstrate deeper conceptual understandings of and identify applications to their teaching of the Seeds during internship and internship seminar.	
Teacher Research (for Master's students only)	**All SEED Seeds: Applications to Teaching and Teaching Inquiries** All five Seeds are explored more deeply, and students demonstrate mastery understandings of, applications to their teaching and teaching inquiries (via their teacher research Methodologies), and future integrations of the Seeds into their teaching and teaching inquiries (via their teacher research Discussions)	