SCIENCE OUTREACH
CRN 27217/27218 – WINTER 2015
PHYS 408/508 Workshop
Tuesday 4-4:50pm, 1 credit
Class meets in Museum of Natural & Cultural History (MNCH) classroom 114

Instructor
Dr. Bryan Rebar
brebar@uoregon.edu, (541) 346-4773
144 Willamette
office hours by appointment

Course Description
This course is designed for undergraduate and graduate students interested in improving their ability to communicate their STEM (science, technology, engineering, math) understandings to public audiences, primarily P-12 age students, in a variety of learning settings. The course involves instruction in inquiry-based teaching methods for informal settings with a learning theory framework plus supervised work in local informal learning settings in partnership with community organizations (museums, afterschool programs, etc.). In this way, students will practice communicating STEM concepts, reflect on their experiences, and receive feedback.

Prerequisites
None. All that is required is an interest in learning about and practicing science outreach with public audiences, especially K-12 audiences. The course is open to undergraduates and graduates at all levels, and targeted for natural sciences and mathematics majors.

Purpose
This course is intended to provide introductory STEM (science, technology, engineering, math) teaching opportunities with structured pedagogical support such that students are able to develop science communication skills, learn effective science outreach approaches, and explore teaching as a career option. Targeted outcomes are STEM majors who are better prepared to support outreach and broader societal impacts related to their career foci and a subset of STEM majors who pursue education careers.

Course Objectives
Throughout the course students will practice and demonstrate the abilities to:
1. Identify pedagogically sound practices for facilitating learning in informal settings including practices that consider different audiences’ interests and needs
2. Engage public audiences in science activities with the effective use of hands-on materials and resources, questioning strategies, and other forms of invitation (signs, etc.).
3. Enhance (undergraduates) and develop (graduates) outreach activities that accurately introduce scientific concepts
4. Assess the impact of various science outreach efforts with supporting evidence

Course Requirements
This is a pass/no pass course. In order to pass the following expectations must be met satisfactorily:

Attendance
Attendance is necessary and mandatory for you to learn and be successful in this course. If circumstances prevent you from attending a given class meeting, please provide me, the instructor, with advance notice. We will arrange a make-up plan to ensure you keep up.

Participation
Class
Class meetings will involve a variety of activities along with small and large group discussions. Attendance and participation in these class activities is expected. Students are expected to come to class prepared having read or viewed any short articles or videos assigned.

Blackboard
Each week you are expected to respond to the prompt posted on Blackboard with a thoughtful reflection that references your outreach experiences and/or course materials. In addition, you should provide constructive feedback, insights, reflections, or supportive questions in response to at least one other student’s post.

Outreach
Students are expected to participate in a minimum of 20 hours of outreach during the quarter, or approximately one outreach activity per week throughout the course, in coordination with one of the partner institutions (see below) or other opportunities as pre-arranged and in consultation with the instructor. A schedule of outreach opportunities will be presented in class and updated as appropriate. Participation in outreach includes training time offered by partners, observation time, facilitation time, and planning time for the products described below. The majority of the outreach time must be facilitation time.

Products
Undergraduates
Undergraduate students are expected to modify an existing outreach activity developed or provided by partner institutions or available from other sources such
as the Physics Demo stock room, STEM CORE, or available on howtosmile.org. The modified activity should be tested with an audience. A written activity plan indicating modifications and following the template provided is due by Thursday of Finals Week along with a reflection regarding how visitors responded to the changes. Prompts will be provided for the reflection. Students will have an opportunity to share and discuss their activity in class to get feedback from peers, and a draft of the lesson plan is due two weeks before the final draft in order for the instructor to provide feedback. You may work with a partner provided you each contribute to the modifications, additions to the written lesson plan, and facilitation—and clearly indicate each partner’s contributions. You will submit individual reflections.

