November 12

FRIDAY

ABBREVIATION KEY

E: *Elementary School*
MS: *Middle School*
HS: *High School*
2Y: *Two-Year College*
4Y: *Four-Year College*
GA: *General Audience*

8:00am - 9:00am

Meet & Greet with NABT Leaders

International C • Committee Meeting • GA

Is it time for you to get more involved with the NABT Community? Learn more about different opportunities from NABT committee chairs, section chairs and regional cordinators.

10:30am – 12:30pm

3218 2021 NABT Evolution Symposium: Squamate Speciation

M103/104 • Evolution • Symposium (120 min) • HS, 2Y, GA

The National Center for Science Education (NCSE) is proud to present this year's Evolution Symposium on "Squamate Speciation". We begin with a presentation from Edward L. Stanley focused on the evolutionary biology of snakes. Then NSCE Teacher Ambassadors will lead a workshop bringing this research into your classroom through an NGSS-storyline.

See page 26 for full details.

10:30am – 2:00pm

Zoo Atlanta Animal Experience

International Ballroom • Special Event • GA

The Exhibit Hall is your destination for a wild encounter with the animal ambassadors from Zoo Atlanta.

10:30am – 11:45am

3211 A Revisit and Deep Dive into the Floating Leaf Disk Assay – a classic

L401- 403 • AP Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Think you know "The Floating Leaf Disk Assay"? This presentation is a deep dive into methods, analysis, troubleshooting, student research, and a way to measure oxygen production directly.

Brad Williamson, University of Kansas (Retired), Lawrence, KS and Bob Kuhn, Innovation Academy, Alpharetta, GA

9:15am – 10:15am

GENERAL SESSION SPEAKER

J. Marshall Shepherd

See page 8 for biography.

The Extreme Weather - Climate Change Connection: Perspectives on the Science, Vulnerability and the Message

Imperial Ballroom • Special Speaker • GA

Dr. Shepherd will discuss how current research is attributing extreme weather events to contemporary climate change. He will also address how highly disproportionate vulnerability is to such events within certain communities, and he will share strategies for communicating the risks of climate change to non-scientists.

10:30am – 11:45am continued

SPECIAL PROGRAMMING PRESENTED BY
CGHI & Innovate Bio

3239 Lesson Resources for Bringing Biotechnology to Your High School Biology Class

L404 • Biotechnology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Teachers review and plan how they might implement a series of lessons introducing students to Biotech skills and careers, and have an opportunity to join InnovATEBIO's high school network.

Philip Gibson, CGHI, Atlanta, GA; Tamara Mandell, University of Florida, Alachua, FL; Bridgette Kirkpatrick, Collin College, Plano, TX; Jennifer Lazare, Austin Community College, Austin, TX; Michael, Fuller, Elizabeth Doggett, and Ying-Tsu Loh, BABEC, Burlingame, CA

3079 More Math, Please! Incorporating Quantitative Skills in Biology Courses

L405/406 • General Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Come experience ready-to-use quantitative biology modules as learners and then as educators. Learn about the QB@CC community and different ways to collaborate, create and contribute to the network.

Vedham Karpakakunjaram, Montgomery College, Rockville, MD; and John Starnes, Southcentral Kentucky Technical & Community College, Bowling Green, KY

3050 Non-majors Matter - Vision and Change for Everyone

L503 • Instructional Strategies • Hands-on Workshop (75 min) • 2Y, 4Y

Participants will work with members of the NSF-funded IGELS project (Improvement of General Education Life Science courses) to modify/reflect on activities for their students that align with new, equitable outcomes, focusing on Reasoning and Relevance.

Heather Rissler, North Iowa Area Community College, Mason City, IA; Sam Donovan, University of Pittsburgh, Pittsburgh, PA; Bryan Dewsbury, Florida International University, Miami, FL

SPECIAL PROGRAMING PRESENTED BY
Pivot Interactives

3238 Introduction to Pivot Interactives: Active Learning Made Easy

L506/507 • Technology in the Classroom • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Experience Pivot Interactives in this active session. Explore the variety of learning modes you can implement in any science classroom: interactive video, sensor integration, Co-Labs™ , and more. Bring a laptop/tablet!

Eric Friberg, Pivot Interactives, Minneapolis, MN and Lee Ferguson, Allen High School, Allen, TX

10:30am – 12:30pm

2021 NABT Evolution Symposium

M103/104 • Evolution • Symposium (120 min) • HS, 2Y, GA

How Snakes Lost Their Legs but Won the Race

Snakes are really odd, really successful kinds of lizards. They are so successful and so unusual that most people don't even think they are lizards. The origin of snakes has led to a deep well of questions: When and why did they lose their limbs? Why don't snakes have eyelids? What's up with all the tongue flicking? This session will talk about the origins of limblessness, the discovery of the largest snake of all time, Titanoboa cerrejonensis, and how 3D imaging of museum specimens opens up a whole new world of opportunities for scientists and educators alike.

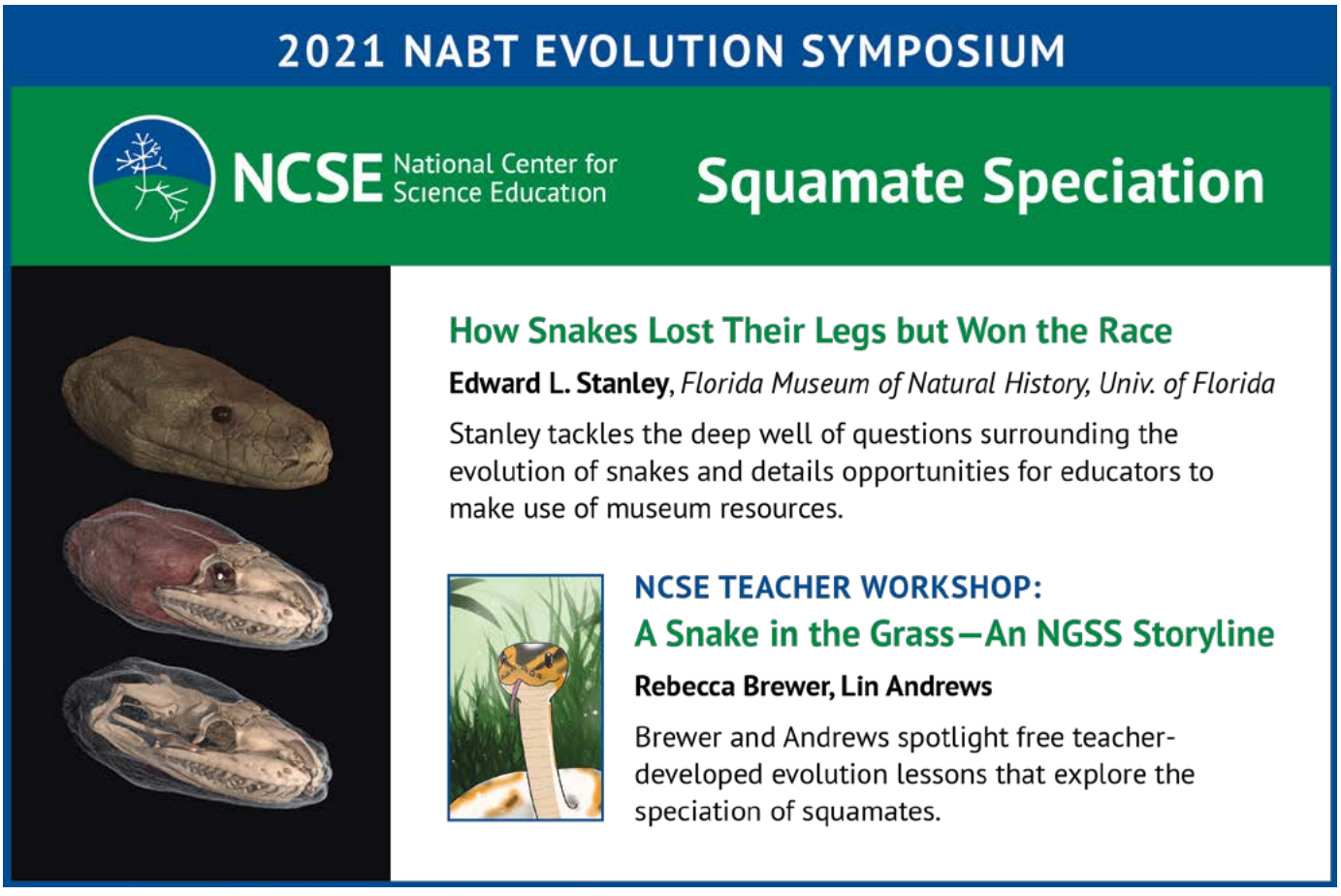
Edward L. Stanley, OvERT Program/Florida Museum, University of Florida, Gainesville, FL

NCSE Teacher Workshop: A Snake in the Grass - An NGSS Storyline

This interactive session spotlights free evolution lesson plans that explore the speciation of squamates (i.e., scaled reptiles such as lizards and snakes) by examining the genetic and environmental factors that led to limb reduction, the human impact on snake morphology, and conservation efforts to preserve snake biodiversity. Teachers will explore a complete unit that begins with the discovery of Titanoboa. From this anchoring phenomenon, we will backtrack through time to study the last of the limbed snakes, the evolution of limblessness, and study a variety of pigmented morphs. and the ecological consequences of human actions on wild populations.

Rebecca Brewer, Troy High School, Troy, MI, and Lin Andrews, NCSE, Oakland, CA

This symposium is made possible by the National Center for Science Education.



10:30am – 11:45am continued

3077 Creating Engaging Phenomena Aligned Units for NGSS Implementation

L508 • Curriculum Development • Hands-on Workshop (75 min) • ML, HS

Use a planning guide to help you develop a phenomenon-aligned unit. Guide includes science practices scaffolding. Come learn strategies to make your science favorites the phenomena for a unit!

