Advanced Instruction & Management of Middle/High School Science Classrooms
George Mason University EDCI 797 (3 credits)

Instructor Information:
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Course Description:
This is the second course in a two-part sequence of courses for beginning science teachers. It is a field- and university-based course designed to provide teachers with an opportunity to reflectively apply their skills and knowledge about teaching science. The course is designed to build on the fundamentals of curriculum design and teaching from the first course and focus on refinement and revision of participants' ideas about teaching, using technology for students to investigate science, and adapting instruction for the diverse needs of learners. Teachers will design and implement science lessons that demonstrate proficiency in the use of educational technology for instruction as well as adaptations for diverse learners, including limited English proficient students, gifted and talented students, and students with disabling conditions, in order to promote student academic progress and provide effective preparation for the Standards of Learning assessments. The course will build upon skills from the previous course for using evaluation of pupil performance to refine instruction. Additionally, teachers will learn about age-appropriate classroom management techniques that address diverse approaches based upon behavioral, cognitive, affective, social and ecological theory and practice in order to support professionally appropriate practices that promote positive redirection of behavior as well as development of social skills and self-discipline.

Goals:
Teachers will:
- Demonstrate the use of technology in teaching science;
- Develop inquiry-based lessons for students to use technology to conduct science experiments, to research science issues, to analyze science data, and to communicate findings;
- Construct, critique, and adapt standards-based lessons including assessment and hands-on experiences for the diverse needs of learners including gender equity, cultural diversity, English language learners, high and low achievement, and the physically, socially, and emotionally challenged;
- 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 STEM areas (science, technology, engineering, math);
- Design a hands-on, inquiry-based PBL unit;
- Develop leadership skills;
- Work collaboratively with peers to conduct classroom research on student learning; and
- Reflect regularly on their progress.

Relationship to Program Goals and Professional Organizations:
The second in a series of two courses, this class 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). This course builds a repertoire of science teaching and assessment strategies to facilitate student learning.

Readings and Resources:

Provided Texts

- Keeley, P. (2014). *Science formative assessment, volume 2: 50 more strategies for linking assessment, instruction, and learning*. Thousand Oaks, CA: Corwin Press.
- Liu, X. (2010). *Essentials of science classroom assessment*. Washington, DC: Sage Publications.
- Pinto, L.E. (2013). *From discipline to culturally responsive engagement: 45 classroom management strategies*. Thousand Oaks, CA: Corwin Press.
- VISTA PBL Manual (2013).
- Wormeli, R. (2007). *Differentiation: From planning to practice grades 6-12*. Portland, ME: Stenhouse Publishers.

Online

- Virginia Science Standards of Learning (2010). http://www.doe.virginia.gov/testing/sol/standards_docs/science/index.shtml
- Next General Science Standards (National Research Council)
  - *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. (2011) http://www.nap.edu/catalog.php?record_id=13165
  - *The Next Generation Science Standards*. (2013) http://www.nextgenscience.org
- *Engineering in K-12 Education: Understanding the Status and Improving the Prospects.* http://books.nap.edu/catalog.php?record_id=12635
- ExploreLearning – Gizmos (www.explorelearning.com)
- National Science Teachers Association (www.nsta.org)
- Virginia Association of Science Teachers (www.vast.org)
- Readings and other resource materials in SharePoint.

Nature of Course Delivery:
This course will be conducted asynchronously online. It is critical that you complete each module in its entire on time in order to maximize your learning experience.

Attendance and Grading:
Since this is a graduate level course, high quality work is expected on every assignment. Due dates are noted on the course schedule. Graded assignments that are late will automatically receive a 25% point reduction. There are a total of 750 points available on the assignments. Course grades will be determined as follows:

A = 700 – 750 points
B = 600 – 699 points
C = 525 – 599 points
F = less than 525 points

Assignments:
All written assignments are to be word-processed and submitted online. Be sure to include your name and the assignment title at the top of the first page. Please create one file for the entire assignment and use the following naming format: YOUR LAST NAME.ASSIGNMENT NAME. Whenever possible, make the project something that you can actually use during teaching. Below is a description of major assignments; please see the end of the syllabus for the rubrics. If no rubric is given, full credit will be given for complete assignments, half credit will be given for partially complete assignments, and no credit will be given for missing assignments. Unless otherwise noted, all assignments should be posted to the appropriate SharePoint folder. The assignments have been grouped into two categories to emphasize their purpose.

