SED 599 Topics in Science Education:
Teaching Weather Concepts: Using Tools for Multi-Disciplinary Teaching

This course combines approximately 90 hours of instruction, online activities, and assignments for 3 credits.

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Prerequisites
Participants should be either a K-12 teacher, free-choice learning educator or have access to an educational setting. A variety of assessments will be used to demonstrate learning. However, part of assessments require participants to be able to use spreadsheets to import and organize data and produce graphs, acquire images from webpages and construct short videos, presentations, websites, or other visual media that will be used to assess learning.

Course Description
Science content and pedagogy in learning and teaching basic weather concepts. A focus of this class is using archived and real-time data sets and visualizations to elaborate on basic weather concepts as well as investigate avenues to integrate these tools in informal and formal learning environments. For K-12 classroom teachers a central outcome for this class is the emergence of mathematics and science educators prepared to be leaders in using innovative technology and data-rich strategies in their educational programs. Free choice participants will grow in their knowledge of weather concepts and gain background in the rich visual and data resources available for engaging a diversity of learners.

Course Information
This course will be delivered via Blackboard, your online learning community, where you will interact with your classmates and with me. Within the course Blackboard site you will access the learning materials, tutorials, and syllabus; discuss issues; submit assignments; take quizzes; email other students and the instructor; participate in online activities; and display your projects. To preview how an online course works, visit the Ecampus Course Demo. For technical assistance, Blackboard and otherwise, see http://ecampus.oregonstate.edu/services/technical-help.htm.

Required Materials
Weather Stations
Participants are required to buy, set up and maintain a small weather station at their educational setting. Free-choice educators can choose to set up the station at their homes or institutions. We recommend purchasing the Ambient Weather WS-1171 Wireless Advanced Weather Station with Temperature, Dew Point, Barometer and Humidity, which is relatively inexpensive but has all the features required for obtaining good measurements. During the term
each participant is required to collect data from the weather station and enter data into a spreadsheet. One of the course requirements will be to produce graphs and other representations of the data. Data, graphs and interpretations will be logged into a website that will be shared with a small discussion group. More details are included in week 1 directions.

**Link to Conceptual Framework, Knowledge Base, and National and State**

This course is associated with the Professional Teacher and Counselor Education (PTCE) unit Conceptual Framework, which is based on four foundational or core values that are listed below. To find out more about how the knowledge base relates to the National Council for Accreditation of Teacher Education (NCATE) guidelines, review the Conceptual Framework at the website: [http://oregonstate.edu/education/accreditation/](http://oregonstate.edu/education/accreditation/)

1. Ethics and Professionalism
2. Reflective Practitioner
3. Lifelong Learners
4. Diversity and Equity

With respect to national standards, this course includes application of NCATE content knowledge, professional and pedagogical knowledge and skills, dispositions, and student learning. NCATE Unit Standards: [http://www.ncate.org/public/unitStandardsRubrics.asp?ch=4](http://www.ncate.org/public/unitStandardsRubrics.asp?ch=4)

The Oregon TSPC Standards addressed in this course include the following:
- Standard 1: Plan Instruction that supports student progress in learning and is appropriate for the developmental level.
- Standard 2: Establish a classroom climate conducive to learning.
- Standard 3: Engage students in planned learning activities.
- Standard 4: Evaluate, act upon, and report student progress in learning.
- Standard 5: Exhibits professional behaviors, ethics, and values.

**Next Generation Science Standards and Pedagogical Links**

This course is linked to recently articulated science and engineering practices as well as specific grade-level content guidelines (NRC, 2012; Next Generation Science Standards (NGSS)). Two pedagogy questions thread through all the units:

1. How can archived data be used in educational settings?
2. How can models be used in educational settings?

Other potential pedagogy questions center on some of the following issues:

1. How to implement various Internet resources into practice;
2. Recognizing and addressing incorrect weather preconceptions;
3. Discussions of NGSS crosscutting concepts that support multi-disciplinary learning;
4. Connections between NGSS and math and literacy Common Core Standards;

Final or capstone projects provide an avenue for participants to address these types of questions through a manner of their choosing, for example by development of weather related materials or curriculum appropriate for their setting.
Learning Outcomes
In this course, participants will:

1. Become knowledgeable in basic weather concepts by examining online resources to investigate essential questions about weather. Each unit involves specific tasks and expected products for motivating participants to reflect on their current knowledge, explore concepts and demonstrate new content knowledge.

2. Apply weather concepts in instruction using online archived and real-time weather data sets to elaborate on their newly acquired knowledge.

3. Become proficient in the following applications:
   - Setup and maintain a small weather station;
   - Navigate Google Earth and load content onto the Google Earth platform;
   - Download online weather datasets and modify these files to use in a spreadsheet program;
   - Identify, access and accurately reference images and other visual media from the Internet;
   - Use Google documents to share and collaborate on data collection and writing;
   - Produce short videos of weather related phenomena.

4. Develop, teach and evaluate a weather lesson or unit in an educational setting.

Academic Expectations
Participants are expected to:

- Login to the class site daily, prepared to engage in dialogue with colleagues
- Prepare materials and think critically about resources
- Demonstrate clarity of ideas, application of knowledge, and appropriate and relevant contributions in class discussion
- Exhibit insight and reflection through self-evaluation
- Prepare assignments, delivered on time, that meet all the criteria and graduate writing standards
- Recognize and respect the ideas and skills of colleagues and experienced professionals
- Participate actively and positively in class activities
- Identify and engage other professionals, networks, organizations, and other resources related to the issues discussed in the class.