Graduates
Graduate students are expected to develop an original outreach activity. The activity may complement activities previously developed or provided by partner institutions or may feature concepts related to your area of study. STEM CORE has a small budget to support the purchase of materials; some materials may be borrowed from the Physics Demo stock room (see instructor to arrange purchases and check outs). The outreach activity must include both hands-on materials and a written facilitator’s guide (lesson plan) following the template provided. Example activity guides will be provided. Students will have an opportunity to share and discuss their activity in class to get feedback from peers. A draft of the written lesson plan is due two weeks before the final draft to allow for the instructor to provide feedback. Students should also present the activity to an audience during the term and submit a reflection of visitors’ responses; prompts will be provided for this reflection on Blackboard in Week 10. The lesson plan and reflection are due by Thursday of Finals Week. You may work with another graduate student provided you each contribute to the modifications, additions to the written lesson plan, and facilitation—and clearly indicate each partner’s contributions. You will submit individual reflections.

Course Materials
Blackboard
Each week you are expected to respond to the prompt or question that I post with a thoughtful reflection that references outreach experiences and/or course materials. In addition, you should provide constructive feedback, insights, reflections, or supportive questions in response to at least one other student’s post. Weekly responses are due by 9am Tuesdays; responses to classmates’ posts are due by 4pm Tuesdays.
Readings & Outside Resources
All readings will be made available electronically on Blackboard. For the most part, readings will be short and highly accessible. All assigned readings will be given with guiding questions to help you focus on the important ideas. Readings/resources may be drawn from:

*How People Learn*

*Surrounded by Science: Learning Science in Informal Environments*

5 E’s Learning Cycle

Minda Borun – “Developing Family Friendly Exhibits”

Judy Diamond – *Practical Evaluation Guide*

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<thead>
<tr>
<th>Partner</th>
<th>Website</th>
<th>Contact(s)</th>
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</thead>
<tbody>
<tr>
<td>Fidgets 2 Widgets</td>
<td><a href="http://fidgets2widgets.com/">http://fidgets2widgets.com/</a></td>
<td>Pam Simon <a href="http://p.simon@fidgets2widgets.com">p.simon@fidgets2widgets.com</a></td>
</tr>
<tr>
<td>Museum of Natural &amp; Cultural History</td>
<td><a href="http://natural-history.uoregon.edu/">http://natural-history.uoregon.edu/</a></td>
<td>Robyn Anderson <a href="http://robyna@uoregon.edu">robyna@uoregon.edu</a></td>
</tr>
<tr>
<td>School Garden Project</td>
<td><a href="http://schoolgardenproject.org/">http://schoolgardenproject.org/</a></td>
<td>Amoreena Guerrero <a href="http://amoreena@schoolgardenproject.org">amoreena@schoolgardenproject.org</a></td>
</tr>
<tr>
<td>Science Factory</td>
<td><a href="http://www.sciencefactory.org/">http://www.sciencefactory.org/</a></td>
<td>Nick Spicher <a href="http://sfeducation@sciencefactory.org">sfeducation@sciencefactory.org</a></td>
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<td>Thinkersmith</td>
<td><a href="http://thinkersmith.org/">http://thinkersmith.org/</a></td>
<td>Bethany Thramer <a href="http://Bethany@thinkersmith.org">Bethany@thinkersmith.org</a></td>
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<td>Opportunities Program</td>
<td><a href="http://opportunities.uoregon.edu/">http://opportunities.uoregon.edu/</a></td>
<td>Antonio Huerta <a href="http://joseh@uoregon.edu">joseh@uoregon.edu</a></td>
</tr>
<tr>
<td>Science on Demand</td>
<td><a href="http://stemcore.uoregon.edu/projects/">http://stemcore.uoregon.edu/projects/</a></td>
<td>Brandy Todd <a href="http://btodd@uoregon.edu">btodd@uoregon.edu</a> Cori Brant <a href="http://cori@uoregon.edu">cori@uoregon.edu</a></td>
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<tr>
<td>STEM CORE</td>
<td><a href="http://stemcore.uoregon.edu/calendar-2/">http://stemcore.uoregon.edu/calendar-2/</a></td>
<td>Katie Heldt <a href="http://stemcore@uoregon.edu">stemcore@uoregon.edu</a></td>
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<tr>
<td>Astrophysics Outreach</td>
<td><a href="http://oregonsky.org/4701.html">http://oregonsky.org/4701.html</a></td>
<td>Rick Kang <a href="http://epoguy@gmail.com">epoguy@gmail.com</a></td>
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<tr>
<td>Central Western Oregon Science Expo (CWOSE)</td>
<td><a href="http://www.nwse.org/cwose">http://www.nwse.org/cwose</a></td>
<td>Karen Sprague <a href="http://kus@uoregon.edu">kus@uoregon.edu</a></td>
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<td>Science and Invention Fair</td>
<td></td>
<td>Brandy Todd <a href="http://btodd@uoregon.edu">btodd@uoregon.edu</a></td>
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<td>Kid Wind Challenge</td>
<td></td>
<td>Cathy Bechen <a href="http://cathy.bechen@bethel.k12.or.us">cathy.bechen@bethel.k12.or.us</a></td>
</tr>
<tr>
<td>WISE – Women in Science &amp; Engineering</td>
<td></td>
<td><a href="mailto:Elam_m@4j.lane.edu">Elam_m@4j.lane.edu</a></td>
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Outreach Schedule
Note: dates below are subject to change and additional dates will likely be added. Please visit the STEM CORE calendar for updated outreach event information:

[http://stemcore.uoregon.edu/calendar-2/](http://stemcore.uoregon.edu/calendar-2/)

We will use a Google spreadsheet to sign up for events on a first-come, first-serve basis. Most events have multiple slots. **It is important that you sign up to provide a record of your outreach participation.**
Fidgets 2 Widgets: Every weekday 3:30 – 7:00; After school enrichment program with technology specialty.

Museum of Natural & Cultural History: First Friday and following weekend of the month 11 – 5; Family Day focused around Darwin on Sunday, February 8th, from 11am-3pm; Training required before first facilitation day.

Science Factory: Saturdays & Sundays 10 – 4; Training required to use Nova and Franklin Institute outreach activities—schedule with Program Director Nick Spicher. Training will be offered January 24th at 1pm, Jan 28th at 5pm and Feb 14th at 4pm. Meet-A-Scientist Day Saturday, February 21st, 11 – 3; Pi Day activities on March 14th from noon to 4 involving facilitation of math activities.

School Garden Project: Training required on a date TBD January 12-23rd. Must arrive 15 minutes prior to times below when leading activities.

- River Road Elementary, Tuesdays and Fridays, 2:45-3:30 and 4:00-5:00 pm
  - Session 1: January 7-February 13, Experiments with Plants
  - Session 2: February 17-March 20, Patterns in Nature: Discover, Draw, Design

- Chavez Elementary Tuesdays and Thursdays, 4-5 PM
  - Session 1: January 7-February 12, Water Cycle
  - Session 2: February 17-March 19, Habitats (?)

- Kelly Middle School, Tuesdays and Thursdays 4:30-5:30 PM
  - Session 1: Jan. 7-Feb 5th, Patterns in Nature: Discover, Draw, Design
  - Session 2: Feb. 10-Mar. 12, Soil Science

Lead lessons on gardening related topics for K-8 students. A minimum of 10 hour commitment required.

Thinkersmith: Teach “unplugged” computer science lessons to elementary students—weekly 1 hour trainings for each week’s lesson. Also opportunities to teach computer science activities with middle and high school students.

Opportunities Program: For typical events, a van leaves at 3pm and returns at 10:30pm. Events are about 2-2.5 hours. A to-go kit of activities is available and volunteers will be paired with trained students.

Science on Demand: TBD. Training will be offered, or it may be possible to join student leaders as helpers.

Central Western Oregon Science Expo (CWOSE): Saturday, March 7, 2015 to be held in Gerlinger Hall and Annex. Opportunity to present your own activities for high school and middle school students, teachers, and parents attending the science fair.
Science and Invention Fair: Date TBD, probably coordinated with CWOSE on March 7th. Elementary students present their projects. Weekly lead up activities in schools help prepare students.

KidWind Challenge: One-time event on Friday, Jan 30th 9:30am – 2pm at Willamette High School. Middle school and high school students participate in wind power related activities and competitions.

WISE Symposium, Friday, Feb. 6th. Lead 40 minute activities with middle school students at Churchill High. Presenter's meeting on Wednesday, January 21, 5:30-7 p.m. Also, a mini-symposium for middle school students will be Saturday, January 17, 1-3 p.m.

