Professional Development in Mathematics and Science Education  
SED 597, Spring 2008, 3 credits

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Course Description:

Welcome to SED 597 – Professional Development in Mathematics and Science Education. As you know, teachers must continue learning in order to be able to establish and maintain effective science and mathematics learning experiences for their students. One of the avenues they learn is through professional development. But, the preparation of effective professional development requires extensive study to identify the key issues, the goals and objectives for the professional development for the specific educational context within which the professional development is to be offered.

SED 597 is a preparatory course in designing a professional development capstone project for the Masters of Science in Mathematics Education or in Science Education. The course focuses on the examination of effective strategies to be considered when developing, implementing and evaluating a program of professional development for mathematics or science educators considering various choices of program settings. The ultimate outcome of this course is a proposal for a professional development capstone project after the completion of a needs assessment and study of the critical issues and strategies for professional development.

Course Content:

1. Establish key questions: In what sense does professional development design and evaluation research direct 21st century science/mathematics education professional development? What is a framework for designing professional development in science/mathematics education?
2. Review literature on effective professional development to identify key strategies and skills for design, implementation and evaluation processes supporting mathematics and science education programs. What knowledge and beliefs support effective professional development?
3. Compare and contrast various structures for design and evaluation proposals in mathematics and science education professional development programs. What context factors influence professional development?
4. Consideration of critical issues in designing science and mathematics professional development
5. Strategies for professional learning – questions of enhancing teacher content, science/mathematics curricular content of a program; designing goals and objectives to that reflect the curricular consideration. Looking at design framework action cases.

**Student Learning Outcomes:**

Participants will demonstrate their abilities to:
1. Articulate key strategies and skills for design, implementation and evaluation processes and clarify how they support effective professional development for mathematics or science education programs.
2. Articulate and reflect on key questions and issues in a professional development program’s design, implementation and evaluation for teachers and programs in mathematics and science.
3. Describe and reflect on tools for monitoring assessment and evaluation of programs using current technologies in science and mathematics education.
4. Develop sensitivity to issues involved in conducting evaluations of professional development activities and programs for science and mathematics education.
5. Complete the IRB training for collecting data on human subjects.
6. Design activities for a mathematics or science education professional development program designed to improve teacher and program effectiveness.
7. Develop, implement and evaluate a needs assessment for a professional development program focused on improvement in science and/or mathematics education.
8. Prepare a professional development proposal complete with analysis of needs assessment and recommendations for strategies to be used.

**Class Schedule:**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weeks</th>
<th>Theme</th>
<th>Topics</th>
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</table>
| 1    | Mar 30- Apr 4 | Consider a framework for professional development | * What is a framework for designing professional development in science/mathematics education?  
* Why are these parts important in designing effective professional development?  
* In what sense is a needs assessment important for the design of science/mathematics education professional development? |
|      |             | INTRODUCTION TO COURSE                    |                                                                        |
| 2    | Apr 5- Apr 25 | Supporting effective professional development:  
  • Knowledge and beliefs?  
  • Context | * What is your preliminary proposal for the professional development program?  
* What knowledge and beliefs are there to support this professional development program?  
* What context factors will influence this professional development program? |
|      |             | PROJECT 1                                  |                                                                        |
| 3    | Apr 26 – May 16 | Critical issues and effective strategies for professional learning | * What are the critical issues to consider in designing professional development?  
* What strategies are effective for professional learning?  
* What is the IRB approval process for |
<table>
<thead>
<tr>
<th>PROJECT 2</th>
<th>conducting research with humans?</th>
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<tbody>
<tr>
<td><strong>4</strong></td>
<td>May 17- Jun 6</td>
</tr>
<tr>
<td>PROJECT 3</td>
<td>Putting the design framework into action</td>
</tr>
<tr>
<td></td>
<td>• What is a professional development plan?</td>
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<tr>
<td></td>
<td>• What must it include?</td>
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</table>

**Evaluation of Student Performance:**

<table>
<thead>
<tr>
<th>Weekly reflections on readings, discussion boards, and/or participant interaction</th>
<th>20%</th>
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<tbody>
<tr>
<td><strong>Project 1:</strong> Knowledge and Beliefs with Context Factors for Proposed Capstone Professional Development Project – preliminary proposal for needs assessment</td>
<td>25%</td>
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<tr>
<td><strong>Project 2:</strong> Exploration of Critical issues and strategies for professional learning along with proposal of strategies for Capstone Professional Development Project. Complete the IRB training for conducting research with human subjects</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Project 3:</strong> Final project proposal including Knowledge and Beliefs with Context Factors for Proposed Professional Development – finalized after conducting the needs assessment and including recommendations for Capstone Professional Development Project based on exploration of issues and strategies</td>
<td>30%</td>
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**Grading of Assignments:**

All assignments must be submitted on or before the due date. One grade level deduction per day will be assessed after the due date (e.g., A to A-, A- to B+, B+ to B, etc.) when no extension has been approved.

