Augu"What greater or better gift can we offer the Republic than to teach and instruct our youth?"
Cicero

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

EDCI 573:001 TEACHING SCIENCE IN THE SECONDARY SCHOOL
Fall Semester, 2015

College of EDUCATION & HUMAN DEVELOPMENT MASON

Promoting Learning & Development Across the Lifespan

Instructor:	Dr. Stephen Burton
Date and Time:	August 31 – December 14 (Tuesdays 7:20-10:00 pm)
Class Location:	Thompson 2020
Telephone:	616-502-2175
E-mail:	sburton7@gmu.edu
Office Hours:	By appointment

REQUIRED TEXTS:

- Models-Based Science Teaching - By: Steven W. Gilbert - ISBN:978-1-936137-23-7
- The BSCS 5E Instructional Model: Creating Teachable Moments - Rodger W. Bybee – ISBN:978-1-941316-00-9
- Assessment in Science: Practical Experiences and Education Research – Edited by: Maureen McMahon - ISBN:978-1-93353-100-7
- Everyday Assessment in the Science Classroom - Edited by: Janet E. Coffey and J Myron Atkin - ISBN:978-0-87355-217-2
- Teaching High School Science Through Inquiry and Argumentation - Douglas Llewellyn - ISBN:978-1-4522-4445-7

COMMUNICATION

If you would like to get in touch with me, email is the best form (sburton7@gmu.edu). During usual circumstances, turnaround time is 24-36 hours. You can also reach me on my cell phone at 616-502-2175. However, please text me first using that phone asking if I can receive a call at that time. If I do not respond right away, then I am unavailable. I will, however, text back later and we can schedule a time to talk on the phone.

Course Description

EDCI 573 is the first course in a two-part sequence of science methods courses for pre-service and provisionally licensed science teachers. The course is designed to build 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.
Field experience is a required part of this course.

Course Materials Online

We will be using the website https://sites.google.com/site/educ473573/ for dissemination of information. Materials will be added throughout the semester based upon needs from the course. The Blackboard site, found at http://mymasonportal.gmu.edu, will be used primarily for submitting assignments and grades. Use the same login as your GMU email for the Blackboard Sites.

Field Experience Signup

The State of Virginia requires a number of hours of field work before you can do your internship. You will acquire 15 of those hours during this class. The university will place you in the field.
The website to sign up is http://cehd.gmu.edu/endorse/ferf.

Nature of Course Delivery

A variety of teaching strategies will be used to explore the themes of the day. These will largely include face-to-face interactions with the professor and fellow students. All students will continuously analyze and evaluate teaching strategies, as well as science content, processes, and ways of knowing in science.

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://www.gmu.edu/service/cert .

Big Ideas In Science Education

During this semester, we will be focusing on developing as a reflective practitioner of reformed science education practices. In particular we will focus on the following big ideas as a way to frame your understanding of effective science education practices throughout both Science Methods I and Science Methods II.

- Our job is to help them figure out how to be lifelong learners
- The more they figure out answers to tough questions on their own, the more they will trust they can learn on their own
- Science is a process that uses evidence to think critically and explain the natural world
    - Process leads to the knowledge we currently teach as facts
    - If students don't experience the process they won't value its ability to explain the natural world – plus they will only see science as a collection of facts
- Know your students – get into their heads when designing lessons

- Have a theory of learning – it is what should guide your instruction as you develop lessons
- Know what you want your students to be able to do and how you will assess it before you design any unit or lesson
- Measure everything you do against student learning
- You don't have to reinvent the wheel, but do need to customize it based on your objectives

Learning Goals, Objectives and Assessments (for both Methods I and Methods II)

Within the big ideas above are more specific goals and objectives (tasks) that you should be able to achieve by the end of the semester and two semester sequence of the Science Methods. Below is a list of the major goals with specific objectives and the assessments that will allow you to show that you have achieved those goals.

