Teaching Portfolio

Submitted to The Graduate School for the 2022 Excellence in Teaching Award

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UNIVERSITY OF GEORGIA

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River Basin Center
11 January, 2022

ETA Selection Committee
UGA Graduate School
RE: Nomination of Carol Yang for ETA

Dear Committee Members:

It is my honor to nominate Carol Yang for the Excellence in Teaching Award. I serve as Carol's PhD advisor and I have also taught alongside Carol, and I can say without hesitation that she is among the most creative, talented and effective instructors I have ever known. Since 2020 she has served as a teaching assistant for ECOL 1000 (twice) and ECOL 3300 (twice), and as the co-coordinator of the "Ecoreach" educational outreach program for 2020-2021. She designed and co-instructed an iteration of ECOL 8030 (a graduate course coordinated by the graduate students themselves) in the spring of 2020 and a month-long module for ECOL 8000 in the fall of 2020. For ECOL 3300, she was credited as a co-instructor of record due to her extensive contributions to course design and content. Finally, this past year she worked with me to design a new course, ECOL 8750, which she co-instructed this past fall (graduate students cannot be officially credited for teaching 8000-level courses, but I can attest that she led the design of the course and delivered much of the content). I know of no other Ecology student who has done so much instruction in a similar amount of time, particularly utilizing so much active learning, and it is all the more impressive that she has done this in the midst of a pandemic in a hybrid learning environment.

Carol has a broad repertoire of instructional skills and a high level of creativity, which together translate into a talent for identifying the right kind of activity or exercise to effectively engage students in a topic. She has a student-centered approach that uses active learning to engage students while promoting an inclusive classroom environment. She honed her skills through five years of environmental education work in Costa Rica prior to returning to school for a graduate degree. As she was completing her master's degree here at UGA's Odum School, however, she realized that her true calling was to teach at the undergraduate level, and she therefore transferred into the PhD program. Since then, she has taken every opportunity to further develop her teaching abilities.

When the US Fish and Wildlife Service (FWS) approached me about developing a course focused on the Endangered Species Act in which students would draft "five-year reviews" of protected species, I turned to Carol for help. I could envision a broad structure for such a practicum course,

but my initial ideas for teaching the content portion of the class were pedestrian and unengaging. Carol developed a series of activities that got the students engaged, animated and genuinely excited about topics. She also designed a series of feedback instruments to figure out what was working and what wasn't, which allowed us to make mid-course adjustments that were critical for making ECOL8750 a success. The FWS now plans to use the course as a model for others across the country.

Dr. Amanda Rugenski, with whom Carol taught ECOL 3300, described Carol's contributions to converting her field-based Maymester course into a semester-long virtual course in the spring of 2021:

> *Carol played a crucial role in the course by developing creative, inclusive activities that engaged the students in the material while fostering teamwork and problem-solving skills. She just needed a general prompt—"we need some kind of activity on this topic"—and within a few hours she would send a message: "I thought some more about what we discussed and put together an activity. Let me know what you think." These activities (~18 of them) ranged from brainstorming activities using guided prompts in Google docs, to collective concept maps, jam boards, and visualization activities (e.g. imagining a collective future for the Appalachicola river basin). Carol works independently and proactively, recognizing what needs to be done without being asked, yet always communicating effectively to ensure efficiency and avoid duplication of effort, which is critical in such an unconventional course with so many moving parts.*

Similarly, Drs. Scott Connelly and Krista Capps both praised Carol's work as the "lecture TA" for ECOL 1000, a role that requires an exceptionally high level of interaction with large numbers of students. Dr. Connelly said "Carol was highly successful at motivating students to stay on track, and she consistently provided accurate, timely and detailed feedback for each student... Carol was highly respected and liked by the students, and it was not surprising that many reached out to me to express their gratitude for Carol's efforts." Dr. Capps said, "Simply stated, Carol is an incredible educator and scientist. Her passion for ecology and empathy for students were evident in everything she did in my class, and her attention to detail made the class run exceedingly well."

I think anyone who has worked with Carol would agree that she is an outstanding instructor and very deserving of this recognition. She is also a genuinely good person: kind, modest, thoughtful, and extraordinarily generous—the kind of person who brings out the best in those around her. Thank you for giving her your consideration.

Best regards,

Seth J. Wenger
Associate Professor, UGA Odum School of Ecology
Director of Science, UGA River Basin Center

Excellence in Teaching Statement

I am a fifth-year doctoral student in the Odum School of Ecology, where I have taught in both co-instructor and teaching assistant roles, including courses such as "Endangered Species Practicum" and "Ecological Problem-Solving." In these roles, I have demonstrated my commitment to connecting students with community stakeholders to work on applied conservation projects. My teaching approach prioritizes inclusivity, where students are empowered to engage in open and thoughtful discussions. As a teacher, I am always learning, and while at UGA, I have actively sought opportunities to collaborate and develop my teaching skills, building on prior K-12 teaching experiences in environmental education.

Last semester, I designed and co-taught an innovative new "Endangered Species Practicum" (ECOL/WILD 8750) in collaboration with the US Fish and Wildlife Service. In addition to providing students with a foundation in conservation, we had student teams apply their learning to research and draft species reviews, thus contributing to species conservation and connecting classroom learning to a broader conservation context. Throughout the semester, we solicited student feedback and adapted the course to respond to the needs and interests of all students. We brought in practitioners to share about their career paths and opportunities, and the unique approaches they employ to tackle conservation challenges from different angles. Students were excited to network with experts in the field and collectively produce species reviews.

In "Ecological Problem-Solving" (ECOL 3300), my co-instructor and I used innovative teaching approaches to engage students with stakeholders and virtual place-based educational experiences across Georgia watersheds. We connected classroom discussions to a broader context by having students attend the virtual Georgia Water Resources Conference, and I designed guided reflection surveys for students to digest, synthesize, and share what they found relevant. Leveraging our hybrid teaching environment, we creatively integrated learning tools such as mentimeter, jamboard, and guided google doc activities to encourage active student participation, teamwork, and community-building. Our course culminated with a graphical recording activity that I led for the class to visually synthesize their water management solutions and vision for communities living across a watershed.

I also designed and co-taught "Cross-Disciplinary Ecology" (ECOL 8030), a graduate seminar that explored representation and identity in the sciences. Our work led to speaking on a panel for the Institute for Women's Studies speaker series, and requests from the Warnell Wildlife Society, Genetics department, and a Life Sciences organization for guidance on developing events that center meaningful discussions about diversity and inclusion. Building on this seminar, I collaborated with graduate students to create a new module within "Topics in Modern Ecology" (ECOL 8000), a required Ecology PhD course. To evaluate the effectiveness of our module, we created pre- and post-assessments with Dr. Alice Hunt from the CTL. We are in the process of publishing our syllabi to support similar initiatives in other departments.

As an educator at UGA, I have taken the initiative to seek out collaborative teaching opportunities, engage students with community stakeholders, facilitate learning applications beyond the classroom, foster inclusivity, and share teaching resources. I have also taken on leadership roles with EcoReach, a graduate student-led organization that provides environmental education programming for K-12 schools, and the Scientific Research and Education Network, which coordinates annual networking events for UGA researchers and K-12 educators. Through my teaching and outreach work, I have learned that the impacts of thoughtful teaching and motivated student learning at UGA ripple far beyond the classroom. Teaching at UGA has allowed me to build my teaching repertoire and I am excited to continue centering inclusive environmental education in my work after graduate school. Thank you for your consideration.

Teaching Philosophy Statement

"I have an idea!" As a teacher who encourages questions, curiosity, and creative expression, I am thrilled to hear this because it signifies a student taking ownership of their learning process. Teaching and learning do not occur on a linear path, but rather, through a web of interactions, collaboration, and overlapping ripples of impact.

As a teacher, I enter the classroom not with all the answers, but with the recognition that I am there to facilitate learning, a process that is shaped not only by me, but also my students. Building relationships is central to fostering an inclusive classroom community. I encourage students to bring their personal viewpoints and lived experiences to the table and to share these strengths with one another. At the beginning of a course, I ask students to write a reflection using an open-ended prompt, *"How did you get here?"* These reflections, which capture the unique backgrounds, interests, and needs of each student, allow me to thoughtfully shape each course I teach.

I believe that knowledge development and classroom community building are more effective when co-created. I empower students in their educational experience by soliciting feedback throughout the semester, through channels ranging from informal questions to specific survey prompts. For the new hybrid course I co-taught this past fall, student feedback enabled us to make specific changes based on student suggestions partway through the semester. We improved communication through weekly overview emails, integrated more guest speakers and discussion days into the schedule, and planned interactive group activities based on topics students were most interested in.

In the sciences, students are often expected to learn by reading textbooks and scientific papers. In my teaching, I build on conventional methods by encouraging students to engage with each other, guest speakers, and multimedia resources. I use multiple formats of group discussions and hands-on activities to empower students to actively explore content and synthesize ideas. For example, I have used open-ended concept map prompts to guide students to think critically and identify questions, connections, and gaps. In an "Ecological Problem-Solving" course, we had students work in teams on a series of concept maps throughout the semester, providing feedback throughout the process. By the end of the semester, students were making concept maps with multiple levels of organization, identifying complex connections between components, and highlighting key areas for implementing solutions.

Groupwork allows students to develop interpersonal and communication skills and collectively apply concepts to practical, real-world problems. To help students build these crucial skills in an "Endangered Species Practicum" course, I provided group assessment surveys partway through the semester for students to not only share concerns about group dynamics, but also reflect on their own contributions. Then, my co-instructor and I led a debrief session during which students could constructively discuss what they could do better as team members. This approach to groupwork allowed us to better facilitate their group learning experiences.

To support student learning, it is important for me to evaluate learning outcomes, which I often do by providing students with assignments where they are synthesizing and creating. In one course, I had students create visual takeaway maps that synthesized key information they learned as we virtually traveled through a watershed and learned from stakeholders. Low stakes assessments, such as takeaway maps, are an effective way for me to get a pulse on learning outcomes throughout the course. Projects, presentations, and written assignments are also effective for assessing student learning, while helping students develop their written, oral, and creative forms of synthesis and expression. I have also designed and implemented pre- and post-

survey assessments with both quantitative and qualitative responses to evaluate student learning. These approaches are helpful not only for students to deepen their learning, but also allow me to pick up on gaps and address points of confusion more quickly and effectively.

I believe that education occurs not only in the classroom, but also through engagement with broader communities. As an educator, I strive to connect students with networks of experts in conservation and other relevant fields. Through these valuable connections, my students have sought opportunities they were previously unaware of. When my students in the "Ecological Problem-Solving" course participated in the Georgia Water Resources Conference, they were able to connect our classroom discussions of water issues to a broader context and further understand the relevance of in-class activities.

Contextualizing concepts from class through community involvement can highlight the relevance and application of class discussions and motivate students to reflect upon their impacts on their communities. I have found that this approach often inspires students to take agency over their own learning, even beyond their coursework and classroom. For example, during my time as EcoReach co-coordinator, I connected Ecology student volunteers, including some of my undergraduate students, with K-12 environmental education events in the community. By participating in community events, students could apply their knowledge and skills in a broader context.

Central to my teaching process is my posture of learning and flexibility – learning to teach is a lifelong process. My passion for teaching was first sparked over a decade ago when I worked in an elementary school as an America Reads teaching assistant. Since then, I have also worked in environmental education at a preK-11 school in Costa Rica. During my time at UGA, I have not only applied skills from prior teaching experiences, but have also expanded my teaching toolkit with new strategies. I continuously reflect on and improve my teaching strategies through coursework, workshops, and collaboration with partners. For example, I used evidence-based instructional strategies in my GRSC 7770 microteach and learned from the feedback I received from the instructor and classmates. During the past four years, I participated in an annual researcher-educator networking event to not only share ecology lesson plans with K-12 educators, but also receive feedback from educators about curriculum needs.

I believe that effective teaching involves relationship-building and mutual trust. I am grateful to all the students I've had the opportunity to work with because a key part of my growth as a teacher is from interacting with students. By listening to and incorporating feedback from students, I can foster a sense of community and knowledge co-creation in the classroom – together – with my students.

Description of Courses Taught

ECOL/WILD 8750: Endangered Species Practicum (4 credits) | Fall 2021

Role: I was formally listed as a graduate teaching assistant because graduate students cannot be officially listed as co-instructors of 8000-level courses, but I played the role of **lead co-instructor**.
Enrollment: 9 UGA graduate students and 4 undergraduate students from GA Gwinnett College
Course Description: This new practicum course was developed with partners at the US Fish and Wildlife Service (USFWS) to engage students in learning about the Endangered Species Act and

conservation in practice, and support students to apply their knowledge to draft 5-year species reviews for the USFWS.
Teaching Responsibilities: I designed and led in-class activities, class discussions, writing assignments, projects, group work, and facilitated guest speakers and career development opportunities for students. Instructional delivery was synchronous hybrid; I developed both in-person and virtual materials for engaging students. I solicited student feedback throughout the semester to adapt the course to student needs and interests, and provided feedback for student writing.

ECOL 3300: Ecological Problem-Solving (4 credits) | Spring 2021

Role: Co-Instructor of Record
Enrollment: 37 undergraduate students, primarily Ecology majors
Course Description: The course engaged students in using resilience principles and problem-solving skills to design solutions to sustainability challenges across river basins.
Teaching Responsibilities: With my co-instructor, I prepared skill-building activities, facilitated groupwork and discussions, and led graphical recording, concept map, and written reflection exercises. We engaged students with stakeholders from across Georgia and Florida. I also created activities to promote student engagement in a hybrid format and graded written assignments.

ECOL 8000: Topics in Modern Ecology – Representation and Identity in the Sciences Module (3 credits) | Fall 2020

Role: While not officially listed so, I played the role of **co-instructor** for one module (6 class sessions) of this semester-long course, developing the curriculum and lesson plans. This course comprises 4 modules led by different instructors to cover topics relevant for Ecology PhD students.
Enrollment: 12 Ecology PhD students
Course Description: The module we led included the following topics: diversity and inclusion, data visualization, research narratives, and intersectionality.
Teaching Responsibilities: I developed the module curriculum and assembled course materials with a graduate student team. I led classroom activities and assignments in a remote, online format. I also developed, administered, and analyzed pre- and post-course assessment surveys, with the support of Dr. Alice Hunt (CTL), to assess learning outcomes and support future module development.

ECOL 8030: Cross-Disciplinary Ecology – Exploring Representation and Identity within the Sciences (1 credit) | Spring 2020

Role: ECOL 8030 is a graduate student-run course with topics that vary from year to year. I was not officially listed as a co-instructor for this course because graduate students cannot be listed as co-instructors of 8000-level courses, but I played the role of **co-instructor**.
Enrollment: 24 graduate students (departments: Ecology, Geography, Anthropology, Genetics)
Course Description: This new course explored topics including intersectional identities, diversity work, and representation and inclusivity within STEM. Students engaged in thoughtful discussions about their identities and interactions in academic environments as scientists.
Teaching Responsibilities: With my co-instructor, I developed the curriculum, prepared educational materials (readings, assignments, resources), and led classroom activities and discussions. I also scheduled and facilitated guest speakers from multiple institutions for in-person and virtual webinars.

ECOL 3300: Ecological Problem-Solving (4 credits) | Maymester 2020

Role: Graduate Teaching Assistant
Enrollment: 5 undergraduates, primarily Ecology majors

Course Description: Students engaged with stakeholders from watersheds in Georgia and Florida. Students approached sustainability challenges with interdisciplinary perspectives, using systems thinking and socioecological and economic lens. This course was adapted to an online format.
Teaching Responsibilities: I assisted with the coordination of guest speakers and development of course materials (in-class activities, assignments), led classroom activities, and graded assessments.

ECOL 1000: Ecological Basis of Environmental Issues (3 credits) | Fall 2019, Spring 2020

Role: Graduate Teaching Assistant
Enrollment: 300 undergraduate students per section, 2 sections per semester, primarily non-major
Course Description: This was a semester-long, in-person lecture course that explored foundational environmental concepts and issues.
Teaching Responsibilities: I assisted with grades and course material preparation for the lecture classes, corresponded with students, held office hours, and helped students prepare for assessments.

ECOL 1000e: Ecological Basis of Environmental Issues (3 credits) | Summer 2019, 2020

Role: Graduate Teaching Assistant
Enrollment: 100 undergraduate students, primarily non-major
Course Description: This was an online summer course for students to explore foundational concepts in ecology and discuss environmental issues.
Teaching Responsibilities: I prepared online course materials, corresponded via email with students, led online discussions and reflections, provided written feedback for students, and managed grades.

Evaluation of Teaching

Selected Qualitative Evaluations

Overall

- "Carol did an incredible job keeping things functioning smoothly as well as creative and entertaining. This is especially important in remaining engaged with online learning."[3]
- "I think that the instructors for this course have done an excellent job with supporting us as students, and I personally really appreciate that not only do I feel like my time is valued, but my personal struggles are understood."[4]
- "I loved how they were both willing to work with us and wanted us all to succeed."[3]
- "Ms. Yang was always so prompt and kind when responding to my emails. She… made the large class feel much more personal."[1]

On learning environment

- "I also loved the class as a whole, they created a very positive environment where I felt like I could speak freely and ask questions or ask for help whenever I needed."[3]
- "This course and its instructors created an amazing and supportive space for conducting open and vulnerable discussions about difficult topics."[2]
- "a course atmosphere that facilitated honesty, transparency, and reflection."[2]

On integrating student ideas and feedback

- "This class provided an opportunity to really shape the content within the course and was fluid enough that it could incorporate strategies throughout the semester that were successful."[2]

- "I liked that we reflected on our growth throughout the course, that the teachers were open to altering the course to best fit the needs of its students."[3]
- "The instructors sought input from the class and incorporated it into the transition to remote instruction. They showed great flexibility and worked hard to maintain high levels of engagement."[2]

On teaching approaches and resources

- "The class was very engaging... The google docs, speaker presentations, and little things like the jamboards all made this class special because we all knew the time that was put into these assignments."[3]
- "The combination of interesting textbook material combined with engaging discussions with speakers and real-life stakeholders equals a recipe for the best class model I've ever experienced. I felt like there was never a dull point in this class and I loved every minute…"[3]
- "Having google docs for all of the group members to share their information as great! It made things simple, and it made working in a group WAY easier."[4]

On applied projects and problem-based learning

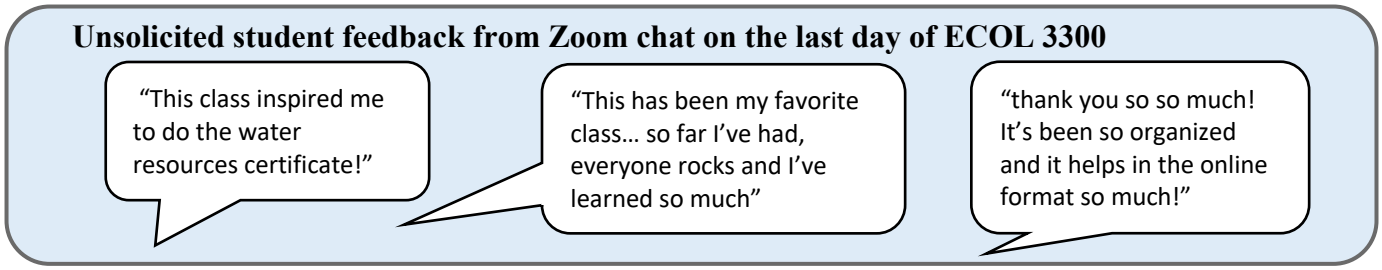
- "The instructor framed the course in such a way that students were always learning and applying knowledge to a real-world problem."[3]
- "I appreciate the opportunity to do real work… The idea of the course is really great and very unique! Great for someone that wants to see what it is kind of like to work for an agency."[4]

On connecting students with guest speakers

- "I loved the personable aspect of the class… we actually got to engage and communicate with real stakeholders and scientists in the field doing what we want to do in 5 or so years. I truly loved this class a lot and found a lot of incredible times when I had A-Ha moments of connecting the concepts in this class with other courses and situations…"[3]
- "I really enjoyed having guest speakers talk to us about their careers, their journey, and what they do for a living. That was my favorite part of the class!"[4]

[1]ECOL1000; [2]ECOL8030; [3]ECOL3300; [4]ECOL8750

Unsolicited student feedback from Zoom chat on the last day of ECOL 3300



Quantitative Evaluations

Prompt	ECOL1000 (Fall 2019)	ECOL8030 (Spring 2020)	ECOL3300 (Spring 2021)	ECOL8750 (Fall 2021)
The instructor explains concepts clearly.	4.54	4.45	4.71	4.38
The instructor was helpful.	4.38	4.82	4.86	4.50
The instructor facilitates critical thinking.	4.23	5.00	4.71	4.38
The instructor presented a positive and constructive teaching skill.	4.38	5.00	4.79	4.50

Each prompt was scored using a 5-point scale. Average scores are reported here.

Professional Activities, Training, and Work Experiences Related to Teaching

Leadership, Service, and Awards

2021	Distinguished Graduate Student Teaching Award, Odum School of Ecology
2020 - 2021	EcoReach Co-coordinator | Organized EcoReach volunteer events and communicated with UGA students and K-12 school partners; developed, compiled, and organized K-12 educational materials
2020 - 2021	Graduate student representative, Undergraduate Program Committee, Ecology | Worked with faculty to make decisions about undergrad education in Ecology
2018 - 2021	Researcher participant, Scientific Research and Education Network (SciREN) Network Event | Created and shared lesson plans with K-12 educators, February.
2018 - 2019	Leadership Team member, SciREN | Organized annual workshop and networking events for UGA researchers and Georgia K-12 educators

Invited Guest Speaker Events

Sept 2020	"Exploring Identity and Representation in Academia," Institute for Women's Studies: Friday Speaker Series Panel | Shared about co-teaching ECOL 8030 and facilitating discussions on intersectional identities, racism, and inclusion in the sciences**;** Met with several departments that reached out to us after the panel for further guidance on developing events centered around identities in STEM
Sept 2018, Oct 2019	ECOL 3400: Professional Development for Careers in Ecology | Spoke about my work in environmental education and path to grad school

Mentorship

2020–2021	Mentored undergraduate internships (Chancey P.; Paula G.)
2020, 2019	Mentor for Society for Freshwater Science Instars Program
2020, 2018	Mentored undergraduates conducting stream research (Daniel V.; Emilio V.)

Training and Professional Development

Oct 2021	"Making Teaching Fun," Center for Teaching and Learning, TA Café, led by 2021 Future Faculty Fellows cohort
Sept 2021	"Embracing Diversity to Increase Inclusivity in the Classroom," Center for Teaching and Learning Workshop, led by Dr. Ashley Harlow
Fall 2019	GRSC 7700: Graduate Teaching Seminar with the Center for Teaching and Learning (3 credits) | Instructor: Dr. Colleen Kuusinen
2018, 2019	Lesson Planning Workshops through SciREN, Georgia Chapter
July 2014	Inquiry in Rainforests: a field-based professional development course for teachers, Organization for Tropical Studies, Costa Rica (CR)

Education Work Experience

Spring 2017	Environmental Ed Internship Supervisor, Council on International Educational Exchange (CIEE) Conservation and Sustainability Program | Monteverde, CR
2012 - 2016	Environmental Education Coordinator, Cloud Forest School | Monteverde, CR
2008 - 2012	America Reads Teaching Assistant, Greer Elementary | Charlottesville, VA

Encouraging active student participation

I often start my classes with a brief, low stakes activity that gets students thinking and interested in a topic. I use mentimeter and jamboard to solicit student ideas. Students can submit responses via any device and the anonymous written format allows students who may otherwise be hesitant about speaking up to also reflect and contribute. The visual overview of responses from the whole class provides a great launching point into discussion.