Reflective Professional Learning Community

1. ***Membership in VAST*** – As part of your participation in this, you are required to join the Virginia Association of Science Teachers (VAST). VISTA pays for your membership. You are highly encouraged to join the National Science Teachers Association (NSTA, http://www.nsta.org) as well. Both NSTA and VAST* provide journals, newsletters and access to information on their websites.

2. ***Resources to Share*** – Throughout the course, please share relevant resources with your instructor and classmates by uploading relevant files and/or links to the class' SharePoint site.

3. ***Student Work Assessment/Analysis*** (50 points each, 100 points total) – As noted in the course schedule, you will analyze samples of student work from spring 2015. Participants will follow a structured process of determining students' understanding of the SOL concepts being taught and implications for future instruction.

First Student Work Analysis

	Target	Satisfactory	Needs Work
Student Work Samples (10 points)		Representative samples brought to class and used for analysis	No samples or missing samples of three levels of student work
Analysis using Protocol (10 points)	Thorough analysis of student samples using the protocol worksheets	Some analysis of student samples using the protocol worksheets	No or limited analysis using the protocol worksheets
Discussion of patterns within and across student work samples (15 points)	Thoughtful and thorough contributions to the discussion of individual student work samples and across the class	Some contributions to the discussion of individual student and class level patterns	Limited or no sharing of patterns within or across the class
Discussion of how to improve student understanding based on identified patterns (15 points)	Thoughtful and thorough contributions to improve student understanding based on identified patterns	Some contributions to improve student understanding based on identified patterns	Limited or no sharing of how to improve student understanding based on identified patterns

Second Student Work Analysis

	Target	Satisfactory	Needs Work
Item analysis (10 points)	All aspects of the item analysis are completed correctly	No more than one aspect of the item analysis is missing or incomplete	More than one aspect of the item analysis is missing or incomplete
Discussion of results (10 points)	Rich and concise discussion of the results, including SOL correlation of low scoring items	Adequate discussion of results, including SOL correlation of low scoring items	Superficial discussion of results OR SOL correlation of low scoring items is missing
Students' misconceptions identified (10 points)		Complete list of student misconceptions	Incomplete list of student misconceptions
Plan for Re-teaching (15 points)	Thoughtful and thorough planning for re-teaching	Some consideration of how to reteach concepts to students	No consideration or weak consideration of how to reteach
Report is professionally prepared (5 points)		Effective, well prepared report	Confusing or ill-prepared presentations

Effective Science Teaching and Management

5. ***Technology Project*** (100 points) – For this assignment you will select a specific instructional technology you would like to implement in your classroom, learn how to use it, and write a lesson that incorporates it.

Component	Target (33 pts)	Satisfactory (15 pts)	Needs Work (0 pts)
Technology description	Comprehensive overview of technology implemented	General overview of technology implemented	Cursory overview of technology implemented
Reflection	Comprehensive overview of the pros and cons of the selected instructional technology	General overview of the pros and cons of the selected instructional technology	Cursory overview of the pros and cons of the selected instructional technology
Lesson plan	Well-prepared lesson that effectively incorporates the selected technology	Well-prepared lesson that incorporates the selected technology adequately	Confusing or ill-prepared lesson OR lesson does not incorporate the selected technology

6. ***Culture Bump*** (100 points) – This is your opportunity to apply what you are learning about yourself and the cultural identity and expectations of yourself and others in the context of your experiences as a teacher. You will document your bump via a written submission using the seven steps listed in the Archer article, including a response to the questions.

Component	Target (33 pts)	Satisfactory (15 pts)	Needs Work (0 pts)
Description of Culture Bump	Rich and concise contextual description, no steps are missing.	Some contextual description AND only 1-2 of the 7 steps are missing or unclear.	Very little contextual description OR 3-6 of the 7 steps are missing or unclear.
Questions 2-5	In-depth and concise response with multiple sources cited. All questions are addressed.	A partial response is given. All questions are addressed. Citations are limited.	Responses are unclear AND/OR not fully developed.
Submission	No grammatical or spelling errors. All references are	Few grammatical, spelling or usage errors. All references	Many grammatical errors, misspellings, or missing

	present. Professional appearance.	are present.	references.

7. ***Differentiation for Diverse Learners*** (100 points) – For this assignment you will research and plan how to successfully differentiate instruction for the diverse learners in your classroom. There are several steps to this assignment:

a. Student Information Survey – Develop a survey for the selected class in order to determine strengths, weakness, preferences, etc. Suggest ways to analyze the results for future resources and needs.

b. Additional Information – Gather additional information about how students learn/behave and differentiation strategies that will maximize learning. Suggested sources include:

(1) Observe, record, and analyze classroom interactions (teacher-student and student-student) from a library of video recordings/links the instructor will give you.
(2) Discuss the role of specialists (special education teacher, school psychologist, school social worker, etc.) in how you can differentiate in your classroom.
(3) Determine how IEPs and 504 plans can used them to guide differentiation
(4) Read books and articles that offer ideas for differentiation.

c. Research – Choose 2-3 strategies, and gather evidence from the literature on their effectiveness (student attendance, attitudes, grades, etc.).

d. Strategies for Unit Plan – Identify at least two differentiation strategies per lesson in your unit plan. Be sure to indicate the group(s) of diverse learners that each modification is intended to target.

Component	Target	Satisfactory	Needs Work
Class Survey (25 points)	Survey questions will gather data for a comprehensive overview of classes' strengths, needs, and preferences	Survey questions will gather data for a general overview of classes' strengths, needs, and preferences	Survey questions will gather data for a cursory overview of classes' strengths, needs, and preferences
Differentiation Strategies in Unit Plan (75 points)	A minimum of two suitable, research-based strategies are included in each lesson plan; targeted group(s) is(are) identified	At least one suitable, research-based strategy is included in each lesson plan; targeted group(s) is(are) identified	No or unsuitable strategies are included, strategies are not research-based AND/OR targeted group(s) is(are) not identified

8. ***Unit Plan*** (350 points) – Develop a 2- to 3-week-long (~15 hours of instruction) series of learning events focused on a science topic. Safety considerations, nature of science, hands-on, inquiry, and "connectivity" are a must. Your module should be developed in sufficient detail (including student and teacher support materials) that a substitute teacher could implement it. This should be a product that you will teach next year. Pieces of this assignment are due at

various times. Please refer to the Course Schedule for due dates. All written parts of this assignment should be posted in the appropriate folder on SharePoint. The final copy of your assignment will include the following:

a. Title Page – Include your name, unit title, targeted subject and grade level(s), and date.
b. Self-Checklist – A completed checklist (which will be provided) indicating all unit plan components are included.
c. Schedule – Include a one-page overview/list showing the science content being studied each day. This could be in the form of a calendar.
c. PBL Scenario – A description of the relevant, real-world scenario and associated problem students are solving during the unit (see PBL manual for examples).
d. Question Map – A graphic organizer that shows all unit questions (see PBL manual for examples).
e. Annotated Lesson Plans – Utilize the daily lesson plan template posted in SharePoint or the one required by your school division. Annotate your lesson plans to indicate where hands-on, inquiry, NOS, connectivity, and differentiation are addressed.
f. Supporting Materials – Include everything necessary to carry out the lesson plans including the assessments (e.g., handouts, readings, rubrics, quizzes, etc.).
g. Unit Presentation – You will present a 10 minute overview of your unit and include your expectations of implementing a PBL unit.
i. References – Appropriately cite your sources.

