Course Syllabus

Teaching Secondary Level Science Methods

Masters in teaching program

2014 Spring Quarter

Phyllis Esposito, Ph.D.

Office SEM II 2108

Phone: 360. 867-6740

E-mail: [espositp@evergreen.edu](mailto:espositp@evergreen.edu)

Class Meeting: 9-12 Fridays

Office Hours: 9-11 Mondays

**COURSE DESCRIPTION, ESSENTIAL QUESTIONS OBJECTIVES, AND STANDARDS**

**COURSE DESCRIPTION**

This course is designed to help you develop the theoretical background, practical knowledge, and skills essential for successful science teaching at the secondary level. Current understandings of best practices will be introduced, discussed and practiced. You will have the opportunity to engage in learning activities both as learner and as a teacher, reflection on each experience and how one influences your thinking on the other. In doing so, you are encouraged to see yourself as a life-long learner and a professional in your field.

**ESSENTIAL QUESTIONS GUIDING OUR WORK TOGETHER THIS QUARTER**

What does it mean to be a professional educator in all of the dimensions of a teacher’s work?

What does it look like in the classroom and through interactions with students, parents, colleagues, and administrators to enact the belief that all students can learn?

How can we organize our classrooms in ways that support student learning, engagement, and empower students?

What does it look like when students are engaged in transformative learning experiences?

**COURSE OVERVIEW AND OBJECTIVES**

We will explore many topics related to quality teaching during the quarter, including the following “big ideas”--Quality science teachers:

* Base their instruction around carefully thought-out instructional goals. They do not simply “cover—the textbook.
* They are able to provide a rationale for both what and how they teach every lesson.
* Know how to create, locate and modify a wide variety of resources for quality instruction.
* Carefully plan instruction to match their goals and rationale. They can articulate what they and their students should be doing throughout each of their lessons.
* Understand and teach about the nature of scientific knowledge
* Are reflective practitioners. They determine their actions produce desired outcomes, and if not, are able to make rational choices about alternative behaviors
* Are able to use a variety of instructional strategies, and can match instructional approaches to lesson goals and student needs
* Understand that teaching does not occur in absence of learning
* Believe that all students can learn science
* Growth towards becoming life-long learners, active in professional development throughout their careers.

At the end of this course, through large and small group instruction and discussion, hands-on learning experiences, clinical field work, and reflective writing, you will work toward the following *essential* instructional objectives:

* Developing specific skills, competencies, and points of view needed by teaching professionals
* Learning to apply course material in the classroom setting
* Gaining a broader understanding and appreciation of science as an intellectual and cultural activity
* Acquiring an interest in learning more by asking questions and seeking answers
* Learning how to find and use resources for answering questions or solving problems

You will also work toward the following *important* instructional objectives:

* Acquiring skills in working with others as a member of a team
* Learning fundamental principles, generalizations, or theories
* Developing skill in expressing oneself orally or in writing
* Developing a clearer understanding of, and commitment to personal values
* Learning to analyze and critically evaluate ideas, arguments, and points of view.

**COURSE STANDARDS**

This course is aligned to the following standards:

1. The Evergreen State College-Masters in Teaching program-Conceptual Framework
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5. The National Science Teachers Association (NSTA) and the (Put here the Washington State Standards)

**CORE ASSESSMENT REQUIREMENTS**

This course includes one NSTA/WS---Core Assessment requirement:

List the assessment by name and the standard-Unit Plan

--------------------------------------------------------Science Safety Plan

Final Reflection Paper

Practicum Experience Lesson Plan & Reflection

These assignments must all be submitted to Moodle

**CONCEPTUAL FRAMEWORK**

This course explicates the conceptual framework-teaching for social justice—of the Masters in Teaching program at The Evergreen State College. As teachers we recognize our connection to students as individuals and as members of a larger community. As leaders in our classrooms and larger school communities, we must attend to how education can be transformational and how we might be agents of change. In this course, we will explore what it means to hold high expectations for *all* learners; this includes academically challenging, personally and socially relevant knowledge and complex learning skills. In order to successfully provide opportunities for youth to meet these expectations, we must also be committed to reflection on our own practice and to continually develop our own knowledge, attitudes, skills and dispositions**.**

