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

EDCI 483: Advanced Methods of Teaching Science in the Secondary School

Spring Semester, 2012

Instructor:	Dr. Stephen Burton
Date and Time:	(January 24 – May 8) Tuesdays 7:20-10 pm
Class Location:	Thompson 2020
Telephone:	616-502-2175
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

- 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. (Your GMU email address is required for communication with the course instructor and for using Blackboard!)

Course Materials Online

The Blackboard site can be found at http://courses.gmu.edu. Use the same login as your GMU email.

Course Description

Prerequisite: EDCI 573. 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 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.

Nature of Course Delivery

A variety of teaching strategies will be used to explore the themes of the day. All students will continuously analyze and evaluate teaching strategies, as well as science content, processes, and ways of knowing in science.

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".

College Expectations and University honor Code

The College Education and Human Development (GSE) expects that all students abide by the following: Students are expected to exhibit professional behavior and dispositions. See gse.gmu.edu for a listing of these dispositions. Students must follow the guidelines of the University Honor Code. See http://academicintegrity.gmu.edu/honorcode/ for the full honor code. Students must agree to abide by the university policy for Responsible Use of Computing. See http://universitypolicy.gmu.edu/1301gen.html for the full policy.

Students with disabilities who seek accommodations in a course must be registered with the GMU Disability Resource Center (DRC) and inform the instructor, in writing, at the beginning of the semester. See www.gmu.edu/student/drc or call 703-993-2474 to access the DRC.

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.

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

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**

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**

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.

Assessments	Points	Due Date
Unit Concept Map – Organization of Ideas	1	February 1, 2012
Unit Objectives/Assessments	1	February 1, 2012
Lesson Plans 1 & 2	2	February 8, 2012
Lesson plans 3 & 4	3	February 29, 2012
Differentiated Lesson Plan 1	3	February 29, 2012
Lesson Plan Incorporating Technology 1	3	February 29, 2012
Unit Plan Overview	3	March 21, 2012
Lesson Plans 5 & 6	4	March 28, 2012
Differentiated Lesson Plan 2	4	March 28, 2012
Lesson Plan Incorporating Technology 2	4	March 28, 2012
Lesson Plans 7 – 10	12	April 25, 2012
Differentiated Lesson Plan 3	10	April 25, 2012
Lesson Plan Incorporating Technology 3	10	April 25, 2012
Field Experience Report	15	May 9, 2012
Microteaching Paper	15	
Reflection Questions	5	
Professionalism	5	

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.

Please submit assignments electronically through the Blackboard site. All written assignments are to be word-processed. Please use standard 12 point font (don't use "Chiller" or

other poster font) and make your margins 1" on each side. All assignments should be double spaced and in APA format (check apa.org for more details). Make each project something that you will actually use in teaching.

You will find all assignments except the next two described in detail with instructions and when appropriate, rubrics, on the blackboard site under the assignments.

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.