

Spring Semester 2008

EMA 601, EPD 690, JOURN 880, InterL&S 701, InterCALs 875
Informal Science Education for Scientists: A Practicum

Course particulars

3 credits (worth of work!)

Meets 8:45-10:45 a.m. in 1143 Mechanical Engineering Building

Instructors

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Course goals

Make no mistake about it. One of the most important skills you need to develop during your graduate school career is the ability to communicate your work to a wide array of audiences. That facility enables you to speak effectively about your research with your scientific peers and then walk into an undergraduate classroom to tell a group of 19-year-old students about the same exciting stuff. Additionally, it equips you to communicate about your work accurately to friends and neighbors, and it even makes it possible for you to communicate directly with the public, through the mass media, in public talks, on your own Web site, perhaps even on DVD and film.

Why is this so important? For one thing, you will encounter a wide array of audiences in the course of your career. For another, evidence suggests that skillfully crafted messages influence not only the public but also your scientific colleagues. It is no accident that the top scientists in any given field are also among the field's best communicators. Learning to communicate well to the most novice audience will help you greatly in all your communications, even your most technical ones.

And finally, if you join the cadre of scientists who use public resources (i.e. federal funds for research), you have a responsibility to share what you learn with the public. That public (publics, really) is often keen to learn but will need your help; thus you must be able to package and "translate" science for public consumption.

We seek to familiarize you with concepts and processes important to communicating science *successfully* to a variety of audiences who are characterized by one or more of the following:

- They may have scant knowledge of science.
- They may not even be sure they are interested in science.
- They will encounter your messages in the context of their hectic, workaday world.
- They are increasingly diverse in both backgrounds and interests.

To accomplish this we will concentrate, in the course of the next 15 weeks, on four learning dimensions. Integrated throughout the semester will be (1) the importance of understanding your audience and the diversity of backgrounds and motivations individuals bring to communication opportunities; (2) how to become a better explainer; (3) the design, production and evaluation of an informal education product; and (4) the breadth of informal science venues and modalities available to the general public.

Do be aware that, although the number of credits for which you are registered can vary, we expect each participant to accomplish all course responsibilities.

Informal education skills

Although any single product will require a bevy of skills, we will concentrate here on three skills important to all informal education efforts: explanation, engagement, and evaluative research.

Explanation: Most of us never think analytically about how to “explain” anything, so we will bring to you a useful body of research and will engage you in efforts to successfully explain concepts and processes, including coping with the factor that undermines many otherwise competent explanations: audience beliefs that make your explanation unpalatable.

Engagement: Informal audiences for science messages don’t have to pay attention, so an important part of message production is luring them into the science. You must make it fun and engaging in some way. Good storytellers know their audience, and they know how to craft tales that accurately reflect the science while offering such a compelling narrative that readers/viewers learn without realizing it. We will practice some components of this difficult skill.

Evaluative research: Perhaps the most important question you can ask of any informal education product is: “How do you know if it worked?” Good communicators must ask a host of such questions as they design a product and after they disseminate it. If you have not yet answered the “how do you know if it worked” question, your informal education job is not yet finished.

Informal education channels

Science communicators commune with audiences via a variety of channels. We will not have time to traverse them all here, but we will give you a taste of the enormous variance and possibilities. As we examine this landscape, we will bring in or take you to visit experts who will share their experiences in such channels as the mass media (newspapers, television, radio), interactive sites (museums, the World Wide Web), one-on-one interactions (public lectures, demonstrations), and persuasive efforts (advocacy groups).

The demonstration/interactive project

Each of you will be encouraged to develop more than a passing familiarity with informal education processes by designing and carrying to fruition a specific project. To accomplish this, we will place you in groups and then will challenge you to create and implement an actual science demonstration or “interactive” appropriate for a general public audience. You will test your prototype as an exploration station at the UW-Madison Science Expeditions and, after further modifications, will conduct a final test of your project at the Chicago Museum of Science and Industry. **Please note that this requires your involvement in course activities on two Saturdays: April 5 and April 26.**

Your group will have the freedom to select the focus of your station and then will move through design and production stages, culminating in a demonstration or interactive station installed and “personed” by the group at Science Expeditions, which attracts thousands of Madison residents. After refinement of your projects based on the evaluation you conduct at Science Expeditions, you will present the next iteration to the visitors and staff of the Museum of Science and Industry in Chicago, IL. Throughout the semester-long process, you will ask and answer questions about audience and will evaluate the product’s effectiveness; those research efforts will be an important part of your project dossier.