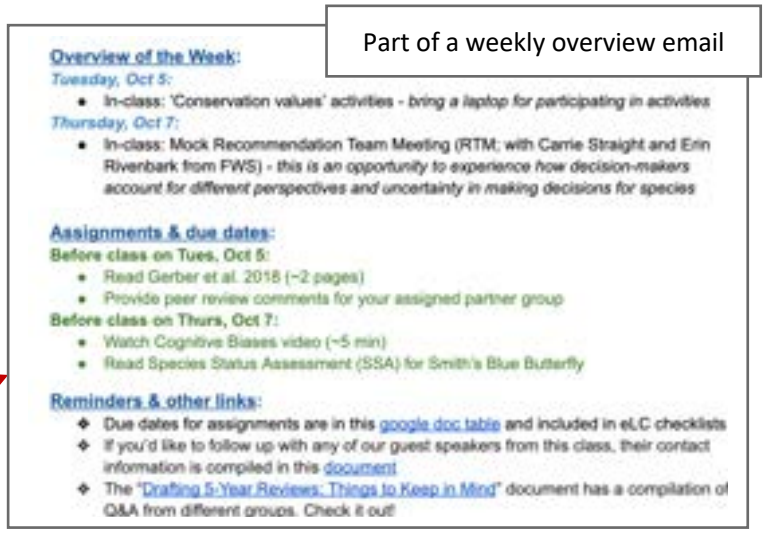
Example of a mentimeter word cloud

Sometimes I use jamboards in breakout groups where students not only generate ideas, but also work together to categorize, reorganize, and synthesize overarching themes.

Jamboard example; students posted *challenges* in yellow and *solutions* in green

Multiple modes of communication

Central to teaching is relationship-building, and central to building relationships is communication. Especially with hybrid education, using multiple modes of clear communication allowed me to reach students more effectively.



Part of a weekly overview email

I post weekly overviews as course announcements on eLC, which are also sent out as emails. I communicate the plan for the week, recap assignments and due dates, and provide any relevant reminders and links.

When I make announcements out loud during class, I also provide students with a written record of the announcements in a digital handout, in the zoom chat, on a powerpoint, or on eLC. This **clarifies expectations** for activity tasks and learning objectives and allows students to reference guidelines.

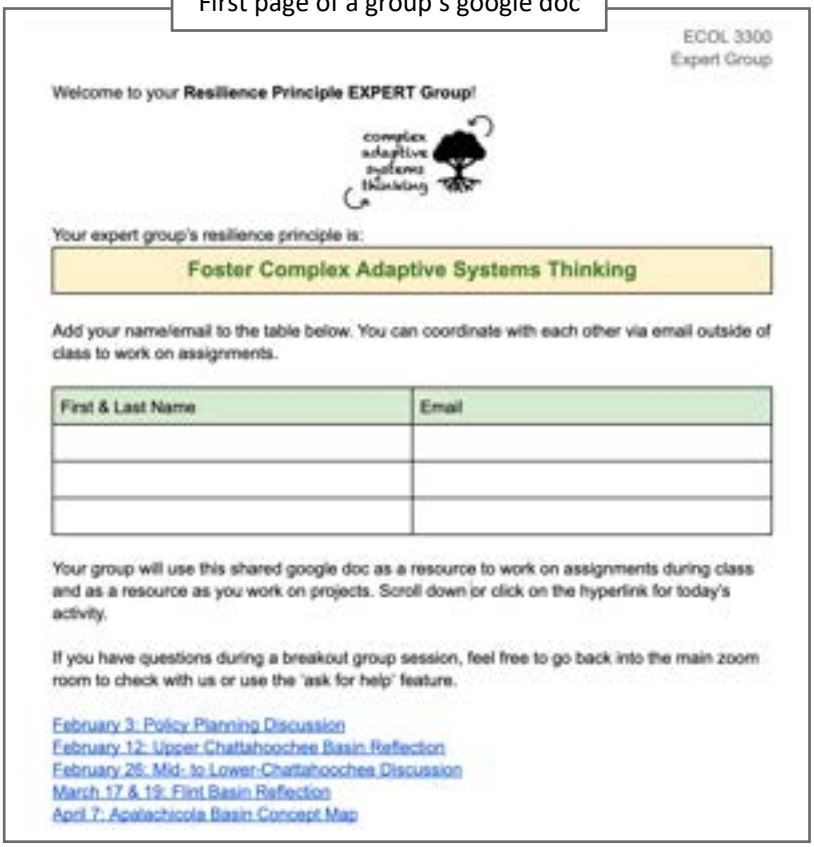
Guided group google docs

To facilitate groupwork, I create guided group google docs that provide clear expectations and outline specific tasks.

Students can directly type into these handouts at the same time, jotting down discussion ideas and organizing team member responsibilities. I can also provide direct feedback into documents through comments and suggested edits.

For group projects, I create a designated google doc for each group and link specific sections within their group's document for different activities.

First page of a group's google doc



ECOL 3300
Expert Group

Welcome to your **Resilience Principle EXPERT Group!**

Your expert group's resilience principle is:

Foster Complex Adaptive Systems Thinking

Add your name/email to the table below. You can coordinate with each other via email outside of class to work on assignments.

First & Last Name	Email

Your group will use this shared google doc as a resource to work on assignments during class and as a resource as you work on projects. Scroll down or click on the hyperlink for today's activity.

