NEW

The Educational Leader’s Guide to Improvement Science
Data, Design and Cases for Reflection
Edited by Robert Crow, Brandi Nicole Hinnant-Crawford, and Dean T. Spaulding

The Educational Leader’s Guide to Improvement Science is a collection illustrating applied organizational problem-solving using methods of improvement science in educational leadership. This text concentrates on the elements faculty, students, and administrators need, and specific models where improvement science frameworks enhance the reliability and validity of improvement or quality enhancement efforts.

Imprint: Stylus Pub. | Date Available: January 2020

Paper $42.95  |  E-Book $42.95

FORTHCOMING TEXT

Improvement Science in Education
A Primer
Brandi Nicole Hinnant-Crawford

This Primer is specifically designed to introduce improvement science to educational audiences. Originally employed in such fields as engineering and health care, it has proven to be a very effective process for improving schools.

Imprint: Stylus Pub. | Date Available: June 2020

Paper $22.95  |  E-Book $22.95

BESTSELLER

The New Science of Learning
How to Learn in Harmony With Your Brain
Second Edition
Terry Doyle and Todd D. Zakrajsek
Foreword by Kathleen F. Gabriel

Paper $19.95  |  E-Book $15.99

Teaching Undergraduate Science
A Guide to Overcoming Obstacles to Student Learning
Linda C. Hodges
Foreword by Jeanne Narum

Paper $29.95  |  E-Book $23.99

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Practical Guidance for Effective Instruction and Lab Work
Edited by Dietmar Kennepohl
Foreword by Michael G. Moore

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NARST
A global organization for improving science education through research

2020 93rd Annual International Conference

March 15–18

Portland, OR, USA

Portland Marriott Downtown Waterfront

Science Education Across Places and Contexts

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ACKNOWLEDGMENTS

The following members of the Program Committee helped in preparing and editing the 2020 NARST Annual International Conference Program Book.

Tali Tal, President and Program Committee Co-Chair

Eileen Carlton Parsons, President-Elect and Program Committee Co-Chair

Helen Schneider Lemay
Executive Director

Paul Kemp
Conference Program and Data Coordinator

Tara M. Reddy
NARST Association Manager
Please note that this program is subject to change.

Check the addendum posted at the meeting and on the website for updates and any presentations that have been withdrawn after the program has been published.
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NARST Mission Statement

NARST is a worldwide organization of professionals committed to the improvement of science teaching and learning through research. Since its inception in 1928, NARST has promoted research in science education and the communication of knowledge generated by the research.

The ultimate goal of NARST is to help all learners achieve science literacy. NARST promotes this goal by:

1) encouraging and supporting the application of diverse research methods and theoretical perspectives from multiple disciplines to the investigation of teaching and learning in science;

2) communicating science education research findings to researchers, practitioners, and policy makers; and

3) cooperating with other educational and scientific societies to influence educational policies.

To learn more about NARST you may visit the Association’s website at http://narst.org/

Member Benefits

1) Ten issues of the Journal of Research in Science Teaching (JRST) are published each volume year. JRST has been ranked as one of the highest quality educational journals according to studies published by War, Holland and Schramm (American Educational Research Journal) and Guba and Clark (Educational Researcher) for the American Educational Research Association (AERA). These authors identified JRST as clearly the top research journal in science education.

2) Website and Listserv, allowing access to further information about the Association. You may access this site at: http://www.narst.org. There is further information about subscribing to the listserv on this site.
GENERAL INFORMATION

NARST Code of Ethical Conduct
(Revised: 20 September 2018)

The purpose of the National Association of Research in Science Teaching (NARST) Code of Ethical Conduct is to articulate a set of aspirational principles to guide and support members as they engage in professional activities—research, teaching, and service. NARST members are science education professionals who include researchers, practitioners, and graduate students from various cultures worldwide. These aspirational principles align with and support the mission of the organization to help all members achieve, develop, and contribute meaningfully to the improvement of science teaching and learning through research. NARST expects its members to adhere to the highest ethical standards. The Code of Ethical Conduct serves as a guide to the everyday professional conduct of science educators. Unfamiliarity with NARST’s Code of Ethical Conduct is not a valid defense for engaging in or failing to challenge observed unethical behavior. We accomplish this through our Code of Ethical Conduct where there is:

A. Professional Competence
Science education professionals strive to maintain the highest levels of competence in their work; they recognize the limitations of their expertise; and they undertake only those tasks for which they are qualified by education, training, or experience. They recognize the need for ongoing education in order to remain professionally competent; and they utilize the appropriate scientific, scholarly, professional, technical, and administrative resources needed to ensure honesty and integrity. Science education professionals conduct research, teach, practice, and provide service only within the boundaries of their competence, based on their education, training, supervised experience, or appropriate professional experience. They consult with other professionals when necessary for the benefit of their students, research participants, and clients. They maintain awareness of current scientific, scholarly, and professional information in their fields of activity and undertake continuing efforts to maintain competence in the skills they use. Importantly, professional competence must also include a willingness to accept and integrate new information and experiences, regardless of the effect that process has on research outcomes.

B. Integrity
It is the social responsibility of science education professionals to maintain integrity in all conduct, publications, and forums, and give due credit to the contributions of others. Adhering to this standard means science education professionals do not fabricate, falsify, or plagiarize. Public comments on matters of importance that are relevant to science education must be made with care and accuracy. Adhering to this standard means science education professionals do not use deficit language, deceptive statements concerning research data, or otherwise knowingly make false, misleading or deceptive statements in practicing and presenting research. Comment and debate within the bounds of collegiality and professionalism that keep the organization moving forward and current with emergent issues and perspectives are encouraged. Adhering to this standard means science education professionals do not use dismissive remarks or gestures, restrict multiple voices, or use derogatory language. In short, science education professionals conduct their professional activities in ways that engender trust and confidence.

C. Professional and Scholarly Responsibility in Science Teaching, Learning, and Research
Science education professionals have a responsibility to use research practice and policy to advance NARST members’ understanding of the teaching and learning of science in all learning contexts—formal, informal, local, and global—through research, practice, and policy. They adhere to the highest scholarly and professional standards within their field of expertise and accept responsibility for adherence to those standards. Science education professionals should regard the tutelage of graduate students and early career faculty as a trust conferred by the organization for which they work, as well as NARST, for the promotion of these individuals’ learning and professional development.
Science education professionals understand that they form a community and show respect for other science education professionals even when they disagree on theoretical, methodological, or personal approaches to professional activities. In activities involving marginalized populations, it is essential that responsible science education professionals seek out the voices and experiences of members of these groups and treat them as critical to their scholarship. While always endeavoring to be collegial, science education professionals must never let the desire to be collegial outweigh their shared responsibility for ethical behavior. When appropriate, they consult with colleagues, NARST’s Equity and Ethics Committee, or organizational entities such as their institutional review board in order to prevent, avoid, or challenge unethical conduct.

D. Respect for People’s Rights, Dignity, and Diversity
Science education professionals respect the rights, dignity, and worth of all people in their professional activities. They treat other professionals, students, research participants, and members of the organization fairly, respectfully, and without exploitation or harassment. Science education professionals acknowledge the rights of others to hold values, attitudes, and opinions that differ from their own and take reasonable steps to avoid harm to others in the conduct of their work. They learn with others, share ideas honestly, give credit for others’ contributions, and encourage others to contribute their unique skills, knowledge, and interests in professional environments. Science education professionals are sensitive to cultural, individual, and role differences in teaching, studying, and providing service to groups of people with distinctive characteristics, as well as the power differential that might result from such differences. Science education professionals carefully avoid discrimination and bias toward individuals and groups based on race, gender, age, religion, ethnicity, nationality, sexual orientation, gender expression, gender identity, presence of disabilities, educational background, socioeconomic status, or other personal attributes. They refrain from making biased assumptions about others and perpetuating demeaning attitudes and stereotypes. Science education professionals do not accept any forms of discrimination and actively challenge implicit and explicit forms of discrimination.

E. Social responsibility
Science education professionals are aware of their scientific and professional responsibility to the communities and societies in which they live. This awareness extends to their involvement and service to an increasingly diverse and international NARST community. NARST members are guided by the values and standards that reflect the professional literature. They strive to promote equity and the public good by advancing scientific and scholarly knowledge. Science education professionals are aware of the differences in society and culture that impact scholarly knowledge and academic work. They value and embrace the public trust in research and teaching and are concerned about their ethical behavior and the behavior of other science education professionals that might compromise that trust. Science education professionals should reasonably expect of themselves and others to be guided by a code of ethics that supports efforts to resolve ethical dilemmas.

References
Explanation of Program Session Formats

Paper Sessions Organized by the Program Committee
In a paper session, the presider introduces the presenters and monitors the time used for each presentation. All papers will be allotted 15 minutes for presentation, followed by approximately 5 minutes of questions or discussion. The presider and audience will use any time remaining in the session for additional discussion, general review, and suggestions for further research. Each presenter is expected to have a manuscript for distribution to attendees. The manuscript may be available either via hard copy distribution at the session or via electronic access provided by the author.

Symposium
A symposium involves a panel of experts or stakeholders who examine a specific theme or issue. This format does not involve the presentation of individual papers. Therefore, individual papers and authors will not be listed under this format. Rather, the participants are listed as panel members. The proposer controls presentations, discussion, and questioning with the assistance of the presider or discussant (if designated). Discussion should promote the expression of similar or alternative viewpoints and theoretical positions. The proposer of the symposium is expected to disseminate a paper or a summary with references either via hard copy distribution at the session or via electronic access provided by the author.

Related Paper Set
This category accommodates, in a single session, three to five related research papers reporting several studies that originate from a common base of research. This format also allows for common elements of design or approach to be presented once rather than repetitively. The proposer and authors may determine the specifics of the session once it is accepted. For instance, those involved may opt for a formal presentation style or they may conduct their session in a more informal, discussion-oriented style. Each presenter is expected to have a manuscript for distribution to attendees. The manuscript may be available either via hard copy distribution at the session or via electronic access provided by the author.

Poster Session
This format offers presenters the opportunity to display their work graphically on a poster display board. The poster display is 4 ft. wide x 8 ft. long (48 inches x 96 inches) – horizontal orientation.

PLEASE NOTE: We are no longer using the tri-fold boards. Each presenter must set up their poster display prior to the start of the Poster Session and then remove it at the end of the Poster Session. Each presenter is expected to have a manuscript for distribution to attendees. The manuscript may be available either via hard copy distribution at the session or via electronic access provided by the author.

Roundtable Session
Roundtable sessions allow maximum interaction among presenters and attendees. Papers accepted for a roundtable session will be grouped into tables with three papers per table, clustered around shared interests. Each roundtable session will be scheduled for a 60-minute time slot, with each presenter presenting for 12-15 min and the rest dedicated for discussion. We ask that the presenters at each table share the time equally. Presenters wishing to display information may do so from their own laptop computer screens. If you plan to use a laptop, please be sure the battery is charged, as a power source will not be provided. Alternatively, presenters can share printed materials.

Guidelines for Meeting Presenters
— Go to the designated room at least 10 minutes early.
— Greet the presider/discussant.
— NARST provides the LCD and screen in each presentation room. NARST does not provide computers, speakers, microphones, pointers, or other audio/visual equipment. You must have your own computer or you may put your file on a USB flash drive in advance, in case you will be using another presenter’s computer for your presentation.
— Check your understanding of the LCD projector and any other audio/visual equipment prior to the session.
GENERAL INFORMATION

— Keep presentation within the designated time limit.
— Invite audience comments and questions.
— If there is no presider assigned for your session, then presenters should keep time for each other.

Guidelines for Presiders and Discussants

We have accommodated most sessions with a presider, whose role is detailed below. For sessions without presiders, we are counting on the presenters to set aside time for discussion so that the audience participants can contribute to a discussion of the papers.

The role of the Presider includes:
— Arrive early at designated room and arrange furniture as per desires of presenters.
— Check and focus LCD projector.
— Check pronunciations of the names of the presenter and their institutions.
— With presenters, make a time plan, retaining the order of presenters in the program.
— Start session promptly.
— Introduce presenters and serve as time-keeper. Alert presenters when they have 5-, 3-, and 1-minute remaining. It is important to end each presentation within the agreed allocated time to ensure fairness to all presenters and in order to end the session on time. One suggestion that may be followed is if someone begins to exceed their allotted time, then it is appropriate to stand up and politely announce to the audience that you invite further discussion directly with the author(s) at the conclusion of the entire session.
— Facilitate discussion, assuring equitable involvement of audience members. Close session on time.

The role of the Discussant includes:
— Read papers before the session and have remarks prepared ahead of time.
— Perform presider duties as detailed above, if there is only a discussant for the session.
— After the presentation, make brief and cogent remarks on each paper with suggestions for future research.

Strand Key

STRAND 1 – Science Learning: Development of Student Understanding
STRAND 2 – Science Learning: Contexts, Characteristics, and Interactions
STRAND 3 – Science Teaching – Primary School (Grades PreK-6): Characteristics and Strategies
STRAND 4 – Science Teaching – Middle and High School (Grades 5-12): Characteristics and Strategies
STRAND 5 – College Science Teaching and Learning (Grades 13-20)
STRAND 6 – Science Learning in Informal Contexts
STRAND 7 – Pre-service Science Teacher Education
STRAND 8 – In-service Science Teacher Education
STRAND 9 – Reflective Practice
STRAND 10 – Curriculum, Evaluation, and Assessment
STRAND 11 – Cultural, Social, and Gender Issues
STRAND 12 – Educational Technology
STRAND 13 – History, Philosophy, and Sociology of Science
STRAND 14 – Environmental Education
STRAND 15 – Policy

A Special Thanks to our Sponsors and Exhibitors

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Stylus Publishing

We acknowledge Wiley-Blackwell and their work as publisher of the Journal of Research in Science Teaching – JRST
2021 NARST Annual International Conference

The Program Chair invites NARST members and others to participate in the 2021 NARST Annual International Conference and contribute to the 2021 conference by submitting program proposals.

Venue: Hilton Orlando Hotel, Orlando, FL
Dates: April 7-10, 2021
Theme: Science Education, a Public Good for the Good of the Public? Research to Empower, Evoke, and Revolutionize

Science Education, a public good for the good of the public? Research to empower, evoke, and revolutionize is a fitting call for this era of drastic change (e.g., population shifts, prominence of technology, disappearing economies) and daunting challenges (e.g., increased frequency of life-impacting natural and human-inspired disasters). It is a charge to conduct science education research for a socially just world.

A critical look at outcomes reveals a socially unjust world resistant to transformation. Throughout time, science education has been a public good of great value, but only and fully accessible to those society regarded as worthy. For example, in some countries, agencies identified individuals early in their development and tracked them into educational experiences for a life in the sciences with all its privileges (e.g. esteemed status, monetary benefits). In the United States (U.S.), science education for much of its existence was overtly reserved for whites, especially those of economic means. It was a vehicle to develop intellectual disciplines to solve real-world problems, competencies to ensure privileged positions in society for its participants. A version less valued by society, designed to hone vocational skills and socialize for subservient roles, was later expanded to include the poor and provided in scarcely resourced segregated settings for those classified as non-white.

Fast forward to the present: the intent of past practices to exclude is not overt in some countries, including the U.S., but parity in group outcomes has been slow and the historical structures (e.g., financing of education, allocation of resources, segregation and tracking of students) that contribute to outcome disparities remain largely intact.

For instance, whites exceed their representation in the U.S. general population in science education of high currency (e.g., AP courses, science majors) and in heavily resourced settings where high-quality science education is provided from preschool to postsecondary. When viewed from a systems and group perspective, who gets access to which opportunities has remained mostly unaltered across time.

Substantial progress towards a socially just world in which science education is a public good for the good of the public—a public inclusive of all desiring to partake—is elusive. A call for research to empower, evoke, and revolutionize may be heretical to those who believe western science, one foundation of science education, is a universal, objective body of knowledge immune to the frailties of humans who construct it and the sociopolitical contexts in which it is constructed. It may be unsettling for others who see science education strictly through an individual rather than group and complex systems lens and it may be disconcerting to those who adhere to presentism, an ahistorical view that exclusively attributes current conditions to the here and now. Receptive or not, the drastic changes and daunting challenges at this time demand all hands on deck and warrant an equity- and equality-oriented criticality—an intentional, exacting examination to deconstruct and disrupt the status quo privileging a few in pursuit of a socially just world for the many. The time for research to empower (envision beyond the existing boundaries), evoke (think and act boldly in times of ease and turmoil), and revolutionize (abandon the idea good intentions are enough and institute change to achieve equitable and equal outcomes) is now. It is this kind of research the 2021 conference aims to inspire.

Submission Deadline:
The Program Chair or designate must receive your program proposals for the 2021 Annual International Conference by August 15, 2020. This deadline allows sufficient time for processing, reviewing, and evaluating the many submitted proposals in a fair manner. By early July 2020, the call for program proposals will appear on the NARST website.

Conference Chair: Eileen Carlton Parsons
President-Elect

NARST • 93rd ANNUAL INTERNATIONAL CONFERENCE • MARCH 15–18, 2020
NARST 94TH ANNUAL INTERNATIONAL CONFERENCE

Science Education, a Public Good for the Good of the Public?
Research to *Empower, Evoke*, and *Revolutionize*

Future Meeting Dates for NARST, NSTA, and AERA

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<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Dates</th>
<th>Location</th>
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<tbody>
<tr>
<td>2020</td>
<td>NSTA</td>
<td>April 2 – 5</td>
<td>Boston, MA</td>
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<tr>
<td></td>
<td>AERA</td>
<td>April 17 – 21</td>
<td>San Francisco, CA</td>
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<tr>
<th>Year</th>
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<tbody>
<tr>
<td>2021</td>
<td>NARST</td>
<td>April 7-10</td>
<td>Orlando, FL</td>
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<tr>
<td></td>
<td>NSTA</td>
<td>April 8 – 11</td>
<td>Chicago, IL</td>
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<td></td>
<td>AERA</td>
<td>April 9 – 12</td>
<td>Orlando, FL</td>
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April 7-10, 2021
Hilton Orlando Hotel
Orlando, Florida
THURSDAY, APRIL 2

NARST-SPONSORED SESSION:
Latent Expectancy-Value-Cost Motivation Study of Black/African American Grade 5 Students
8:00 AM – 9:00 AM
Room: Flagship A, Seaport Hotel
Discussion centers on what affects student motivation (and a survey to help determine this). Review a study of expectancy-value-cost motivation categories of 860 Black/African American fifth grade students in an urban school district.
Speaker: David McKinney
Issac Newton Middle School
Session Topic: General Science Education
Session Type: Presentation

FRIDAY, APRIL 3

NARST-SPONSORED SESSION:
Exploring the Potential of Teacher Leadership to Drive STEM Programming in Public Schools
9:30 AM – 10:30 AM
Room: Flagship A, Seaport Hotel
Discuss findings from a research project on the development of STEM programming in schools. Recommendations are provided for approaches to developing STEM programming through teacher leadership initiatives.
Speakers: Gillian Roehrig
Professor
STEM Education Center
Elizabeth Crotty
STEM Education Center
Session Topic: General Science Education
Session Type: Presentation
GENERAL INFORMATION

NARST Sponsored Sessions at NSTA Conferences 2020 (con’t)

SATURDAY, APRIL 4

NARST-SPONSORED SESSION:
Clarifying the Role(s) of the Crosscutting Concepts in Science and Engineering Learning
8:00 AM – 9:00 AM
Room: Flagship A, Seaport Hotel
Review outcomes of a 2.5-day NSF-funded workshop held in December 2018 focused on clarifying the roles the crosscutting concepts play in supporting science learning. We will share potential theories-of-action describing how CCCs support science learning and priorities for future research.
Speakers: Jeff Nordine
Deputy Head of Department Physics Education
Leibniz Institute for Science and Mathematics Education
Sarah Fick
Research Assistant Professor of Science Education
University of Virginia
Session Topic: Engineering-Technology-and the Application of Science
Session Type: Presentation

NARST-SPONSORED SESSION:
Culturally Relevant Virtual Reality (VR) Learning: Bridging Cultures, Content, and Contexts
9:30 AM – 10:30 AM
Room: Flagship A, Seaport Hotel
Review findings from a two-year-long study on the role of culturally relevant virtual reality (VR) science curriculum in teaching and learning. We will cover how the images and videos can be used to introduce students to science within
Speakers: Norman Lederman
Professor
Illinois Institute of Technology
Radu Bogdan Toma
Session Topic: Physical Science
Session Type: Hands-On Workshop

NARST-SPONSORED SESSION:
Teaching STEM Through an Interdisciplinary Approach: An Example of Water Quality and Physical Mix Separation Methods
2:00 PM – 3:00 PM
Room: Flagship A, Seaport Hotel
Take part in the development of the water quality research activity, enabling you to understand how to connect official curriculum standards with a teaching approach that is highly relevant to science education. Discover how to use a research-based teaching model in an eminently practical and interactive way.
Speakers: Norman Lederman
Professor
Illinois Institute of Technology
Radu Bogdan Toma
Session Topic: Physical Science
Session Type: Hands-On Workshop

NARST-SPONSORED SESSION:
Science Across the Spectrum—Including Students with Autism and Intellectual/Developmental Disabilities
12:30 PM – 1:30 PM
Room: Flagship A, Seaport Hotel
Using an original research study, strategies will be shared that guide participants on any modifications that may be needed based on their individual classroom and teaching needs. As the interventions presented will be specific to students with ASD and IDD, few modifications or accommodations should be needed.
Speakers: Jiwon Hwang
California State University Bakersfield
Jonté Taylor
Assistant Professor, Penn State
Session Topic: General Science Education
Session Type: Presentation
their local contexts—how sounds and images can offer real-world connectivity—and how students’ experiences using VR improved recall as specific images and sounds triggered their prior knowledge.