Throughout the semester, your group will generate documents reflecting various design and implementation stages. The instructors will read these documents and will provide feedback along the way. The collection of documents, completed by a summative evaluation report due at the end of the semester, will form your project dossier, which will contribute to the project portion of your final grade.

The Delta program will provide to each group a \$200 budget for equipping your project. You will need to send original receipts and a completed reimbursement form (to be provided) to Chris Pfund at Delta (Science House, 1614 Linden Drive, campus).

What this course is not

•It is **not** a course in science writing or in television film, or Website production. Other courses on campus provide such instruction. Here, we seek to provide you with an introduction to the multidimensional nature of communicating about science to a variety of audiences, and

particularly to the need to be analytical as you decide to whom you will communicate and what you intend to say.

•It is **not** a course in *formal* education strategies. Although many skills discussed here will transition readily to the classroom, we will not consider students in formal classroom settings as one of our audiences. Other resources made available by Delta, a campus-based teaching and learning community created specifically for science students (www.delta.wisc.edu) can help you build formal pedagogical skills.

Join our learning community: Spring semester roundtables

This course is part of a larger effort at UW-Madison to better prepare science graduate students for the multivariate responsibilities of teaching, research, and service that await them on campuses around the country and the world. Originally funded by the National Science Foundation, this effort—operationalized on campus by the Delta program—seeks to provide a place where students can talk about and practice learning strategies that will make them better classroom teachers and informal communicators.

To help foster this community, Delta will organize three roundtable talks this spring, and we invite you all to join us for a free meal, camaraderie, and the opportunity to reflect on learning practices. All roundtables will take place from 6 to 7:15 p.m. at the Memorial Union. Spring dates:

•**February 13:** 21st Century Faculty Member (Speaker: Ann Austin - MSU)

•**March 5:** Campus Climate Study (Speaker: John Foley)

April 23: LEAP Initiative (Speakers: J. Vanderwal-Taylor and N. Westphal-Johnson)

Readings

Most readings listed in the weekly syllabus below will be available online at our course web site on LEARN@UW.

Evaluation and grading

50% experiential project and its evaluation (including written reports)

20% individual writing assignments

30% class participation

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Spring 08 class days

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January 22:

Course introduction

Sample tabletop demonstrations/interactives.

Small groups begin their own design process

Individual Assignment: Revisit the explanatory writing topic you completed in class and explain this concept, process or term in **two** additional ways appropriate for a public audience. You can use written descriptions, diagrams, graphs or other images, demonstration concepts, or any combination of strategies. Turn in by 5pm on Friday, January 25, via email to dunwoody@wisc.edu AND crone@engr.wisc.edu.

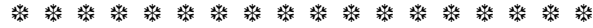
Preparing for next week's class:

Team Assignment: Meet with your team to develop a demonstration/interactive topic idea.

Read:

•“Science for All Americans” Project 2061, AAAS, Chapter 13

•Chapters 2 and 5 from “Questioning Assumptions: An Introduction to Front-end Studies in Museums” (1998)



January 29:

Share group ideas on demonstration topics
Introduction to evaluation strategies: front-end, formative, and summative

Preparing for next week's class:

Team Assignment: Write a 1-2 page summary of your team's demonstration/interactive idea and turn in by class time via email to dunwoody@wisc.edu AND crone@enr.wisc.edu

Read:

- Chapter 7 of *Science and Engineering Indicators 2008*
- Banks et al, *Learning In and Out of School in Diverse Environments*
- Bruns et al, "Scholarship: The Key to Creating Change through Outreach," *Journal of Higher Education Outreach and Engagement*
- Rennie and McClafferty, *Handbook for Formative Evaluation of Interactive Exhibits*



