### #1-29--- 2nd floor white boards

#### 1. How instruction with multiple equations promotes knowledge coordination in physiology
   - Matthew Lira (University of Iowa)*

#### 2. Validity of the Revised Student Process Questionnaire (R-SPQ-2F) in Undergraduate Anatomy & Physiology Students
   - Staci N Johnson (Clemson University)*

#### 3. Using NeuroNotebooks to Improve Students’ Understanding of Developmental Neurobiology, Attitudes Toward Research, and Experimental Design Competency
   - David Esparza (University of Texas at El Paso)*; Nayeli Reyes (University of Texas at El Paso); Karina Leon (University of Texas at El Paso); Anita Quintana (The University of Texas at El Paso); Jeffrey T. Olimpo (The University of Texas at El Paso)

#### 4. Alluvial diagrams track student reasoning pre- and post-instruction as assessed by the Electrochemical Gradients Assessment Device (EGAD)
   - Jack Cerchiara (University of Washington)*; Mary Pat Wenderoth (University of Washington); Jennifer H Doherty (University of Washington)

#### 5. Oaks to Arteries: Principle-based Reasoning Varies with Physiological Context
   - Jack Cerchiara (University of Washington)*; Emily Scott (Univ. Washington); Mary Pat Wenderoth (University of Washington); Jennifer H Doherty (University of Washington)

#### 6. Impact of out-of-class video presentations for content review in an allied health pathophysiology course
   - Kristen L Walton (Missouri Western State University)*

#### 7. A learning progression characterizing how students use mass balance reasoning to understand physiology
   - Emily Scott (Univ. Washington)*; Jack Cerchiara (Univ. Washington); Mary Pat Wenderoth (University of Washington); Jennifer H Doherty (University of Washington)

#### 8. Assessing the impact of “Osmotion”: an active learning module focused on improving comprehension of osmosis and diffusion for underrepresented minority students
   - James Boyett (University of Alabama at Birmingham); Sebastian Schormann (University of Alabama at Birmingham); David Esparza (University of Texas at El Paso); Jeffrey T. Olimpo (The University of Texas at El Paso); Samiksha Raut (UAB)*

#### 9. Connecting ideas across courses: Relating energy, bonds, and how ATP hydrolysis can power a molecular motor
   - Abby Green (Michigan State University)*; Kristin Parent (Michigan State University); Sonia Underwood (Florida International University); Becky Matz (Michigan State University)

#### 10. A Comparison of Instructional Design Approaches for Teaching Noncovalent Interactions in Biochemistry
    - Stephanie Halmo (University of Georgia)*; Sasha Stogniy (University of Georgia); Logan Fiorella (University of Georgia); Paula P. Lemons (University of Georgia)

#### 11. Collaborative Active Learning Spaces Foster Increased Relatedness and Participation in Introductory Biology Students
    - Kim M Pigford (NC Wesleyan College)*; Miriam Ferzli (NC State University); Margaret Blanchard (NC State University); Michelle Nugent (NC State University)

#### 12. How are tours of Botanical Gardens enhancing the student experience in General Bio 2?
    - Melissa R McCartney (Florida International University); Simone Oliphant (Florida International University); Ateev Shirajee (Florida International University); Jose Alberte (Florida International University)

#### 13. Impact of knowledge surveys and student demographics on metacognitive knowledge in an introductory biology course
    - Ginger R Fisher (University of Northern Colorado)*

#### 14. Curiosity killed the cat!: Characterizing student-generated questions in a non-majors biology lab
    - Kimberly K Booth (North Dakota State University)*

#### 15. Development of an Integrated First-Year Undergraduate Biology and Chemistry Program
    - Stefanie R DeVito (University of Delaware)*; Alyssa Hull (University of Delaware)

    - Aakanksha Angra (Georgia State University)*

#### 17. Making Biology a Game Worth Playing
    - William E Falkner (Central Michigan University)*; Debra L Linton (Central Michigan University)

#### 18. Modeling Global Citizenship Education in the Tibetan Buddhist monastic science classroom
    - Kelsey Gray (Emory University)*; Jacob Shreckengost (Craig H. Neilsen Foundation); Carol Worthman (Emory University); Arri Eisen (Emory University)

#### 19. Digging Deeper into the Cost Component of Expectancy-Value Theory and its Relationship to Gender and Student Performance
    - Melissa L Aikens (University of New Hampshire)*

#### 20. Scientific literacy and interdisciplinary thinking via embedded research in a non-majors environmental science course
    - Keith E Gilland (University of Wisconsin-Stout)*; Emily Makina (University of Wisconsin-Stout); Stephen Nold (University of Wisconsin-Stout)
#21 Investigating relationships among the individual, the team, personal strengths, and peer evaluation in a team-based introductory biology course.  Paper ID 144  David E Steen (University of Minnesota)*; Susan Wick (University of Minnesota)

