The University of Maryland Baltimore County - UMBC
The UMBC Department of Education
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The UMBC Department of Education mission ...
Preparing Teachers Committed to the Learning Success of ALL Students

EDUC 332 - Science in the Secondary School (3)
EDUC 629 - Instructional Strategies for Teaching Secondary Science (3)

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Monday 9:00-11:00am
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Course Description:
This course is designed to help teacher candidates acquire holistic, interdisciplinary understandings of science and to develop a variety of developmentally appropriate rationales/strategies for teaching and assessing science in the secondary school. Students will gain the knowledge, skills, and dispositions needed to design, implement, and evaluate developmentally ***appropriate science experiences for all students studying science at the middle or high school levels***. The course is taught using a variety of active learning strategies/tools, including: inquiries, demonstrations, constructions, observations, field trips, teaching trials, and instructional technologies. The course is focused on helping teacher candidates move toward deeper understandings of science and science teaching thus allowing them to become more responsive and reflective science teachers. Teacher candidates are expected to demonstrate their abilities to question, problem solve, reflect, and act in a professional manner.

Goals for the Course:
The following goals are based on ***NCATE Professional Guidelines*** as translated by The National Science Teachers Association and are aligned with ***INTASC Core Standards*** (see attached INTASC Core Standards) for excellence in secondary school teacher preparation. Teacher candidates enrolled in this course will...

1. Develop holistic, interdisciplinary understandings of concepts in the earth/space, environmental, life and physical sciences ***(INTASC Principle #1)***;
2. Develop understandings of the ways in which children learn science and provide opportunities for teacher candidates to apply these understandings as they experience, design, teach, and assess developmentally appropriate, inquiry-based learning activities ***(INTASC Principles # 1, 2 , 3, 4,5,6 and 8)***
3. Develop the knowledge, skills, and dispositions needed to adapt science instruction to meet the diverse needs of students in secondary science courses ***(INTASC Principle***
4. Develop knowledge, skills, and dispositions necessary to integrate instruction across the curriculum and relate science to contemporary events, research results, the students' daily lives, and students' questions ***(INTASC Principles # 1, 2,4,5 and 7)***;
5. Develop basic competencies in using laboratory and field skills, including the use of scientific processes to investigate phenomenon, interpret findings, and communicate results ***(INTASC Principles # 1, 2, 3, 4, 5 and 8)***.
6. Develop knowledge, skills, and dispositions necessary to establish and maintain a ***safe*** and stimulating environment for learning science ***(INTASC Principles #1, 5)***;
7. Develop knowledge, skills, and dispositions necessary to effectively use educational technologies to enhance the teaching and learning of science ***(INTASC Principles # 1,2,3,4,5 and 6)***;
8. Develop professional inquiry and self-reflection skills. **(*INTASC Principle #9)***;
9. **D**develop confidence as well as diverse and dynamic worldviews related to science and science teaching ***(INTASC Principles 1,2, and 9)***;
10. Develop knowledge, skills, dispositions needed to extend science teaching beyond classroom - helping teacher candidates make important connections with the community ***(INTASC Principle #10)***.

Tenets of the Course:
The *National Science Education Standards (NRC 1996)* and The National Science Teachers Association call for a reexamination of our how secondary science methods courses are taught and underscore the importance of modeling these tenets in courses for preservice teacher candidates. The following tenets are based on these standards NCATE/NSTA Professional Guidelines and serve as a foundation of philosophical beliefs for the course.

- The teaching and learning of science is an active process where both the teacher and the student view themselves as learners;
- Excellence in science teaching means moving beyond the status quo;
- Teachers learn best through direct experiences with students and other teachers;
- Human experiences provide the richest contexts for the teaching and learning of science;
- Meaning is personally constructed;
- Exemplary science teaching demands a strong understanding of science content and pedagogy as well positive and professional attitudes.

Required Textbooks and Materials/Tools:

Note: A set of the required texts is on reserve in the curriculum library.

**National Science Education Standards (NSES).* National Research Council (NRC). Washington, DC. (Access via www - http\\www.nsta.org\onlineresources\nses.asp - use pdf format to print your individual copy)

**Supplemental Readings (to be given out in class)*

**Global Learning Observations to Benefit the Environment (GLOBE) - Teacher Resource Notebook* (provided free as part of GLOBE training component)

**All students must have a student computer/e-mail account by end of first week of class.*

Reserved Books:

Note: These resources along with copies of the required texts are on reserve in the curriculum library.

**Benchmarks for Science Literacy.* American Association for the Advancement of Science (AAAS). Oxford University Press. New York, NY: 1993.