February 5:

The importance of understanding audience
Formative evaluation strategies

Preparing for next week's class:

Read:

- Chapter on "Interviews and Questionnaires" from J. Diamond, *Practical Evaluation Guide*



February 12:

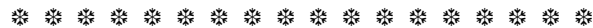
Groups share front-end and formative evaluation designs for their demonstration/interactive
Summative evaluation strategies

Preparing for next week's class:

Team Assignment: Arrange a team meeting with one of the instructors between Feb. 13-18 to discuss your project and your front-end/formative evaluation plan

Read:

- K.E. Rowan, "Explaining difficult ideas: Spotting, tackling, and rendering them sensible for lay readers," *English Quarterly*
- The National Academies, "News & Terrorism: Communicating in a Crisis" fact sheets (to be handed out in class)



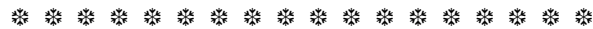
February 19:

Explaining things well: discussion and practice

Preparing for next week's class:

Read:

- B.V. Lewenstein, "Who Produces Science Information for the Public?" Chapter 2 of *Free-Choice Science Education: How We Learn Science Outside of School*
- Chapters 4 and 5 from "Scientist's Guide to Talking with the Media"



February 26:

Journalists, storytelling and you
Radio as an informal science education medium. Guest speaker: Prof. Jonathan Martin,
atmospheric and oceanic sciences

Preparing for next week’s class:

Fill in the message box with information relevant to a specific research study or other project.
Send relevant readings (but NOT your message box) to your interviewer.

Read:

- L. Rubinkowski, “Rules to Interview By” (also available at http://www.poynter.org/content/content_view.asp?id=4565)
- W.MacAuliffe, “The Really Great Interview,” *Above the Fold*, 2002
- M.H. Massé, “Structure: Roadmap to Successful Storytelling,” 2008



March 4:

Students interview each other
(each student will play two roles: interviewer and interviewee)

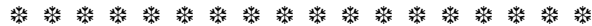
Preparing for next week’s class:

Individual Assignments:

Team Assignment: Write a 5-page report detailing your front-end and preliminary formative evaluation strategies and results for your project dossier and turn in by class time via email to dunwoody@wisc.edu AND crone@engr.wisc.edu. Prepare AV presentation to offer in class.

Read:

- D.L. Perry, “Designing exhibits that motivate,” *ASTC Newsletter*, 20(2), 9-10, 12 (1992).
- User Friendly Exhibit Design Checklist from J. Kennedy, “User Friendly: Hands-on Exhibits that Work” (1994)
- M. Powell and D.L. Kleinman, “Building citizen capacities for participation in nanotechnology decision-making: The democratic virtues of the consensus conference model. *Public Understanding of Science* (in press)



March 11:

Front-end and preliminary formative evaluation reporting out
Public participation science venues. Guest speaker: Maria Powell, Nanoscience and Engineering Center

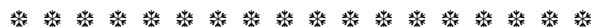


March 18: NO CLASS – Spring Break

Preparing for next week’s class:

Individual Assignment: Write a story based on your student interview and turn in by 5 p.m. March 20 via email to dunwoody@wisc.edu, crone@engr.wisc.edu, AND your student source. Read the story about you carefully and come to class prepared to give your interviewer feedback.

NOTE: Bring a paper copy of **both** the story you wrote and the story about you to class



March 25:

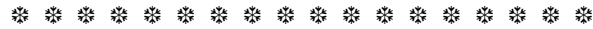
Peer feedback on stories

Report on formative evaluation strategies for demonstration/interactive prototypes

Preparing for next week's class:

Read:

•“Sharing Science with Children: a survival guide for scientists and engineers. North Carolina Museum of Life and Science, (1996). Retrieved June 21, 2006, from <http://www.noao.edu/education/ncmlssg.html>



April 1:

Tabletop demonstration/interactive dry runs

Preparing for next week's class:

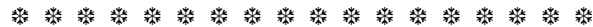
Read:

•vom Lehn et al, “Exhibiting Interaction: Conduct and Collaboration in Museums and Galleries, *Symbolic Interaction*, 2001



Saturday April 5:

Team Presentation of demonstration/interactive prototype at Science Expeditions. Interact with campus visitors from 1pm to 4pm (UW Engineering Campus).