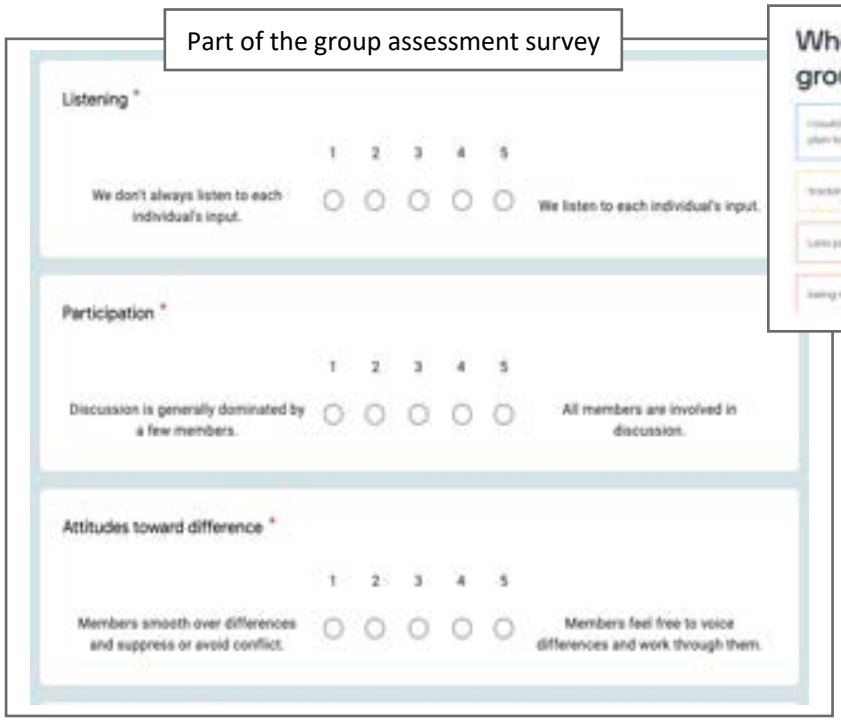
If you have questions during a breakout group session, feel free to go back into the main zoom room to check with us or use the 'ask for help' feature.

February 3: Policy Planning Discussion
February 12: Upper Chattahoochee Basin Reflection
February 26: Mid- to Lower-Chattahoochee Discussion
March 17 & 19: Flint Basin Reflection
April 7: Apalachicola Basin Concept Map

Facilitating teamwork

I encourage students to develop their interpersonal, communication, and groupwork skills. In ECOL 8750, students worked in teams to write endangered species reviews. Partway through the semester, we used group assessment surveys to **check in about group dynamics**. The responses allowed us to support students in specific areas and facilitate a whole class discussion on areas for improvement.

Part of the group assessment survey



Listening *

1 2 3 4 5

We don't always listen to each individual's input. — We listen to each individual's input.

Participation *

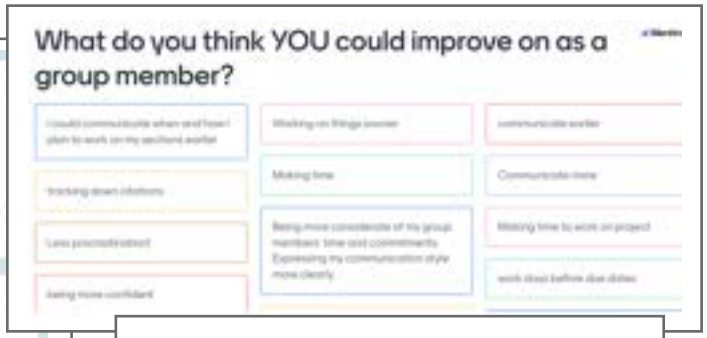
1 2 3 4 5

Discussion is generally dominated by a few members. — All members are involved in discussion.

Attitudes toward difference *

1 2 3 4 5

Members smooth over differences and suppress or avoid conflict. — Members feel free to voice differences and work through them.



What do you think YOU could improve on as a group member?

Mentimeter results from in-class discussion

"Communication was the biggest challenge we had, but I feel that it has gotten a lot better since Carol and Seth had that in-class discussion with us. I think that really helped."

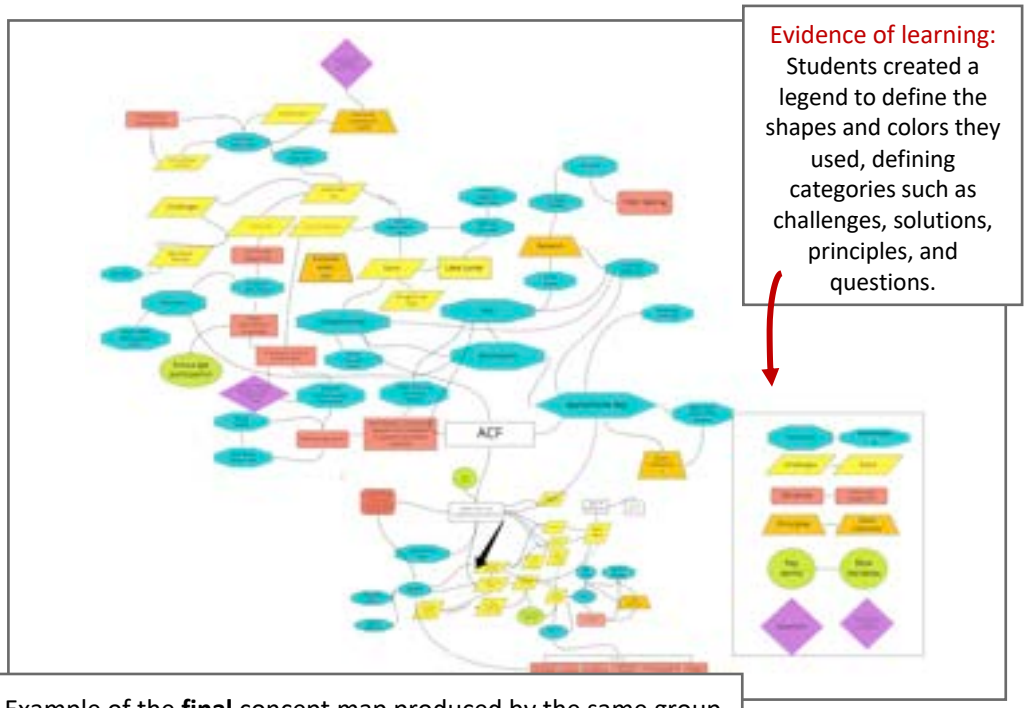
-feedback from ECOL 8750 student after group survey & class discussion