**A Different Kind of Classroom: Teaching with the Dimensions of Learning*. Robert J. Marzano. Association for Supervision and Curriculum Development (ASCD). Alexandria, VA: 1992.

** In Search of Understanding: The Case for Constructivist Classrooms.* Jacqueline Grennon Brooks & Martin G. Brooks. Association for Supervision and Curriculum Development. Alexandria, VA: 1993.

**Learning in Science: Implications of Children's Science*. Roger Osborne and Peter Freyburg. Heinnemann Publishing. Portmouth, NH:1988.

**Science for All Americans.* American Association for the Advancement of Science (AAAS). Oxford University Press. New York, NY: 1990.

**Science/Technology/Society as Reform in Science Education*. R.E. Yager ed. State University of New York Press. Albany, NY: 1996.

**Science Workshop: A Whole Language Approach*. W. Saul, J. Reardon, A Schimdt, C. Pearce, D. Blackwood, & M. Bird. Heinnemann Publishing. Portsmouth, NH:1993.

**Teaching Science for All Children (TSAC).* Ralph Martin, Colleen Sexton, Kayo Wagner, and Jack Gerlovich. Allyn & Bacon. Boston, MA: 1997.

**The Young Child As A Scientist*. Christine Chaille and Lorie Britain. Harpers Collin Publishers. New York, NY: 1991.

The Nature of the Instruction & Overview of the Course/Major Projects:

The goals and tenets of the course are operationally defined using *National Science Education Standards (NSES)* and the most current research/literature related to science teaching and learning. Students in the course are taught using many strategies that can be used in their own classrooms. Students are provided many opportunities to learn science through an inquiry process. The class sessions are divided to provide time to design and teach activities, reflect on the activities, and have discussions related to the activities. Students explore and discuss a variety of issues related to secondary science education (see course calendar). A variety of instructional technologies are used by the students in the course. Students are expected to come to all classes, complete all individual/group assignments and participate in class activities and discussions. All students are required to get a computer E-mail account. Graduate students are

responsible for doing a practicum project that will be arranged with the instructor. This project will be described in class.

The course projects are centered on two key ideas - **professional inquiry and professional expertise components.** The major projects for the course are outlined below and will be defined in more detail within the context of the course.

I. Professional Inquiry Component - 35% of course grade

1. ***Professional Inquiry Project*** - Become an "expert" on science issue/question/topic that has personal interest and develop a 2 week instructional plan with the following components-

a. document the science learned through your research by creating two concept maps that reflect your understandings

1) pre concept map - done before starting the project;
2) post concept map - done after the project is finished;

b. create a two week, long-range,"block plan" of activities/experiments related to the research topic. The plan will include the following:

*Overview/Summary of the plan;
*Outcomes and Indicators for each day keyed to ***Maryland State Performance Assessment Outcomes and Maryland Core Learning Goals;***
*list of considerations/strategies for adapting lessons to needs of all students;
*one page explanation of how instructional technology will be used to enhance instruction in the plan;
*authentic assessments for each day;
*list of resources and minimum of three of the most valuable teacher resources;
*an expanded lesson plan for one of the ten days (student's choice on day) - format for this plan will be discussed in class.

II. Professional Expertise Components - 35% of course grade

1. Content Expertise: Teacher candidates will choose a topic within their discipline to study in depth. This content area should be the focus of the two week professional inquiry project. Teacher candidates are required to write a 5 page paper reflecting their understanding of the content and their ability to link the content with real world issues, examples, questions. The pre and post concept maps required for professional inquiry project will be focused on this topic as well. In the pre and post concept maps you will demonstrate how your understandings have have changed over time.

2. ***Micro-Teaching and video taping:*** Teacher candidates will plan and teach a set of micro lessons to the members of the class. These lessons will be video taped, reviewed, and analyzed by the teacher candidate, other students, and the instructor.

3. Technology Expertise: The teacher candidate will develop deeper understanding of various technologies needed to support the teaching of their specific discipline. Teacher candidates will

be required to demonstrate the use of the instructional technology in the micro lessons taught in class and will write a description of five technology enhancements with recommendations for using to improve instruction.

5. GLOBE Training Component - Students will be trained in Global Learning Observations to Benefit the Environment (GLOBE) teaching strategies and earn certification as a GLOBE teacher on completion of the course.

III. Ongoing Course Participation - 10% of course grade

1. Attendance - Students are expected to be actively involved in discussions and activities - complete weekly assignments and demonstrate understandings related to the assignments.