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

Objective	Assignment	Who must do this?
Students will be able to explain why a student-centered approach to learning is effective in learning	Research Review	Methods I and II – Grad Students Only
Students will be able to describe their theory of learning, supporting with evidence from the literature	Learning Theory/ Teaching Philosophy	Methods I and II
Student will be able to design lessons that clearly reflect their learning theory	Lessons (Both), Unit Plan (Methods II), Microteaching Reflection (Both)	Methods I and II
Students will be able to explain how the 5-E lesson design, the Learning Cycle, and a student-centered learning theory are effective ways to think about learning and lesson design	Reflection Questions	Methods I and II

Goal: Do science to understand how science is done

Objective	Assignment	Who must do this?
Students will be able to conduct an investigation that results in new scientific knowledge	Scientific Investigation	Methods I
Students will be able to explain the epistemic features and unique characteristics (NOS) of science	Nature of Science Assignment	Methods I

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

Objective	Assignment	Who must do this?
Students will be able to explore the web to describe the major safety and ethical concerns associated with conducting science in the classroom	Safety Assignment	Methods I
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 the students get while conducting inquiries	Safety Assignment	Methods I
Students will be able to design lessons and clearly indicate within the lesson: safety concerns, how to reduce them and what to do when accidents happen	Lessons (Both), Unit Plan (Methods II)	Methods I and II

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

Objective	Assignment	Who must do this?
Students will be able to explain what inquiry in a science class looks like	Reflection Questions	Methods I and II
Student will develop lessons that are inquiry	Lessons (Both), Unit Plan (Methods II)	Methods I and II
Students will be able to explain Model-Based Inquiry and its potential impact on helping students learn science content and scientific thinking	Reflection Questions	Methods I
Students will be able to develop lessons that incorporate Model-Based Inquiry	Lessons (Both), Unit Plan (Methods II)	Methods I and II
Students will be able to explain Cognitive Apprenticeships and its potential impact on helping students learn science content and scientific thinking	Reflection Questions	Methods I and II
Students will be able to develop lessons that incorporate Cognitive Apprenticeships	Lessons (Both), Unit Plan (Methods II)	Methods I and II

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

Objective	Assignment	Who must do this?
Student will be able to explain the basic premise and order of backwards	Reflection Questions	Methods I and II
Students will use the basic organization of backwards design to develop a lesson plan	Lessons (Both), Unit Plan (Methods II)	Methods I and II
Students will be able to write measurable objectives	Lessons (Both), Unit Plan (Methods II)	Methods I and II
Students will be able to describe how teaching activities support student achievement of measurable objectives	Lessons (Both), Unit Plan (Methods II), Microteaching Reflection (Both)	Methods I and II
Students will be able to describe how assessments evaluate student achievement of the measurable objectives	Lessons (Both), Unit Plan (Methods II), Microteaching Reflection (Both)	Methods I and II

Goal: Develop skills as reflective practitioners.

Objective	Assignment	Who must do this?
Students will be able to effectively examine classrooms using their learning theory as a lens and student behavior, engagement, and learning (when possible) as the evidence	Field Experience Paper	Methods I and II
Students will be able to examine use assessment data to reflect on and improve upon lessons	Microteaching Reflection (Both)	Methods I and II

Relationship to Program Goals and Professional Organizations

EDCI 473/573 is the first course in a two-course sequence of science methods courses for students seeking a secondary school teaching license in earth science, biology, chemistry, or physics. The course builds on students' knowledge of their subject matter. 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 473/573 builds a repertoire of science teaching and assessment strategies to facilitate student learning.

Professional Association Standards (met through EDCI 473/573)

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

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. Each graded assignment will be assessed using a scoring rubric which will be handed out before the assignment is due. All assignments are due at the beginning of class on the day they are due. Graded assignments that are late will automatically receive a ten percent grade reduction (one full letter grade lower).

Grading Scale

A = 93-100%
A- = 90-92%
B+ = 88-89%
B = 80-87%
C = 70-79%
F = Below 70%

Policy on Incompletes

If circumstances warrant, a written request 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.

Assignments

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 used as a tool for information that informs both learning and teaching, so this two-way communication loop is necessary for optimal learning.