Component (points)	Target	Satisfactory	Needs Work
General Components			
• Self Checklist (15)		The checklist is completed	The checklist is not completed
• Schedule (15)		One-page overview of daily activities	Multiple pages OR no schedule provided
• PBL Scenario (15)		The scenario describes a relevant, real-world problem with multiple solutions	The scenario describes a problem that is not realistic OR has only one solution
• Question Map (20)	Graphic shows all questions addressed in the unit AND cites the SOL each question covers	Graphic shows all questions addressed in the unit	Graphic shows only a few questions addressed in the unit OR no map is provided.
• Support Materials (25)		All support materials are provided and are professional quality	Some support materials are missing OR they are not professional quality
• Unit Presentation (65)		Presentation is ~10 minutes, includes a detailed overview of the PBL unit and expectations on implementing the unit	Presentation is <<10 minutes, does not include a detailed overview of the PBL unit and expectations on implementing the unit
Lesson Plans			
• Annotation (10)		Lesson plans are annotated to indicate where hands-on, inquiry, NOS, connectivity, and differentiation are	Lesson plans are not annotated to indicate where hands-on, inquiry, NOS, connectivity, and/or

		addressed	differentiation are addressed
• Content (30)	The unit is standards-based and works through the content in a connected, appropriate sequence	The unit is standards-based and worked through the content in an appropriate sequence	The unit is not standards-based AND/OR does not work through the content in an appropriate sequence
• Differentiation (30)	Appropriate differentiation strategies are implemented for all students	Appropriate differentiation strategies are implemented for most students	Appropriate differentiation strategies are implemented for few students OR the strategies are inappropriate
• Hands-On – Amount (10)	~50% of the lessons meet the VISTA definition	At least 25% of the lessons meet the VISTA definition	Less than 25% of the lessons meet the VISTA definition
• Hands-On – Quality (30)	Meaningful, appropriate hands-on lesson are utilized	Appropriate hands-on lessons are utilized	Hands-on lessons are inappropriate
• Inquiry – Amount (10)	100% of the activities are inquiry-based	At least 50% of the lessons are inquiry-based	Less than 50% of the lessons are inquiry-based
• Inquiry – Quality (30)	A variety of inquiry levels are utilized appropriately	A few levels of inquiry are utilized appropriately	Only one level of inquiry is utilized appropriately
• NOS – Amount (10)	NOS reflection occurs regularly	NOS reflection occurs occasionally	NOS reflection occurs minimally OR not at all
• NOS – Quality (30)	Allows for both the teacher and students to explicitly reflect on NOS	Only the teacher explicitly reflects on NOS	Reflection on NOS is implicit

College of Education and Human Development Statement of Expectations:
All students must abide by the following:

- Students must adhere to the guidelines of the George Mason University Honor Code [See http://academicintegrity.gmu.edu/honorcode/].
- 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 for Responsible Use of Computing [See http://universitypolicy.gmu.edu/1301gen.html].
- 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/].
- 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.
- Students must follow the university policy stating that all sound emitting devices shall be

turned off during class unless otherwise authorized by the instructor.

- Students are expected to exhibit professional behaviors and dispositions at all times. http://cehd.gmu.edu/assets/docs/forms/secondary_ed/sec_ed_handbook.pdf
- Core Values Commitment
  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/

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.
   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.

Course Schedule:

Date	Topic(s)/Activities	Readings/Assignments Due
June 23, 2015 10am – 12pm (via AdobeConnect)	• Course overview • Goal setting	• *Teacher as Warm Demander* • Pinto book
June 23 – June 30	• complete hands-on/inquiry/ NOS review module • complete PBL module	• *VISTA PBL Manual* • PBL components draft
July 1 – July 8	• complete engineering module • complete technology project	• *Inquiry by Design Briefs* • technology project
July 5 – July 15	• complete differentiation modules	• Wormeli book • Culture Bump
Juy 16 – July 22	• complete assessment modules	• Keeley and Liu books • Student work analysis #1 & #2
July 23 10am – 12pm (via AdobeConnect)	• Course wrap-up and evaluation	• Differentiation assignment • Unit plan

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