2. Developing a Growth Portfolio - built throughout the semester

This portfolio will contain all the student work done across the semester as well as a logs and special projects. A written analysis of what you have learned and how you have changed across the semester is also required.

IV. Reflective Logs - 20% of course grade -

Three reflective logs are required. One at the end of each instructional block - refer to the course course calendar. Teacher candidates will be expected to reflect on the experiences they have throughout the course and are required to write three logs that document what they have done and what has been learned. Students will be evaluated on their ability to critically analyze and connect ideas, concepts, and experiences they encounter across the semester. These written learning logs (required to be typed using a computer) provide students with an opportunity to describe how they are changing and what they are learning across the semester. The learning logs will be collected at the end of each instructional block (see course calendar).

Exit interviews will be held with each student during finals week. During the interviews, students will present and discuss their portfolio, discuss their professional growth, and accomplishments with the instructor of the course.

Student Expectations:

Computer Account: **Students need to have access to computer/e-mail account.** This can be either a UMBC e-mail account or any other personal account that a student might have.

Other Course Resources:

Curriculum Library (First floor ACIV): There are many other science teaching and curriculum resources to review in the curriculum library. Sample curriculum guides, textbook series, and professional magazines are located in the library on the first floor of ACIV. *Science Teacher* (secondary level) magazine is a valuable resource for secondary science teachers as well as *Science Scope* (middle level).

UMBC Kuhn Library (Fourth floor Kuhn Library) - Special Collection of Children's Science Trade Books: This collection of children's science trade books is one of the finest in the country. Books in this collection may not be checked but are placed on the fourth floor of the library

where you can browse for hours. The special *Search It Science* computer program located near the collection allows students to find the science books at "lightening speed".
UMBC Computer Laboratories: Students in this course will be using e-mail and the Internet to communicate and access information. There are both PC and Mac computer labs on the UMBC campus for students to use. All students must register for an e-mail account before the second class. Contact student support services to get information on the registration process.

Course Assessment/Grading/Exit Performance Interviews

Students will be assigned a letter grade - A, B, C, D, F- based on the assessments made on projects/assignments done across the semester - see percentage breakdown marked above next to each course component. Assessments will be made using the following point scale A+=12, A=11 ,A-=10, B+=9, B=8, B-=7, C+=6, C=5, C-=4, D+=3, D=2, D-=2, F=0. More detailed rubrics for individual projects will be shared as the course proceeds. The following performance rubric will be used in assigning the grades based on specific requirements for each project .

A **Distinguished Abilities** 12-10 points	**B** **Above Average Abilities** 9-7 points	**C** **Average Abilities** 6-4 points	**D** **Below Average Abilities** 3-1 points	**F** **Inadequate Abilities** 0 points
Teacher candidate completes all task requirements. Teacher candidate excels in all task requirements. Teacher candidate demonstrates exceptional effort, outstanding professional enthusiasm, and deep understandings.	Teacher candidate completes all task requirements. Teacher candidate excels in majority of the task requirements and performs adequately on other requirements. Teacher candidate demonstrates more than adequate effort, some professional enthusiasm, and some deep understandings.	Teacher candidate completes all task requirements. Teacher candidate adequately completes the majority of the task and performs less than adequately on other requirements. Teacher candidate demonstrates moderate effort, some professional enthusiasm, and some understandings.	Teacher candidate fails to complete all task requirements. Teacher candidate performs less than adequately on the majority of the task requirements. Teacher candidate demonstrates minimal effort, minimal professional enthusiasm, and few understandings.	Teacher candidate fails to complete all requirements of the task Teacher candidate fails to demonstrate effort, professional enthusiasm, and knowledge.

Each teacher candidate will be responsible for developing a portfolio which will be used to demonstrate their growth and achievements. This portfolio will contain all assignments/projects completed during the semester as well as 3 learning logs. Assessments will be ongoing and authentic in their nature. There are major check points where students will be expected to synthesize what they have learned in the course by completing projects and learning logs.

Course Calendar for Instructional Block I
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Instructional Block I - Becoming a Science Teacher - "Big Ideas" of Secondary Science

January 28	**Nature of Science - Personal Goals and Perspectives**
February 4	**Historical Perspectives and Contemporary Trends in Secondary Science Teaching** **Read: Science for All Americans - Reading Set #1**
February 11	**Science as Inquiry and Conceptual Change Models** **Read: The National Science Education Standards/Constructivist Teaching Models - Reading Set #2**
February 18	**Preparing, Planning, Scheduling and Modeling Effective Practices - Jennifer Clements**
February 25	**Preparing, Planning, Scheduling and Modeling Effective Practices - Jennifer Clements** **Reflective Log # 1 Due**