#22 Fear of negative evaluation: A novel construct underlying student anxiety in active learning college science courses  Paper ID 46  Katelyn M Cooper (Arizona State University)*; Virginia Downing (Arizona State University); Logan Gin (Arizona State University); Sara E Brownell (Arizona State University)

#23 Examining the Landscape of Anxiety in Introductory Biology Classrooms  Paper ID 55  Beth Schussler (“University of Tennessee, Knoxville”)*; Brianna Reynolds (University of Tennessee, Knoxville)

#24 Creating inclusive classroom environments through institutional change towards adopting active learning practices  Paper ID 149  Kelly M Schmid (Syracuse University)*; Jason Wiles (Syracuse University)

#25 Developing a questionnaire measuring university students’ sense of belonging and involvement within their home department  Paper ID 189  Melissa R McCartney (Florida International University)*; Eva Knekta (FIU); Kyriaki Chhtazikyriakidou (Florida International University)

#26 Effect of Using Centralized University Testing Centers on Student Test Anxiety, Performance, and Study Time  Paper ID 205  Elizabeth G Bailey (Brigham Young University)*; Josh Payne (Brigham Young University)

#27 Investigating the personal values and cultural wealth assets of students in an introductory science course  Paper ID 272  Laura Beaster-Jones (University of California-Merced)*

#28 Does student mindset affect study habits, problem solving strategies and achievement?  Paper ID 282  Malin J Hansen (Red Deer College)*

#29 The Dreamcatcher Conference: promoting transfer student success in the biological sciences  Paper ID 115  Marina Crowder (University of California, Davis)*

#30-45 Room 312

#30 Do I Belong Here? Examining If STEM Support Programs Impact Sense of Belonging Among Undergraduates  Paper ID 283  MacKenzie Gray (Portland State University)*; Emma C Goodwin (Portland State University); Suzanne Estes (Portland State University); ERIN E SHORTLIDGE (PORTLAND STATE UNIVERSITY)

#31 What makes for an inclusive classroom? Student voices and perspectives.  Paper ID 294  Natalia Caporale (UC Davis)*; Alicia Garcia (UC Davis)

#32 Empowered acceptance or hopeless denial: Can compassion training alter reactions to uncomfortable truths in environmental education?  Paper ID 299  Peter D. Wragg (Metropolitan State University)*

#33 Figure of the Day: An Enjoyable Classroom Activity that Improves Students’ Figure Creation Skills  Paper ID 102  Caitlin Kirby (Michigan State University)*; Peter J.T. White (Michigan State University); Arietta Fleming-Davies (University of San Diego)

#34 Using a graphic syllabus to support the process of science in an inquiry-based biology course  Paper ID 161  Heidi A Horn (University of Wisconsin-Madison)*; Janet Batzli (University of Wisconsin-Madison)

#35 Knowledge of learning makes a difference: a comparison of metacognitive regulation in introductory and senior-level biology students  Paper ID 166  Julie Dangremond Stanton (University of Georgia)*; Kathryn Morris Dye (South Georgia State College); Me'Shae Johnson (University of Georgia)

#36 Interviews of Female Undergraduate Bioinformatics Students Provide Insight into Gender Gaps in Performance and In-Class Participation  Paper ID 170  Emilee Severe (Brigham Young University); Elizabeth G Bailey (Brigham Young University)*

#37 Elementary Education Students’ Attitudes toward Biology in an Upper-level Biology Course  Paper ID 178  Brittany Smith (Minnesota State University Mankato)*

#38 A large-scale survey of the study strategies of incoming first-year university students: the relationships of strategy to gender, ethnicity, course type and course grade.  Paper ID 302  Adrienne Williams (UC Irvine)*; Kamaeryn Denaro (UC Irvine); Michael Dennin (UC Irvine); Brian Sato (UC Irvine)

#39 The Modulation of Flipped Classroom Design and Student Performance  Paper ID 15  Chaya Gopalan (Southern Illinois University Edwardsville)*

#40 Preventing Student Procrastination Via Positive Reinforcement  Paper ID 16  Carlos Rojo (San Jose City College)*

#41 Can video introductions from authors can enhance student understanding of primary scientific literature?  Paper ID 19  Melissa R McCartney (Florida International University)*; Kiana Kasmaii (Florida International University)

#42 Does Flipped Teaching Improve Student Success In Anatomy at A Community College?  Paper ID 31  Kim-Leiloni Nguyen (Mt San Antonio College)*