**COURSE TEXTS**

**\****Other Readings will be provided in class and/or through Moodle*

**MATERIALS**

* Composition notebook
* Common Core Standards and the Next Generation Science Standards
* 3-ring binder

**COURSE POLICIES**

**ATTENDANCE AND PARTICIPATION**

Attendance is required. If you are unable to attend class, it is your responsibility to:

1. Notify the instructor in advance. Please note that informing the instructor does not excuse your absence.
2. Send assignments that are due.
3. Obtain handouts, assignments, class notes, and information about activities from a classmate prior to the meeting of the next class.
4. Be prepared for the next class.

*Participation in class activities and discussion is expected. You should come to class prepared and be ready to contribute and take part in class activities. Your contributions to discussions are valued.*

**LATE WORK AND EXTENSIONS REQUESTS**

All assignments are due on the dates listed in the syllabus. Late work will only be accepted under special circumstances (e.g. family emergency, illness). Please contact me in person or by phone or email prior to any given due date to discuss assignments extensions requests.

**REQUIREMENTS FOR ALL WRITTEN ASSIGNMENTS**

* Unless otherwise instructed, all written assignments completed outside of class must be double spaced, with one inch margins, word-processed in Times New Roman, 12-point font and saved electronically. You must have the capacity to produce the assignment again.
* **Unless noted all assignments should be submitted in class**. **Please note that the core assessments for this course will be submitted to Moodle.**
* References should be cited where applicable, following American Psychological Association style guidelines (APA-current edition)
* Written assignments will be evaluated for accurate mechanics and English grammar usage as well as thoughtful pertinent and clear content.

**ASSIGNMENTS**

Educators need to have three kinds of knowledge to deliver quality instruction in the classroom:

* Content knowledge—an understanding of the subject area to be taught-You received this through your undergraduate program of study.
* Pedagogical knowledge—an understanding of how people learn and how to teach—this will be a continuation of the previous strands (learning theory and child development) as well as central part of the work that we will do this quarter, including this strand and the understanding acquired from the differentiated instruction and classroom management strands)
* Pedagogical content knowledge—the central point to this course. What are the specific issues that are unique to teaching science?

To demonstrate your preparation in all these areas you will need to demonstrate the ability to plan lessons, implement at least portions of a lesson, and be reflective about your own practice. You will have the opportunity to demonstrate these skills through a variety of assignments listed below.

**Standards Assignment--**Access the ***Next Generation Science Standards*** Select the grade level in which you are currently placed and review the expectations for that particular grade level. Identify those areas from the standards that you see as your strengths and those areas in which you will need to grow. Be prepared to share this information in class.

**\*Science Interview—**Interview two students (one at a time) to get a sense of their scientific literacy. As you think of planning the interview consider the following: what have you seen students do in science, what concepts do you see students struggling with. Another thought is that you could focus on the science concept in which you will base your short unit plan.

You will only need to write up one of the interviews. *(Science Interview Assignment adapted from Secondary Science Methods syllabus by Dr. Sonia Wiedenhaupt)*

1. Tape record the conversation and keep all artifacts of the interview.
2. Before you start the interview, let the student know why you want to talk with them. Explain to them that you want to get a sense of what they think about science. You can also let them know that the conversation will help you as you are learning to become a teacher. End the interview with the following kind of questions: What do you think science is all about? Do you think scientists ask questions? What kind? What is an experiment? Do scientists do experiments? If so why? How does a scientist decide what kind of experiment to do?
3. Write Up-The write up consists of four parts. Treat each section as a section of your paper to which you should attend.
4. Describe the student you plan to interview. Include information you gather about the child (tell me what you know about this child as a learner, as an individual) Write about what you know about the students level of scientific literacy before the interview. \*Remember do not use the child’s real name
5. Scientific Literacy- Briefly explain the question or task you gave the student. Explain why you chose these tasks. For each main question asked (you will want to pose a probing question)
6. Analysis and Reflection-think about the questions posed and how your questions helped you to understand the child’s scientific literacy (what did the students do? Use verbatim comments from the student that helps clarify what the student did?)
7. What did the student understand about science? What misconceptions did the student have about science? What questions would you like to ask the student now in retrospect? (Individual)