**Speakers:**
- Bryan Brown
  Stanford University
- Phillip Boda
  Graduate Student
  Teachers College, Columbia University
- Matthew Wilsey
  Stanford University
- Greses Jöhnk
  Stanford University
- Kathryn Ribay
  Stanford University

**Session Topic:** Engineering-Technology and the Application of Science

**Session Type:** Presentation

**Track:** Learning Science in All Spaces and Places: Near and Far

**NARST-SPONSORED SESSION:**
Planning Ambitious Science Lessons, Analyzing and Adapting Curriculum Materials to Better Support Three-Dimensional Teaching and Learning

11:00 AM – 12:00 PM
Room: Flagship A, Seaport Hotel

Review findings from a research study related to some of the challenges elementary preservice teachers experienced as they adapted published science curriculum materials in order to support students’ engagement in ambitious three-dimensional science learning.

**Speaker:** Carrie-Anne Sherwood
Assistant Professor of Science Education
Southern Connecticut State University

**Session Topic:** General Science Education

**Session Type:** Presentation

**NARST-SPONSORED SESSION:**
Yes! Fourth Graders Can Develop and Use a Scientific Model of Energy

12:30 PM - 1:30 PM
Room: Flagship A, Seaport Hotel

The practice of creating and using models is arguably the central activity of science, but teachers tell us it can be among the most challenging to implement in the classroom. Find out how to use “energy cubes” to track the flow of energy—an abstract and invisible quantity—in a simpler model system.

**Speakers:**
- Roger Tobin
  Tufts University
- Sara Lacy
  Senior Scientist
  TERC
- Sally Crissman
  Senior Scientist
  TERC
- Nick Haddad
  Project Director
  TERC

**Session Topic:** Physical Science

**Session Type:** Hands-On Workshop
## NARST Leadership Team 2020-2022

### Officers and Board of Directors:

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  - The University of North Carolina at Chapel Hill

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  - The Schneider Group, Inc.

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  - International Coordinator

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  - University of Minnesota

- **Noemi Waight** (2022)
  - University of Buffalo

- **Jennifer D. Adams** (2022)
  - University of Calgary

- **Michael G. Bowen** (2021)
  - Mount Saint Vincent University
  - NARST Liaison to NSTA

- **Alejandro J. Gallard M.** (2021)
  - Georgia Southern University

- **Christa Haverly** (2021)
  - Graduate Student Representative
  - Michigan State University

- **Senay Purzer** (2022)
  - Purdue University

- **Judith S. Lederman** (2020)
  - Illinois Institute of Technology

- **Norman Lederman** (2020)
  - NSTA Representative

- **Femi S. Otulaja** (2020)
  - University of the Witwatersrand, Johannesburg

- **Christian Siry** (2020)
  - The University of Luxembourg

**JRST Editors:**

- **Fouad Abd-El-Khalick** (2020)
  - The University of North Carolina at Chapel Hill

- **Dana L. Zeidler** (2020)
  - University of South Florida—Tampa Bay

### Association Management:

- **Tara M. Reddy**
  - Virtual, Inc.

### Website Editor:

- **Paul F. Kemp**

## 2019 – 2020 Strand Coordinators

### STRAND 1: Science Learning: Development of Student Understanding

- **(21) Sarah J. Fick**
  - University of Virginia

- **(20) Calvin Kalman**
  - Concordia University

### STRAND 2: Science Learning Contexts, Characteristics, and Interactions

- **(21) Julia Plummer**
  - Pennsylvania State University

- **(20) David Owens**
  - University of Missouri

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

- **(21) Ryan Nixon**
  - Brigham Young University

- **(20) Carrie-Anne Sherwood**
  - Southern Connecticut State University

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

- **(21) Neta Shaby**
  - Ben Gurion, University of the Negev

- **(20) Justina Ogodo**
  - Ohio State University
GENERAL INFORMATION

STRAND 5: College Science Teaching and Learning (Grades 13-20)
  (21) Lisa Kenyon
      Wright State University
  (20) Jana Bouwma-Gearhart
      Oregon State University

STRAND 6: Science Learning in Informal Contexts
  (21) Anton Puvirajah
      University of Western Ontario
  (20) Nancy Staus
      Oregon State University

STRAND 7: Pre-service Science Teacher Education
  (21) Michelle Fleming
      Wright State University
  (20) Shannon Sung
      Concord Consortium

STRAND 8: In-service Science Teacher Education
  (21) Nidaa Makki
      The University of Akron
  (20) Tracy Huziak-Clark
      Bowling Green State University

STRAND 9: Reflective Practice
  (21) Heather Page
      New York University
  (20) Pei-Ling Hsu
      University of Texas-El Paso

STRAND 10: Curriculum, Evaluation, and Assessment
  (21) Elon Langbeheim
      The Weizmann Institute of Israel
  (20) Hun Jin
      Educational Testing Service

STRAND 11: Cultural, Social, and Gender Issues
  (21) Cesar Delgado
      North Carolina State University
  (20) Natalie King
      Georgia State University

STRAND 12: Educational Technology
  (21) Denise M. Bressler
      Rutgers University
  (20) Jonah Firestone
      Washington State University-Tricity

STRAND 13: History, Philosophy, Sociology, and Nature of Science
  (21) Alexandria Hansen
      Fresno State University
  (20) Dina Tsybulsky
      Technion-Israel Institute of Technology

STRAND 14: Environmental Education
  (21) Idit Adler
      Michigan State University
  (20) Isis Alkaher Kibbutzim
      College of Education

STRAND 15: Policy
  (21) Audrey Msimanga
      University of the Witwatersrand South Afric
  (20) Carrie Allen
      SRI International
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Darrin Collins
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Keren Dalyot
Danielle Dani
Emily Dare
Ido Davidesco
Shannon Davidson
Amber Davis
Elizabeth De Los Santos
Isha DeCoto
Lillian Degand
Cesar Delgado
Coralie Delhaye
Narendra Deshmukh
Adam Devitt
Jessica Dewey
Michael Dias

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Remy Dou
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Irene Drymiotou
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Rebecca Eagle-Malone
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Kirsten Edwards
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Nizar El Mehtar
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Mohammed Estaiteyeh
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Michelle Forsythe
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Gavin Fulmer
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Adid Gal
Dafna Gan
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GENERAL INFORMATION

Casandra Gonzalez
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Gonzalo Guerrero
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Qingna Jin
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Nam-Hwa Kang
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Eleanor Kenimer
Lisa Kenyon
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Chi-Chang Liu
Shiang-Yao Liu
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Charnell Long
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Lisa Lundgren
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Xiaolin Lyu
Lauren Madden
Massa Mafi
Jennifer Maguire
Nidaa Makki
Hamza Malik
Lisa Marco-Bujosa
Stefanie Marshall
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Nitasha Mathayas
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Rebecca Matz
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Jonathan McCausland
Lucy McClain
William McComas
Lisa McDonald
Christine McDonald
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Deb McGregor
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David McKinney
Felicity McClure
Preeha Menon
Felicia Mensah
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Joi Merritt
Gunkut Mesci
J. Mesiner
Mark Meszaros
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Emily Miller
GENERAL INFORMATION

Program Proposal Reviewers (con't)

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Greses Pérez
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Takesha Pierre
Ashlyn Pierson
Daniel Pimentel
Jacob Pleasants
Pongpapan Pongsophon
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Tiffini Pruitt-Britton
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Arif Rachmatullah
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Cody Smith
Theil Smith
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Virginia Snodgrass Rangel
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Regina Soobard
Stefan Sorge
David Sparks
Ornit Spektor-Levy
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Nancy Stauss
Molly Stuhlsatz
Cathlyn Stylinski
Jason Sullivan
Ryan Summers
Regina Suriel
Cina Svarovsky
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Tali Tal
Kristina Tank
Amy Tankersley
Stephanie Teeter
Ana Paula Teles
Sibel Telli
Jared Tenbrink
Ebony Terrell Shockley
Meredith Thompson
Stephen Thompson
Rudiger Tiemann
Deborah Tippins
Preethi Titu
Radu Bogdan Toma
Aphisong Tongchai
Brit Toven-Lindsey
Brie Tripp
Dina Tsbulsky
Eli Tucker-Raymond
Imran Tufail
Shane Tutwiler
Mayreen Rose Tuvilla
Bhaskar Upadhyay
Katrin Vaino
Ana Valdmann
Helena Van Vorst
Emily Van Zee
Kristin Van Wyngaarden
Ann Varne
Lucia Vazquez-Ben
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Tina Vo
Katherine Wade-Jaimes
Noemi Waiga
Wendy Wakefield
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Lu Wang
Xuehui Wang
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Yan Wang
Cong Wang
Abdirizak Warfa
Gary Weiser
Kristen Wendell
Niva Wengrowicz
Jill Wertheim
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Jeanna Wieselmann
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Tory Williams
Grant Williams
Sara Wilmes
Dionne Wilson
Kerri Wingert
Donald Wink
Panchompoo Wisittanawat
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Diane Wright
Christopher Wright
Diane Wright
Sally Wu
Sihan Xiao
Jing Yang
Fang-Ying Yang
Heesun Yang
Yang Yang
Kuay-Keng Yang
Melo-Jean Yap
Edit Yerushalmi
Laura Zeller
Xiaoming Zhai
FangFang Zhao
Minghui Zhu
Michal Zion
Lynne Zummo
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1929  W. L. Eikenberry
1930  W. L. Eikenberry
1931  Elliot R. Downing
1932  Elliot R. Downing
1933  Francis D. Curtis
1934  Ralph K. Watkins
1935  Archer W. Hurd
1936  Gerald S. Craig
1937  Walter G. Whitman
1938  Hanor A. Webb
1939  John M. Mason
1940  Otis W. Caldwell
1941  Harry A. Carpenter
1942  G. P. Cahoon
1943  Florence G. Billig
1944  Florence G. Billig
1945  Florence G. Billig
1946  C. L. Thield
1947  Earl R. Glenn
1948  Ira C. Davis
1949  Joe Young West
1950  N. Eldred Bingham
1951  Betty Lockwood
1952  Betty Lockwood
1953  J. Darrell Barnard
1954  George G. Mallinson
1955  Kenneth E. Anderson
1956  W. C. Van Deventer
1957  Waldo W. Blanchet
1958  Nathan S. Washton
1959  Thomas P. Fraser
1960  Vaden W. Miles
1961  Clarence H. Boeck
1962  Herbert A. Smith
1963  Ellsworth S. Obourn
1964  Cyrus W. Barnes
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1967  H. Craig Sipe
1968  John M. Mason
1969  Joseph D. Novak
1970  Willard D. Jacobson
1971  Paul D. Hurd
1972  Frank X. Sutman
1973  J. David Lockard
1974  Wayne W. Welch
1975  Robert E. Yager
1976  Ronald D. Anderson
1977  O. Roger Anderson
1978  Roger G. Olstad
1979  James R. Okey
1980  John W. Renner
1981  Stanley L. Helgeson
1982  Stanley L. Helgeson
1983  Carl F. Berger
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1985  Ertle Thompson
1986  David P. Butts
1987  James P. Barufaldi
1988  Linda DeFure
1989  Patricia Blosser
1990  William G. Holliday
1991  Jane Butler Kahle
1992  Russell H. Yeany
1993  Emmett L. Wright
1994  Kenneth G. Tobin
1995  Dorothy L. Gabel
1996  Barry J. Fraser
1997  Thomas R. Koballa, Jr.
1998  Audrey B. Champagne
1999  Joseph S. Krajcik
2000  David F. Treagust
2001  Sandra K. Abell
2002  Norman G. Lederman
2003  Cheryl L. Mason
2004  Charles W. (Andy) Anderson
2005  John R. Staver
2006  James A. Shymanksy
2007  Jonathan F. Osborne
2008  Penny J. Gilmer
2009  Charlene M. Czerniak
2010  Richard A. Duschl
2011  Dana L. Zeidler
2012  J. Randy McGinnis
2013  Sharon J. Lynch
2014  Lynn A. Bryan
2015  Valarie L. Akerson
2016  Mary M. atwater
2017  Mei-Hung Chiu
2018  Barbara Crawford
2019  Gail Richmond
2020  Tali Tal
2021  Eileen Parsons

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(NARST created the position of Executive Secretary in 1975; the title was changed to Executive Director in 2003.)

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1985 – 1990  Glenn C. Markle
1990 – 1995  John R. Staver
1995 – 2000  Arthur L. White
2000 – 2002  David L. Haury
2002 – 2007  John W. Tollotson
2018 – 2020  Helen Schneider Lemay
2020 – 2025  Troy Dow Sadler

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1970 – 1974  O. Roger Anderson
1975 – 1979  David P. Butts
1980 – 1984  James A. Shymansky
1990 – 1993  Ronald G. Good
2006 – 2010  J. Randy McGinnis and Angelo Collins
2011 – 2015  Joseph S. Krajcik and Angela Calabrese Barton
2016 – 2020  Fouad Abd-El-Khalic and Dana L. Zeidler
2021-2025  Troy Dow Sadler and Felicia Mensah
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Angell, Carl
Arzi, Hanna
Baker, Dale
Barnes, Marianne
Bartlett, Guilford
Berkheimer, Glenn
Bethel, Lowell
Christopher, John
Dahncke, Helmut
De Jong, Onno
Dehaan, Robert
Doran, Rodney
Enochs, Larry
Feher, Elsa
Ganiel, Uri
Haney, Richard
Haury, David
Helgeson, Stanley
Hewson, Peter
Hill, Todd
Holliday, William
Jaffarian, Bill
Joslin, Paul
Kahle, Jane
Kennedy, David
Krockover, Gerald
Lemke, Jay
Lindauer, Ivo
Lunetta, Vincent
Mallinson, Jacqueline
Markle, Glenn
McCormack, Alan
McFadden, Charles
Niaz, Mansoor
Nous, Albert
Novak, Joseph
Olstad, Roger
Padilla, Michael
Pak, Sung Jae
Pedemonte, Gian
Piburn, Michael
Poth, James
Prather, J.
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Sherwood, Robert
Simmons, Ellen
Simonis, Doris
Smith, Edward
Swift, J. Nathan
Thier, Herbert
Thier, Marlene
Van Den Berg, Ed
Walding, Richard
Welch, Wayne
Williams, Robert
Yore, Larry

NARST Award Recipients

Distinguished Contributions to Science Education through Research Award
This award is presented at the Annual International Conference but is bestowed only when an outstanding candidate, or candidates, has been identified. It is given to recognize individuals who, through research over an extended period of time, have made outstanding and continuing contributions, provided notable leadership, and made a substantial impact in the area of science education.

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
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<tbody>
<tr>
<td>1986</td>
<td>Anton E. Lawson</td>
<td>2002</td>
<td>Audrey B. Champagne</td>
<td>2014</td>
<td>Glen Alkenhead, Richard Gunstone,</td>
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<tr>
<td>1987</td>
<td>Paul DeHart Hurd</td>
<td>2003</td>
<td>Barry J. Fraser</td>
<td>2015</td>
<td>Richard A. Duschl and Meshach</td>
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<td>1992</td>
<td>Pinchas Tamir</td>
<td>2008</td>
<td>Dorothy Gabel</td>
<td>2020</td>
<td>Mary M. Atwater and Maria</td>
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<td>1994</td>
<td>Marcia C. Linn</td>
<td></td>
<td>Rennie, and Wolff-Michael Roth</td>
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<td>Judy Dori and Saouma Bou Jaoude</td>
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<td>1995</td>
<td>Wayne W. Welch</td>
<td>2010</td>
<td>Reinders Duit and Joseph Krajcik</td>
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<td>1996</td>
<td>Carl F. Berger</td>
<td>2011</td>
<td>Norman Lederman</td>
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<td>1997</td>
<td>Rosalind Driver</td>
<td>2012</td>
<td>Charles W. (Andy) Anderson and</td>
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<td>1998</td>
<td>James J. Gallagher</td>
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<td>Larry Yore</td>
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<td>1999</td>
<td>Peter J. Fensham</td>
<td>2013</td>
<td>Dale R. Baker</td>
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<td>2000</td>
<td>Jane Butler Kahle</td>
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<td>2001</td>
<td>John K. Gilbert</td>
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</tr>
</tbody>
</table>
**Outstanding Doctoral Research Award**

This award is given annually for the Doctoral Research judged to have the greatest significance in the field of science education from among all theses and dissertations nominated this year for the award.

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Major Professor</th>
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<tbody>
<tr>
<td>1992</td>
<td>Rene Stofflett</td>
<td>Dale R. Baker</td>
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<td>1993</td>
<td>Julie Gess-Newsome</td>
<td>Norman G. Lederman</td>
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<td>1994</td>
<td>Carolyn W. Keys</td>
<td>Burton E. Voss</td>
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<td>1995</td>
<td>Jerome M. Shaw</td>
<td>Edward Haertel</td>
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<td>1996</td>
<td>Christine M. Cunningham</td>
<td>William L. Carlsten</td>
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<td>1997</td>
<td>Jane O. Larson</td>
<td>Ronald D. Anderson</td>
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<td>1998</td>
<td>Kathleen Hogan</td>
<td>Bonnie K. Nastasi</td>
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<td>1999</td>
<td>Fouad Abd-El-Khalick</td>
<td>Norman G. Lederman</td>
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<td>2000</td>
<td>Danielle Joan Ford</td>
<td>Annemarie S. Palinscar</td>
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<td>2001</td>
<td>Iris Tabak</td>
<td>Brian Reiser</td>
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<td>2002</td>
<td>Mark Girod</td>
<td>David Wong</td>
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<td>Joseph Krajcik</td>
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<td>David L. Fortus</td>
<td>Ronald Marx and Joseph Krajcik</td>
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<td>2005</td>
<td>Thomas Tretter</td>
<td>Gail M. Jones</td>
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<tr>
<td>2006</td>
<td>Stacy Olitsky</td>
<td>Kenneth Tobin</td>
</tr>
</tbody>
</table>

**Early Career Research Award**

The Early Career Research Award is given annually to the early researcher who demonstrates the greatest potential to make outstanding and continuing contributions to research in science education. The recipient will have received his/her Doctoral degree within five years of receiving the award.