Assessments	EDCI 473	EDCI 573	Due Date
Learning Theory/Teaching Philosophy	5	4	October 5
Lesson Critique	4	3	October 12
Science Investigation	10	10	October 19
Safety Assignment (PBA)	10	10	October 26
Nature of Science Assignment (PBA)	10	10	November 2
Lesson Revision	9	8	November 9
Research Review	NA	5	November 23
Original Lesson	16	15	November 30
Microteaching Reflection	6	5	December 14
Field Experience Paper	10	10	December 14
Reflection Questions	10	10	Varied
Professionalism	10	10	Varied
Total Points	**100**	**100**	

Performance-Based Assessments (PBA) and Task Stream

In this course, there are two performance based assessments required. These are the Nature of Science Assignment and the Safety Assignment. Every student registered for any Secondary Education course with a required performance-based assessment (will be designated as such in the syllabus) is required to submit these assessments to TaskStream (regardless of whether a course is an elective, a onetime course or part of an undergraduate minor.) Evaluation of your performance-based assessment will also be provided using TaskStream. Failure to submit the assessment to TaskStream will result in a the course instructor reporting the course grade as Incomplete(IN). Unless this grade is changed upon completion of the required TaskStream submission, the IN will convert to an F nine weeks into the following semester.

Professionalism

Learning depends on the active engagement of the participant and frequent checking by the instructor as to the progress of the learner. Smaller assignments will be given as necessary in class in order to inform your learning and my teaching. Your participation in these assignments is essential to valuable class discussions and will help to "chunk" the large assignments into smaller, more attainable learning goal. Your classmates depend on your comments to extend their learning. Attendance for each class is necessary – please contact the professor BEFORE any absence.

See ***Graduate School of Education Dispositions for A Career Educator*** section below and follow the instructions to sign the form stating you will behave professionally during this course. You cannot earn the points for professionalism UNTIL you have completed and signed the form. Attendance is an important component of professionalism to consider as well. Learning depends on the active engagement of the participant and frequent checking by the instructor as to the progress of the learner. Smaller assignments will be given as necessary in class in order to inform your learning and my teaching. Your

participation in these assignments is essential to valuable class discussions and will help to "chunk" the large assignments into smaller, more attainable learning goal. Your classmates depend on your comments to extend their learning. Attendance for each class is necessary – please contact the professor BEFORE any absence. **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.**

Tentative Calendar (subject to change based on student needs):

Date	Topic
Aug 31	What is learning? What is important for students to learn? Introduction to scientific investigation and NOS
Sept 7	Science Lesson Teaching with Inquiry
Sept 14	Science Lesson How students learn science? What are big ideas? What are misconceptions?
Sept 21	Science Lesson Revisiting Learning Model
Sept 28	Science Lesson Constructivism, big ideas and backwards design, writing objectives
Oct 5	Science Lesson Lesson Planning – 5-E, Learning Cycle
Oct 12	Columbus Day Recess
Oct 19	Lesson Revision
Oct 26	ONLINE SAFETY ASSIGNMENT
Nov 2	Reflecting on Safety Lesson Revision
Nov 9	Reflection - Exploring assessment data and lesson design
Nov 16	Planning Original Lesson
Nov 23	Planning Original Lesson
Nov 30	Micro-teaching
Dec 7	Micro-Teaching
Dec 14	**NO CLASS – FIELD EXPERIENCE PAPER AND MICROTEACHING REFLECTION DUE**

Online Resources

- Achieve, Inc. on behalf of the twenty-six states and partners that collaborated on the NGSS (2013). Next Generation Science Standards (2013). Achieve, Inc. Available online at http://www.nextgenscience.org/next-generation-science-standards
- Commonwealth of Virginia (2010). *Standards of Learning for Virginia Public Schools.* Richmond, Virginia. Retrieved on August 14, 2011 from http://www.doe.virginia.gov/testing/index.shtml
- Commonwealth of Virginia (2003). *Science Standards of Curriculum Framework Guides.* Retrieved on August 14, 2007 from http://www.pen.k12.va.us/VDOE/Instruction/sol.html#science.
- National Research Council (1996). *National science education standards.* Washington, DC: National Academy Press. Available online at http://www.nap.edu/openbook.php?record_id=4962
- National Science Teachers' Association. *Science Class* newsletter. Retrieved on August 14, 2007 from http://www.nsta.org/publications/enewsletters.aspx.
- American Association for the Advancement of Science (1993). *Benchmarks for Science Literacy*. Retrieved on August 14, 2007 from http://www.project2061.org/tools/benchol/bolframe.htm.
- McComas, W. F. (1998). *The principle elements of the nature of science: Dispelling the myths.* Retrieved on August 14, 2007 from http://coehp.uark.edu/pase/TheMythsOfScience.pdf.
- Peters, E. E. (2006). *Why is teaching the nature of science so important?* Retrieved on August 14, 2007 from http://www.vast.org/content/File/v1n1/linkedwhole.pdf.
- American Chemical Society (2007). *Educators & Students page.* Retrieved on August 14, 2007 from 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: http://membership.acs.org/c/ccs/pubs/sacl_faculty.pdf
- U.S. Government Printing Office (2007). *Code of Federal Regulations.* Retrieved on August 14, 2007 from http://www.gpoaccess.gov/cfr/index.html.
- U.S. Department of Labor (2007). *Occupational Health and Safety Administration.* Retrieved on August 14, 2007 from http://www.osha.gov/.
- American National Standards Institute (2007). *American National Standards Institute Homepage.* Retrieved on August 14, 2007 from http://www.ansi.org/.
- Maryland Public Schools (2007). *Legal Aspects of Laboratory Safety.* Retrieved on August 14, 2007 from http://mdk12.org/instruction/curriculum/science/safety/legal.html.

Other articles/handouts will be distributed in class or posted on-line at the course website. (Your GMU email address is required for communication with the course instructor and for using Blackboard!)

Other Resources

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.

Hassard, J. (2005). *The art of teaching science: Inquiry and innovation in middle school and high school.* New York: Oxford University 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., Eberle, F., & Farrin, L. (2005). *Uncovering student ideas in science: 25 formative assessment probes.* Arlington, VA: National Science Teacher Association Press.

Llewellyn, D. (2002). *Inquire within: Implementing inquiry-based science standards.* Thousand

Oaks, CA: Corwin Press.
McComas 2008. Proposal for core nature of science content in popular books on the history and philosophy of science: lessons for science education. In Lee, Y.J. & Tan, A.L. (Eds.) *Science education at the nexus of theory and practice.* Rotterdam: Sense Publishers.
National Resource Council. (2005). *How Students Learn: Science in the Classroom.* Committee on *How People Learn,* A Targeted Report for Teachers, M.S. Donovan and J.D. Bransford, Editors. Division of Behavioral and Social Science and Education. Washington, DC: The National Academies Press.
Slavin, R. E. (1995). *Cooperative learning.* Boston: Allyn and Bacon.
Tomlinson, C. A. (1999). *The differentiated classroom: Responding to the needs of all learners.* Alexandria, VA: Association for Supervision and Curriculum Development.
Wiggins, G. & McTighe, J. (1998). *Understanding by design.* Alexandria, VA: Association for Supervision and Curriculum Development.

ATTACHED ARE TWO PERFORMANCE BASED ASSESSMENTS REQUIRED FOR NCATE/NSTA ACCREDITATION.

PERFORMANCE BASED ASSESSMENT 1

NATURE OF SCIENCE AND SCIENTIFIC INQUIRY ASSIGNMENT

During the early part of the semester, you will be engaged in doing a scientific investigation. Provide a written reflection highlighting how your experience has assisted you in addressing the 9 core nature of science ideas (see table below). Further, describe in relative detail how you developed and used at least 10 of the science process skills (see table below). Finally, explain whether you feel that you might apply scientific inquiry in your classroom to teach a science concept.

NATURE OF SCIENCE (Derived from McComas 2008*)

1. Science cannot answer all questions
2. Science employs multiple methods and types of reasoning that share many common factors, habits of mind and norms
3. Science produces, demands, and relies on empirical evidence
4. Scientific knowledge is tentative, durable, and self-correcting
5. Laws and theories are related but distinct kinds of scientific knowledge and play central roles
6. Science is a creative endeavor
7. Social, historical and cultural factors play a role in the construction of scientific knowledge
8. Science and technology are not the same but impact one another
9. Science has a subjective element

SCIENCE PROCESS SKILLS

- Classification – describes patterns in nature and is a human construct
- Measurement – standardized and reproducible way of collecting empirical evidence
- Observation – description of the natural world intended to be free from interpretation
- Analysis – interpreting empirical evidence
- Synthesis
- Using hypotheses to make predictions
- Generating falsifiable questions
- Finding appropriate resources/information/data to evaluate questions
- Generating falsifiable hypotheses
- Using models as a way to examine phenomena
- Identifying patterns
- Generating investigations and ability troubleshoot
- Dissemination of knowledge
- Generating inferences

*McComas 2008. Proposal for core nature of science content in popular books on the history and philosophy of science: lessons for science education. In Lee, Y.J. & Tan, A.L. (Eds.) *Science education at the nexus of theory and practice*. Rotterdam: Sense Publishers.

NATURE OF SCIENCE ASSIGNMENT RUBRIC

Standard	Unsatisfactory	Acceptable	Target	Accomplished
1d - Understand research and can successfully design, conduct, report and evaluate investigations in science	Product submitted is not an example of scientific inquiry	Product provided is a classroom assignment in which candidate was given the question and methods for investigating the question but candidate conducts the investigation and reports on the findings.	Product provided is a classroom assignment in which candidate is given a question but designed and implemented the methods for investigating the question as well as reports on the findings.	Product provided is an independent investigation in which the candidate identifies the question, designs and implements the methods for investigating the questions and reports the findings.
Standard	Unsatisfactory	Acceptable	Target	Accomplished
1e - Understand and can successfully use mathematics to process and report data, and solve problems, in their field(s) of licensure.	Product has inappropriate or no examples of mathematics used to address report their investigation or solve problems.	Product provided is a classroom assignment that appropriately uses mathematics to report their investigation or solve problems but the procedures were largely defined by the instructor.	Product provided is a classroom assignment that appropriately uses mathematics to report their investigation or solve problems and the procedures were largely determined by the candidate.	Product provided is an independent investigation in which the candidate identifies the question, designs and implements the methods for investigating the questions and reports the findings. In the reporting the candidate appropriately uses mathematics to report their investigation or solve problems.

Standard	Unsatisfactory	Acceptable	Target	Accomplished
2b - Understand the philosophical tenets, assumptions, goals, and values that distinguish science from technology and from other ways of knowing the world;	Candidate cannot explain any of the following characteristics of the nature of science: 1. Science cannot answer all questions. 2. Science produces, demands, and relies on empirical evidence. 3. Science and technology are not the same but impact one another.	Candidate can explain all of the following characteristics of the nature of science in a superficial way: 1. Science cannot answer all questions. 2. Science produces, demands, and relies on empirical evidence. 3. Science and technology are not the same but impact one another.	Candidate can fully explain all of the following characteristics of the nature of science way BUT DO NOT connect them to their research product: 1. Science cannot answer all questions. 2. Science produces, demands, and relies on empirical evidence. 3. Science and technology are not the same but impact one another.	Candidate can fully explain all of the following characteristics of the nature of science way AND connects them to their research product: 1. Science cannot answer all questions. 2. Science produces, demands, and relies on empirical evidence. 3. Science and technology are not the same but impact one another.