#43 Leaving Research: Factors that impact a student leaving an academic year research experience.  Paper ID 69  Logan E Gin (Arizona State University)*; Katelyn M Cooper (Arizona State University); NSF LEAP Scholars (Arizona State University); Sara E Brownell (Arizona State University)
#44 Shifting stereotypes? Investigating the impact of an abbreviated intervention for combating students' stereotypes of scientists.  
Kelsey J Metzger (University of Minnesota Rochester)*

#45 Exploring URM Students’ Preferences for Learning Events Incorporated in Introductory Biology  
Michelle Nugent (NC State University)*; Miriam Ferzli (NC State University)

#46 A Network for Three Communities Centered on Visualizations for Biology Education  
Susan Keen (UC Davis)*; Gael McGill (Harvard Medical School); Jodie Jenkinson (University of Toronto)

#47 A Qualitative Investigation of Students’ Motivation to Engage in the Critical Experiences Required for Persistence in a Biology Career Path  
Ashley A Rowland (University of Colorado - Boulder)*; Katie Franks (University of Colorado at Boulder); Sarah L Eddy (Florida International University); Lisa A Corwin (University of Colorado Boulder)

#48 A Longitudinal Study on the Effect of Active Learning on Persistence in Biology  
Rebecca C Lindow (Eastern Michigan University)*; Gillian A Autterson (Eastern Michigan University); Anne Casper (Eastern Michigan University)

#49 “Like a Scientist with Training Wheels:” Students describe their science identities  
Cara Gormally (Gallaudet University)*; Rachel Inghram (Gallaudet University); Megan Majocha (Gallaudet University)

#50 Assessment norms have disparate impacts on under-represented minority and first-generation undergraduates in introductory STEM classes  
Shima Salehi (Stanford University); Sehoya Cotner (University of Minnesota); Cissy Ballen (Auburn University)*

#51 A Framework to Guide Undergraduate Education in Interdisciplinary Science  
Brie Tripp (Portland State University)*; ERIN E SHORTLIDGE (PORTLAND STATE UNIVERSITY)

#52 A summary of concept inventories relating to evolution  
Jeremy Hsu (Chapman University)*; Robert Furrow (“University of California, Davis”)

#53 Lessons learned during the evolution process from lab reports to peer reviewed publication  
Bhupinder P Vohra (William Jewell College)*

#54 Effects of Assessment Format on Eliciting Student Reasoning About Natural Selection  
Caitlin Anderson (North Dakota State University)*; Jonathan Dees (University of Georgia); Jennifer Momsen (North Dakota State University)

#55 Using annotated research articles in the cell biology classroom: increases in scientific literacy, comprehension, and knowledge of scientific techniques  
Mary E Washburn (University of North Georgia)*; Melissa R McCartney (Florida International University); Ryan Shanks (University of North Georgia); Miriam Segura-Totten (University of North Georgia)

#56 Data MAKER Biology Framework: Designing across biology, data modeling, and argumentation learning goals  
Anna Grinath (Middle Tennessee State University)*; Seth Jones (Middle Tennessee State University); Casey Whitworth (Middle Tennessee State University); Angela Google (Middle Tennessee State University); Harlee Morphis (Middle Tennessee State University)

#57 Undergraduate Students Communicating Science with the Public  
Heather E Bergan-Roller (Northern Illinois University)*

#58 Asynchronous Discussions to Engage Students in Scientific Argumentation  
Iresha N Jayasinghe (Illinois State University)*; Ranija Turner (Illinois State University); Kristine L Callis-Duehl (East Carolina University); James Wolf (Illinois State University); Rebekka Darner (Illinois State University)

#59 Testing Religious Cultural Competence in Evolution Education Nationwide  
Elizabeth Barnes (Arizona State University); Hayley Dunlop (Arizona State University); Sara E Brownell (Arizona State University)*

#60 Connecting Science to Society in an Undergraduate Evolution Course  
Erin R Fried (University of Colorado, Boulder)*

#61 Different Evolution Acceptance Instruments Lead to Different Research Findings  
Sara Brownell (Arizona State University); Hayley Dunlop (Arizona State University)*

#62 Validating existing assessments of non-cognitive psychological and motivational frameworks for undergraduate STEM populations  
Meredith A Henry (Emory University)*; Shayla Shorter (Emory University); Louise Charkoudian (Haverford College); Jennifer Heemstra (Emory University); Lisa A Corwin (University of Colorado Boulder)

#63 The Five Core Concepts in Biology (SCCs) in the classroom: Developing Assessment Tools for Student Understanding of the SCCs  
Kyriaiki Chatzikiyiakidou (*); Melissa R McCartney (Florida International University)

#64 Development of an instrument to assess student ability to select and incorporate scientific evidence from the primary literature in their writing  
Kate Hill (Florida State University)*

#65 From Fruit Flies to Phalaropes: Textbook Examples of Sexual Selection  
Linda Fuselier (University of Louisville Biology Department)*; Kasi Jackson (West Virginia University); Perri Eason (University of Louisville)
#66  Test Driving the Conclusion Assessment Rubric (CAR)  Paper ID 137  Tawnya Cary (Beloit College)*; Michelle A Harris (UW - Madison Biocore Program); Seung Hong (University of Delaware); Yue Yin (University of Illinois at Chicago)

#67  Consensus Messaging Using Scholarly Literature: Impacts on Students' Conceptions of Global Climate Change  Paper ID 154  Jeremy D Sloane (University of Virginia)*; Jason Wiles (Syracuse University)

#68  A conceptual framework for case study pedagogy in the undergraduate biology classroom.  Paper ID 176  Ally Hunter (University of California, San Francisco)*

#69  Student-generated conceptual models as a form of assessment in introductory biology  Paper ID 193  Konnor Brennan (Saint Louis University)*; Elena Bray-Speth (Saint Louis University)

#70  Assessment of a Curriculum Redesign Highlighting Development of Experimental Design Skills  Paper ID 211  Victoria Fringer (1996)*; Elijah Farley (University of Minnesota Duluth Department of Chemistry); Jacob W Wainman (University of Minnesota Duluth)

#71  The DNA Illustration Spectrum: The Variety of Ways in which DNA is Represented to Biology Learners  Paper ID 217  Dina Newman (Rochester Institute of Technology)*; Hannah Spector (Rochester Institute of Technology); Julia Steele (Rochester Institute of Technology); Emalee Wrightstone (Rochester Institute of Technology); Kate Wright (Rochester Institute of Technology)

#72  Got DNA? Teaching Science with Culturally Responsive Pedagogy  Paper ID 236  Kelsie M Bernot (North Carolina A&T State University)*; Sabena Bell (North Carolina A&T State University); Kayla Antione (North Carolina A&T State University); Brittney Council (North Carolina A&T State University); Roy Coomans (North Carolina A&T State University); Joseph Graves (North Carolina A&T State University); Aditi Pai (Spelman College)

#73  College Student’s Consider Diversity and Designer Babies when Reasoning about uses of CRISPR/CAS9  Paper ID 246  Katie Humrick (University of Louisville)*; Linda Fuseriel (University of Louisville)

#74  Workshop Including Science and Religious Educators leads to Positive Attitudes toward Evolution Education  Paper ID 251  John Lindsay (Brigham Young University)*; Jamie L Jensen (Brigham Young University); Danny Ferguson (Brigham Young University)

#75  Investigation of the Relationship between Intuitive Thinking and Reasoning about Vaccines across Levels of Expertise  Paper ID 253  Melinda T Owens (UC San Diego)*; Erin Nale (San Francisco State University); Jonathon Torres (San Francisco State University); Kristin De Nesnera (Utah Valley University); Kimberly Tanner (San Francisco State University)

#76  Undergraduate Learning Researchers: A New Role in the Classroom for Promoting Formative Assessment Opportunities  Paper ID 258  Young Ae Kim (University of Arizona)*; Katelyn Southard (University of Arizona); Jonathon Torres (San Francisco State University); Lisa Elfring (University of Arizona); Paul Blowers (University of Arizona); Vicente Talanquer (University of Arizona)

#77  What Are We Measuring? Comparisons between the Biology Concept Inventory and the Biology Card Sorting Task  Paper ID 265  Kamali Sripathi (South Dakota State University)*; Karly Ackerman (South Dakota State University); Dylan Blomme (South Dakota State University); Anne-Marie Hoskinson (South Dakota State University)

SUNDAY

#78  Test-Enhanced Learning in Biology Education: a Laboratory study  Paper ID 191  Bryn St Clair (Brigham Young University)*; Jamie L Jensen (Brigham Young University); Sam Millar (Brigham Young University); Max Putnam (Brigham Young University); Haley Michelsen (Brigham Young University)

#79  Developing Conceptual Frameworks in Evolutionary Medicine  Paper ID 235  Daniel Grunspan (Arizona State University)*; Angela Garcia (Arizona State University); Jon Harrison (Arizona State University); Silvie Huijben (Arizona State University); Ana Magdalena Hurtado (Arizona State University); Randolph Nesse (Arizona State University); Benjamin Trumble (Arizona State University); Sara Brownell (Arizona State University)

#80  Learning Theories Unleash the Power of CUREs (Course-Based Undergraduate Research Experiences) in REIL (Research Experiences in Introductory Lab) Biology Courses and Boost Student Self Efficacy in Scientific Reasoning and Experimental Design  Paper ID 29  Cheryl L Berry (Saint Leo University)*


#82  Can Students Build Data Analysis Skills Using Course-Based Research in Introductory Biology?  Paper ID 35  Marney Pratt (Smith College)*

#83  Implementation and Refinement of a Full-length Course-Based Undergraduate Research Experience (CURE) in Microbial Ecology and Molecular Evolution  Paper ID 52  Blythe E Janowiak (Saint Louis University)*

#84  Implementation of a Progressive Scale-up Model for the Development of Research Expansion Modules for a Consortium-based CURE  Paper ID 83  Adam Kleinschmit (Adams State University)*; Jordan Jackson (Adams State University); Wyanet Bresnitz (Adams State University); Austin Baumeister (Adams State University)
#85 REIL Biology at St. Philip's College  Paper ID 103  Stacie R. Koonhow (St. Philip's College)*
#86 From rigid syllabi to democratic CELLS (Civically Engaged Lectures and Labs): an attempt to boost science literacy among non-majors  Paper ID 123  Robert D Sieg (Truman State University)*; Jennifer Schroeder (Young Harris College)
#87 Student perceptions of iteration and collaboration in research during a laboratory course  Paper ID 198  Caroline L Dahlberg (Western Washington University)*; Suzanne Lee (Western Washington University); Benjamin Wiggins (University of Washington); Leah Lily (Western Washington University)
#88 CUREing exposure to environmental chemicals from personal care products  Paper ID 219  Erika L Doctor (Lynn University); Cassandra Korte (Lynn University)
#89 Developing a sustainable, common thread research experience through multiple 100-level and 200 level science majors biology courses at a two-year community college  Paper ID 276  David A Beamer (Nash Community College)*
#90 Impact of a Course-Based Undergraduate Research Experience on Students' Science Identity: A Qualitative Approach  Paper ID 22  Alaina J. Buchanan (University of Northern Colorado)*
#91 Male and Female Perceptions of the Culture of Biological Research following a Course-based Undergraduate Research Experience  Paper ID 182  Jessica Dewey (University of Minnesota)*; Anita Schuchardt (University of Minnesota)
#92 Pilot Phase Analysis of a CURE Implementation in a Large Enrollment Introductory Biology Laboratory Course  Paper ID 187  Kelly Barry (Southern Illinois University Edwardsville)*; Christine Simmons (Southern Illinois University Edwardsville)
#93 Can Course-Specific CURES be Broadly Applicable at Diverse Institutions?  Paper ID 190  Kevin W Floyd (University of Texas at El Paso); Ginger R Fisher (University of Northern Colorado); David Esparza (University of Texas at El Paso); Jeffrey T. Olimpo (The University of Texas at El Paso)*
#94 Interviews reveal perceptions of students participating in a series of conceptually-linked Course-based Undergraduate Research Experiences  Paper ID 203  Kelly McDonald (California State University, Sacramento)*; Allison Martin (California State University, Sacramento); Salem Bitwoded (California State University, Sacramento); Heather Fletcher (California State University, Sacramento); Navneet Singh (California State University, Sacramento); Thomas Landerholm (California State University, Sacramento)
#95 Nationally expanding a CURE through new faculty development program: a case study and preliminary investigation of multi-day summer workshop.  Paper ID 213  Ashley Vater (UC Davis)*
#96 Describing instructor decisions around student ownership and collaboration in CUREs  Paper ID 215  Kelly Hogan (UNC Chapel Hill)*; John Bruno (University of North Carolina, Chapel Hill); Blaire Steinwand (University of North Carolina, Chapel Hill); Sabrina Robertson (UNC Chapel Hill); Bryant Hutson (UNC Chapel Hill)
#97 The Benefits of Iteration in a Sequence of Course-based Undergraduate Research Experiences  Paper ID 218  Caitlin Light (Binghamton University)*; Megan Fegley (Binghamton University); Nancy Stamp (Binghamton University)
#98 Investigating Student Outcomes and Evolution of Antibiotic Resistance in an Introductory Biology CURE (Course-based Undergraduate Research Experience) to Broaden Participation in STEM  Paper ID 230  Joya Mukerji (University of Washington)*; Katie J. Dickinson (University of Washington - Seattle); Liz M. Warfield (University of Washington - Seattle); Ellj J Theobald (University of Washington); Matt Sievers (University of Washington - Seattle); Mariah Hill (University of Washington); Elsa Tran (University of Washington); Grace E.C. Dy (University of Washington - Seattle); Elizabeth H. Glenski (University of Washington - Seattle); Benjamin Kerr (University of Washington); Scott Freeman (University of Washington)
#99 An Epistemic Perspective on Student Argumentation in a CURE  Paper ID 245  Dennis M Lee (Clemson University)*; Cazembe Kennedy (Clemson University); Jason Tedstone (Clemson University); Dylan Dittrich-Reed (Clemson University); Lisa Benson (Clemson University)
#100 The Elephant in the CURE Classroom: What Do We know About CUREs Taught by Graduate Teaching Assistants?  Paper ID 252  Emma C Goodwin (Portland State University)*; Kelly McDonald (California State University, Sacramento); ERIN E SHORTLIDGE (PORTLAND STATE UNIVERSITY)
#101 The Impact of a Course-based Undergraduate Research Experience (CURE) in a Non-majors Introductory Biology Course at a Community College  Paper ID 255  Katherine A Marsh (Compton College)*
#102 Mine! Microbe ownership as a gateway for project ownership and positive affect in an introductory biology CURE  Paper ID 264  Pamela Hanson (Birmingham-Southern College)*; Kevin Drace (Birmingham-Southern College)
#103 Does a CURE Improve Students' Scientific Literacy?  Paper ID 266  Brian P Teague (University of Wisconsin -- Stout)*
#104 Comparing learning and attitudes between introductory CURE and traditional lab sections over different instructors and semesters by both quantitative and qualitative measures  Paper ID 285  Iglika V Pavlova (UNC Greensboro)*
#105 **Classroom Undergraduate Research Experiences (CUREs) do no harm, and show statistically significant benefits for females.** Paper ID 295 Alaron Lewis (UW Bothell School of STEM)*; Irene Shaver (Rise Institute, Bellevue College); Gita Bangera (Bellevue College); Thelma Madziala (University of Washington, Bothell)

#106 **Seeking methods to measure underlying thinking: validating and using the LIWC software tool for STEM writing** Paper ID 145 Faith Hyun (University of California Santa Barbara); Lidia Swanson (University of Minnesota); Beverly L Smith-Keiling (University of Minnesota)*

### #107-122 Room 312

#107 **Using Project EDDIE Curricular Modules to Build Quantitative Reasoning Skills** Paper ID 13 Rebekka Darner (Illinois State University)*; Tanya Josek (Illinois State University)

#108 **Socioscientific Decision-Making in Undergraduate Students: The Role of Epistemic Cognition** Paper ID 49 Jordan D Bader (University of New Hampshire)*; Melissa L Aikens (University of New Hampshire)

#109 **Visualizing crosscutting mathematics concepts in science: Helping students (and faculty) understand rates of change** Paper ID 79 Stanley M Lo (University of California San Diego)*; Adam Burgasser (University of California San Diego); Thomas Bussey (University of California San Diego); John Eggers (University of California San Diego); Jeff Rabin (University of California San Diego); Sherry Seethaler (University of California San Diego); Laura Stevens (University of California San Diego); Haim Weizman (University of California San Diego)

#110 **Weekly e-learning journals as a tool to promote and improve metacognition in undergraduate life science majors** Paper ID 117 Seth W Hunt (University of Delaware)*; Alan L Housek-Radojic (University of Delaware)

#111 **Bioflours as a Context for Understanding Mechanistic Reasoning by Undergraduates** Paper ID 143 Sharleen Flowers (Purdue University)*

#112 **Characterizing instructional approaches to mathematics in the undergraduate biology** Paper ID 158 Fangfang Zhao (University of Minnesota)*; Linh Chau (University of Minnesota); Anita Schuchardt (University of Minnesota)

#113 **Combating cognitive load with metacognition to improve student performance in introductory genetics** Paper ID 160 Gretchen Wettstein (University of Colorado Boulder)*; Jenny Knight (University of Colorado, Boulder)

#114 **Developing a teaching intervention to promote effective transfer across biological phenomena using general quantitative relationships** Paper ID 167 Mallory Jackson (University of Washington)*; Emily Scott (University of Washington); Mary Pat Wenderoth (University of Washington); Jennifer H Doherty (University of Washington)

#115 **Persistent Insect Misconceptions** Paper ID 293 Emma Wester (East Carolina University)*

#116 **A collaborative digital approach to building primary paper literacy within a framework that fosters critical high-level skills in data analysis and interpretation** Paper ID 298 Revati Masilamani (Tufts University)*

#117 **Students’ Mechanistic Explanations Across Undergraduate Chemistry and Biology Courses** Paper ID 210 Melanie Cooper (Michigan State University); Joelyn de Lima (Michigan State University); Kenna Noyes (Michigan State University); Christina Schwarz (Michigan State University); Caleb M Trujillo (Michigan State University); Jon Stoltzfus (Michigan State University)*

#118 **Comparison of Analytic and Holistic Coding Approaches and Machine Learning Performances Across A Flux Learning Progression** Paper ID 194 Lauren J Jescovitch (Michigan State University)*; Emily Scott (Univ. Washington); Jack Cerchiara (University of Washington); Mark Urban-Lurain (Michigan State University); John Merrill (Michigan State University); Jennifer H Doherty (University of Washington); Kevin Haudek (Michigan State University)

#119 **Contribution of Course-Associated Labs to Student Mastery of Lecture Content at a PUI: A Pilot Study** Paper ID 179 Jennifer Bankers-Fulbright (Augsburg University)*; Demey Everett (Augsburg University); Alana Goodson (Augsburg University)

#120 **Exploring the role of motivation on retention of conceptual knowledge and model-based competencies** Paper ID 135 Bethany J Gettings (Michigan State University)*; Tammy M Long (Michigan State University)

#121 **The effectiveness of virtual labs in introductory Biology course in promoting basic laboratory techniques.** Paper ID 34 Douglas Ayega (University of North Texas)*

#122 **Characterizing students’ graphing practices in pen-and-paper and digital formats** Paper ID 65 Elizabeth Suazo-Flores; Anupriya Karippadath; Stephanie M Gardner (Purdue)*; Joel Abraham (CSU Fullerton); Eli Meir (SimBio); Susan Maruca (SimBio)

### #123-138 Room 330

#123 **Exploring Student Self-Efficacy Through Quantitative Biology Group Work** Paper ID 107 Alexander Kulacki (University of New Hampshire)*; Melissa L Aikens (University of New Hampshire)

#124 **Modification of the Experimental Design Ability Test to Assess Learning Gains in Introductory Chemistry Laboratories** Paper ID 206 Elijah Farley (University of Minnesota Duluth Department of Chemistry)*; Victoria Fringer (1996); Zoe Suter (University of Minnesota Duluth); Jacob W Wainman (University of Minnesota Duluth)

#125 **Where to sit? Student seating preference, motivation, and performance in introductory biology.** Paper ID 242 Chloe Wasendorf (Iowa State University)*; Nancy Boury (Iowa State University)
#126 How do STEM instructors use the first day of class? Aligning noncontent instructor talk with topics covered on the first day of class  
Paper ID 243  A. Kelly Lane (University of Nebraska-Lincoln)*; Claire Meaders (Cornell University); Justin Shuman (University of Nebraska-Lincoln); Michelle Smith (Cornell University); MacKenzie Stetzer (University of Maine); Erin Vinson (University of Maine); Marilyne Stains (University of Nebraska-Lincoln); Brian Couch (University of Nebraska-Lincoln)

#127 Investigating pre-class activities to support argumentation-to-learn in large-lecture introductory biology  
Paper ID 250  Erika Offerdahl (Washington State University)*; Andy Cavagnetto (Washington State University); Jessie Arneson (Washington State University); Jacob Woodbury (Washington State University); Larry Collins (Washington State University)

#128 Can we influence student success in groupwork? The impact of lab group composition on student outcomes  
Paper ID 261  Tanya Tan (Simon Fraser University); Onkar Bains (Simon Fraser University); Erin Barley (Simon Fraser University); Joan C Sharp (SFU); Megan Barker (Simon Fraser University)*

#129 Agents of Change - Face to Face and Hybrid Introductory Biology course modifications along Vision and Change guidelines.  
Paper ID 287  Rachael Hannah (University of Alaska Anchorage)*; Cindy Trussell (University of Alaska Anchorage); Kathryn Schild (University of Alaska Anchorage)

#130 Inspiring Evidence-Based Teaching Innovations with the Journal CourseSource  
Paper ID 14  Erin Vinson (University of Maine)*; Michelle Smith (Cornell University)

#131 Democratizing Science Communication Training Access for STEM Graduate Students  
Paper ID 18  Melissa R McCartney (Florida International University)*; Tessy Ritchie (USNA); Idarabasi Akpan (Florida International University); Hannah Opris (Florida International University)

#132 Biology Graduate Students Perceptions of Research and Teaching: An Ecological Approach  
Paper ID 68  Joshua W Reid (Middle Tennessee State University)*; Grant E Gardner (Middle Tennessee State University)

#133 “Time spent on outreach is time spent away from research”: Do STEM graduate students experience conflict between research and outreach activities?  
Paper ID 78  Margarete A Romero (University of Tennessee)*; Beth Schussler (“University of Tennessee, Knoxville”)

#134 The effects of a semester-long pedagogical training on the teaching knowledge and mentoring relationships of graduate and undergraduate teaching assistants  
Paper ID 81  Mitra Asgari (Cornell University)*; Frank R. Castelli (Cornell University); Mark A. Sarvary (Cornell University)

#135 Detecting the Winds of Change: Classroom Observations and Syllabi as independent indicators of instructor transition  
Paper ID 138  Rebecca S Reichenbach (North Dakota State University)*; Madison Milbrath (North Dakota State University); Lisa M Montplaisir (North Dakota State University)

#136 Survey data support international graduate students as biology instructors  
Paper ID 141  Lisa L Walsh (University of Michigan)*

#137 Graduate Teaching Assistants’ Cognition Related to Teaching: A Comparison of STEM and Non-STEM Groups  
Paper ID 183  Dirhat M Mohammed (MTSU)*; Grant E Gardner (Middle Tennessee State University)

#138 Analysis of instructional practices used by graduate teaching assistants in response to training that incorporates pedagogical content knowledge  
Paper ID 184  Jenna Hicks (University of Minnesota)*; Michael Abebe (University of Minnesota); Jessica Dewey (University of Minnesota); Anita Schuchardt (University of Minnesota)

#139-154 room 412

#139 Titles used by undergraduate students to refer to their instructors: Effects of instructor gender and age  
Paper ID 185  Courtni Horsley (Brigham Young University); Naomi Marshall (Brigham Young University); Elizabeth G Bailey (Brigham Young University)*

#140 An exploration of the benefits of the undergraduate teaching assistant (UTA) experience across biology courses and other STEM courses at an R1 research-focused university.  
Paper ID 200  Frank R. Castelli (Cornell University)*; Mark A. Sarvary (Cornell University)

#141 Anchoring the Adrift: Developing an instructional training program for our teaching assistants  
Paper ID 201  Elizabeth MY Steves (Simon Fraser University)*; Megan Barker (Simon Fraser University)

#142 Empirical insights into the negative mentoring experiences of doctoral students  
Paper ID 208  Trevor T Tuma (University of Georgia)*; Benjamin Huluquist (University of Georgia); Erin Dolan (University of Georgia)

#143 Examining Graduate Teaching Assistants’ Knowledge and Confidence with Inclusive Teaching Practices After Targeted Professional Development  
Paper ID 221  Meaghan Stein (University of Minnesota); Seth Thompson (University of Minnesota)*

#144 Meeting the needs of current and future biology teachers with a hybrid online/in-person approach that teaches biology concepts and pedagogy  
Paper ID 232  Elizabeth A Genne-Bacon (Tufts University School of Medicine)*

#145 Modeling the effect of social interactions on the instructional decisions of biology faculty  
Paper ID 237  Melody McConnell (North Dakota State University)*; Lisa M Montplaisir (North Dakota State University); Erika Offerdahl (Washington State University)
#146 Development of an in-depth training guide for a Scientific Teaching observation tool Paper ID 240 Emily Bremers (University of Nebraska-Lincoln)*; Jameson DeFreece (University of Nebraska-Lincoln); Mary Durham (University of Nebraska-Lincoln); Brian Couch (University of Nebraska-Lincoln)

#147 How teaching experience and professional development impacts GTA approaches, self-efficacy, and knowledge of student-centered learning at two universities Paper ID 244 Heather D. Vance-Chalcraft (East Carolina University)*; Kari Nelson (University of Nebraska Medical Center)

#148 Professional Development for All: Practices to Broaden Participation in Education Reform Paper ID 257 Christopher Beck (Emory University)*; Rachelle Spell (Emory University); Lawrence Blumer (Morehouse College); Pamela Hanson (Birmingham-Southern College); Joanna Vondrasek (Piedmont Virginia Community College)

#149 Are PIs’ supervisory responsibilities impacting the power dynamics with their trainees, and trainees’ ability to attain their training goals? Paper ID 275 Laurence Clement (University of California, San Francisco)*; Karen Leung (City College of San Francisco); James Lewis (City College of San Francisco); Naledi Saul (University of California, San Francisco)

#150 Being a Learning Assistant: A Potential Pathway to Improve Students’ Self-efficacy, Science Identity, and Metacognition. Paper ID 288 Natalia Caporale (UC Davis)*; Jia Tan (UC Davis)

#151 Self-perception of Research Ability and Performance of Experimental Design Among First-Semester Bioscience Doctoral Students Paper ID 290 Madhvi J Venkatesh (Harvard Medical School)*

#152 Increasing retention by involving students in an undergraduate research program during their introductory experience: Results of matched-pairs and mixed methods analyses. Paper ID 122 Edward A Leone (Oklahoma State University)*; John Stewart (Oklahoma State University); Lucy Bailey (Oklahoma State University); Coral Rewasiewicz (Oklahoma State University); Donald French (Oklahoma State University)

#153 Expert and novice conceptions of the biotic impacts of climate change paper ID 26 Emily Holt (University of Northern Colorado)*; Julie Sexton (University of Northern Colorado); Krystal Hinerman (Lamar University); Alicia Romano (University of Northern Colorado)

#154 Novice and expert: what happens when students interview a scientist about their research? Paper ID 28 Kyriaki Chtzikyrtakiou (Florida International University); Cynthia Cabrera (Florida International University); Melissa R McCartney (Florida International University)*