Example of the **first** concept map created by a group

Using concept mapping as a synthesis tool

In groups, ECOL 3300 students used concept maps to visualize, organize, and synthesize information from guest speakers, readings, videos, and class discussions. They used miro, an interactive platform that allowed them to work synchronously on a concept map. After building multiple maps for different river basins throughout the semester and receiving instructor and peer feedback, students were able to capture more complex levels of organization, identify specific connections, highlight gaps, and propose solutions.

In addition to strengthening students' visual synthesis skills, concept maps help me evaluate student learning and skill development over time. Students presented their concept maps to the class as they worked on them, allowing them to receive not only instructor feedback, but also peer suggestions and ideas.



Evidence of learning: Students created a legend to define the shapes and colors they used, defining categories such as challenges, solutions, principles, and questions.

Example of the **final** concept map produced by the same group

Individual reflections

Sample student written reflection after learning about regional water issues from stakeholders

The middle Chattahoochee portion of this course has moved us into a new ideas and new topics. By speaking with members from different stakeholder groups, we moved a little bit away from the community aspect, and more towards industry and local government. The first thing that I took away was the essential need for smaller municipalities to be involved in the ACF Basin, just as much as places like Atlanta. Atlanta may have a lot of pull as to how the watershed is managed, but the smaller towns are the ones who see dramatic impacts depending on water conservation practices. Columbus saw a significant benefit when they prioritized water treatment, even to the aesthetic of their town in ways that could bring in more people and more revenue. My second takeaway was the power of nuclear and the dominance of nuclear in this region. In my home state of Wisconsin there are 3 nuclear plants, but those 3 plants provide less power than the ones in Georgia, though they are larger facilities.

Evidence of learning: The student highlighted takeaways and key examples.

Individual reflection assignments allow students to **integrate new content** and discussions with stakeholders with **their own experiences** and perspectives. Through written exercises, students can also identify questions and proposed ideas.

Post-speaker surveys

After hearing from a guest speaker, students filled out a post-speaker survey to reflect on ideas that resonated, link resilience principles from course content, and ask additional questions. I shared student responses and questions with speakers and many were excited to provide follow-up answers!

"The post speaker forms were really helpful because they kept us focused."

-feedback from ECOL 3300 student

Some students were excited to get involved in conservation projects.

Examples of student responses to a post-speaker survey

What is one idea, concept, lesson, or example from the talk that resonated with you? Why did you find this message particularly important and impactful?	Which resilience principle(s) relate to what the speaker shared with us? Why?	What question(s) do you have for the speaker? (The question can be about something you would like to learn more about or to clarify a concept or example, etc.
I really loved the mapping activity! I had no idea where some of these rivers were, especially those that were up North. It's so important to know where these rivers are as they are the main focus of this course and understanding their location can help make some points about what's affecting these rivers clearer.	Manage diversity and encourage learning. I felt like this talk helped to encourage learning about the diversity in different water ways, by allowing us to look at species and more in separate locations instead of overall.	Are there ways for us to get involved in trying to help these water systems?
The idea that resonated with me the most was the dilemma faced by Dr. Freeman and her team to manage Robust Redhorse populations. The team has the skillset and tools to spawn Robust Redhorse populations, but the habitat degradation does not support these populations well enough. This is an important idea because it suggests that we need to consider the costs and benefits of several solutions. This can be challenging and may require an integrated form of solutions.	Connectivity relates to the above description because it reminds me that freshwater systems are highly interconnected in a both a matter of positionality and functionality. Thus, the solutions we propose need to apply to these connected systems by mitigating problems associated with two or more parts of the system.	How do researchers manage their resources to manage the populations of a certain species? D researchers and managers need to make decisions around which species is "worth" conserving depending on the role the species play in the system entirely?

Real-world examples made conservation and sustainability principles much more concrete and illustrated complexities.

