Pushing Past Barriers: Ecological Science for All

7th LIFE DISCOVERY—DOING SCIENCE

Biology Education

September 30-October 2, 2021
YMCA of the Rockies,
Conference Center,
Estes Park, Colorado

Organized by:
Ecological Society of America
Botanical Society of America
Society for the Study of Evolution

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Life Discovery—Doing Science Biology Education Conference

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In an effort to conserve resources, we have not printed session descriptions as part of the program.

You can view full session descriptions at the registration desk or view them online

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Conference Planning Committee

Andrew Martin, University of Colorado (chair)
Catrina Adams, Director of Education, Botanical Society of America
Arietta Fleming-Davies, University of San Diego, QUBES
Richard Kliman, Cedar Crest College, Society for the Study of Evolution
Paul Strode, Science Teacher, Fairview High School, Boulder CO
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Warren Sconiers, University of the Ozarks

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Conference Collaborators

Many thanks to our Conference Collaborators who promoted the conference to their professional networks:

American Geophysical Union (AGU)

American Institute of Biological Sciences (AIBS)

Biodiversity Literacy in Undergraduate Education – Data Initiative (BLUE Data)

BioQuest

Cary Institute of Ecosystem Studies

Data Nuggets

Ecological Research as Education Network (EREN)

Integrated Digitized Biocollections (iDigBio)

InnovATEBIO

USA National Phenology Network | Nature's Notebook (NPN)

Quantitative Undergraduate Biology Education and Synthesis (QUBES)

Undergraduate Field Experiences Research Network (U-FERN)

ESA Staff

Teresa Mourad, *Director of Education and Diversity Programs, Ecological Society of America*

Jessica Johnston, *Education Programs Coordinator, Ecological Society of America*

Keynote Speakers

Friday, October 1 at 8:00 AM, *Room: Emerald Mountain*

Dr. Rashidah Farid-Tilghman is a Research Assistant Professor of Wildlife Ecology and Coordinator for the Forestry and Wildlife Program at Tuskegee University in the Department of Agricultural and Environmental Sciences. Originally, from the rural town of Abbeville, Alabama, her passion for nature and conservation has been in the forefront of her life's mission. While her research varies from soil conservation to marine species feed strategies, she is most proud of her extension work with students and the development of natural resource management tools for low-resource landowners.

Dr. Lisa Corwin is an Assistant Professor in the Ecology and Evolutionary Biology Department at the University of Colorado, Boulder. She is a Discipline-Based Education Researcher and focuses on understanding how learning experiences in STEM classrooms, and specifically research-based courses, can help students to develop scientific resilience, civic engagement, and creativity. Corwin is particularly interested in community college and transfer students' experiences in these courses. She seeks to understand the outcomes these students experience while participating in course-based research and the value they add to the course for their peers.

Keynote Panelists

Saturday, October 2 at 8:00 AM, *Room: Emerald Mountain*

Dr. Carmen Cid is an urban forest and wetland ecologist, professor of ecology, and Dean of Arts and Sciences at Eastern Connecticut State University. For many years she has worked with ESA to increase the diversity of ecologists and elevate the human dimension in the teaching of ecology.

Miss Amber Finley is an enrolled member of the Mandan Hidatsa Arikara Nation (or Three Affiliated Tribes) and a descendant of the Spirit Lake Dakota and Standing Rock Lakota. She serves as Science Faculty and Director of Research and Development at Nueta Hidatsa Sahnish College, in New Town, North Dakota.

Ross Sappenfield has spent the last 30 years as a science teacher at Vail Mountain School in Vail, Colorado. In his classes, he is passionate about creating a classroom environment where his students feel safe to fully engage in "doing science." In 2020 he was recognized by NABT as "Outstanding Biology Teacher of the Year."

Friday Short Presentations

9:45 AM - 10:15 AM

Integrating Evidentiary Reasoning into a Structural Biology Investigation in an Undergraduate Biology Laboratory Course | Room: Emerald Mountain
Chaonan Liu, Purdue University
Audience: Undergraduate: Lower Division
We present a hands-on structural biology investigation with the implementation of scaffolding questions in guiding students reasoning about scientific evidence. A practical handout for designing scaffolding questions for evidentiary reasoning will be presented to the audience.

