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

EDCI 673: Advanced Methods of Teaching Science in the Secondary School

Fall Semester, 2014

College of EDUCATION & HUMAN DEVELOPMENT MASON

Promoting Learning & Development Across the Lifespan

Instructor:	Dr. Stephen Burton
Date and Time:	August 26 – December 10 (Tuesdays 4:30 – 7:10 pm)
Class Location:	Thompson Hall 2020
Telephone:	616-502-2175 – this is a cell phone, please text first to make sure I can take the call
E-mail:	sburton7@gmu.edu
Office Hours:	By appointment

Required Text Resources

N/A

Recommended Text Resources

- Bell, R., Gess-Newsome, J. & Luft, J. (2008). *Technology in the secondary science classroom.* Arlington, VA: NSTA Press.

- Liu, X. (2010). *Essentials of science classroom assessment.* Washington, DC: Sage Publications.

- Tomlinson, C. A. (2005). *How to differentiate instruction in mixed-ability classrooms.* Upper Saddle, NJ: Pearson.

- Tomlinson, C. A., & McTighe, J. (2006). *Integrating differentiated instruction and understanding by design.* Alexandria, VA: ASCD (200 pp).

- Keeley, P. (2008). *Science formative assessment: 75 practical strategies for linking assessment, instruction, and learning.* Arlington, VA: NSTA Press.

- Nitko, A. J. & Brookhart, S. M. (2007). *Educational assessment of students*. Upper Saddle River, NJ: Pearson

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 (2003). *Standards of Learning for Virginia Public Schools.* http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

- Commonwealth of Virginia (2003). *Science Standards of Curriculum Framework Guides.* http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml

- National Science Teachers' Association. *Science Class* newsletter. http://www.nsta.org/publications/enewsletters.aspx.

- American Association for the Advancement of Science (1993). *Benchmarks for Science Literacy*. http://www.project2061.org/tools/benchol/bolframe.htm.

- National Academies Press (1996). *Classroom Assessment and the National Science Education Standards.* http://www.nap.edu/catalog.php?record_id=9847

Other articles/handouts will be distributed in class or posted on-line at the course website.

Course Description

Prerequisite: EDCI 673. This is the second course in a two-part sequence of courses for preservice science teachers. The course is designed to build on the fundamentals of curriculum design and teaching from the first course and focus on using technology for students to investigate science and adapting instruction and assessment for the diverse needs of learners. In additional to using technology in the schools, preservice teachers will modify lessons and assessments to address the diverse needs of students, implement those lessons and assessments with their peers, and analyze the effectiveness of those lessons and assessments.

Goals

- Understand the relationship of assessment in understanding student learning and informing instruction; RESEARCH-BASED PRACTICE; SPA STANDARD 8

- Design evidence-based assessment techniques in science instruction; RESEARCH-BASED PRACTICE; SPA STANDARD 8

- Build a repertoire of science teaching and assessment strategies using technology to help students become scientifically literate, think critically and creatively, and see relationships among science, technology, and society; RESEARCH-BASED PRACTICE; INNOVATION; COLLABORATION; SPA STANDARDS 1, 2, 3, 5, 6, 8, 10

- Critique, adapt, and construct standards-based lessons including assessment and hands-on experiences for the diverse needs of learners including gender equity, cultural diversity, English language learners, gifted/talented students, and students with learning, physical, social, and emotional challenges. RESEARCH-BASED PRACTICE; SOCIAL JUSTICE; ETHICAL LEADERSHIP; SPA STANDARDS 1, 3, 4, 5, 6, 7, 8, 10

Relationship to Program Goals and Professional Organizations

EDCI 483/673 is the second 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 and from their first science methods course. The course focuses on using technology in science teaching and learning and meeting the diverse needs of learners as called for by the *Standards of Learning for Virginia Public Schools* and *National Science Education 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 673 introduces students to integrating technology in learning and teaching science, adapting inquiry-based lessons, assessment techniques, and the diverse needs of students.

Field Experience Signup

The State of Virginia requires a number of hours of field work before you can do your internship. You will acquire 30 of those hours during this class. The university will place you in the field if you are not already teaching. EVERYONE needs to register on the website even if you are teaching, so that GMU has a record of where/when everyone did this 30 hours of field work.

The website to sign up is **http://cehd.gmu.edu/endorse/ferf.**

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.

Learning Objectives and Assessments:

Below are the major learning objectives that you will be held accountable for in this course and the assessments that will be used to evaluate your achievement of the objectives.

