

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

**EDCI 673-001: Advanced Methods of Teaching Science in the Secondary School
3 credits, Spring Semester, 2018
Mondays, 4:30 - 7:10 pm, Thompson 2020 – Fairfax Campus**

Faculty

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Prerequisite: EDCI 573 and EDUC 522

Recommended Corequisite: EDRD 619

University Catalog Course Description

Provides advanced study of teaching and curriculum development based on research and current issues. Emphasizes integrating science and technology, and adapting instruction to the needs of diverse learners. School-based field experience required. Offered by Graduate School of Education. May not be repeated for credit.

Course Overview

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 addition 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.

Course Delivery Method

A variety of teaching strategies will be used to explore the themes of each class session. These will largely include face-to-face interactions with the professor and fellow students, but a few sessions will be done synchronously online. All students will continuously analyze and evaluate teaching strategies, as well as science content, processes, and ways of knowing in science. A couple sessions may also be in an asynchronous online environment.

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.

- Our job is to help them figure out how to be lifelong learners
- Consider the teacher's role in evoking wonder, emotion and deep connection to science content
- 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 subjective activity

- The Nature of Science (NOS) frames science processes that lead to the creation of science knowledge (later taught as facts)
- Students should experience this process to understand its value in explaining the natural world
- Know your students
- 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

Learner Outcomes or Objectives

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 |
|---|--------------------------------------|
| Students will be able to explain why a student-centered approach to learning is effective in learning | Learning Theory/ Teaching Philosophy |
| Students will be able to describe their theory of learning, supporting with evidence from the literature | Learning Theory/ Teaching Philosophy |
| Student will be able to design lessons that clearly reflect their learning theory | Unit Plan, Microteaching Reflection |
| 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 | Unit Plan |

Goal: Do science to understand how science is done

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 an ethical and safe manner.

| Objective | Assignment |
|--|-------------------|
| 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 | Unit Plan |

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

| Objective | Assignment |
|---|-------------------------------|
| Students will be able to explain what inquiry in a science class looks like | Unit Plan |
| Student will develop lessons that are inquiry-based | Unit Plan/clinical experience |
| Students will be able to develop lessons that incorporate Model-Based Inquiry | Unit Plan/clinical experience |
| Students will be able to explain Cognitive Apprenticeships and its potential impact on helping students learn science content and scientific thinking | Unit Plan |
| Students will be able to develop lessons that incorporate Cognitive Apprenticeships | Unit Plan |

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

| Objective | Assignment |
|--|--------------------------------|
| Student will be able to explain the basic premise and order of backwards design | Unit Plan/clinical experience |
| Students will use the basic organization of backwards design to develop a lesson plan | Unit Plan/clinical experience |
| Students will be able to write measurable objectives | Unit Plan/clinical experience |
| Students will be able to describe how teaching activities support student achievement of measurable objectives | Unit Plan, Clinical Reflection |
| Students will be able to describe how assessments evaluate student achievement of the measurable objectives | Unit Plan, Clinical Reflection |

Goal: Develop skills as reflective practitioners.

| Objective | Assignment |
|--|--|
| Students will be able to effectively examine classrooms using their learning theory as a lens and student behavior, engagement, and learning (when possible) as the evidence | Clinical reflection |
| Students will be able to examine use assessment data to reflect on and improve upon lessons | Clinical reflection/unit plan assessment |

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.

Associated Professional Association Standards

- 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

Required Texts

Required readings will be posted on the Blackboard site for this course. This can be found at <http://mymasonportal.gmu.edu>. Students are expected to routinely check the online course portal for supplemental information, readings, assignments, etc.

Online Resources

- 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. <http://www.doe.virginia.gov/testing/index.shtml>
- <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
- 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>.

Course Performance Evaluation

All assignments for this course will be submitted to Blackboard from evaluation. In addition TK20 will be used for all assignments specific as Performance Based Assessments (PBA)

TK20 PERFORMANCE-BASED ASSESSMENT SUBMISSION REQUIREMENT

Every student registered for any Secondary Education course with a required performance-based assessment is required to submit this assessment, Lesson Plan to Tk20 through Blackboard (regardless of whether the student is taking the course as an elective, a onetime course or as part of an undergraduate minor). Evaluation of the performance-based assessment by the course instructor will also be completed in Tk20 through Blackboard. Failure to submit the assessment to Tk20 (through Blackboard) will result in the course instructor reporting the course grade as Incomplete (IN). Unless the IN grade is changed upon completion of the required TK20 submission, the IN will convert to an F nine weeks into the following semester.

The breakdown of points for each assignment for this course can be found below.

- **Assignments/Assessments**

- *Descriptions and rubrics for each of these assignments can be found on Blackboard*

| Assessments | Points | Due Date |
|--|-------------|--------------------|
| Clinical Assignments – 40 points total | | |
| Critical Incident Analysis (posted to GoReact) | 10 | 4/9/18 |
| Critical Incident Lesson Plan (posted to GoReact) | 5 | 4/9/18 |
| Individualized Instruction and Assessment Task | 10 | 4/23/18 |
| Clinical Experience Reflection Paper | 10 | 4/30/18 |
| Candidate Dispositions Assessment | 0 | 4/16/18 |
| Unit Plan (PBA) - 30 pts. total | | |
| Learning Theory/Teaching Philosophy | 3 | 1/29/18 |
| Unit Concept Map – Organization of Ideas | 3 | 2/5/18 |
| Unit Objectives/Assessments | 4 | 2/19/18 |
| Unit Plan Overview | 5 | 3/5/18 |
| *Lesson 1 – Inquiry-Based | 5 | 3/19/18 |
| *Lesson 2 – Technology-Enhanced | 5 | 3/26/18 |
| *Lesson 3 – Differentiated | 5 | 4/2/18 |
| In-Class Assignments – 35 points total | | |
| Discrepant Event Presentations (posted to GoReact) | 10 (5 each) | Assigned classes |
| Microteaching Presentation (posted to GoReact) | 10 | Assigned class |
| Reading Assignments | 10 | Beginning of class |
| Participation | 5 | Continuous |
| Total Points | 100 | |
| * one of these can be a lesson from your clinical site | | |

- 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. Please notify instructor when any class session must be missed. All assignments are graded according to standards and rubrics laid out during the course. All assignments are due at the beginning of class on the day they are due.
- Assignments that are late will automatically receive a ten percent grade reduction per day beyond the due date and after 5 days will not be accepted unless prior arrangements have been made well in advance and approved by instructor.
- Completing work ahead of the scheduled due date is acceptable and encouraged. There are many assignments in this course, so staying organized and on top of the schedule is important for success.

- **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.

Professional Dispositions

See <https://cehd.gmu.edu/students/policies-procedures/>

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

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.

Core Values Commitment

The College of Education and Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: <http://cehd.gmu.edu/values/>.

GMU Policies and Resources for Students

Policies

- Students must adhere to the guidelines of the Mason Honor Code (see <https://catalog.gmu.edu/policies/honor-code-system/>).
- Students must follow the university policy for Responsible Use of Computing (see <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- Students are responsible for the content of university communications sent to their Mason email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students **solely** through their Mason email account.
- Students with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see <http://ods.gmu.edu/>).
- Students must follow the university policy stating that all sound emitting devices shall be silenced during class unless otherwise authorized by the instructor.

Campus Resources

- Support for submission of assignments to Tk20 should be directed to tk20help@gmu.edu or <https://cehd.gmu.edu/aero/tk20>. Questions or concerns regarding use of Blackboard should be directed to <http://coursessupport.gmu.edu/>.
- For information on student support resources on campus, see <https://ctfe.gmu.edu/teaching/student-support-resources-on-campus>

For additional information on the College of Education and Human Development, please visit our website <https://cehd.gmu.edu/students/> .

Class Schedule

Note: Faculty reserves the right to alter the schedule as necessary, with notification to students.

| Date | Location | Topic | Assignments Due (all assignments are due by the start of class – 4:30pm – whether F2F or online) |
|---------|---|---|---|
| 1/22/18 | F2F | <ul style="list-style-type: none"> • Introduction to Course • Discrepant Event Introduction • Lesson Plan Review • Learning Theory/Teaching Philosophy Overview | |
| 1/29/18 | F2F (Meet at Clinical Orientation and then we will move to classroom after that) | <ul style="list-style-type: none"> • Methods 2 Clinical Orientation (4:30-5:15pm) – Room TBA • Connecting Lessons and Unit Concept Mapping • Nature of Science (NOS) | <ul style="list-style-type: none"> • Reading Assignment • Learning Theory/Teaching Philosophy |
| 2/5/18 | F2F | <ul style="list-style-type: none"> • Unit Objectives and Assessments Overview • Backwards Design • Inquiry Learning/5E process in Science, Part 1 | <ul style="list-style-type: none"> • Reading Assignment • Unit Concept Map |
| 2/12/18 | F2F | <ul style="list-style-type: none"> • Inquiry Learning/5E process in Science, Part 2 | <ul style="list-style-type: none"> • Reading Assignment |
| 2/19/18 | Online – Synchronous (login at normal class time) | <ul style="list-style-type: none"> • Unit Plan Overview • Online Learning • Instructional Technology in Science, Part 1 | <ul style="list-style-type: none"> • Reading Assignment • Unit Objectives/Assessments |
| 2/26/18 | F2F | <ul style="list-style-type: none"> • Instructional Technology in Science, Part 2 | <ul style="list-style-type: none"> • Reading Assignment |
| 3/5/18 | F2F | <ul style="list-style-type: none"> • Lesson Plan Assignments Overview • Assessments in Science, Part 1 | <ul style="list-style-type: none"> • Reading Assignment • Unit Plan Overview |
| 3/12/18 | | <ul style="list-style-type: none"> • No Class (Spring Break) | |
| 3/19/18 | F2F | <ul style="list-style-type: none"> • Assessments in Science, Part 2 | <ul style="list-style-type: none"> • Reading Assignment • Lesson Plan #1 |