April 8:

Science Expeditions debrief, with emphasis on results of formative evaluation efforts

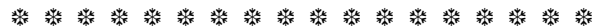
Preparing for next week's class:

Individual Assignment:

•Revise your student interview story based on the feedback you received and turn in by class time via email to dunwoody@wisc.edu AND crone@engr.wisc.edu.

Read:

•Stories and other features on The Why Files (www.whyfiles.org)
•S. Dunwoody, “Studying Users of The Why Files,” *Science Communication*, 2001
•Explore web outreach resources of the Wisconsin Energy Institute:
<http://www.energy.wisc.edu/programs/>



April 15:

Web science communication via The Why Files. Guest speaker: Terry Devitt, editor of The Why Files.

Web strategies for the science practitioner. Guest speaker: Paul Meier, Associate Scientist and Director of the Wisconsin Energy Institute

Preparing for next week's class:

Individual Assignment: Take a look at science writer Alan Boyle's blog, *Cosmic Log* (<http://cosmiclog.msnbc.msn.com/>), as well as at MSNBC's science and technology pages on the WWW (<http://www.msnbc.msn.com/id/3032118/>)



April 22:

Strategies for interacting with journalists

Panelists:

Prof. Michael Corradini, engineering

Prof. Mark A. Eriksson, physics

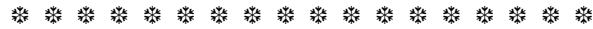
Prof. Emily Stanley, zoology/limnology

The world of professional science journalism. Guest speaker: Alan Boyle, MSNBC.com science editor



Saturday April 26:

***Team Presentation of your final tabletop demonstration/interactive at the Chicago Museum of Science & Industry
ALL-DAY TRAVEL REQUIREMENT***

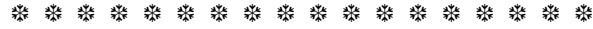


April 29:

Museum debrief

Preparing for next week's class:

Team Assignment: Write a 5-page report on your summative evaluation strategies and results for your project dossier and turn in by class time via email to dunwoody@wisc.edu AND crone@engr.wisc.edu. Be prepared to present your results in class.

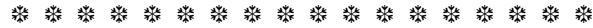


May 6:

Groups present final summative evaluation

One more task:

Individual Assignment: You will complete a final communication assignment and will hand it in to both instructors via email by 5pm of the Friday of finals week. Details will be provided on May 6.



Supplemental Readings:

D. Ash, "Reflective Science Sense-Making Dialogue in Two Languages: The Science in the Dialogue and the Dialogue in the Science," *Science Education*, 88, 855-884 (2004)

G. Carrada, *Communicating Science: A Scientist's Survival Kit*, European Communities (2006)

W.C. Crone "Bringing Nano to the Public: A Collaboration Opportunity for Researchers and Museums," Edited by S. Koch, Science Museum of Minnesota, St. Paul, MN (2006)

R. Korn, "Studying your visitors: Where to begin," from *Introduction to Museum Evaluation* (1999)

C. Screven, "What is Formative Evaluation?," from *Introduction to Museum Evaluation* (1999)

Rowe, et. al., "Difficulties in Evaluating Public Engagement Initiatives" *Public Understand. Sci.*, 14, 331-352 (2005)

Heath, et. al., "Interaction and Interactives" *Public Understand. Sci.*, 14, 91-101 (2005)

"How Experts Differ from Novices," in *How People Learn*. National Academy Press, 2000

D.L. Perry, "Profound Learning: Stories from Museums," *Educational Technology*, Mar-Apr (2002)