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Wolff-Michael Roth</td>
</tr>
<tr>
<td>1994</td>
<td>Deborah J. Tippins</td>
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<td>Nancy B. Songer</td>
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<td>1996</td>
<td>Mary B. Nakhleh</td>
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<td>Peter C. Taylor</td>
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<td>Angela Calabrese Barton</td>
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<td>Julie A. Bianchini</td>
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<td>Hsin-Kai Wu</td>
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<td>Troy D. Sadler</td>
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<td>Thomas Tretter</td>
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<td>2011</td>
<td>Katherine L. McNeil</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Victor Sampson</td>
</tr>
<tr>
<td>2013</td>
<td>Alandeom W. Oliveira</td>
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<td>2014</td>
<td>Cory Forbes</td>
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<td>2015</td>
<td>Benjamin C. Herman</td>
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<td>2016</td>
<td>Richard L. Lamb</td>
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<td>Ying-Chih Chen</td>
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<tr>
<td>2018</td>
<td>Doug Lombardi</td>
</tr>
<tr>
<td>2019</td>
<td>Hosun Kang</td>
</tr>
<tr>
<td>2020</td>
<td>Brian Donovan</td>
</tr>
<tr>
<td>2020</td>
<td>Dana Vedder Weiss</td>
</tr>
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The Journal of Research in Science Teaching (JRST) Award
The JRST Award was awarded annually to the author or authors of the Journal of Research in Science Teaching article judged to be the most significant publication for the Volume year. It was awarded annually between 1974 and 2015.

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<tr>
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<td>Marcia C. Linn and Herbert C. Thier</td>
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<td>1977</td>
<td>Anton E. Lawson and Warren T. Wollman</td>
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<td>1978</td>
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<td>1979</td>
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<td>Robert G. Good and Harold J. Fletcher (tie) F. David Boulanger</td>
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<tr>
<td>1983</td>
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<tr>
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<td>Julie P. Sanford</td>
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<tr>
<td>1986</td>
<td>Anton E. Lawson</td>
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<tr>
<td>1987</td>
<td>Russell H. Yeany, Kueh Chin Yap, and Michael J. Padilla</td>
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<tr>
<td>1988</td>
<td>Kenneth G. Tobin and James J. Gallagher</td>
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<td>1988</td>
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<td>E. P. Hart and I. M. Robottom</td>
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<td>David F. Jackson, Elizabeth C. Doster, Lee Meadows, and Teresa Wood</td>
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<td>2000</td>
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<td>Allan G. Harrison, J. Grayson, and David F. Treagust</td>
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<td>Joseph Taylor, Susan Kowalski, Christopher Wilson, Stephen Getty, and Janet Carlson</td>
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The NARST Outstanding Paper Award
The NARST Outstanding Paper Award was awarded annually for the paper or research report presented at the NARST Annual International Conference that was judged to have the greatest significance and potential in the field of science education. It was awarded annually between 1975 and 2015.

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<td>2008</td>
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<td>2012</td>
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<td>2014</td>
<td>Ying-Chih Chen, Soonhye Park, and Brian Hand</td>
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<td>2015</td>
<td>Lori M. Ihrig, Michael P. Clough, and Joanne K. Olson</td>
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Outstanding Masters Thesis Award
This award was established in 1995 to be given annually for the Master’s Thesis judged to have the greatest significance in the field of science education. It was last awarded in 2002.

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<td>Fouad Abd-El-Khalick</td>
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<td>2004</td>
<td>Marcy Hamby Towns</td>
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Classroom Applications Award
The Classroom Applications Award was established in 1979. The award was given annually to authors whose papers were presented at the previous NARST Annual International Conference and judged to be outstanding in terms of emphasizing classroom application of research in science education. The award was last presented in 1991.

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<td>Allan Griffiths</td>
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<td>Ramona Saunders and</td>
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<td></td>
<td>Russell H. Yeany</td>
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<td>Joe Long,</td>
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<tr>
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<td>James R. Okey, and</td>
</tr>
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<td>Russell H. Yeany</td>
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<td>M. James Kozlow and</td>
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<td>Larry G. Enochs</td>
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<td></td>
<td>Ronald D. Anderson, and</td>
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<td></td>
<td>Harold Pratt</td>
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<td>Mary Ellen Quinn and</td>
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<td>Carolyn Kessler</td>
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<td>P. Ann Miller and</td>
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<td>Russell H. Yeany</td>
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<td>1982</td>
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<td>Louise L. Gann and</td>
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<td>Seymour Fowler</td>
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<td>Hanna J. Arzi,</td>
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<td>Uri Ganiel</td>
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<td>V. K. Samuel</td>
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<td>Linda Cronin,</td>
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<tr>
<td></td>
<td>Meghan Tweist, and</td>
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<td>Saundra McGuire,</td>
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<td>Joseph D. Novak, and</td>
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<td>John Butzow,</td>
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<td>Dale S. Niederhauser</td>
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<td>1991</td>
<td>David F. Jackson, Billie Jean Edwards, and</td>
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## General Information

### Elections Committee

<table>
<thead>
<tr>
<th>Immediate Past President (Ex Officio)</th>
<th>2020</th>
<th>Gail Richmond</th>
<th>Michigan State University</th>
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<tbody>
<tr>
<td><strong>Board Member Liaison</strong></td>
<td>2021</td>
<td>Alejandro Gallard</td>
<td>Georgia Southern University</td>
</tr>
<tr>
<td><strong>Representative from Ethics and Equity Committee</strong></td>
<td>2020</td>
<td>Catherine Quinlan</td>
<td>Howard University</td>
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<tr>
<td><strong>Representative from the International Committee</strong></td>
<td>2020</td>
<td>Hye-Eun Chu</td>
<td>Macquarie University</td>
</tr>
<tr>
<td><strong>Co-Chairs</strong></td>
<td>2020</td>
<td>Leon Walls (Chair)</td>
<td>University of Vermont</td>
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<td>2021</td>
<td>Regina Suriel (Co-Chair)</td>
<td>Valdosta State University</td>
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<td><strong>Members</strong></td>
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<td>Bar Ilan University</td>
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<td>2021</td>
<td>Ibrahim Delen</td>
<td>Usak University</td>
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<td>2022</td>
<td>Mary Atwater</td>
<td>University of Georgia</td>
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<td>2022</td>
<td>Nazan U. Bautista</td>
<td>Miami University</td>
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<td>2022</td>
<td>Bridget Mulvey</td>
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### Equity and Ethics Committee

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GENERAL INFORMATION

Equity and Ethics Committe Members (continued)

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<td>Clarkson University</td>
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<td>Justina Ogodo</td>
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External Policy and Relations Committee

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Chair

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<td>2021</td>
<td>Stefanie Marshall</td>
<td>Michigan State University</td>
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Members

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<th>Year</th>
<th>Name</th>
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<tr>
<td>2020</td>
<td>Sharon Lynch</td>
<td>George Washington University</td>
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<tr>
<td>2020</td>
<td>Stacy Olitsky</td>
<td>Saint Joseph’s University</td>
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<td>2020</td>
<td>Margaret M Lucero</td>
<td>Santa Clara University</td>
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<td>2021</td>
<td>Kadir Demir</td>
<td>Georgia State University</td>
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<td>Sarah Carrier</td>
<td>North Carolina State University</td>
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<tr>
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<td>Tom Bielik</td>
<td>The Weizmann Institute</td>
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<td>Eugene Judson</td>
<td>Arizona State University</td>
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<tr>
<td>2022</td>
<td>Remy Dou</td>
<td>Florida International University</td>
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Graduate Student Committee

<table>
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<th>Board Liaison</th>
<th>University</th>
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<tbody>
<tr>
<td>2020</td>
<td>Judith Lederman</td>
<td>Illinois Institute of Technology</td>
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Chair

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<td>Christa Haverely</td>
<td>Northwestern University</td>
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Members

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<td>2020</td>
<td>Emmanuel Jaff</td>
<td>Morgan State University</td>
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<tr>
<td>2020</td>
<td>Ayca Karasahinoglu</td>
<td>University of Georgia</td>
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<tr>
<td>2020</td>
<td>Margaret Connell</td>
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<td>2021</td>
<td>Kathryn E Green</td>
<td>North Carolina State University</td>
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### Graduate Student Committee Members (continued)

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<tr>
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<td>2021</td>
<td>Sina Joshua Fakoyede</td>
<td>University of Witwatersrand</td>
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<td>2021</td>
<td>Melanie Kinskey</td>
<td>University of South Florida</td>
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<td>Star Sharp</td>
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<td>Theila Smith</td>
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### International Committee

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<tr>
<td>2022</td>
<td>Sonya Martin</td>
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### Members

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<tr>
<td>2020</td>
<td>Andri Christodoulou</td>
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</tr>
<tr>
<td>2020</td>
<td>Hye-Eun Chu</td>
<td>Macquarie University</td>
</tr>
<tr>
<td>2020</td>
<td>Ravinder Koul</td>
<td>The Pennsylvania State University</td>
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<tr>
<td>2020</td>
<td>Rea Lavi</td>
<td>Technion</td>
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<tr>
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<td>Peter Wulff</td>
<td>Leibniz Institute, Kiel University</td>
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<tr>
<td>2022</td>
<td>Saramma Chandy</td>
<td>University of Mumbai</td>
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<td>Jing Lin</td>
<td>Beijing Normal University</td>
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<td>Sara Wilmes</td>
<td>University of Luxemburg</td>
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### Membership Committee

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<tr>
<td>2022</td>
<td>Baskhar Upadhyay</td>
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<th>Institution</th>
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<tr>
<td>2020</td>
<td>Gary Holliday</td>
<td>University of Akron</td>
</tr>
<tr>
<td>2020</td>
<td>Amanda Peel</td>
<td>University of Missouri</td>
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<td>Alison Riley Miller</td>
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<td>Felicia Moore Mensah</td>
<td>Teachers College, Columbia University</td>
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## Membership Committee Members (continued)

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<tr>
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<td>Shirly Avargil</td>
<td>Technion</td>
</tr>
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<td>Reanna S Roby</td>
<td>Michigan State University</td>
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<td>2022</td>
<td>Knut Neuman</td>
<td>Leibniz Institute for Science and Mathematics Education at the University of Kiel</td>
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</tbody>
</table>

## Program Committee

### Co-Chairs
- Tali Tal (Chair) | Technion-Israel Institute of Technology
- Eileen Parsons (Co-Chair) | University of North Carolina at Chapel Hill

### Members (Strand Co-Coordinators)

### Strand 1: Science Learning: Development of Student Understanding
- (21) Sarah J. Fick | University of Virginia
- (20) Calvin Kalman | Concordia University

### Strand 2: Science Learning Contexts, Characteristics, and Interactions
- (21) Julia Plummer | Pennsylvania State University
- (20) David Owens | University of Missouri

### Strand 3: Science Teaching—Primary School (Grades preK-6)
- (21) Ryan Nixon
- (20) Carrie-Anne Sherwood | Southern Connecticut State University

### Strand 4: Science Teaching—Middle and High School (Grades 5-12)
- (21) Neta Shaby | Ben-Gurion University of the Negev
- (20) Justina Ogodo | Ohio State University

### Strand 5: College Science Teaching and Learning (Grades 13-20)
- (21) Lisa Kenyon | Wright State University
- (20) Jana Bouwma-Gearhart | Oregon State University

### Strand 6: Science Learning in Informal Contexts
- (21) Anton Puvirajah | University of Western Ontario
- (20) Nancy Staus | Oregon State University

### Strand 7: Pre-service Science Teacher Education
- (21) Michelle Fleming | Wright State University
- (20) Shannon Sung | Spelman College
## General Information

### Program Committee Members (continued)

<table>
<thead>
<tr>
<th>Strand 8: In-service Science Teacher Education</th>
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<tbody>
<tr>
<td>(21) Nidaa Makki The University of Akron</td>
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<tr>
<td>(20) Tracy Huziak-Clark Bowling Green State University</td>
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<thead>
<tr>
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<tbody>
<tr>
<td>(21) Heather Page New York University</td>
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<tr>
<td>(20) Pei-Ling Hsu University of Texas-El Paso</td>
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<thead>
<tr>
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<tbody>
<tr>
<td>(21) Elon Langbeheim The Weizmann Institute of Israel</td>
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<tr>
<td>(20) Hun Jin Educational Testing Service</td>
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<tr>
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<tbody>
<tr>
<td>(21) Cesar Delgado North Carolina State University</td>
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<tr>
<td>(20) Natalie King Georgia State University</td>
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<tbody>
<tr>
<td>(21) Denise M. Bressler Rutgers University</td>
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<tr>
<td>(20) Jonah Firestone Washington State University-Tricity</td>
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<thead>
<tr>
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<tr>
<td>(21) Alexandria Hansen Fresno State University</td>
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<tr>
<td>(20) Dina Tsybulsky Technion-Israel Institute of Technology</td>
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<tbody>
<tr>
<td>(21) Idit Adler Michigan State University</td>
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<tr>
<td>(20) Isis Alkaher Kibbutzim College of Education</td>
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<tr>
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<tbody>
<tr>
<td>(21) Audrey Msimanga University of the Witwatersrand South Africa</td>
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<tr>
<td>(20) Carrie Allen SRI International</td>
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<tr>
<td>Helen Schneider Lemay</td>
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## The Publications Advisory Committee

<table>
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<tr>
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<tbody>
<tr>
<td>2020</td>
<td>Christina Siry</td>
<td>University of Luxembourg</td>
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### Research for Practitioners and Policymakers Sub Committee

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<tbody>
<tr>
<td>2020</td>
<td>Hayat Alhokayem</td>
<td>Texas Christian University</td>
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### Scholarship Sub Committee

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<tr>
<td>2020</td>
<td>Justin McFadden</td>
<td>University of Louisville</td>
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### Pre-Conference Workshop and Sponsored Symposium Sub Committee

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<tbody>
<tr>
<td>2021</td>
<td>Heidi Carlone</td>
<td>University of North Carolina, Greensboro</td>
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## Members

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<tr>
<td>2020</td>
<td>Greses Perez Gonzalez</td>
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<tr>
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<td>Amanda (Mandi) Berry</td>
<td>Monash University</td>
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<td>2021</td>
<td>Jeanne Brunner</td>
<td>University of Massachusetts, Amherst</td>
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<td>Deena Gould</td>
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<td>Allison Antink-Meyer</td>
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<td>2022</td>
<td>Kyungjin Cho</td>
<td>Pennsylvania State University</td>
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<td>Shuly Kapon</td>
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<td>Ibrahim Yeter</td>
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## Research Committee

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<tr>
<td>2022</td>
<td>Jennifer D. Adams</td>
<td>University of Calgary</td>
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### Chairs

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<tbody>
<tr>
<td>2020</td>
<td>Ryan Summers</td>
<td>University of North Dakota</td>
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<tr>
<td>2021</td>
<td>Tina Vo</td>
<td>University of Nebraska-Lincoln</td>
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### Members

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<tr>
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<td>Vanashri Nargund</td>
<td>New Jersey City University</td>
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<tr>
<td>2020</td>
<td>Joe Taylor</td>
<td>BSCS Science Learning</td>
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<tr>
<td>2021</td>
<td>Abdi Warfa</td>
<td>University of Minnesota</td>
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<td>Carina Rebello</td>
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<tr>
<td>2021</td>
<td>Banu Avsar Erumit</td>
<td>Recep Tayyip Erdogan University (Turkey)</td>
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<tr>
<td>2021</td>
<td>Patricia Patrick</td>
<td>Columbus State University</td>
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<tr>
<td>2020</td>
<td>George Turner</td>
<td>Auburn University</td>
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<tr>
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<td>Jennifer Parrish</td>
<td>University of Northern Colorado</td>
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<td>Kelsey Lipsitz</td>
<td>University of Missouri, Exploratorium</td>
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<td>Li Ke</td>
<td>University Of North Carolina, Greensboro</td>
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<tr>
<td>2022</td>
<td>Ling L. Liang</td>
<td>La Salle University</td>
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<td>Yann Shiou Ong</td>
<td>National Institute of Education</td>
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<td>Nanyang Technological University</td>
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<tr>
<td>2022</td>
<td>Asli Sezen-Barrie</td>
<td>University of Maine</td>
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<td>Marcus Kubsch</td>
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### Website Committee

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<tbody>
<tr>
<td></td>
<td>Greg Kelly (Ex Officio) Pennsylvania State University</td>
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#### Chairs

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<tr>
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<tbody>
<tr>
<td>2020</td>
<td>Scott McDonald (Chair) Penn State University</td>
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<td>Katherine Wade-James (Co-Chair) University of Memphis</td>
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#### Members

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<tbody>
<tr>
<td>2020</td>
<td>Jennifer Weible</td>
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<td>Jennifer Oramous</td>
<td>University of Arkansas</td>
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<tr>
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<td>Sandhya Krishnan</td>
<td>University of Georgia</td>
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<td>2022</td>
<td>Nazihan Ursavas</td>
<td>Erdogan University Turkey</td>
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<td>Lisa Lundgren</td>
<td>North Carolina State University</td>
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<td>Minjung Ryu</td>
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<tr>
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<tr>
<td>March 15–18</td>
<td>Portland, OR, USA</td>
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# SCHEDULE AT A GLANCE

## SATURDAY, MARCH 14

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>8:00 AM - 5:00 PM</td>
<td><strong>NARST Executive Board Meeting #1</strong></td>
<td>Meadow Lark/ Douglas Fir 3rd Floor</td>
</tr>
<tr>
<td>2:00 PM - 5:00 PM</td>
<td><strong>Conference Registration</strong></td>
<td>Ballroom Foyer - Lower Level</td>
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## SUNDAY, MARCH 15

<table>
<thead>
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<tr>
<td>8:00 AM - 5:00 PM</td>
<td><strong>NARST Executive Board Meeting #1 (continued)</strong></td>
<td>Meadow Lark/ Douglas Fir 3rd Floor</td>
</tr>
<tr>
<td>8:00 AM - 11:45 AM</td>
<td><strong>PRE-CONFERENCE WORKSHOPS</strong></td>
<td>Ballroom Foyer - Lower Level</td>
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NOTE: You MUST register for Pre-Conference Workshops with you advance conference registration. You may only register for ONE Workshop.