Class schedule (more details of the learning activities and assignments can be found in folders for each unit)

<table>
<thead>
<tr>
<th>Unit 1: Tools for Learning and Teaching (Week 1&amp;2)</th>
<th>Content Topics: Introductions. Gaining expertise with Google Earth, accessing Internet data sets, setting up weather stations and using weather observations websites.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 2: Earth’s Atmosphere (Week 3&amp;4)</td>
<td>Content Topics: Earth’s energy balance, temperature, temperature measurements, pressure, pressure measurements and wind.</td>
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<tr>
<td>Unit 3: Water in the Atmosphere (Week 5&amp;6)</td>
<td>Content Topics: Clouds, precipitation, humidity, layers of atmosphere</td>
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<td>---------------------------------------------------------------------</td>
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<tr>
<td>Unit 4: Convective Processes (Week 7&amp;8)</td>
<td>Content Topics: Lapse rate, stability, fronts and weather maps</td>
</tr>
<tr>
<td>Work on Final Course Project (Week 9&amp;10)</td>
<td>Project due by Friday of finals. Early submission during finals week is appreciated.</td>
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**Required Assignments**

All assignments should reflect writing skills consistent with expectations for graduate level courses and the professional teacher. Due dates are noted on Course Schedule and in weekly modules on Blackboard. **The deadline for each due date is 12:00 AM (midnight) Pacific Standard Time (USA) on the day indicated at the end of each assignment.**

1. **Weekly Assignments**

Each unit contains specific tasks aimed at answering content questions and supporting participant learning. Some of these tasks involve accessing and interpreting online archived data. The production of visual models and media is used to support learning and integration into participant’s practice. Collaboration within an assigned community of learners supports learning and engaging in discussions around key content and pedagogy questions.

2. **Weather Stations, Analysis of Weather Data and Personal Weather Website**

All participants are required to maintain a weather station including downloading data into a spreadsheet program to produce time series graphs (changes in variable with time). Participants will upload weather data from their weather station onto a **Personal Weather Website**. The template for the website will be distributed on the first week of class. The **Personal Weather Website** includes spaces to add tabulated data, observations, images, graphs and interpretations. Participants are assigned to a small group for the entire term and share weather observations from different geographic regions. Discussions of weather for the different geographic regions are recorded on a separate section of the **Personal Weather Website**. In these and other discussions, participants are expected to use newly acquired weather concepts and terms as part of the discourse.

3. **Final Course Project**

Participants design, teach and evaluate outcomes of a weather lesson or short unit. Project ideas are submitted by end of the 3rd week of term and subject to approval from instructor. An update is due on the 6th week of the term. Final projects are due the Friday of finals although early submissions during finals week are appreciated. More details for the final course project are included in a separate document under course documents.
Evaluation of Student Performance

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Assignments (Unit 1: 30 pts. Units 2-4 40 pts each)</td>
<td>150</td>
</tr>
<tr>
<td>Maintain Weather Stations and Personal Weather Website</td>
<td>200</td>
</tr>
<tr>
<td>Midterm</td>
<td>100</td>
</tr>
<tr>
<td>End of semester</td>
<td>100</td>
</tr>
<tr>
<td>Final Course Project</td>
<td>150</td>
</tr>
<tr>
<td>Project ideas submitted by end of the 3rd week of term.</td>
<td>15</td>
</tr>
<tr>
<td>Update on project due at 6th week of term.</td>
<td>15</td>
</tr>
<tr>
<td>Final project due Friday of finals.</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
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</table>

**Note to students:** Keep a copy of everything you submit.

**Grading scale:**
- A: 470-500 points
- A-: 450-469 points
- B+: 435-449 points
- B: 420-434 points
- B-: 400-419 points
- C+: 385-399 points

**Statement of Expectations for Student Conduct:** [http://oregonstate.edu/admin/stucon/achon.htm](http://oregonstate.edu/admin/stucon/achon.htm)

**Statement Regarding Students with Disabilities:**
Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS 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 DAS immediately at 737-4098.

[http://oregonstate.edu/dept/budgets/genupol/gupdissu.htm](http://oregonstate.edu/dept/budgets/genupol/gupdissu.htm)

**Plagiarism**
Students are expected to comply with all regulations pertaining to academic honesty, defined as: An intentional act of deception in which a student seeks to claim credit for the work or effort of another person or uses unauthorized materials or fabricated information in any academic work. For further information, visit [Avoiding Academic Dishonesty](http://oregonstate.edu/university/academic-dishonesty), or contact the office of Student Conduct and Mediation at 541-737-3656.

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.”

**Conduct in this online classroom**
Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the [university’s regulations regarding civility](http://oregonstate.edu/university/conduct). Students will be expected to treat all others with the same respect as they would want afforded themselves. Disrespectful behavior to others (such as harassing behavior, personal insults, inappropriate language) or disruptive behaviors in the course (such as persistent and unreasonable demands for time and attention both in and out of the classroom) is unacceptable and can result in sanctions as defined by Oregon Administrative Rules Division 015 Student Conduct Regulations.