Learning Objectives:	Assessment:
A student will be able to consistently write measureable objectives	**Unit Plan**
A student will be able to develop assessments aligned with measureable objectives	**Unit Plan**
A student will be able to design a lesson in which students are actively engaged and follow a student-centered theory	**Unit Plan**
A student will be able to use assessment data to evaluate student achievement of objectives	**Unit Plan, Microteaching Paper**
A student will be able to design a lesson in which students will learn characteristics of the nature of science	**Unit Plan**
A student will be able to examine student achievement of objectives to evaluate and modify their lessons	**Microteaching Reflection Paper**
A student will be able to describe the safety issues and solutions for lessons	**Unit Plan**
A student will be able to organize curriculum topics to build integrated student knowledge	**Unit Plan**
A student will be able to effectively incorporate technology into the classroom.	**Technology Lessons**
A student will be able to differentiate lessons to address the diverse needs of students.	**Differentiation Lessons**
A student will be able to be reflective about their own teaching and the teaching of others based upon evidence.	**Reflection Questions, Microteaching Reflection Paper, Field Experience Paper**

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	Points	Due Date
Unit Concept Map – Organization of Ideas	1	9-Sep
Unit Objectives/Assessments	1	23-Sep
Lesson Plan 1	2	7-Oct
Lesson Plan 2	2	21-Oct
Differentiated Lesson Plan 2	2	28-Oct
Lesson Plan 3	4	4-Nov
Differentiated Lesson Plan 3	5	11-Nov
Unit Plan Overview	2	11-Nov
Lesson Plan 4	4	18-Nov
Differentiated Lesson Plan 4	8	25-Nov
2 Lesson Plans Incorporating Technology	10	10-Dec
Field Experience Report	20	10-Dec
Teaching Reflection	15	15-Dec
Participation/Reflection Questions	10	Ongoing
Professionalism (see below)	5	Ongoing
Final Unit Plan Submission	3	End of Semester

GOOGLE SITES: Over the course of the semester, you will be working with a partner to organize 4 weeks of teaching (in block schedules). You will be creating multiple products and support materials for these 4 weeks of teaching. All of these products and organization will be posted through a website you and your partner will author using Google Sites (https://sites.google.com/). In order to create a website with Google Sites, you will need to sign

up for a gmail email account (if you do not already have one). More information on how to work with Google Sites can be found at https://support.google.com/sites/?hl=en#topic=1689606.

BLACKBOARD: All other assignments will be posted on the course Blackboard site. This site can be found at http://courses.gmu.edu. Use the same login as your GMU email.

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.

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

Date	Topic
Aug 26	Backwards Design, Connecting Lessons– Work on Unit Concept Map-Organization of Ideas
Sept 2	Assessment - Work on Unit Concept Map-Organization of Ideas
Sept 9	Assessment – Work on objectives and summative assessment
Sept 16	Model-based Instruction – Work on objectives and summative assessment
Sept 23	Cognitive Apprenticeships – Work on Lesson 1
Sept 30	Technology in the Classroom - Work on Lesson 1
Oct 7	Understanding by Design - Work on Lesson 2
Oct 14	**NO CLASS COLUMBUS DAY RECESS**
Oct 21	Understanding by Design – Work on Differentiated Lesson Plan 2
Oct 28	Work on Lesson 3
Nov 4	Reflection - Using Assessment to Guide Instruction
Nov 11	Work on lesson 4
Nov 18	**NO FORMAL CLASS MEETING** - Online Assignment – Field Experience Report
Nov 25	Micro-Teaching – 4 groups
Dec 2	Micro-Teaching – 4 groups
Dec 10	Micro-Teaching – 4 groups
Dec 15	**NO CLASS - ASSIGNMENTS DUE**

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
- You should consider reducing waste in your teaching practice (ex: unnecessary paper) and in developing your work products for this class
- 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".

Dispositions

Students are expected to exhibit professional behavior and dispositions. See gse.gmu.edu for a listing of these 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:

Commitment to the profession

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

Commitment to honoring professional ethical standards

Fairness
Honesty
Integrity
Trustworthiness
Confidentiality
Respect for colleagues and students

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

Commitment to being a member of a learning community

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

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

COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT STATEMENT OF EXPECTATIONS:

All students must abide by the following:

Professional Dispositions: Students are expected to exhibit professional behaviors and dispositions at all times.

- Students are expected to exhibit professional behavior and dispositions. See http://gse.gmu.edu/facultystaffres/profdisp.htm for a listing of these dispositions.
- Students must follow the guidelines of the University Honor Code. See http://oai.gmu.edu/honor-code/<http://oai.gmu.edu/honor-code> for the full honor code.

Please note that:

- "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 agree to abide by the university policy for Responsible Use of Computing. See http://www.gmu.edu/facstaff/policy/newpolicy/1301gen.html. Click on responsible Use of Computing Policy at the bottom of the screen.

- Students with disabilities who seek accommodations in a course must be registered with the GMU Office of Disability Services (ODS) and inform the instructor, in writing, at the beginning of the semester. See http://www2.gmu.edu/dpt/unilife/ods/ or call 703-993-2474 to access the ODS.

    - 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/].
    - 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/].

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