Kelly Kveton and April Pence, Huntington Beach Union High School District, Huntington Beach, CA

3217 Using Educative Materials that Highlight the Cultural Resources of Black Heritage to Explore Biology Concepts

M101 • Curriculum Development • Hands-on Workshop (75 min) • ELEM, ML, GA

This workshop implements and shares a unit created from a larger National Science Foundation Grant that uses the narratives and lived experiences of Black African heritage to learn biology concepts.

Catherine Quinlan, Howard University, Washington, DC

3149 Half-Earth Project Guided Inquiry: Mapping Hummingbirds and Other Species to Understand Patterns in Biodiversity

M105 • Ecology / Environmental Science / Sustainability • Hands-on Workshop (75 min) • ML, HS, 2Y

The Half-Earth Map (half-earthproject.org/map) reveals Earth's species, nature reserves, and human impacts. Explore team-based, hands-on student inquiries that reveal biodiversity fundamentals using charismatic species.

Dennis Liu, E.O. Wilson Biodiversity Foundation, Potomac, MD; Jonathan Bower, Del Mar High School, San Gabriel, CA; Erika Mitkus, Governor's Academy, Newbury, MA

SPECIAL PROGRAMING PRESENTED BY
miniPCR

3243 Knockout! Bringing Authentic CRISPR/Cas to Your Class

M106/107 • AP Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Use CRISPR/Cas to disable, or knock out, a gene in bacteria and then use simple phenotypic screening to confirm successful gene knockout in this authentic but accessible lab activity.

Zeke Alvarez-Saavedra, miniPCR bio, Cambridge, MA

ABT Advisory Committee Meeting

M108 • Committee Meeting (75 min) • GA

William McComas, ABT Editor

3177 Using Anatomy Analogies to Anchor and Advance Student Learning

M301 • Anatomy & Physiology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Anatomy analogies can come in many sizes – simple to complex – as well as many formats – written, drawn, even kinesthetic. Come discuss my favorites and create your own!

Jennifer Welch, Madisonville Community College, Madisonville, KY

NABT Student Un-Conference Session

M302 • Instructional Strategies • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Help NABT better support its student members during this participant-oriented session featuring an agenda and discussion topics decided upon by the attendees. This session will result in an online student event in the spring of 2022.

Organized by the NABT Student Committee

10:30am – 11:45am continued

3210 Exploring Phenomenon with CODAP Data Excursions

M303 • General Biology • Hands-on Workshop (75 min) • HS

Engage in a data excursion within the inquiryHub biology curriculum. Analyze data to determine if changes in feeding and migration caused the population increase for large mammals in the Serengeti.

Kate Hensen, University of Colorado - Institute of Cognitive Science, Boulder, CO

3047 Infusing 21st Century Skills into Undergraduate Biology Courses while Helping 3rd-8th Grade Students Conduct Research

M304 • Instructional Strategies • Demonstration (75 min) • ML, 2Y, 4Y

Come learn about iBEARS, a program that trains undergraduate biology majors to virtually mentor 3rd - 8th-grade students through authentic research experiences. Attendees will learn about iBEARS and opportunities to join.

Micheal Moore, University of Arkansas at Little Rock, Little Rock, AR; Tracey Sulak, Baylor University, Waco, TX; Alex Tolar, Texas Christian University, Fort Worth, TX

12:00pm – 12:30pm

3046 A New Approach for Non-Majors–Laboratory and Active Learning Exercises Using Computer Simulations

L401- 403 • General Biology • Paper (30 min) • HS, 2Y, 4Y

We discuss a new approach for non-majors biology with laboratory exercises using computer simulations, impossible to perform in traditional labs. The free software (NetLogo) contains numerous models; we developed more.

George Shiflet and Angela Shiflet, Wofford College, Greenville, SC

SPECIAL PROGRAMING PRESENTED BY
CGHI & Innovate Bio

3242 Biotechnician Assistant Credentialing Exam (BACE)

L 404 • AP Biology • Demonstration (30 min) • HS, 2Y, 4Y

Developed from a framework of industry-defined standards, BACE has gained national attention within industry and academia as the standard for documenting mastery of competencies and skills valued for technician-level positions.

Philip Gibson, CGHI, Atlanta, GA; Tamara Mandell, University of Florida, Alachua, FL; Bridgette Kirkpatrick, Collin College, Plano, TX

3017 Making It Personal: How to Teach Cancer with Personalized Medicine

L405/406 • Biotechnology • Demonstration (30 min) • HS, 2Y

We will feature a suite of biology lessons, taught through a social justice lens, which will include pgEd materials, making pedigrees with gel electrophoresis, and integration of clinical trials.

Julie Boehm and Ken Bateman, Wellesley High School, Wellesley, MO

12:00pm – 12:30pm continued

3176 The Introductory Biology Experience (IBEx): Evaluating Progress in the Adoption of a Multidimensional Curriculum

L503 • General Biology • Paper (30 min) • 2Y, 4Y

We will feature a suite of biology lessons, taught through a social justice lens, which will include pgEd materials, making pedigrees with gel electrophoresis, and integration of clinical trials.

Anna Hiatt, Daniel Gutzmann, and Joshua Jolton, University of Nebraska – Lincoln, Lincoln, NE

3081 Citizen Science within Formal Classrooms using Common Milkweed

L504/505 • Ecology / Environmental Science / Sustainability • Paper (30 min) • ML, HS, 4Y

This session addresses the absence of citizen science(CS) in 6-16 classrooms using local adaptation of common milkweed. We report on ways that CS supported principles of evolution and the NGSS.

Michele Koomen, Jolie Grimes, Jake Ross, Ellen Hofstede, and Emelia Hinrichs, Gustavus Adolphus College, St. Peter, MN

SPECIAL PROGRAMING PRESENTED BY
Pivot Interactives

3250 Introducing Pivot Interactive's Simulations: Gene to Protein and Mutations

L 506/507 • Technology in the Classroom • Hands-on Workshop (30 min) • HS, 2Y, GA

Use the simulations within Pivot Interactives that will change how you teach gene expression and mutations. Students become active directors of these processes. General and advanced modes. Bring a laptop/tablet!

Eric Friberg, Pivot Interactives, Minneapolis, MN and Lee Ferguson, Allen High School, Allen, TX

3204 Math Prereqs for Intro Biology: What are the Effects at One Community College?

M101 • General Biology • Paper (30 min) • 2Y, 4Y

This workshop implements and shares a unit created from a larger National Science Foundation Grant that uses the narratives and lived experiences of Black African heritage to learn biology concepts.

Stacey Kiser, Lane Community College, Eugene, OR

3044 Social Justice in the Biology Classroom

M102 • General Biology • Paper (30 min) • GA

Social justice is of-the-moment. Does science have a role? Yes. Facts matter to understanding the consequences of social policy and finding effective solutions. Learn about some cases using standard topics.

Douglas Allchin, University of Minnesota, St. Paul, MN

3208 A Discovery into Wild Insect Responses to Chemical and Physical Stimuli using Chi-Square and Smartphones

M105 • Ecology / Environmental Science / Sustainability • Paper (30 min) • ML, HS

Identify insect species and how they behave using a home-made behavioral chamber and running Chi-square analysis for chemical and physical attractants and repellants.

Claudia Ochatt, Ransom Everglades School, Miami, FL

SPECIAL PROGRAMING PRESENTED BY
miniPCR

3245 Explore the Tools and Techniques Behind COVID Testing

M106/107 • General Biology • Demonstration (30 min) • MS, HS, GA

Introduce students to how qPCR and molecular diagnostic tools can manage disease outbreaks. Use affordable PCR with a fluorescent readout to test fictional patients for COVID-19.

Zeke Alvarez-Saavedra, miniPCR bio, Cambridge, MA

Member Resources Committee

M108 • Committee Meeting (30 min) • GA

Catherine Ambos, Committee Chair

3191 Science for All, One Microbiome at a Time

M301 • Microbiology & Cell Biology • Demonstration (30 min) • HS, 2Y, 4Y

The session will describe environmental microbiome projects in the context of class-based research experiences (CREs). The session will include sample collection and microbiome data analysis and quantitative measurements of biodiversity.

Theodore Muth, Brooklyn College-CUNY, Brooklyn, NY

3124 Synchronous Student Teamwork in an Asynchronous Course

M303 • Instructional Strategies • Demonstration (30 min) • 2Y, 4Y

Participants will learn tips for incorporating teamwork in their classes- even asynchronous online courses- including how to create teams, hold team members accountable, and create metacognitive activities.

Andrea Bierema, Michigan State University, East Lansing, MI

12:00pm – 12:30pm

3016 Beyond Current Events: Using Contemporary Readings and Media to Support Student Science Practice

M304 • Instructional Strategies • Hands-on (30 min) • 2Y

Help students become critical consumers of science and media through practicing analysis of data and improving their evidence-based claims. See how to support these inter-related goals through guided activities.

Stephen Traphagen, Oak Park and River Forest High School, Oak Park, IL and Julie Minbiole, Columbia College, Chicago, IL

12:45pm – 1:45pm

SPECIAL PROGRAMING PRESENTED BY
miniPCR

3245 Explore the Tools and Techniques Behind COVID Testing

M106/107 • General Biology • Demonstration (30 min) • MS, HS, GA

Introduce students to how qPCR and molecular diagnostic tools can manage disease outbreaks. Use affordable PCR with a fluorescent readout to test fictional patients for COVID-19.

Zeke Alvarez-Saavedra, miniPCR bio, Cambridge, MA

2:00pm – 4:00pm

3230 12th Annual Biology Education Research Symposium

M103/104 • Instructional Strategies • Symposium (120 min) • 2Y, 4Y, GA

NABT is proud to present the 12th Annual Biology Education Research Symposium. Accepted presentation went through a double-blind review process that was open to biology instructors and education researchers at all levels. The format for the symposium is a traditional presentation of papers by individual or co-authors lasting 15 minutes each.

See page 34 for full listing.

12:45pm – 1:45pm continued

THIS YEAR, NABT INVITES YOU TO GRAB A LUNCH IN THE EXHIBIT HALL AND JOIN YOUR YOUR COLLEAGUES DURING A LEVEL/SECTION LUNCHEON.

Elementary & Middle Level Teachers Luncheon

International A • Meal Function (60 min) • ELEM, ML

Grab your lunch and meet up with other K-8 teachers at this informal networking lunch designed to help you connect with colleagues

Two-Year College Section Luncheon

International B • Meal Function (60 min) • 2Y

Join a supportive community of two-year college educators to share your strategies, your struggles, and your successes. The winners of the T*wo-Year College Biology Teaching Award* and the *Professor Chan Teaching Award* will also be recognized

High School Teachers Luncheon

International C• Meal Function (60 min) • HS

If you teach funny Freshmen, serious Seniors and/or everyone in-between, you will want to grab your lunch, grab a seat, and connect with other high school biology teachers in this informal setting.

AP Biology Section Luncheon

International 9 • Meal Function (60 min) • AP

Meet AP Biology teachers in a friendly, informal setting to share insights, ask questions, and build community. You may even get to meet some of your favorite AP colleagues in person. The luncheon includes a special presentation of the *Kim Foglia AP Biology Service Award*.

Sponsored by miniPCR

Four-Year College & University Section Luncheon

International 10 • Meal Function (60 min) • 4Y

Faculty, education researchers, graduate students, and anyone associated with four-year colleges and universities are invited to network with colleagues and learn about section programs and opportunities. There will also be a special presentation of the *Four-Year College & University Section Awards*.

2:00pm – 3:15pm

3227 Guy Harvey Ocean Foundation Collections

L401-403 • Ecology / Environmental Science / Sustainability • Hands-on Workshop (75 min) • ELEM, ML, HS

Hands-on exploration of the Guy Harvey Ocean Foundation's Curriculum collection available free to educators. Lessons for grades 2-5, 6-8, and HS aimed to increase understanding of sharks and their role.

Lesley Kirkley, Pasco County Schools, Land O' Lakes, FL

3118 Having a BLAST: Getting Comfortable Using Sequence Comparison Program

L405/406 • AP Biology • Hands-on Workshop (75 min) • HS, 2Y, 4Y

Participants will go through exercises that will help them navigate with confidence various websites/software to compare DNA/protein sequences (such as BLAST) and determine evolutionary relationships based on sequence comparisons. BYOD

Dessy Dimova, Franklin High School, Somerset, NJ

3067 Tick-Borne Diseases: One Health Lessons Connecting Humans, Animals, and the Environment

L503 • General Biology • Hands-on Workshop (75 min) • HS

Investigate the spread of tick-borne diseases in humans and animals. Experience hands-on, minds-on, NGSS practice-based lessons related to One Health – the connections between human, animal, and environmental health.

Dina Markowitz, University of Rochester, Rochester, NY; Lisa Brosnick, SUNY College at Buffalo, Buffalo, NY

3209 The Ethics of Access: A Framework for Making Decisions about Access to Vaccines and Insulin

L504/505 • General Biology • Hands-on Workshop (75 min) • ML, HS, GA

You've taught the biology. Now engage students in using ethical frameworks and decision-making models to support systematic, rational ways to work through social dilemmas about access to vaccines and insulin.

Joan Griswold and Atom Lesiak, University of Washington, Seattle, WA

SPECIAL PROGRAMING PRESENTED BY
Pivot Interactives

3251 Fill in the Gaps in your AP Biology Lab Activities

L506/507 • AP Biology • Demonstration (75 min) • HS, 2Y, 4Y

Missing relevant phenomena for specific topics? Unreliable lab data obscuring learning goals? Let Pivot Interactives help fill the gaps. Topics featured: respiration, biodiversity index, energy flow, genetics. Bring a laptop/tablet!

Eric Friberg, Pivot Interactives, Minneapolis, MN and Lee Ferguson, Allen High School, Allen, TX

2:00pm – 3:15pm continued

3154 Death from Above or Below? Designing Curriculum to include NGSS Nature of Science Representations

M101 • Nature of Science • Hands-on Workshop (75 min) • HS

Participants will experience an overview of the nature of science (NOS) in NGSS, examine NOS in sample lessons, then collaboratively plan to implement NOS in their own classrooms.

John Maddux, Festus High School, Festus, MO and Jim Lane, Mahtomedi High School, Mahtomedi, MN

3260 Writing for the ABT

M106 • Instructional Strategies • Hands-on Workshop (75 min) • GA

The editorial team of *The American Biology Teacher* will jointly present a workshop for all those who would like to be authors and/or reviewers with a practice review and article development session.

William McComas, ABT Editor and University of Arkansas, Fayetteville, AR

SPECIAL PROGRAMING PRESENTED BY
miniPCR

3247 Investigate Lemurs, Conservation Genetics, and Evolution with the Duke Lemur Center and miniPCR bio

M106/107 • AP Biology • Hands-on (75 min) • HS, 2Y 4Y

Analyze authentic genetic and ecological data to identify a species of lemur. Use gel electrophoresis, build phylogenetic trees, and help identify threats to a species on the verge of extinction.

Zeke Alvarez-Saavedra, miniPCR bio, Cambridge, MA

Awards Committee

M108 • Committee Meeting (75 min) • GA

Jason Crean, Committee Chair

SPECIAL PROGRAMMING PRESENTED BY
Bedford, Freeman & Worth High School Publishers

3255 Efficiently Teaching the Science Practices in AP® Biology - Part 1

M302 • AP Biology • Demonstration (75 min) • HS

This session will provide AP® Biology teachers ideas, bell ringers, and activities for numerous opportunities to practice the process of science and much more (assessment, etc!) throughout the school year.

Thomas Menna, BFW Publishers, Hamilton, NJ; Jim Smanik, Sycamore High School, Cincinnati, OH; Paula Phillips, Lansing High School, Lansing, NY

3086 Sharing Science with Skeptical Students

M304 • Science Practices • Symposium (75 min) • GA

Dr. Lamb, an award-winning educator, shares best practices for communicating science. Using his Beyond the Blog video series, Lamb shares how he opens doors to the curious, unsure, or skeptical.

Neil Lamb and Madelene Loftin, HudsonAlpha Institute for Biotechnology, Huntsville, AL

3:30pm – 4:00pm

3031 Equity and Belonging through Modified Biology Storylines

L401/403 • General Biology • Demonstration (30 min) • HS

Explore strategies to modify storylines that increase belonging. Testimonies from biology and special education teachers who have implemented storylines to bring NGSS and equity to students with learning needs will be shared.

Lisa Pavic and Madeline Thomas, Glenbrook South High School, Glenview, IL

3052 Using Biotechnology for Inquiry-Based Genetic Studies in AP Biology

L405/406 • AP Biology • Demonstration (30 min) • HS, 2Y, 4Y

Learn how to guide students through developing an inquiry-based genetics project incorporating biotechnology. This will encompass AP biology Units 5 and 6 as well as all science practices.

Heidi Tarr, The Emery/Weiner School, Houston, TX

3:30pm – 4:00pm continued

3073 Implementing the Plant Awareness Disparity Index in Undergraduate Classrooms

L503 • Botany & Plant Biology • Paper (30 min) • 4Y

Learn about and how to administer and analyze results from the Plant Awareness Disparity Index (PAD-I), a survey designed to measure students' plant awareness disparity (PAD, formerly plant blindness).

Kathryn Parsley, University of Memphis, Memphis, TN

3145 How COVID-19/SARS-CoV-2 Can Be Used to Anchor Concepts and Science Practices in AP Biology

L504/505 • AP Biology • Hands-on Workshop (30 min) • HS, 2Y

Concepts of gene expression, protein structure, gene technology, cell receptors and signaling, viral life cycles, phylogeny, and natural selection are made accessible and engaging through modeling and study of COVID-19/SARS-CoV-2.

Jennifer Newitt, Friends Academy, Locust Valley, NY

SPECIAL PROGRAMING PRESENTED BY
Pivot Interactives

3252 Integrate Numeric Questions to Teach, Practice, and Assess Math Skills for Biology

L506/507 • Science Practices • Demonstration (30 min) • HS, 2Y, 4Y

We will demonstrate randomization and auto-graded numeric questions within Pivot Interactives. Embed more math skills within your biology curriculum. This session will feature the chi-square statistic. Bring a laptop/tablet!

Eric Friberg, Pivot Interactives, Minneapolis, MN and Lee Ferguson, Allen High School, Allen, TX

3:30pm – 4:00pm continued

3166 Wooly Bully: Exploring Science Identity and Attitudes through Citizen Science

L508 • Ecology / Environmental Science / Sustainability • Paper (30 min) • ML, HS, 2Y

Citizen science immerses students in science practices and builds content knowledge. In this study, students participating in the Harvard Forests' Woolly Adelgid project experienced increases in science identity and attitudes.

Tara Alcorn, Greater Lowell Technical High School, Tyngsboro, MA

3064 Building Evolution Curriculum from a Feminist Perspective

M101 • Curriculum Development • Paper (30 min) • HS, 4Y, GA

Explore an NGSS-aligned evolution curriculum designed from a feminist perspective that uses scientific practice as its pedagogical strategy and encourages all students to "do science".

Heather Page, New York City Department of Education, Brooklyn, NY

3089 Algal Blooms! Designing Solutions to Reduce the Impact of Human Activity on the Environment

M102 • Ecology / Environmental Science / Sustainability • Demonstration (30 min) • ML, HS, GA

Experience a lesson where students take on roles of stakeholders while engaging in guided research, discussion, and design of solutions to address algal blooms in Florida. Plans/Templates will be shared.

Steve Kuninsky, The Gwinnett School of Mathematics, Science, and Technology, Lawrenceville, GA

3183 Experimenting on Enzyme Velocity and Allosteric Regulators Using Smartphone Applications at Home

M105 • AP Biology • Paper (30 min) • HS, 2Y

Solutions to isolate potato peroxidase and guaiacol from tree bark, pH strip making with coffee filters and cabbage, smartphone applications to detect RGB hue, or sound produced to quantitate the reaction.

Claudia Ochatt, Ransom Everglades, Miami, FL

SPECIAL PROGRAMING PRESENTED BY
miniPCR

3248 BioBits: Central Dogma - Experiment Directly with Transcription and Translation Using Simple Tools and Procedures

M106/107 • AP Biology • Demonstration (30 min) • HS, 2Y 4Y

Bring the Central Dogma of molecular biology to life. With the BioBits® cell-free system, you can use fluorescence to watch transcription and translation in real time.

Zeke Alvarez-Saavedra, miniPCR bio, Cambridge, MA

OBTA Directors & Regional Coordinators Meeting

M108 • Committee Meeting (30 min) • GA

3099 Ecosystem Explorers: What's in your Neighborhood?

M301 • General Biology • Demonstration (30 min) • ML, HS

Learn about an inquiry-based investigation that gets students venturing out of the classroom and exploring nature through the use of iNaturalist. Help them become Ecosystem Explorers!

Alexander Eden, Greater Lowell Technical High School, Tyngsborough, MA

SPECIAL PROGRAMMING PRESENTED BY
Bedford, Freeman & Worth High School Publishers

3255 Efficiently Teaching the Science Practices in AP® Biology - Part 2 Q&A

M302 • AP Biology • Demonstration (30 min) • HS

A continuation of the session "Efficiently teaching the science practices in AP® Biology - Part 1" talk with the presenters and learn more about "Biology for the AP Course".

Thomas Menna, BFW Publishers, Hamilton, NJ; Jim Smanik, Sycamore High School, Cincinnati, OH; Paula Phillips, Lansing High School, Lansing, NY

12th Annual Biology Education Research Symposium

2:00 PM – 4:00 PM
M103/M104

The symposium is coordinated by the NABT Four-Year College & University Section's Reseach Committee.

Proceedings will be posted online at www.NABT.org.

Differences in How STEM Students Define Themselves as a "STEM Person": Implications for College STEM Instructors

Valentina Espinosa Suarez, Heidi Cian, & Remy Dou, Florida International University, Miami, FL

Recognition by others in the STEM community plays a crucial role in STEM identity construction, which is related to the pursuit of and persistence in STEM careers. For undergraduate students, recognition that is especially formative to their STEM identity comes from their university STEM instructors. Identity research with STEM professionals suggest that the types of recognition needed to sustain STEM pursuits differ depending on career aspirations—particularly noting differences for those in research compared to health fields—implying that students may need different identity-supportive experiences based on their career intentions. We extend that work to pre-career individuals by using mixed methods to explore how premed students differ from their peers in how they see themselves as a "STEM person." Results show that, while students rate themselves as a "STEM person" similarly regardless of premed status, the reasons that contribute to this self-perception differ in ways that align with their chosen fields. Results additionally highlight some intersection between gender and experiences that contribute to STEM identity. Implications for college biology instructors include the potential value in selecting laboratory experiences that reflect diverse ways of "doing STEM" and in explicitly communicating the relationship between their discipline and career aspirations associated with care.

Instructor Conceptions and Implementation of Course-based Undergraduate Research Experience (CURE) Features

Ruth Kaggwa, Lisa Walsh, & Kristine Callis-Duehl, Donald Danforth Plant Science Center, St. Louis, MO

Course-based undergraduate research experiences (CUREs) defined by five features/attributes; use of scientific practices/process, iteration, collaboration, broad relevance and discovery, are a unique form of pedagogy that incorporates authentic research into classroom teaching. Despite their contributions to improving student outcomes, CUREs are not widespread. Insights into the conceptions of instructors that implement CUREs might inform efforts towards increased adoption and improved student outcomes. The goal of our study was therefore to investigate instructor conceptions of the CURE features and their influence on implementation. We developed a survey informed by research goals targeting biology undergraduate instructors and shared it on the online platform Qualtrics to professional scientific organization directories. Our respondents comprised 53 instructors with CUREs experience including faculty and graduate students. Of the five CURE features, the highest proportions of misaligned conceptions were in the discovery and broad relevance aspects. Furthermore, fewer respondents reported including broad relevance and iteration in implementation of their CUREs relative to the other three. Our findings suggest the need for greater professional development efforts focused on the framework of CUREs to improve fidelity of implementation and consequently student outcomes; and a revision of the current framework to incorporate new instructor suggested aspects such as student-centered communication.

Performance, Prediction, and Preparedness: Do Biology-Major-Specific Courses Provide an Advantage?

Emily Weigel, Georgia Institute of Technology, Atlanta, GA and Juanita Pardo-Sanchez; University of Michigan, Ann Arbor, MI

Active learning's success in STEM courses has sparked hope in lessening the fear non-STEM majors have towards STEM courses (Garcia et al, 2015). But what of STEM majors in STEM coursework that does not match their major? We hypothesized that student major will not dictate performance, but rather differences in how students prepare for and anxiety around exams. We used two sections (Biology vs. Any-STEM Major) of an identically-taught introductory-level biology course at a large, southeastern R1 university. Each section was team-taught in an active-learning format for 50 minutes three times a week. Throughout the semester, 4 multiple-choice exams with questions spanning all Bloom's levels were administered alongside an 'exam wrapper' survey (Thompson, 2012) which included 5-item Likert-scale and short, open-ended questions regarding student's perceived anxiety and satisfaction levels, preparation for the exam, and predicted scores. No significant difference was found in anxiety levels, days spent preparing for exams, studying satisfaction levels, total hours studying, and test score predictions. This suggests that students may treat STEM courses similarly, regardless of being in-major, which may relieve teaching burdens on departments where efforts may be better spent on providing cohort-like or additional external classroom experiences to provide community within-major and increase persistence.

Evaluating Science Identity, Communication Self-efficacy, Value, and Skills Gained in a Hybrid CURE Lab

Austin Leone and Donald French, Oklahoma State University, Stillwater, OK

Disseminating research and communicating scientific findings is an accepted part of the research experience, but few science programs include explicit curricula for practicing oral science communication at the undergraduate level. Course-based undergraduate research experiences (CUREs) can provide opportunities for students to practice oral science communication, but few studies describe or assess authentic oral science communication activities within CUREs. Additionally, existing literature lacks substantial evidence for how science communication activities impact students' science identity, science communication self-efficacy, and the relationships therein. To address this, we collected students' quantitative perceptions of science identity and science communication self-efficacy and qualitative perceptions of a poster activity in a hybrid lab CURE. While we found students' science identity and science communication significantly improved, we did not find a significant relationship between these perceptions. Students reported gaining personal development, quantitative process skills, and conversational science skills. They also reported valuing the more focused and straightforward approach of research posters, their improved communication about science, and the authentic nature of research posters. Our results will be valuable to educators who are interested in improving their students' science identity and science communication self-efficacy, as affective factors strongly relate to students' persistence in science

Collaboration Affects Student Learning and Sense of Belonging in Introductory Biology

Sayali Kukday, Iowa State University, Ames, IA; Patricia Habersham; College of William & Mary, Williamsburg, VA; J. Elizabeth Richey; Carnegie Mellon University, Pittsburgh, PA

Although there is a large body of research on collaborative learning, less is known about the impact of collaboration on student belonging, especially in undergraduate biology courses. Addressing student belonging could be one pathway to achieve greater diversity and inclusion in STEM disciplines. We investigated social and cognitive impacts of collaboration in introductory biology by asking the research question: How does collaboration impact cognitive and social outcomes in collaborative teams compared to students working independently? This study was conducted in introductory biology courses at two institutions (n=731). We varied the conditions under which the students completed specific learning activities either in teams or individually. Students' test performance and pre-post responses to student affect assessments were analyzed using analyses of covariance. Initial results indicate that a positive team experience is better for fostering an increased sense of belonging. Unexpectedly, we found that a less-positive team experience correlated with significantly higher test scores indicating that productive struggle is beneficial to student learning. Our work identifies a relatively simple instructional intervention to increase students' experiences of belonging while achieving better course learning outcomes.

SPECIAL PRESENTER

Jason R. Wiles

Syracuse University, Syracuse, NY

Recipient of the 2021 NABT Four-Year College & University Section Research in Biology Education Award

3:30pm – 4:00pm continued

3121 What Happened to the Fat? A Storyline for Teaching Cellular Respiration and Growth

M303 • General Biology • Demonstration (30 min) • HS, 2Y

I will share an NGSS-aligned storyline (including all resources) that engages students in figuring out what happens to matter and energy when a person gains or loses weight.

Wendy Johnson, Kentwood Public Schools, Kentwood, MI

3042 DNA Club - Student Biology Research Incubator

M304 • Biotechnology • Demonstration (30 min) • HS

DNA Club provides students a holistic way to perform quality biology research as a, low pressure, collaborative, and equitable experience. I'd like to show you how to get started.

Bob Kuhn, Innovation Academy, Alpharetta, GA

4:00pm – 5:30pm

Exhibit Hall Closing Reception

International Level • Special Event • GA

It's last call in the NABT Exhibit Hall. It is also your last chance to visit booths, talk to exhibitors, and get those freebies for the classroom. We're closing the 2021 Exhibit Hall in style with a special reception, giveaways, and grand prize drawings!

4:15pm – 5:00pm

SPECIAL PROGRAMING PRESENTED BY
miniPCR

3249 Connect Genotype to Phenotype with PTC Tasting using PCR and Gel Electrophoresis

M106/107 • AP Biology • Hands-on (75 min) • HS, 2Y 4Y

Presenting new, updated curriculum to one of our most popular labs. Connect genotype and phenotype. Explore signal transduction and G-protein coupled receptors, and use quantitative approaches to measure taste response.

Zeke Alvarez-Saavedra, miniPCR bio, Cambridge, MA