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>8:00 AM - 10:00 AM</td>
<td><strong>Pre-Conference Workshop #1:</strong> Membership Committee</td>
<td>Salon C - Lower Level</td>
</tr>
<tr>
<td><strong>Title:</strong></td>
<td>Early Career Faculty Forum</td>
<td></td>
</tr>
<tr>
<td><strong>Presenters:</strong></td>
<td>Brooke Whitworth, University of Mississippi</td>
<td></td>
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<tr>
<td></td>
<td>Alison Miller, Bowdoin College</td>
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<td>Shirly Avargil, Technion - Israel Institute of Technology</td>
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<tr>
<td>8:00 AM - 11:45 AM</td>
<td><strong>Pre-Conference Workshop #2:</strong> Research Committee</td>
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<tr>
<td><strong>Title:</strong></td>
<td>Next Generation Labs for Next Generation Science Standards: Mobile Sensing as an Example</td>
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<tr>
<td><strong>Presenters:</strong></td>
<td>Charles Xie</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shannon Sung</td>
<td></td>
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<tr>
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<td>Xudong Huang</td>
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<td></td>
<td>Guanhua Chen</td>
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<tr>
<td>8:00 AM - 11:45 AM</td>
<td><strong>Pre-Conference Workshop #3:</strong> Membership Committee</td>
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<tr>
<td><strong>Title:</strong></td>
<td>Writing in Community: NARST Membership Committee Writing Retreat</td>
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<tr>
<td><strong>Presenters:</strong></td>
<td>Knut Neuman, Leibniz Institute for Science Education</td>
<td></td>
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<td>Felicia Mensah, Columbia University</td>
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<td>Time</td>
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<td>8:00 AM - 11:45 AM</td>
<td>Pre-Conference Workshop #4: Research Committee</td>
<td>Salon D - Lower Level</td>
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<td>Title: How to Access Learners’ Connections Across Nature of Science Aspects: Using Card Sorts and Epistemic Network Analysis</td>
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<td>Presenters: Bridget K. Mulvey, Jennifer C. Parrish, Erin Peters-Burton</td>
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<td>8:00 AM - 11:45 AM</td>
<td>Pre-Conference Workshop #5: Equity and Ethics Committee</td>
<td>Salon I - Lower Level</td>
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<td></td>
<td>Title: Equity and Ethics Pre-conference Workshop</td>
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<td>Presenters: Sara Raven, Danielle Dani, Seema Rivera, Sheron Mark, Saiqa Azam, Jordan Henley</td>
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<tr>
<td>8:00 AM - 11:45 AM</td>
<td>Pre-Conference Workshop #6: Research Committee</td>
<td>Salon G - Lower Level</td>
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<td>Title: An Observation Protocol for Integrated STEM Instruction in K-12 Science and Engineering Classes</td>
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<td>Presenters: Emily A. Dare, Assistant Professor of Science Education at Florida International University, Joshua A. Ellis, Assistant Professor of Science Education at Florida International University, Elizabeth A. Ring-Whalen, Assistant Professor of Education, Coordinator for the EcoSTARS and Elementary STEM Certificate programs, and Director of the National Center for STEM Elementary Education at St. Catherine University, Gillian H. Roehrig, Professor of STEM Education at the University of Minnesota–Twin Cities</td>
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<td>Title: Clarifying the Role(s) of the Crosscutting Concepts in Science and Engineering Learning</td>
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## SCHEDULE AT A GLANCE

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
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</table>
| 10:00 AM - 11:00 AM | Pre-Conference Workshop #8: National Science Foundation  
(Salmon C - Lower Level)  
(The National Science Foundation  
Cost: Free / Maximum attendance: 50) |  
Title: Work at the National Science Foundation as a Rotater/IPA/Program Officer. Is it right for me?  
Presenters: Rob Ochsendorf, Sharon Lynch, Monica Cardella, Gavin Fulmer |
| 11:45 AM - 1:00 PM | Lunch  
On Your Own |  
1:00 PM - 2:15 PM | Conference Welcome & Plenary Session 1  
(Salmon E & F - Lower Level)  
Title: Migrating Birds Know No Boundaries: The Scientific and Educational Dimension  
Speaker: Dr. Yossi Leshem, Tel Aviv University |
| 6:00 PM - 7:00 PM | Mentor/Mentee Nexus  
Mt. Hood |  
6:00 PM - 7:00 PM | Research Interest Group (RIG) Meetings  
(Salmon I - Lower Level)  
(Salmon H - Lower Level)  
Continental and Diasporic Africa in Science Education (CADASE) RIG  
Contemporary Methods for Science Education Research RIG |
| 7:00 PM - 9:30 PM | Award Ceremony and Presidential Reception  
Light appetizers will be served. Cash bar.  
(Salmon E & F - Lower Level/Ballroom Foyer) |  
MONDAY, MARCH 16 |
| 6:00 AM - 7:15 AM | Mind and Sole  
This event is not sponsored or endorsed by NARST  
Off-site |  
8:00 AM - 4:30 PM | Conference Registration  
Ballroom Foyer - Lower Level |  
8:30 AM - 10:00 AM | CONCURRENT SESSION #3  
Concurrent Session Rooms |  
10:00 AM - 10:30 AM | Networking Break |  
10:30 AM - 12:00 PM | CONCURRENT SESSION #4  
Concurrent Session Rooms |  
12:00 PM - 1:45 PM | Committee Meetings  
Concurrent Session Rooms |  
12:00 PM - 1:45 PM | Lunch  
On Your Own |
SCHEDULE AT A GLANCE

1:45 PM - 3:15 PM  CONCURRENT SESSION #5

3:15 PM - 3:45 PM  Networking Break

3:45 PM - 4:45 PM  CONCURRENT SESSION #6A: Roundtable Session

4:45 PM - 5:45 PM  CONCURRENT SESSION #6B: Poster Session

5:45 PM - 7:15 PM  Graduate Student Forum

6:00 PM - 8:30 PM  JRST Editorial Team Meeting/Dinner

6:00 PM - 7:30 PM  Research Interest Group (RIG) Meetings

TUESDAY, MARCH 17

7:30 AM - 4:30 PM  Registration

8:00 AM - 9:30 AM  CONCURRENT SESSION #7

9:30 AM - 10:00 AM  Networking Break

10:00 AM - 11:30 AM  CONCURRENT SESSION #8

11:30 AM - 12:30 PM  NARST Annual Membership Meeting

11:30 AM - 12:30 PM  Lunch

12:30 PM - 1:45 PM  Announcement of 2021 Venue & Passing the Gavel & Plenary Session 2

Title: Making Science Education Matter in a Damaged and Unjust World

Speaker: Philip Bell, University of Washington

2:00 PM - 3:30 PM  CONCURRENT SESSION #9

3:30 PM - 3:45 PM  Networking Break

3:45 PM - 5:15 PM  CONCURRENT SESSION #10
## SCHEDULE AT A GLANCE

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
<th>Location</th>
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<tr>
<td>5:15 PM - 6:15 PM</td>
<td>STRAND Meetings</td>
<td>Concurrent Session Rooms</td>
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<tr>
<td>6:30 PM - 9:30 PM</td>
<td><strong>Equity &amp; Ethics Dinner</strong>&lt;br&gt;Boarding is at <strong>6:30 PM</strong> (Maximum attendance: 75) Dinner, including tax and gratuity, is <strong>$58</strong>. Please note: You must register for this event with your Advance Conference Registration. Tickets purchased for this event are not refundable. <strong>NOTE:</strong> The Spirit of Portland departs from the Salmon Springs Dock, approximately three blocks from the hotel. Transportation services will not be provided.</td>
<td>Off-site: Spirit of Portland Dinner Cruise Salmon Street Springs Dock</td>
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<td>8:00 AM - 11:00 AM</td>
<td><strong>Registration</strong></td>
<td>Ballroom Foyer - Lower Level</td>
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<td>8:30 AM - 10:00 AM</td>
<td><strong>CONCURRENT SESSION #11</strong></td>
<td>Concurrent Session Rooms</td>
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<td>10:00 AM - 10:30 AM</td>
<td><strong>Networking Break</strong></td>
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<tr>
<td>10:30 AM - 12:00 PM</td>
<td><strong>CONCURRENT SESSION #12</strong></td>
<td>Concurrent Session Room</td>
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<tr>
<td>12:00 PM - 1:00 PM</td>
<td><strong>Lunch</strong></td>
<td>On Your Own</td>
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<td>1:00 PM - 2:30 PM</td>
<td><strong>CONCURRENT SESSION #13</strong></td>
<td>Concurrent Session Room</td>
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<tr>
<td>4:00 PM - 9:00 PM</td>
<td><strong>NARST Board Meeting #2</strong></td>
<td>Pearl - 2nd Floor</td>
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**WEDNESDAY, MARCH 18**

- Registration: Ballroom Foyer - Lower Level
- Concurrent Session Rooms
- Networking Break
- Lunch: On Your Own
- Concurrent Session Room
- NARST Board Meeting #2: Pearl - 2nd Floor
SATURDAY, MARCH 14, 2020
NARST Executive Board Meeting #1
7:30 AM – 5:00 PM
Meadow Lark/Douglas Fir – 3rd Floor

Conference Registration
2:00 PM – 5:00 PM
Ballroom Foyer
Lower Level
Conference Registration  
7:30 AM – 4:30 PM  
Ballroom Foyer – Lower Level

NARST Executive Board Meeting #1  
(continued)  
8:00 AM – 11:45 AM  
Meadow Lark/Douglas Fir – 3rd Floor – 3rd Floor

PRE-CONFERENCE WORKSHOPS  
8:00 AM – 11:45 AM  
NOTE: You MUST register for Pre-Conference Workshops with you advance conference registration. You may only register for ONE Workshop.

Pre-Conference Workshop #1:  
Membership Committee  
Salon C – Lower Level  
*Early Career Faculty Forum*  
Presenters:  
Brooke Whitworth, University of Mississippi  
Alison Miller, Bowdoin College  
Shirly Avergil, Technion - Israel Institute of Technology

Pre-Conference Workshop #2:  
Research Committee  
8:00 AM – 11:45 AM  
Salon A – Lower Level  
*Next Generation Labs for Next Generation Science Standards: Mobile Sensing as an Example*  
Presenters:  
Charles Xie  
Shannon Sung  
Xudong Huang  
Guanhua Chen

Pre-Conference Workshop #3:  
Membership Committee  
8:00 AM – 11:45 AM  
Salon B – Lower Level  
*Writing in Community: NARST Membership Committee Writing Retreat*  
Presenters:  
Knut Neuman, Leibniz Institute for Science Education  
Felicia Mensah, Columbia University  
Shirly Avergil, Technion - Israel Institute of Technology

Pre-Conference Workshop #4:  
Research Committee  
8:00 AM – 11:45 AM  
Salon D – Lower Level  
*How to Access Learners' Connections Across Nature of Science Aspects: Using Card Sorts and Epistemic Network Analysis*  
Presenters:  
Bridget K. Mulvey  
Jennifer C. Parrish  
Erin Peters-Burton

Pre-Conference Workshop #5:  
Equity and Ethics Committee  
8:00 AM – 11:45 AM  
Salon I – Lower Level  
*Equity and Ethics Pre-conference Workshop*  
Presenters:  
Sara Raven  
Danielle Dani  
Seema Rivera  
Sheron Mark  
Saiqa Azam  
Jordan Henley
**PRE-CONFERENCE WORKSHOPS**

8:00 AM – 11:45 AM (con’t)

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Pre-Conference Workshop #6: Research Committee

8:00 AM – 11:45 AM
Salon G – Lower Level

*An Observation Protocol for Integrated STEM Instruction in K-12 Science and Engineering Classes*

Presenters:
Emily A. Dare, Assistant Professor of Science Education at Florida International University
Joshua A. Ellis, Assistant Professor of Science Education at Florida International University
Elizabeth A. Ring-Whalen, Assistant Professor of Education, Coordinator for the EcoSTARS and Elementary STEM Certificate programs, and Director of the National Center for STEM Elementary Education at St. Catherine University
Gillian H. Roehrig, Professor of STEM Education at the University of Minnesota -Twin Cities

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Pre-Conference Workshop #7: Research Committee

8:00 AM – 11:45 AM
Salon H – Lower Level

*Clarifying the Role(s) of the Crosscutting Concepts in Science and Engineering Learning*

Presenters:
Sarah J. Fick
Jeffrey Nordine

---

Pre-Conference Workshop #8: National Science Foundation

10:00 AM – 11:00 AM
Salon C – Lower Level

*Title: Work at the National Science Foundation as a Rotater/IPA/Program Officer. Is it right for me?*

Presenters:
Rob Ochsendorf
Sharon Lynch
Monica Cardella
Gavin Fulmer

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**LUNCH**

11:45 AM – 1:00 PM
On Your Own

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**Conference Welcome & Plenary Session 1**

1:00 PM – 2:15 PM
Salon E & F – Lower Level

Speaker: *Dr. Yossi Leshem*
Tel Aviv University

Yossi Leshem is a Professor Emeritus in the School of Zoology, Faculty of Life Sciences at Tel Aviv University, and founder of the International Center for the Study of Bird Migration. In 1971, he began his career at the Society for the Protection of Nature in Israel and was CEO (1991-1995) and chair of its public council.

Prof. Leshem has been researching bird migration and raptor breeding ecology for 5 decades. His doctoral research at Tel Aviv University, conducted in cooperation with the Israel Air Force, reduced aircraft-bird collisions by 76%, thus saving the national budget $1.5 billion. Yossi developed an educational online science program (www.birds.org.il) that is currently taught at approximately 450 schools. He spearheaded the national effort to use barn owls as biological pest control agents in agriculture, significantly reducing the use of pesticides, and led an extensive research project in cooperation with the
Max Planck Institute at Radolfzell to track migrating storks, using satellite transmitters. To this project joined the Ministry of Education in Israel, who financed the program to promote STEM learning by tracking the Migrating Storks on-line.

Since 2002, Prof. Leshem has initiated a host of successful joint projects with the Jordanians and Palestinians using Barn Owls as biological pest control agents in agriculture, combining education, research, and nature conservation. The project became a national and regional project with 4,500 nesting boxes dramatically reducing the use of pesticides in the region. Currently, Prof. Leshem leads a trilateral project with Cyprus, Greece and Israel on the subject. In parallel, he works with the Chief of General Staff’s office to implement the “Nature Defense Forces – Commanders Take Responsibility for their Environment” project. This initiative consists of 60 projects with an educational emphasis.

Prof. Leshem received Lifetime Achievement Award for Environmental Protection, from the Minister for Environmental Protection (2008); Bruno H. Schubert Foundation Award for World Nature Conservation (2012); Lifetime Achievement Award of The Israel Society of Ecology and Environmental Sciences (2017); Honorary Fellowship of the Technion Board of Governors (2017); Honorary Membership, Israel Zoological Society (2018). The award of “Significant Contribution to Israel Aviation”, from the Israeli Airline Pilots Association (2019) and an appreciation medal from the the Israeli Air Force commander.

Prof. Leshem is the author of 11 books, many scientific articles, and hundreds of popular articles. He is father to five, and grandfather to eight.

**Migrating Birds Know No Boundaries: The Scientific and Educational Dimension**

During thousands of years of history, the Middle East, located at the junction of three continents – Europe, Asia and Africa – has been a focus for tension, conflicts and wars which continue to these days. On the other hand, the Middle East comprises a bottleneck of international importance for bird migration, one of the most important worldwide. Over 500 million birds migrate over the region twice a year. The diversity of species is also exceptional, 540 species of birds can be observed in Israel.

In my talk, I will present a unique effort to use the outstanding phenomenon of bird migration for science and peace education. The educational and conservation programs are designed for formal school systems, informal settings and the broad public and the Israel Defense Forces. The programs are based on research in several fields in the past five decades. The birds and migration constitute a platform for learning on the unique nature phenomenon, developing inquiry-learning and developing interest in the subject that combines activities in the class, and in the field. Birds and their migration were used for joint learning between Israelis, Jordanians and Palestinians, known more about the geopolitical conflict. The emphasis is that birds and nature are a connecting tool between people and religions regardless of politics and boundaries.

Based on the joint research of Tel-Aviv University and Max Planck Institute in Radolfzell, Germany, funded by the German Ministry of the Environment, satellite transmitters were attached to 120 German Storks and students from Israel, Jordan and the Palestinian Authority followed the migration using a website (www.birds.org.il), whilst also understanding key questions like the effect of the weather. In addition the students could track the data of the joint research with the Israeli Air Force, which suffered many collisions from migrating birds, and is based on the data that was gathered from a ground-network of bird-watchers, radars, a motorized-glider and UAV’s. A joint research and activity was developed in cooperation with farmers in Jordan, Palestine Authority, Cyprus and Greece, in which Barn Owls are used as biological pest-control agents in order to significantly reduce the use of pesticides. An educational program was developed in which students could follow data from 5,000 nesting boxes in the Middle East and track the cameras in the nesting boxes, whilst also taking part field-trips in the areas of the nesting boxes.

Other initiatives I’ll describe encourage the Israeli Defense Forces to integrate nature conservation education.

Currently, 550 schools from all Israeli sectors (Jewish, Arab and Druse) teach about birds and their uniqueness in the Middle East.

Funded by the government, a network of seven birding centers were established that constitutes an educational hubs and research and nature protection centers for students and the public, led by the Society for the Protection of Nature in Israel (NGO).
Concurrent Session 1
2:40 PM – 4:10 PM

Equity and Ethics Committee
Admin Symposium-Addressing Issues of Equity and Justice across Places and Context in Science
2:40 PM – 4:10 PM
Mt Hood

Organizers:
Catherine Quinlan, Howard University
Ying-Ting Chiu, The Ohio State University
María González-Howard, The University of Texas at Austin
Stephanie Eldridge, The University of Georgia
James Nyachwaya, North Dakota State University

Presenters:
Christopher Atchison, University of Cincinnati
Ashley Eaton, The University of Vermont
Sami Kahn, Princeton University
Shari Watkins, American University
Brittany Garvin-Hudson, Duke University

High School Students’ Types of Teleological Explanations: Implications for Item Development and for Teaching-Learning Strategies
Janina Jördens, Münster University
Marcus Hammann, Münster University

Experiencing the Development of Antibiotics Resistant Bacteria: Students’ Understanding of the Nature of Evolution
Bat-Shahar Dorfman, Weizmann Institute of Science
Orna Dahan, Weizmann Institute of Science
Amir Mitchell, University of Massachusetts Medical School
Anat Yarden, Weizmann Institute of Science

Plant Blindness—What German High School Students and In-service Biology Teachers
Daniela Fiedler, IPN, Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Isabell Rösberg, IPN, Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Marc Rodemer, IPN, Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Birgit Heyduck, IPN, Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Ute Harms, Leibniz Institute for Science and Mathematics Education (IPN)

Capturing Instructional Strategies of Pre-service Biology Teachers to Counter Misconceptions about Evolution by the SCRBio
Julian Fischer, Leibniz Institute for Science and Mathematics Education
Nils Machts, Department of Educational Psychology (IPL), Kiel University
Jens Möller, Department of Educational Psychology (IPL), Kiel University

STRAND 1: Science Learning: Development of Student Understanding
Learning and Teaching Evolution in High School: Challenges and Possible Remedies
2:40 PM – 4:10 PM
Salmon

Discussant:
Kostas Kampourakis, University of Geneva
Presider:
Anat Yarden, Weizmann Institute of Science
STRAND 2:
Science Learning: Contexts, Characteristics and Interactions
Language & Learning Science
2:40 PM – 4:10 PM
Hawthorne/Belmont/Laurelhurst

Presider:
Katherine Carr Chapman, Vanderbilt University

Hispanic Student Perceptions toward Spanish, Learning Science, and Attitudes
Angela Chapman, University of Texas Rio Grande Valley
Anthony Bailey, University of Texas Rio Grande Valley
Amy Weimer, Texas State University
Shania Pintor, University of Texas Rio Grande Valley
Stephany Pinales, University of Texas Rio Grande Valley

Languages of Modeling, Modeling in Languages: Integrating Science and Translanguaging
Ashlyn Pierson, Vanderbilt University
Douglas B. Clark, University of Calgary
Corey E. Brady, Vanderbilt University

The Effects of Language and other Home Factors on Lebanese Students’ Performance in TIMSS
Rayya Younes, University of Balamand
Sara Salloum, University of Balamand
Maya Antoun, University of Balamand

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions
The Chemistry Learning Environment
2:40 PM – 4:10 PM
Meadow Lark/Douglas Fir – 3rd Floor

Presider:
Jonathon Grooms, George Washington University

Why do Students Choose a Context? Students’ Reasons For Choosing a Learning Task in Chemistry
Helena Van Vorst, University of Cologne
Hatice Aydogmus

High School Student’s Understanding of Molecular Representations in a Chemistry Context-Based Learning Environment
Ran Piorko, Technion–Israel institute of Technology
Shirly Avargil, Technion–Israel Institute of Technology

Impact of Earth Science Integration on Student Learning in a High School Chemistry Course
Jonathon Grooms, George Washington University
Kevin J. Fleming, George Washington University
Alan R. Berkowitz, Cary Institute of Ecosystem Studies
Mary Ellen Wolfinger, George Washington University
Bess Caplan, Cary Institute of Ecosystem Studies
Chelsea McClure, Cary Institute of Ecosystem Studies
STRAND 3: Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies

**Teacher Knowledge, Beliefs, & Use of Science Practices with Students**

2:40 PM – 4:10 PM
**Medford**

- **Presider:** Jol Merritt, James Madison University

- *An Exploratory Comparative Video-study of Scientific Modeling in Elementary/Primary Classrooms in the U.S. and Germany*
  - Florian Böschl, University of Leipzig
  - Kim Lange-Schubert, University of Leipzig
  - Cory T. Forbes, University of Nebraska–Lincoln

- *Examining the Relationship between Preschool Teachers’ attitudes and Beliefs towards Science and Children's Science Achievement*
  - Elica B Sharifnia, University of Miami
  - Alexandra Alexander, University of Miami
  - Silvia Niño, University of Miami

- *Ms. Bernina's Knowledge of Her Students' Knowledge and of Science Teaching*
  - Ashley N. Kook, West Virginia University
  - Melissa J. Luna, West Virginia University

- *Using Digital Simulated Classrooms to Examine Elementary Teachers' Ability to Engage Students in Scientific Argumentation*
  - Jamie N. Mikeska, Educational Testing Service (ETS)
  - Pamela S. Lottero-Perdue, Towson University
  - Debra Brockway, Educational Testing Service

Andrew Finnegan, Educational Testing Service
Jonathan Steinberg, Educational Testing Service
Heather Howell, Educational Testing Service

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STRAND 4: Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies

**STEM Integration across Disciplines**

2:40 PM – 4:10 PM
**Salon D**

- **Presider:** David McKinney, University of Nevada, Las Vegas

- *Comparison of Academic and Attendance Outcomes between an Integrated STEM High School and Comparison Schools*
  - Carla C. Johnson, North Carolina State University
  - Toni A. Sondergeld, Drexel University

- *Science and Literacy Integration by Secondary Science and English Language Arts Teachers*
  - Laura E. Robertson, East Tennessee State University
  - ChihChe Tai, East Tennessee State University
  - Renee Rice Moran, East Tennessee State University
  - Karin Keith, East Tennessee State University

- *Semantic Patterns of an Integrated STEM Curriculum and its Enactment*
  - Chelsey A. Dankenbring, Purdue University
  - Selcen Guzey, Purdue University
  - Lynn A. Bryan, Purdue University
STRAND 5: College Science Teaching and Learning (Grades 13-20)
Frameworks of TA learning and Development as Educators
2:40 PM – 4:10 PM
Salon C

Presider:
Kübra Özmen, Baskent University

Cognitive Demand of Curricular Activities and Content-Situated Professional Development Influence Teaching Assistants’ Teaching Practices
Jenna Hicks, University of Minnesota
Jessica Dewey, University of Minnesota
Michael Abebe, University of Minnesota
Anita Schuchardt, University of Minnesota

Eliciting Students’ Ideas: An Exploratory Study of Biology Teaching Assistant Learning
Anna S. Grinath, Idaho State University
Sherry A. Southerland, Florida State University

Laboratory Teaching Assistants’ Learning to Develop Ambitious Teaching Practices
Ryan Coker, Florida State University
Miray Tekkumru Kisa, Florida State University

Training for Culturally Responsive Science Teaching in Undergraduate Science Impacts Teaching Assistants’ Practice
Hillary A. Barron, University of Minnesota–Twin Cities
Julie C. Brown, University of Florida
Lorelei E. Patrick, Fort Hays State University
Sehoya Cotner, University of Minnesota

STRAND 6: Science Learning in Informal Contexts
Admin Symposium-Igniting Informal Science
2:40 PM – 4:10 PM
Salon E & F

Igniting Informal Science
Nancy L. Staus, Oregon State University
Anton Puvirajah, University of Western Ontario
Neta Shaby, Oregon State University
Dana Vedder-Weiss, Ben-Gurion University of the Negev, Israel
Todd Campbell, University of Connecticut
Scott A. Pattison, TERC
Geeta Verma, University of Colorado Denver
Michael Dias, Kennesaw State University
John Pecore, Temple University
Smirla Ramos-Montañez, Oregon Museum of Science and Industry

STRAND 7: Pre-service Science Teacher Education
Building Knowledge through Asset-Based Pedagogy
2:40 PM – 4:10 PM
Salon A

Presider:
Julianne A. Wenner, Boise State University

A Critical Examination of the Deficit Perspective in Science Education Pre-service Teacher Knowledge Studies
Ron Gray, Northern Arizona University
David Stroupe, Michigan State University
Scott McDonald, Pennsylvania State University
Pre-service Science Teachers' Engagement with Asset-Based Pedagogies in a University Science Methods Course

Rachael M. Gordon, University of Michigan

Access Points that Facilitate Pre-service Teachers' Sense-making about Systemic Issues within a Field Experience

Victor Kásper, Florida State University
Lama Jaber, Florida State University
Shannon G. Davidson, Florida State University

Pre-service Science Teacher Education

STRAND 7: Pre-service Science Teacher Education
2:40 PM – 4:10 PM
Salon B

Pre-service Teachers' Self-Efficacy in Engineering

Jing Yang, Indiana University

Sources of Engineering Teaching Self-Efficacy in a STEAM Methods Course for Elementary Pre-service Teachers

Donna L. Webb, George Fox University
Keelan P. LoFaro, Portland State University

Pre-service Teachers' Self-Efficacy Beliefs about Scientific Practices: Validation of the Science and Engineering Self-efficacy Instrument

Fatma Kaya, Kent State University
Lisa A. Borgerding, Kent State University
Shannon Navy, Kent State University

STRAND 8: In-service Science Teacher Education
2:40 PM – 4:10 PM
Pearl

A 'Levels of Engineering Design' Rubric for Science Teachers Incorporating NGSS

Sarah B. Boesdorfer, Illinois State University

Characterizing Multi-Dimensional, Teacher-Designed, Science Assessments: Dimensions, Integration, and Cognitive Demand

Laura Zeller, University of Illinois at Chicago
Donald J. Wink, University of Illinois at Chicago

Impact of Scoring the Illinois Science Assessment on K-12 Science Teachers' Practices

Senetta F Bancroft, Southern Illinois University Carbondale
Harvey Henson, Southern Illinois University
Daniel L. Brown, Illinois State Board of Education
Angela D. Box, Southern Illinois University-Carbondale
Yanyan Sheng, Southern Illinois University-Carbondale
Jennifer Rhodes, Southern Illinois University-Carbondale

Effects of Informal versus School-Based Field Experience on Elementary Pre-service Teachers' Self-Efficacy for Teaching Science

Nicole Hesson, York College of Pennsylvania
Jason Forsyth, James Madison University
Interpreting Teacher Understanding of 5D Science: A Vision Survey

Kerri Wingert, University of Colorado at Boulder
Melissa R. Campanella, CU Boulder
William R. Penuel, University of Colorado
Kris Kilibarda, Iowa Department of Education

STRAND 10: Curriculum, Evaluation, and Assessment

Automated Assessment of Argumentation in School Science: Developments and Challenges
2:40 PM – 4:10 PM
Columbia

Selected Response Item Formats: Addressing the Practice of Arguing from Evidence in Science

Linda Morell, University of California, Berkeley
Sara J. Dozier, Stanford University
Weeraphat Suksiri, University of California, Berkeley
Jonathan Francis Osborne, Stanford Graduate School of Education
Mark R. Wilson, University of California, Berkeley

Using Automated Analysis to Assess Middle School Students’ Competence with Scientific Argumentation

Christopher Wilson, BSCS
Molly Stuhlsatz, BSCS
Brian M. Donovan, BSCS
Zoe E. Buck Bracey, BSCS
April L. Gardner, Biological Science Curriculum Study


Hee-Sun Lee, The Concord Consortium
Gey-Hong Gweon, Physics Front
Amy R. Pallant, The Concord Consortium

Exploring Bias in Automated Scoring of Student Argumentation

Zoe E. Buck Bracey, BSCS
Molly Stuhlsatz, BSCS
Tina Cheuk, Stanford University
Marisol Mercado
Christopher Wilson, BSCS
Jonathan Francis Osborne, Stanford Graduate School of Education
Kevin C. Haudek, Michigan State University
Brian M. Donovan, BSCS
April L. Gardner, Biological Science Curriculum Study

STRAND 10: Curriculum, Evaluation, and Assessment

Teachers’ Understanding and Use of Science Curriculum and Assessment
2:40 PM – 4:10 PM
Salon I

Presider:
Lisa M. McDonald, Columbia University

“We Get to See What Works”: Teacher Commitment to Curriculum within a Research Practice Partnership

Jayma Koval, Georgia Institute of Technology
Jessica Gale, Georgia Institute of Technology –CEISMC
Meltem Alemdar, Georgia Institute of Technology
Sabrina Grossman, Georgia Institute of Technology-CEISMC
Marion Usselman, Georgia Institute of Technology

How Teachers Understand the Curriculum and Frameworks They Use
Kristin N. VanWyngaarden, University of Nebraska Omaha
Michelle Friend, University of Nebraska at Omaha

Teacher Decision-Making in High School Biology Curriculum Co-Design: A Critical Incidents Analysis
Elizabeth Chatham, New Visions for Public Schools
Kiran D. Purohit, New Visions for Public Schools

Using Hybrid Online/Face-to-Face Courses to Support Teachers’ Development and Use of 3D Performance Assessments
Jill Wertheim, Stanford Center for Assessment, Learning, and Equity

STRAND 11: Cultural, Social, and Gender Issues
Creating Space for the Inclusion of Social Justice within Engineering Learning Environments
2:40 PM – 4:10 PM
Salon G

Design Problems in Context: A Longitudinal Examination of Students’ Design Considerations in a Course about Engineering Culture, Diversity, and Equity
Greses Pérez, Stanford University
Shannon Gilmartin, Stanford University
Carol Muller, Stanford University
Patrick Danner, Stanford University
Sherri 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, Stanford University

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

Using Hybrid Online/Face-to-Face Courses to Support Teachers’ Development and Use of 3D Performance Assessments
Jill Wertheim, Stanford Center for Assessment, Learning, and Equity

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

STRAND 11: Cultural, Social, and Gender Issues
Exploring the Experiences and STEM Identity Development of Black Students and Teachers
2:40 PM – 4:10 PM
Salon H

Presider:
Reanna S. Roby, Michigan State University

A Narrative Inquiry into the Making of an Urban Science Teacher: Felicia’s Story
Lisa Marco-Bujosa, Villanova University
Examining Factors Influencing African American Students' Scientific Identity in STEM

Lezly Taylor, Virginia Polytechnic Institute and State University
Brenda R. Brand, Virginia Tech University
Takumi Sato, Virginia Polytechnic Institute & State University
Anza Mitchell, Virginia Tech University

Exploring Discursive Performance of Race in Advanced Placement Biology Classrooms

Deborah J. Tippins, University of Georgia
Sophia (Sun Kyung) Jeong, University of Georgia

Identity Formation in Science During Adolescence: How do Future Possible Selves Take Shape For Diverse Students of Color?

Ross Anderson, Inflexion
Ed Madison, University of Oregon
Niki Derosia, University of Oregon

Impacts of Sequential Experience with Agent-Based Modeling and System Dynamics Modeling on Students' Ability to Link Across Levels in Reasoning about Complex Phenomena

Jie Chao, The Concord Consortium
Carolyn Staudt, The Concord Consortium
Daniel Wendel, Massachusetts Institute of Technology

Much.Matter.in.Motion: 7th Grade Students Learn Chemistry through Constructing Computational Models of Complex Systems

Janan Saba, University of Haifa
Sharona T. Levy, University of Haifa
Elon Langbeheim, The Weizmann Institute of Science
Hagit Hel-Or, University of Haifa

STRAND 12: EDUCATIONAL TECHNOLOGY

Technology Tools to Support Scientific Thinking

2:40 PM – 4:10 PM
Portland

Presider:
Kit Martin, Northwestern University

Blending Drama and Computer Supported Collaborative Learning for Socioscientific Argumentation

Aysegul Oguz Namdar, Recep Tayyip Erdogan University
Bahadir Namdar, Recep Tayyip Erdogan University

ENVIRONMENTAL EDUCATION

Environmental Education—Educator's Perspective

2:40 PM – 4:10 PM
Eugene

Presider:
Iris Alkaher, Kibbutzim College of Education

Framing Differences Reveal Argumentation Complexities in Education for Sustainability—The Case of Natural-Gas Distribution

Hagit Shasha Sharf, The Technion–Israel Institute of Technology
Tali Tal, Technion
How do Faculty at a Business School Conceptualize Environmental Issues and Incorporate these Issues in their Classrooms?

Hamza Malik, University of Massachusetts Dartmouth
Stephen B. Witzig, University of Massachusetts Dartmouth

Population Growth: Do Teachers Perceive It As a Problem And What Are Their Concerns About Including It In Their Teaching?

Iris Alkaher, Kibbutzim College of Education
Nurit Carmi, Tel Hai Academic College

Pre-service Secondary Teachers’ Emotional Sense-Making of Learning to Teach Climate Change

Elizabeth Hufnagel, University of Maine
Anica Miller-Rushing, University of Maine

Concurrent Session 2
4:20 PM – 5:50 PM

STRAND 1: Science Learning, Understanding and Conceptual Change
Recent Trends in Genetics Education Research
4:20 PM – 5:50 PM
Salmon

Presider:
Kostas Kampourakis, University of Geneva

Mechanistic Reasoning about Gene Environment Interactions

Michal Haskel-Ittah, Weizmann Institute of Science
Ravit Golan Duncan, Rutgers University
Anat Yarden, Weizmann Institute of Science

STRAND 2: Science Learning: Contexts, Characteristics and Interactions
Improving Guidance for Classroom Argumentation in Science Inquiry
4:20 PM – 5:50 PM
Mt Hood

Discussant:
Marcia Linn, University of California, Berkeley
Changes in Classroom Argumentation Practices in Elementary Science during Teachers’ Participation in a Year-long Professional Development Program

Coralie F. Delhaye, Stanford University
Matthew Wilsey, Stanford University
Emily Reigh, Stanford
Hilda Borko, Stanford University
Jonathan Francis Osborne, Stanford Graduate School of Education

Supporting Student-Directed Discussion in Elementary Science: A Case Study of One Teacher's Instructional Change

Emily Reigh, Stanford
Florencia Gomez Zaccarelli, Facultad de Educación, Pontificia Universidad Católica de Chile
Hilda Borko, Stanford University
Jonathan Francis Osborne, Stanford Graduate School of Education

Learning to Revise: Using Annotation to Model Integrated Revision of Explanations

Libby Gerard, University of California, Berkeley, Graduate School of Education
Marcia C. Linn, University of California, Berkeley

Impact of Autoscored Student Data Reports on Teacher Customizations and Students' Science Learning

Jennifer King-Chen

Supporting Teachers to Customize Science Curriculum for Self-directed Learning Impacts Both Teacher and Student Learning

Allison Bradford, University of California, Berkeley
Libby Gerard, University of California, Berkeley, Graduate School of Education

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions
Interest, Identity, & Empathy
4:20 PM – 5:50 PM
Hawthorne/Belmont/Laurelhurst

Presider:
Ying-Ting Chiu, The Ohio State University

Using Argument-Based Inquiry to Teach Nutrition in Animals—Impact on Students' Achievement and Interest

Festus Osasumwen Idiaghe, University of Benin
Christiana Nkechi Omoifo, University of Benin

The Role of Children's Racial Identity and its Impact on Their Science Education

Lisa M. McDonald, Teachers College, Columbia University
Felicia Moore Mensah, Teachers College, Columbia University

Everyday Engineers: An Analysis of Youth's Everyday Engineering Practices and Identities Across Settings

Veronica McGowan, University of Washington
Philip L. Bell, University of Washington

Development of the Scientific Empathy Index

Heesun Yang, University of British Columbia
Seong-Joo Kang, Korea National University of Education
David Anderson, University of British Columbia
**STRAND 2:**
Science Learning: Contexts, Characteristics and Interactions

**Socioscientific Reasoning, Decision-Making, & Discourse**

4:20 PM – 5:50 PM
Meadow Lark/Douglas Fir – 3rd Floor

Presider: Jean-Philippe Ayotte-Beaudet, Université De Sherbrooke

Multimodal Coherence-Seeking in Global Socioscientific Issues-Based Discourse

Mary E. Short, The George Washington University

'I Wouldn't Want to be the Animal nor the Patient'—Students’ Decision-Making on Animal Testing

Carola Garrecht, IPN–Leibniz Institute for Science and Mathematics Education
Ute Harms, IPN–Leibniz Institute for Science and Mathematics Education

Students’ Context-Specific Epistemic Justifications, Prior Knowledge, Engagement and Socioscientific Reasoning in a Mobile Augmented Reality Learning Environment

Hsin-Yi Chang, National Taiwan Normal University
Jyh-Chong Liang, National Taiwan Normal University
Chin-Chung Tsai, National Taiwan Normal University

The Effects of Critique-driven Inquiry (CDI) Teaching on Elementary and Secondary School Students’ Tendency of Critical Thinking and Scientific Competency

Ying-Yan Lu, National Sun Yat-Sen University
Zuway-R Hong, National Sun Yat-sen University/Australian Catholic University

Huann-Shyang Lin, National Sun Yat-Sen University/Australian Catholic University
Hsin-Hui Wang, Australian Catholic University
Hsiang-Ting Chen, National Sun Yat-sen University
Kuay-Keng Yang, National Pingtung University
Yi-Ting Pan, National Sun Yat-sen University

**STRAND 3:**
Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies

Supporting Elementary & Early Childhood STEM Learning

4:20 PM – 5:50 PM
Medford

Presider: Justin McFadden, University of Louisville

Promoting Elementary Students STEM Learning by Employing Engineering Design Process in the Inquiry-Based Science Activity

Kuay-Keng Yang, National Pingtung University
Zuway-R Hong, National Sun Yat-Sen University
Huann-Shyang Lin, National Sun Yat-Sen University

Prospective Elementary Teachers Plan STEAM Lessons Focused on Science & Engineering

Jaclyn K. Murray, Augusta University
Teacher Scaffolding to Support Student Learning in an NGSS-Aligned Unit Integrating Science and Engineering
Sarah Lilly, University of Virginia
Sarah J. Fick, University of Virginia
Anne McAlister, The University of Virginia
Jennifer Chiu, University of Virginia
Kevin W. McElhaney, SRI International

Teaching STEM Concepts in Elementary School with Biomechanics
Michelle Friend, University of Nebraska at Omaha
Anne Karabon, University of Nebraska at Omaha
Amelia Lanier Knarr, University of Nebraska at Omaha
Kota Takahashi, University of Nebraska at Omaha
Neal Grandgenett, University of Nebraska at Omaha

STRAND 4: Science Teaching—Middle and High School (Grades 5-12):
Characteristics and Strategies
Teacher Knowledge and Implementation
4:20 PM – 5:50 PM
Salon D

Presider:
Lucia Chacon-Diaz, The Ohio State University

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

Science Teachers’ Integration of Knowledges and Skills in Enacted Pedagogical Content Knowledge in their Teaching
Imran Tufail, University of Waikato
Chris Eames, University of Waikato
Cathy Bunting, University of Waikato
Maurice M. W. Cheng, University of Waikato

The Development of an Instrument to Measure Teachers’ Perceptions of STEM Practices
Anthony Sparks, Southern Methodist University
Elizabeth L. Adams, Southern Methodist University
Lindsey Perry, Southern Methodist University
Leanne R. Ketterlin-Geller, Southern Methodist University

STRAND 5: College Science Teaching and Learning (Grades 13-20)
Postsecondary Educators’ Perceptions, Planning, and Practices
4:20 PM – 5:50 PM
Salon C

Presider:
Joshua Reid, Middle Tennessee State University

Classroom Discourse Patterns of Biology Instructors in Undergraduate STEM Classrooms
Petra Kranzfelder, University of California, Merced
Jennifer L. Bankers-Fulbright, Augsburg University
Marcos E. Garcia-Ojeda, University of California, Merced
Marin Melloy, University of Minnesota
Sagal Mohammed, University of Minnesota
Abdirizak M. Warfa, University of Minnesota
Investigating the Conceptualization and Implementation of Quantitative Reasoning (QR) Skills in Introductory Undergraduate Biology Courses

Ann Cleveland, Maine Maritime Academy
Asli Sezen-Barrie, University of Maine
Gili Marbach-Ad, University of Maryland

Pre-service Early Childhood Teachers’ Difficulties in Planning and Implementing STEM-based Lessons

Mustafa S. Topcu, Yildiz Technical University
Ayse Ciftci, Mus Alparslan University

The Effects of Flipping STEM Classrooms on Instructional Practices

Robert Idsardi, Eastern Washington University
Ivy Tietsort, Eastern Washington University
Jennifer Mancinelli, Eastern Washington University

STRAND 6: Science Learning in Informal Contexts
Educating Informal Science Educators
4:20 PM – 5:50 PM
Salon E & F

Presider:
Brenda L. Carpenter, Lower Columbia College

Analyzing Contradictions in Project-Based Learning Internships from the Cultural—Historical Activity Theory Perspective

Pei-Ling Hsu, University of Texas at El Paso

How does a STEM Outreach Event Impact Scientists’ Communication Objectives?