| | | | |
|---------|--|---|--|
| 3/26/18 | Online – Synchronous (login at normal class time) | <ul style="list-style-type: none"> • Critical Incident Analysis Overview • Differentiation in Science, Part 1 | <ul style="list-style-type: none"> • Reading Assignment • Lesson Plan #2 |
| 4/2/18 | F2F | <ul style="list-style-type: none"> • Microteaching Presentation Overview • Differentiation in Science, Part 2 | <ul style="list-style-type: none"> • Reading Assignment • Lesson Plan #3 |
| 4/9/18 | F2F | <ul style="list-style-type: none"> • Individualized Instruction and Assessment Task Overview • Clinical Experience Reflection Overview • Scientific Discourse • Interdisciplinary Science Connections and Science Education Policy Perspectives | <ul style="list-style-type: none"> • Reading Assignment • Critical Incident Analysis and Lesson Plan |
| 4/16/18 | Online - Asynchronous | <ul style="list-style-type: none"> • Work on assignments | <ul style="list-style-type: none"> • Candidate Dispositions Assessment • Unit Plan uploaded to TK20 |
| 4/23/18 | F2F | <ul style="list-style-type: none"> • Microteaching Presentations | <ul style="list-style-type: none"> • Microteaching Presentation • Individualized Instruction and Assessment Task |
| 4/30/18 | F2F | <ul style="list-style-type: none"> • Microteaching Presentations | <ul style="list-style-type: none"> • Clinical Experience Reflection |
| 5/7/18 | F2F (Meet at Clinical Orientation) | <ul style="list-style-type: none"> • Methods 2 Clinical Debrief (4:30-5:15pm) – Room TBA • NO CLASS AFTER THIS | |

Memo:

To: all CEHD students seeking student teaching internships in spring 2018 and forward

From: Jeff Davis, Director of Educator Preparation, CEHD

Re: Internship application requirements

Date: May 1, 2017

Students – please note the following requirements for Spring 2018 internship applications. **No extensions to the application deadlines will be given for missing/incorrect/failing test scores, missing endorsements, or missing/incorrect CPR/AED/First Aid certifications.**

Student Clinical Practice: Internship Application Requirements

TESTING

Since 2015, internship applications must include **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.**

For Spring 2018 internships, this means that the latest you could test in time for scores to be reported to Mason by September 15th is August 1st.

Required tests:

▪ Praxis Core Academic Skills for Educators Tests (or qualifying substitute)

▪ VCLA

▪ RVE (specific programs only...see link below)

▪ ACTFL (Foreign Language only...unofficial scores are acceptable *for this test only*)

▪ 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 – NEW hands-on training required for licensure!

Due to a recent change in Virginia law, effective July 1, 2017, all new license applications and license renewals must include verification that “hands-on” First Aid/CPR/AED training was completed. This means that applications for spring 2018 internships must also include verification of completing “hands-on” training. **After June 30, 2017, the online training will no longer be accepted.**

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 the CEHD Educator Preparation Office. In order to have the requirement reflected as met in the Mason system, documents can be scanned/e-mailed to internsh@gmu.edu or dropped-off in Thompson Hall, Suite 1700.

DYSLEXIA AWARENESS TRAINING – NEW requirement for licensure!

Effective July 1, 2017, every person seeking initial licensure or renewal of a license shall complete awareness training, provided by VDOE, on the indicators of dyslexia, as that term is defined by the board and regulations, and the evidence-based interventions and accommodations for dyslexia. The training module is located at <http://www.doe.virginia.gov/teaching/licensure/dyslexia-module/story.html>.

Similar to the Child Abuse Prevention Module, students will need to save and print out the completion certificate at the end of the module.

BACKGROUND CHECKS/FINGERPRINTING

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.

When applying for their background check/fingerprinting, students are **strongly advised** to disclose any/all legal incidents that may appear on their records. School divisions can and will withhold internship placement if discrepancies are found between a student's disclosure and their official judicial record. Students must assume the risk that classes may be deferred and their program progress delayed or altered due to the individual severity of notations on such a check and review by individual agencies.

PLEASE NOTE:

Your G# must be clearly noted (visible and legible) on the face of any & all documents that you submit.

APPLICATION

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

DEADLINES

Spring 2018 internship application deadline:

* Traditional Internship: *September 15, 2017*

* On-the Job Internship: *November 1, 2015*

If you have any questions about the above requirements, **don't wait** - please contact your advisor or the Clinical Practice Specialist at internsh@gmu.edu Please be sure to include your G# and program/content area information in your email.

This communication to you, including all requirements and deadlines, will be referenced upon receipt of any request for application deadline extension.