Finding ecology where you look: Demonstrating ecological concepts through a photo scavenger hunt portfolio | Room: Aspen Glen
Erica Tietjen, Nevada State College
Audience: Undergraduate: Lower Division
Undergraduate ecology students developed an ecological concept photo portfolio by choosing and describing 25 ecological terms from field observations and shared the ecological significance of their favorite photo during their end of course reflection presentation.

Enhancing Student Understanding of the Biotic Impacts of Climate Change using the BIC^4 | Room: Glacier Basin
Ryan Dunk, University of Northern Colorado
Audience: Undergraduate: Lower and Upper Division
We will present the Biotic Impacts of Climate Change Core Concepts (BIC^4), a guide for instructors to enhance undergraduate students understanding of climate change. The BIC^4 extends the 4DEE guidelines by focusing on how climate change affects ecological systems.

3:45 PM - 4:15 PM

Teaching Co-Evolution Through Active Learning | Room: Emerald Mountain
Rupesh Kariyat, University of Texas Rio Grande
Audience: Undergraduate: Lower and Upper Division
Teaching co-evolution in a classroom setting is exciting but challenging. Using easily available resources and a caterpillar species, I have designed an active learning-based module that can be modified to teach this concept.

Squirreling Around for Science: Doing Field-Based Animal Behavior Research in Undergraduate Courses | Room: Glacier Basin
Johanna Varner& Patrice Connors, Colorado Mesa University
Audience: Undergraduate: Lower and Upper Division
We present a course-based research experience in which students investigate tradeoffs in behavioral ecology. In four modules adaptable to a variety of courses and habitats, students use protocols to observe squirrels, then analyze national datasets to test hypotheses.

4:30 PM - 5:00 PM

Underwater Education: Designing & implementing a Big Data project to understand marine biodiversity | Room: Emerald Mountain
Deanna Soper, University of Dallas
Audience: Undergraduate: Lower and Upper Division
Exploration of the deep sea is restricted due to the remote nature of the habitat, which subsequently limits the ability to engage students with this environment. To address this we developed an educational program in collaboration with NOAA, MBARI, and CVision AI to introduce the deep sea to students while also contributing to ocean science research efforts.

The Impact of Obstacles to Learning Faced by College Students in the COVID-era: Effect on Learning Gains | Room: Aspen Glen
Sunshine Brosi, Utah State University, Eastern
Becky Williams, Utah State University, Uintah Basin
Audience: Undergraduate: Lower and Upper Division
Our students are faced with additional personal obstacles enhanced by the current epidemic in our remote ecology courses. We assess the change in number and magnitude of obstacles faced in the COVID-era and how they affect learning gains. Our success strategies include telling stories, adding flexibility, frequent contact with students, and a focus on relevant course outcomes.

Teaching Whale Evolution & Ecology Using a Traditional Ecological Knowledge (TEK) Framework | Room: Glacier Basin
Melissa Haswell, Delta College
Audience: Undergraduate: Lower Division
This multi-week module uses both contemporary and traditional ecology knowledge (TEK) of whales as a framework for introducing undergraduate biology students to the nature of science, natural history, ecology, and evolution using whales as a model.

Saturday Short Presentations

9:15 AM - 9:45 AM

NetLogo: an online simulation model for remote learning science lessons | Room: Emerald Mountain
Meg Kargul, UC Riverside
Audience: Grades 6-12
Our outreach group developed lessons amenable to remote learning for teachers and following NGSS using NetLogo, a simulation model. Students use this tool to evaluate, manipulate, and extend computational models of life science concepts and are exposed to coding.

The ecology of social annotation: adapting the 4DEE framework to evaluate student engagement | Room: Aspen Glen
Erin McKenney, North Carolina State University
Audience: Grades 9-12, Lower and Upper Division
Social annotation assignments have been particularly useful to enhance remote learning communities during COVID-19. Here we share instructional approaches and integrate the 4DEE framework with the ecology of education to inform scholarship of teaching and learning.

Schoolyard Biodiversity Community: Student Scientist Global Network to Increase Biodiversity | Room: Glacier Basin
Shari Wilson, University of Wisconsin-Stevens Point
Audience: Grades 9-12
This presentation introduces the Schoolyard Biodiversity Community, a web-based portal developed by the presenter where students enter biodiversity data inventoried from their school grounds, design projects with other schools, and present results in an effort to increase wildlife habitat.

10:00 AM - 10:30 AM

My Classes Are Pointless | Room: Glacier Basin
Paul Strode, Fairview High School
Audience: Grades 9-12, Undergraduate: Lower and Upper Division
Join us in a discussion on running your classes without points, in a low stress environment, and where student focus is on learning and not grades.

Strategies to increase girls' connection to field science communities of practice | Room: Aspen Glen
Laura Conner, University of Alaska, Fairbanks
Audience: Grades 9-12, Undergraduate: Lower Division
Gender differences in science interest and identification are well documented. This presentation features results from our educational research studies and associated strategies that can be used to connect girls to field science.

Thursday At-a-Glance

12:00 PM **Registration Opens,** ***Room: Emerald Mountain Room***

1:00 PM **Fieldtrip - Boulder Apple Tree Project ($20)**

1:00 PM **Workshop - EREN-NEON Flexible Learning Project ($25)**

4:00 PM **Fieldtrip - Sunset Hike in Estes Park**

7:00 PM **Welcome Event**

Friday At-a-Glance

7:30 AM **Registration Opens,** ***Room: Emerald Mountain Room***

8:00 AM **Welcome/Keynote: Dr. Rashidah Farid-Tilghman, Tuskegee University**

8:50 AM **Keynote: Dr. Lisa Corwin, University of Colorado Boulder**

9:30 AM **Break**

	Short Presentation *Room: Emerald Mntn*	**Short Presentation** *Room: Aspen Glen*	**Short Presentation** *Room: Glacier Basin*
9:45 AM	Liu: Integrating Evidentiary Reasoning into a Structural Biology Investigation in an Undergraduate Biology Laboratory Course	Tietjen: Finding ecology where you look: Demonstrating ecological concepts through a photo scavenger hunt portfolio	Dunk: Enhancing Student Understanding of the Biotic Impacts of Climate Change using the BIC4

10:15 AM **Break**

10:30 AM **Four-Dimensional Ecology Education (4DEE) Workshop,** ***Room: Emerald Mountain Room***

11:45 AM **Lunch,** ***Aspen Dining Room***

12:45 PM **Education Share Fair Session 1,** ***Room: Emerald Mountain Room***

1:45 PM **Break**

	Workshop *Room: Emerald Mntn*	**Workshop** *Room: Aspen Glen*	**Workshop** *Room: Glacier Basin*
2:00 PM	Berkowitz: A Four-Dimensional Ecology Field Experience Studying Water on the YMCA Campus	Baker: Online Resources that can be Used in a Metagenomic Course Utilizing CURE Pedagogy	Martin: Using Two-stage Exams to Practice and Improve Collaboration

3:30 PM **Break**

	Short Presentation *Room: Emerald Mntn*	**Short Presentation** *Room: Aspen Glen*	**Short Presentation** *Room: Glacier Basin*
3:45 PM	Kariyat: Teaching Co-Evoution Through Active Learning		Varner: Squirreling Around for Science: Doing Field-Based Animal Behavior Research in Undergraduate Courses

4:15 PM **Break**

	Short Presentation *Room: Emerald Mntn*	Short Presentation *Room: Aspen Glen*	Short Presentation *Room: Glacier Basin*
4:30 PM	Soper: Underwater Education: Designing & implementing a Big Data project to understand marine biodiversity	Brosi: The Impact of Obstacles to Learning Faced by College Students in the COVID-era: Effect on Learning Gains	Haswell: Teaching Whale Evolution & Ecology Using a Traditional Ecological Knowledge (TEK) Framework

5:00 PM **Break**

5:15 PM **Publishing with LifeDiscoveryEd Digital Library**

6:00 PM **Dinner,** ***Aspen Dining Room***

7:00 PM **Social Night,** ***Room: Emerald Mountain Room***

Saturday At-a-Glance

7:30 AM **Registration Opens,** ***Room: Emerald Mountain Room***

8:00 AM **Keynote Panel: Dr. Carmen Cid, Ross Sappenfield, and Amber Finley**

9:00 AM **Break**

	Short Presentation *Room: Emerald Mntn*	Short Presentation *Room: Aspen Glen*	Short Presentation *Room: Glacier Basin*
9:15 AM	Kargul: NetLogo: An Online Programmable Simulation Model for Remote Learning Science Lessons	McKenney: The ecology of social annotation: adapting the 4DEE framework to evaluate student engagement	Wilson: Schoolyard Biodiversity Community: Student Scientist Global Network to Increase Biodiversity
9:45 AM	**Break**		
10:00 AM		Conner: Strategies to increase girls' connection to field science communities of practice	Strode: My Classes Are Pointless

10:30 AM **Break**

10:45 AM **Networking Session,** ***Room: Emerald Mountain Room***

11:45 AM **Lunch,** ***Aspen Dining Room***

	Workshop *Room: Emerald Mntn*	Workshop *Room: Aspen Glen*	Workshop *Room: Glacier Basin*
12:45 PM	Hane & Magalhães: A Metacognitive Toolkit to Improve Retention of Underrepresented Science Students	Kline: Engaging Students in Watershed Awareness, Technology, & Environmental Research For Sustainability	Starnes: Bridging the divide: Helping students connect learned quantitative skills to biology

2:15 PM **Break**

2:30 PM **Education Share Fair Session 2,** ***Room: Emerald Mountain Room***

3:30 PM **Wrap Up**

4:00 PM **Adjourn**

Education Share Fair Roundtable

This session is designed for educators to share or gather feedback on teaching ideas and activities with a peer working group. Ideas or activities may be at any stage of development. Authors describe their teaching idea for about 15 minutes and then facilitate feedback regarding the core concepts addressed, methodology, misconceptions, assessment, educational extensions or implementation in various institutional settings and audiences. There will be two rounds of 30 minutes each.

Session 1: 10/1 12:45 PM

Table #1
Curing Plant Blindness: Exploring the effects of an online intervention in a large enrollment majors Biology class
Samiksha Raut, University of Alabama Birmingham
Audience: Undergraduate: Lower Division
Vision and Change in Undergraduate Biology has emphasized Biological literacy but much work needs to be done as regards botanical literacy especially for non-majors biology students. The problem of botanical literacy is even more profound and has led to the official coining of the phrase Plant Blindness. This session explores the impact of an online intervention to cure blindness in a large enrollment biology class.

Table #2
Creating student "cohorts" to facilitate student-instructor engagement in large courses
Warren Sconiers, University of the Ozarks
Audience: Undergraduate: Lower and Upper Division
Courses at larger institutions tend to have fewer student-instructor interactions by nature, while smaller institutions are known for these interactions. I propose implementing cohorts, course assigned groups of students that complete group assignments to encourage interactions and are TA/instructor managed.

Table #3
Tree Cover Equity Across Urban Landscape Types
Tamara Basham, Collin County Community College
Audience: Undergraduate: Lower Division
In this data-focused activity, students use a combination of publicly-available and self-generated data to test their hypotheses about tree cover equity across communities in the Dallas, Texas area.

Table #4
Bacterial Fermentation of Carbohydrates
Erin McKenney, North Carolina State University
Audience: Undergraduate: Lower and Upper Division
We present a tactile teaching tool to help students (1) compare the structures of different carbohydrates and bacterial fermentative abilities, and (2) predict the fermentation products of different bacteria / diets and their impacts on host health.

Table #5
Scientific Figures: Pairing Data Points with Other BioInteractive Resources
Parks Collins, Mitchell Community College
Audience: Grades 9-12, Undergraduate: Lower Division
Interpreting figures is essential for scientists, but it is one of the most challenging skills for students to develop. Come learn about a series of resources called Data Points that are geared towards helping students increase quantitative skills.

Table #6
Scientists in Classrooms: PlantingScience Online Mentoring, Barriers and Opportunities
Jennifer Hartley and Catrina Adams, Botanical Society of America
Audience: Grades 6-12, Undergraduate: Lower Division
PlantingScience is a free NSF-supported student-teacher-scientist partnership program where small teams of students design and implement their own science investigations on one of several big themes in biology, while communicating online with a volunteer scientist mentor. We'll discuss features of PlantingScience, how teachers have implemented modules within different kinds of courses, and barriers to successful implementation. We'd like feedback on ways the program can address teacher and district concerns and overcome barriers in order to reach more teachers.

We want your feedback!

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Table #7
UEL: A framework for an undergraduate-focused urban ecology research community
Maria Stanko, New Jersey Institute of Technology
Audience: Undergraduate: Lower and Upper Division
The UEL is a research community established to train leaders in urban ecology and ensure that they reflect the communities they serve. We outline our research projects and discuss strategies for securing funding, recruiting students, and developing a mentoring framework.

Table #8
Multiple Projects, One Plant: The Saguaro Cactus
Karen Wellner, Chandler Gilbert Community College
Audience: Undergraduate: Lower Division
The saguaro cactus represents different things to different cultures. We examine the importance of this cactus by integrating field work, climate change, ecosystem services, geospatial technologies, and microbiology in a project-based learning experience utilizing the saguaros on campus.

Table #9
Tracking antibiotic resistance through a sexual network
Gabriela Hamerlinck, University of Florida
Audience: Undergraduate: Lower Division
This resource is a hands-on simulation game of how antibiotic resistant gonorrhea might develop and spread through a sexual network.

Table #10
Phenology Protocols in Development for the Milkweed Adaptation Research and Education Network
Emily Mohl, St. Olaf College
Audience: Grades 9-12, Undergraduate: Lower Division
We will discuss a draft of newly revised protocols for a distributed investigation of common milkweed plants and their interactions with herbivores, including monarchs, to help students predict the potential for shifting phenology to disrupt species interactions.

Table #11
What do scientists do?
Laura Gonzalez, University of Texas at Austin
Audience: Undergraduate: Lower and Upper Division
What do scientists do? is a series of scaffolded assignments designed to teach students how to ask and answer scientific questions. The objective of the experiential learning activity is for students to develop a collaborative independent scientific proposal tackling an ecological question of their own choosing.

Table #12
Assessing forest community diversity
Andrew Kozich, Keweenaw Bay Ojibwa Community College
Audience: Undergraduate: Lower Division
Students in introductory environmental science courses benefit from hands-on learning in outdoor settings. This presentation describes a hands-on activity for students to learn basic ecological concepts about forested ecosystems and gain skills in data collection and analysis.

Session 2: 10/2 2:30 PM

Table #1
All hands on all the time?
Brent Voels, Cankdeska Cikana Community College
Audience: Grades 9-12, Undergraduate: Lower Division
Successes and challenges during the COVID-19 pandemic. Could the move to online learning create new opportunities in how STEM education is delivered?

Table #2
Constructing a multi-media active learning project in biology education
Chinyere Knight, Tuskegee University
Audience: Grades 9-12, Undergraduate: Lower and Upper Division
Students have integrated advanced understanding of biology, technology and art by creating multi-media videos as final projects in a general ecology course during the virtual transition 2019/2020. Students incorporated animations, news broadcasts, interviews, and bio documentaries formats for content dissemination.

Table #3
Field Sampling Methods: Impact of Invasive Species
John Starnes, Southcentral Kentucky Community and Technical College
Audience: Undergraduate: Lower Division
This field-based resource is for use in a non-majors ecology laboratory. It will explore field sampling methods, and the impacts that invasive species have on the environment.

Table #4
Case Study: Pine Barrens Ecology and Human Dimensions
Joanna Lumbsden-Pinto, SUNY ESF
Audience: Undergraduate: Lower Division
Pine barrens require fire to stay healthy and provide ecosystem services users enjoy. Nevertheless, fire can jeopardize properties and people. Therefore, we can help people understand the pine barren's ecology and change their attitude towards managing forests with fire.

Education Share Fair Roundtable

Table #5
Effects of Environmental Stress on Parasite - Host Interactions
Tyrell Carr, Saint Augustine's University
Audience: Undergraduate: Lower and Upper Division
A Case Study - Course-based Undergraduate Research Experience (CURE) for Non-Biology Majors and Biology Majors is being developed for the Biology Program at Saint Augustine's University - Raleigh, North Carolina by Khadijah Payne and Dr. Tyrell Carr. The Case Study - CURE is centered on parasite - host interactions for studies in BIOL 131 - Fundamentals of Biology and BIOL 132 - Introduction to Environmental Science

Table #6
Scientific Communication in STEM: Exploring food-borne pathogens, Elements, and Healthy Eating
Florastina Payton-Stewart, Xavier University of Louisiana
Audience: Undergraduate: Lower and Upper Division
How can we improve scientific communication among STEM and non-STEM? Food is a universal language. The objective is to expose students to case studies and discussions to enhance their science communication skills related to food.

Table #7
Online Ecological Education via Jupyter Notebooks and NEON data
John Sutor, SciTeens / Florida State University
Audience: Grades 9-12, Undergraduate: Lower Division
SciTeens Inc. (501(c)3) engages Title 1 high school students in STEM through online data science curricula and research collaboration. Educators will learn about novel technologies and project-based teaching strategies adopted for a Jupyter Notebook-based curriculum.

Table #8
Hanging on Your Every Word: Ecology for Everyone with AAAS's Science in the Classroom (SitC)
Anne Fernald Cross, Tulsa Community College
Audience: Grades 9-12, Undergraduate: Lower and Upper Division
This lesson introduces students to the value of the scientific literature using the AAAS website Science in the Classroom. We examine the science behind the emerging infectious disease, white-nose syndrome (WNS) in the Little Brown Bat (Myotis lucifugus).

Table #9
Exploring Citizen Science for All Learners
Kathryn Bender, Albemarle County Public Schools/ Monticello High School
Audience: Grades 9-12
Planning citizen science projects for use in the classroom can be overwhelming. Let's break it down into practical ways you can differentiate a lesson into a standards aligned, authentic and accessible learning experience all students can engage in and benefit from.

Table #10
Indigenous Science
Kaitlyn Haskie, Din College
Audience: Undergraduate: Lower Division
Indigenous Science refers to the science knowledge of peoples who as participants in their culture have traditional wisdom, values, and decision-making that inform how they interact with the world. This project draws on Navajo knowledge of traditional food systems and how effective those foods are in providing nutrition.

Workshops

Friday 10:30 AM - 11:30 AM

Using the 4-Dimensional Ecology Education (4DEE) Framework to Create Learning Opportunities for Non-Majors; Audience: Undergraduate: Lower and Upper Division
Vikki Rodgers, Babson College; Sara Scanga, Utica College

What are the key ecology concepts, practices, interactions, and themes all students should learn, regardless of major? This workshop will begin by introducing the 4DEE framework and then participants will identify which ecology concepts they teach in their non-majors, general education, and introductory classes. Groups will be formed to focus on the concepts identified to be most important for teaching non-majors and will be led through an exercise to create an effective hands-on learning activity integrating the chosen concepts. Groups will be encouraged to finalize the activity and to test it in their own classroom settings. Although the focus of the workshop will be for those teaching non-majors, there will be a group dedicated to teaching majors as well.

Friday 2:00 PM - 3:30 PM

A Four-Dimensional Ecology Field Experience Studying Water on the YMCA Campus | Room: Emerald Mountain
Alan Berkowitz, Cary Institute of Ecosystem Studies
Audience: Grades 9-12, Undergraduate: Lower and Upper Division
Participants will investigate a driving question about water on the Y campus that demands 4-dimensional exploration, followed by reflection on the experience using ESA's 4DEE Framework and UFERN's Model for Undergraduate Field Experience Design and Assessment.

Online Resources that can be Used in a Metagenomic Course Utilizing CURE Pedagogy | Room: Aspen Glen
Stokes Baker, University of Detroit Mercy
Audience: Undergraduate: Upper Division
The workshop will present how metagenomics courses utilizing CURE pedagogy aligns with 4DEE. Participant will learn in how to use free online tools to obtain 16S rRNA homology data and how to analyze the data with advance statistical tools.

Using Two-stage Exams to Practice and Improve Collaboration | Room: Glacier Basin
Andrew Martin, University of Colorado
Audience: Grades 9-12, Undergraduate: Lower and Upper Division
Two-stage exams have students answer a set of questions multiple times, once individually and one or more times in a small groups. Questions can be selected or free response. The strategy is designed to accomplish two goals: emphasize learning is a social endeavor and emphasize collaboration depends on effective communication and leveraging the intellect of diverse group members. The approach is demonstrated and participants engage in a two -stage exam and the analysis of exam scores for the purpose of data-driven revision of curriculum.

Saturday 12:45 AM - 2:15 PM

Bridging the divide: Helping students connect learned quantitative skills to biology | Room: Glacier Basin
John Starnes, Southcentral Kentucky Community and Technical College and Joe Esquibel, Lansing Community College
Audience: Grades 9-12, Undergraduate: Lower Division
Looking for activities that will help your students improve and connect their quantitative skills? This session will explore freely available OER materials designed by teams of mathematicians and biologists and focus on teaching quantitative biology.

A metacognitive toolkit to improve retention of underrepresented science students | Room: Emerald Mountain
Elizabeth Hane, Rochester Institute of Technology and Rita Margarida Magalhães, Rochester Institute of Technology
Audience: Grades 9-12, Undergraduate: Lower and Upper Division
This workshop is focused on metacognitive classroom techniques that 1) advance students' abilities to monitor and assess their own learning; and 2) foster a sense of belonging in science. Participants will have the opportunity to explore various metacognitive techniques.

Networking Sessions

Pushing Past Barriers: Ecological Science for All Saturday October 2, 10:45AM

In recent years, we have seen a significant change in public attitudes in support of climate science and sustainability. At the same time, whether it is about food safety, endangered species or protection of waterways, we continue to see the latest science being pushed aside in public discourse. As a society, we are working towards achieving greater inclusivity and equality in the success of students pursuing science degrees, especially those with an emphasis in ecology. In the face of pressing environmental challenges, ecological science is a dynamic discipline that can offer solutions that touch every aspect of life. As we embark on a new decade, ensuring that ecology is relevant to all students is vital so that we can prepare all students to be ecologically literate.

This year's Networking Session will focus on the four thematic tracks of the conference:

N1) Engaging Non-Science Majors

1. How do we encourage nonscience majors to take away important messages that will inform their personal and professional decisions?
2. What is one thing you can implement when you return to your classroom?
3. What recommendations do you have for educators to engage a student population that is not interested in science?

N2) Incorporating culturally relevant and inclusive teaching

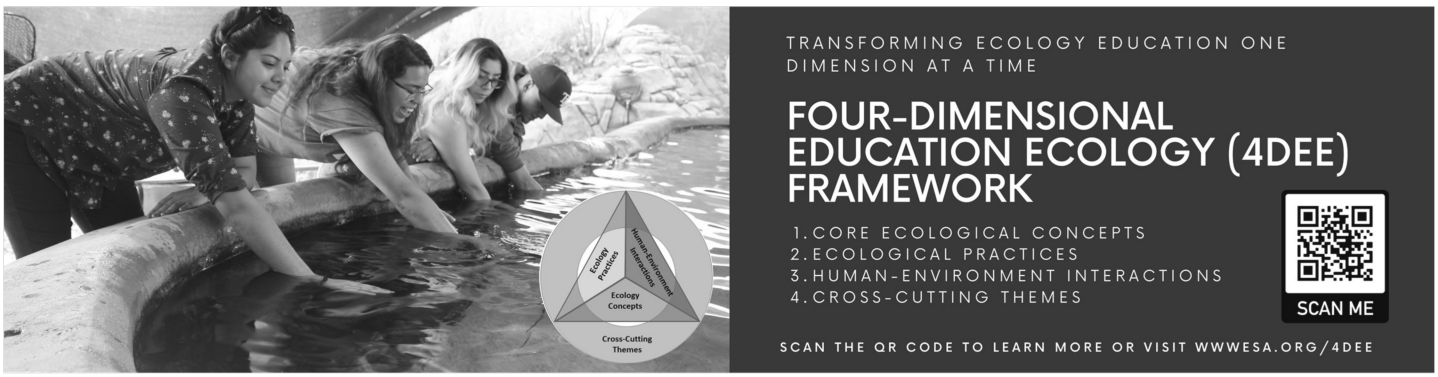
1. What do we understand today about faculty and student mindsets, classroom environments and learning conditions that contribute to students who feel they don't belong in STEM?
2. What immediate steps can you take to build a more inclusive classroom?
3. What recommendations do you have to retain students from culturally diverse backgrounds to become scientists and science professionals?

N3) Connecting Current Events to Curriculum

1. What is the most successful strategy you have adopted to connect with current events in your biology/environmental courses?
2. What are the challenges you faced in its implementation and how did you overcome them?
3. What recommendations do you have to support educators to connect current events to curriculum?

N4) Addressing systemic barriers to effective teaching and learning in environmental biology

1. What have we learned from prior education reform efforts such as NGSS, Vision and Change in Undergraduate Biology Education, and the newly minted 4DEE framework?
2. How can workforce expectations drive change?
3. How can we foster greater partnerships between high schools, community colleges and four-year institutions?
4. What recommendations do you have for educators to activate these levers of change?



Preconference Events

The 2021 LDC is pleased to offer three preconference events on Thursday September 30.

1. Boulder Apple Tree Project - Field Trip

Join the BATP in Lyons CO to visit a historic apple orchard site. Participants will tag some apple trees, take tree health measurements, learn more about the unique tree varieties in the region, and discuss how this community-engaged project benefits undergraduate researchers and creates greater access to ecology and evolutionary biology.

Cost $20.00

2. EREN-NEON Flexible Learning Projects - Workshop

Expand your skillset in field ecology and data science, while building a new network of people who want to engage their students in authentic ecological science, whether your students are in-person or remote, or both. In this workshop, you will learn about standardized ecological monitoring across geographic scales through the EREN-NEON Flexible Learning Projects (http://erenweb.org/eren-neon-flexible-learning-projects/). By using free online resources (GoogleEarth, iNaturalist) and inexpensive materials, you will identify and characterize a study site near the conference center and then choose one of the projects related to trees or lichens. Thus, depending on your choice, you would measure local anthropogenic impact, measure tree diameter, and calculate biomass, or characterize lichens and their association to air pollution.

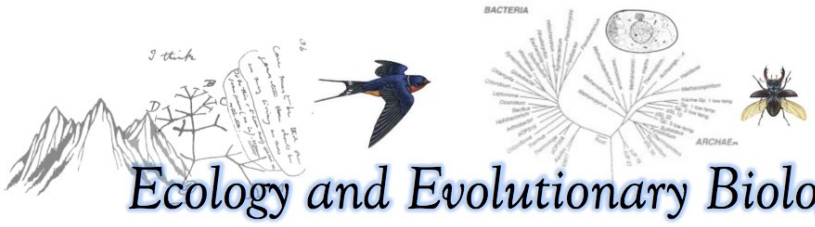
Cost $25.00

3. Sunset Hike at Estes Park - Field Trip

Get a breath of fresh air and soak in the beautiful views of the Colorado Rockies by joining us for a late afternoon hike. Attendees will hike from the YMCA of the Rockies conference center to Bible Point and back. This hike will be guided by Andrew Martin, Paul Strode, and Catrina Adams as they share their knowledge of the surrounding plants and wildlife that occur in this park. The hike will be about 2.8 miles long and is rated easy for beginners.

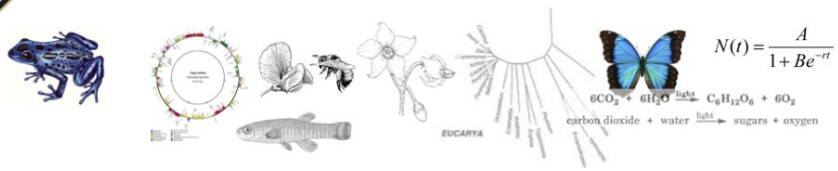
The Cost to attend this event is free. Please be sure to wear appropriate shoes and pack your own water.

Conference Host



Ecology and Evolutionary Biology

University of Colorado **Boulder**



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