Stephanie D. Teeter, NC State University
Jacqueline H. Cole, NC State University

iPCK: Developing a Framework for Pedagogical Content Knowledge for Informal Science Educators

K. C. Busch, North Carolina State University
Mwenda Kudumu, NC State University
Soonhye Park, North Carolina State University

Teacher Learning through Participation in an Outreach Program to Link Field Trips with Classroom Curriculum

Alexandria Muller, University of California at Santa Barbara
Victor Corona, University of California at Santa Barbara
Ron Skinner, MOXI, The Wolf Museum of Exploration + Innovation
Tarah Connolly, MOXI, The Wolf Museum of Exploration + Innovation
Danielle Boyd Harlow, University of California at Santa Barbara

STRAND 7: Pre-service Science Teacher Education
Accessing Funds of Knowledge to Enhance Instruction
4:20 PM – 5:50 PM
Salon A

Presider:
Sibel Erduran, University of Oxford

Pre-service Science Teachers’ Understanding of Instruction for Diverse Learners: A Focus on Funds of Knowledge

Stacey L. Carpenter, University of California, Santa Barbara
Erik Arevalo, University of California, Santa Barbara
Meghan Macias, University of California, Santa Barbara
Alexandria K. Hansen, Fresno State University
Leslie Bushong, University of California, Riverside
Susann Pinter, University of California, Davis
Elisa M. Stone, University of California, Berkeley
Julie A. Bianchini, University of California, Santa Barbara

Funds of Knowledge in Making: Re-envisioning Maker Education in STEM Teacher Preparation

Myunghwan Shin, California State University, Fresno
Jane J. Lee, Michigan State University

Attention to Students’ Cultural Funds of Knowledge within Pre-service Teachers’ Lesson Plans

Kirby Whittington, Florida State University
Miray Tekkumru Kisa, Florida State University
Sherry A. Southerland, Florida State University

STRAND 7:
Pre-service Science Teacher Education

Pre-service Teachers’ Identities and Beliefs
4:20 PM – 5:50 PM
Salon B

Presider:
Ryan Coker, Florida State University

“More than I thought I would”—Effect of an NGSS-aligned Biology Content Course on Pre-service Elementary Teachers’ Self-Efficacy and Related Self-Perceptions

Darcy M. Ronan, Sacred Heart University

Pre-service Elementary Teachers’ Science Teacher Science Teaching Beliefs: Influence of Science Learning and Teaching Experiences

Saiqa Azam, Memorial University of Newfoundland
Deepika Menon, Towson University

Exploring How Early Classroom Teaching Experiences Help Develop a Teacher Identity in Undergraduate Science Students

Megan Beckham, University of Nevada, Reno
Mandi Collins, University of Nevada, Reno
Elizabeth X. De Los Santos, University of Nevada, Reno

Pre-service Elementary Teachers’ Identity Development in Learning to Teach Science: A Multi-site Case Study

Deepika Menon, Towson University
Saiqa Azam, Memorial University of Newfoundland

STRAND 8:
In-service Science Teacher Education

Engineering Practices to Support NGSS
4:20 PM – 5:50 PM
Pearl

Presider:
Nidaa Makki, The University of Akron

A Mixed Methods Study of the Impact of Engineering PD on Teachers’ Motivation & Practices

Nidaa Makki, The University of Akron
Kristin L. Koskey, The University of Akron
Wondimu Ahmed, The University of Akron
Tania Jarosewich, Donald P. Visco, The University of Akron
Nicholas Garafolo, The University of Akron
Fourth Grade Feelings—Elementary Teachers’ Affective Experiences in Authentic Engineering Tasks
Merredith D. Portsmore, Tufts University
Jessica Watkins, Vanderbilt University
Rebecca D. Swanson, Tufts University

NGSS Teacher Professional Development to Implement Engineering Practices in Science Instruction
Kimberly B. Christian, Stony Brook
University Smithtown High School East
Angela M. Kelly, Stony Brook University
Monica F. Bugallo, Stony Brook University

STRAND 8: In-service Science Teacher Education
Professional Development to Support Curriculum Design
4:20 PM – 5:50 PM
Columbia
Presider:
Gayle Nelson Evans, University of Florida

Storytelling for Collaborative STEM Curriculum Development: Negotiating Discourses of Play and Learning
Charlene L. Ellingson, Mankato State
Sue Staats, University of Minnesota
Gillian H. Roehrig, University of Minnesota

Supporting Teachers’ Vision of Science Instruction through Professional Development for Reform-Based Curriculum Materials
Katherine L. McNeill, Boston College
Renee Affolter, University of Massachusetts, Amherst
Benjamin R. Lowell, Boston College
Casandra Gonzalez, Boston College
Kevin Cherbow, Boston College

PD for Middle School Science Teachers for Integration of 3D Learning using NASA Education Resources
SoonChun Lee, Wichita State University
Daniel Bergman, Wichita State University
Greg Novacek, Wichita State University
Cathy Durano, Wichita State University

STRAND 10: Curriculum, Evaluation, and Assessment
Novel Approaches to Science Assessment
4:20 PM – 5:50 PM
Salon I
Presider:
Xiaoming Zhai, Michigan State University

A Framework to Conceptualize Machine Learning-based Science Assessments
Xiaoming Zhai, Michigan State University
Kevin C. Haudek, Michigan State University
Lehong Shi, East Lansing
Ross H. Nehm, Stony Brook University, SUNY
Mark Urban-Lurain, Michigan State University

Accessible NGSS Assessment: Technology-Based Innovative Methodologies for Multidimensional Teaching and Learning
Heather K. Harkins
Laura J. Wright
Rebecca Kopriva
Linda Malkin
Blake Myers
Ellyssa Eiring, University of Wisconsin, Madison
Designing Crosscutting Concepts Assessments to Support NGSS Teaching and Learning
Lei Liu, Educational Testing Service
Dante Cisterna, Educational Testing Service
Cindy E. Hmelo-Silver, Center for Research on Learning & Technology
Abeera Rehmat
Karyn Housh, Indiana University
Shu-Kang Chen, ETS
Peter van Rijn
Aurora Edith Graf, Educational Testing Service

Gary Weiser, WestEd
Brian D. Gane, University of Illinois at Chicago
Christopher J. Harris, WestEd
James Pellegrino
Sania Z. Zaidi, University of Illinois at Chicago

STRAND 11: Cultural, Social, and Gender Issues
Establishment and Maintenance of Black STEM Community Institutions
4:20 PM – 5:50 PM
Salon H

Establishing a Black STEM Expert Community during the 20th Century
Charnell Long, University of Wisconsin, Madison

Exploring STEM Afro-Futurites through the Narratives of HBCU Educated Black Women Scientists
Reanna S. Roby, Michigan State University

And Her Name is Me: Insight Behind the Meaning of Being a Black Woman in Undergraduate STEM Education
Terrell R. Morton, University of Missouri, Columbia

Creating a Culturally Relevant Digital Sphere for Black and Brown Youth
Justin Shaifer, Columbia University

STRAND 11: Cultural, Social, and Gender Issues
Renegotiating Multiculturalism & Multilingualism in Science Education
4:20 PM – 5:50 PM
Salon G

Presider:
Bhaskar Upadhyay, University of Minnesota

Addressing Cultural Validity in Science Assessments for English Learners: A Guiding Framework
Preetha K. Menon, Stanford University

An Apprenticeship Model for Culturally Responsive STEM Research in Pacific Island Cultures
Tobias Irish, University of Hawaii at Hilo
Joseph Genz, University of Hawaii at Hilo
Cheryl Sangueza, University of Guam
Marata Tamaira, University of Hawaii at Hilo
Dwayne Anefal, University of Hawaii at Hilo
Yubee Isaac, University of Hawaii at Hilo

An Asset-Based Introduction to Multilingualism: Effects on Student Attitudes and Beliefs about Science
Catherine Lemmi, California State University, Chico
Formative Interventions for Expansive Teacher Learning in Multilingual Science Education: Change Laboratories for Practice Transformation

Sara Salloum, University of Balamand
Saouma B. Boujaoude, American University of Beirut
May Antoun, University of Balamand

Undergraduates’ Grounded Critique of Knowledge Claims in Socioscientific Decision Making

Won Jung Kim, Michigan State University
Alicia C. Alonzo, Michigan State University

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

Learning of NOS

4:20 PM – 5:50 PM
Portland

Presider: Isha DeCoito, Western University

International Collaborative Investigation of Third Grade Students’ Understandings of Scientific Inquiry

Judith S. Lederman, Illinois Institute of Technology
Norman G. Lederman, Illinois Institute of Technology
Selina L. Bartels, Valparaiso University
Juan Jimenez, Illinois Institute of Technology

Talk is Cheap: Could Changing our Metaphors of Teaching and Learning Actually Help Enhance our Teaching?

Glenn Dolphin, University of Calgary

STRAND 14: Environmental Education

Environmental Education—Learner’s Perspective

4:20 PM – 5:50 PM
Eugene

Presider: Alexandra T. Gillis, Brooklyn College

Developing Socioscientific Perspective Taking

Mark H. Newton, East Carolina University
Dana L. Zeidler, University of South Florida

Environmental Education as a Chance to Foster the Motivation Towards Learning Science?

Mona L. Schönfelder, University of Bayreuth
Franz X. Bogner, University of Bayreuth

Student Agency and Climate Science: Legitimacy, Saliency, and Credibility in Place Based Education

Alexandra T. Gillis, Brooklyn College
Jennifer Adams, University of Calgary
Brett Branco, Brooklyn College

Synergizing Science Communities in Project X: Curriculum X for Public Health Citizenship

Katherine R. Bruna, Iowa State University
Lyric Bartholomay, University of Wisconsin, Madison
Mentor/Mentee Nexus
6:00 PM – 7:00 PM
Mt. Hood

Research Interest Group (RIG) Meetings
6:00 PM – 7:00 PM

- *Continental and Diasporic Africa in Science Education (CADASE) RIG*
  - Salon I – Lower Level
- *Contemporary Methods for Science Education Research RIG*
  - Salon H – Lower Level

Award Ceremony & Presidential Reception
7:00 PM – 9:30 PM
Salon E & F – Lower Level/Ballroom Foyer

*Light appetizers will be served. Cash bar.*
Mind and Sole  
6:00 AM – 7:15 AM  
Off-site  
This event is not sponsored or endorsed by NARST

Conference Registration  
8:00 AM – 4:30 PM  
Ballroom Foyer – Lower Level

Concurrent Session 3  
8:30 AM – 10:00 AM

External Policy And Relations Committee

Admin Symposium-Research Practice Partnerships: Collaborations toward Equitable STEM Education Research, Reform, and Implementation  
8:30 AM – 10:00 AM  
Mt Hood

Research Practice Partnerships: Collaborations toward Equitable STEM Education Research, Reform, and Implementation  
Stefanie Marshall, University of Minnesota  
Deb Morrison, University of Washington  
Philip L. Bell, University of Washington  
André E DeLeón, Nevada Department of Education  
Jamie Rumage, Oregon Department of Education

STRAND 1:  
Science Learning: Development of Student Understanding  
Admin Symposium-Developing Science Literacy and the Potential for Conceptual Change  
8:30 AM – 10:00 AM  
Salmon

Developing Science Literacy and the Potential for Conceptual Change  
Keri-Anne Croce, Towson University  
Marcia J. Watson-Vandiver, Towson University  
Huili Hong, Towson University  
Renee Rice-Moran, East Tennessee State University  
Bridget T. Miller, University of South Carolina  
Christie Martin, University of South Carolina  
Richard Lamb, East Carolina University  
Etopio Etopio, University of Buffalo  
Jonah B. Firestone, Washington State University Tri-Cities  
Calvin S. Kalman, Concordia University

STRAND 1:  
Science Learning: Development of Student Understanding  
Supporting Understanding with Mathematics and Computational Thinking  
8:30 AM – 10:00 AM  
Columbia

Presider: Kathryn Green, University of Georgia

Effective Algebraic Problem-Solving in Physics Through Activation of Prior-Mathematical Knowledge  
Süleyman Tursucu, Radboud University Nijmegen  
Erik Barendsen, Radboud University & Open University
Intertwining Three Dimensions: Levels of Performance for Computational Thinking While Using Models of Hydrologic Systems

Kristin L. Gunckel
Daniel L. Moreno, University of Arizona
Beth A. Covitt, University of Montana, SpectrUM Discovery Area
Bess Caplan, Cary Institute of Ecosystem Studies
Judith A. Cooper-Wagoner, University of Arizona
John C. Moore, Colorado State University
Alan R. Berkowitz, Cary Institute of Ecosystem Studies

Multiple Representations in Computational Thinking: A Study of Second Grade Students

Kristina M. Tank, Iowa State University
Tamara J. Moore, Purdue University

Seeing the Forest through the Trees using Network Analysis: Exploring Student Responses to Physics Problems

Mihwa Park, Texas Tech University

STRAND 2: Science Learning: Contexts, Characteristics and Interactions
Modeling and Model-Based Teaching
8:30 AM – 10:00 AM
Hawthorne/Belmont/Laurelhurst

Presider:
Ryan Coker, Florida State University

Modes and Transfer of Authority: Cultural Historical Activity Theory Analysis of Modeling Activities

Hyun-Jung Cha, Seoul National University
YoonJoo Shin, Seoul National University
Chan-Jong Kim, Seoul National University

Model-Based Science Teaching: Effects on Confidence, Interest, and Attitudes of Female High School Students

Grant Williams, St. Thomas University
John J. Clement, University of Massachusetts
Duy Pham, University of Massachusetts Amherst

Using the Preschool Scientific and Engineering Practices (PreSEP) Instrument to Explore Preschoolers’ Engagement with Elements of Modeling Practice

Alison R. Miller, Bowdoin College

STRAND 3: Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies
Analyses of Elementary Pre-service and Inservice Teachers’ Use of Crosscutting Concepts in Plans and Enactments
8:30 AM – 10:00 AM
Meadow Lark/Douglas Fir – 3rd Floor

Discussant:
Deborah Hanuscin, Western Washington University

Elementary Pre-service Teachers’ Use of the CCCs in Lesson Plans in Two Practice-Based Science Methods Courses

Carrie-Anne Sherwood, Southern Connecticut State University
Amanda Benedict-Chambers, Missouri State University
Deborah L. Hanuscin, Western Washington University
Investigating Elementary Pre-service Teachers' Implicit use of CCC's Overtime through Lesson Planning
Tina Vo, University of Nevada, Las Vegas
Nicole Thomas, University of Nevada, Las Vegas

Inservice Teachers' Use of Crosscutting Concepts in Planning for 3D Elementary Learning
Anna Maria Arias, Kennesaw State University
Brendan E. Callahan, Kennesaw State University
Michael Dias, Kennesaw State University
Karen Kuhel, Kennesaw State University

Reference to CCCs in Conversation Supporting an Integrated STEM Elementary Unit
Sarah J. Fick, University of Virginia
Jennifer Chiu, University of Virginia
Kevin W. McElhaney, SRI International

STRAND 4: Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies
Secondary Science Teaching in the US: Current Status, Trends over Time, and Factors Affecting Instruction
8:30 AM – 10:00 AM
Salon E

Secondary Science Teaching in the US: Current Status, Trends over Time, and Factors Affecting Instruction
Eric R. Banilower, Horizon Research, Inc.
Peggy J. Trygstad, Horizon Research, Inc.
Laura M. Craven
Patrick S. Smith, Horizon Research, Inc.

STRAND 5: College Science Teaching and Learning (Grades 13-20)
Affordances for Students' Literacy and Engagement in Postsecondary Biology
8:30 AM – 10:00 AM
Salon D

Presider:
Andy Cavagnetto, Washington State University

Case Study Pedagogy and Learning Outcomes: A Framework for Teaching Biology with Narratives
Ally Hunter, University of Massachusetts, Amherst
Melissa Zwick, Stockton University

Developing Learning Progression for Botanical Literacy and Measuring Learning Gains: Construct Modeling Approach
Pongprapan Pongsophon, Kasetsart University, Bangkok, Thailand
Artitaya Jituafua, Suratthani Rajabhat University, Suratthani, Thailand

Exploring Approaches to Engaging Undergraduates in Research: Differential Impacts on Students' Self-efficacy and Science Skills
Kelly M. Schmid, Syracuse University
Jason R. Wiles, Syracuse University

Exploring Peer Learning Assistants' Impact on Student Performance and Perceptions in an Undergraduate Biology Course
Brittney A Ferrari, University of Georgia
Jonathan Dees, University of Georgia
Norris Armstrong, University of Georgia
Kristen Miller, University of Georgia
Julie M. Kittleson, University of Georgia
STRAND 5:  
**College Science Teaching and Learning (Grades 13-20)**  
*Investigating Faculty Change*  
8:30 AM – 10:00 AM  
Salon C

**Presider:**  
Jana L. Bouwma-Gearhart, Oregon State University

**A Close Look at Change: Understanding Factors that Shape Instructor Evolution during Instructional Reform Efforts**  
Katelyn Southard, University of Arizona  
Jonathan Cox, University of Arizona  
Young Ae Kim, University of Arizona  
Jazmin Jurkiewicz, University of Arizona  
Lisa Elfring, University of Arizona  
Paul Blowers, University of Arizona  
Vicente A. Talanquer, University of Arizona

**Are Faculty Changing? Sampling Effects on Measures of Instructor Adoption of Evidence-based Teaching Practices**  
Justin A. Goodridge, Stony Brook University  
Lucy H. Gordon, Stony Brook University  
Ross H. Nehm, Stony Brook University, SUNY  
Gena C. Sbeglia, Stony Brook University

**Re-thinking Notions of Change and Learning as Ontological Work in College Instructors’ Professional Development**  
Sophia (Sun Kyung) Jeong, University of Georgia  
Paula Lemons, University of Georgia

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STRAND 6:  
**Science Learning in Informal Contexts**  
*Family Engagement in Informal Science Experiences*  
8:30 AM – 10:00 AM  
Salon F

**Presider:**  
Scott A. Pattison, TERC

**"I have a Gut Feeling about this" Adult Engagement with SSI in Daily Life**  
Keren E. Dalyot, Technion Israel Institute of Technology  
Ayelet Baram-Tsabari, Technion–Israel Institute of Technology

**Building the Cultural Wealth of Parents to Support Science Career Aspirations of Youth**  
Megan Ennes, University of Florida  
M. Gail Jones, North Carolina State University  
Emily M. Cayton, Campbell University  
Katherine Chesnutt, North Carolina State University  
Pamela Huff, North Carolina State University

**Family Matters: A Mixed-Methods Study of Everyday Science Talk and STEM Identity Development**  
Remy Dou, Florida International University  
Heidi Cian, Florida International University

**Using Question Prompts to Support Families’ Embodied Sensemaking and Reasoning in a Water Quality Workshop**  
Lucy R. McClain, Pennsylvania State University  
Yu-Chen Chiu, Pennsylvania State University  
Heather Toomey Zimmerman, Pennsylvania State University
STRAND 7: Pre-service Science Teacher Education