Diversity
This course and university celebrate open inquiry, freedom of expression, and respect for differences. As the instructor, I am committed to upholding these ideals by encouraging the exploration, engagement, and expression of divergent perspectives and diverse identities. By participating in this class, you affirm your commitment to these ideals as well.

Academic Integrity
All students are expected to complete assignments in a manner consistent with academic integrity. Students must produce their own work, acknowledge when collaborative work is involved and describe their unique contributions, and properly acknowledge and document all sources (lessons, ideas, quotations, paraphrases). Students can find more complete information about the University of Oregon’s Policy on Academic Dishonesty in the University of Oregon Student Handbook.

Students with Disabilities
The University of Oregon is working to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in barriers to your participation, please notify me, the instructor, as soon as possible. You are also welcome to contact the Accessible Education Center (AEC) in 164 Oregon Hall at 346-1155 or uoaec@uoregon.edu.

If you are not a student with a documented disability through AEC, but you would like for me to know about class issues that will impact your ability to participate and learn, I encourage you to come visit with me during my office hours so that we can strategize how you can get the most out of this course.

Equal Opportunity
I support Title IX and have a duty to report relevant information.

The UO is committed to providing an environment free of all forms of prohibited discrimination.
and sexual harassment, including sexual assault, domestic and dating violence and gender-based stalking. Any UO employee who becomes aware that such behavior is occurring has a duty to report that information to their supervisor or the Office of Affirmative Action and Equal Opportunity. The University Health Center and University Counseling and Testing Center can provide assistance and have a greater ability to work confidentially with students.

Note: UO employees also have a duty to report child abuse. For those classes and/or processes in which students have historically reported information regarding child abuse, the language can be expanded to provide that notice as well by adding the following statement:

All UO employees are required to report to appropriate authorities when they have reasonable cause to believe that any child with whom they come in contact has suffered abuse or any person with whom they come in contact has abused a child.
## Class Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Objectives</th>
<th>Activities/Assignments</th>
<th>Resources</th>
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<tbody>
<tr>
<td>1</td>
<td>What is science outreach?</td>
<td>1</td>
<td>Observe/participate in outreach; BB response; Review Ch. 1</td>
<td>Ch. 1 Surrounded by Science</td>
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<tr>
<td>2</td>
<td>Learning cycle introduction - 5 E’s:</td>
<td>1, 2</td>
<td>Develop invitations</td>
<td>Handout – 5 E’s model; Duran et al. article</td>
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<td></td>
<td>Engagement</td>
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<td>3</td>
<td>Student-centered instruction</td>
<td>1, 2</td>
<td>Safety; Activity introductions</td>
<td>Rowe talk – Youtube vid</td>
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<td>4</td>
<td>How People Learn</td>
<td>1, 2, 3, 4</td>
<td>Preconceptions, assimilation of ideas, &amp; addressing misconceptions</td>
<td>How People Learn</td>
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<td>5</td>
<td>Reflective teaching</td>
<td>1, 2</td>
<td>Reflecting on teaching; introduction to lesson template</td>
<td>howtosome.org</td>
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<td>6</td>
<td>Big ideas</td>
<td>1, 2, 3</td>
<td>Develop outreach activities with big idea</td>
<td>nextgenscience.org</td>
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<td>7</td>
<td>Learning goals &amp; assessment</td>
<td>4</td>
<td>Gather evidence about the impact of your outreach activity</td>
<td>Handout – STEM Stops eval plan; Diamond book*</td>
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<tr>
<td>8</td>
<td>Workshop Activities</td>
<td>3</td>
<td>Receive feedback on your outreach activities from peers</td>
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<td>9</td>
<td>Culture, Diversity, and Equity</td>
<td>1</td>
<td>Try your improved or original activity</td>
<td>Surrounded by Science</td>
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<td>10</td>
<td>Linking Informal and Formal Settings</td>
<td>1, 2, 3, 4</td>
<td>Link activity to standards</td>
<td>Surrounded by Science</td>
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<tr>
<td>11</td>
<td></td>
<td></td>
<td>Submit final outreach lesson plan and reflection</td>
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### Resource References