**Practicum Teaching Experience & Reflection**

*Science teaching at the elementary level in the age of accountability is often a difficult challenge, but one that nevertheless as elementary teachers we are accountable for ensuring takes place. The following assignment is an opportunity for you to enact the science pedagogy you have been learning this quarter in your field placement. Early in the quarter speak with your cooperating mentor teacher and let them know that teaching a science lesson is part course expectations this quarter. You will be responsible for using the district-mandated curriculum and create a 5-day unit of study, see the following description to guide you in preparing for this assignment.*

1. Sketch out a 5-day unit of which you will teach one 45 to 50 minute lesson. The outline should include a big idea in science and the relevant science standards students will learn as a result of the unit.
2. Write a lesson plan which includes enough detail that the reader can create the lesson in their minds-eye. The lesson plan should include the following information: (a) a clear learning objective; (b) the specific science standard you are working from with this particular lesson; (c) the big idea your lesson is based upon. And lastly, (d) make sure that you attend to the instructional strategy and teach points that enables one to deliver quality instruction (this includes actions and strategies upon the part of the teacher). Also, in your lesson plan make sure that you attend to how you will ensure lab safety and how you will intentionally address the issue of safety as a part of your science lesson (you will need to speak to your cooperating mentor teacher for insight)
3. As part of this lesson, you will need to administer a formative assessment that will enable you to determine student learning as well as your next steps as a teacher.

After you deliver the lesson-You will write a reflective piece examining the strengths of the lesson and potential areas of the growth for you as a teacher. Use the following questions to guide your reflection:

* Was I able to anticipate what students would do and say?
* Were my interventions effective?
* What ideas did the students have that I did not anticipate?
* In what ways did the lesson plan help my teaching of the lesson?
* What evidence do I have of student learning?
* What evidence do I have that the content was accessible to all learners?
* What changes do I need to make the strategy accessible for all learners?

After the reflection attend to the following…return to your lesson plan and identify those points in the lesson that you would change and in the reflection speak to where and why you would make those changes as it supports student learning. (Use the track changes component of Word to note those specific areas of changes that you would make, save and turn in this revised version of your lesson plan with the reflection)

Lastly, review the student work associated with the lesson, identity a next step, where would you continue from here with the lesson—what might you have to reteach. Ground your reflection in specific student learning. Think what does the assessment data tell you about what the students did or did not understand. \*Don’t be hard on yourself…the point here is to get in the habit of using the student data to reflect upon and improve your teaching—so give yourself grace…but take up this matter critically and honestly!

**The Critical reflection, lesson plan with revisions is due the first Tuesday after you have taught. \*This can be accomplished at any point in the quarter but all lessons should be taught and reflected upon by week 8.**

**Science Safety Plan**

In order to help you develop the knowledge and skills to create a safe science classroom and laboratory, you will be required to create a comprehensive safety play. You can work with collaboratively in groups of two or three to create and compile multiple components throughout the quarter in order to fulfill the requirements for this assignment (Note: each group member must contribute to the development of each component of the project so they are familiar with each component of classroom safety. This plan will be submitted as part of your unit plan for this course. It should contain the following components:

* Classroom/laboratory safety guidelines for students (check with your school and the OSPI website for specifics)
* A safety quiz designed for students to take at that beginning of the school year, which includes questions on the safety rules/guidelines for the classroom, as well as what to do in various emergency situations.
* A safety contract that explains the basic safety procedures and features of the science classroom. The contract should include a space where students and parents can sign after reading
* An informational page explaining the safe, ethical, and humane treatment of living organism in the classroom and in the field. This should include rules and regulations for collecting organisms in the field and for handling living organisms during classroom experiences based on local, state, and/or national regulations
* A plan for behavior management of students in the science classroom. Be sure to include a clear description of proper student behavior in the lab, including special precautions that should be taken in science classroom when handing chemicals and lab equipment, working with living or non-living organism, or using safety equipment. In addition positive and negative consequence for behavior should be provided. Focus on making this a proactive plan to prevent unsafe behavior.