Context-Dependent Approaches to Partnering with Mentor Teachers: Supporting Novice Teachers Ambitious Science Teaching

8:30 AM – 10:00 AM
Salon A

Discussant: Matthew Kloser, University of Notre Dame
Presider: Todd Campbell, University of Connecticut

Context-Dependent Approaches to Partnering with Mentor Teachers: Supporting Novice Teachers Ambitious Science Teaching

Todd Campbell, University of Connecticut
Jessica J. Thompson, University of Washington
David Stroupe, Michigan State University
Mark Windschitl, University of Washington
Scott McDonald, Pennsylvania State University
April Lynn Luehmann, University of Rochester
Lisa Lundgren, University of Connecticut
J. Brian Hancock, Alma College
Sara Hagenah, Boise State University
Matthew Kloser, University of Notre Dame

What Matters? Influence of Quality and Quantity of Learning Opportunities in Pre-service Physics Teacher Education

Dustin Schiering, Leibniz Institute for Science and Mathematics Education (IPN Kiel)
Stefan Sorge, Leibniz Institute for Science and Mathematics Education (IPN Kiel)
Knut Neumann, Leibniz Institute for Science and Mathematics Education (IPN Kiel)

Engaging in the Science Practices: Pre-service Elementary Teachers’ Experiences and Lesson-Planning in a Physics Course

Adam Bennion, University of Michigan
Elizabeth A. Davis, University of Michigan

Creating Coherent Connections to Support STEM: Utilizing Design in a Teacher Education Program

Ibrahim Delen, Usak University
Consuelo J. Morales, Michigan State University CREATE for STEM Institute
Joseph S. Krajcik, Michigan State University

Choosing to Teach Physics: Faculty and Student Perspectives

Lauren Madden, The College of New Jersey
Susan C. Eriksson, Virginia Tech
Nathan Magee, The College of New Jersey, Physics Department
AJ Richards, The College of New Jersey
Marissa E. Bellino, The College of New Jersey
Desaree Vaughan, The College of New Jersey

STRAND 7: Pre-service Science Teacher Education

Retaining Pre-service Physics Teachers

8:30 AM – 10:00 AM
Salon B

Presider: Angela Fitzgerald, University of Southern Queensland
**STRAND 8:**
*In-service Science Teacher Education*

*Context in Professional Development*

*8:30 AM – 10:00 AM*

*Pearl*

*Presider:*

*Casandra Gonzalez*, Boston College

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*Bring Your Own Context: Personalization of High-School Science Teachers’ Professional Development*

*Ron Blonder*, The Weizmann Institute of Science

*Bat-Shahar Dorfman*, Weizmann Institute of Science

*Bronwyn Terrill*, Garvan Institute of Medical Research

*Kate Patterson*, Garvan Institute of Medical Research

*Anat Yarden*, Weizmann Institute of Science

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*Examining Elementary Teachers’ Pedagogical Perspectives and Agency to Teach Science Through School-Based Science Professional Development*

*Jessica Lee Chen*, Teachers College, Columbia University

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*The Complexity of Responsiveness: How Professional Development Providers Shape their work with Elementary Science Teachers*

*Patricia S. Bills*, Oakland University

*Madhura Kulkarni*, Center for Interective Natural Science & Mathematics, Northern Kentucky University

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*What Kind of Active Learning? Examining Intersections of Learner Positioning and Engagement in Professional Development*

*Patrick J. Enderle*, Georgia State University

*Jennifer Schellinger*, Florida State University

*Claudia Hagan*, Georgia State University

*Ozlem Akcil Okan*, Florida State University

*Ellen M. Granger*, Florida State University

*Todd Bevis*, Florida State University

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

*Critical Views of Science Education Research in Linguistically and Culturally Diverse Contexts*

*8:30 AM – 10:00 AM*

*Salon I*

*Discussant:*

*Maria Varelas*, University of Illinois at Chicago

*Presider:*

*Sara E. Wilmes*, University of Luxembourg

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*Critical Views of Science Education Research in Linguistically and Culturally Diverse Contexts*

*Helen Douglass*, University of Tulsa

*Semiha Gun-Yildiz*, University of Massachusetts, Dartmouth

*Minjung Ryu*, Purdue University

*Sara Salloum*, University of Balamand

*Christina Siry*, University of Luxembourg

*Mavreen Rose S. Tuvilla*, Purdue University

*Geeta Veerma*, University of Colorado Denver

*Sara E. Wilmes*, University of Luxembourg

*Casey E Wright*, Purdue University

*Maria Varelas*, University of Illinois at Chicago
STRAND 11:
Cultural, Social, and Gender Issues
Exploring Science Identities through the Lenses of Possible Selves
8:30 AM – 10:00 AM
Salon H

“Now I Actually Enjoy Teaching Science!” Exploring the Emerging Science Identity of a Veteran Elementary Teacher
Terrance Burgess, Syracuse University

What Makes Science Careers Possible for Undergraduate Science Majors? Understanding the Roles of Science Capital and Science Outreach
Allison J. Gonsalves, McGill University
Hailey Iacono, McGill University
Alexandre Soares Cavalcante, McGill University
Emily Sprowls, McGill University

Enacting Identities, Imagining Worlds: How Visions of Possible Selves Shape Science Teacher Planning and Persistence
Stacy Olitsky, Saint Joseph’s University

Negotiating, Resisting and Aligning Narratives about the Future: An Ethnographic Study of Higher Education Science Students’ Possible Selves
Katia Kromann, University of Copenhagen
Henriette T. Holmegaard, University of Copenhagen

STRAND 11:
Cultural, Social, and Gender Issues
Persistence & Retention Strategies for Underrepresented Populations in STEM
8:30 AM – 10:00 AM
Salon G

Presider:
Gillian U. Bayne, Lehman College of CUNY

New Majority Students’ Challenges in STEM Education and their Coping Strategies to Thrive
Mojtaba Khajeloo, University of Missouri, Columbia
Joinee Taylor, University of Missouri, Columbia
Terrell R. Morton, University of Missouri, Columbia
Marcelle Siegel, University of Missouri, Columbia
Johannes Schul, University of Missouri, Columbia
Charles Nilon, University of Missouri, Columbia

The Effect of Peer Mentoring and Achievement Goals on Persistence for Female Undergraduate STEM Majors
Jennifer Gatz, Stony Brook University
Angela M. Kelly, Stony Brook University
Monica Bugallo, Stony Brook University

The Role of Resilience in the STEM Identities of Post-Secondary Students: A Qualitative Metasynthesis
Karen Benn Marshall, Oakwood University
Sylvia M. James, National Science Foundation
Two-Year STEM Pathways and Transitions across Minority Serving Destinations
Felisha Herrera, San Diego State University
Victoria Rodriguez-Operana, San Diego State University
Marlena Wolfgramm, Claremont Graduate University/San Diego State University

STRAND 13: History, Philosophy, Sociology, and Nature of Science
Nature of Scientific Practices
8:30 AM – 10:00 AM
Portland
Presider: Sibel Erduran, University of Oxford

Establishing a Framework for the Culture of Scientific Research and Application to Course-based Undergraduate Research
Jessica Dewey, University of Minnesota
Anita Schuchardt, University of Minnesota

Nature of Science and The Nature of The Scientist—Socialization in Scientific Communities
Ashwin Krishnan Mohan, Pennsylvania State University
Gregory J. Kelly, Pennsylvania State University

The Nature of Scientific Explanation (NOSE): A Philosophically-Guided Framework Examining the Nature and Quality of Scientific Explanations
Sahar Alameh, University of Illinois at Urbana, Champaign
Fouad Abd-El-Khalick, University of North Carolina at Chapel Hill
David E. Brown, University of Illinois

STRAND 14: Environmental Education
Place-Based and Community-Based Education
8:30 AM – 10:00 AM
Eugene
Presider:
Scott Byrd, Maine Mathematics and Science Alliance

Added Value of Contextualizing Learning about Living Organisms in Schools' Immediate Surroundings
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 - Cascades
Fatima Bousadra, Université de Sherbrooke
Marie-Claude Beaudry, Université de Sherbrooke
Kassandra L’Heureux, Université de Sherbrooke
Estelle Desjarlais, Université du Québec à Montréal
Sophie Perron, Université de Sherbrooke

Co-Constructing a Trans-Systemic Place-Based Environmental Education Model
Meena M. Balgopal, Colorado State University
Deepti Bhatt, Dakshin Foundation
Karishma Modi, Dakshin Foundation
Vani Sreekanta, Dakshin Foundation
Mythreyi Kumaraswamy, Dakshin Foundation
Kartik Shanker, Dakshin Foundation
Naveen Namboothri, Dakshin Foundation
Fostering Relationships between Elementary Students and the More-than-Human World: A Nature Center/School/University Collaboration
Sarah R. Stapleton, University of Oregon
Kathryn Lynch, University of Oregon

Middle School Science Teachers’ Motivations to Implement Place-based Education Curricula about Local Wildlife
Diane Susan Wright, Colorado State University
Meena M. Balgopal, Colorado State University

Science Practice Pathways in Community-Based Environmental Education
Scott Byrd, Maine Mathematics and Science Alliance
Ruth Kermish-Allen, Maine Mathematics and Science Alliance
Alexandria Brasili, Maine Mathematics and Science Alliance

NETWORKING BREAK
10:00 AM – 10:30 AM

Concurrent Session 4
10:30 AM – 12:00 PM

Presidential Symposium
Admin Symposium-Citizen Science—An International and Integrative Look at a Scientific and Educational Method
10:30 AM – 12:00 PM
Meadow Lark/Douglas Fir – 3rd Floor

Citizen Science—an International and Integrative Look at a Scientific and Educational Method

Ayelet Baram-Tsabari, Technion–Israel Institute of Technology
Joseph L. Polman, University of Colorado, Boulder
Justin Dillon, University of Exeter
Heidi Ballard, University of California Davis
Tali Tal, Technion
Arjen E. J. Wals, Wageningen University, NL
Deborah Tippins, University of Georgia

STRAND 1: Science Learning: Development of Student Understanding
Engineering Framework
10:30 AM – 12:00 PM
Salmon
Presider: Helen Semilarski, University of Tartu

Assessing Student Learning of Core Ideas and Practices from Participating in an Integrated Engineering Framework
Lawrence Chu, The University of Texas at Austin
Victor D. Sampson, University of Texas at Austin
Todd L. Hutner, The University of Alabama
Richard H Crawford, The University of Texas at Austin
María González-Howard, University of Texas at Austin
Christina L. Baze, University of Texas at Austin
Catherine Riegle-Crumb, University of Texas at Austin
Kindergartners’ Engagement in two Epistemic Practices of Engineering: Making Trade-offs and Applying Science

Pamela S. Lottero-Perdue, Department of Physics, Astronomy & Geosciences Towson University

Ming Tomayko, Department of Mathematics Towson University

Promoting and Evaluating Conceptual Development in Early Elementary Science Using Engineering Design and Multimodal Assessment

Christine McGrail, University of Massachusetts Amherst

Eliciting Students’ Abstract and Multidisciplinary Thinking in a Design Review

Jenny P. Quintana Cifuentes, Purdue University

Senay Purzer, Purdue University

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Characterizing computational thinking in the context of technology-enhanced multilevel system modeling

10:30 AM – 12:00 PM
Mt Hood

A Framework for Computational Thinking in the Context of System Modeling

Daniel N. Damelin, The Concord Consortium

Joseph S. Krajcik, Michigan State University

Relationship between Students’ Understanding and Multi-Level System Modeling Capability through the Lens of Computational Thinking

Israel Touitou, Michigan State University

Emil Eidin, Michigan State University

Tom Bielik, Michigan State University

Namsoo Shin,

Joseph S. Krajcik, Michigan State University

Characterizing Progression of Computational Thinking Practices as Students Build and Revise Dynamic Models

Tom Bielik, Michigan State University

Emil Eidin, Michigan State University

Israel Touitou, Michigan State University

Joseph S. Krajcik, Michigan State University

Structural Aspects of Student Dynamic Models

A. Lynn Stephens, The Concord Consortium

Steve Roderick, The Concord Consortium

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Motivation & Self-Efficacy

10:30 AM – 12:00 PM
Hawthorne/Belmont/Laurelhurst

Presider:

Elizabeth Hufnagel, University of Maine

Motivational and Instructional Factors Predicting Performance in Science: A Machine Learning Approach

Wondimu Ahmed, The University of Akron

The Relationships Between Hormones and the Motivation of Adolescents to Learn Science

David L. Fortus, Weizmann Institute of Science

Ella Ofek-Geva, Weizmann Institute of Science

Michal Vinker, Samson Assuta Ashdod Hospital

Tevie Mehlman, Weizmann Institute of Science
**STAND 4: Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies**

**Critical Factors for Effective and Equitable NGSS Science Teaching Practices**

**10:30 AM – 12:00 PM**

**Salon E**

**Teachers’ Variable Subject Matter Knowledge and Inquiry-based Instruction**

- **Lyrica Lucas**, University of Nebraska, Lincoln
- **Elizabeth Hasseler**, University of Nebraska, Lincoln
- **Amy Tankersley**, University of Nebraska, Lincoln
- **Elizabeth B. Lewis**, University of Nebraska, Lincoln
- **Brandon Helding**, Boulder Learning, Inc.

**NGSS-aligned Science Lesson Exemplars**

- **Elizabeth Hasseler**, University of Nebraska, Lincoln
- **Elizabeth B. Lewis**, University of Nebraska, Lincoln

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**STAND 4: Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies**

**Socioscientific Issues in the Science Classroom**

**10:30 AM – 12:00 PM**

**Salon D**

**Presider:**

- **Heidi Cian**, Florida International University

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Alexander Brandis, Weizmann Institute of Science
Yonatan Yeshayahu, Samson Assuta Ashdod Hospital

**Self-Assessment and Underrepresentation in AP Physics 1**

- **Marta R Stoeckel**, University of Minnesota

**Tales of Learning Science in and Out of School Between Ages 9-13**

- **Ella ofek-Geva**, Weizmann Institute of Science
- **David L. Fortus**, Weizmann Institute of Science

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Lyrica Lucas, University of Nebraska, Lincoln
Amy Tankersley, University of Nebraska, Lincoln

**Connections between Teacher and Classroom Variables and Use of NGSS Scientific Practices**

- **Amy Tankersley**, University of Nebraska, Lincoln
- **Lyrica Lucas**, University of Nebraska, Lincoln
- **Elizabeth B. Lewis**, University of Nebraska–Lincoln
- **Elizabeth Hasseler**, University of Nebraska, Lincoln

Science Teachers’ Professional Development and its Effect on Inquiry-Based Instruction

- **Elizabeth B. Lewis**, University of Nebraska, Lincoln
- **Amy Tankersley**, University of Nebraska, Lincoln
- **Elizabeth Hasseler**, University of Nebraska, Lincoln
- **Lyrica Lucas**, University of Nebraska, Lincoln
- **Brandon Helding**, Boulder Learning, Inc.
Exploring Science Teachers’ Pedagogical Design Capacity for Citizenship

Ineke Henze-Rietveld, Delft University of Technology
Durdane Bayram-Jacobs, Department of Science Education, Radboud University, Nijmegen, The Netherlands
Erik Barendsen, Radboud University & Open University

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
Cory T. Forbes, University of Nebraska, Lincoln
Mark Chandler, NASA-GISS Columbia University

The Influence of Context: Comparing High School Students’ Socioscientific Reasoning by Socioscientific Topic

Heidi Cian, Florida International University

What Factors Do Secondary Students Consider when Making Decisions across Multiple Socioscientific Issue Topics

Dawnne M. LePretre, Illinois Institute of Technology
Norman G. Lederman, Illinois Institute of Technology

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

Fostering Students’ Communication and Argumentation
10:30 AM – 12:00 PM
Salon C

Presider:
Jessica Karch, University of Massachusetts Boston

Discourse Remixed: Using Interdependency to Shift Science Learning through Talk

Joshua Premo, Utah Valley University
Andy Cavagnetto, Washington State University
Larry Collins, Washington State University
William B. Davis, Washington State University
Erika Offerdahl, Washington State University

Self-efficacy in Scientific Oral Communication: Exploratory Study with Postsecondary Science Students

Caroline Cormier, Cégep André-Laurendeau
Simon Langlois, Cégep Marie-Victorin

The Effect of Argumentative Writing to Promote Nonscience Major Students’ Learning in an Chemistry Course

Claudia P. Aguirre-Mendez, Emporia State University
Ying-Chih Chen, Arizona State University
Takeshi Terada, Arizona State University

The Use of Problem Typology for the Promotion of Argumentation Among Undergraduate Engineers

Randy K. Yerrick, University at Buffalo
Andrew Olewnik, University at Buffalo
Yonghee Lee, University at Buffalo
Amanda Simmons, University at Buffalo
Brian Stuhlmiller, University at Buffalo
STRAND 6:
Science Learning in Informal Contexts
Museum participant experiences
10:30 AM – 12:00 PM
Salon F

Presider:
Katherine Carr Chapman, Vanderbilt University

A New Generation of Science Educators and Communicators: Unexpected Career Aspirations in Museum Program Participants
Kathryn Rende, North Carolina State University
Gail Jones, North Carolina State University
Emma J. Refvem, North Carolina State University
Megan Ennes, University of Florida
Pamela Huff, North Carolina State University

CoP at a Museum to Support Early Childhood Teachers’ Identities as Teachers of Science
Jenny D. Ingber, American Museum of Natural History
Jacqueline Horgan, American Museum of Natural History
Veena Vasudevan, American Museum of Natural History

Embodied Interaction in a Science Museum
Neta Shaby, Ben-Gurion University of the Negev, Israel
Dana Vedder-Weiss, Ben-Gurion University of the Negev, Israel

Impacts of Museum Tour Interpretation on Visitors’ Post-Visit Marine Conservation Behaviors and Transformative Learning
Yi Ting Pan, Institute of Education, National Sun Yat-sen University
Kuay-Keng Yang, National Pingtung University
Zuway-R Hong, National Sun Yat-Sen University
Huann-Shyang Lin, National Sun Yat-Sen University

STRAND 7:
Pre-service Science Teacher Education
Building Pre-service Teacher Capacity through Stakeholders
10:30 AM – 12:00 PM
Salon A

Presider:
Frackson Mumba, University of Virginia

The Elementary Science Partnership: An Evolving School-University Collaboration Around a Pre-service Science Methods Course
Jerome M. Shaw, University of California, Santa Cruz
Samuel Severance, University of California, Santa Cruz

Shifting Teacher Preparation for NGSS: Using a Networked Improvement Community to Promote Change Across Contexts
Michelle L. Sinapuelas, California State University, East Bay
Corinne H. Lardy, California State University, Sacramento

Using Expectation Violation Theory to Determine the Three Stakeholders’ Expectations from the Teaching Experience Course based on Clinical Supervision Model
Tugba Yuksel, Recep Tayyip Erdogan University
Banu Avsar Erumit, Recep Tayyip Erdogan University
STRAND 7:  
Pre-service Science Teacher Education  
Pre-service Teaching Practices  
10:30 AM – 12:00 PM  
Salon B  
Presider:  
Michelle Forsythe, Texas State University

Using Rehearsals with Teacher Educator Feedback to Support Pre-service Teachers’ Vision of Ambitious Science Teaching  
Amanda Benedict-Chambers, Missouri State University

Probing The Myth: Are Cognitive Abilities And Modeling Processes Really Related?  
Maximilian Göhner, Freie Universität Berlin  
Moritz Krell, Freie Universität Berlin

An Investigation of Pre-service Elementary Teachers Reaction to Integrating Computational Thinking in Their Teaching  
Diane Jass Ketelhut, University of Maryland  
Randy McGinnis, University of Maryland  
Kelly M. Mills, University of Maryland  
Merijke Coenraad, University of Maryland  
Lautaro Cabrera, University of Maryland, College Park  
Heather Killen, University of Maryland College Park