Standard	Unsatisfactory	Acceptable	Target	Accomplished
3a - Understand the processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge;	Candidate cannot explain any of the following characteristics of the nature of science: 1. Science cannot answer all questions. 2. Science employs multiple methods and types of reasoning that share many common factors, habits of mind and norms 3. Science produces, demands, and relies on empirical evidence. 4.Scientific knowledge is tentative, durable, and self-correcting	Candidate can explain all of the following characteristics of the nature of science in a superficial way: 1. Science cannot answer all questions. 2. Science employs multiple methods and types of reasoning that share many common factors, habits of mind and norms 3. Science produces, demands, and relies on empirical evidence. 4.Scientific knowledge is tentative, durable, and self-correcting	Candidate can fully explain all of the following characteristics of the nature of science way BUT DO NOT connect them to their research product: 1. Science cannot answer all questions. 2. Science employs multiple methods and types of reasoning that share many common factors, habits of mind and norms 3. Science produces, demands, and relies on empirical evidence. 4.Scientific knowledge is tentative, durable, and self-correcting	Candidate can fully explain all of the following characteristics of the nature of science way AND connects them to their research product: 1. Science cannot answer all questions. 2. Science employs multiple methods and types of reasoning that share many common factors, habits of mind and norms 3. Science produces, demands, and relies on empirical evidence. 4.Scientific knowledge is tentative, durable, and self-correcting

Standard	Unsatisfactory	Acceptable	Target	Accomplished
4a - Understand socially important issues related to science and technology in their field of licensure, as well as processes used to analyze and make decisions on such issues;	Candidate cannot explain any of the following characteristics of the nature of science: 1. Science is a creative endeavor 2. Social, historical and cultural factors play a role in the construction of scientific knowledge 3.Science has a subjective element	Candidate can explain all of the following characteristics of the nature of science in a superficial way: 1. Science is a creative endeavor 2. Social, historical and cultural factors play a role in the construction of scientific knowledge 3.Science has a subjective element	Candidate can fully explain all of the following characteristics of the nature of science way BUT DO NOT connect them to their research product: 1. Science is a creative endeavor 2. Social, historical and cultural factors play a role in the construction of scientific knowledge 3.Science has a subjective element	Candidate can fully explain all of the following characteristics of the nature of science way AND connects them to their research product: 1. Science is a creative endeavor 2. Social, historical and cultural factors play a role in the construction of scientific knowledge 3.Science has a subjective element

PERFORMANCE BASED ASSESSMENT 2

SAFETY ASSIGNMENT:

Safety Assignment

A **Safety Plan** is necessary for the health and safety of your students and yourself, as well as, for legal reasons. You will design a science safety plan which will include (1) a list of **safety rules/procedures** that ends with a **safety contract** for the parents and students to sign and date (front and back of one page – ready to distribute to students), (2) analyses of science classroom legal cases (which will be given in class), (3) a lesson analysis (provided online) that requires you to look at two labs and analyze it for safety, identifying the major aspects (one lab will be with animals), (4) a safety related assignment that engages students and teaches the importance of safety in the science classroom, and (5) active maintenance of safety equipment in a science classroom (which will be performed in class).

Post the entire assignment on Taskstream.

Post the safety lesson/assignment (part 4) onto the discussion board on MyMason – Blackboard site.

SAFETY ASSIGNMENT RUBRIC

Standard	Unsatisfactory	Acceptable	Target	Accomplished
9a - Understand the legal and ethical responsibilities of science teachers for the welfare of their students, the proper treatment of animals, and the maintenance and disposal of materials	Unable to list the legal responsibilities as a teacher AND Unable to describe how to address these responsibilities	Able to list the legal responsibilities as a teacher AND Able to describe how hypothetically address these responsibilities	Given a hypothetical lab activity: Able to identify the legal responsibilities of the teacher AND Able to describe how to address these responsibilities within a specific lab	Within self-developed lessons and unit: Consistently identifies the legal responsibilities of the teacher AND Able to describe how to address these responsibilities
Standard	Unsatisfactory	Acceptable	Target	Accomplished
9b - Know and practice safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction	Unable to list safe practices associated with non-living materials	Able list safe practices associated with non-living materials including preparation, storage, disposal and supervision	Given a hypothetical activity: Able list safe practices associated with non-living materials including preparation, storage, disposal and supervision AND Able to appropriate outline emergency procedures for the science lab and classroom	Within self-developed lessons and unit: Safely prepare, store, dispense, and dispose of materials used during science instruction AND Provide appropriate emergency procedures to share with students for the activity within the lesson

Standard	Unsatisfactory	Acceptable	Target	Accomplished
9c - Know and follow emergency procedures, maintain safety equipment, and ensure safety procedures appropriate for the activities and the abilities of students	Unable to describe emergency procedures, explain maintenance of any safety equipment, or determine and address safety concerns associated with a particular activity	Able describe emergency procedures, explain the maintenance of primary safety equipment and determine and address safety concerns associated with a particular activity	Given a hypothetical activity: Able to identify safety concerns associated, appropriate emergency procedures, and what safety equipment should be available and how to maintain that equipment	Within self-developed lessons and unit: Able to articulate to students safety concerns associated, appropriate emergency procedures, and what safety equipment should be available
Standard	Unsatisfactory	Acceptable	Target	Accomplished
9d - Treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restrictions on their collection, keeping, and use	Unable to list safe and ethical practices associated with living organisms	Able to list safe and ethical practices associated with living organisms including humane and ethical treatment, safety (both human and of the living organism), husbandry or disposal	Given a hypothetical activity: Able to list safe and ethical practices associated with living organisms including humane and ethical treatment, safety (both human and of the living organism), husbandry or disposal	Within self-developed lessons and unit: Able to articulate to students safe and ethical practices associated with living organisms including humane and ethical treatment, safety (both human and of the living organism), husbandry or disposal

SUSTAINABILITY AND DISPOSITIONS INFORMATION

SUSTAINABILITY AT GMU

George Mason University is focusing on making our community "greener" and reducing the impact on the environment. This course will contribute to this effort in the following ways. I hope that you will create other ways to contribute to contribute to this effort.

- Handouts will be available electronically through the Blackboard platform
- All assignments will be submitted through the blackboard on a Wiki site established fir each individual student.
- You should consider reducing waste in your teaching practice (ex: unnecessary paper) and in developing your unit plan
- Incorporate teaching sustainability in the content of your lesson plans (for example, human's role in reducing their impact on the environment.) Think about what the next generation needs to know about "greening".

COLLEGE EXPECTATIONS AND UNIVERSITY HONOR CODE

- Students are expected to exhibit professional behaviors and dispositions at all times. See ***Graduate School of Education Dispositions for A Career Educator*** section below and follow the instructions.
- Students must adhere to the guidelines of the George Mason University Honor Code [See http://oai.gmu.edu/honor-code/].
    - Please note the following.
        - "Plagiarism encompasses the following:
            1. Presenting as one's own the words, the work, or the opinions of someone else without proper acknowledgment.
            2. Borrowing the sequence of ideas, the arrangement of material, or the pattern of thought of someone else without proper acknowledgment." (from Mason Honor Code online at http://mason.gmu.edu/~montecin/plagiarism.htm)
        - Paraphrasing involves taking someone else's ideas and putting them in your own words. When you paraphrase, you need to cite the source using APA format.
        - When material is copied word for word from a source, it is a direct quotation. You must use quotation marks (or block indent the text) and cite the source.
        - Electronic tools (e.g., SafeAssign) may be used to detect plagiarism if necessary.
        - Plagiarism and other forms of academic misconduct are treated seriously and may result in disciplinary actions.
- 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 George Mason University 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.**
- The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu/].
- Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu/].

- Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See http://writingcenter.gmu.edu/].
- The College of Education & 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/

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

Graduate School of Education Dispositions for A Career Educator

Students are expected to exhibit professional behavior and dispositions. The Virginia Department of Education and the National Council for Accreditation of Teacher Education promote standards of professional competence and dispositions. Dispositions are values, commitments, and professional ethics that influence behaviors toward students, families, colleagues, and all members of the learning community. The Graduate School of Education expects students, faculty, and staff to exhibit professional dispositions through a:

I. Commitment to the profession

- Promoting exemplary practice
- Excellence in teaching and learning
- Advancing the profession
- Engagement in partnerships

II. Commitment to honoring professional ethical standards

- Fairness
- Honesty
- Integrity
- Trustworthiness
- Confidentiality
- Respect for colleagues and students

III. Commitment to key elements of professional practice

- Belief that all individuals have the potential for growth and learning
- Persistence in helping individuals succeed
- High standards
- Safe and supportive learning environments
- Systematic planning
- Intrinsic motivation
- Reciprocal, active learning
- Continuous, integrated assessment
- Critical thinking
- Thoughtful, responsive listening
- Active, supportive interactions
- Technology-supported learning
- Research-based practice
- Respect for diverse talents, abilities, and perspectives
- Authentic and relevant learning

IV. Commitment to being a member of a learning community

- Professional dialogue
- Self-improvement
- Collective improvement
- Reflective practice
- Responsibility
- Flexibility
- Collaboration
- Continuous, lifelong learning

V. Commitment to democratic values and social justice

- Understanding systemic issues that prevent full participation
- Awareness of practices that sustain unequal treatment or unequal voice
- Advocate for practices that promote equity and access
- Respects the opinion and dignity of others
- Sensitive to community and cultural norms
- Appreciates and integrates multiple perspectives

GO TO THE FOLLOWING WEBSITE, DOWNLOAD SIGN AND PROVIDE THE FOLLOWING DOCUMENT AGREEING TO DEMONSTRATE THE ABOVE PROFESSIONAL DISPOSITIONS:
http://cehd.gmu.edu/assets/docs/cehd/Dispositions%20for%20a%20Career%20Educator.pdf

IMPORTANT INFORMATION FOR LICENSURE COMPLETION

Student Clinical Practice: Internship Requirements

Testing

Beginning with Spring 2015 internships, **all** official and passing test scores must be submitted and in the Mason system (i.e. Banner/PatriotWeb) by the internship application deadline. Allow a minimum of six weeks for official test scores to arrive at Mason. Testing too close to the application deadline means scores will not arrive in time and the internship application will not be accepted.

Required tests:

- Praxis Core Academic Skills for Educators Tests (or qualifying substitute)
- VCLA
- Praxis II (Content Knowledge exam in your specific endorsement area)

For details, please check http://cehd.gmu.edu/teacher/test/

Endorsements

Please note that ALL endorsement coursework must be completed, with all transcripts submitted and approved by the CEHD Endorsement Office, prior to the internship application deadline. Since the internship application must be submitted in the semester prior to the actual internship, please make an appointment to meet with the Endorsement Specialist and plan the completion of your Endorsements accordingly.

CPR/AED/First Aid

Beginning with spring 2015 internships, verification that the Emergency First Aid, CPR, and Use of AED Certification or Training requirement must be submitted and in the Mason system (i.e. Banner/PatriotWeb) by the application deadline. Students must submit one of the "acceptable evidence" documents listed at http://cehd.gmu.edu/teacher/emergency-first-aid to CEHD Student and Academic Affairs. In order to have the requirement reflected as met in the Mason system, documents can be scanned/e-mailed to CEHDacad@gmu.edu or dropped-off in Thompson Hall, Suite 2300.

Background Checks/Fingerprints

All local school systems require students to complete a criminal background check through their human resources office (not through George Mason University) **prior to beginning the internship**. Detailed instructions on the process will be sent to the student from either the school system or Mason. Students are **strongly advised** to disclose any/all legal incidents that may appear on their records. The consequence of failing to do so, whether or not such incidents resulted in conviction, is termination of the internship.

Please Note: Your G-Number must be clearly noted (visible and legible) on the face of the document(s) that you submit.

Application

The internship application can be downloaded at http://cehd.gmu.edu/teacher/internships-field-experience

Deadlines:

Spring internship application:

- Traditional: September 15
- On-the Job: November 1

Fall internship application:

- Traditional: February 15
- On-the Job: May 1