Instructor
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Course Description
Successful conservation outcomes, environmental health, and human capital development are just a few of the benefits of effective communication between scientists and the general public. Many major funding agencies evaluate research proposals' broader impacts as an integral part of proposal review. This ABS III graduate course, Outreach: From Theory to Practice (ESSM 689), is designed to teach graduate students about informal STEM education (ISE), and how to incorporate ISE methods into outreach efforts to the general population. Students will learn about the role ISE plays in a democratic society and how ISE can impact a wide range of public policies from air quality monitoring to controlling the spread of zebra mussels. Using their gained insight into ISE, students will propose and implement an ISE program that relates to their own research or related STEM topic at an outreach event of their choosing.

Learning Outcomes
By the end of this course, students will be able to:

1. Articulate and critique the role of informal STEM education (ISE) in a democratic society
2. Evaluate the various ways that ISE can affect public policy
3. Assess the quality of ISE efforts and provide constructive feedback on how to improve or expand such efforts
4. Create an ISE activity that demonstrates an understanding of ISE
5. Present scientific research to the general public at an Outreach event

Absence and Late Work Policy
“The University views class attendance as the responsibility of an individual student. Attendance is essential to complete the course successfully. University rules related to excused and unexcused absences are located on-line at http://student-rules.tamu.edu/rule07."

Late assignments will be accepted only in the case of a University Excused Absence with no penalty within a reasonable timeframe (i.e., one week). All other work will be given a five-percentage point penalty for every day it is late, including weekends. University Excused Absences must have written verification, like a doctor’s note.
Grading
All assignments must be submitted to pass this course.

The Standard Letter Grading Scale will be applied:
A = 90-100; B = 80-89; C = 70-79; D = 60-69; F = <60

Participation (30%)
Classes will be journal club format so plan to lead some discussions.

The syllabus is broken up into three sections as follows:

Part I: Informal STEM Education (ISE)
  - ISE literature synthesis paper (15%)
    - Students must demonstrate their understanding of ISE theories and creatively explore what a successful Outreach event might look like based on the ISE literature (1,000 - 1,500 words).

Part II: Public and Policy Impacts
  - ISE Project Proposal (25%)
    Students must design a project that can be implemented by the end of the course and has the potential to affect public attitudes or knowledge (this will be implemented in part 3 of the class). The project must have an evaluation component and implementation venues identified and secured for Part III of the course.

Part III: Educating the Public
  - ISE Project implementation (20%)
  - ISE Project Evaluation (10%)

Topics and Related Reading Assignments
NOTE: Required readings are subject to change
Part I: Informal STEM Education (5 weeks)

Week 1 (August 29): Teaching and Learning in different contexts
- What is “pedagogy” and what are the underpinnings of a quality educational experience?
- What is science education v communication
- Informal v Formal Science Education (similarities and differences)

Required Readings: Falk et al 2007; Falk & Dierking 2010; Stocklmeyer et al 2010

Week 2 (September 5): Informal Education Venues (e.g., aquaria, museums, zoos, field stations)
- What do different venues offer participants?
- How similar/different are these venues?

Required Readings: Struminger et al 2018; Schwan et al 2014
Suggested Readings: Falk, Randol, & Dierking 2012; Nadkarni 2013

Week 3 (September 12): Informal Learning Activities, Relevant Pedagogies and Frameworks
- In what ways does pedagogy matter for assessment and evaluation?
- How does science benefit? (e.g., science literacy, quality big data, new directions/innovation)

Required Readings: Varner 2014; Bonney et al 2009a

Week 4 (September 19) & Week 5 (September 26): Assessing Implementation in Informal Contexts and Evaluating Learning in Informal Contexts
- What does quality implementation look like? (e.g., participation, products, return visits)
- What impact does/could ISE have on participants of all ages? (e.g., science literacy, 6 science strands)

Required Readings Week 5 (Sept 26): Lesen et al 2016; Grand and Sardo 2017
Suggested Readings: Phillips et al 2018

End of Part I: ISE Synthesis Paper (Due October 4 – Friday)
Students must demonstrate their understanding of ISE theories and creatively explore what a successful Outreach event might look like based on the ISE literature (1,000 -1,500 words).
Part II: Planning & Implementing an ISE Project (4 weeks)

Week 6 (October 3): What is the Texas A&M University Internal Review Board (IRB) process for human research? What documents are needed for the process? What does a valid, efficient, and useful survey look like?

GUEST: Tara Foster, Research Compliance Coordinator, Division of Research, Texas A&M University – Human Research Protection Program

Required Readings: Rubin 2013/14 (CAISE IRB Blog Series); Chapter 9 in Price et al 2015; Collie & Rine 2009

Week 7 (October 10): Creating an Evaluation Plan

Required Readings: Garabay & Teasdale 2019; Fu et al 2019; Friedman 2008 (pp 17 – 27)

Suggested Readings: Allen & Peterman 2019

Week 8 (October 17): Submitting to the IRB and Project Planning

Rough Draft of the Project Proposal Due beginning of class for class discussion/review

Week 9 (October 24): Considerations when interacting with the public (especially around controversial topics)

Required Readings: Blanton & Ikizer 2019; Fernbach et al 2019 (GMOs); Drummond & Fischhoff 2017

ISE Project Proposal (Due Friday, November 8 or earlier!)

Students must propose a project that can be implemented by the end of the course and has the potential to affect public attitudes or knowledge. The project must have an evaluation component that has met IRB standards.

Part III: Public and Policy Impacts (4 weeks)

Week 10 (October 31) What is the potential for informal learning to affect individual and community behaviors, as well as science research? Which individuals are left out?

Required Readings: Struminger & Ross (submitted); Riesch & Potter 2014; Dawson 2018


Week 11 (November 7) What is the potential for informal learning to affect public support of government policy (especially in the areas of conservation, natural resource management, and environmental protection)?

Required Readings: Dean 2018; Ellwood et al 2017; McKinley et al 2017

Suggested Readings: Fernández Pinto & Hicks 2019
Week 12 (November 14): Science outreach among skeptics; when scientific credibility is questioned or appears biased

**Required Readings:** Hardy 2019; Ross et al. 2018; Pettorelli et al. 2019

Week 13 (November 21): Project Reflection and Next Steps

**Required Readings:** Cockrell et al 2018; Hulcr et al 2019; Lubchenco 1998

Week 14 (November 28) – No Class (Thanksgiving Holiday)

Week 15 (TUESDAY, December 3) – Reassigned Class Day – Wrap Up and Reflections

**Evaluation is due on December 6**
Submit an evaluation of the implemented project. What succeeded? Why? What could have been done better? Make recommendations (1,000 - 1,500 words).

**Notice**
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit [http://disability.tamu.edu](http://disability.tamu.edu).

**Honor Code**
“An Aggie does not lie, cheat or steal, or tolerate those who do.” ([www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor))
Readings/Bibliography


Bell, Jamie, John Falk, Roxanne Hughes, Geoff Hunt, Julia Parrish, Monya Ruffin, Kalie Sacco, and Grace Troxel. 2016. “Informal Stem Education: Resources for Outreach, Engagement and Broader Impacts.” *Science Education (CAISE)*.


https://kora.kpu.ca/islandora/object/kora%3A384/datastream/PDF/view


doi:10.1371/journal.pbio.1001986

doi:10.1080/00461520.2014.917588


doi:https://doi.org/10.1093/biosci/biy108


**Additional Readings that may be of interest:**


Scheffer, Marten, Jordi Bascompte, Tone Bjordam, Stephen Carpenter, Laurie Clarke, Carl Folke, Pablo Marquet, Nestor Mazzeo, Mariana Meerhoff, and Osvaldo Sala. 2015. “Dual Thinking for Scientists.” *Ecology and Society* 20(2).


Other Resources:
http://www.nisenet.org/search/product_type/programs-and-activities-10