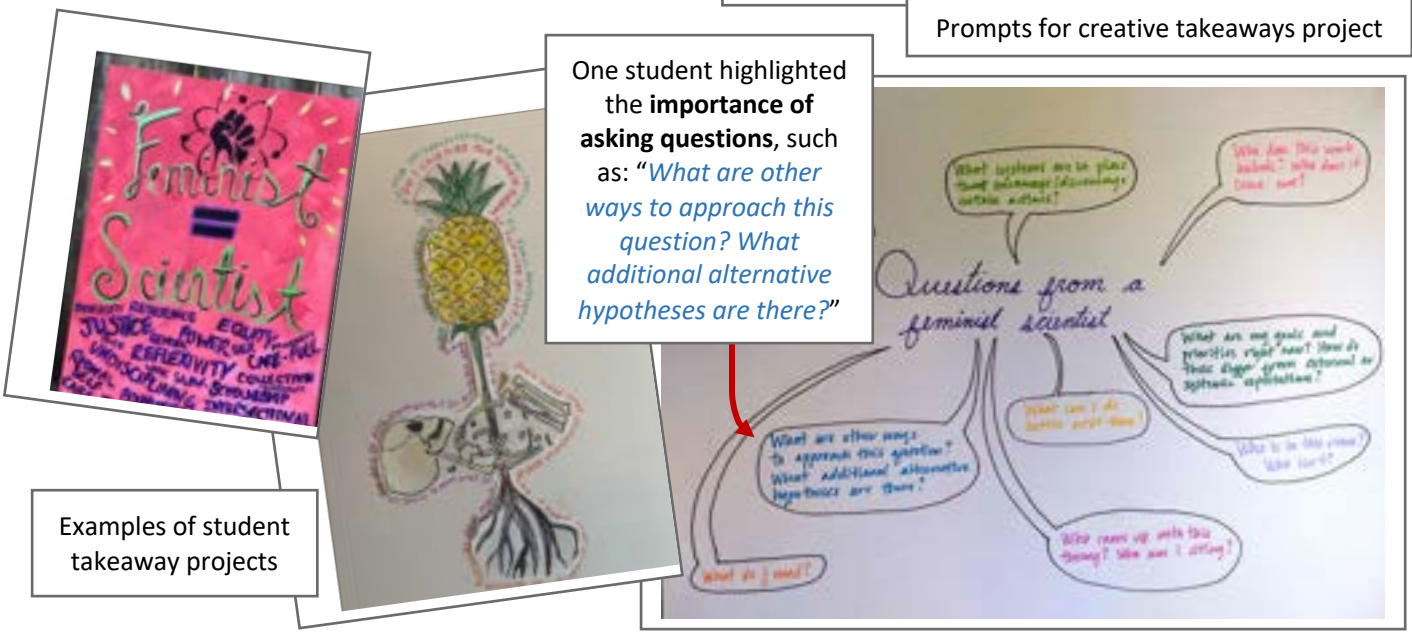
Creative takeaways project

ECOL 8030 students were given these prompts and encouraged to creatively capture their reflections to share with the class. By providing open-ended questions and space for creative expression, students were able to personalize their work, have fun, and learn from one another.

REFLECT: What are some take-aways that have stuck with you? Are there snapshots of stories or advice that stuck with you? Was there a moment of a mental shift? Were there ideas, readings, resources, frameworks that resonated with you? Were there particular emotions or thoughts that were kindled? What inspired you?

SHARE your take-away(s) however you would like: as a... typed quote, a written reflection, anecdote, video, GIF, poem, meme, artwork or sketch, a doodle of a quote, a photo of a cross-stitch, a song, music, write-up of a module idea, list of resources to share, etc.

Prompts for creative takeaways project



One student highlighted the **importance of asking questions**, such as: "*What are other ways to approach this question? What additional alternative hypotheses are there?*"

Examples of student takeaway projects

Creating a collective class vision through graphical recording

Graphical recording piece visualizing the ideas generated by ECOL 3300 students

I believe open-ended prompts that allow for synthesis and imaginative thinking are effective strategies for students to not only analyze, but also build upon concepts with creative solutions. The last day of ECOL 3300 culminated in a graphical recording exercise that I led on my screen, a way for students to collectively see their thoughts and ideas come to life visually. Recognizing that unmuting to speak up on zoom is challenging for some students, my co-instructor monitored the zoom chat and we encouraged students to respond to prompts in their preferred mode.

Through the visualization exercise, students imagined the future of a Georgia watershed together. I shared my screen and visually recorded their ideas through words and images as they shared them. Students drew upon a multitude of experiences accumulated over the semester – class discussions, readings, guest lectures, individual reflections, and expert group* activities –to respond to open-ended prompts about key stakeholders and relationships that would need to be fostered for the future they imagined.

*Throughout the semester, students worked in 7 resilience principle expert groups. Each group used their specific principle to research and analyze water issues faced by communities living in a watershed. Students developed groupwork skills and applied interdisciplinary thinking to propose solutions to water challenges.

River basin takeaways map

During the ECOL 3300 Maymester course, students engaged with stakeholders over zoom and virtually experienced and learned about issues along key rivers in Georgia and Florida.

Students created their maps by adding key takeaways after hearing from each speaker, resulting in a visual/written record of highlights from their virtual interactions through the river basin.

The building of this project over time allowed students to visualize their "travels" through the river basin and stay rooted to the geography and relative locations of key landmarks. This was particularly important for this online version of the course.

Prompts provided to students to help them in writing key takeaway points after each guest speaker

1. What were key challenges and solutions shared by these speakers?
2. What insights did they share that are related to social ecological water issues in the basin?
3. How does your principle of resilience apply to what the speaker talked about?

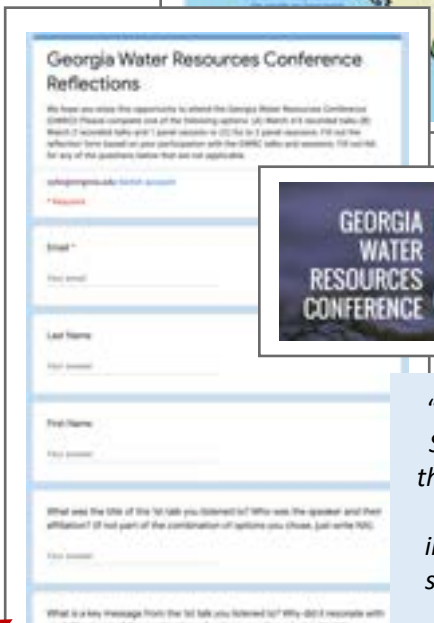
Example of a student takeaway map

Students accumulated their reflections over the semester and developed a resource that they could draw on for synthesis essays and group discussions.

Connecting course concepts to a broader context

As a part of ECOL 3300, students virtually attended the Georgia Water Resources Conference. Between all the students, they watched 47 different talks, attended 5 panels, and listened to the plenary talk.

Students were given a handout that guided them through conference registration and chose a certain number of talks to listen to. They filled out a form as they listened to talks to capture key ideas, questions, and feedback. As a class, we debriefed using jamboard and students shared what they learned from the talks they attended. This experience allowed students to draw connections between course discussions and conference themes, as well as develop their understanding of what ecological professionals do.



Student feedback about attending the conference

"I really enjoyed this conference… Seeing ecological professionals in their job setting talking about what they actually do for a living is incredibly helpful as an undergrad student trying to figure out what I want to do post undergrad."

Using a form, students reflected on each talk they attended.

"Enjoyed this activity very much because I got to pick and choose what topics appealed to me/my desired career field."