The University of North Carolina at Chapel Hill has a set of edible gardens next to their dining facilities that provide fresh greens and fruit to anyone who needs them. Photo by Heidi Scott.

Lesson: Creating Actionable Science on Campus

By Heidi Scott, SESYNC | June 7, 2023

How do researchers approach the complex problem of turning science into realized, positive ecological and social impacts? Creating collaborative interdisciplinary research teams and engaging stakeholders are important enablers to translating science into action. These fusions among research, policy, administration, industry, and citizen preferences are essential to improving the sustainability of our lived environment. In this lesson, learners will practice the art of stakeholder-engaged research by developing a sustainability project in their local campus or town. Learners will not conduct new research but will use existing science, solicit and assess various stakeholder views, and strategize how to integrate the diversity of opinion into a valued, new sustainability initiative. This lesson builds on the earlier lesson, Creating Interdisciplinary Research Teams, but instructors can use it independently, as well. The ideal result of this lesson is not only to learn ways to integrate science with implementation but to launch a collaborative, semester-long experiential group project that tackles a real-world problem.

Assumed Prior Knowledge:

Appropriate for undergraduate, graduate, and higher-level learners; may be especially useful for students who wish to develop team-building and stakeholder-engagement skills before embarking on a career in socio-environmental (S-E) science

Learning Objectives:

- Identify a local S-E problem and target it for actionable research.
- Develop social sensitivity and communication skills with stakeholders to ensure that research and project design have been informed by many perspectives.

- Compose a project proposal and plan of action for a hypothetical or real sustainability need in your local environment.

Key Terms/Concepts:

team-building; epistemology; interdisciplinary design; actionable science; stakeholder engagement; group diversity; applied research; green infrastructure

The "Hook" (suggestions for quickly engaging students):

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Ask each learner to identify a time they practiced empathy or consciously placed themselves in another's perspective to resolve an interpersonal problem. For 3 minutes have them jot down their initial belief, steps they took to understand an opposing perspective, and how they worked to integrate beliefs and resolve the conflict. Was this work primarily logical, emotional, or a combination of both? For 2 minutes, invite learners to reflect on how interpersonal conflict resolution may relate to strategies to integrate multiple stakeholder perspectives into S-E solutions.

Teaching Assignments:

Creating Actionable Science on Campus (Three, 75-minute classes; may be consolidated to two)

1. As preparation for the session, have learners read [Boyd's SESYNC explainer](#) and Gerber et al. (2020), "Producing actionable science in conservation: Best practices for organizations and individuals," paying special attention to the highlighted portions.

   [Gerber et al. 2020 – Highlighted.pdf](#)

   - Prior to class, create a "Sustainability Initiatives" entry on the course discussion board and ask learners to start threads with specific ideas on how to implement new initiatives in your campus or local town. These ideas may be related to energy use, waste, transportation, food provision, wildlife habitat, outdoor classrooms, facilities and landscaping, and/or curriculum design, among others. Try to create about five distinct themes for sustainability initiatives. Learners may reply within a thread to deepen a theme.

   - If you have completed the previous lesson, [Creating Interdisciplinary Research Teams](#), be prepared to convene those teams again. If not, you will organize learners according to their area of interest, selected from the sustainability themes posted to the discussion board.

2. **(10 min.)** After "the Hook" above, use the Lesson PPT slides below to provide common understanding.

    Creating Actionable Science Lesson Slides.pptx

3. **(10 min.)** Reconvene the previous interdisciplinary research groups or form new groups of four to six individuals by asking learners to review the posted Sustainability Initiatives and choose one that interests them most. (Instructors, keep in mind that the best teams have diversity both of knowledge and identity, so try to form teams that embody multifactor diversity.) Identify a research area for each group (i.e., food provision, outdoor classrooms, etc.). Have learners introduce themselves within the group and appoint a Principal Investigator (PI) who will lead communication and outreach to campus stakeholders.

4. **(30 min.)** Now that they've identified an area of interest and PI, ask groups to deepen their knowledge of research in their areas. They should create a group-edit document (like Google Docs) to begin organizing ideas that might go into a grant proposal:

    -   Compose a brief "problem statement" that *uses research citations* to establish how some aspect of campus/town operations is unsustainable. For example, if food for the dining halls is sourced using a wholesale distributor (e.g., Sysco, U.S. Foods), your campus eats non-local food with thousands of food miles, industrial-style agriculture, and potentially reduced freshness. What other effects on the local environment come as a result of this common form of provisioning? (E.g., little local agriculture, food deserts, inequities of access, lack of knowledge about food, lawns instead of gardens, food waste, etc.)

    -   Compose a brief "program description" that details a project that provides a solution, however partial, to the problem. In the food-sourcing example, the solution might be to create a pilot project with a campus vegetable garden, permaculture, and/or fruit orchard. It is important not to develop a large and unwieldy project idea or to overstate positive impacts. At this stage, smaller is better, and achievable is best.

    -   List potential stakeholders who would have a perspective on the issue—not only the problem but especially the solution to the issue. In the food-sourcing example, a solution is on-campus and local food production. Students, faculty, dining staff, dining managers, administration, facilities or landscape management, local residents, Indigenous tribes, and community groups may all have (divergent) perspectives on this solution.

    -   Is there a "boundary organization," that is, a broker that facilitates information flow between researchers and stakeholders, or between knowledge producers and users? On many campuses, this would be the Sustainability Office.

    -   After this initial brainstorming session, each group should have a preliminary problem statement, program description, a list of potential stakeholders and their views, and perhaps a boundary organization to help with facilitation.

5. **(20 min.)** For the rest of the session, have each group PI present their initial findings to the whole assembly and ask for feedback on every aspect: problem, solution, stakeholders, brokers. Depending on the class size, each group should have 4-5 minutes to solicit additional insights. ***Instructor Note:*** *In a condensed two-class version of this lesson, skip steps #5 and #6 and move on to #7 below: it becomes the last step in the first class with reduced time for completion. Then assign step #8 as homework to be completed as soon as possible after class, and skip #9. Resume with #10 before the second class session.*

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6. As homework, have each group revise their draft grant proposal/stakeholder analysis with the new information and any additional research they can integrate. Learners should note: Grant proposals require specific exigency, program details, and budgets to be compelling. They are also stronger when the writers have considered ethos (their reputation and the University's) and pathos (where emotion and feeling are important to belief), as well as logos (stats, facts, published research).

7. **(35 min.) In the next class session**, learners should sit in their groups from the start. Have them spend 5 minutes critically appraising the draft program they wish to introduce to stakeholders and finishing their revisions. Then, have them compose as a group a brief email message to diverse stakeholders and brokers. Choose knowledgeable people most likely to reply (i.e,. not the University President, but the Vice President for Student Affairs or the Facilities Manager). This email (CC'd to the course instructor) should include:

   - A title with the course name, code, and new sustainability program title
   - A two-to-four sentence problem statement
   - A three-to-five sentence program description
   - A one-sentence overview of the boundary organization or broker among stakeholders
   - A request to reply all with questions, concerns, or additional information, within 2-4 days, due to the timeline of stakeholder engagement.

8. **(20 min.)** Assign learners to send individualized emails to selected stakeholders and brokers (try for three to five total). They should maintain a pleasant, respectful, informative, and open voice, and they should not create the narrative of "heroes vs. villains" when describing the issue, problems, and solutions.

9. **(25 min.)** For the rest of this session, have groups brainstorm their expectations for how particular stakeholders will respond to the plan. Of course, people and institutions can be surprising, but it's also important to pre-develop fair responses to anticipated objections. Have the groups outline a range of possible stakeholder objections and create responses or program revisions to accommodate them.

10. As homework, learners should receive email responses to their stakeholder queries. They should compile the new information in their group's shared document and send grateful replies to stakeholders who responded. If this lesson aims to create actual projects, the reply should include an invitation to the stakeholder to continue engaging with program developers in the design process.

11. **(20 min.)** In the next class session, have groups compare their anticipated stakeholder feedback with the actual responses. This works best if the group has received responses from a variety of stakeholders who provide diverse insights into the feasibility and impacts of program elements. Have them list anticipated and actual feedback along with updated responses or revisions to the program.

12. **(30 min.)** With the entire class, have each PI share the group's stakeholder feedback and resulting revisions to the program (~5 minutes per group). It may be useful to ask groups to role-play specific stakeholder perspectives in dialogue with all projects; for example, ask one group to represent the university administration, one to represent students, and one to represent the local community. Instructors may step in to represent stakeholder groups and deepen relative perspectives as needed.

13. **(25 min.)** To end this lesson, have groups update their program to accommodate stakeholder perspectives and formalize the positive S-E outcomes of the program for a variety of users. Then, have each group reflect on how this integrative process helped their project design become more inclusive, circumspect, achievable, and sustainable. If this is not a hypothetical exercise, but the beginning of a true collaboration, end the session by assigning further rounds of grant proposal development and revision, and solicit engagement from critical campus and community partners.

Background Information for the Instructor:

1. Best Practices for Interdisciplinary Team Research: Shaping a Team's Social Environment

- The environment that teams collectively create as they interact—their social environment—has a significant influence on the likelihood their experience will be positive and productive. It includes how members deal with differences and make decisions, as well as their willingness to take risks. This brief SESYNC explainer describes what influences collaborative environments and provides a few practical ways to enhance them.

- Palmer, M.A. (2023, May 31). *Best Practices for Interdisciplinary Team Research: Shaping a Team's Social Environment*. SESYNC. https://www.sesync.org/resources/best-practices-interdisciplinary-team-research-shaping-teams-social-environment

2. Who Are Stakeholders? What Is the Role of Stakeholders in Convergent Research?

- As the need increases for convergent research, research teams must learn to identify and understand how to successfully engage stakeholders. This brief SESYNC explainer defines who stakeholders are, why convergent research requires the input of stakeholders, and how to identify and engage stakeholders.

- Palmer, M.A., Boyd, J., Kramer, J.G. et al. (2023, May 12). *Who Are Stakeholders? What Is the Role of Stakeholders in Convergent Research?*. SESYNC. https://www.sesync.org/resources/who-are-stakeholders-what-role-stakeholders-convergent-research

3. Engaging with Stakeholders to Produce Actionable Science: A Framework and Guidance

- This overview article presents an adapted framework derived from Davidson's wheel of participation to describe common stakeholder-engagement strategies across the spectrum of engagement, including stages to inform, consult, participate, and empower stakeholders. It includes strategies to revisit program objectives through iterative rounds of development.

- Bamzai-Dodson, A., Cravens, A.E., Wade, A.A. et al. (2021). Engaging with Stakeholders to Produce Actionable Science: A Framework and Guidance. *Weather, Climate, and Society, 13*(4), 1027-1041. https://doi.org/10.1175/WCAS-D-21-0046.1

4. Five approaches to producing actionable science in conservation

- This research uses a grounded theory approach to identify 16 activities that make research more actionable within 3 nested categories: motivations, strategies, and tactics. The authors detail five stakeholder profiles in their analysis:

  a. The Discloser – Focused on open access

  b. The Educator – Focused on science communication

  c. The Networker – Focused on user needs and building relationships

  d. The Collaborator – Focused on boundary spanning

  e. The Pluralist – Focused on knowledge co-production resulting in valuable outcomes for all parties.

- Carr Kelman, C., Barton, C.J., Whitman, K., et al. (2023). Five approaches to producing actionable science in conservation. *Conservation Biology, 37*, e14039. https://doi.org/10.1111/cobi.14039

5. Edible Campus – University of North Carolina

- This website details the North Carolina Botanical Garden's support of the University of North Carolina's Edible Campus initiative, including information on the program's advisors, team, volunteers, and operations. This model may serve many campuses and urban areas in developing their own self-sustaining edible landscape initiatives.

- North Carolina Botanic Garden. (n.d.) *Edible Campus UNC*. https://ncbg.unc.edu/engagement/edible-campus-unc/

Related SESYNC Content:

- SESYNC. (2023, May 19). *Team Science, Interdisciplinary, and Transdisciplinary Resources*. https://www.sesync.org/resources/team-science-interdisciplinary-and-transdisciplinary-resources

- Scott, Heidi. (2023, May 15). *Creating Interdisciplinary Research Teams, A Two Session Exercise*. SESYNC. https://www.sesync.org/resources/lesson-creating-interdisciplinary-research-teams-two-session-exercise

- Arnott, J.C., Mach, K.J., & Wong-Parodi, G. (2020, February 1). *Editorial overview: The science of actionable knowledge. Current Opinion in Environmental Sustainability, 42*, A1-A5. https://doi.org/10.1016/j.cosust.2020.03.007

- Fiore, S. (2021, November 23). *The Science of Team Science Part 2: Conducting Team Science and Measuring Outcomes*. SESYNC. https://www.sesync.org/resources/science-team-science-part-2-conducting-team-science-and-measuring-outcomes

- Palmer, M.A. (2012). Socioenvironmental sustainability and actionable science. *BioScience, 62*(1), 506. https://doi.org/10.1525/bio.2012.62.1.2

- SESYNC. (2022, March 4) *What Is Actionable Science Video*. https://www.sesync.org/resources/what-actionable-science-video