Grading is criterion-referenced, with no curve.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>A+</td>
<td>98% ≤ A+ ≤ 100%</td>
</tr>
<tr>
<td>A</td>
<td>94% ≤ A &lt; 98%</td>
</tr>
<tr>
<td>A-</td>
<td>90% ≤ A- &lt; 94%</td>
</tr>
<tr>
<td>B+</td>
<td>88% ≤ B+ &lt; 90%</td>
</tr>
<tr>
<td>B</td>
<td>84% ≤ B &lt; 88%</td>
</tr>
<tr>
<td>B-</td>
<td>80% ≤ B- &lt; 84%</td>
</tr>
<tr>
<td>C+</td>
<td>78% ≤ C+ &lt; 80%</td>
</tr>
<tr>
<td>C</td>
<td>74% ≤ C &lt; 78%</td>
</tr>
<tr>
<td>C-</td>
<td>70% ≤ C- &lt; 74%</td>
</tr>
<tr>
<td>D</td>
<td>60% ≤ D &lt; 70%</td>
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**General rubric for assessing the quality of evidence in meeting the outcomes:**

<table>
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<tr>
<th>Weekly reflections on readings, discussion boards, and/or participant interaction</th>
<th>Inadequate (D and F range)</th>
<th>Adequate (B and C range)</th>
<th>Outstanding (A range)</th>
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<tbody>
<tr>
<td>Little if any thoughtful recognition of the topic in the reflections, journals or other responses; lack of analysis or synthesis in the response; posting on discussion board does not add to the discussions; timeliness of the submissions is inadequate</td>
<td>Timely and some thoughtful recognition of the topic. Reflection, journal or response responds to the challenge. Questions posted are adequate for engaging others in discussion. Timely responds to at least two colleagues’ questions if on the discussion board. Timely submission of other documents.</td>
<td>Timely, clear summary and description of the readings and topics. Reflections, journals are thoughtful and probing. Discussion board responses post questions that are thoughtful and engaging; engage in thoughtful discussion with most of the class members’ questions. Connect ideas that clearly connect and extend from the readings, discussions,</td>
<td></td>
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<tr>
<td>Proposed professional development plan (Projects 1 and 2)</td>
<td>Little if any evidence of understanding of key strategies and skills. Questionable application of the research literature in science/mathematics education professional development.</td>
<td>Demonstrates most of the fundamentals and does provide some indication of the research literature guiding effective professional development. Potential activity for professional development in science/mathematics education.</td>
<td>Outstanding demonstration of basic fundamentals of the science/mathematics professional development requirements. Excellent potential for a successful professional development plan.</td>
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<tr>
<td>Project 3 for capstone professional development of science/mathematics education</td>
<td>Little attention and development of a professional development plan for improvement in math/science education. Questionable evaluation component.</td>
<td>Adequate attention and development of a professional development program with some evaluation components and that integrates appropriate research and literature for designing effective professional development in math/science education.</td>
<td>Clear demonstration of a successful professional development program that involves strong evaluation components and that integrates appropriate research and literature for designing effective professional development in math/science education.</td>
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**Proposed Text:**

**Additional Learning Resources:**


National Science Teachers Association: www.nsta.org

Oregon Council of Teachers of Mathematics: http://www.octm.org

Oregon Science Teachers Association: http://www.oregonscience.org

Oregon State Department of Education Standards for Mathematics: http://www.ode.state.or.us/teachlearn/real/newspaper/Newspaper_Section.aspx?subjectcd=ma

Oregon State Department of Education Standards for Science: http://www.ode.state.or.us/teachlearn/real/newspaper/Newspaper_Section.aspx?subjectcd=sc

http://www.21stcenturyskills.org/index.php?option=com_content&task=view&id=31&Itemid=33


Also, Oregon State University Library
http://osulibrary.oregonstate.edu/index2.html
Click on e-journals for access to electronic journals
To search for resources relevant to a topic of interest or by a particular author, click on databases and select “education” from menu. From the large array of education databases, a good place to start is ERIC (Educational Resource Information Center). Enter author’s name to find papers by an individual or enter one of an array of descriptors to find papers about a particular topic.

**Statement Regarding Students with Disabilities:**
Accommodations are collaborative efforts between students, faculty, and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact SSD immediately at 541 737 4098.

**Plagiarism:**
You are expected to submit your own work in all your assignments, postings to the discussion board, and other communications, and to clearly give credit to the work of others when you use it. Academic dishonesty will result in a grade of “F.”

**Link to Statement of Expectations for Student Conduct:**
http://oregonstate.edu/admin/stucon/achon.htm

**Course evaluation:**
We encourage you to engage in the course evaluation process each term – online, of course. The evaluation form will be available toward the end of each term, and you will be sent instructions by Ecampus. You will login to “Student Online Services” to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted.