Welcome & Plenary Session

9:15 am-11:00 am
Real-time/ live

Welcome
Eileen Parsons, NARST President

Plenary Keynote Title: Beyond Buzzwords: Reimagining the Default Settings of Science & Society
Keynote Presenter: Ruha Benjamin, Princeton University

Presenter Introduction:
David Stroupe, Michigan State University
Presiders:
Terrell Morton, University of Missouri
Beth Covitt, University of Montana
Alison Cullinane, University of Oxford

Plenary Abstract: From everyday apps to complex algorithms, data science and technology have the potential to hide, speed, and deepen discrimination, while appearing neutral and even benevolent when compared to racist practices of a previous era. In this talk, Ruha Benjamin explores a range of discriminatory designs that encode inequity – what she terms the “New Jim Code.” This presentation takes us into the world of biased bots, altruistic algorithms, and their many entanglements, and provides conceptual tools to decode tech promises with historical and sociological insight. In so doing, Ruha will also focus on the role of STEM education as the ground zero for reimagining and retooling the default settings of science, technology, and society.

Award 2020 & 2021 DCRA Citations

11:00 am-11:30 am
Presider: Noemi Waight, University of Buffalo

Networking / Social Sessions

11:30pm -1:30 pm
Real-time/ live

Participate in the “round robin.” Please visit committees in 15-minute segments from 11:30-12:15. Meet the leadership and find out more about any three of the following:
- Awards Committee
- Elections Committee
- External Policy and Relations Committee
- Program Committee
- Research Committee
- Website Committee

Drop-In Visit #1: 11:30 am-11:45 am
Drop-In Visit #2: 11:45 am-12:00 pm
Drop-In Visit #3: 12:00 pm-12:15 pm

Following the drop-in visits, please join the business meeting of a committee from 12:30-1:30 (except for the Elections Committee scheduled on Friday, April 9th from 8:30 am-9:30 am).

LUNCH BREAK (on your own)
11:30am -12:30pm
Wednesday, April 7, 2021

Research Interest Groups (RIGs) Meetings

Continental and Diasporic Africa in Science Education (CADASE)
12:30pm – 1:30pm
Real-time/ live
Presiders: Mary Atwater, University of Georgia
Rona Robinson-Hill, Ball State University

The mission of CADASE is to support research in science education that will have a positive impact on the lives of people of African ancestry. This is accomplished by (a) encouraging science educators to engage in research aimed at meeting the needs of people of African ancestry; and (b) providing intellectual, professional, and personal space for science educators engaged in such research.

At the 2021 business meeting, CADASE members will approve the minutes of the last business meeting-2019, receive information about how to become a CADASE member, hear a brief treasurer report, learn about the election procedures for the candidates, and break out into rooms in which the CADASE Standing Committees will meet.

Contemporary Methods for Science Education Research
12:30pm – 1:30pm
Real-time/ live
Presiders: Robert Talbot, University of Colorado Denver; Joe Taylor, University of Colorado Colorado Springs

The broad purpose of this RIG is to advance the mission of NARST by maintaining the rigor of science education studies, as well as promoting more standardized research practices across the organization such that we are better able to learn from and synthesize each other’s work. The intent is that these outcomes will, in turn, allow us to keep advancing the field and maintain the relevance of our research to improving science teaching and learning. At the 2021 Business Meeting, the RIG members will discuss current and future projects and identify folks interested in participating in these projects. We will also discuss RIG leadership positions in preparation for the upcoming election.
Wednesday, April 7, 2021

Concurrent Session # 1 (Format: Real Time / Live)
1:45 pm-3:15 pm

Administrative Sponsored Session
Strand 11: Cultural, Social, and Gender Issues

Engaging Science Education Research and Praxis for the Good of the “Public” Amid Global Pandemics
1:45 pm -3:15 pm
Real time/ live

Presenters:
Bryan Brown, Stanford University
Angela Calabrese-Barton, University of Michigan
Natalie King, Georgia State University
Okhee Lee, New York University
Jomo Mutegi, Indiana University, IUPUI
Vanessa Grady, Georgia State University
Laura Peña, Georgia State University
Elizabeth Davis, University of Michigan
Leslie Herrenkohl, University of Michigan
Day Greenberg, Michigan State University

Effects of preservice biology teachers’ conceptions of purpose on engagement of learners’ funds of knowledge
Matthew Shackley, University of California - Santa Barbara

Engaging in Sensemaking For Equity: STEM Teacher Professional Development in Core Practices
Karen Woodruff, Montclair State University

Investigating Perceptions, Experiences, and Collectivism within Interdisciplinary Collaborations: A National Survey
Katie McCance, North Carolina State University

The Girl Boat: Shifting marginalized Mexican students’ identities, participation, and agency through community conservation
Kelsie Fowler, University of Washington

Rachel Juergensen, University of Missouri Columbia

Towards a Conceptual Profile of Chemical Control
Klaudja Caushi, University of Massachusetts Boston

Biology Methods: A Course in Need of a Catalogue
Cole Entress, Columbia University

A Portrait of Identity and Context: Manifestation of Postsecondary STEM Teaching
Sule Aksoy, Syracuse University

Going Virtual: Underrepresented Student Experiences in a Virtual Computing Camp
Kristina Kramarczuk, University of Maryland, College Park

Intersectionality of Black Male College Students: Their Science Identity, Science Learning, and Science Profession Decisions
Regina McCurdy, University of Central Florida

Administrative Sponsored Session
Graduate Student Committee

Graduate Student Research Symposium
1:45pm-3:15pm
Real time/ live / posters

Presiders:
Christa Haverly, Northwestern University
Kathryn Green, University of Georgia
Melanie Kinskey, Sam Houston State University
Theila Smith, University of Groningen
Timothy Klavon, Temple University
Lindsay Lightner, Washington State University
Jessica Karch, University of Massachusetts Boston
Chelsea Sexton, University of Georgia
Klaudja Caushi, University of Massachusetts – Boston
Ayca Fackler, University of Georgia
An Investigation of Undergraduate Students' Spatial Thinking about Groundwater
Holly White, University of Nebraska - Lincoln

Tracking elementary pre-service teachers' teaching efficacy and attitudes towards STEM after engagement with nanotechnology basics
Martyna Laszcz, University of Massachusetts Boston

Elementary Teachers’ Verbal Support of Disciplinary Integration in an NGSS-Aligned Unit
Sarah Lilly, University of Virginia

Exploring Epistemic Practices of Middle School Students in Collaborative Contexts
Ramya Sivaraj, University of Minnesota

Informal Education Outreach to Combat Deficit SciComm Training in University STEM Students
Brenda Guerrero, Florida International University

How Do Young Children Learn Science through Narrative, Embodiment, and Play?
Kyungjin Cho, Pennsylvania State University

An Exploration of Urban Latinx Youth Growth Mindsets in a Middle School Science Classroom
Mark Waka, University of Buffalo

What are the sources of teaching self-efficacy for international graduate students? A survey study
Zhigang Jia, Middle Tennessee State University

Administrative Sponsored Session
Indigenous Science Knowledge Research Interest Group

Science Education, a Public Good for the Good of the Public? Contributing Indigenous Methodologies to Teaching, Learning and Research
1:45pm-3:15pm
Real time/ live

Presenters:
Julie Robinson, University of North Dakota
Joshua Hunter, University of North Dakota
Bonni Gourneau, University of North Dakota
Anna Bahnson, United Tribes Technical College
Pauline Chinn, University of Hawai‘i at Manoa
Dinesh Gautam, Shree Jagadamba Higher Secondary School
Yun-Ciao Wang, National Museum of Marine Biology and Aquarium
Bhaskar Upadhyay, University of Minnesota
Paichi Shein, National Sun Yat-sen University
Peresang Sukinarhimi, Rukai Cultural Museum of the Indigenous People Cultural Development Center
Strand 1: Science Learning: Development of Student Understanding

*Ethics and Decision-Making in Science Education*
1:45 pm - 3:15 pm
Real time/ live
**Presider:** Amy Farris, Pennsylvania State University

**Developing and Using Multiple Models to Promote Scientific Literacy**
Li Ke, University of North Carolina at Chapel Hill
Troy Sadler, University of North Carolina at Chapel Hill
Laura Zangori, University of Missouri - Columbia
Patricia Friedrichsen, University of Missouri - Columbia

**Consideration of participatory ethics when eliciting etic and emic perspectives of learning**
Sarah Frodsham, Oxford Brookes University
Deb McGregor, Oxford Brookes University

**Defining Skills Required in the Decision-Making Process around Socioscientific Issues**
Caitlin Kirby, University of Nebraska – Lincoln
Amanda Sorensen, Michigan State University
Jenny Dauer, University of Nebraska – Lincoln

Strand 2: Science Learning: Contexts, Characteristics and Interactions

*Contexts, Characteristics, and Interactions in Science Education*
1:45 pm - 3:15 pm
Real time/ live
**Presider:** Susanna Hapgood, University of Toledo

**Sounds of Science Sensemaking: Interrogating the Norms of Learning Spaces with Acoustemology and Critical Frames**
Michelle Brown, Pennsylvania State University
Frances Nebus Bose, Pennsylvania State University
Carla Zembal-Saul, Pennsylvania State University

**The Influence of Teacher Questioning Approaches on Students’ Productive Thinking**
Anne Emerson Leak, High Point University
Corrie Bruce, High Point University
Selcen Guzey, Purdue University

**Defining the Future and Standing Apart: Opportunity Structures at an Urban, Inclusive STEM-Focused High School**
Jennifer Tripp, University of Buffalo
Noemi Waight, University of Buffalo

**What’s the Point?: Student Perspectives on Computation in Physics Class**
Paul Hamerski, Michigan State University
Daryl McPadden, Michigan State University
Marcos Caballero, Michigan State University
Paul Irving, Michigan State University
Wednesday, April 7, 2021

Strand 3: Science Teaching—Primary School (Grades preK-6)

Engaging Young Children in Science and Engineering Practices: A Conversation about Approaches to Research and Design
1:45 pm - 3:15 pm
Real time/ live

Dance-STEP: Collective Embodied Science Models and the Particulate Nature of Matter
Chris Georgen, Boston University

Using Iterative Co-Design to Develop Classroom Empirical Activity
Eve Manz, Boston University
Betsy Beckert, Boston University

Kindergarten Playground Collisions: Reconceptualizing Gravity as a Necessary Intellectual Resource
Michelle Salgado, University of Washington
David Phelps, University of Washington

Considerations when Engaging Young Learners in Scientific Modeling for Sense-making
Christina Schwarz, Michigan State University
Eve Manz, Boston University

Strand 4: Science Teaching—Middle and High School (Grades 5-12)

Curricular Sensemaking and Implementation
1:45 pm - 3:15 pm
Real time/ live
Presider: Magdeline Stephen, University of Witwatersrand

Changing Teacher Practice at Scale through Instructional Routines: Findings from a Field Test of High School Materials
Kiran Purohit, New Visions for Public Schools
Elizabeth Chatham, New Visions for Public Schools

Teacher planning for epistemic agency in discussion-based, storyline unit lessons
Kevin Cherbow, Boston College
Katherine McNeill, Boston College

Secondary Science Teachers Implementation of a Curricular Intervention when Teaching with Global Climate Models
Kimberly Carroll Steward, University of Nebraska – Lincoln
Devarati Bhattacharya, University of Nebraska – Lincoln
Cory Forbes, University of Nebraska – Lincoln
Mark Chandler, Columbia University

3D Alignment Between Curriculum and Assessments Matters: Results from a New Genetics Curriculum Field Test
Ann Lambert, University of Utah
Dina Drits-Esser, University of Utah
Sheila Homburger, University of Utah
Kristin Fenker, University of Utah
Molly Malone, University of Utah
Louisa Stark, University of Utah
**Wednesday, April 7, 2021**

### Strand 5: College Science Teaching and Learning (Grades 13-20)

**Intersection of Socio-cultural factors and college STEM**
1:45 pm - 3:15 pm  
Real time/ live  
**Presider:** Andy Cavagnetto, Washington State University

**BioTAP: Barriers and Supports to Conducting Science Education Research on Graduate Student Teaching Development Practices**
Grant Gardner, Middle Tennessee State University  
Judith Ridgway, Ohio State University  
Gili Marbach-Ad, University of Maryland  
Kristen Miller, University of Georgia  
Elisabeth Schussler, University of Tennessee Knoxville

**Facilitating First-Generation College Student Persistence in STEM Majors**
Lisa Marco-Bujosa, Villanova University  
Lauren Baker, Villanova University

**Using Cultural-Historical Activity Theory to Understand an Interdisciplinary Team’s Co-Development of High School Lab Activities**
Katherine McCance, North Carolina State University  
Stephanie Teeter, North Carolina State University  
Margaret Blanchard, North Carolina State University  
Richard Vanditti, North Carolina State University

**Productive Patterns of Overcoming Struggle During Undergraduate Chemistry Laboratory Activities**
Clarissa Keen, University of Massachusetts Boston  
Hannah Sevian, University of Massachusetts Boston

### Strand 6: Science Learning in Informal Contexts

**Youth Centered Informal Science**
1:45 pm - 3:15 pm  
Real time/ live  
**Presider:** Ngozi Okafor, University of Lagos

**A Mixed Methods Study of Youths’ STEM Interests in an After-School Club**
Deena Gould, University of New Mexico  
Ian Gould, Arizona State University

**The Design and Development of a Youth-Centered Art-Science Program**
Megan McKinley-Hicks, Boston College  
Michael Barnett, Boston College  
Helen Zhang, Boston College  
Ariella Suchow, Boston College

**Adding narrative elements to engineering activities evokes empathy and supports girls’ use of engineering practices**
Susan Letourneau, New York Hall of Science  
Dorothy Bennett, New York Hall of Science  
ChangChia Liu, New York Hall of Science  
Yessenia Argudo, New York Hall of Science  
Dana Schloss, New York Hall of Science  
Amelia Merker, New York Hall of Science  
Satbir Multani, New York Hall of Science  
Katherine Culp, New York Hall of Science

**Hearing the Engineering in Children’s Talk**
Ron Skinner, MOXI, The Wolf Museum of Exploration and Innovation  
Danielle Harlow, University of California at Santa Barbara  
Alexandria Muller, University of California at Santa Barbara
Wednesday, April 7, 2021

Strand 7: Pre-service Science Teacher Education

*Equity-driven approaches among pre-service teachers*
1:45 pm - 3:15 pm
Real time/ live
**Presider:** Scott Cohen, Georgia State University

Examining Relevance in Pre-service Science Teacher Lesson Plans
Kirby Whittington, Gooru.Org
Sherry Southerland, Florida State University
Miray Tekkumru Kisa, Florida State University

Pre-Service Science Teachers' Development of Equitable and Just Approaches to Practice in University Methods Coursework
Rachel Gordon, University of Michigan

'Staying with the Trouble': Praxis Crisis in Science Teacher Education for Emergent Bilingual Learners
Sara Tolbert, Te Whare Wananga O Waitaha
University of Canterbury
Caroline Spurgin, University of California- Santa Cruz
Doris Ash, University of California- Santa Cruz

"Others have it, why can't they?" Leveraging collaborative inquiry in science teacher education
Christina Macias, California State University- Fresno
Myunghwan Shin, California State University- Fresno

Strand 8: In-service Science Teacher Education

**Approaches to PD Supporting Teacher Learning**
1:45 pm - 3:15 pm
Real time/ live
**Presider:** Elizabeth Lewis, University of Nebraska– Lincoln

Comparing Contexts for Professional Development: Student Work Analysis and Video Club
Heather Johnson, Vanderbilt University
Andrea Henrie, Vanderbilt University
Bethany Daniel, Vanderbilt University
Ashlyn Pierson, Ohio State University
Danielle Kiefert, University of North Texas

Elementary Science Teachers’ Purposes and Practices for Connecting Multiple Representations
Ashlyn Pierson, Ohio State University
Danielle Kiefert, University of North Texas
Sarah Lee, Vanderbilt University
Heather Johnson, Vanderbilt University
Andrea Henrie, Vanderbilt University

Supporting Science Instruction with Vertical Teams: Teachers’ Perceptions of Mixed Grade-Band Professional Learning Communities
Daniel Pimentel, Stanford University
Tammy Moriarty, Stanford University
Janet Carlson, Stanford University

Preparing Science Educators for Contextualized Instruction
Kassandra L'Heureux, Université de Sherbrooke
Michael Giamellaro, Oregon State University
Marie-Claude Beaudry, Université de Sherbrooke
Jean-Philippe Ayotte-Beaudet, Université de Sherbrooke
Cory Buxton, Oregon State University
Talal Alajmi, Oregon State University
**Wednesday, April 7, 2021**

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**Strand 10: Curriculum and Assessment**

*NGSS aligned assessment and instruction*
1:45 pm - 3:15 pm
Real time/ live
**Presider:** Marcus Kubsch, Leibniz Institute for Science and Mathematics Education

*Noticing-Sensemaking-Modeling: A Framework for the Crosscutting Concepts*
Lori Andersen, University of Hawaii at Manoa

*A Three-Dimensional Integrated Learning Progression and Aligned Assessments to Monitor Middle School Student Proficiency of Energy, Modeling and Cause and Effect*
Namsoo Shin, Michigan State University
Peng He, Michigan State University
Tingting Li, CREATE for STEM Institute
Joseph Krajcik, Michigan State University

*Bridging the Gap: Evaluating a Design Approach for Curriculum-neutral NGSS Benchmark Assessments in Middle School*
Maia Binding, University of California Berkeley - Lawrence Hall of Science
Lauren Brodsky, University of California Berkeley - Lawrence Hall of Science

*Validating a Claim-Evidence-Science Idea-Reasoning (CESR) Framework for use in NGSS assessment Tasks*
Joseph Hardcastle, American Association for the Advancement of Science
Cari Herrmann Abell, BSCS Science Learning
George De Boer, American Association for the Advancement of Science

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**Strand 11: Cultural, Social, and Gender Issues**

*Science Identity*
1:45 pm - 3:15 pm
Real time/ live
**Presider:** Terrell Morton, University of Missouri-Columbia

*Figured Worlds of Successful Women in Science During Their School Years*
Jonathan Hall, University of West Florida

*Novice to Expert: Science Identity Development in Academically Proficient Students at an HBCU*
Karen Marshall, Oakwood University
Carmen Bucknor, Oakwood University
Sylvia James, National Science Foundation
Christyn Byrd, Oakwood University
Tatiana Fowler, Oakwood University

*Promoting Scientific Literacy for All in the Classroom*
Gianna Lopez-Colson, University of Texas Rio Grande Valley
Miriam Ortiz, University of Texas Rio Grande Valley

*Afterschool STEM Program as a Transformative Space for Teachers to Support Relationship Building with Students*
Ti’Era Worsely, University of North Carolina at Greensboro
Sara Heredia, University of North Carolina at Greensboro
Strand 12: Technology for Teaching, Learning, and Research

Reconstructing Reality through Simulations to Enable Classroom Enactment of Science Practices
1:45 pm - 3:15 pm
Real time/ live
Presider: Hee-Sun Lee, The Concord Consortium
Discussant: Scott McDonald, Pennsylvania State University

Presenters:
Hee-Sun Lee, The Concord Consortium
Scott McDonald, Pennsylvania State University
Amy Pallant, The Concord Consortium
Chris Lore, The Concord Consortium
Jie Chao, The Concord Consortium
Gey-Hong Gweon, Physics Front
Charles Conner, University of South Florida
Trudi Lord, The Concord Consortium
Lisa Hardy, The Concord Consortium

Strand 13: History, Philosophy, Sociology, and Nature of Science

Socioscientific Issues
1:45 pm - 3:15 pm
Real time/ live
Presider: Shaghig Chaparian, American University of Beirut

University Biology Students' Pandemic Decisions: The Role of COVID-19 Science Beliefs and Sociocultural Membership
Benjamin Herman, Texas A&M University
Michael Clough, Texas A&M University
Asha Rao, Texas A&M University
Joanne Olson, Texas A&M University
Alister Olson, Texas A&M University
Alex Sobota, Texas A&M University
Sarah Poor, Texas A&M University

Exploring Undergraduates' Breadth of Socio-Scientific Reasoning through Domains of Knowledge
David Owens, Georgia Southern University
Troy Sadler, University of North Carolina at Chapel Hill
Destini Petitt, University of Nebraska-Lincoln
Corey Forbes, University of Nebraska-Lincoln

Changes in NOS Understandings after Engaging in Reflective Discussions and Information Evaluation about Socioscientific Issues
Shaghig Chaparian, American University of Beirut
Saouma Boujaoude, American University of Beirut

Reviving the Orchard: Visions of Reclaiming Science Education for Nicaragua
Kelsie Fowler, University of Washington
Strand 14: Environmental Education and Sustainability

Sociocultural and Situated Perspectives of Environmental Science Education
1:45 pm - 3:15 pm
Real time/ live
Presider: Tamara Peffer, Pennsylvania Department of Education

An Inclusive Model of Theoretical Rigor in Environmental Education
Roberta Hunter, Michigan State University
Gail Richmond, Michigan State University

Productive Disciplinary Engagement in Three-Dimensional Agriscience Instruction
Craig Kohn, Michigan State University

A Situated Learning Approach for Designing and Implementation Educational Escape Games about Healthy Nutrition
Tal Yachin, Technion - Israel Institute of Technology
Miri Barak, Technion - Israel Institute of Technology

Environmental science curriculum development in local communities: A 'Cultural Historical Activity Theory' perspective
Xavier Fazio, Brock University

Strand 15: Policy, Reform, and Program Evaluation

Science teacher resiliency, commitments, and disciplinary sense-making within complex systems
1:45 pm - 3:15 pm
Real time/ live
Presider: Kathryn Bateman, Temple University

Self-Efficacy and Commitment of Mid and Late Career High School Science Teachers
Dorothy Holley, West Johnston High School
Soonhye Park, North Carolina State University

Disciplinary Conflation in Integrated Science and Engineering
Jacob Pleasants, Keene State College
Ilíana De La Cruz, Texas A&M University

Are the best and brightest high school students interested in science or mathematics teaching careers?
Travis Fuchs, University of British Columbia
Gerhard Sonnert, Harvard Smithsonian
Sandra Scott, University of British Columbia
Philip Sadler, Harvard Smithsonian

Perceptions of Coherence: Learning About Systems and Structures Through Participatory Redesign and Implementation
William Lindsay, University of Colorado Boulder
### Administrative Sponsored Session

#### Graduate Student Committee

**Graduate Student Forum**
3:30 pm - 5:00 pm  
Real time / live

The forum aims to guide and encourage beginning researchers by discussing the various parts of a graduate career, including getting involved in NARST, completing the dissertation, or searching for a position. Attendees of the forum are given the opportunity to participate in discussions with experienced colleagues on matters of academic and career interest.

### Administrative Sponsored Session

#### Membership Committee

**Mentor-Mentee Nexus**
5:00 pm - 6:00 pm  
Real-time / live

**Presiders**: ReAnna Roby, Vanderbilt University  
Shirly Avargil, Technion Israel Institute of Technology  
Sule Aksoy, Syracuse University

This session serves as a context for those first-time attendees, or those relatively new, to NARST (i.e. Mentee) to interact with more experienced NARST members (i.e. Mentor). Session leaders facilitate the introduction of mentors and mentees by identifying and matching interested parties and creating an environment that supports communication among mentors and mentees.
NETWORKING/ SOCIAL SESSIONS
6:00 pm-8:00 pm
Real Time/ Live

Participate in the “round robin.” Please visit committees in 15-minute segments from 6:00-6:45 pm. Meet the leadership and find out more about any three of the following:
• Equity and Ethics Committee
• Membership Committee
• Publications Advisory Committee
• Graduate Student Committee
• International Committee

Drop-In Visit #1: 6:00 pm-6:15 pm
Drop-In Visit #2: 6:15 pm-6:30 pm
Drop-In Visit #3: 6:30 pm-6:45 pm

Following the drop-in visits, please join the business meeting of a committee from 7:00-8:00 pm.
Thursday, April 8, 2021

Thursday 8:00am through Friday 7:00am

**Poster Session #1**

Posters are available for viewing for a 23-hour window for asynchronous interactions. Attendees can view the poster at the indicated link and post comments to which the presenter may respond. The posters in Session 1 will become inactive and inaccessible after Friday, 7:00 am. For a complete listing of Thursday’s posters, please refer to the end of the Thursday schedule.

**Author-scheduled 30-minute Q&A sessions**

Presenters will pre-record their presentations. Attendees will view the recorded presentations in advance of the Q&A session. Presenters will schedule a 30-minute block (like “office hours”) on a sign-up sheet in advance of the conference. The scheduled time will be listed in the conference program.

6:30am-8:00am
Real time/ Live

**Administrative Sponsored Session**

**International Committee**

*Promoting an International Agenda for Research and Science Teacher Education to Improve Science and Special Education*

6:30am-8:00am
Real time/ live

**Presenters:**
Sonya Martin, Seoul National University
Ileana Greca, Universidad de Burgos
Eva Silfver, Umeå University, Sweden
Ying-Ting Chiu, The Ohio State University
Da Yeon Kang, Seoul National University
Sungmin Im, Daegu University
Daniel Cha, Daegu University
Scott Cohen, Georgia State University
Patrick Enderle, Georgia State University
Renee Schwartz, Georgia State University
Administrative Sponsored Session
Awards Committee

DCRA: On a Continuum of the Professional Scholarly Trajectories in Science Education: The Urgent Questions for the Next Generation of Science Education Research
8:00am-9:30am
Real time/ live

Presenters:
Noemi Waight, University at Buffalo

Concurrent Session # 2 (Real Time / Live)
8:00am -9:30am

Strand 1: Science Learning: Development of Student Understanding

Science Learning through Modeling
8:00am-9:30am
Real time/ Live
Presider: Sharona Levy, University of Haifa

Modeling-based Inquiry Instruction for promoting 10th graders' modeling competence and conceptual understanding of the Periodic Table
Mei-Hung Chiu, National Taiwan Normal University
Mao-Ren Zeng, National Taiwan Normal University and Municipal Dazhi High School, Taipei
Shiao-Lan Chung, New Taipei Municipal and New Taipei Senior High School
Jing-Ping Jong, New Taipei Municipal Jinhe High School

Enhancing Student Modeling within an Integrated Chemistry and Earth Science Curriculum
Jonathan Grooms, George Washington University
Kevin Fleming, George Washington University
Alan Berkowitz, Cary Institute of Ecosystem Studies
Bess Caplan, Cary Institute of Ecosystem Studies

Climate Education in Secondary Science: Comparison of Model-Based and Non-Model- Based Investigations of Global Climate Data
Devarati Bhattacharya, University of Nebraska
Kimberly Carroll Steward, University of Nebraska - Lincoln
Corey Forbes, University of Nebraska – Lincoln
Strand 2: Science Learning: Contexts, Characteristics and Interactions

**Community & Social Factors in Identity, Motivation, and Learning**
8:00am-9:30am
Real time/ Live

**Presider:** Cesar Delgado, North Carolina State University

**Factors Contributing to Career Aspirations: Access to Science Resources and People**
M. Gail Jones, North Carolina State University
Katherine Chesnutt, North Carolina State University
Megan Ennes, University of Florida
Emily Cayton, Campbell University

**Health in Our Hands: A community-inspired project-based learning approach to support social and emotional learning**
Idit Adler, Tel Aviv University
Consuelo Morales, Michigan State University
Irene Bayer, Michigan State University
Tali Tal, Technion - Israel Institute of Technology
Joseph Krajcik, Michigan State University

**Gender Differences in STEM Classroom Emotional**
Felicity McLure, Curtin University
Barry Fraser, Curtin University
Rekha Koul, Curtin University

**Capturing Chemical Control Speaking, Thinking and Doing**
Klaudja Caushi, University of Massachusetts – Boston
Hannah Sevian, University of Massachusetts – Boston

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**Strand 2: Science Learning: Contexts, Characteristics and Interactions**

**Studying Contestations of Hegemonic Science Education as Public Good**
8:00am -9:30am
Real time/ live

**Rejecting Narrow Definitions: Reimagining Equitable Science Classroom Discourse**
Enrique Suarez, University of Massachusetts – Amherst

**Children's Play in Making as Contestations and Moves to Sociopolitical Elsewhere(s)**
Natalie Davis, Georgia State University
Shirin Vossoughi, Northwestern University

**Repurposing the Physics Classroom for Environmental Justice**
Jasmine Jones, University of Illinois at Chicago

**Co-designing Professional Development to Support Science Teachers Transdisciplinary Learning**
Daniel Morales-Doyle, University of Illinois at Chicago
Alejandra Frausto, Chicago Public Schools
Mindy Chappell, University of Illinois at Chicago
Tiffany Childress Price, University of Illinois at Chicago
Abel Farias, University of Illinois at Chicago
Thursday, April 8, 2021

Strand 3: Science Teaching—Primary School (Grades preK-6)

Engaging Students in Science and Engineering Practices
8:00am-9:30am
Real time/ Live
Presider: Anna Maria Arias, Kennesaw State University

Teaching evolution in a 5th grade Spanish classroom: "Why do we have different skin colours?"
Lucia Vazquez-Ben, Universidade da Coruña, Spain
Anxela Bugallo-Rodriguez, Universidade da Coruña, Spain

An Exploratory Study on Computational Thinking in Elementary Science
Jennifer Pietros, University of Rhode Island
Sara Sweetman, University of Rhode Island

Elementary Teachers' Verbal Supports Across Science, Engineering, and Computer Science Disciplines in an NGSS-Aligned Unit
Sarah Lilly, University of Virginia
Anne McAlister, University of Virginia
Sarah Fick, Washington State University
Jennifer Chiu, University of Virginia

Implementation of NGSS Scientific Practices in Elementary Science Classrooms: A Comparative Study of Video Analysis
Peter Hu, University of Pittsburgh
Ling Liang, La Salle University
Ying-Chih Chen, Arizona State University
Takeshi Terada, Arizona State University

Strand 4: Science Teaching—Middle and High School (Grades 5-12)

Model-based Teaching and Learning
8:00am-9:30am
Real time/ Live
Presider: Zac Patterson, The Ohio State University

High School Science Teachers' Integration of Computational Thinking into Data Practices to Support Student Investigations
Erin Peters-Burton, George Mason University
Peter Rich, Brigham Young University
Laura Laclede, George Mason University
Stephanie Stehle, George Mason University
Anastasia Kitsantas, George Mason University
Timothy Cleary, Rutgers University

A Preliminary Study to Explore In-Service Science Teachers Assessment Literacy in MBT
Alexis Gonzalez-Donoso, University of British Columbia
Samia Khan, University of British Columbia

Engaging secondary school students in model-based reasoning for conceptual understanding
Shingo Uchinokura, Kagoshima University

Scientific Simulations as Educational Tools for the Post-Pandemic Era: the Case of the Susceptible-Infectious-Removed Model
Eleonora Barelli, University of Bologna
Olivia Levrini, University of Bologna
Thursday, April 8, 2021

**Strand 5: College Science Teaching and Learning (Grades 13-20)**

*Scaffolding and Support for College STEM Learning*
8:00am-9:30am
Real time/ Live
Presider: Robert Idsardi, Eastern Washington University

Vygotskian professional development for biology instructors focusing on student thinking
Sophia (Sun Kyung) Jeong, Ohio State University
Jakayla Clyburn, University of North Carolina at Greensboro
Paula Lemons, University of Georgia

Mentoring early-year undergraduate researchers: Structures and support mechanisms
Gaye Ceyhan, Bogazici University
John Tillotson, Syracuse University

A Framework Situating Failure in Developing Scientific Understanding: Investigating Students’ Scientific Failures in Undergraduate Research
Sandhya Krishnan, University of Georgia

Investigating the Relationship Between Self-Efficacy and Approach to Teaching in Undergraduate and Graduate Teaching Assistants
Cody Smith, University of Nebraska-Lincoln
Annette Wierzbicki, University of Nebraska–Lincoln
Jenny Dauer, University of Nebraska–Lincoln

**Strand 6: Science Learning in Informal Contexts**

*From 'Physical to Digital': How institutions of informal science education adapt to an online presence during the COVID-19 crisis (and beyond)*
8:00am-9:30am
Real time/ Live
Presider: Neta Shaby, Ben Gurion University of the Negev
Discussant: Ran Peleg, University of Southampton

Presenters:
Ran Peleg, University of Southampton
Neta Shaby, Ben Gurion University of the Negev
Carys Hughes, University of Southampton
Sarah Funk, Science Center Network
Claudia Sodini, K-productions
Nancy Staus, Oregon State University
Victoria Bonebrake, University of Washington
Ann Astroga, University of Washington
Elena Janniello, Università di Pisa
Antonella Gioli, Università di Pisa
Strand 7: Pre-service Science Teacher Education

*Making a Case for Emphasizing Modeling and Engineering*
8:00am-9:30am
Real time/Live
**Presider:** Jianlan Wang, Texas Tech University

**Results of Elementary Preservice Teachers’ Promotion of Norms of Interaction for Engineering Design**
Elaine Silva Mangiante, Salve Regina University
Kaitlin Gabriele-Black, Salve Regina University

**Developing Preservice Science Teachers’ Conceptions of Engineer and Engineering through an Elective STEM Course**
Nilay Ozturk, Kirsehir Ahi Evran University
Meltem Irmak, Gazi University

**Preservice Elementary Teachers Making Sense of Scientific Modeling: A Longitudinal Study**
Adam Bennion, University of Michigan
Elizabeth Davis, University of Michigan

**Dimensions of modeling: Knowledge, practice and product**
Maximillian Göhner, Freie Universität Berlin
Tom Bielik, Freie Universität Berlin
Moritz Krell, Freie Universität Berlin

Strand 8: In-service Science Teacher Education

*Curriculum and Assessment*
8:00am -9:30am
Real time/live
**Presider:** Ashley Iveland, WestEd

**Assessment for Learning: High School Science Teachers’ Performance Assessment Practices during Integrated Science Teaching**
Nam-Hwa Kang, Korea National University of Education

**Impact of Scoring the Illinois Science Assessment on K-12 Science Teachers’ Practices**
Senetta Bancroft, Southern Illinois University Carbondale
Harvey Henson, Southern Illinois University Carbondale
Daniel Brown, Illinois State Board of Education
Angela Box, Southern Illinois University Carbondale
Yanyan Sheng, University of Chicago
Jennifer Rhodes, Southern Illinois University Carbondale

**Growth in STEM Teachers’ Formative Assessment Practices as Teachers Remain in High-Need Districts**
Shahar Abramvotich, University of Massachusetts Boston
Hannah Sevian, University of Massachusetts Boston

**Expectations Regarding Students’ Knowledge and Teachers’ Content Knowledge in Particle Physics: A Comparative Study**
Anja Kranjc Horvat, CERN & University of Potsdam
Gerfried Wiener, CERN
Sascha Schmeling, CERN
Andreas Borowski, University of Potsdam
Strand 10: Curriculum and Assessment

Learning progression assessments and teachers’ classroom enactments of curricula
8:00am-9:30am
Real time/ Live
Presider: Joseph Krajcik, Michigan State University
Discussant: Knut Neumann, Leibniz Institute for Science and Mathematics Education

Presenters:
Elon Langbeheim, Ben-Gurion University of the Negev
David Fortus, Weizmann Institute of Science
Jeffery Nordine, Leibniz Institute for Science and Mathematics Education
Knut Neumann, Leibniz Institute for Science and Mathematics Education
Joseph Krajcik, Michigan State University
Hui Jin, Educational Testing Service
Hyo-Jeong Shin, Educational Testing Service
Dante Cisterna, Educational Testing Service
Erin Furtak, University of Colorado
Clarissa Deverel-Rico, University of Colorado Boulder

Strand 11: Cultural, Social, and Gender Issues

Context, gender, and guidance
8:00am-9:30am
Real time/ Live
Presider: Charnell Long, University of Wisconsin-Madison

Connections between negative academic experiences and the impostor phenomenon in STEM
Devasmita Chakraverty, Indian Institute of Management, Ahmedabad

Can the Culturo-Techno-Contextual Approach (CTCA) Dissolve the Barriers of African Students to Learning Difficult Concepts in Biology?
Peter Okebukola, Lagos State University
Franklin Onowugbeda, Lagos State University
Oluseyi Ajayi, Lagos State University
Tokunbo Odekeye, Lagos State University
Deborah Agbanimu, Lagos State University
Esther Peter, Lagos State University
Aderonke Ebisin, Lagos State University
Fred Awaah, University of Professional Studies Accra

Exploring Gender Issues in Higher Secondary Science Classroom
Mohammad Siddique, University of Dhaka
Anina Mahmud, University of Dhaka

How Biology and Physics Faculty Guide Female and URM Faculty toward Leadership, Research, and Teaching
Eugene Judson, Arizona State University
Lydia Ross, Arizona State University
Thursday, April 8, 2021

Strand 12: Technology for Teaching, Learning, and Research

**Modeling Tools that Support Thinking and Learning**
8:00am-9:30am
Real time/ Live
**Presider:** Megan Silander, Center for Children and Technology

**Using Automated Feedback to Engage Students in Discourse-Rich Modeling Practices**
Kihyun Ryoo, University of North Carolina-Chapel Hill

**The World as a Lab: Real-life Data in STEM Projects**
Lutz Kasper, University of Education Schwaebsch Gmuend
Patrik Vogt, Institute of Teacher Training, Mainz

**Students' development of mental models when constructing particle-based computational models of electric conductors**
Elon Langbeheim, Ben Gurion University of the Negev
Sharona Levy, University of Haifa
Hagit Hel-Or, University of Haifa
Janan Saba, University of Haifa

**Learning about Photosynthesis and Cellular Respiration in Plants with Cell-based Emergent Models (CEM)**
Sharona Levy, University of Haifa
Shani Goldstein, University of Haifa
Hana Anutza Almog, University of Haifa
Anat Yarden, Weizmann Institute of Science

Strand 13: History, Philosophy, Sociology, and Nature of Science

**Nature of Science in K-12 Education**
8:00am-9:30am
Real time/ Live
**Presider:** Alison Cullinane, University of Oxford

**Indiana Third/Fourth Grade Students’ Conceptions of the Nature of Scientific Inquiry**
Valarie Akerson, Indiana University
Claire Cesljarev, Indiana University
Conghui Liu, Indiana University
Judith Lederman, Illinois Institute of Technology
Norman Lederman, Illinois Institute of Technology

**Formative assessment of nature of science in a Grade 10 lesson on paradigm shift**
Wonyong Park, University of Oxford
Sibel Erduran, University of Oxford
Judith Hillier, University of Oxford

**Exploring the Nature of Science in the Italian Physics Curriculum**
Alison Cullinane, University of Oxford
Martina Caramaschi, University of Bologna
Olivia Levrini, University of Bologna
Sibel Erduran, University of Oxford

**NOS and Science Identity: “I Learned I didn't Know How to do Science”**
Robert Bennett, Georgia State University
Emily Turner, Georgia State University
Renee Schwartz, Georgia State University
Strand 14: Environmental Education and Sustainability

*Engaging with Socioscientific Issues*
8:00am-9:30am
Real time/ Live
**Presider:** Bryan Nichols, Florida Atlantic University

**Problematising intuitive universals in socioscientific reasoning: using meta-epistemic reasoning practices to link mechanisms to context**
John Ruppert, Saint Peter's University
Masiel Infante, Saint Peter’s University

**Doing Battle with the Dragons of Inaction: Place-Based SSI and Pro-Environmental Behaviors**
Mark Newton, East Carolina University
Benjamin Herman, Texas A&M University
Dana Zeidler, University of South Florida

**Middle School Students' Informal Reasoning and Argument Quality for Different SSI**
Cansu Başak Uygun, Middle East Technical University
Ozgul Yilmaz-Tuzun, Middle East Technical University
Concurrent Session # 3 (Real Time / Live)  
9:45 am - 11:15 am

**Administrative Sponsored Session**  
Publications Advisory Committee  

*NSA’s Annual Research Worth Reading Recognition*  
9:45 am - 11:45 am  
Real time/ live

**Presenters:**  
Deena Gould, Arizona State University  
Shakhnoza Kayumova, University of Massachusetts-Dartmouth  
Michael Bowen, National Science Teacher Association  
Cynthia Crockett, Harvard-Smithsonian Center for Astrophysics, Science Education Department, Cambridge, Massachusetts  
Knut Neumann, Leibniz Institute for Science Education

**Administrative Sponsored Session**  
External Policy and Relations Committee  

*Beyond Policies and Statements: Towards Equity in STEM Education*  
9:45 am - 11:45 am  
Real time/ live

**Presenters:**  
Maya Garcia, Colorado Department of Education  
André DeLeón, Nevada Department of Education  
Jamie Rumage, Oregon Department of Education  
Philip Bell, University of Washington  
Remy Dou, Florida International University  
Deb Morrison, University of Washington

**Administrative Sponsored Session**  
Research Committee  

*2019 Sandra K. Abell Institute for Doctoral Students*  
9:45 am - 11:45 am  
Real time/ live

**Presenters:**  
Gregory Rushton, Middle Tennessee State University  
Grant Gardner, Middle Tennessee State University  
Julie Luft, University of Georgia  
Anna Grinath, Idaho State University
Thursday, April 8, 2021

Strand 1: Science Learning: Development of Student Understanding

**Using Assessment to Characterize Student Knowledge**
9:45am -11:15 am
Real time/live
Presider: Cesar Delgado, North Carolina State University

Mapping Consensus and Dissensus in Perspectives on Learning Progressions Research: Past, Present, and Future Figurations
Michelle Wooten, University of Colorado Boulder
Scott McDonald, Pennsylvania State University

Mind wandering of grade five students with high and low performance in TIMSS-like science test
Sulaiman Al-Balushi, Sultan Qaboos University
Khadijah Al-Balushi, Ministry of Education, Oman
Rashid Al-Mherzi, Sultan Qaboos University
Ibrahim Al-Harthi, Sultan Qaboos University
Abdullah Ambusaaidi, Ministry of Education, Oman
Khalid Al-Saadi, Sultan Qaboos University
Mohammed Al-Aghbari, Sultan Qaboos University

Using Mind Maps to Determine Students’ Knowledge Dimensions on Disciplinary & Interdisciplinary Core Ideas
Helen Semilarski, University of Tartu
Regina Soobard, University of Tartu
Miia Rannikmae, University of Tartu

Characterization of Undergraduate Students’ and Instructors’ Knowledge Integration of Cellular Biology Concepts
Sharleen Flowers, Purdue University
Stephanie Gardner, Purdue University

Strand 2: Science Learning: Contexts, Characteristics and Interactions

**Eliciting and Supporting Students Doing Science**
9:45am -11:15 am
Real time/live
Presider: Andy Cavagnetto, Washington State University

Strategies to Manage Uncertainty in Scientific Argumentation
Ying-Chih Chen, Arizona State University

The Development of Middle School Students’ Model-Based Explanations on Energy Transformations through Design Thinking
Mustafa Topcu, Yildiz Technical University
Ayse Ciftci, Mus Alparslan University

Factors Impacting Teachers’ Understanding and Experiences Supporting Student Epistemic Agency During STEM Design Challenges
Maria González-Howard, University of Texas at Austin
Victor Sampson, University of Texas at Austin
Christina Baze, University of Texas at Austin

Uncertainty and Cognitive Demand on Students’ Thinking in Science Classrooms
Danielle Vande Zande, Florida State University
Ozlem Akcil Okan, Florida State University
Miray Tekkumru Kisa, Florida State University
Strand 3: Science Teaching—Primary School (Grades preK-6)

Science Education in Preschool
9:45am -11:15 am
Real time/live
Presider: Alison Mercier, University of Wyoming

Developing Preschool-Age Children's Spatial Sensemaking Practices through a Story-Driven Investigation
Kyungjin Cho, Pennsylvania State University
Madison Botch, Pennsylvania State University
Julia Plummer, Pennsylvania State University

Culturally Responsive Teaching in an Elementary Science Enrichment Class
Misty Thomas, Academic Venture Teacher
Melody Russell, Auburn University

Introducing a Lab Center in the Classroom—Promoting Preschoolers' Inquiry Practices and Science Preferences
Netta Perry, Bar Ilan University
Ronit Fridman, Bar Ilan University
Ornit Spektor-Levy, Bar Ilan University

Modeling-based learning through distance education: The case of pre-school children investigating snails during covid-19 quarantine
Loucas Luca, European University-Cyprus

Strand 4: Science Teaching—Middle and High School (Grades 5-12)

Curriculum Integration
9:45am -11:15 am
Real time/live
Presider: Zehavit Kohen, Technion Israel Institute of Technology

An Exploratory Study of the Goals Science Teachers' Achieve by Integrating Engineering into Science Class
Todd Hutner, University of Alabama
Victor Sampson, University of Texas at Austin
Lawrence Chu, University of Texas at Austin
Christina Baze, University of Texas at Austin
Richard Crawford, University of Texas at Austin

The Effects of Integrated STEM Teaching on Students' STEM Literacy: A meta-analysis
Waralee Sinthuwa, Kasetsart University
Chatree Faikhamta, Kasetsart University
Pongprapan Pongsophon, Kasetsart University

A Methodological Framework for Analyzing An Integrated STEM Curriculum and Its Enactment
Chelsey Dankenbring, Purdue University
Selcen Guzey, Purdue University
Lynn Bryan, Purdue University

Teacher Change during Integrated Curriculum Reform as Evidenced by Episodes of Pedagogical Reasoning
Kevin Fleming, George Washington University
Jonathon Grooms, George Washington University
Alan Berkowitz, Cary Institute of Ecosystem Studies
Bess Caplan, Cary Institute of Ecosystem Studies
Strand 5: College Science Teaching and Learning (Grades 13-20)

Innovative Techniques in College STEM Instruction
9:45am -11:15 am
Real time/live
Presider: Jonah Firestone, Washington State University Tri-Cities

The Effects of Scaling Up the Flipped Classroom Approach
Robert Idsardi, Eastern Washington University
Luis Matos, Eastern Washington University

Understanding the Emergence of Abstraction in Physical Chemistry Problem Solving
Jessica Karch, University of Massachusetts Boston
Hannah Sevian, University of Massachusetts Boston

Faculty Perceptions of College Students’ Preparedness to Use Quantitative Reasoning (QR) in Introductory Biology Courses
Anne Cleveland, Maine Maritime Academy
Asli Sezen-Barrie, University of Maine
Gili Marbach-Ad, University of Maryland

Out of Sight, Out of Mind? Effects of Using Concept Mapping in a Retrieval Setting
Lukas Becker, University of Cologne
Virginia Welter, University of Cologne
Steffen Tröbst, Kiel University
Ellen Aschermann, University of Cologne
Jörg Großschedl, University of Cologne

Strand 6: Science Learning in Informal Contexts

The Role of Informal Science Learning Environments in Supporting Scientific Engagement
9:45am -11:15 am
Real time/live
Presider: Orit Ben Zvi Assaraf, Ben-Gurion University of the Negev
Discussant: Eleni Kyza, Cyprus University of Technology

Presenters:
Tali Tal, Technion - Israel Institute of Technology
Merav Shreiber, Netaim School, Ramat Gan
Tom Bielik, Berlin Freie Universität
Patricia Patrick, Columbus State University
Neta Shaby, Ben-Gurion University of the Negev
Orit Ben Zvi Assaraf, Ben-Gurion University of the Negev
Richard Sheldrake, University College London
Michael Reiss, University of London
Eleni Kyza, Cyprus University of Technology
Strand 7: Pre-service Science Teacher Education

*Coherent and current approaches in science teacher preparation*
9:45am - 11:15 am
Real time/live
**Presider:** Richard Lamb, East Carolina University

*Promoting Coherent Science Teaching through Coherent Science Teacher Education: A Model Framework for Program Design*
Jeffrey Nordine, Leibniz Institute for Science and Mathematics Education
Stefan Sorge, Leibniz Institute for Science and Mathematics Education
Ibrahim Delen, Usak University
Robert Evans, University of Copenhagen
Kalle Juuti, University of Helsinki
Jari Lavonen, University of Helsinki
Pernilla Nilsson, Halmstad University
Mathias Ropohl, University of Duisburg-Essen
Matthias Stadler, University of Bergen

*The tangle of emotions, agency, digital communication, and science as pre-service teachers learn to teach climate change*
Elizabeth Hufnagel, University of Maine

*Teacher discourse practices supporting student progressive discourse in an ambitious science classroom*
Kraig Wray, Pennsylvania State University
Madison Botch, Pennsylvania State University
Scott McDonald, Pennsylvania State University
Amy Pallant, The Concord Consortium
Hee-Son Lee, The Concord Consortium

*Investigating Preservice Teachers' Conceptualizations on Teaching Engineering: A Sequential Explanatory Design*
Rebekah Hammack, Montana State University
Tina Vo, University of Nevada- Las Vegas

Strand 8: In-service Science Teacher Education

*Computational Thinking and STEM Integration*
9:45am-11:15am
Real time/ Live
**Presider:** Stephen Witzig, University of Massachusetts Dartmouth

*The Effects of Teacher Professional Development in STEM Education: A Meta-Analysis*
Hye Sun You, Arkansas Tech University
Sunyoung Park, California Lutheran University
Minju Hong, University of Georgia

*STEM as Pakistani Teachers view it: A Case of contextually relevant curricular units*
Tasneem Anwar, The Aga Khan University

*Help Me Understand CT: Science Teachers' Perceived Barriers to CT Integration and Professional Support Needs*
Vance Kite, North Carolina State University
Soonhye Park, North Carolina State University

*Integrating Computational Thinking into Elementary Inquiry-based Science Instruction: Affordances of a Community of Practice Model*
Heather Killen, University of Maryland – College Park
Merijke Coenraad, University of Maryland – College Park
Lautaro Cabrera, University of Maryland – College Park
Virginia Byrne, Morgan State University
Diane Ketelhut, University of Maryland
Strand 10: Curriculum and Assessment

*Linguistic and cultural aspects of science curricula*
9:45am - 11:15 am
Real time/live
**Presider:** Peng He, Michigan State University

- Exploring Plurality in Students’ Ways of Knowing with Learning Progression-based Assessments of Computational Thinking
  Beth Covitt, University of Montana
  Carolyn Staudt, The Concord Consortium
  Dale Cope, Independent Education Consultant
  Joyce Massicotte, The Concord Consortium
  Nathan Kimball, The Concord Consortium

- Authentic Literacy and Language (ALL) for Science: Evaluating a Curriculum to Develop Elementary Disciplinary Literacy
  Nancy Moreno, Baylor College of Medicine
  Alana Newell, Baylor College of Medicine
  Misty Sailors, University of North Texas

- Culturally relevant or more of the same? Unpacking standards-aligned elementary science curriculum materials
  Terrance Burgess, Michigan State University

- Evaluating Educative Features for Emergent Multilingual Learners’ Opportunities to Learn and Support for Three-dimensional Science and Language instruction
  Samuel Lee, Boston College
  Sage Andersen, University of Texas at Austin
  Karina Mendez Perez, University of Texas at Austin
  Katherine McNeill, Boston College

Strand 11: Cultural, Social, and Gender Issues

*Physical Sciences and Equity*
9:45am - 11:15 am
Real time/live
**Presider:** Bhaskar Upadhyay, University of Minnesota

- Scientists’ perspectives: Choosing an academic career in chemistry
  Shirly Avargil, Technion - Israel Institute of Technology
  Daphna Shwarts Asher, Technion - Israel Institute of Technology
  Shari Reiss, Technion - Israel Institute of Technology
  Yehudit Judy Dori, Technion - Israel Institute of Technology
  Samuel Neaman Institute for National Policy Research

- Experiences in Freshman Chemistry: Using Cogenerative Dialogues to Identify Critical Issues Impacting African American Females
  Natasha Johnson, University of Toledo
  David Jackson, University of Georgia
  Deborah Tippins, University of Georgia
  Ji Shen, University of Miami

- Examining English Learners’ Perceptions of Native Language Use in a Physical Science Classroom
  Rebecca Robertson Konz, University of Minnesota Twin Cities
  Felicia Dawn Leammukda, Saint Cloud State University
  Preethi Titu, Kennesaw State University
  Gillian Roehrig, University of Minnesota

- Israeli Arab students’ participation in authentic physics inquiry in school
  Lulu Garah, Technion - Israel Institute of Technology
  Shulamit Kapon, Technion - Israel Institute of Technology
Thursday, April 8, 2021

Strand 12: Technology for Teaching, Learning, and Research

*Using technology to improve students' scientific thinking*
9:45 am-11:45 am
Real time/live
**Presider:** Jonah Firestone, Washington State University Tri-Cities

**CAI on Adaptation in Organisms and Biological Mechanism among Igbo Senior Secondary School Students**
Ngozika Mbaigorgu, Enugu State University of Science and Technology, Nigeria
Patrick Ugwu, Enugu State University of Science and Technology, Nigeria

**Framing in gesture-augmented simulations: How differing student frames impacts their sensemaking**
Nitasha Mathayas, Indiana University

**Opening the Gate of Logic Gate as a Difficult Topic in Computer Studies in Nigerian Secondary Schools: Can CTCA be the Key?**
Deborah Agbanimu, Lagos State University, Nigeria
Peter Okebukola, Lagos State University, Nigeria
Esther Peter, Lagos State University, Nigeria
Adonkbe Ebisin, Lagos State University, Nigeria
Franklin Onowugbeda, Lagos State University, Nigeria
Adewale Adesina, National Open University of Nigeria

**The Generation of Location-based Questions as means for Promoting Scientific Thinking among Middle School Students**
Shadi Asakle, Technion – Israel Institute of Technology
Miri Barak, Technion – Israel Institute of Technology

Strand 12: Technology for Teaching, Learning, and Research

*Inservice Teachers’ Needs and Uses of Digital Tools and Resources*
9:45am -11:15 am
Real time/live
**Presider:** Alpaslan Sahin, Harmony Public Schools

**Elementary Teachers’ Adaptations of Technology for Knowledge Generation: Do Their Epistemic Orientations Make a Difference?**
Jale Ercan-Dursun, University of Alabama
Krystal Flantroy, University of Alabama
Jee Keyung Suh, University of Alabama
Brian Hand, University of Iowa
Gavin Fulmer, University of Iowa

**Computer-Supported Collaborative Learning (CSCL): Pedagogical design framework**
Irit Sasson, Tel-Hai College

**The Use of Simulations in Science Education**
Lisa Stinken-Rösner, Leuphna Universität Lüneburg

**Design Principles and Evaluation of an Online Nanotechnology Professional Development Course for Teachers**
Yael Feldman-Maggor, Weizmann Institute of Science
Inbal Tuvi-Arad, The Open University of Israel
Ron Blonder, Weizmann Institute of Science
Strand 13: History, Philosophy, Sociology, and Nature of Science

*Acknowledging African American Scientists and Scientific Research*
9:45am - 11:15 am  
Real time/live  
**Presider:** Shari Watkins, American University  
**Discussant:** Brian McGowan, American University

**Presenters:**  
Shari Watkins, American University  
Melody Russell, Auburn University  
Willie Pearson, Georgia Institute of Technology  
Ronald Mickens, Clark Atlanta University  
Christopher Williams, National Museum of African American History and Culture  
Brian McGowan, American University

Strand 14: Environmental Education and Sustainability

*Education in Place and Community*
9:45am - 11:15 am  
Real time/live  
**Presider:** Devarati Bhattacharya, University of Nebraska

**Indigenous Education and Behavior Modification Strategies for HIV/AIDS Management in Mining Communities in Zimbabwe: A case Study**  
Emmanuel Mushayikwa, University of the Witwatersrand  
Ledwina Hungwe, University of the Witwatersrand

**The Impact of Place Attachment in Socioscientific Reasoning of Puerto Rican High School Students**  
Lorraine Ramirez Villarin, University of North Georgia  
Samantha Fowler, Florida Institute of Technology

**Bridging Home Culture and School Science Culture Through Ethnic Education in Indigenous Community**  
Mu-Yin Lin, University of Georgia

**Community Science, Citizen Science, and Community Scientific Literacy: Opportunities and Challenges for Environmental Stewardship**  
Christopher Jadallah, University of California, Davis  
Alexis Patterson Williams, University of California, Davis  
Heidi Ballard, University of California, Davis
Concurrent Session # 4. (Real Time / Live)
11:30 am- 1:00 pm

Administrative Sponsored Session
Strand 6: Science Learning in Informal Contexts

**Learning in the Informal Context**
11:30am -1:00pm
Real time/ live

Examining the nature of science understanding through Canadians’ Tweets about COVID-19
Samantha Jewett, University of Western Ontario
Anton Puvirajah, University of Western Ontario
Mohammad Azzam, University of Western Ontario
Jingrui Jiang, University of Western Ontario

Multimodal analysis of engagement in a science museum: The role of the body
Dana Vedder-Weiss, Ben Gurion University of the Negev
Neta Shaby, Ben-Gurion University of the Negev

Leveraging acts of authentication to engage recent immigrant children in informal STEM
Anton Puvirajah, University of Western Ontario
Mina Sedaghatjou, Alfred University
Mohammad Azzam, University of Western Ontario

Engaging Learners in Computer Modeling and Flight Simulation to Create STEM Pathways
Geeta Verma, University of Colorado Denver

“I feel like I know everything about ants” - How youth navigate a learning ecosystem?
Neta Shaby, Ben-Gurion University of the Negev
Nancy Staus, Oregon State University
Lynn Dierking, Oregon State University
John Falk, Oregon State University

Minoritized teens’ communication competency as a proxy to STEM identification: A science center context
Anton Puvirajah, University of Western Ontario
Todd Campbell, University of Connecticut
Geeta Verma, University of Colorado Denver

Administrative Sponsored Session
Research Committee

**A Retrospective of the Abell Institute for Doctoral Students: Mentorship within the NARST community**
11:30am-1:00pm
Real time/ live

Presenters:
Tina Vo, University of Nevada, Las Vegas
Asli Sezen-Barrie, University of Maine
Li Ke, University of North Carolina at Chapel Hill
Joshua Reid, Middle Tennessee State University
Kelsey Lipsitz, Exploratorium
Thursday, April 8, 2021

Administrative Sponsored Session
Equity and Ethics Committee

*Basu Symposium*
11:30am -1:00pm
Real time/ live

Understanding international graduate students’ teaching experience in science classroom through the lens of cultural competence: An exploratory study
Zhigang Jia, Middle Tennessee State University
Grant E. Gardner, Middle Tennessee State University

Access points that facilitate preservice teachers’ sense-making about systemic issues within a field experience
Victor Kasper, Florida State University
Shannon Davidson, Florida State University
Lama Jaber, Florida State University

*Virtual Mentoring and Epistemic Justice*
Deena L. Gould, University of New Mexico
Priyanka Parekh Transylvania University
Eduardo Jose Nuñez Cruz University of New Mexico

*Learning to Integrate Science-Specific Literacy in Science Teaching: A Study of Elementary Preservice Teachers*
Regina McCurdy, University of Central Florida
Su Gao, University of Central Florida
Vassiliki Zygouris-Coe, University of Central Florida
Katherine Cruz-Dieter, University of Central Florida
Rebeca Grysko, University of Central Florida

Examining assessments in a technology-enhanced active learning science classroom
Lucía B. Chacón-Díaz, The Ohio State University

Case study pedagogy and learning outcomes: A framework for teaching biology with narratives
Ally Hunter, University of Massachusetts at Amherst
Melissa Zwic, Stockton University

Creating Nuance for Black Girls’ Science Alignment Using the CLIC Framework
Ashley Jackson, University of Michigan

*A Critical Race Perspective of African American Elementary Teachers of Science*
Mario Pickens, University of North Florida

*Exploring Pre-Service Teachers Science Teaching Identity and Agents of Change*
Katherine Cruz-Dieter, University of Central Florida

*Fugitive Science Societies: Re-envisioning Science Education for Black people during the early 20th Century*
Charnell Chasten Long, University of Wisconsin-Madison

*The STEM impostor: A comparative study of Black females in two global contexts*
Marsha Simon, University of West Georgia
Thursday, April 8, 2021

Strand 2: Science Learning: Contexts, Characteristics and Interactions

Engaging science teachers in Socioscientific implementation for global citizenship
11:30 am -1:00pm
Real time/ live

Science teachers' pedagogical content knowledge development during enactment of socioscientific curriculum materials
Durham Bayram-Jacobs, Eindhoven University of Technology

Relation between SSI and scientific knowledge, according to a group of secondary school science teachers from Spain
Silvia Alcaraz-Dominguez, Universitat de Barcelona

Tension and conflict in implementing SSI as reflected in teachers' beliefs and implementation
Emil Eidin, Michigan State University
Yael Shwartz, Weizmann Institute of Science

Socio-scientific issues as tools for improving environmental knowledge, skills, and behavior in pre-service education
Anat Abramovich, Gordon Teachers College

Science Teaching, Learning, & Social Justice
11:30 am -1:00pm
Real time/ live
Presider: Sameer Honwad, SUNY Buffalo

A Longitudinal Study Comparing Student Motivational Changes towards Science Learning in Grades 6 to 9
Moonika Teppo, University of Tartu
Regina Soobard, University of Tartu
Miia Rannikmäe, University of Tartu

Tools for Learning or Tools for Power? Middle School Students' Use of Engineering Tools
Jeanna Wieselmann, Southern Methodist University
Khomson Keratithamkul, University of Minnesota
Emily Dare, Florida International University
Elizabeth Ring-Whalen, St. Catherine University
Gillian Roehrig, University of Minnesota

Let's Count the Flowers: How Emergent Bilinguals' Collaboration Leads to Productive Disciplinary Engagement
Sara Lee, Vanderbilt University

Science Citizenship through Secondary Agricultural Education
Rosalind Gawryla, Onondaga Central Schools
Kevin Curry, c


Thursday, April 8, 2021

Strand 5: College Science Teaching and Learning (Grades 13-20)

Supporting 21st Century Students and Faculty
11:30 am -1:00pm
Real time/ live
Presiders: Anne Emerson Leak, High Point University

Suddenly Online: Exploring Postsecondary Teaching, Attitudes, Technology, and Faculty Mental Well Being in Spring 2020
Emily Walter, California State University, Fresno
Makayla Bailey, California State University, Fresno
Patricia Fernandez, California State University, Fresno
Arashnoor Gill, California State University, Fresno

Investigating instructional and discourse practices of college STEM instructors across instructor types, disciplines, years of teaching experiences, and class sizes
Jourjina Alkhouri, University of California Merced
Cristie Donham, University of California Merced
Téa Pusey, University of California Merced
Alexander Stivers, University of California Merced
Adriana Signorini, University of California Merced
Petra Kranzfelder, University of California Merced

Exploring the Role of Peer Learning Assistants in Supporting Student Learning in College Biology Courses
Brittney Ferrari, University of Georgia
Peyton LeBonte, University of North Carolina Greensboro
Julie Kittleson, University of Georgia

Developing 21st Century Skills Through Teaching and Learning Methods: Perceptions of STEM Students and Alumni
Marina Tal, Technion - Israel Institute of Technology
Rea Lavi, Massachusetts Institute of Technology
Yehudit Judy Dori, Technion - Israel Institute of Technology and Samuel Neaman Institute for National Policy Research

Strand 7: Pre-service Science Teacher Education

Examining Empathy and Emotions in Science Education
11:30 am -1:00pm
Real time/ live
Presider: Jennifer Mesa, University of West Florida

The Role of Epistemic Empathy in Teachers' Learning and Responsiveness to Students' Experiences in Science
Lama Jaber, Florida State University

Design Thinking for Making: Preservice Teachers' Learning to Teach Human-centered Making
Myunghwan Shin, California State University, Fresno
Trang Phan, California State University, Fresno

Experiencing Science Through Wonder: Incorporating Aesthetics in Pre-Service Teacher Science Education
Sharon Pelech, University of Lethbridge
David Blades, University of Victoria

Preservice Teacher Emotions in Teaching Science and Math
Mihwa Park, Texas Tech University
Raymond Flores, Texas Tech University

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Preservice Teacher Emotions in Teaching Science and Math
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Raymond Flores, Texas Tech University
Thursday, April 8, 2021

Strand 8: In-service Science Teacher Education

The Influence of Networks on Teachers' Professional Development and Retention: Insights from Examining Communities of Practice through a Lens of Social Networks
11:30 am -1:00pm
Real time/live

Teacher Perceptions of Belonging in Communities of Practice: What are you Belonging to?
Rebecca Konz, University of Minnesota Twin Cities
Jessica Doering, University of Kentucky
Gillian Roehrig, University of Minnesota
Margaret Schroeder, University of Kentucky
Michael Beeth, University of Wisconsin/Oshkosh/COEHS

Science and Mathematics Teacher Communities of Practice: Social Influences on Discipline-based Identity and Self-efficacy Beliefs
Samuel Polizzi, Georgia Highlands College
Joshua Reid, Middle Tennessee State University
Yicong Zhu, Stony Brook University
Gregory Rushton, Middle Tennessee State University

Early Career Teachers: Social Networks in Schools Affect Job Satisfaction and Career Commitment
Gregory Rushton, Middle Tennessee State University
Samuel Polizzi, Georgia Highlands College
Yicong Zhu, Stony Brook University
Joshua Reid, Middle Tennessee State University

Perceived Network Bridging Influences the Retention Decisions of Early Career Teachers
Gillian Roehrig, University of Minnesota
Yicong Zhu, Stony Brook University
Samuel Justin Polizzi, Georgia Highlands College
Joshua Reid, Middle Tennessee State University
Greg Rushton, Middle Tennessee State University

Strand 10: Curriculum and Assessment

Automated Assessment of Argumentation in School Science: Developments and Challenges
11:30am -1:00pm
Real time/live

Assessing Higher Order Thinking of Complex Skill using Selected Response Items
Linda Morrell, University of California - Berkeley
Sara Dozier, Stanford University
Weerephat Suksiri, University of California - Berkeley
Jonathan Osborne, Stanford University
Mark Wilson, University of California - Berkeley

Developing Automated Analysis for a Learning Progression to Assess Scientific Argumentation in Middle School Students
Christopher Wilson, BSCS Science Learning
Molly Stuhlsatz, BSCS Science Learning
Brian Donovan, BSCS Science Learning
Zoe Buck Bracey, BSCS Science Learning
April Gardner, BSCS Science Learning
Jonathan Osborne, Stanford University
Tina Cheuk, Stanford University
Kevin Haudek, Michigan State University
Xiaoming Zhai, Michigan State University

Automated feedback to support students' revision of scientific arguments based on data from simulations
Hee-Sun Lee, The Concord Consortium
Gey-Hong Sam Gweon, Physics Front
Amy Pallant, The Concord Consortium

Exploring bias in automated scoring of student argumentation
Zoe Buck Bracey, BSCS Science Learning
Molly Stuhlsatz, BSCS Science Learning
Tina Cheuk, Stanford University
Marisol Mercado Santiago, Michigan State University
Christopher Wilson, BSCS Science Learning
Jonathan Osborne, Stanford University
Kevin Haudek, Michigan State University
Brian Donovan, BSCS Science Learning
April Gardner, BSCS Science Learning
Thursday, April 8, 2021

Strand 11: Cultural, Social, and Gender Issues

* Teachers and Justice  
  11:30 am - 1:00pm  
  Real time/ live  
  **Presider:** Mary Atwater, University of Georgia

  Teachers of Color negotiating positionality in implementing justice-centered science pedagogy  
  David Segura, Beloit College  
  Maria Varelas, University of Illinois at Chicago  
  Daniel Morales-Doyle, University of Illinois at Chicago

  Leadership Professional Development for Diversifying the K-12 STEM Teaching Workforce  
  Hyunju Lee, Smithsonian Science Education Center  
  Katie Gainsback, Smithsonian Science Education Center  
  Amy D’Amico, Smithsonian Science Education Center

  Is it possible to teach just science? Designing Professional Development for justice-oriented science education  
  Lenora Crabtree, University of North Carolina Charlotte

Strand 11: Cultural, Social, and Gender Issues

* Towards a Socially Just Society: Creating Learning Environments for Dignity and Equity in Engineering Education  
  11:30am - 1:00pm  
  Real time/live

  An Identity Resources Approach for Supporting Teachers-of-Engineering for Minoritized Young People  
  Christopher Wright, Drexel University  
  Bryan Brown, Stanford University  
  Rasheda Likely, Drexel University  
  Mikhail Miller, Drexel University

  Centering Social Justice in Engineering: The Transformative Power of Learning about Diversity and Equity in Design  
  Greses Pérez, Stanford University  
  Shannon Gilmartin, Stanford University  
  Carol Muller, Stanford University  
  Patrick Danner, Technical University of Munich  
  Sheri Sheppard, Stanford University

  Becoming Part of an Engineering Community of Practice: How Students Across Lines of Difference Find Their Place in a Makerspace  
  Eric Reynolds Brubaker, Stanford University  
  Chielo Mbaezue, Stanford University

  My Life's Work: Re-engineering Education for Black Boys  
  James Holly, Jr., Wayne State University

  Design Justice in Humanitarian Engineering Education  
  Brandon Reynante, Stanford University
## Thursday, April 8, 2021

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<th>Strand 11: Cultural, Social, and Gender Issues</th>
<th>Strand 12: Technology for Teaching, Learning, and Research</th>
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<td><strong>Storied-Identities as a Lens to Studying Science Identity</strong>&lt;br&gt;11:30am-1:00pm&lt;br&gt;Real time/ Live</td>
<td><strong>Integrating Computational Thinking in Science Curricula: Teacher Professional Development and Student Assessment</strong>&lt;br&gt;11:30 am -1:00pm&lt;br&gt;Real time/ live</td>
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<tr>
<td>Presenters:&lt;br&gt;Amal Ibourk, Florida State University&lt;br&gt;Lucy Avraamidou, University of Groningen&lt;br&gt;Theila Smith, University of Groningen&lt;br&gt;Alison Mercier, University of North Carolina at Greensboro&lt;br&gt;Shakhnoza Kayumova, University of Massachusetts-Dartmouth&lt;br&gt;Allison Gonsalves, McGill University&lt;br&gt;Anna Danielsson, Uppsala University&lt;br&gt;Katia Nielsen, University of Copenhagen&lt;br&gt;Jennifer Adams, University of Calgary</td>
<td>Positioning Teachers as Co-designers To Integrate CT Practices in STEM&lt;br&gt;Sally Wu, Northwestern University&lt;br&gt;Amanda Peel, Northwestern University&lt;br&gt;Michael Horn, Northwestern University&lt;br&gt;Uri Wilensky, Northwestern University</td>
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<td>Teachers’ Sensemaking of CT Integration and Pedagogical Approaches&lt;br&gt;Mariissa Levy, Northwestern University&lt;br&gt;Sally Wu, Northwestern University&lt;br&gt;Sugat Dabholkar, Northwestern University&lt;br&gt;Michael Horn, Northwestern University&lt;br&gt;Uri Wilensky, Northwestern University</td>
<td>Teachers’ Perceptions of the Contribution of Computational Thinking to Science and Math Classrooms&lt;br&gt;Arnon Hershkovitz, Tel Aviv University&lt;br&gt;Connor Bain, Northwestern University&lt;br&gt;Jacob Kelter, Northwestern University Michael Horn, Northwestern University&lt;br&gt;Michael Horn, Northwestern University&lt;br&gt;Uri Wilensky, Northwestern University</td>
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<tr>
<td>Identifying Evidence of Student Engagement in CT via Automated Response Analysis&lt;br&gt;Connor Bain, Northwestern University&lt;br&gt;Arnon Hershkovitz, Tel Aviv University&lt;br&gt;Sugat Dabholkar, Northwestern University&lt;br&gt;Michael Horn, Northwestern University&lt;br&gt;Uri Wilensky, Northwestern University</td>
<td>Students’ Attitudinal Change After Participating in a CT integrated Biology Unit&lt;br&gt;Sugat Dabholkar, Northwestern University&lt;br&gt;Susan Tran, Northwestern University&lt;br&gt;Michael Horn, Northwestern University&lt;br&gt;Uri Wilensky, Northwestern University</td>
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### Strand 13: History, Philosophy, Sociology, and Nature of Science

**Reimagining Science Education in the Anthropocene**  
11:30am - 1:00pm  
Real time/live  
**Presider:** Maria Wallace, University of Southern Mississippi  
**Discussant:** Sara Tolbert, University of Canterbury  
**Presenters:**  
Maria Wallace, University of Southern Mississippi  
Sara Tolbert, University of Canterbury  
Matthew Weinstein, University of Washington-Tacoma  
Darrin Collins, University of Illinois at Chicago  
Chessa Adsit-Morris, University of California - Santa Cruz  
Lawrence Bencze, University of Ontario - Toronto  
Michelle Wooten, University of Colorado - Boulder  
Kathryn Ryker, University of South Carolina  
Travis Weiland, University of Houston  
Rachel Askew, Vanderbilt University

### Strand 14: Environmental Education and Sustainability

**Models for Place-Based Science Education in Schools**  
11:30am - 1:00pm  
Real time/live  
**Investigating local environmental issues and fostering youth agency through a place-based participatory science model**  
Erin Bird, University of California – Davis  
Heidi Ballard, University of California – Davis  
**Centering Power, Historicity, and Nature-Culture Relations in Place-Based Science Education**  
Megan Bang, University of Washington  
Carrie Tzou, University of Washington Bothell  
Sharon Siehl, Tilth Alliance  
Charlene Nolan, Western Washington University – Bremerton  
Priya Pugh, University of Washington  
Jordan Sherry-Wagner, University of Washington  
Christine Benita, Seattle Public Schools  
Leah Bricker, Spencer Foundation and Northwestern University  
Veronica McGowan, University of Washington  

**A national-scale curriculum adaptation model to incorporate local phenomena**  
Katahdin Cook Whitt, Maine Mathematics and Science Alliance  
Emily Harris, BSCS Science Learning  
Lindsay Mohan, BSCS Science Learning  

**Place-based storyline design: Selecting an anchoring problem for engineering in the garden**  
Emily Harris, BSCS Science Learning  
Lindsay Mohan, BSCS Science Learning  
Whitney Cohen, Life Lab  
Sara Severance, Life Lab  
Jeffery Snowden, BSCS Science Learning  

**Discussion of Models for Place Based Science in School**  
Déana Scipio, Islandwood Graduate Program
Thursday, April 8, 2021

Strand 14: Environmental Education and Sustainability

Supporting climate and data literacy in rural communities by incorporating authentic experiences in formal and informal settings
11:30 am - 1:00pm
Real time/live
Iterating a scientifically authentic data-rich informal learning experience to empower the next generation of climate stewards
Leigh Peake, Gulf of Maine Research Institute
Andrew Pershing, Gulf of Maine Research Institute
Jeff Bate, Gulf of Maine Research Institute
Jacqueline DeLisi, Education Development Center, Inc.

Developing data- and climate-focused classroom curriculum
Erin Bardar, Education Development Center
Amy Busey, Education Development Center
Patrick McDeed, Education Development Center
Randy Kochevar, Education Development Center

Got Data? Developing an online, choice-based assessment of data literacy skills
Doris Chin, Stanford University
Rachel Wolf, Stanford University
Kristin Blair, Stanford University
Daniel Schwartz, Stanford University

Supporting student learning and interest in climate and data through a formal-informal connection
Jacqueline DeLisi, Education Development Center
Janna Kook, Education Development Center
Una MacDowell, Education Development Center
Peter Tierney-Fife, Education Development Center
Virginia Fitzhugh, Education Development Center

Building a data-focused science center community of practice
Virginia Fitzhugh, Education Development Center
Jeff Bate, Gulf of Maine Research Institute
Leigh Peake, Gulf of Maine Research Institute

Strand 15: Policy, Reform, and Program Evaluation

Theorizing and envisioning more equitable science education
11:30am - 1:00pm
Real time/live
Presider: Stefanie Marshall, University of Minnesota

The Impact of Neoliberal Ideologies on Elementary Science Education Policy: A Case Study
Stefanie Marshall, University of Minnesota

Using Assemblage Theory to Develop New Ideas for Science Teacher Learning
Kathryn Bateman, Temple University
Scott McDonald, Pennsylvania State University

Using an Ecological Model to Study Novice STEM Teacher Professional Resilience During the COVID-19 Pandemic
Diane Wright, Colorado State University
Meena Balgopal, Colorado State University
Laura Sample McMeeking, Colorado State University
Andrea Weinberg, Arizona State University

How State Leaders Would Change Their State Systems of Science Education
Abby Rhinehart, University of Washington
William Penuel, University of Colorado
Kathleen Arada, University of Washington
Maya Garcia, Colorado Department of Education

LUNCH BREAK
1:00pm - 2:00pm
Concurrent Session # 5 (Format: Advance Viewing of Pre-recorded Presentations with 60-minute Real time/ Live Q&A)
2:00pm-3:00pm

Strand 2: Science Learning: Contexts, Characteristics, and Interactions

Scientific Discourse and Argumentation
2:00pm- 3:00pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: David McKinney, University of Nevada, Las Vegas

Towards improving science discussions: A framework to guide instructional decision making
Emily Reigh, Stanford University
Jonathan Osborne, Stanford University

Using a Discussion Types Framework to Support Collective Sensemaking
Benjamin Lowell, Boston College
Kevin Cherbow, Boston College
Katherine McNeill, Boston College

Students' argument evaluation as an epistemic and cognitive practice
Qingna Jin, University of Alberta
Mijung Kim, University of Alberta

Supporting progressive discourse in epistemically authentic geoscience investigations
Scott McDonald, Pennsylvania State University
Kraig Wray, Pennsylvania State University
Jonathan McCausland, Pennsylvania State University
Kathryn Bateman, Temple University
Amy Pallant, The Concord Consortium
Hee-Sun Lee, The Concord Consortium

Constructing and Receiving Peer Feedback on Engineering Designs: Student Engagement and Pedagogical Supports
2:00pm -3:00 pm
Advanced Pre-recorded Viewing & Live Q&A

Exploring Peer-Observers' Feedback on Engineering Communication Challenges
Michelle Jordan, Arizona State University
Mia DeLaRosa, Arizona State University

"I'm like a scientist:" Critique Sessions as Spaces of Learning and Identity in Urban Classrooms
Rasheda Likely, Drexel University
Christopher Wright, Drexel University
Mikhail Miller, Drexel University

Structures of Interaction in Elementary Engineering Peer-to-Peer Feedback
Nicole Batrouny, Tufts University

Elementary Teachers' Responsiveness to Supporting Students' Engineering Design Feedback
Jeffrey Radloff, SUNY Cortland
Brenda Capobianco, Purdue University

Towards a More Expansive Framing of Feedback in Elementary Engineering: The Social and Affective Benefits of Asking for and Giving Advice
Chelsea Andrews, Tufts University
Kristen Wendell, Tufts University
Strand 3: Science Teaching—Primary School (Grades preK-6)

**Elementary teachers' agency, confidence, and knowledge**
2:00pm -3:00 pm
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Karl Jung, University of South Florida

**Variations in Rural Elementary Teachers' Confidence and Experience with Computer Science Integration by Teacher Type**
Joseph Brobst, Old Dominion University
Jennifer Maeng, University of Virginia
Joanna Garner, Old Dominion University

**What is Necessary beyond Knowledge?: Exploring Epistemic Orientation as a Critical Element for Adaptive Expertise**
Jee Kyung Suh, University of Alabama
Jale Dursun, University of Alabama
Catherine Lammert, University of Iowa
Krystal Flantroy, University of Alabama
Eric Akuoko, University of Iowa
Brian Hand, University of Iowa
Gavin Fulmer, University of Iowa

**Agency of In-service Elementary Science Teachers During a Global Pandemic**
Anica Miller-Rushing, University of Maine

**Science as Thinkable and Doable: The Nature of Elementary Teachers' Professional Agency in High-Needs Schools**
Alison Mercier, University of Wyoming

Strand 3: Science Teaching—Primary School (Grades preK-6)

**Implementing Elementary Science New Curricula**
2:00pm- 3:00pm
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Susanna Hapgood, University of Toledo

**STEAM Curriculum Design and Implementation: Understanding Curricular Changes in an Elementary School**
Cassie Quigley, University of Pittsburgh
Dani Herro, Clemson University
Holly Plank, University of Pittsburgh

**Framing Participant Structures for NGSS Teaching: Exploring Tenuous Terrain**
Laura Zangori, University of Missouri
Rachael Pinnow, University of Missouri

**How Teacher Practices Influence Elementary Students' Social Emotional Learning**
I-Chien Chen, Michigan State University
Cory Miller, Michigan State University
Tingting Li, Michigan State University
Kayla Bartz, Michigan State University
Joseph Krajcik, Michigan State University
Barbara Schneider, Michigan State University

**First Grade Teachers' Uptake of an Integrated Science-Literacy Curriculum in support of NGSS Instruction**
Ashley Iveland, WestEd
Robert Murphy, RAND
Alison Billman, University of California, Berkeley
Melissa Rego, WestEd
Christopher Harris, WestEd
Strand 4: Science Teaching—Middle and High School (Grades 5-12)

Pedagogical Content Knowledge
2:00pm - 3:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Henriette Burns, Washington State University

Investigating Science Teachers’ Pedagogical Content Knowledge Related to Socio-scientific Issues and Development of their Students’ Citizenship Skills
Saiqa Azam, Memorial University of Newfoundland
Dürdane Bayram-Jacobs, Eindhoven University of Technology
Ineke Henze, Radboud University, Nymegen
Patrick Wells, Memorial University of Newfoundland

Biology teachers’ Pedagogical Content Knowledge of Argumentation in China through Rasch analysis
Yingzhi Zhang, Capital Normal University
Chenyan Liu, Taiyuan Normal University

Interactions between science teachers’ pedagogical content knowledge and skills in their chemistry teaching practice
Imran Tufail, University of Waikato
Chris Eames, University of Waikato
Maurice Cheng, University of Waikato

Pedagogical Content Knowledge of Computer Science Teachers for Teaching Algorithms
Jacqueline Nijenhuis-Voogt, Radboud University, Nijmegen
Dürdane Bayram-Jacobs, Eindhoven University of Technology
Paulien Meijer, Radboud University, Nijmegen
Erik Barendsen, Radboud University & Open University

Strand 4: Science Teaching—Middle and High School (Grades 5-12)

How Teachers Navigate Tensions between Enacting Coherent Curriculum Materials and Supporting Students’ Epistemic Agency
2:00pm -3:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Discussant: Andy Elby, University of Maryland

Designing materials for student coherence, then revising for epistemic agency: A case for epistemic agency as an explicit design focus
Mon Lin Ko, University of Illinois Chicago
Barbara Hug, University of Illinois at Urbana–Champaign
Stina Krist, University of Illinois at Urbana-Champaign

Variations in one teacher’s conceptualization and support of students’ epistemic agency within and across instructional moments
Soo-Yean Shim, University of Illinois
Susan Kelly, University of Illinois
Daniel Voss, Northwestern University
Jacqueline Chis, University of Illinois at Urbana-Champaign

"Shutting down" now to "open up" later: Temporal tensions in pedagogical strategies for supporting epistemic agency
Stina Krist, University of Illinois at Urbana-Champaign
Nitasha Mathayas, Indiana University
Nessrine Machaka, University of Illinois at Urbana-Champaign

Coordinating strategic responsiveness: Building on student thinking over time through instructional design
Elizabeth Dyer, Middle Tennessee State University
Strand 5: College Science Teaching and Learning (Grades 13-20)

*Educational Reform for Justice and Access*
2:00pm - 3:00 pm
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Jacquleyn Chini, University of Central Florida

**Teaching- & Research-Focused Faculty: Exploring STEM Instructional Reform in Higher Education**
Melo-Jean Yap, San Diego State University
Felisha Herrera, San Diego State University
Gabriela Kovats Sánchez, San Diego State University

**Helping Students Rise to Their Full Potential through a Research Immersive Scholastic Experience in Biology**
Brittany Smith, Minnesota State University Mankato
David Sharlin, Minnesota State University Mankato
Rachel Cohen, Minnesota State University Mankato
Allison Land, Minnesota State University Mankato

**Supporting Transfer Students Career Development through Science/Engineering Internships: A Narrative Case Study**
Shana Mcalexender, North Carolina State University
Margaret Blanchard, North Carolina State University
Richard Venditti, North Carolina State University

**An Exploration of Perceptions of Justice in a Career-Forward Problem-Based Chemistry Laboratory**
Corey Payne, University of Florida
Kent Crippen, University of Florida

Strand 6: Science Learning in Informal Contexts

*Social Justice & Citizen Science*
2:00pm - 3:00 pm
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Ayelet Baram-Tsabari, Technion - Israel Institute of Technology

**Developing Sense of Place in Urban Youth Through Citizen Science**
Cornelia Harris, University at Albany, SUNY
Alandeom Oliveira, University at Albany, SUNY
James Wager, University at Albany, SUNY

**The Impacts of Informal Science Education on the Science Identity of Students of Color**
Roya Heydari, Columbia University
Felicia Mensah, Columbia University

**Examining youth perceptions of citizen science and their agency with science during Citizen Science Programs**
Maryam Ghadiri, University of California-Davis
Heidi Ballard, University of California-Davis
Ana Benavides Lahnstein, The Natural History Museum, London, UK
Sasha Pratt-Taweh, The Natural History Museum, London, UK
Julia Lorke, Wissenschaft im Diolog, Berlin, Germany
Jessie Jennewein, Natural History Museum of Los Angeles County
Annie Miller, California Academy of Sciences, San Francisco
Lila Higgins, Natural History Museum of Los Angeles County
Rebecca Johnson, California Academy of Sciences
Lucy Robinson, The Natural History Museum, London

**Youth-Initiated Moments Seeking Justice: Making Visible Youth's Imaginaries for STEM Learning**
Won Kim, Michigan State University
Angela Calabrese-Barton, University of Michigan
Sinead Brien, Michigan State University
Louise Archer, University College London
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<th>Time</th>
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<td>2:00pm - 3:00pm</td>
<td><strong>Culture and Language Considerations in Pre-service Programs</strong>&lt;br&gt;Advanced Pre-recorded Viewing &amp; Live Q&amp;A&lt;br&gt;<strong>Presider:</strong> Justina Ogodo, Baylor University</td>
<td>Proposing Translanguaging Pedagogical Competencies for Enhancing Science Learning for Bilingual Students: A Meta-Synthesis Approach&lt;br&gt;Nooshin Nouri, University of Texas Rio Grande Valley&lt;br&gt;Alma Rodriguez, University of Texas Rio Grande Valley&lt;br&gt;Maryam Saberi, University of Shiraz</td>
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<td>2:00pm - 3:00pm</td>
<td><strong>Fostering the Discourse of English Learners During the Enactment of Cognitively Demanding Task</strong>&lt;br&gt;Walter Aminger, University of California, Santa Barbara and Nevada State College</td>
<td>Secondary Science Pre-Service Teachers’ Enactment of Language- and Literacy-Integrated Science Instruction in Linguistically Diverse Classrooms&lt;br&gt;Alexis Rutt, University of Virginia&lt;br&gt;Frackson Mumba, University of Virginia</td>
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<td>2:00pm - 3:00pm</td>
<td><strong>Virtual STEM Microteaching Experiences for Pre-Service Teachers: A Community Cultural Wealth Approach</strong>&lt;br&gt;Vanessa Grady, Georgia State University&lt;br&gt;Natalie King, Georgia State University</td>
<td><strong>Early Childhood and Elementary Pre-service teachers</strong>&lt;br&gt;2:00pm- 3:00pm&lt;br&gt;Advanced Pre-recorded Viewing &amp; Live Q&amp;A&lt;br&gt;<strong>Presider:</strong> Stephen Thompson, University of South Carolina&lt;br&gt;Pinterest as a Resource for Elementary Science Teachers: A Comparison of Two Science Topics&lt;br&gt;Ryan Nixon, Brigham Young University&lt;br&gt;Shannon Navy, Kent State University&lt;br&gt;Developing Perceptions About Science in Preservice Early Childhood Educators&lt;br&gt;Bridget Miller, University of South Carolina&lt;br&gt;Benjamin Wiles, Clemson University&lt;br&gt;<strong>Engineering Practices as Fertile Ground for Pre-Service Teachers’ Development of Pedagogical Beliefs</strong>&lt;br&gt;Gözde Tosun, Pennsylvania State University&lt;br&gt;Amy Farris, Pennsylvania State University&lt;br&gt;“Can we add a goal?”: Examining unintended teacher learning within an instructional coaching partnership&lt;br&gt;Amanda Tompkins, University of South Florida&lt;br&gt;Karl Jung, University of South Florida</td>
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Strand 8: In-service Science Teacher Education

**In-service Teachers Engaging in Science and Engineering Practices**
2:00pm - 3:00 pm
Advanced Pre-recorded Viewing & Live Q&A

**Changes in teacher self-efficacy and beliefs: The impact of an engineering research experience for teachers (RET) program on science teachers**
Tiffany Lewis, Pennsylvania State University
Amber Cesare, Pennsylvania State Center for Science and the Schools
Kathleen Hill, Pennsylvania State University

**Supporting teachers to MASTER developing practices-based curriculum**
Jennifer Jackson, Pennsylvania State University
Kathleen Hill, Pennsylvania State University

**Advancing Teachers’ Curricular Integration of Mathematics and Computational Thinking through a Research Experience Program**
Amber Cesare, Pennsylvania State Center for Science and the Schools
Kathleen Hill, Pennsylvania State University
Tiffany Lewis, Pennsylvania State University
Amy Farris, Pennsylvania State University
Courtney Nagle, Pennsylvania State University – Behrend

**K-12 teachers use authentic STEM practices in the classroom based on research immersion experiences**
Matthew Johnson, Pennsylvania State University
Kathleen Hill, Pennsylvania State University

Strand 10: Curriculum and Assessment

**Design, Development, and Testing of a Media-Rich Three-dimensional Middle School Science Unit**
2:00pm - 3:00 pm
Advanced Pre-recorded Viewing & Live Q&A

**Developing a unit designed for NGSS: Successes and Lessons Learned in the Development Process**
Lindsey Mohan, BSCS Science Learning

**Developing a Media-Rich Digital Unit to Support 3D Teaching and Learning**
Catherine Stimac, Oregon Public Broadcasting
Heather Young, Oregon Public Broadcasting

**Professional Development: Moving Beyond the Curriculum**
Betty Stennett, BSCS Science Learning

**A Quasi-experimental Study of the Efficacy of a Designed-for-NGSS Unit and PD**
Susan Kowalski, BSCS Science Learning
Jeffrey Snowden, BSCS Science Learning
Lisa Carey, BSCS Science Learning
Thursday, April 8, 2021

Strand 11: Cultural, Social, and Gender Issues

* Culturally Responsive Instruction*
  2:00pm -3:00 pm
  Advanced Pre-recorded Viewing & Live Q&A
  **Presider:** Noemi Waight, University of Buffalo

  **A Case Study of a Teacher Attempting to Introduce a Culturally Relevant Approach to Physics**
  Clausell Mathis, University of Washington
  Sherry Southerland, Florida State University

  **Science Education in a Diaspora Refugee Community: Perspectives from Two Tibetan Science Teachers**
  Ngawang Gonsar, Gustavus Adolphus College, University of Minnesota

  **The Relationship between Secondary Science Teachers’ Self-Efficacy for Culturally Responsive Instruction and their Observed Practices**
  Zachary Stepp, University of Florida
  Julie Brown, University of Florida

  **The Emphasis on Culturally Responsive Instruction in NSTA Science Scope and The Science Teacher Journals**
  Michelle Joyce, University of Florida
  Julie Brown, University of Florida

Strand 12: Technology for Teaching, Learning, and Research

* Capitalizing on the Intersections of Pop Culture and Science*
  2:00pm -3:00 pm
  Advanced Pre-recorded Viewing & Live Q&A
  **Presider:** Denise Bressler, East Carolina University

  **Forecasting Community Development and Sustainability on Social Media with Topic Modeling**
  Lisa Lundgren, Utah State University
  Richard Bex, University of Florida
  Kent Crippen, University of Florida
  Jennifer Bauer, University of Michigan

  **Visual Literacy in Chemistry: Infographic vs Comic Book**
  Christopher Preece, University of Kentucky

  **Using Flipgrid as a reflection tool to capture students’ design thinking in a second grade science classroom**
  Sarah Guffy, University of South Alabama
  Joe Gaston, University of South Alabama
  Angela Rand, University of South Alabama

  **Imagining Robots of the Future: Examining Sixth-Graders’ Perceptions of Robots Through Their Literary Products**
  Changzhao Wang, University of Miami
  Ji Shen, University of Miami
  Hua Ran, University of Miami
Research Interest Groups (RIGs) Meeting  
3:15pm – 4:15pm  
Real-time/ live  

**Latino/a (LARIG)**

The Latino/a research interest group supports social networks that further research agendas regarding Latino/a science learners. LARIG also serves as a support and mentoring alcoba (space) for Latin@/s/Latino science educators and others interested in Latin@ science education. During our business meeting, we seek to plan future presentation formats, themes associated with presentations and online discussions, establish a system for collaborating on paper sets and workshops, update member contact lists, and discuss leadership roles and budget.

**3:30pm-until (Real time/ Live)**

**NETWORKING/ SOCIAL CONCURRENT SESSIONS**

3:30pm – until  
Real-time/ live

**Aikido - (and Physics!) Inspired Breathing, Balance, Stretching, and Movement** (duration: 30 min)  
Organizer: Cathy Cullicott, Arizona State University

We will spend our time together learning and practicing a series of movements we can use to help our bodies and minds prepare for or unwind from too much computer time. Combining movements from Aikido (a Japanese Martial Art), understandings from physics, and some ideas from Tai Chi, we will focus on necks, shoulders, backs, and wrists in particular, but we will also do whole body movements to reconnect with our bodies and help us move more comfortably. We will also do some focused breathing. No experience, ability, or equipment necessary - all are welcome. Looking forward to seeing you on the (virtual) mat!

**CADASE Graduate Student Fireside Chat: Navigating Academe with Success** (duration: 60 min)  
Organizer: Olayinka Mohorn, University of Illinois Chicago

The goal of this session is to support doctoral candidates and newly minted graduates with securing careers in the academy. Panelists include early career scholars who will discuss their experiences navigating the academic job market.

**The CADASE Social: Intriguing Scenes from Movies and TV Shows** (duration: 45 min)  
Organizer: Shari Watkins, American University

The CADASE Steering Committee will feature members of the CADASE RIG to facilitate the engagement of informal conversations around movies and TV shows that have entertained and intrigued us throughout the COVID-19 pandemic.

**Knitting Circle - all levels welcome** (duration: 60 min)  
Organizer: Erin Furtak, University of Colorado Boulder

Wouldn’t it be great to just sit and knit? Bring your own yarn and needles - this session will gather knitters new and experienced to create the community that is built when we learn and create together. New knitters can pick up some tips on casting on, and simple stockinette stitches, while experienced knitters can swap ideas and techniques.

**Learning science in the schoolyard - centering equity** (duration: 60 min)  
Organizer: Roberta Howard Hunter, Michigan State University

Come gather with other researchers and practitioners interested in outdoor learning at school. Hear about others’ work and share ways in which we can work towards more equitable experiences in the schoolyard. Topics include place-based instruction, building educator capacity, and
the impact of remote learning in the pandemic. Bring some tea or coffee and meet new colleagues!

*Let's Escape Together!* (duration: 60 min)
Organizer: Denise Bressler, East Carolina University

Need to escape from your reality for a little while? We will divide up in pairs to try a virtual escape style experience. It’s freely available online and partners can simply call each other to communicate. If you escape with time to spare, we can chat about the value of escape experiences for STEM education or we can just celebrate your epic escapes!

*NSF Funding Programs and More* (duration: 120 min)
Organizer: Xiufeng Liu, National Science Foundation

In this session, NSF program officers will describe various funding opportunities in formal and informal STEM education, undergraduate and graduate STEM education, as well as CAREER for junior faculty. They will also describe the standard proposal review process and the merit review criteria. Much time will be for Q&A on various topics ranging from writing competitive proposals, to volunteering to be a proposal reviewer, managing funded programs, and working at NSF as a rotating and permanent program officer. The session will consist of both formal presentations and informal discussion. Pending the interests of attendees and availability of technology, break-out rooms may also take place.

*NARST Fellows Award Program* (duration: 45 min)
Organizer: Noemi Waight, University at Buffalo

This session will introduce and celebrate NARST’s first named Fellow(s). The Fellow(s) will have an opportunity to briefly share their work and engage with a vision for developing the NARST Fellows Community. In addition, this session will also provide a forum for the NARST community to learn more about the award program.

*NARST Has Talent: An April FARSE* (duration: 45 min)
Organizers: Meg Blanchard, NC State University
Sherry Southerland, Florida State University
A digital reincarnation of FARSE, this year’s "Talent" show will feature a competition of creative 3-minute video products competing for "likes" to make it into the final online showcase sent out via the NARST listserv. A farcical look at academic life through the eyes of our members in the context of COVID-19, pets, children, backyard activities, new hobbies, exercise, musical ventures, and academic pursuits.

"PeTagogy": *Meeting pets of NARST members* (duration 30 min)
Organizer: Sahar Alameh, University of Kentucky

PeTagogy is an informal 30-minute session for NARST members to introduce their pets. Pets include loving dogs, grumpy cats, chickens, horses, lizards, and all the exotic pets one can have! Live pet introductions are encouraged, but pictures and short videos are accepted to show during this live session.
Thursday, April 8, 2021

Poster Session #1
Thursday 8:00am through Friday 7:00am

The following posters are available for viewing for a 23-hour window for asynchronous interactions. Attendees can view the poster (links will be provided) and post comments to the presenter, to which the presenter can respond. The posters will become inactive and inaccessible after Friday, 7:00 am.

Strand 1 Posters

Consistency and Contradiction
Cesar Delgado, North Carolina State University
Gary Wright, North Carolina State University

Socioscientific issues to engage middle school students in claims, evidence and reasoning
Sissy Wong, University of Houston
Jie Zhang, University of Houston
Jennifer Donze, University of Houston
Ma Glenda Wui, University of Houston
Jackie Relyea, University of North Carolina
Araceli Enriquez, University of Houston

Student Learning in OTL Engineering Design integrated Science Instruction
Laura Pottmeyer, University of Virginia
Frackson Mumba, University of Virginia
Ji Hoon Ryoo, Yonsei University, South Korea

The role of confusion in conceptual change scenarios for pre-service science teachers
Hye-Eun Chu, Macquarie University
Mariya Pachman, Florida University
Lori Lockyer, University of Technology Sydney

Strand 2 Posters

Negotiation to Consensus: Argumentation about Climate Change Evidence and Explanations
Donna Governor, University of North Georgia
Doug Lombardi, University of Maryland, College Park
Catie Duffield, Temple University

Research mentors’ perceptions on ways to engage high school students in authentic inquiry
Salih Yousef Faraj, Technion - Israel Institute of Technology
Amos Cohn Oranim, Haifa University and ACHERET Center, Israel
Shulamit Kapon, Technion - Israel Institute of Technology

Metacognitive knowledge of science university students: the relationship with critical thinking skills
Takuya Matsuura, Hiroshima University

Introduce a coding instrument for the quantitative analysis of teachers’ questioning chains
Jianlan Wang, Texas Tech University
Yuanhua Wang, West Virginia University
Lu Guo, Texas Tech University
Yanhong Guo, Texas Tech University
Stacey Sneed, Texas Tech University
Kyle Wipfli, Texas Tech University

Computational Thinkers in Unplugged Pre-K Science Classrooms
Semih Gun-Yildiz, University of Massachusetts Dartmouth
Stephen Witzig, University of Massachusetts Dartmouth

The effects of flipped classrooms on K-16 students’ science and math achievement: A systematic review
Gary Wright, North Carolina State University
Soonhye Park, North Carolina State University

Using Social Network Analysis to Understand Longitudinal Change in Small Groups
Brock Couch, Middle Tennessee State University
Grant Gardner, Middle Tennessee State University
### Strand 3 Posters

**Students' Understandings and Experiences of Creativity and Risk in Science Learning**  
Claire Paton, University of Calgary  
Jennifer Adams, University of Calgary  
Kristal Turner, University of Calgary

**Impact of Argumentation on Students' Informal Reasoning about Socio-Scientific Issues**  
Ihsan Ghazal, Texas Christian University  
Saouma Boujaoude, American University of Beirut

**When an NGSS-friendly Genetics Curriculum Unit Goes Online: A Naturalistic Study**  
Ann Lambert, University of Utah  
Dina Drits-Esser, University of Utah  
Sheila Homburger, University of Utah  
Kristin Fenker, University of Utah  
Molly Malone, University of Utah  
Louisa Stark, University of Utah

**Translanguaging from the Perspective of Disciplinary Science**  
Ashlyn Pierson, Ohio State University  
Scott Grapin, University of Miami

**Strand 4 Posters**

**Examining the Relationship between Preschool Teachers' Attitudes and Beliefs towards Science and Classroom Practice**  
Elica Bahar Sharifnia, University of Miami

**Using Online Interventions to Address Summer Learning Loss in Rising Sixth-Graders**  
Bob Shaw, Mary Institute and St. Louis Country Day School  
Scott Osborne, Clayton School District

**Strand 3 Posters**

**Engaging students in PBL in science classrooms: The challenges for Chinese primary teachers**  
Jing Lin, Beijing Normal University  
Liang Zeng, Beijing Normal University  
Huilei Han, Beijing Normal University  
David Fortus, Weizmann Institute of Science  
Knut Neumann, Leibniz-Institute for Science and Mathematics Education

**Declarative Knowledge about the NGSS Among Early Childhood Educators Across A Year of Professional Development**  
Susanna Hapgood, The University of Toledo  
Grant Wilson, The University of Toledo  
Jeanna Heuring, Keene State College  
Charlene Czerniak, The University of Toledo

**Science Visual Literacy Practices of Current Elementary Teachers**  
Michele Colandene, George Mason University

**Evaluating intercultural STEAM program in Australia-Korea contexts: Teachers' attitudes and beliefs towards STEAM**  
Hye-Eun Chu, Macquarie University  
Sonya Martin, Seoul National University

**The MakerSTEM Project: Building secondary educator's capacity engage youth in independent, place and community-based, scientific inquiry**  
Judith Lemus, University of Hawaii at Manoa  
Tara O'Neill, University of Hawaii at Manoa
Revisiting the Relationship Between Science Teaching Practice and Scientific Literacy from a Global Perspective
Hye Sun You, Arkansas Tech University
Sunyoung Park, California Lutheran University

Investigating Groundwater: 7th-Grade Students' Mapping Models to Phenomena
Holly White, University of Nebraska–Lincoln
Cory Forbes, University of Nebraska–Lincoln

Exploring the Intersection of Data Practices and Computational Thinking: A Literature Review
Laura Laclede, George Mason University

Knowledge Transfer: Instructional Approaches for Helping Students Understand the Deep Structure of Scientific Problems
Hong Tran, University of Georgia
Deborah Tippins, University of Georgia

Involvement of Industry in STEM education is South Africa
Magdeline Stephen, Wits School of Education
Emmanuel Mushayikwa, University of the Witwatersrand

Strand 5 Posters

Manifestation of Antisocial and Prosocial Power: Teacher Authority in Undergraduate Student Research Field Study Experiences
Patricia Patrick, Columbus State University

Designing Professional Development of Higher Education Science Faculty Which Impacts Student Learning
Peter Cormas, California University of Pennsylvania
Louise Nicholson, California University of Pennsylvania
Kyle Fredrick, California University of Pennsylvania
Gregg Gould, California University of Pennsylvania

The Impact of Biology Instruction on Evolution Acceptance and Conflict in Underrepresented Minority Undergraduates
Gena Sbeglia, Stony Brook University
Ross Nehm, Stony Brook University

Training Scientists to Teach: Lessons Learned from Course Participant Reflections
Sara Petchey, University of Zurich
Kai Niebert, University of Zurich

Examining the Reasons Women Choose and Stay in a Geology Major: A Qualitative Multi-Case Analysis
Ron Gray, Northern Arizona University
Alexis Riche, Northern Arizona University
Isabel Shinnick-Gordon, Northern Arizona University
James C. Sample, Northern Arizona University

Chemistry students' understanding of dissolving and associated phenomena: The case of sodium chloride
James Nyachwaya, North Dakota State University
Krystal Grieger, North Dakota State University

Everything is Connected: Building Preservice Elementary Teachers' Content Knowledge through Educative Curriculum Materials
Brooke Whitworth, Clemson University
Lauren Simpson, Center for Mathematics & Science Education
Whitney Jackson, University of Mississippi
Julie James, University of Mississippi
Alice Steimle, University of Mississippi

Examining Pre-service Teachers' Scientific Reasoning Skills When Learning to Attend to Students' Scientific Thinking
Andrea Phillips, Indiana University - Bloomington
Meredith Park Rogers, Indiana University

Undergraduate Engineering Students' Value Beliefs for Modeling Problems in Chemistry
Lorelie Imperial, University of Florida
Kent Crippen, University of Florida
Charlotte Bolch, University of Florida
Corey Payne, University of Florida

Building Student Confidence through Micro-Internships at a Central California Community College
Zoe Buck Bracey, BSCS Science Learning
Monica Weindling, BSCS Science Learning
Mohammed Yahdi, Hartnell Community College
Thursday, April 8, 2021

Emergency Response Teaching Online: STEM Faculty Perceptions and the Zone of Proximal Development
Lynn Tashiro, California State University, Sacramento
Mary McCarthy Hintz, Sacramento State University
Judith Kusnick, California State University, Sacramento

Distinct Role of Peer Effects and Sense of Belonging in Student Socialization and College Success
Narmin Ghalichi, Bowling Green State University
Clare Barratt, Bowling Green State University
Moira Van Staaden, Bowling Green State University

Strand 6 Posters

Navigating a STEM Learning Ecosystem: Obstacles and Opportunities
Neta Shaby, Oregon State University
Nancy Staus, Oregon State University
Lynn Dierking, Oregon State University
John Falk, Institute for Learning Innovation

Who has a ruler? Parent and youth perceptions of family science capital
Megan Ennes, University of Florida
M. Gail Jones, North Carolina State University
Gina Childers, Texas Tech University
Katherine Chesnutt, North Carolina State University
Emily Cayton, Campbell University

Exploring the presentation of climate change through virtual aquarium exhibits
Dominique Ocampo, Texas State University
Jenn Idema, Texas State University
Kristy Daniel, Texas State University

Peer-Learning Research Community: An Investigation into the Effects on High School Students’ Identity in Research
Ben Koo, University of California, Berkeley
Shruti Bathia, University of California, Berkeley
Linda Morell, University of California, Berkeley
Perman Gocheyev, University of California, Berkeley
Mark Wilson, University of California, Berkeley
Rebecca Smith, University of California, San Francisco

Parents Attitudes Towards Wi-Fi In Schools: The Role of Education in Engagement with Real-Life SSIs
Keren Dalyot, Technion - Israel Institute of Technology
Ayelet Baram-Tsabari, Technion - Israel Institute of Technology

The weight of motivational factors on undergraduate students’ decision to join STEM youth-based programming
Alexandria Muller, University of California-Santa Barbara
Kassandra Ortega, University of California-Santa Barbara
Devon Christman, University of California-Santa Barbara
Diana Arya. University of California-Santa Barbara
Sarah Hirsch, University of California-Santa Barbara

Informal learning in social media? Comparing a popular COVID-19 podcast with its YouTube comments
Anna Beniermann, Humboldt-Universität zu Berlin
Alexander Bergmann, Leipzig University
Alexander Büßing, Leibniz University Hannover; Institute of Natural Science Education

Identity Across the STEM Ecosystem
Katie Wade-Jaimes, University of Memphis
Kate Ayers, St. Jude Children’s Research Hospital
Robyn Penella, St. Jude Children’s Research Hospital

Exploring the Relationship Between Personal Scientific Epistemologies and Free-Choice Learning Experiences
Allison Metcalf, Florida State University
Katrina Roseler, Chaminade University
Sherry Southerland, Florida State University

Strand 7 Posters

Revisiting the Elementary Science Partnership: Adjusting to Shifting Challenges in a Pre-Service School-University Collaboration
Jerome Shaw, University of California - Santa Cruz
Samuel Severance, University of California - Santa Cruz
Mapping Community Assets in Preservice Secondary Science Education
Kirsten Mawyer, University of Hawaii
Heather Johnson, Vanderbilt University

Researching Teacher Self-efficacy: Linking Self-Efficacy to Teacher Effectiveness, Persistence and Retention
Sarah Haines, Towson University
Deepika Menon, University of Nebraska-Lincoln
Jeanna Wieselmann, Southern Methodist University
Sumreen Asim, Indiana University Southeast

Preservice Teachers' Unpacking Community Cultural Wealth with 5th Graders Learning about the COVID-19
Christina Restrepo Nazar, California State University, Los Angeles
Jamie Marsh, California State University, Los Angeles
Socorro Orozco, California State University, Los Angeles

Convergence of Scientific and Mathematical modeling: Investigating elementary pre-service teacher interest and confidence in STEM
Andrew Gilbert, George Mason University
Jennifer Suh, George Mason University

Linking Pedagogical Content Knowledge and Teaching Practice in Science Teacher Education: A Systematic Literature Review
Lukas Mientus, University of Potsdam
Anne Hume, University of Waikato
Peter Wulff, University of Potsdam
Andreas Borowski, University of Potsdam

How Effective Is Feedback regarding Pre-Service Teachers' Representational Competence?
Mathias Ropohl, University of Duisburg-Essen
Julia Schwanewedel, Humboldt University of Berlin

Examining PCK Readiness from Participating in a Co-plan, Co-teach, and Co-reflect Early Practicum Experience
Steven Newman, Indiana University
Meredith Park Rogers, Indiana University

Exploring Teacher Candidates' Knowledge of Assessment through Science Journals
E.J. Bahng, Iowa State University

Learning to Listen: Cultivating Pre-Service Teachers' Attunement and Responsiveness to Student Thinking
Shannon Davidson, Florida State University
Lama Jaber, Florida State University
Allison Metcalfe, Florida State University

Perspectivization: Empowering, Evoking and Revolutionizing Science Teacher Education for Social Justice
Christina Restropo Nazar, California State University, Los Angeles
Jose Martinez Hinestroza, Texas State University
**Friday, April 9, 2021**

<table>
<thead>
<tr>
<th><strong>Friday 8:00am through Saturday 7:00am</strong></th>
<th><strong>8:30 am-9:30 am (Real time/ Live)</strong></th>
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</thead>
</table>

### Poster Session #2

*Posters are available for viewing for a 23-hour window for asynchronous interactions. Attendees can view the poster at the indicated link and post comments to the presenter for which the presenter may respond. The posters will become inactive and inaccessible after Saturday, 7:00 am. For a complete listing of Friday’s posters, please refer to the end of the Friday schedule.*

*Presenters will pre-record their presentations.*

### Author-scheduled, 30-minute Q&A sessions #2

*Attendees will view the recorded presentations in advance of the Q&A session. Presenters will schedule a 30-minute block (like “office hours”) on a sign-up sheet in advance of the conference. The scheduled time will be listed in the conference program.*

### Research Interest Groups (RIGs) Meetings

#### 8:30am – 9:30am

**Real-time/ live**

**Engineering Education Research Interest Group (ENE-RIG)**

*Presiders:*

Kristina Tank, Iowa State University
Anne Leak, High Point University

*The purpose of the RIG in Engineering Education is to synergize research in science and engineering education, promote rigorous research in engineering education, and provide a collaboration and discussion space supporting intellectual and professional exchange and networking. At the 2021 Business Meeting, the RIG members will discuss the following items: a) Updates on membership (100+ members), listserv, website; b) Discussion on NARST strands and involvement of the ENE-RIG; c) Plans for collaborative paper sets, symposiums, and panels; and d) Updates on leadership team, elections, roles, and budget.*

**Indigenous Science Knowledge Research Interest Group (ISK-RIG)**

*Presiders:*

Bhaskar Upadhyay, University of Minnesota
Stacey Britton, University of West Georgia
Sharon Nelson-Barber, WestEd
Rouhollah Aghasaleh, Humboldt State University

*At the 2021 business meeting, ISK members will discuss the following items: developing ideas and activities to engage with Indigenous Tribes and the NARST, developing ideas and activities to promote visions and missions of the ISK RIG more globally, developing priorities on how to use funds donated to ISK by NARST members, update on the edited book series on ISK, and any other ISK RIG related business the membership needs to discuss.*
NETWORKING/ SOCIAL CONCURRENT SESSIONS
8:30am – 9:30am
Real-time/ live

Art-based social meet-up (duration: 30 min)
Organizer: Katia Kromann Nielsen, University of Copenhagen

This is a short informal session where we can get to know each other in a different way. In the session I will give a brief introduction of art-based-methods and we will then engage in an exercise. The idea is to use art-based methods to experiment with getting to know each other in a fun way despite the distance.

Drop Your Research/Theory/Test tube like it’s Hot (duration: 60 min)
Organizers: Noemi Waight, University at Buffalo
Jennifer Adams, University at Calgary

This session will provide a space for informal community building. It will involve a jam session that will feature an eclectic musical lineup from all over the world. The goal here is to provide a space to connect with other NARST members, decompress, and dance the time away. Since the act of dancing is related to spatial awareness, raises the heart rate, and results in the release of endorphins, we hypothesize that dancing in community will inform positive vibes for NARST'ers.
Concurrent Session # 6 (Advance Viewing of Pre-recorded Presentations with 60-minute Real time/ Live Q&A)
Special Time Slot 7:15 AM - 8:15 AM

Strand 5: College Science Teaching and Learning (Grades 13-20)
Special Time Slot, 7:15-8:15 AM

Pedagogy and partnerships for the modern STEM college classroom
7:15 am -8:15am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Emily Walter, California State University, Fresno

Revision as an Essential Step in Modeling Cellular Respiration System Dynamics
Lyrica Lucas, University of Nebraska–Lincoln
Tomáš Helikar, University of Nebraska–Lincoln
Joseph Dauer, University of Nebraska–Lincoln

Impacts of Inquiry-based Teaching on Undergraduate Students’ Engagement in Science and Environmental Awareness
Ya-Chun Chen, National Chiao Tung University
Zuway-R Hong, Kaohsiung Medical University
Huann-Shyang Lin, National Sun Yat-Sen University; Australian Catholic University

Enacting a Persona Strategy in Knowledge Construction to Elicit Epistemic Goals and Support Epistemic Agency
Heesoo Ha, Seoul National University

Comparing Learning Assistant and Professor Talk Moves in an Undergraduate Engineering Science Class
Isabella Stuopis, Tufts University
Kristen B. Wendell, Tufts University
Hoda Koushyar, Tufts University

Strand 6: Science Learning in Informal Contexts
Special Time Slot, 7:15-8:15 AM

Informal Science Learning in Museums and other places
7:15 am -8:15am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Ran Peleg, University of Southampton

Assessing participant learning outcomes in science museums: Building capacity for collective evaluation
K. C. Busch, North Carolina State University
Lynn Chesnut, North Carolina State University
Regina Ayala Chavez, North Carolina State University
Lincoln Larson, North Carolina State University
Kathryn Stevenson, North Carolina State University
Charles Yelton, North Carolina Museum of Natural Sciences
Nicole Coscolluela, North Carolina Museum of Natural Sciences

Online Learning in Museums and the influence of COVID-19 Museum Closures
Megan Ennes, University of Florida

Characteristics of Students’ Abductive Reasoning According to Scientific and Historical Knowledge in Deoksugung Palace, Korea
Jooyoung Jeon, Ewha Womans University
Donghee Shin, Ewha Womans University

Empowering Publics to Engage with Socio-Scientific Issues in Science Exhibitions: Mental Health-Mind Matters
Ana Maria Navas Iannini, University of Los Andes
Erminia Pedretti, University of Toronto
Kristen Schaffer, University of Toronto
Daniel Atkinson, University of Toronto
Strand 10: Curriculum and Assessment
Special Time Slot, 7:15-8:15 AM

Automated scoring and machine learning in science assessment
7:15 am -8:15am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Shahar Abramovitch, University of Massachusetts Boston

When Can Multinomial Logistic Regression Best Classify Pre-Service Physics Teachers' Written Reflections?
Peter Wulff, University of Potsdam
David Buschhüter, University of Potsdam
Anna Nowak, University of Potsdam
Andreas Borowski, University of Potsdam

Towards automated formative assessment of students' scientific explanations in Biology using Natural Language Processing
Moriah Ariely, Weizmann Institute of Science
Tanya Nazaretsky, Weizmann Institute of Science
Giora Alexandron, Weizmann Institute of Science

Automated Scoring of Chinese Grades 7-9 Students' Competence in Interpreting and Arguing from Evidence
Cong Wang, Beijing Normal University
Xiufeng Liu, State University of New York At Buffalo
Lei Wang, Beijing Normal University
Ying Sun, State University of New York At Buffalo
Jian Wang, Beijing Normal University
Shan Lin, Beijing Normal University

Applying Machine Learning to Automatically Evaluate Student Scientific Modeling Competence
Xiaoming Zhai, Michigan State University
Jie Yang, Beijing Normal University
Tingting Li, CREATE for STEM Institute
Peng He, Michigan State University
Joseph Krajcik, Michigan State University
Strand 1: Science Learning: Development of Student Understanding

**Multiple Ways of Representing Knowledge**  
9:30 am -10:30 am  
Advanced Pre-recorded Viewing & Live Q&A  
**Presider:** Anita Schuchardt, University of Minnesota

**A Framework to Foster Knowledge Acquisition Processes in STEM and Computing Education**  
Burkhard Priemer, Humboldt-Universität zu Berlin  
Annette Upmeier Zu Belzen, Humboldt-Universität zu Berlin

**Breaking Barriers to Students Multiple Representations Using Multiple Representations Learning Strategy**  
Olugbenga Akindoju, Lagos State University  
Olatunde Owolabi, Lagos State University  
Hakeem Akintoye, Lagos State University, Ojo  
Yinka Orulebaja, Lagos State University

**Writing in Science: A Tool for Personal and Three-Dimensional Sensemaking**  
Kirsten Edwards, Michigan State University  
Charles Anderson, Michigan State University

**A New Perspective on Multimodality in Science Learning and Teaching**  
Ayca Fackler, University of Georgia

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Strand 1: Science Learning: Development of Student Understanding

**Student Thinking About Genetics and Evolution**  
9:30 am -10:30 am  
Advanced Pre-recorded Viewing & Live Q&A  
**Presider:** Cari Herrmann Abell, BSCS Science Learning

**Mechanistic reasoning about gene environment interactions**  
Michal Haskel Ittah, Weizmann Institute of Science  
Ravit Golan Duncan, Rutgers University

**Teleology and essentialism in the context of genetics: a fresh look at students' conceptions**  
Florian Stern, University of Geneva  
Kostas Kampourakis, University of Geneva  
Marine Delaval, Université de Lille  
Andreas Mueller, University of Geneva

**Learning About Evolution: An Intervention Study on the Elucidation of Misconceptions and Context-related Surface Features**  
Helena Aptyka, University of Cologne  
Victoria Hollmann, University of Cologne  
Daniela Fiedler, Kiel University  
Jörg Großschedl, University of Cologne

**Characterizing Students' Use of Mechanistic Reasoning to Explain Allele Relationships**  
Gur Livni Alcasid, Weizmann Institute of Science  
Michal Haskel Ittah, Weizmann Institute of Science
Strand 2: Science Learning: Contexts, Characteristics, and Interactions

*Interest, Motivation, and Critical Thinking in Science Learning*
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Sara Samiphak, University of California – Berkeley

*Elementary Student Latent Expectancy-Value-Cost Science Motivation Classes and Their Association with Science Achievement*
David McKinney, University of Nevada, Las Vegas

*Examining the Predictors of Middle School Students’ Interests in Computationally Demanding Science Careers*
Arif Rachmatullah, North Carolina State University
Madeline Hinckle, North Carolina State University
Danielle Boulden, North Carolina State University
Eric Wiebe, North Carolina State University

*The Effects of Critique-driven Inquiry (CDI) Teaching Intervention on Primary and Secondary School Students’ Critical Thinking and Scientific Inquiry Competency*
Ying-Yan Lu, Kaohsiung Medical University
Zuway-R Hong, Kaohsiung Medical University
Huann-Shyang Lin, National Sun Yat-Sen University
Thomas Smith, Northern Illinois University
Wen-Yi Hsu, Kaohsiung Medical University

*An Exploration of Multilevel Effects of Student- and School- Factors on Elementary Students’ Attitudes towards Science*
Shuchen Guo, Nanjing Normal University
Enshan Liu, Beijing Normal University

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*Research of Primary Science Teaching and Learning in China – the Past and the Future*
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Yang Yang, Beijing Normal University
**Discussant:** Siqi Li, Beijing Normal University

**Presenters:**
Yang Yang, Beijing Normal University
Siqi Li, Beijing Normal University
Yajie Xin, Qingdao University
Zongfang Zhang, Qingdao University
Yueyuan Meng, Qingdao University
Xinhui Zhou, Qingdao University
Strand 3: Science Teaching—Primary School (Grades preK-6)

Engineering Education in the Primary Grades
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Laura Zangori, University of Missouri

To What Extent Does Construction Play Enhance Engineering Thinking and Self-Regulation Capabilities?
Ornit Spektor-Levy, Bar-Ilan University
Taly Shechter, Bar-Ilan University

Elementary Teachers’ Scaffolding of Engineering Practices: Issues with “The Engineering Design Process” as Instructional Model
Jacob Pleasants, Keene State College
Joanne Olson, Texas A&M University

Examining Changes in Practitioner Journals Pre and Post Covid as a Worked Example
Brandi Kamp, Clemson University
Daniel Alston, University of North Carolina at Charlotte

Elementary Teacher Beliefs, Understandings, and Confidence to Integrate Engineering: Implications and Opportunities
Whitney McCoy, University of Virginia
Jennifer Maeng, University of Virginia
Amanda Gonczi, Michigan Technological University
Robert Handler, Michigan Technological University

Strand 4: Science Teaching—Middle and High School (Grades 5-12)

In Search of New Tools for Meaningful Learning in Chemistry – We Stumbled on Culturo-Techno-Contextual-Approach
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A

Presenters:
Adekunle Ibrahim Oladejo, Lagos State University
Ibukunolu Adebiyi Ademola, Lagos State University
Peter Okebukola, Lagos State University
Fred Awaah, University of Professional Studies, Ghana
Deborah Oluwatosin Agbanimu, Lagos State University
Franklin Onowugbeda, Lagos State University
Aderonke Foluso Ebisin, Ogun State Institute of Technology
Esther Oluwafunmilayo Peter, Lagos State University
Michael Adelani Adewusi, Lagos State University
Tokunbo Ola Odekeye, Lagos State University
Strand 5: College Science Teaching and Learning (Grades 13-20)

Rethinking STEM college course designs
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Joshua Reid, Middle Tennessee State University

Integrating a Real-Life Software Project into a Model-Based Systems Engineering MOOC
Hanan Kohen, Technion - Israel Institute of Technology
Niva Wengrowicz, Technion- Israel Institute of Technology
Dov Dori, Technion- Israel Institute of Technology

Students’ and Instructors’ Conceptions of Scientific Hypotheses and Predictions: A Case for Closer Scrutiny
Anupriya Karippadath, Purdue University
Stephanie Gardner, Purdue University

Partnering With Undergraduates to Redesign an Introductory Chemistry Laboratory Course
Hannah Jardine, The Catholic University of America
Elizabeth Griffith, University of Maryland

How does the lack of effective training impact biology GTAs? A descriptive study
Santiago Ojeda-Ramirez, Universidad de los Andes
Stephanie Toro, Universidad de los Andes
Catalina Zuluaga-Arias, Universidad de los Andes

Strand 6: Science Learning in Informal Contexts

Scaling an Effective Analysis-of-Practice PD Program in Four Contexts: Development, Successes, and Challenges
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A

Translating and Scaling a Face-to-Face, Video-based Elementary Science PD Program to an Online Environment
Susan Kowalski, Biological Science Curriculum Study
Amy Belcastro, Biological Science Curriculum Study
Connie Hvidsten, Biological Science Curriculum Study
Angelina Constantine, University of Minnesota
Farah Faruqi, University of Minnesota
Karen Askinas, Biological Science Curriculum Study
Renee DeVaul, Biological Science Curriculum Study
Gillian Roehrig, University of Minnesota

Adapting and Scaling a Videobased, Analysis-of-Practice PD Program for High School Biology Teachers
Jody Bintz, Biological Science Curriculum Study
Connie Hvidsten, Biological Science Curriculum Study
Cynthia Gay, Biological Science Curriculum Study
Lacey Eckels, Jefferson County KY Public Schools
Christopher Wilson, Biological Science Curriculum Study
Molly Stuhlsatz, Biological Science Curriculum Study

Adapting and Scaling the LAST PD Program Conceptual Framework in Preservice Teacher Education Programs
Abraham Lo, Biological Science Curriculum Study
Betty Stennett, Biological Science Curriculum Study
Connie Hvidsten, Biological Science Curriculum Study
Karen Askinas, Biological Science Curriculum Study

Factors that Support and Challenge Scaling of Videobased Analysis-of-Practice PD through K-6 Teacher Leader Development
Kathleen Roth, Cal Poly Pomona Foundation
Nicole Wickler, Cal Poly Pomona
Rebecca Eddy, Cobblestone Applied Research & Evaluation, Inc.
Strand 7: Pre-service Science Teacher Education

Identity Development in Science Teachers
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Frackson Mumba, University of Virginia

Challenges in Representing Science Teacher Identity in Classroom-Based Science Formative Assessments
Kristen Larson, Columbia University
Felicia Mensah, Columbia University
Jessica Riccio, Columbia University

"I wasn’t aware, until I was aware ": Reflective Practices for Teacher Empowerment
Elanur Yilmaz, Middle East Technical University
Elif Sönmez, Kastamonu University

Persistence in a STEM Teaching Program: Examining the Effects of Disciplinary Identity and Teaching Identity
Ingelise Giles, Florida International University
Nicole Cook, Florida International University
Zahra Hazari, Florida International University
Maria Fernandez, Florida International University
Laird Kramer, Florida International University

The role of motivation in pre-service physics teachers’ learning to notice students’ preconception
Martin Schwichow, PH Freiburg
Katharina Hellmann, University of Education Freiburg

Strand 8: In-service Science Teacher Education

Teacher Engagement and Leadership
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Douglas Larkin, Montclair State University

Which Hat Should I Wear? Examining Teacher Positioning and Engagement in Professional Development
Patrick Enderle, Georgia State University
Jennifer Schellinger, Florida State University
Ozlem Akcil Okan, Florida State University
Claudia Hagan, Georgia State University
Samantha Skrob, Florida State University
Ellen Granger, Florida State University
Todd Bevis, Florida State University

Pushing against the tides: How engaging in research promotes teacher leadership development
Joshua Reid, Middle Tennessee State University
Allison Hardee, Middle Tennessee State University
Brett Criswell, West Chester University
Gregory Rushton, Middle Tennessee State University

Curriculum-Based Professional Development to Support Teachers’ Vision of Recent Shifts in Science Instruction
Katherine McNeill, Boston College
Renee Affolter, Boston College
Benjamin Lowell, Boston College
Casandra Gonzalez, Boston College
Kevin Cherbow, Boston College

Job Embeddedness and Professional Support: A Case Study of Science Teacher Retention in One District
Douglas Larkin, Montclair State University
Liz Carletta, Montclair State University
Suzanne Poole Patzelt, Montclair State University
Khadija Ahmed, The Center for Research and Evaluation on Education and Human Services
Strand 8: In-service Science Teacher Education

Opportunities and Challenges of Facilitating Educators’ Understanding and Use of the Next Generation Science Standards
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
Discussant: Annemarie Palincsar, University of Michigan

Presenters:
Susanna Hapgood, University of Toledo
Charlene Czerniak, University of Toledo
Amelia Wenk Gotwals, Michigan State University
Tanya Wright, Michigan State University
Gavin Fulmer, University of Iowa
Brian Hand, University of Iowa
Elizabeth Lehman, University of Chicago
James Pellegrino, University of Illinois at Chicago
Nancy Songer, University of Utah
Michelle Newstadt, Gooru.org

Strand 10: Curriculum and Assessment

Teacher observation and attitudes towards science evaluation
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Lori Andersen, University of Hawai’i, Manoa

Teachers' perspectives of three-dimensional formative assessments embedded within a curriculum: An initial study
Consuelo Morales, Michigan State University
Jane Lee, Michigan State University
Idit Adler, Tel Aviv University
Irene Bayer, Michigan State University

Empirical Validation of a STEM Observation Instrument Using Exploratory Factor Analysis
Joshua Ellis, Florida International University
Emily Dare, Florida International University
Mark Rouleau, Michigan Technological University
Elizabeth Ring-Whalen, St. Catherine University
Benny Mart Hiwatig, University of Minnesota Twin Cities
Khomson Keratithamkul, University of Minnesota
Feng Li, Florida International University
Farah Faruqi, University of Minnesota
Preethi Titu, Kennesaw State University
Gillian Roehrig, University of Minnesota

Challenges in assessing chemistry lab reports among pre-service teachers
Yoram Zemel, Technion - Israel Institute of Technology
Gabriela Shwartz, Technion - Israel Institute of Technology
Shirly Avargil, Technion - Israel Institute of Technology

Educative Curriculum Materials for Teacher Educators: Building Preservice Teachers’ Content Knowledge for Teaching about Matter
Deborah Hanuscin, Western Washington University
Emily Borda, Western Washington University
Josie Melton, Western Washington University
Jamie Mikeska, Educational Testing Service
Strand 12: Technology for Teaching, Learning, and Research

Virtual Rehearsal Simulations to Explore Elementary Pre-service Teachers’ Scientific Discourse Skills
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
Discussant: Carrie Lee, East Carolina University

Presenters:
Tammy Lee, East Carolina University
Carrie Lee, East Carolina University
Mark Newton, East Carolina University
Paul Vos, East Carolina University
Jennifer Gallagher, East Carolina University
Daniel Dickerson, East Carolina University

Strand 13: History, Philosophy, Sociology, and Nature of Science

Teaching and Learning in the College Science Classroom
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Sally Wu, Northwestern University

The design components of an online course in research ethics for science and engineering students
Miri Barak, Technion - Israel Institute of Technology

Interrelationship between perceived innovative thinking and actual innovation, online vs. face-to-face learners
Maya Usher, Technion - Israel Institute of Technology
Miri Barak, Technion - Israel Institute of Technology

Computational Practices in Science Disciplines
Claudia Fracchiolla, University College Dublin
Claire Mullen, University College Dublin
Maria Mehaan, University College Dublin

Investigating Students’ Engagement with Science Videos: An EEG Study
Ido Davidesco, University of Connecticut
Or Dagan, New York University
Strand 14: Environmental Education and Sustainability

*Approaches to education for sustainability and sustainable development*
9:30 am -10:30 am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Shelley Rap, Weizmann Institute of Science

"Speak to Me in Numbers" – Interdisciplinary Teaching of Sustainable Development Goals
Shelley Rap, Weizmann Institute of Science
Ayshi Sindiani, Weizmann Institute of Science
Moran Bodas, Sheba Medical Center; Tel Aviv University
Sherman Rosenfeld, Weizmann Institute of Science
Ron Blonder, Weizmann Institute of Science

**Science Comics for the Public Good: Enhancing Environmental Literacy in/of the Anthropocene**
Katherine Bruna, Iowa State University
Lyric Bartholomay, University of Wisconsin-Madison
Sara Erickson, Iowa State University

**Realizing the social dimension of science education for desired citizenry**
Tapashi Binte Chowdhury, University of Tartu
Jack Holbrook, University of Tartu
Miia Rannikmae, University of Tartu

**Sustainable Development Practices: Impacts of Significant Life Experiences, Knowledge, and Attitudes by Controlling School Environment**
Ridvan Elmas, Afyon Kocatepe University
Savas Pamuk, Akdeniz University
Yakup Saban, Afyon Kocatepe University
Concurrent Session # 7 (Advance Viewing of Pre-recorded Presentations with 60-minute Real time/ Live Q&A)
10:45-11:45 AM

Strand 2: Science Learning: Contexts, Characteristics, and Interactions

COVID & Social Justice
10:45am -11:45am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Gianna Lopez-Colson, University of Texas Rio Grande Valley

STEM teachers' curriculum practices in online teaching during the Covid-19 pandemic: A Canadian context
Isha DeCoito, Western University
Mohammed Estaiteyeh, University of Western Ontario

Empowering K-12 Science Teachers as Equity Advocates and Designers of Transformative Justice-Centered Science Learning Communities
Tammie Visintainer, San José State University

Ideological Practice in Science Learning: Navigating Complex Terrain of Climate and Politics in US Classrooms
Lynn Zummo, University of Utah

Has COVID-19 left 3D Science in Elementary School on Life Support?
Sally Crissman, TERC
Roger Tobin, Tufts University
Sara Lacy, TERC

Testing Two Teacher Preparation Programs for Effective Science Teaching
Elizabeth Lewis, University of Nebraska–Lincoln
Lyrica Lucas, University of Nebraska–Lincoln
Amy Tankersley, University of Nebraska–Lincoln
Elizabeth Hasseler, University of Nebraska–Lincoln
Anna Rivero, Seattle University
Brandon Helding, University of Nebraska-Lincoln

Overcoming Obstacles - Supporting Teachers to Implement Inquiry-Based Teaching
Alice Hesse, Leibniz Institute for Science and Mathematics Education
Stefan Sorge, Leibniz Institute for Science and Mathematics Education
Knut Neumann, Leibniz Institute for Science and Mathematics Education

Evoking Meaning and Connection: Using Awe to Teach Science
Julianna Nieuwsma, North Carolina State University
Gail Jones, North Carolina State University
Kathryn Rende, North Carolina State University
Emma Refvem, North Carolina State University
Sarah Carrier, North Carolina State University
Jill Grifenhagen, North Carolina State University
Cesar Delgado, North Carolina State University
Pamela Huff, North Carolina State University

Exploring Interactions between Urban Science Teachers' Epistemological Beliefs and their Understanding of Argumentation
Teresa Massey, Georgia State University
Patrick Enderle, Georgia State University
Desmond Lee, Georgia State University
Claudia Hagan, Georgia State University

Strand 4: Science Teaching—Middle and High School (Grades 5-12)

Teaching Practices
10:45am -11:45am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Todd Hutner, University of Alabama
**Strand 6: Science Learning in Informal Contexts**

**STEM Interest Development**
10:45am - 11:45am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Susan Letourneau, New York Hall of Science

Authentic STEM research, practices of science, and interest development in an informal science education program
Bobby Habig, American Museum of Natural History
Preeti Gutpa, American Museum of Natural History

Content, Context, and Structure of Family STEM Conversations and Their Influence on STEM Identity
Heidi Cian, Florida International University
Remy Dou, Florida International University

Parent Gender as a Contributing Factor in the Development of College Students' STEM Identity
Sheila Castro, Florida International University
Heidi Cian, Florida International University
Remy Dou, Florida International University

Integrating Authentic Learning with Career Role Models to Promote Student Interest in Biosciences
Stephanie Couch, Massachusetts Institute of Technology
Melanie Kalainoff, Kalainoff Consulting and Research, LLC
Leigh Estabrooks, Lemelson-MIT Program
Helen Zhang, Boston College
Anthony Perry, Lemelson-MIT Program
Alazar Ayele, Biogen Community Lab, Biogen Inc.
Amanda Marvelle, Biogen Community Lab, Biogen Inc.
Connor Hanley, Biogen Community Lab, Biogen Inc.
Alex Cameron, Biogen Community Lab, Biogen Inc.

**Strand 7: Pre-service Science Teacher Education**

**Development of Pedagogy and Practice of Pre-service Teachers**
10:45am - 11:45am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Karin Lohwasser, University of California, Santa Barbara

Examining asset and deficit perspectives of preservice science teachers' knowledge and learning
Ron Gray, Northern Arizona University
Scott McDonald, Pennsylvania State University
David Stroupe, Michigan State University

Reflective Practice in Microteaching: An Analysis of Preservice Secondary STEM Teachers' Video-based Reflections
Deepika Menon, University of Nebraska-Lincoln
Rosetta Ngugi, Towson University

Employing Distinctiveness as A Framework to Understand Teacher Noticing
Lu Wang, Indiana University Kokomo

From Fractured to Structured: Examining the Characteristics of Preservice Science Teachers' PCK and PCK Development
William Reynolds, North Carolina State University
Soonhye Park, North Carolina State University
Mwenda Kudumu, North Carolina State University
Strand 7: Pre-service Science Teacher Education

_Taking Up Socioscientific Issues_
10:45am - 11:45am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Stephen Witzig, University of Massachusetts Dartmouth

_Pre-service Science Teachers' Informal Reasoning and Decision-Making Modes regarding COVID-19_
Cigdem Han Tosunoglu, Marmara University
Ferah Ozer, Bogazici University

_Instructional Decision-Making for Preservice Teachers' Socioscientific Issues-Based Teaching_
Melanie Kinskey, Sam Houston State University
Dana Zeidler, University of South Florida

_Pre-service teachers' experiences and perceptions of learner-learner talk: A lens into future teaching methods_
Nomfundo Radebe, University of Witwatersrand
Emmanuel Mushayikwa, University of the Witwatersrand

_Influence of a COVID-19 SSI Unit on Elementary Teachers' Trust in Science and Scientists_
Lisa Borgerding, Kent State University
Bridget Mulvey, Kent State University

Strand 10: Curriculum and Assessment

_Curricular innovations in high school biology_
10:45am - 11:45 am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Cari Hermann Abell, BSCS Science Learning

_Measuring the Efficacy of an Approach to Integrating Quantitative Reasoning in High School Biology_
Molly Stuhlsatz, BSCS Science Learning
Melissa Kjelvik, Michigan State University
Elizabeth Schultheis, Michigan State University
Jeffrey Snowden, BSCS Science Learning
Brian Donovan, BSCS Science Learning
Louise Mead, Michigan State University

_Teacher Decision-Making in High School Biology Curriculum Co-Design: A Comparative Case Study Analysis_
Elizabeth Chatham, New Visions for Public Schools
Kiran Purohit, New Visions for Public Schools

_Teaching an SSI Unit in an Inclusive Secondary Biology Classroom_
Rachel Juergensen, University of Missouri Columbia
Laura Zangori, University of Missouri
Patricia Friedrichsen, University of Missouri Columbia
Tanner Oertli, University of Missouri Columbia
Troy Sadler, University of North Carolina at Chapel Hill

_Update Genetics Education - Introducing Epigenetics with Dialogic Teaching in Secondary Classrooms_
Karin Thörne, Karlstad University
Niklas Gericke, Karlstad University
Birgitta Mc Ewen, Karlstad University
Strand 10: Curriculum and Assessment

In-service Teachers Engaging in Science and Engineering Practices
10:45am - 11:45am
Advanced Pre-recorded Viewing & Live Q&A

Changes in teacher self-efficacy and beliefs: The impact of an engineering research experience for teachers (RET) program on science teachers
Tiffany Lewis, Pennsylvania State University
Amber Cesare, Pennsylvania State Center for Science and the Schools
Kathleen Hill, Pennsylvania State University

Supporting teachers to MASTER developing practices-based curriculum
Jennifer Jackson, Pennsylvania State University

Advancing Teachers' Curricular Integration of Mathematics and Computational Thinking through a Research Experience Program
Amber Cesare, Pennsylvania State Center for Science and the Schools
Kathleen Hill, Pennsylvania State University
Tiffany Lewis, Pennsylvania State University
Amy Farris, Pennsylvania State University
Courtney Nagle, Pennsylvania State University - Behrend

K-12 teachers use authentic STEM practices in the classroom based on research immersion experiences
Matthew Johnson, Pennsylvania State University
Kathleen Hill, Pennsylvania State University

Strand 10: Curriculum and Assessment

Evaluating science identity, attitudes, and career aspirations
10:45am - 11:45am
Advanced Pre-recorded Viewing & Live Q&A

Presider: Xiaoming Zhai, Michigan State University

A Survey to Measure Secondary School Students' Identity in Research (IR-SH)
Linda Morrell, University of California, Berkeley
Shruti Bathia, University of California, Berkeley
Ben Koo, University of California, Berkeley
Perman Gochyyev, University of California, Berkeley
Mark Wilson, University of California, Berkeley
Rebecca Smith, University of California, San Francisco

A systematic review of the conceptual framework of attitude toward science instruments
Radu Bogdan Toma, Universidad de Burgos
Jesús Ángel Meneses Villagrá, Universidad de Burgos
Norman Lederman, Illinois Institute of Technology

Career Aspirations in Elementary Students: A Comparison of Three Measures
Kelli Paul, Indiana University
Adam Maltese, Indiana University
Meredith Portsmore, Tufts University
Karen Miel, Tufts University
Jungsun Kim, Indiana University

Reproducing Oppression: Identifying How Four Levels of Oppression are Reproduced within the Science Classroom
Khanh Tran, Purdue University
Selcen Guzey, Purdue University
Strand 11: Cultural, Social, and Gender Issues

*Science Education Research in Culturally and Linguistically Diverse Contexts: Critical Views and Emerging Questions*
10:45am- 11:45 am
Advanced Pre-recorded Viewing & Live Q&A
*Presider:* Sara Wilmes, University of Luxembourg
*Discussant:* Maria Varelas, University of Illinois At Chicago

*Presenters:*
Sara Wilmes, University of Luxembourg
Christina Siry, University of Luxembourg
Helen Douglass, University of Tulsa
Shakhnoza Kayumova, University of Massachusetts-Dartmouth
Minjung Ryu, University of Illinois at Chicago
Casey Elizabeth Wright, Purdue University
Sara Salloum, University of Balamand
Mavreen Rose Tuvilla, Texas State University
Geeta Verma, University of Colorado Denver
Maria Varelas, University of Illinois At Chicago

Strand 12: Technology for Teaching, Learning, and Research

*STEM Capital*
10:45am -11:45am
Advanced Pre-recorded Viewing & Live Q&A
*Presider:* Cassie Quigley, University of Pittsburgh

*Constructing "STEM Identity": Test of an Expanded Identity Model*
Remy Dou, Florida International University
Heidi Cian, Florida International University

*Gender Differences in Early STEM Capital: A Focus on K-4 STEM Experiences*
Susie Cohen, Florida International University
Zahra Hazari, Florida International University
Gerhard Sonnert, Harvard Smithsonian
Philip Sadler, Harvard Smithsonian

*’It Was a Completely Different Change in Environment’: Contribution of Immigration History to STEM Identity*
Alexandra Martinez, Florida International University
Remy Dou, Florida International University
Heidi Cian, Florida International University

*Building Community and Leveraging Cultural Resources: Black & Latina Girls in a Virtual STEM Camp*
Laura Peña, Georgia State University
Natalie King, Georgia State University
Friday, April 9, 2021

Strand 12: Technology for Teaching, Learning, and Research

**Leveraging Mixed-reality Classroom Simulators for Professional Development to Support Student-centered STEM Learning Environments**
10:45am -11:45am
Advanced Pre-recorded Viewing & Live Q&A

**Using TeachLivE Mathematics Diagnosis Simulations with Pre-service Elementary Teachers**
Enrique Ortiz, University of Central Florida

**How Do GTAs Conceptualize and Utilize Error Framing in a Mixed-reality Classroom Simulator**
Ashley Geraets, University of Central Florida
Constance Doty, University of Central Florida
Andrew Chesire, University of Central Florida
Tong Wan, Westminster College
Jacqueline Chini, University of Central Florida
Erin Saitta, University of Central Florida

**Impact of GTA Practice with Questioning Strategies Using a Mixed-reality Simulator**
Constance Doty, University of Central Florida
Ashley Geraets, University of Central Florida
Tong Wan, Westminster College
Erin Saitta, University of Central Florida
Jacqueline Chini, University of Central Florida

**Mixed Reality Integrated Learning Environment for Teaching Training of STEM Teaching Assistants**
Fengfeng Ke, Florida State University
Zhaihuan Dai, Florida State University
Chih-Pu Dai, Florida State University
Luke West, Florida State University
Xin Yuan, Florida State University

Strand 13: History, Philosophy, Sociology, and Nature of Science

**The Nature of Science & Engineering Practices**
10:45am -11:45am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Sahar Alameh, University of Kentucky

**The Nature of Scientific Explanation (NOSE): Examining the Quality and 'Goodness' of Explanation among Students, Teachers, and Scientists**
Sahar Alameh, University of Kentucky
Fouad Abd-El-Khalick, University of North Carolina at Chapel Hill
David Brown, University of Illinois

**County Science Specialists' Views of Aligning Historical and Experimental Sciences with NGSS Science Practices**
Laura Schneider, St. Mary's College of Maryland
Julie Kittleson, University of Georgia

**Epistemic Aspects of Engineering for K-12 Education**
Ezgi Yesilyurt, Weber State University
Hasan Denzi, University of Nevada, Las Vegas
Erdogan Kaya, George Mason University

**Differences and interrelations between science and engineering – Stereotypes and experts' perceptions**
Lior Keren, Technion - Israel Institute of Technology
Shulamit Kapon, Technion - Israel Institute of Technology
Friday, April 9, 2021

Strand 15: Policy, Reform, and Program Evaluation

*From 'Physical to Digital': How institutions of informal science education adapt to an online presence during the COVID-19 crisis (and beyond)*

10:45am -11:45am
Advanced Pre-recorded Viewing & Live Q&A

**Presider:** Neta Shaby, Ben Gurion University of the Negev

**Discussant:** Ran Peleg, University of Southampton

**Presenters:**
Ran Peleg, University of Southampton
Neta Shaby, Ben Gurion University of the Negev
Carys Hughes, University of Southampton
Sarah Funk, Science Center Network
Claudia Sodini, K-productions
Nancy Staus, Oregon State University
Victoria Bonebrake, University of Washington
Ann Astroga, University of Washington
Elena Janniello, Università di Pisa
Antonella Gioli, Università di Pisa

**NARST MEMBERSHIP MEETING**
12:00pm -1:00pm

**LUNCH BREAK**
12:00pm -1:00pm
## Concurrent Session # 8 (Real Time / Live)
1:15 pm - 2:45 pm

### Administrative Sponsored Session
**Equity and Ethics Committee**

**Making the Case to Empower, Evoke, and Revolutionize the Culture of Science for Social Equity**
1:15 pm - 2:45 pm
Real time/ live

**Presenters:**
Sami Kahn, Princeton University
Stefanie Marshall, University of Minnesota
Shari Watkins, American University

### Administrative Sponsored Session
**Publications Advisory Committee**

**How to Get Your Research Published in Science Education Journals**
1:15 pm - 2:45 pm
Real time/ live

**Presiders:**
Shakhnoza Kayumova, University of Massachusetts-Dartmouth
Tina Cheuk, Stanford University
Dante Cisterna, Educational Testing Service

**Presenters:**
Asia-Pacific Science Education
Sonya Martin, Seoul National University

Cultural Studies of Science Education
Catherine Milne, New York University
Christina Siry, University of Luxembourg

Evolution: Education and Outreach
Ross Nehm, Stony Brook University

International Journal of Science Education
Gail Jones, North Carolina State University

- Journal of Research in Science Teaching
  Felicia Mensah, Columbia University
  Troy Sadler, University of North Carolina, Chapel Hill

- Journal of Science Education and Technology
  Kent Crippen, University of Florida, Gainesville

- Journal of Science Teacher Education
  Geeta Verma, University of Colorado, Denver
  Todd Campbell, University of Connecticut

- Journal of Teacher Education
  Gail Richmond, Michigan State University

- Research in Science Education
  Angela Fitzgerald, University of Southern Queensland

- Science Education
  Sherry Southerland, Florida State University

- Science & Education
  Sibel Erduran, University of Oxford

- Studies in Science Education
  Lucy Avraamidou, University of Groningen
  Justin Dillon, University of Exeter
Administrative Sponsored Session
Continental and Diasporic Africa in Science Education (CADASE) RIG

**CADASE RIG: Educative STEM Materials That Use and Evoke African American Capital**
1:15 pm - 2:45 pm
Real time / live

**Going beyond Ceremony: Creating Educative STEM Materials That Use and Evoke African American Capital**
Catherine Quinlan, Howard University

**Science Education, A Public Good for the Good of the Public? Research on and for the African Diaspora to Empower, Evoke, and Revolutionize**
Contributed CADASE posters

Administrative Sponsored Session
President

**National Academies of Sciences (NAS) Board of Science Education (BOSE) Contribution to Science Education as a Public Good**
1:15 pm - 2:45 pm
Real time / live

**Presenters:**
Heidi Schweingruber, National Academies of Science BOSE
Kenne Dibner, The National Academies of Sciences, Engineering and Medicine
Megan Bang, Northwestern University
Maya Garcia, Colorado Department of Education
William Penuel, University of Colorado
Strand 2: Science Learning: Contexts, Characteristics, and Interactions

**Social Factors in College Science**
1:15pm - 2:45 pm
Real time/ Live
**Presider:** Veronique Merritt, Columbia University

Group interaction patterns during argument-based data interpretation tasks in undergraduate biology
Andy Cavagnetto, Washington State University
Olivia Prestis, Washington State University
Ayden Hackett, Washington State University
Larry Collins, Washington State University
Jessie Arneson, Washington State University
Jacob Woodbury, Washington State University
William Davis, Washington State University
Erika Offerdahl, Washington State University

What Professors Say during Collaborative Tasks: Facilitation in a POGIL Chemistry Class
Shaghayegh Fateh, Middle Tennessee State University
Zubeyde Demet Kirbulut, Harran University
Amy Phelps, Middle Tennessee State University
Joshua Reid, Middle Tennessee State University
Gregory Rushton, Middle Tennessee State University

Should high school biology teachers relate to students' religious faith during evolution class?
Reut Stahi-Hitin, Weizmann Institute of Science
Anat Yarden, Weizmann Institute of Science

Disparities in Mentoring Experiences and Academic/Career Outcomes of STEM Undergraduates during the COVID-19 Pandemic
Guan Saw, Claremont Graduate University
Chi-Ning Chang, University of Kansas
Paul Hernandez, Texas A&M University

Strand 3: Science Teaching—Primary School (Grades preK-6)

**The Roles and Uses of Crosscutting Concepts in Elementary Teaching**
1:15pm -2:45pm
Real time/ Live

Co-occurring Crosscutting Concept Use in Elementary Preservice Teachers' Lesson Plans to Support Ambitious Teaching and Three-dimensional Science Learning
Amanda Benedict-Chambers, Missouri State University
Carrie-Ann Sherwood, Southern Connecticut State University

A Comparative Case Study of Preservice and Inservice Teachers' Implicit Use of CCCs in Lesson Planning
Tina Vo, University of Nevada - Las Vegas
Nicole Thomas, University of Nevada - Las Vegas
Asta Metha, University of Nevada - Las Vegas

Exploring Relationships among Educatable Materials and Elementary Teachers' Use of CCCs in NGSS-based instruction
Sarah Fick, Washington State University
Jennifer Chiu, University of Virginia

Inservice Elementary Teachers' Successes and Challenges in Using the Crosscutting Concepts in Three-Dimensional Learning
Anna Maria Arias, Kennesaw State University
Brendan Callahan, Kennesaw State University
Michael Dias, Kennesaw State University
Karen Kuhel, Kennesaw State University
Deborah Hanuscin, Western Washington University
Strand 4: Science Teaching—Middle and High School (Grades 5-12)

Investigating Aspects of the Modeling Competence: Practices and Metaknowledge
1:15 pm -2:45 pm
Real time/ live

Examining Student Engagement with ST and CT through Modeling in a Science Classroom
Jonathan Bowers, Michigan State University

Characterizing students progression patterns in CT and ST through modeling
Emil Eidin, Michigan State University
Israel Touitou, Michigan State University

Validation of a Rating Scale to Assess Learners' Meta modeling Knowledge using the Argument-based Approach
Paul Engelschalt, Humboldt University of Berlin
Anna Beniermann, Humboldt University of Berlin
Annette Upmeier Zu Belzen, Humboldt-Universität Zu Berlin
Dirk Krueger, Freie Universitaet Berlin

Evaluating Pre-service Science Teachers' Metacognitive Knowledge of the Modeling Process
Tom Bielik, Freie Universitaet Berlin
Moretz Krell, Freie Universitaet Berlin
Dirk Krueger, Freie Universitaet Berlin

Strand 7: Pre-service Science Teacher Education

Beliefs and Efficacy Among Pre-service teachers
1:15pm -2:45 pm
Real time/ live
Presider: Jennifer Maguire, Virginia Tech University

Experiences in Science Methods Courses and Science Teaching Efficacy
Sheryl McGlamery, University of Nebraska Omaha
Bridget Franks, University of Nebraska at Omaha
Saundra Shillingstad, University of Nebraska at Omaha

Influence of preservice science teachers' beliefs and goals in the learning tasks they design
Diego Rojas-Perilla, Columbia University

Changes in Pre-Service Elementary Teachers' Science Teaching Self-Efficacy and Reformed-Based Science Teaching and Learning Beliefs
Laura Eicher, Clemson University
Cynthia Deaton, Clemson University

To Teach or not to Teach: Examining persistence of interest in mathematics and science teaching
Andrew Marichal, Florida International University
Zahra Hazari, Florida International University
Gerhard Sonnert, Harvard Smithsonian
Philip Sadler, Harvard Smithsonian
Strand 8: In-service Science Teacher Education

*Handbook of Research on Science Teacher Education*
1:15pm - 2:45pm
Real time / Live
**Discussant:** Michele Koomen, Gustavus Adolphus College

**Presenters:**
Julie Luft, University of Georgia
Gail Jones, North Carolina State University
Andrew Gilbert, George Mason University
Elizabeth Edmondson, Virginia Commonwealth University
Allan Feldman, University of South Florida
Michael Reiss, University of London
Eve Manz, Boston University
David Stroupe, Michigan State University
Michele Koomen, Gustavus Adolphus College
Shannon Navy, Kent State University

Strand 10: Curriculum and Assessment

**Assessing student reasoning in the context of systems and processes**
1:15 pm - 2:45 pm
Real time / Live
**Presider:** Molly Stuhlsatz, BSCS

**Improving Student’s Understanding of Biological Variation in Experimental Design and Analysis Through a Curricular Intervention**
Anita Schuchardt, University of Minnesota
Jessica Dewey, University of Minnesota
Jenna Hicks, University of Minnesota

**Uncovering Students’ Developing Understanding of Interdependent Relationships in Ecosystems**
Sara Dozier, Stanford University
Anna MacPherson, American Museum of Natural History
Linda Morell, University of California, Berkeley
Weerephat Suksiri, University of California, Berkeley
Mark Wilson, University of California, Berkeley
Jonathan Osborne, Stanford University

**Rethinking Assessments for Systems**
Karyn Housh, Indiana University
Abeera Rehmat, Indiana University-Bloomington
Cindy Hmelo-Silver, Center for Research on Learning & Technology
Dante Cisterna, Educational Testing Service
Lei Liu, Educational Testing Service

**High school students’ ability to connect biological processes when studying evolution**
Rebecca Ellis, Michigan State University
Louise Mead, Michigan State University
Frieda Reichsman, The Concord Consortium
Jim Smith, Michigan State University
Kiley McElroy-Brown, The Concord Consortium
Genevive Bondaryk, Brandeis University
Maria Berry, Michigan State University
Pete White, Michigan State University
Strand 11: Cultural, Social, and Gender Issues

Whiteness
1:15pm-2:45pm
Real time/live
Presider: Natalie King, Georgia State University

The Power of Faculty Learning Communities on the development of Inclusive Teaching in STEM Learning Environments
Mojtaba Khajeloo, University of Missouri – Columbia
Marcelle Siegel, University of Missouri – Columbia
Yejun Bae, University of Missouri – Columbia
Terrell Morton, University of Missouri – Columbia
Charles Nilon, University of Missouri – Columbia
Johannes Schul, University of Missouri – Columbia
Courtney Ngai, University of Missouri – Columbia
Adele Du, University of Missouri – Columbia

STEM Schools as a Property of Whiteness in Urban Areas
Katie Wade-Jaimes, University of Memphis
Bonelli Dobbs, University of Memphis

Hear and Listen: Experiences of Adult Black Women in Science Classes
Renee Schwartz, Georgia State University
Melissa Schoene, Georgia State University

Discourses White Men Use to Maintain White and Male Supremacy in Physics
Melissa Dancy, Dancy Consulting
Apriel Hodari, Eureka Scientific Inc

Motivation and Under-Representation
1:15pm – 2:45 pm
Real Time/Live
Presider: Katie Wade-Jaimes, University of Memphis

Analyzing discussions of under-representation in a high school classroom
Ben Archibeque, Florida International University
Geoff Potvin, Florida International University
Zahra Hazari, Florida International University
Robynne Lock, Texas A&M Commerce

Individualistic or Systemic? High School Girls Make Sense of Gender Inequality in Engineering
Tatiane Russo-Tait, University of Texas at Austin
Katherine Doerr, University of Texas at Austin
Catherine Riegle-Crumb, University of Texas at Austin
Ursula Nguyen, University of Texas at Austin

Motivational factors mediating attitudes toward STEM careers amongst a national sample of middle school students
Elif Oz, University of Notre Dame
Matthew Kloser, University of Notre Dame

Making Explicit Latinx Female Physics Students’ Goal Contents
Brian Zamarripa Roman, University of Central Florida
Jacqueline Chini, University of Central Florida
Strand 12: Technology for Teaching, Learning, and Research

Alternate Avenues of Assessment
1:15pm – 2:45 pm
Real time/ Live
Presider: Jamie Mikeska, Educational Testing Service

Exploring the Effect of Construct Complexity on Machine Learning Assessments of Argumentation
Kevin Haudek, Michigan State University
Xiaoming Zhai, Michigan State University

Automatic Assessment of Electronic Causal Maps for Authentic Scientific Inquiry
Joseph Reilly, Harvard University

Comparing two Task Analysis Guides in Science: Examination of Cognitive Demand
Richard Lamb, East Carolina University
Troy Sadler, University of North Carolina at Chapel Hill
Knut Neumann, Leibniz Institute for Science Education
David Fortus, Weizmann Institute of Science
Pavlo Antonenko, University of Florida
Amanda Kavner, East Carolina University
Douglas Hoston, East Carolina University

Integrating Flipgrid for Science Formative Assessment: A Case Study of an Elementary Preservice Teacher’s Learning
Sharfun Islam Nancy, University of South Florida
Karl Jung, University of South Florida

Strand 14: Environmental Education and Sustainability

Education for environmental science literacy
1:15pm -2:45pm
Real time/ Live
Presider: May Lee, University of Groningen

Secondary Students' Sense-Making of Graphs Related to Climate Change
May Lee, University of Groningen
Alicia Alonzo, Michigan State University

Unifying formal academic and environmental education priorities: Student outcomes framework for Environmental Literacy Education
Amy Green, University of Maryland, College Park
John Baek, NOAA Education

Reimagining open schooling as a sustainable goal in the pandemic era
Giulia Tasquier, University of Bologna
Olivia Levrini, University of Bologna
Paola Fantini, University of Bologna
Erik Knain, University of Oslo
Alfredo Jornet Gil, University of Oslo

Perceptions of Environmental Literacy Preparedness: An Intrastate Systemic Analysis of Districts’ Environmental Literacy Plan Implementation
Tamara Peffer, Pennsylvania Department of Education
Ann Gaudino, Millersville University
Nanette Marcum-Dietrich, Millersville University
Steven Kerlin, Stroud Water Research Center
Strand 15: Policy, Reform, and Program Evaluation

**Designing Learning for Just and Resilient Climate Action**
1:15pm - 2:45pm
Real time/ Live
**Presider:** Rachel Han, University of Washington
**Discussant:** Alberto Saldamando, Indigenous Environmental Network

**Presenters:**
Rachel Han, University of Washington
Alberto Saldamando, Indigenous Environmental Network
Sara Tolbert, Te Whare Wananga O Waitaha University of Canterbury
Daniel Wildcat, Haskell Indian Nations University
Asli Sezen-Barrie, University of Maine
David Long, Morehead State University
Alexandra Gillis, Brooklyn College
Christina Guevara, University of Washington
Roberta Hunter, Michigan State University
Deb Morrison, University of Washington

Fri 3:15pm – until (Real time/ Live)

**NETWORKING/ SOCIAL CONCURRENT SESSIONS**
3:15pm – until
Real-time/ live

**Among Us Scholars** (duration: 60 min)
Participants for this session will play the video game "Among us".
Organizer: Karina Del Carmen Mendez Perez, University of Texas at Austin

**Enjoying or enduring the process of tenure during the COVID-19 pandemic** (duration: 60 min)
Organizer: Justina Ogodo, Baylor University

This general session is open to all non-tenure, tenure-track professors and postdoctoral fellows. The goals are 1) to socialize and get to know others who are in the tenure process, 2) to use discourse to ease our pent-up stress and emotions, and 3) to amuse, uplift, share, and guide each other on ways to fulfill this self-enamored milestone, which we all hope to achieve. Lastly, it will provide a networking opportunity for collaborative work for those with similar interests.

**Informal Music Sharing/Jamming Networking**
(duration: 60 min)
Organizer: Joseph Taylor, University of Colorado-Colorado Springs

The session will start by networking fellow musicians within the NARST community. We will discuss common musical interests and any instruments we play (including vocals). This could lead to collaborations between annual meetings that could lead to fun live performances and or/ sing-a-longs at annual meetings. At the session, if time permits, we might even jam a little.
The following posters are available for viewing for a 23-hour window for asynchronous interactions. Attendees can view the poster (links will be provided) and post comments to the presenter, to which the presenter can respond. The posters will become inactive and inaccessible after Saturday, 7:00 am.

**Strand 8 Posters**

**Rethinking Professional Development in STEM education: A situated perspective in Qatar**
Nasser Mansour, University of Exeter
Carol Murphy, University of Tasmania
Abdullah Abu-Tineh, Qatar University
Nigel Calder, Waikato University

**Moving beyond providing resources: A multi-system analysis of science teacher leadership**
Rachel Ruggirello, Washington University St. Louis
Alison Brockhouse, Washington University St. Louis
Maia Elkana, Washington University St. Louis
Derek Scott, Wentzville School District

**PD for Elementary Teachers’ Instruction for Space-Sciences Lessons Focusing on Crosscutting Concepts**
Soon Lee, Kennesaw State University

**Evaluating a Network Improvement Community Program: A Cohort-Based Study of Longitudinal Student STEM Outcomes**
Jessica Richardi, University of Rhode Island
Shane Tutwiler, University of Rhode Island
Jay Fogleman, University of Rhode Island
Sara Sweetman, University of Rhode Island

**Science Teachers’ Discourse and Professional Vision of Student Motivation**
Wisam Sedawi, Ben-Gurion University of the Negev
Livat Eshchar-Netz, Ben-Gurion University of the Negev
Hasida Yakobov, Ben-Gurion University of the Negev
Dana Vedder-Weiss, Ben-Gurion University of the Negev

**Developing Ambitious Instruction through Pedagogical Reasoning with Peers**
Kimberly Lebak, Stockton University

**A review of Intervention Studies to improve Teacher 21st Century Skills**
Hiya Almazroa, Princess Nourah Bint Abdulrahman University
Wadhya Alotaibi, Princess Nourah Bint Abdulrahman University

**Invested Students are Engaged Students: Science Teachers’ Focus on Student Behavior and Student-Centered Teaching**
Vance Kite, North Carolina State University
Megan Polzin, North Carolina State University
Wm. Matthew Reynolds, North Carolina State University
Soonhye Park, North Carolina State University

**"That's not evidence!": Teacher's navigating conceptual and pedagogical dilemmas in Earth science teaching**
Jonathan McCausland, Pennsylvania State University
Jennifer Jackson, Pennsylvania State University
Scott McDonald, Pennsylvania State University
Amy Pallant, The Concord Consortium
Hee-Sun Lee, The Concord Consortium

**From Being A Science Teacher to A Science Teacher Leader: A Review of the Literature**
Hatice Ozen Tasdemir, University of Georgia
Julie Luft, University of Georgia

**A Study of Teacher Sensemaking about Productive Student Talk in Science Classrooms Problem**
Danielle Vande Zande, Florida State University
Miray Tekkumru Kisa, Florida State University
District Science Coordinators and Science Teaching-Research Officers: A Review of the Literature Comparing Science Teacher Leaders in the United States and Mainland China
Yuxi Huang, University of Georgia
Julie Luft, University of Georgia

Supporting novice STEM teachers through the Noyce Buddy Program
Sarah Guffey, University of South Alabama
Susan Ferguson, University of South Alabama
Andre Green, University of South Alabama

Talking about English Learners: Integrating Language and Content in Inquiry Science
Bethany Daniel, Vanderbilt University

Exploring Experienced Science Teachers’ Vision for Science Teaching
Alfred Limbere, Montclair State University
Mika Munakata, Montclair State University
Emily Klein, Montclair State University
Monica Taylor, Montclair State University

Strand 10 Posters

Developing Assessment Tasks to Measure Model-Based Reasoning in Biology
Cari Herrmann Abell, BSCS Science Learning
Brian Donovan, BSCS Science Learning
Emily Harris, BSCS Science Learning
Jeffery Snowden, BSCS Science Learning
Molly Stuhlsatz, BSCS Science Learning
Christopher Wilson, BSCS Science Learning

Exploring Science Teacher Educators’ Evaluation of a Score Report to Support Content Knowledge for Teaching
Dante Cisterna, Educational Testing Service
Jamie Mikeska, Educational Testing Service
Katherine Castellano, Educational Testing Service
Jennifer Lentini, Educational Testing Service

Challenges of Prospective Science Teacher Educators When Designing Science Methods Courses: Analysis Through a PCK Lens
Jose Pavez, University of Georgia

Conceptual Models of Technological Solutions: Assessing Graduate Engineering Students’ Novelty and Model-based Systems Thinking
Rea Lavi, Massachusetts Institute of Technology
Yehudit Judy Dori, Technion - Israel Institute of Technology; Samuel Neaman Institute for National Policy Research
Dov Dori, Technion - Israel Institute of Technology; Massachusetts Institute of Technology

Does the term "argument" make it harder to measure argument? Item Difficulty After Revised Wording
Andrea Ash, University of Iowa
Gavin Fulmer, University of Iowa
Brian Hand, University of Iowa
Jihyun Hwang, University of Iowa
Jee Kyung Suh, University of Alabama

Assessing algorithmic thinking skills in early primary school amid environmental studies
Kalliopi Kanaki, University of Crete
Michail Kalogiannakis, University of Crete
Emmanouil Poulakis, University of Thessaly
Panagiotis Politis, University of Thessaly

Evolution acceptance and knowledge in Europe: a systematic review of the state of research
Anna Beniermann Humboldt-Universität zu Berlin
Paul Kuschmierz, Justus Liebig University Giessen; Institute for Didactics of Biology
Andra Meneganzin, Università degli Studi di Padova
Rianne Pinxten, University of Antwerp; Antwerp
Telmo Pievani, Università degli Studi di Padova
Dragana Cvetkovi, University of Belgrade
Evangelia Mavrikaki, National and Kapodistrian University of Athens
Dittmar Graf, Justus Liebig University Giessen; Institute for Didactics of Biology

How does Integrated STEM Life Sciences Unit Affect Middle School Students’ Engagement and Academic Success?
Zeynep Akdemir, Purdue University
Saira Anwar, University of Florida
Muhsin Menekse, Purdue University
Selcen Guzey, Purdue University
Investigating students' performance on explanations, developing and using model via the use of Next Generation Science Assessment (NGSA)
Mao-Ren Zeng, National Taiwan Normal University
Mei-Hung Chiu, National Taiwan Normal University
Peng He, Michigan State University
Joseph Krajcik, Michigan State University

Diversity in Knowledge, Conformity in Acceptance of Evolution? Lessons From a Cross-European Evolution Assessment
Paul Kuschmierz, Justus Liebig University Giessen; Institute for Didactics of Biology
Anna Beniermann, Humboldt University of Berlin
Dittmar Graf, Justus Liebig University Giessen; Institute for Didactics of Biology

The Effect of Teacher Talk on Student Engagement during an Integrated Unit
Valarie Bogan, Purdue University
Selcen Guzey, Purdue University

Assessment of Student Learning in Integrated STEM Education: A Descriptive Study
Benny Mart Hiwatig, University of Minnesota - Twin Cities
Gillian Roehrig, University of Minnesota

Introducing Engineering as an Altruistic STEM Career to Broaden Participation
Joni M Lakin, University of Alabama
Edward W Davis, Auburn University
Zahra Karimi, Auburn University
Lindsay Norris, Auburn University
Virginia Davis, Auburn University

Transnational Ph.D. Students' Learning Trajectories with the Lens of Identity Resources
Selin Akgun, Michigan State

Factors Affecting High School Students' STEM Career Interest: Findings from A 4-Year Study
Alpasian Sahin, Harmony Public Schools
Hersh Waxman, Texas A&M University - College Station

Building antiracist science teachers for Indigenous schools: Lessons from a science professional development workshop
Bhaskar Upadhyay, University of Minnesota

Maintaining Critical Virtual Counterspaces for Minoritized Communities in the COVID-19 Pandemic
Ann Varnedoe, Vanderbilt University
William Robinson, Vanderbilt University
Ebony McGee, Vanderbilt University

Factors affecting science academic achievement of women and girls of color: A Meta-synthesis
Joe De Leon, University of Texas Rio Grande Valley
Maria Rodriguez, University of Texas Rio Grande Valley

In Their Words: How Students Discuss Motivation, Success, and Learning After Designing STEM Video Games
Denise M. Bressler, East Carolina University
Len Annetta, East Carolina University
Richard Lamb, East Carolina University
Alexis Dunekack, East Carolina University

Strand 11 Posters

Multicultural Science Content and Contexts in Zambian Biology Curriculum Materials
Vivien Chabalengula, University of Virginia

STEM Career Transformation: Influences to the Pathways of Community College Women of Color STEM Majors
Melo-Jean Yap, San Diego State University

Preparing Culturally Responsive Elementary Science Teachers: The SCI-Bridge Model
Brian Williams, Georgia State University
Nancy Schafer, Georgia State University
Diane Truscott, Georgia State University
Ana Solana-Campos, Georgia State University
Stephanie Byrd, Georgia State University

Strand 12 Posters

In Their Words: How Students Discuss Motivation, Success, and Learning After Designing STEM Video Games
Denise M. Bressler, East Carolina University
Len Annetta, East Carolina University
Richard Lamb, East Carolina University
Alexis Dunekack, East Carolina University
Teacher Perceptions about an Engineering Argumentation Discussion within a Simulated Classroom after Feedback and Practice
Jamie Mikeska, Educational Testing Service
Pamela Lottero-Perdue, Towson University
Debra Brockway, Educational Testing
Dante Igor, Cisterna-Alburquerque, Pontificia Universidad Católica de Chile
Samira Sackietey, Educational Testing Service
Joseph Ciofalo, Educational Testing Service

Developing Online Assignments: Chemistry Teachers’ Knowledge and Perceptions
Orit Hercovitz, Technion - Israel Institute of Technology
Merav Versano, Technion - Israel Institute of Technology
Yehudit Judy Dori, Technion - Israel Institute of Technology; Samuel Neaman Institute for National Policy Research, Haifa

Development of representational competence through a sequence with augmented reality for the learning of chromatography
Cristian Merino, Pontificia Universidad Católica de Valparaíso
Ainoa Marzabal, Pontificia Universidad Católica de Chile
Waldo Quiroz, Pontificia Universidad Católica de Chile
Sonia Pino, Pontificia Universidad Católica de Chile
Brant Miller, University of Idaho

Augmented Reality Teaching in Science Education
Philipp Strauß, University of Education, Weingarten
Manuel Krug, University of Education, Weingarten
Johannes Huwer, University of Education, Weingarten
Holger Weitzel, University of Education, Weingarten

Technological pedagogical content knowledge in biology education: Educational technologies in secondary and post-secondary classrooms a systematic literature review
Olena James, Middle Tennessee State University
Grant Gardner, Middle Tennessee State University

Exploring User Actions while Engaged with a Haptically-enabled Science Simulation (HESSs) for Teaching about Buoyancy
James Minogue, North Carolina State University
Emily Brunson, North Carolina State University
Kern Qi, Davidson College
Tabitha Peck, Davidson College
David Borland, University of North Carolina - Chapel Hill

Describing Perceptions of Presence Among Students with ADHD in Using Emerging Technologies for Science Learning
Rebecca Hite, Texas Tech University
Gina Childers, Texas Tech University
Gail Jones, North Carolina State University
Elysa Corin, Institute for Learning Innovation
Mariana Pereyra, Universidad De La República Uruguay

A CSCL Approach for Learning Communities: Supporting Development of Students’ Scientific Competencies and STEM Identities
Elena Boldyreva, University of Toronto
James Slotta, University of Toronto

Strand 13 Posters

Empowering Informed Action Using an Integrated Nature of Science and Socio-scientific Reasoning Framework
Zoubeida Dagher, University of Delaware

Upper Elementary Students’ Interactions with Nature of Science Read-Alouds
Jeanne Brunner, University of Massachusetts Amherst
Christine McGrail, University of Massachusetts Amherst
Kathleen Mahoney, University of Massachusetts Amherst

The Most Common Ideas Secondary Students Considered When Making Decisions Across Socioscientific Issue Topics
Dawnne LePretre, Illinois Institute of Technology
Norman Lederman, Illinois Institute of Technology
Exploring school students’ ability to recognise warrants in interdisciplinary argumentation between science and religious education
Liam Guilfoyle, University of Oxford
Sibel Erduran, University of Oxford

How scientists perceive and value communicating the nature of science to the public
Sarah Poor, Texas A&M University
Benjamin Herman, Texas A&M University

Investigating University Students’ Perceptions of the Nature of Science
Selin Akgun, Michigan State University
Ebru Kaya, Bogazici University

New Directions in Socioscientific Issues Research
Dana Zeidler, University of South Florida
Benjamin Herman, Texas A&M University
Troy Sadler, University of North Carolina-Chapel Hill

Illustrating Linkages between Natures of Science and Engineering
Jefrey Radloff, SUNY Cortland
Brenda Capobianco, Purdue University

Ayca Fackler, University of Georgia

Exploring Physicist, Chemist, and Biologist Views of Scientific Models
Yi-Wen Huang, National Changhua University of Education
Meng-Fei Cheng, National Changhua University of Education

Exploring Physicists’ Views of Scientific Models
Meng-Fei Cheng, National Changhua University of Education
Yi-Wen Huang, National Changhua University of Education
Chien-Yu Lin, National Changhua University of Education

Strand 14 Posters

A Multi-Perspective Reflection of High School Science Students on Environmental Issues
Mercy Nyamekye, University of Education of Winneba, Ghana
Sakyiwa Danso, University of the Witwatersrand, Johannesburg

Art and Travel Abroad: Influencing Student Goals, Environmental Interests and Conceptions of Science
Susannah Sandrin, Arizona State University
Becky Ball, Arizona State University
Richard Lerman, Arizona State University

Caring about where we are: Exploring philosophical and pedagogical perspectives of place
Sara Salisbury, Middle Tennessee State University

How do Faculty at a Business School Conceptualize Environmental Issues and Incorporate these Issues in their Classrooms?
Hamza Malik, University of Massachusetts Dartmouth
Stephen Witzig, University of Massachusetts Dartmouth

Relationships between College Students’ Epistemological Beliefs About Climate Science and Attitudes toward Climate Change
Lisa Borgerding, Kent State University
Jeff Papa. Kent State University
Barb Currey, Kent State University

Seeing Stuff Differently: Inquiry Science Didn’t Change the Environmental Worldview of Preservice Teachers But...
Jean-Philippe Ayotte-Beaudet, Université De Sherbrooke
Bryan Nichols, Florida Atlantic University

Climate Change Education in Rural Spaces
Jean-Philippe Ayotte-Beaudet, Université De Sherbrooke
Madison Scheer, Colorado State University
Meena Balgopal, Colorado State University
Science Education Contexts of Culture, Land, and Community: An 'Aina-Based Model Supporting Teacher Eco-Identity Development
Sheri Fitzgerald, Pacific American Foundation

Turkish Preschool Teachers' Professional Development Needs: A Joint Collaboration Project on Education For Sustainability
Tulin Guler Yildiz, Hacettepe University
Ridvan Elmas, Afyon Kocatepe University
Savas Pamuk, Akdeniz University
Deniz Kahirman-Pamuk, Mersin University
Gelengul Haktanir, Ankara University

Strand 15 Posters

Translating Research into Classroom Practice: Who is Publishing in Science Education Practitioner Journals (SEPJs)?
Joseph A. Taylor, University of Colorado, Colorado Springs
G. Michael Bowen, Mount Saint Vincent University
Marcus Kubisch, Leibniz Institute for Science and Mathematics Education
Ryan Summers, University of North Dakota
Patricia Patrick, Columbus State University
Abdirizak Warfa, University of Minnesota
Cathy Lachapelle, Boston College
Asli Sezen-Barrie, University of Maine
Selcen Guzey, Purdue University

Teachers' negotiations of bias in relation to teaching resources offered to schools by industrial actors
Maria Andrée, Stockholm University
Lena Hansson, Kristianstad University

Spectacle and Policy: STEM in the Early Trump Administration
Matthew Weinstein, University of Washington-Tacoma

Basu Scholars Posters

2019 Basu Scholars

Examining Elementary Students' Images of Engineers and Interests in Engineering Careers
Ezgi Yesilyurt, Weber State University

Minority STEM Undergraduates: A Comprehensive Model for STEM Identity and Self-Efficacy
Kelly Shepard, Illinois Institute of Technology
Ivan Mutis, Illinois Institute of Technology

Urban Science Teacher Education Across Contexts: An Examination of Teacher Learning through the Lenses of Identity and Agency
Lisa Marco-Bujosa, Villanova University

A case study of how science and mathematics teachers’ knowledge and beliefs influence their implementation of a problem and project based curriculum
Mary Nyaema, University of Iowa

Approaches to Learning Biology of Women of Color: The Intersectionality of Gender, Race, and Science Identity
Angela Google, Middle Tennessee State University
Anna Grinath, Idaho State University
Grant Gardner, Middle Tennessee State University

How a “Judgement Free” Space Influences African American Girls Sisterhood and STEM Identity
Faith Freeman, Guilford County Schools
Edna Tan, University of North Carolina at Greensboro

Gendered preferences for science education disciplines in elementary grades
Radu Bogdan Toma, University of Burgos

Teaching Practices in large STEM classes: Perception from Undergraduate and Graduate Students
Ngawang Gonsar, University of Minnesota and Gustavus Adolphus College
Lorelai Patrick, Fort Hays State University
Sehoya Cotner, University of Minnesota
2018 Basu Scholars

Supporting multilingual students’ engagement in science practices: A case for fostering translanguage science classrooms
Maria González-Howard, University of Texas at Austin
Karina Mendez Perez, University of Texas at Austin
Sage Andersen, University of Texas at Austin

Becoming a Teacher: Reflective Practice as a Way of Exploring Secondary Science Teacher Beliefs and Practices
Preethi Titu, Kennesaw State University
Gillian Roehrig, University of Minnesota
Joshua Ellis, Florida International University

Science for Our Children: Othermothering within an Elementary Science Network
Stefanie Marshall, University of Minnesota-Twin Cities
Jessica Forrester, University of Minnesota-Twin Cities
Concurrent Session # 9 (Real Time / Live)
8:00 am – 9:30 pm

Administrative Sponsored Session
International Committee

Crossing Boundaries: Examining and Problematizing Interdisciplinarity in Science Educations
8:00 am -9:30 am
Real time/ live

Presenters:
Laura Branchetti, University of Parma, Italy
Olivia Levrini, University of Bologna
Shalamit Kapon, Technion – Israel Institute of Technology
Maayan Schwartzer, Technion – Israel Institute of Technology
Tal Peer, Acheret Center, Israel
Wonyong Park, University of Oxford
Jen-Li Wu, National Taiwan Normal University
Sharona Levy, University of Haifa
Asnat Zoharm, University of Haifa
Ilana Dubovi, Ben-Gurion University

Administrative Sponsored Sessions
Awards Committee

ODRA and ECRA: On a Continuum of the Professional Scholarly Trajectories in Science Education: The Urgent Questions for the Next Generation of Science Education Research
8:00am-9:30am
Real time/ live

Presenter:
Noemi Waight, University at Buffalo

Strand 2: Science Learning: Contexts, Characteristics, and Interactions

Socioscientific Issues-Based Instruction for Scientific Literacy Development
8:00am -9:30 am
Real time/ Live
Presider: Wardell Powell, Framingham State University
Discussant: Aysegul Oguz Namdar, Recep Tayyip Erdogan University

Presenters:
Sami Kahn, Princeton University
Wardell Powell, Framingham State University
Aysegul Oguz Namdar, Recep Tayyip Erdogan University
Hyunok Lee, Seoul National University
Mark Newton, East Carolina University
Dilek Karisan, Adnan Menderes University
Gillian Roehrig, University of Minnesota
Benzegül Durak, Duzce University
Li Ke, University of North Carolina at Chapel Hill
Dana Zeidler, University of South Florida
Strand 4: Science Teaching—Middle and High School (Grades 5-12)

NGSS Practices and Implementation
8:00am -9:30am
Real time/ Live
Presider: Teresa Massey, Georgia State University

Impacts of COVID-19 on Science Instruction and NGSS Enactment in Grades 6-8
Meghan Macias, University of California, Santa Barbara
Ashley Iveland, WestEd
Elizabeth Arnett, WestEd
Melissa Rego, WestEd
Maya Salcido White, WestEd

Teachers’ use of the Next Generation Science Standards for alignment of instructional materials
Jamie Tanas, University of Iowa
Gavin Fulmer, University of Iowa

How Middle-School Science Teachers Enact Phenomena in NGSS Classrooms
Jonathan Boxerman, WestEd
Kimberly Nguyen, WestEd
Jasmine Marckwordt, University California Santa Barbara
Ashley Iveland, WestEd

The Effect of 5E Instructional Model-Based Class on Students’ Understanding of Crosscutting Concepts
Dongxue Jin, Beijing Normal University
Enshan Liu, Beijing Normal University

Strand 7: Pre-service Science Teacher Education

Pre-Service Teachers’ Use of Learning Progressions to Inform Classroom Instruction
8:00am -9:30 am
Real time/ Live

How Do Pre-Service Teachers Use Learning Progressions When Interpreting Student Thinking in Mechanics?
Cristoph Münster, Justus Liebig University Giessen
Claudia Von Aufschnaiter, Justus Liebig University Giessen

Investigating How Pre-service Teachers Draw on Their Understanding of Student Ideas to Elicit Student Thinking
James Hancock, Alma College
Alicia Alonzo, Michigan State University

Pre-service Teachers’ Use of Learning Progressions When Responding to Students’ Ideas
Sisi Han, Beijing Normal University
Alicia Alonzo, Michigan State University

A Pre-service Teacher’s Use of Learning Progressions When Planning Instruction in Two Contexts
Julia Christensen, Michigan State University
Sisi Han, Beijing Normal University
Alicia Alonzo, Michigan State University
Strand 10: Curriculum and Assessment

Learning and assessment in project-based and problem-based curricula
8:00am -9:30 am
Real time/ Live
Presider: Jeffery Nordine, Leibniz Institute for Science and Mathematics Education

Integrating Computer Science in Science Classrooms: Learning Computational Thinking and Expanding Perceptions of Computer Science
Eric Greenwald, University of California, Berkeley
Ari Krakowski, University of California, Berkeley

The Performance and Assessment of Students' Collaborative Problem Solving in Project-based Learning
Yanan Zhao, Beijing Normal University
Lei Wang, Beijing Normal University

Examining the relationships between post-unit assessments and summative assessment in elementary project-based science classrooms
Tingting Li, CREATE for STEM Institute
I-Chien Chen, Michigan State University
Emily Miller, University of Wisconsin Madison
Kayla Bartz, Michigan State University
Joseph Krajcik, Michigan State University

Tracking the Progress of High School Students' Modeling Proficiencies Across Sequential Project-based Learning Chemistry Curriculum: A Longitudinal Study
Peng He, Michigan State University
I-Chien Chen, Michigan State University
Israel Touitou, Michigan State University
Sarah Maestrales, Michigan State University
Joseph Krajcik, Michigan State University

Strand 14: Environmental Education and Sustainability

Traditional Ecological Knowledge (TEK): Water Stories, Sustainability, Models, and Evidence
8:00am -9:30 am
Real time/ Live
Presider: Bhaskar Upadhyay, University of Minnesota
Discussant: Femi Otulaja, University of the Witwatersrand

Presenters:
Rouhollah Aghasaleh, Humboldt State University
Bhaskar Upadhyay, University of Minnesota
Sharon Nelson-Barber, WestEd
Pauline Chinn, University of Hawaii at Manoa
Jonathan Boxerman, WestEd
Paichi Shein, National Sun Yat-sen University
Kai-Lung Wang, National Sun Yat-sen University
Wei-Ting Li, Taichung Municipal Sha-Lu Junior High School
Peresang Sukinarhimicc, Indigenous People Cultural Development Center
Femi Otulaja, University of the Witwatersrand
Concurrent Session # 10 (Advance Viewing of Pre-recorded Presentations with 60-minute Real time/ Live Q&A)
9:45 am – 10:45 am

Strand 1: Science Learning: Development of Student Understanding

*Students' Understanding of Physical Science Concepts*
9:45 am -10:45am
Advanced Pre-recorded Viewing & Live Q&A
*Presider:* Jennifer Tripp, University at Buffalo

Experience doesn’t matter but the direction does:
*Differential accuracy in relative motion problems*
Jason Morphew, Purdue University

*Mapping the territory: The development of students’ repertoires of ideas about energy*
Marcus Kubsch, Leibniz Institute for Science and Mathematics Education

*The Development of Middle School Students’ Conceptual Learning on Energy Transformations through Design Thinking*
Ayse Ciftci, Mus Alparslan University
Mustafa Topcu, Yildiz Technical University

*The Process of Doing Science – a Study of Three Students Exploring Sound and Light*
Sebastian Björnhammer, Stockholm University
Jakob Gyllenpalm, Stockholm University
Iann Lundegård, Stockholm University

Strand 2: Science Learning: Contexts, Characteristics and Interactions

*Contextual, Socio-Emotional, and Attitudinal Factors across K-12 Education*
9:45 am -10:45am
Advanced Pre-recorded Viewing & Live Q&A
*Presider:* Henriette Burns, Washington State University

*Investigating the relevance of an intervention course to raise middle school student’s science-related career awareness*
Regina Soobard, University of Tartu
Aet Möllits, Tallinn University
Miia Rannikmäe, University of Tartu

*The Efficacy of Project-based Learning Science on Supporting Students’ Learning Energy in No-Western Classroom*
Jie Yang, Beijing Normal University
Sisi Han, Beijing Normal University
Jian-Xin Yao, National Institute for Curriculum and Textbook Research, P. R. China
Yu-Ying Guo, Beijing Normal University
Joseph S. Krajcik, Michigan State University

*Addressing the Affective Dimension of Learning through Biophilia in Classroom Gardening*
Aimee Fraulo, North Carolina State University

*The Trade-Off Between STEM Knowledge Acquisition and Language Learning in Short-Scale Bilingual Implementations*
Tamara Roth, University of Bayreuth
Franz Bogner, University of Bayreuth
Strand 2: Science Learning: Contexts, Characteristics and Interactions

Epistemic & Disciplinary Engagement in Middle and Secondary School
9:45 am - 10:45am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Zoe Buck Bracey, BSCS

Small Teacher Moves with Big Impacts in Shaping Students’ Sensemaking and Intellectual Authority in Science
Jennifer Schellinger, Florida State University
Sierra Morandi, Florida State University
Sherry Southerland, Florida State University
Lama Jabar, Florida State University
Miray Tekkumru Kisa, Florida State University
Harini Krishnan, Florida State University

"Dude... Just Put a Mirror Here": Examining Epistemic Practices in Middle School Collaborative Engineering Contexts
Ramya Sivaraj, University of Minnesota
Jeanna Wieslmann, Southern Methodist University
Gillian Roehrig, University of Minnesota

Finding Alignment in Framing: Dynamics of Collaborative Disciplinary Engagement in Science
Harini Krishnan, Florida State University
Lama Jabar, Florida State University
Jennifer Schellinger, Florida State University
Sherry Southerland, Florida State University

Anchoring epistemic agency and participation within place-based learning progressions
Lezly Taylor, Virginia Polytechnic Institute and State University
Brenda Brand, Virginia Tech University
George Glasson, Virginia Polytechnic Institute and State University

Strand 4: Science Teaching—Middle and High School (Grades 5-12)

Socioscientific Issues in the Science Classroom
9:45 am - 10:45am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Joseph Brobst, Old Dominion University

Teaching Science During a Pandemic: A National Study of Teacher Decision Making
Patrick Smith, Horizon Research, Inc.
Peggy Trygstad, Horizon Research, Inc.
Laura Craven, Horizon Research, Inc.

The most challenges and needs for teachers to engaging students in SSI learning
Jing Lin, Beijing Normal University
Huilei Han, Beijing Normal University
Liang Zeng, Beijing Normal University
Troy Sadler, University of North Carolina at Chapel Hill
Knut Neumann, Leibniz Institute for Science and Mathematics Education

Teaching Controversial Socio-Scientific Issues: Challenges and Affordances
Janelle Bailey, Temple University
Ananya Matewos, St. Norbert College
Sanlyn Buxner, Planetary Science Institute/University of Arizona
Strand 4: Science Teaching—Middle and High School (Grades 5-12)

**Student Thinking and Interest in Science**
9:45 am -10:45am
Advanced Pre-recorded Viewing & Live Q&A
*Presider*: John Holmquist, Florida Institute of Technology

An Analysis of Secondary Student Views of Quantum Physics
Zac Patterson, Ohio State University
Lin Ding, Ohio State University

Enhancing Students' Interest in Science and STEM Careers: The Role of Career-based Scenarios
Irene Drymiotou, University of Cyprus and University of Groningen
Lucy Avraamidou, University of Groningen
Constantinos Constantinou, University of Cyprus

Enacting Rigorous Science Lessons: Leveraging Students' Ideas for Enhancing Demand on Student Thinking Problem
Ozlem Akcil Okan, Florida State University
Miray Tekkumru Kisa, Florida State University

Concept Maps in Learning Biology: Concept Mapping from Memory is more beneficial than from Text
Sina Lenski, University of Cologne
Jörg Großschedl, University of Cologne

Strand 4: Science Teaching—Middle and High School (Grades 5-12)

**Teacher Learning Through Practice**
9:45 am -10:45am
Advanced Pre-recorded Viewing & Live Q&A
*Presider*: Gregory Banks, University of Massachusetts Boston

Teacher Emphasis and What It Reveals About Chemical Ideas and Practices
Gregory Banks, University of Massachusetts Boston
Hannah Sevian, University of Massachusetts Boston

What Epistemological Resources Affect Chemistry Teachers' Sense of “What worked”
Adam Schafer, University of Wisconsin - Madison
Ryan Stowe, University of Wisconsin - Madison

Expanding the STEM teacher pool: A history teacher’s experience teaching a high school engineering course
Adam Carberry, Arizona State University
Medha Dalal, Arizona State University
Malay Nagda, Arizona State University
Brendan McCarthy, College Park Academy

Challenges and Supports for Secondary Science and Mathematics Teacher Retention
Christine Lotter, University of South Carolina
Jennifer Crooks-Monastra, University of South Carolina
Greysi Irdam, University of South Carolina
Jan Yow, University of South Carolina
Strand 5: College Science Teaching and Learning (Grades 13-20)

**Authentic Learning Inside and Outside the Classroom**
9:45 am - 10:45am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Jorge Solis, University of Texas At San Antonio

**Exploring the Kinds of Evidence Cited in an Integrated STEM Learning Experience Incorporating Argumentation**
Carina Rebello, Purdue University
Jeffrey Murray, Purdue University
N. Sanjay Rebello, Purdue University

**Exploring Students' Values and Classroom Experiences across a Consortium of Four Universities**
Gili Marbach-Ad, University of Maryland
Patrick Sheehan, University of Maryland
Katerina Thompson, University of Maryland
Lindsay Wheeler, University of Virginia
Cindy Ghent, Towson University
Jackie Bortiatynski, Pennsylvania State University

**Establishing a Baseline of Science Communication Skills**
Rashmi Shivni, Northern Illinois University
Christin Cline, Northern Illinois University
Morgan Newport, Northwestern University
Shupei Yuan, Northern Illinois University
Heather Bergan-Roller, Northern Illinois University

**How Different Course-based Undergraduate Research Experience Models Impact Student Perceptions of the Scientific Research Culture**
Jessica Dewey, University of Minnesota
Anita Schuchardt, University of Minnesota

**Reasoning and Thinking about STEM**
9:45 am -10:45am
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Scott Cohen, Georgia State University

**Students' Visual Patterns in Solving Synthesis Physics Tasks**
Bashirah Ibrahim, University of Bahrain
Lin Ding, Ohio State University

**Student Explanations about Molecular Processes in Information Flow and Transfer in Biology**
Juli Uhl, Michigan State University
Kevin Haudek, Michigan State University

**An Investigation of Undergraduate Students’ Spatial Thinking about Groundwater**
Holly White, University of Nebraska–Lincoln
Cory Forbes, University of Nebraska–Lincoln

**Sensemaking opportunities for mathematical equations differ across instructors teaching the same scientific phenomenon**
FangFang Zhao, NanJing Normal University
Linh Chau, University of Minnesota
Anita Schuchardt, University of Minnesota
Strand 6: Science Learning in Informal Contexts

Creating in Informal Science
9:45 am - 10:45 am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Elgin Leary, University of Georgia

Once Upon a Time We Had to Stay at Home: STEM Stories and Phone Photos in My (or Any) Family Culture
Phyllis Katz

Making Board Games as Building Models: What are Some Implications for Environmental Science Education?
Priyanka Parekh, Transylvania University
Elisabeth Gee, Arizona State University
Kelly Tran, High Point University
Earl Aguilera, California State University, Fresno
Taylor Kessner, Arizona State University
Luis E. Pérez Cortés, Arizona State University
Sinem Siyahhan, California State University, San Marcos

Creating Comics about COVID-19 to understand the intersections between Science, Community, and Equity
Shakuntala Devi Gopal, SUNY Buffalo
Anthony White, SUNY Buffalo
Jessica Scates, SUNY Buffalo
Sameer Honwad, SUNY Buffalo
Ryan Rish, SUNY Buffalo

Photo-elicitation as a technique for identifying triggers of Situational Interest during a nature reserve visit
Bhamini Kamudu, University of Witwatersrand
Marissa Rollnick, University of Witwatersrand
Eunice Nyamupangedengu, University of Witwatersrand

Strand 6: Science Learning in Informal Contexts

Experiences in Informal Science
9:45 am - 10:45 am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Henry James Evans, University of Copenhagen

A Mixed Blessing: High School Students' Visiting a University: Self-Reported Experience and a Wishlist
Efrat Nativ Ronen, Technion - Israel Institute of Technology
Tali Tal, Technion - Israel Institute of Technology

Students' Perception of Kitchen Activities in Promoting Secondary School Chemistry Learning Outcomes in Nigeria
Ngozi Philomena Okafor, University of Lagos

An authentic experience with a SEM as Enacting Endogenous Science for Capacity Building
Ella Yonai, Weizmann Institute of Science
Ron Blonder, Weizmann Institute of Science

Using Makerspace Activity in a Low-income Context
Wanja Gitari, University of Toronto
Strand 6: Science Learning in Informal Contexts

Informal Science in Media and Society
9:45 am - 10:45am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Sanlyn Buxner, University of Arizona

Supports and Challenges during Educational Crisis: Examining the Impact of the Pandemic on Youth Pathways
Rachel Chaffee, American Museum of Natural History
Preeti Gupta, American Museum of Natural History
Karen Hammerness, American Museum of Natural History
Timothy Podkul, SRI International
Anna MacPherson, American Museum of Natural History
Michael Chavez-Reilly, American Museum of Natural History
Kea Anderson, SRI International
Daniel Princiotta, SRI International
Daniela Saucedo, SRI International

Gendered engagement with posts authored by female scientists on Facebook
Keren Dalyot, Technion - Israel Institute of Technology
Yael Rozenblum, Technion - Israel Institute of Technology
Ella Lachman, Little Big Science
Ayelet Baram-Tsabari, Technion - Israel Institute of Technology

Science News Websites: Making Science Accessible for All
Ifat Zimmerman, Technion - Israel Institute of Technology
Tali Tal, Technion - Israel Institute of Technology
Avshalom Ginosar, The Academic College of Emek Yezreel

Depression and Test Anxiety in Science Stream high Schoolers: Influence of Dummy Schools in India
Parth Soni, Indian Institute of Management Ahmedabad
Kathan Shukla, Indian Institute of Management Ahmedabad

Strand 7: Pre-service Science Teacher Education

COVID and Course Design
9:45 am - 10:45am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Elizabeth Lewis, University of Nebraska–Lincoln

Emergency Remote Teaching of Science Methods Courses During the COVID-19 Pandemic
Martha Canipe, Northern Arizona University

Edgineering Teams of Undergraduate Education and Engineering Students Transition Online to Teach Elementary Students Engineering
Kristie Gutierrez, Old Dominion University
Orlando Ayala, Old Dominion University
Jennifer Kidd, Old Dominion University
Pilar Pazos, Old Dominion University
Stacie Ringleb, Old Dominion University
Krishna Kaipa, Old Dominion University

Supporting Preservice Elementary Teachers' Development of Science Concepts and Practices in an Online Course
Nidaa Makki, The University of Akron
Danielle Dani, Ohio University
Andrea Maria Anderson, Ohio University
Strand 8: In-service Science Teacher Education

Sociocultural Perspectives on teacher learning and classroom practice
9:45 am -10:45am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Jennifer Maguire, Virginia Tech

Exploring Teachers’ Stories through a Culturally Responsive Lens
Jamie Wallace, American Museum of Natural History
Elaine Howes, American Museum of Natural History
Arthur Funk, American Museum of Natural History
Sean Krepski, American Museum of Natural History
Maya Pincus, American Museum of Natural History
Raghida Sharif, American Museum of Natural History
Samantha Swift, American Museum of Natural History
Susan Sylvester, American Museum of Natural History
Kin Tsoi, American Museum of Natural History
Caity Tully, American Museum of Natural History

Opportunities for Reflecting on Opposition to Learning Evolution During a Teacher Training Course
Merav Siani, Weizmann Institute of Science and Herzog College
Reut Stahi-Hitin, Weizmann Institute of Science
Anat Yarden, Weizmann Institute of Science

Analyzing whether teachers’ task values influenced their implementation of bioeconomy-focused lessons: A pilot study
Margaret Blanchard, North Carolina State University
Karen Collier, North Carolina State University
Aparajita Rajwade, North Carolina State University
Katherine McCance, North Carolina State University
Shana McAlexander, North Carolina State University
Richard Venditti, North Carolina State University

Formative Interventions for Expansive Teacher Learning in Multilingual Science Education: Change Laboratories for Transformation of Practice
Sara Salloum, University of Balamand
Saouma Boujaoude, American University of Beirut

Strand 13: History, Philosophy, Sociology, and Nature of Science

Using Augmented Reality and Mixed Reality to Enhance Science Learning
9:45 am -10:45am
Advanced Pre-recorded Viewing & Live Q&A
Presider: Richard Lamb, East Carolina University

Working as Intended? How Procedural Fidelity and Flow Impact Learning in a Game-Based Science Curriculum
Shane Tutwiler, University of Rhode Island
Denise Bressler, East Carolina University
Len Annetta, East Carolina University

Using Augmented-Reality to reduce Cognitive Load while learning Organic Chemistry
Sebastian Keller, University of Duisburg-Essen
Stefan Rumann, University of Duisburg-Essen
Sebastian Habig, University of Duisburg-Essen

Comparing Integrated Presentation Formats for Technology-Enhanced Science Experiments
Michael Thees, Technische Universität Kaiserslautern
Kristin Altmeyer, Saarland University
Sebastian Kapp, Technische Universität Kaiserslautern
Eva Rexigel, Technische Universität Kaiserslautern
Fabian Beil, Technische Universität Kaiserslautern
Pascal Klein, Georg-August Universität Göttingen
Sarah Malone, Saarland University
Roland Brünken, Saarland University
Jochen Kuhn, Technische Universität Kaiserslautern

A Study of Mixed Reality Technology on Elementary School Students Reading of Science Expository Text
Len Annetta, East Carolina University
Denise Bressler, East Carolina University
Ashley Holder, Fayetteville State University
Alexis Dunekack, East Carolina University
## Saturday, April 10, 2021

### Concurrent Session # 11 (Advance Viewing of Pre-recorded Presentations with 60-minute Real time/ Live Q&A)
11:00 am – 12:00 pm

#### Strand 5: College Science Teaching and Learning (Grades 13-20)

**Buttress and Barriers to Constructing College Cultures of STEM**
11:00am - 12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
*Presider:* Shana McAlexander, North Carolina State University

**Approaches to Learning Biology of Women of Color: The Intersectionality of Gender, Race, and Science-Identity**
Angela Google, Middle Tennessee State University
Anna Grinath, Idaho State University
Grant Gardner, Middle Tennessee State University
Eshan Patel, Middle Tennessee State University

**A qualitative investigation of students' acceptance of evolution**
Ryan Dunk, University of Northern Colorado
Jason Wiles, Syracuse University

**Culturally Responsive Teaching in Undergraduate Science Learning Spaces**
Hillary Barron, University of Minnesota - Twin Cities
Julie Brown, University of Florida
Sehoya Cotner, University of Minnesota

**Physical Science Doctoral Students' Perspectives on Obstacles and Opportunities for Identity Development in Graduate School**
Anne McAlister, University of Virginia
Sarah Lilly, University of Virginia
Jennifer Chiu, University of Virginia

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#### Strand 5: College Science Teaching and Learning (Grades 13-20)

**Alternative Routes to College STEM**
11:00am - 12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
*Presider:* Petra Kranzfelder, University of California, Merced

**Nature of Uncertainty in Undergraduate Non-Majors Biology Labs: Face-to-Face vs. Online Formats**
Samantha Skrob, Florida State University
Sherry Southerland, Florida State University

"In the End, You Actually Remember Learning Stuff": First-Generation College Undergraduates Perspectives of Student-Centered Instruction
Ashley Harlow, University of California, Irvine
Brian Sato, University of California, Irvine

**Non-traditional adult learners as legitimate participants in undergraduate STEM outreach programs**
Hannah Huvard, University of Colorado, Denver
Robert Talbot, University of Colorado, Denver
Michael Ferrara, National Science Foundation

**Creating Communities of Support at Two-Year HSIs: Serving Underrepresented Students in STEM**
Victoria Rodriguez-Operana, San Diego State University
Gabriela Kovats Sánchez, San Diego State University
Felisha Herrera, San Diego State University
Marlena Wolfgramm, San Diego State University
Strand 6: Science Learning in Informal Contexts

Informal Educator Experiences
11:00am -12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Clausell Mathis, University of Washington

Preservice Elementary Teachers' Perspectives of Informal Science Spaces
Michelle Forsythe, Texas State University
Yun-Wen Chan, Texas State University

Teaching Science to Refugees: A Multi-site Case Study of Volunteer Educators in Non-formal Education Settings
Erika Gillette, College of Mount Saint Vincent

Informal Science Educators' Perceptions of Effective Facilitation Practices
Alexandria Muller, University of California- Santa Barbara
Kyle Van Loon, University of California- Santa Barbara
Molly Hay, University of California- Santa Barbara
Jasmine Marckwordt, University of California- Santa Barbara
Ron Skinner, MOXI, The Wolf Museum of Exploration and Innovation
Danielle Boyd Harlow, University of California- Santa Barbara

Parent-child Science Talk to Support Children’s Informal Learning at Home
Wahyu Setioko, Ohio State University
Lin Ding, Ohio State University

Informal Science Clubs
11:00am -12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Alpaslan Sahin, Harmony Public Schools

Bridging formal and informal education in an afterschool science club for children from low-income communities
Lydia Burke, University of Toronto
Megan Pham-Quan, University of Toronto
Novella Ricotti, University of Toronto
Natalie Marentic, University of Toronto

Investigating How 4-H Project Manuals Engage Children in Science & Engineering Practices
Ashley Kooken, West Virginia University
Jennifer Murray, West Virginia University
Melissa Luna, West Virginia University

Students as Informed Citizens: Constructing Socioscientific Arguments in an Elementary After-School Program
Melissa Cieto, University of Massachusetts Dartmouth
Stephen Witzig, University of Massachusetts Dartmouth

"A Leg Up": Accelerating High School Students' Career Trajectories Through Informal STEM Programs
Kathryn Rende, North Carolina State University
Emma Refvem, North Carolina State University
M. Gail Jones, North Carolina State University
Sarah Carrier, North Carolina State University
Megan Ennes, University of Florida
Julianna Nieuwsma, North Carolina State University
Strand 7: Pre-service Science Teacher Education

*Development of Pre-service Teacher Knowledge and Practice*
11:00am -12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Bridget Miller, University of South Carolina

*Fostering the TPACK of science teacher students in a pedagogical makerspace*
Anna-Lisa Max, PH Weingarten
Sarah Lukas, PH Weingarten
Holger Weitzel, PH Weingarten

*The Effects of Modeling Based STEM Education on Alternative Nature of Science Understandings of Pre-service Science Teachers*
Ayse Buber, Dokuz Eylul University
Gul Unal Coban, Dokuz Eylul University

*Impact of Professional Learning Communities on Preservice Teacher Usage of Reformed Teaching Practices*
Rachael Tawbush, University of Alabama
Dennis Sunal, University of Alabama

*Towards a Deeper Understanding - The Impact of Cognitive Support on Pre-Service Teachers' Content Knowledge*
Dustin Schiering, Leibniz Institute for Science and Mathematics Education
Stefan Sorge, Leibniz Institute for Science and Mathematics Education
Knut Neumann, Leibniz Institute for Science and Mathematics Education

*Expanding the Toolkit for Pre-service Teachers*
11:00am -12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Imran Tufail, University of Waikato

*Opportunities and Tensions When Teaching for the edTPA*
Karin Lohwasser, University of California, Santa Barbara
Soo-Yean Shim, University of Washington
Caroline Hadley Long, University of Washington
Mark Windschitl, University of Washington

*Lessons from using PAR as Pedagogy in science methods with elementary preservice teachers*
Rachel Askew, Vanderbilt University

*Engaging international emerging teachers in co-authoring tools through a TAS framework*
Moyu Zhang, New York University

*How Practice-oriented Teacher-training Modules Affect Pre-service Biology Teachers' Views on Inclusive Science Education*
Elizabeth Watts, Friedrich Schiller Universität Jena
Saturday, April 10, 2021

Strand 8: In-service Science Teacher Education

Teacher Engagement in Science Practices
11:00 am - 12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Nidaa Makki, The University of Akron

Research Experience Enriches Teachers' Classroom Practices Related to Science and Engineering Practices and STEM Careers
Sanlyn Buxner, University of Arizona
Daniel Moreno, University of Arizona
Larry Horvath, San Francisco State University
John Keller, University of Colorado
Melissa Yisak, American Institutes for Research
Bo Zhu, American Institutes for Research
Deidre Sessoms, Sacramento State University
Dermot Donnelly-Hermosillo, Fresno State
Elsa Bailey, San Francisco State University
Stamatis Vokos, Cal Poly, San Luis Opisbo

Critical Events as Catalysts for Cultivating Teachers' Understandings about Science through Firsthand Research Experiences
Shannon Davidson, Florida State University
Lama Jaber, Florida State University
Sherry Southerland, Florida State University

Designing professional learning experiences to support teachers' computational thinking learning and confidence
Amanda Peel, Northwestern University
Jacob Kelter, Northwestern University
Michael Horn, Northwestern University
Uri Wilensky, Northwestern University

The Efficacy of SciWorld in Solving the Transfer Problem and Supporting Teacher Enactment of the Next Generation Science Standards
Darby Feldwinn, University of California, Santa Barbara
Sarah Hough, University of California, Santa Barbara
Sammi Lambert, University of California, Santa Barbara
Vanessa Woods, University of California, Santa Barbara

Strand 8: In-service Science Teacher Education

Teacher Self Efficacy and Perceptions
11:00 am - 12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Elizabeth Lewis, University of Nebraska–Lincoln

Supporting Elementary Teachers in High-need Schools to Teach STEM
Amanda Gunning, Mercy College
Meghan Marrero, Mercy College
Elena Nitecki, Mercy College
Latanya Brandon, SUNY New Paltz
Kristen Larson, Mercy College
Brian Baldwin, Kean University

In-service Course Supporting Teacher Ownership of Proposed Teaching Strategies
Ana Valdmann, University of Tartu
Miia Rannikmäe, University of Tartu
Jack Holbrook, University of Tartu

Teachers' Self-Efficacy Beliefs for Teaching Science as Inquiry: A Large National Sample in Oman
Mohamed Shahat, Sultan Qaboos University
Ambusaidi Abdullah, Sultan Qaboos University
David Treagust, Curtin University

A Comparative Analysis of High School Science Teachers' Perceived Approach and Efficacy Teaching Problem-Solving
Bryanna Nelson, Purdue University
Hui-Hui Wang, Purdue University
Neil Knobloch, Purdue University
Sarah LaRose, Purdue University
### Strand 8: In-service Science Teacher Education

**Approaches to STEM Implementation**  
11:00am - 12:00 pm  
Advanced Pre-recorded Viewing & Live Q&A  
**Presider:** Matthew Johnson, Pennsylvania State University

**Exploring Science Teacher Noticing in Informal Science Settings**  
Sara Heredia, University of North Carolina Greensboro  
Ti’Era Worsley, University of North Carolina at Greensboro  
Jakayla Clyburn, University of North Carolina at Greensboro

**Digging Deeper into Conceptions of Integrated STEM: Focusing on 21st Century Skills and STEM Careers**  
Emily Dare, Florida International University  
Khomson Keratithamkul, University of Minnesota  
Benny Mart Hiwatig, University of Minnesota Twin Cities  
Feng Li, Florida International University

**Engaging Agency to Teach Science: Examining Elementary Teachers’ Participation and Enactment of School-Based Professional Development**  
Jessica Chen, Columbia University

**Enhancement of the pedagogy of scientific argumentation and supporting teacher agency in the secondary classroom**  
Zeynep Guler, University College London

### Strand 10: Curriculum and Assessment

**Curriculum and assessment in the context of physics**  
11:00am - 12:00 pm  
Advanced Pre-recorded Viewing & Live Q&A  
**Presider:** Ya-nan Zhao, Beijing Normal University

**Analysis of the Spanish-Language Force Concept Inventory: Lost in Translation?**  
Cesar Delgado, North Carolina State University  
Hye Sun You, Arkansas Tech University  
Natalia Murillo-Quirós, Instituto Tecnológico de Costa Rica  
Mónica Hernández-Campos, Instituto Tecnológico de Costa Rica

**Subject matter as a discipline-culture a new curricular organization for improving understanding in learning science**  
Lina Vinitsky-Pinsky, Achva Academic College, Israel  
Irena Vladimirsky, Achva Academic College, Israel  
Igal Galili, Hebrew University of Jerusalem, Israel

**Student Facets of Thinking in Parallel Contexts**  
Philip Hernandez, Stanford University  
Jim Minstrell, FACET Innovations, LCC  
Maria Araceli Ruiz-Primo, Stanford University  
Min Li, University of Washington  
Klint Kanopka, Stanford University  
Ruth Anderson, FACET Innovations, LLC  
Dongsheng Dong, University of Washington  
Xiaoming Zhai, Michigan State University

**Analyzing the Use of Educative Curriculum Materials in Physics Teaching**  
Judith Breuer, Universität Paderborn  
Christoph Vogelsang, Universität Paderborn  
Peter Reinhold, Universität Paderborn
Strand 11: Cultural, Social, and Gender Issues

Students and STEM
11:00am - 12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Maria Wallace, University of Southern Mississippi

"It just represents, you know, me": Latinx Students Developing Identities as Engineers-in-training
Jasmine McBeath Nation, California Polytechnic University

Science practices as an opportunity for student language development: Affordances, tensions, and ideological contradictions
Emily Reigh, Stanford University

Shifting stereotypes: low-stakes assignments highlighting counterstereotypical scientists alter students’ perceptions of and relatability to scientists
Kelsey Metzger, University of Minnesota Rochester
Bradley Craker, University of Minnesota Rochester
Yuefei Shen, University of Minnesota Twin Cities

Influences on Historically Underrepresented Minority Students’ Decisions to Enroll and Persist in STEM Majors
Shetay Ashford-Hanserd, Texas State University
Kristy Daniel, Texas State University
Dana García, Texas State University
Yasiry Lerma, Texas State University
Rosio Pedroso, Texas State University

Teacher Leadership and Engagement in PD
11:00am - 12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Kimberly Staples, Kansas State University

Science Teachers’ Process Skills, Inquiry, and Problem-Based Learning During Induction: A Randomized Controlled Trial
Shannon Navy, Kent State University
Jennifer Maeng, University of Virginia
Randy Bell, Oregon State University
Fatma Kaya, Kent State University

Experiences of School Science Coordinators During the COVID-19 Pandemic: An International Perspective
Harleen Singh, University of Georgia
Hong Tran, University of Georgia
Hatice Ozen Tasdemir, University of Georgia
Yuxi Huang, University of Georgia
Julie Luft, University of Georgia

Science Teacher Engagement in Professional Learning
Irit Vivante, Ben Gurion University of the Negev
Dana Vedder-Weiss, Ben-Gurion University of the Negev
Saturday, April 10, 2021

Strand 11: Cultural, Social, and Gender Issues

**STEM Identity**
11:00am -12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Cesar Delgado, North Carolina State University

**STEM Identities, First-generation College Students, and Family Influence**
Megan McGinty, University of Alaska Fairbanks
Laura Carsten Conner, University of Alaska Fairbanks

**Developing STEM identities in students in the "big middle". Connections between identity and socioeconomic level**
Carme Grimalt-Álvaro, Universitat Rovira I Virgili
Digna Couso, Crecim-Universitat Autonoma De Barcelona

**Examining the Intersection of Spirituality/Religiousness, Race/Ethnicity, and Gender on the Physics Career Choices**
Saeed Moshfeghyeganeh, Florida International University
Amanda Smith, Florida International University
Zahra Hazari, Florida International University

**Who is a STEM Person?: Analysis of Criteria Used to Define and Differentiate STEM People**
Elizabeth Palma-D’Souza, Florida International University
Remy Dou, Florida International University
Heidi Cian, Florida International University

Strand 12: Technology for Teaching, Learning, and Research

**Digital Tools to Support Inservice and Pre-Service Teachers' Professional Learning**
11:00am -12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
**Presider:** Yael Feldman-Maggor, Weizmann Institute of Science

**Promote computational thinking of middle-school teachers through SPARC-integrated science instruction**
Jianlan Wang, Texas Tech University
Yuanlin Zhang, Texas Tech University
Joshua Hawkins, Texas Tech University
Monica Romero, Texas Tech University

**Elementary Pre-Service Teachers' Learning of Content Knowledge: A Qualitative Research Using Top Hat Digital Platform**
Samantha Lynch, Wayne State University
Jazlin Ebenezer, Wayne State University

**Different Teaching Experience: How Teachers Personalized a Teaching Unit in an Online Chemistry Learning System**
Ehud Aviran, Weizmann Institute of Science
Ron Blonder, Weizmann Institute of Science
Strand 12: Technology for Teaching, Learning, and Research

Teaching and Learning with Technology through the COVID-19 Pandemic
11:00am - 12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Miri Barak, Technion - Israel Institute of Technology

The COVID-19 Pandemic Implications on a Flipped Project-Based MBSE course
Niva Wengrowicz, Technion- Israel Institute of Technology
Hanan Kohen, Technion - Israel Institute of Technology
Dov Dori, Technion - Israel Institute of Technology

Uncharted Territories: Teaching Science Virtually in the Era of COVID-19
Justina Ogodo, Baylor University
Marsha Simon, University of West Georgia
Dana Morris, Baylor University
Mark Akubo, Florida State University

Learning Experience and Instructional Design Efforts Promoting Self-Efficacy and Task-Value in Undergraduate Science Online Courses
Joseph Wong, University of California, Irvine
Brad Hughes, University of California, Irvine

Multi-modal online teaching during national lockdown: Exploring the blended continuum teaching science
Frikkie George, Cape Peninsula University of Technology
Ekaterina Rzyankina, Cape Peninsula University of Technology
Keith Langenhoven, University of the Western Cape

Strand 14: Environmental Education and Sustainability

Learning out of doors
11:00am - 12:00 pm
Advanced Pre-recorded Viewing & Live Q&A
Presider: Sara Salisbury, Middle Tennessee State University

Engaging the Urban Classroom with the Natural World: Lessons Learned During A Pandemic
Gary Holliday, The University of Akron
Lara Roketenetz, The University of Akron

Impacts of contextualized outdoor education on what and how elementary students learn about ecosystem relationships
Jean-Philippe Ayotte-Beaudet, Université De Sherbrooke
Pierre Chastenay, Université du Québec à Montréal
Alain Paquette, Université du Québec à Montréal
Michael Giamellaro, Oregon State University
Marie-Claude Beaudry, Université de Sherbrooke
Kassandra L’Heureux, Université de Sherbrooke
Estelle Desjarlais, Université du Québec à Montréal

A Comparative Study Between Outcomes of an In-person vs. Online Introductory Field Course
Alexandra Race, University of California - Santa Cruz
Maria De Jesus, Florida State University
Roxanne Beltran, University of California - Santa Cruz
Erika Zavaleta, University of California - Santa Cruz

Preservice teachers’ perceptions and practices of outdoor learning: A case study of time spent outdoors
Gerald Tembrevilla, University of British Columbia – Vancouver
Hartley Banack, University of British Columbia
Saturday, April 10, 2021

CLOSING SESSION
12:15-1:00 pm (Real time/ Live)

Presidential Closing Remarks,
2022 Conference Information
12:15pm-1:00pm
Real time/ Live

Author-Scheduled Presentations
Day and Time to be determined by authors

*Author-scheduled presentations will be listed here as their dates and times are established.*

Science teachers' perceptions regarding digital curation as a personalized learning activity that promotes professional learning
Thursday, April 8, 8:00 am-8:30 am
Efrat Dayan, Technion - Israel Institute of Technology
Dina Tsybulsky, Technion - Israel Institute of Technology

Fostering Transformative Agency in Science Education: Students Imagining Technological Futures
Friday, April 9, 8:00 am-8:30 am
Antti Laherto, University of Helsinki
Tapio Rasa, University of Helsinki
Elina Palmgren, University of Helsinki

STEM Teachers' Professional Learning Community During the COVID-19 Pandemic
Thursday, April 8, 11:30 am-12:00 pm
Zehavit Kohen, Technion - Israel Institute of Technology
Orit Cohen Nissan, Technion - Israel Institute of Technology