**Classroom Demonstration**

Every student in the class will be required to set up and perform a science demonstration to the rest of the class sometime during the quarter. You will need to give a brief introduction to your demo, which must be accompanied by handouts for each person and instructor in the class. The handouts must include a very detailed explanation of the demon, including materials needed, procedures, and safety concerns. The demonstration should emphasize your enactment of one of the CLASS domains. Your peers as well as I will offer constructive feedback.

**Discussion Facilitation**

You will be responsible for leading one discussion during the quarter. This leadership will be done in small groups (2-3) students. It is your responsibility to do the reading and formulate focus questions based on both your and your classmates’ ideas. You need to come to class on your assigned day prepared. Demonstrate one of the discussion formats found in *The Sourcebook for Teaching Science* this book will be placed on reserve for check-out or come up with your own ideas for engaging the class.

**Reflective Paper**

At the end of the quarter, you will write a short (3-5 pages) reflective essay discussing your progression in this course and towards becoming a science teacher.

**Tentative Calendar**

*\*Instructor reserves the right to make changes to syllabus as deemed appropriate*

Class Agenda

* Teacher Talk/Video
* Classroom Discussion
* Classroom Demonstration

\*Hardcopies of assignments are due in class the day listed unless otherwise noted!

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| Week | Topic/Focus | Readings | Tasks/Assignment Due |
| Week 1 | Standards/NGSS  Using Science Notebooks  Review Syllabus/Assignments/Essential Questions | Fort article  Text: Harlen (chaps. 1-3)  Text: Marcarelli (chaps 1-3) | Standards Assignment  **Reflection Questions-What do you think about science education? Are you science shy, savvy, or smart?** |
| Week 2 | What is Scientific Literacy?  What is Inquiry?  Stage One: Big Idea/Essential Questions | Bybee article  Translating the NGSS Standards for Classroom Instruction (chap. 2-article)  Text: Abell (pgs. 1-37); Harlen (chaps. 4-5)  Discussion Facilitators: | Science Student Interview  **Reflection Questions-How does the learning cycle connect with Piaget’s ideas about how children learn? How can you use science** notebooks to teach the inquiry process?  **\*Bring to class science curriculum from your practicum/teachers manual or student textbook** |
| Week 3 | Stage Two: Assessments | Abell (pgs. 58-85;101-114)  Harlen (chap. 6)  Discussion Facilitators: | Stage One-Due  **Reflection Questions: How do you plan on assessing your inquiry science classroom? How can science notebooks help you achieve this goal?** |
| Week 4 | Stage Three: Learning Activity Plan  Instructional Learning Targets  Learning targets/organization   * Variety of modalities, strategies and materials * Active Facilitation * Effective Engagement | Marcarelli (chaps 4-6)  Discussion Facilitators: | Stage Two-Due |
| Week 5 | Content Understanding   * Depth of Understanding * Communication of Concepts and procedures * Building Background Knowledge * Transmission of Content Knowledge and Procedures   Lesson Plan Format (5E Model) | Marcarelli (chaps 7-8)  Harlen (chaps 7-8)  Crowther article  Discussion Facilitators: | Stage Three-Due  **Reflection Questions: What is constructivism? How does that relate inquiry science methodology?**  Science Notebooks Due |
| Week 6 | Analysis and Problem-solving   * Inquiry and Analysis * Opportunities for Novel Applications | Student Demonstrations  Readings TBD | Peer Review of High Quality Draft of short-unit  Reflection Questions: |
| Week 7 | In-Field | In Field | In Field |
| Week 8 | Quality of Feedback   * Feedback Loops * Scaffolding * Building on Student Responses   Encouragement and Affirmation | Student Demonstrations  Readings TBD | Practicum Teaching Experience & Reflection to Moodle by 11:55pm |
| Week 9 | Instructional Dialogue   * Cumulative Content-driven * Distributed Talk * Facilitation Strategies | Student Demonstrations  Readings TBD | Upload Short-unit with Safety from teaching to Moodle by 11:55pm |
| Week 10 |  | Student Demonstrations | Final Reflection Paper due to Moodle by 11:55 pm |