Impact of a Phenomenon-Based Science Workshop on Prospective Elementary Teachers’ Science Content Knowledge  
Martha M. Canipe, Northern Arizona University  
Lucas Mulcahy, Northern Arizona University  
Maggie Reid, Northern Arizona University

STRAND 8:  
In-service Science Teacher Education  
Meeting the Content Needs of STEM Educators  
10:30 AM – 12:00 PM  
Pearl  
Presider:  
Kathryn N. Hayes, California State University, East Bay

A Needs Assessment of Central California Science Teachers: Professional Development Challenges & Opportunities  
Alexandria K. Hansen, Fresno State  
Quinn Camara, Fresno State University  
Prabhjot Kaur, Fresno State University  
Anahi Martinez

Adapting Professional Development for Urban Science Teachers by Foregrounding the Educator’s Perspective  
Darrin A Collins, University of Illinois at Chicago  
Julio Mendez, University of Illinois at Chicago  
Jennifer Olson, University of Illinois at Chicago  
Miiri Kotche, University of Illinois at Chicago
**Construction of STEM literacy and Chinese Teachers' Understanding**

Xiao Huang, Zhejiang Normal University  
Sibel Erduran, University of Oxford  
Kang Kang Luo, Zhejiang Normal University  
Sa Piao Zhang, Zhejiang Normal University

**Retaining Science Teachers: A Mixed—Methods Study on the Relationship between Professional Development and Retention**

Kathryn N. Hayes, California State University, East Bay  
Linda Preminger, Teacher, San Lorenzo District  
Christine L Bae, Virginia Commonwealth University

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**STRAND 10: Curriculum, Evaluation, and Assessment**

**Socio-scientific Issue and Model Based Learning (SIMBL): Advances in Research to Inform Practice and Theory**

10:30 AM – 12:00 PM  
Columbia

Discussant:  
Vaille Dawson, University of Western Australia

**Co-Designed Socio-Scientific Issues-Based Curriculum Unit Implementation: A Case of Secondary Science Teacher Learning**

Patricia J. Friedrichsen, University of Missouri–Columbia  
Li Ke, University of North Carolina, Greensboro  
Troy D. Sadler, University of North Carolina at Chapel Hill  
Laura Zangori, University of Missouri

**Students’ Perceptions of Socio-Scientific Issue-Centered Learning and their Appropriation of Epistemic Tools for Systems Thinking**

Li Ke, University of North Carolina, Greensboro  
Troy D. Sadler, University of North Carolina at Chapel Hill  
Patricia J. Friedrichsen, University of Missouri–Columbia  
Laura Zangori, University of Missouri

**Developing Systems Thinking through Modeling in the Context of Socio-Scientific Issues among Elementary Learners**

Laura Zangori, University of Missouri  
Li Ke, University of North Carolina, Greensboro  
Troy D. Sadler, University of North Carolina at Chapel Hill

**Supporting Socio-Scientific Issues Teaching and Learning with Computational Thinking**

Amanda N. Peel, Northwestern University  
Patricia J. Friedrichsen, University of Missouri–Columbia  
Troy D. Sadler, University of North Carolina at Chapel Hill
**STRAND 11: Cultural, Social, and Gender Issues**

**Grappling with Coming Closer to Equity and Justice in Science Education: Students and Teachers Pondering Identities, Engaging in Multimodal Representations, and Pursuing Critical Hope**

**10:30 AM – 12:00 PM**

**Salon I**

Presider:

Maria Varelas, University of Illinois at Chicago

Grappling with Coming Closer to Equity and Justice in Science Education: Students and Teachers Pondering Identities, Engaging in Multimodal Representations, and Pursuing Critical Hope

Maria Varelas, University of Illinois at Chicago
David Segura, Beloit College
Eli Tucker-Raymond, TERC
Christopher G. Wright, Drexel University
Rebecca Kotler, University of Illinois at Chicago
Brezhnev Batres, University of Illinois at Chicago
Nina Hike, University of Illinois at Chicago
Darrin Collins, University of Illinois at Chicago
Tiffany Childress Price, University of Illinois at Chicago
James Klock, University of Illinois at Chicago

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

**Promoting Inclusion in Culturally and Linguistically Diverse Science Classrooms**

**10:30 AM – 12:00 PM**

**Salon G**

Presider:

Charnell Long, University of Wisconsin-Madison

“When the Learning Experience is Fun and Sometimes a Challenge, that Intrigues Me”: Affirming Science Experiences in a STEM-Focused Urban High School

Noemi Waight, University at Buffalo
Jennifer Tripp, University at Buffalo
Lorenda Chisolm, University at Buffalo

A Critical Discourse Analysis of Disability in a Science Teacher Education Textbook: Implications for Equity

Teresa Shume, North Dakota State University

Case Study of Physics Coursetaking, Contextual Characteristics, and Physics Achievement in Urban Schools

Martin F. Palermo, Stony Brook University
Robert Krakehl, Stony Brook University
Angela M. Kelly, Stony Brook University
Keith Sheppard, Stony Brook University

R is for Resilience and Retention: The Role of Sociocultural Awareness and Affirming Attitudes towards Students

Maria S. Rivera Maulucci, Barnard College
Lisa M. McDonald, Teachers College, Columbia University
Shane Coleman, Teachers College, Columbia University
STRAND 11:
Cultural, Social, and Gender Issues

Spaces of Agency: Centering Teacher Agency and Expanding Contexts for Equitable Science Teaching and Learning
10:30 AM – 12:00 PM
Salon H

Discussant: Felicia Mensah, Teachers College, Columbia University

Applying Strength-Based Approaches and Re-positing Emergent Bilingual/Multilingual Learners as Epistemic Agents
Shakhnoza Kayumova, University of Massachusetts Dartmouth
Akira Harper, University of Massachusetts Dartmouth

Examining Relational Agency to Understand Teacher Educators’ Professional Growth within the Individual/Collective Dialectic
Christina Siry, University of Luxembourg
Sara Wilmes, University of Luxembourg
Kerstin te Heesen, University of Luxembourg
Sandy Heinericy, University of Luxembourg
Nora Kneip, University of Luxembourg

Spaces of Agency for Pre-service Teachers: Capitalizing on Out-of-School to Develop Culturally-Sustaining Professional Identities
April Luehmann, University of Rochester
Yang Zahng, University of Rochester
Heather Boyle, University of Rochester

Dutch-Caribbean Students’ Formation of Agentic Science Identities through Their Participation in an After-School Program
Theila Smith, University of Groningen, NL
Lucy Avraamidou, University of Groningen, NL
Jennifer Adams, University of Calgary, Canada

Teacher as Bricoleur: Spaces of Agency around Resources and Informal Science Practices
Jennifer Adams, University of Calgary, Canada
LaToya Strong, The Graduate Center, City University of NY
Atasi Das, The Graduate Center, City University of NY
Susan McCullough, Queens College, CUNY

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

Nature of Engineering
10:30 AM – 12:00 PM
Portland

Presider: Ryan Summers, University of North Dakota

Development of a Nature of Engineering Instrument: Results from Field Tests
Jacob Pleasants, Keene State College
Joanne K. Olson, Texas A&M University
Iliana E. De La Cruz, Texas A&M University
Kristina M. Tank, Iowa State University

Engineering Professional Development with Robotics and Assessment of K-12 Teachers’ Understandings of Nature of Engineering
Hasan Deniz, University of Nevada Las Vegas
Ezgi Yesilyurt, University of Nevada, Las Vegas
Erdogan Kaya, University of Nevada, Las Vegas

Science Teachers' Nature of Engineering Knowledge and Instructional Planning
Allison Antink-Meyer, Illinois State University
Anna Maria Arias, Kennesaw State University
**STRAND 15: Policy**

**Understanding and Supporting STEM Education Improvement Efforts Within Schools and Districts**

**10:30 AM – 12:00 PM**

**Eugene**

Presider:

Carrie D. Allen, University of North Texas

*Principals as Policy Players: How Leadership Practices Impact Science Instruction*

Kathryn M. Bateman, Temple University

Scott McDonald, Pennsylvania State University

*An Emerging Model of Instructional Change Teams*

Ntiana (Diana) Sachmpazidi, Western Michigan University

Alice Olmstead, Texas State University

Charles R. Henderson, Western Michigan University

Andrea Beach, Western Michigan University

*Making Sense of Reform: Hybridizing Local and Ideal Instructional Practices*

William E. Lindsay, University of Colorado, Boulder

*Science Professional Development and Barriers to Elementary Science Education in a High Need School District*

Kathleen D. Johnson, Boston University

Peter S. Garik, Boston University

Bruce Anderson, Boston University

Donald DeRosa, Boston University

Caleb Farny, Boston University

Melissa Kaufman, Boston University

Evangeline Stefanakis, Boston University

**LUNCH**

12:00 PM – 1:45 PM

On Your Own

**Concurrent Session 5**

**1:45 PM – 3:15 PM**

**Publications Advisory Committee**


1:45 PM – 3:15 PM

Mt Hood


Fouad Abd-El-Khalick, University of North Carolina at Chapel Hill

Dana L. Zeidler, University of South Florida

Troy Sadler, University of North Carolina at Chapel Hill

Felicia Moore-Mensah, Teachers College, Columbia University

Elizabeth C. Niswander, University of Illinois at Urbana, Champaign

**STRAND 1: Science Learning: Development of Student Understanding**

**Modeling**

1:45 PM – 3:15 PM

**Salmon**

Presider:

Cesar Delgado, North Carolina State University
Fostering Students’ Understanding of Iconic Model Comprehension
Veronika Bille, University of Duisburg Essen
Maria Opfermann, Ruhr-Universität Bochum
Julian Roelle, Ruhr-Universität Bochum
Stefan Rumann, University of Duisburg, Essen

How Modeling can Help Students Condense Meaning Within Language
Daniel K. Capps, University of Georgia
Jonathan Shemwell, The University of Alabama
Ayca K. Fackler, The University of Georgia
Carlson H. Coogler, The University of Alabama
Hong T. Tran, The University of Georgia

Identifying Large Scale Scientific Modeling Practices That Can Organize Scaffolding Strategies for Whole Class Discussions
Maria Cecilia Nunez-Oviedo, University of Conception
John J. Clement, University of Massachusetts

The Affordances of Integrating Crosscutting Concepts and Modeling: Improving Science Learning With a Connective Structure
Ayca K. Fackler, The University of Georgia
Carlson H. Coogler, The University of Alabama
Daniel K. Capps, The University of Georgia
Jonathan Shemwell, The University of Alabama
Hong T. Tran, The University of Georgia

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Moves in Teaching & Discourse
1:45 PM – 3:15 PM
Hawthorne/Belmont/Laurelhurst

Presider:
Luiz Gustavo Franco Silveira, Universidade Federal de Minas Gerais

Gender, Power, and Positioning: Examining Discourse in Middle School Students’ Small Group Engineering Interactions
Jeanna R. Wieselmann, Southern Methodist University
Khomson Keratithamkul, University of Minnesota
Emily A. Dare, Florida International University
Elizabeth A. Ring-Whalen, St. Catherine University
Gillian H. Roehrig, University of Minnesota

Characterizing the Teaching Moves of Engineering Outreach Ambassadors
Karen Miel, Tufts University
Elizabeth Moison, Tufts University
Merredith D. Portsmore, Tufts University
Kelli Paul, Indiana University
Euisuk Sung, Indiana University
Adam V. Maltese, Indiana University

Tracing Links Between Teacher Moves, Student Framing, and Student Learning in a Middle School Classroom
Sherry A. Southerland, Florida State University
Jennifer Schellinger, Florida State University
Lama Jaber, Florida State University
Harini Krishnan, Florida State University
STRAND 3:
Science Teaching—Primary School
(Grades PreK-6): Characteristics and Strategies

Elementary Science Instruction in the US: Warning Signs and Ways Forward

1:45 PM – 3:15 PM
Meadow Lark/Douglas Fir – 3rd Floor

Trends in Elementary Science Instruction From 2012 to 2018
Eric R. Banilower, Horizon Research, Inc.

Novice Elementary Science Teachers
Peggy J. Trygstad, Horizon Research, Inc.

Factors that Predict the Extent to Which Elementary Teachers' Engage Students in the Science Practices
Laura M. Craven, Horizon Research, Inc.

Differences Between Self-Contained and Non-Self-Contained Elementary Science Classes
Patrick S. Smith, Horizon Research, Inc.

STRAND 4:
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies

Teaching for Science Literacy at Scale

1:45 PM – 3:15 PM
Salon E

Discussant:
Joseph Krajcik, Michigan State University

Presider:
Charles W. Anderson, Michigan State University

Designing Curriculum to Support the Literacy Aspects of Science Literacy
Kirsten D. Edwards, Michigan State University
Charles W. Anderson, Michigan State University

Utilizing Three-Dimensional Science Learning and Situated Instruction to Increase the Adoption of Sustainable Knowledge and Practice Among Rural Agriscience Students
Craig Kohn, Michigan State University

Factors Affecting Students' Learning about [name of project]
Qinyun Lin, Michigan State University
Ken Frank, Michigan State University
Charles W. Anderson, Michigan State University

Classroom Discourse and Its Connections to Student Learning
Beth A. Covitt, University of Montana
Christie Morrison Thomas, Michigan State University
Qinyun Lin, Michigan State University
Elizabeth X de los Santos, University of Nevada, Reno
Charles W. Anderson, Michigan State University
Teacher Orientations and Contexts: Making Connections to Classroom Discourse and Student Learning

Christie Morrison Thomas, Michigan State University
Qinyun Lin, Michigan State University
Stefanie Marshall, University of Minnesota
J. Brian Hancock, Alma College
Elizabeth Tompkins, Michigan State University
Charles W. Anderson, Michigan State University

STRAND 4:
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies
Teacher Learning, Efficacy and Practice
1:45 PM – 3:15 PM
Salon D
Presider:
Kathryn Green, University of Georgia

Learning Against All Odds: A Case Study of an Out-of-Field Science Teacher in a Small Rural School
Harleen Singh, University of Georgia
Elana B. Worth, University of Georgia
Julie A. Luft, University of Georgia

Finding One's Professional Self: Navigating Teacher Identity in the Figured Worlds of Schools
Gail Richmond, Michigan State University
Kraig A. Wray, Michigan State University

Teachers' Pre-Emptive Instructional Adjustments Based on Awareness of Student Ideas Highlighted in a Learning Progression
Julia Christensen, Michigan State University
Alicia Alonzo, Michigan State University

STRAND 5:
College Science Teaching and Learning (Grades 13-20)
Student Metacognition and Systems Thinking
1:45 PM – 3:15 PM
Salon C
Presider:
FangFang Zhao, University of Minnesota

Impacts of Inquiry-Based Teaching on Undergraduate Students’ Contextualized Problem-solving through the Lens of Systems Thinking
Ya-Chun Chen, National Sun Yat-sen University; Australian Catholic University
Zuway-R Hong, National Sun Yat-sen University; Australian Catholic University
Huann-Shyang Lin, Australian Catholic University; National Sun Yat-sen University

Socio-Hydrologic Systems Thinking: An Analysis of Undergraduate Students' Operationalization and Modeling of Coupled Human-Water Systems
Diane Lally, University of Nebraska-Lincoln
Cory T. Forbes, University of Nebraska-Lincoln

Supporting Student Generalizable Metacognitive Frameworks for Stem Learning
Regina Barber DeGraaff, Western Washington University
Gabriel Critquit-Matos, Western Washington University
Thanh K. Le, Western Washington University
Perceptions of STEM Students and Alumni on Developing 21st Century Skills
Judy Yehudit Dori, Technion-Israeli Institute of Technology
Rea Lavi, Technion- Israeli Institute of Technology
Marina Tal, Technion- Israeli Institute of Technology

STRAND 6: Science Learning in Informal Contexts
Informal Science in Afterschool Programs
1:45 PM – 3:15 PM
Salon F
Presider: Ying-Ting Chiu, The Ohio State University

Authentic STEM Research, Practices of Science, and Interest Development in an Informal Science Education Program
Bobby Habig, American Museum of Natural History; Queens College, City University of New York
Preeti Gupta, American Museum of Natural History

Burmese Youths’ Enactment of Critical STEM Literacy Practices in an Afterschool Program
Minjung Ryu, Purdue University
Shannon M. Daniel, Vanderbilt University
Mavreen Rose S. Tuvilla, Purdue University
Casey E Wright, Purdue University

Investigating Productive Science Engagement in an Afterschool Science Program for Resettled Burmese Refugee Youth
Mavreen Rose S. Tuvilla, Purdue University
Minjung Ryu, Purdue University
Casey E Wright, Purdue University
Shannon M. Daniel, Vanderbilt University

Student Use of Evidence in Constructing Socioscientific Arguments in an Elementary After School Program
Melissa M. Cieto, University of Massachusetts Dartmouth
Stephen B. Witzig, University of Massachusetts Dartmouth

STRAND 7: Pre-service Science Teacher Education
English Learners and Literacy Integration
1:45 PM – 3:15 PM
Salon A
Presider: Xiaoxin Lyu, Teachers College Columbia University

The Impact of a Teacher Preparation Intervention on Secondary Pre-service Teachers Beliefs Toward Teaching Science to English Learners with Language and Literacy Integration
Edward G. Lyon, Sonoma State University

Promoting the Discourse of English Learners During the Enactment of Cognitively Demanding Work
Walter Aminger, University of California, Santa Barbara

Learning to Integrate Science-Specific Literacy in Science Teaching: A Study of Elementary Pre-service Teachers
Regina P. McCurdy, University of Central Florida
Su Gao, University of Central Florida
Vassiliki ("Vicky") I. Zygouris-Coe, University of Central Florida
Katherine Cruz-Dieter, University of Central Florida
Rebeca A Grysko, University of Central Florida
STRAND 7: Pre-service Science Teacher Education
Science Education and Cultural Access
1:45 PM – 3:15 PM
Salon B

Presider:
Pamela S. Lottero-Perdue, Towson University

Supporting Pre-service Community Teachers in Implementing Culturally Responsive PBL
Imelda L. Nava, University of California, Los Angeles
Jaime Park, University of California, Los Angeles, Center X

Issues in Preparing American Indian STEM Teachers
Regina C. Sievert, Salish Kootenai College/ National Science Foundation
Joan LaFrance, Mekinak Consulting

Elementary Science Pre-service Teachers’ Perceptions of the Interactions of Science and Culture
Jordan L. Henley, University of Georgia
Dorothy Y. White, University of Georgia
Phaidra Buchanan, University of Georgia
Julie M. Kittleson, University of Georgia

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STRAND 8: In-service Science Teacher Education
Teacher Identity
1:45 PM – 3:15 PM
Pearl

Presider:
Sage Andersen, University of California, Irvine

Dialogic Investigation of Science Teacher Identity Development: The Case of 3 Career Changers
Lara Smetana, Loyola University Chicago
Ali Kushki, Loyola University Chicago

Middle Grade STEM Teachers' Conceptions and Prioritization of Core Instructional Practices Over Time
Matthew Kloser, University of Notre Dame
Matthew Wilsey, Stanford University

Science and Mathematics Teacher Communities of Practice: Social Influences on Discipline-Based Identity and Self-Efficacy Beliefs
Samuel J Polizzi, Georgia Highlands College
Yicong Zhu, Stony Brook University
Brandon Ofem, University of Missouri, St. Louis
Sara L. Salisbury, Middle Tennessee State University
Greg Rushton, Middle Tennessee State University

The Professional Journey of STEM Teachers in Egyptian STEM Schools: Transformation and Identity Evolution in a Time of Transition
Mohamed A. El Nagdi, University of Minnesota
Gillian H. Roehrig, University of Minnesota
STRAND 10: Curriculum, Evaluation, and Assessment

Productively Engaging 'Community' in Project-Based Learning: Approaches to Supporting Meaningful Science Learning in Formal Classrooms
1:45 PM – 3:15 PM
Columbia

Presider:
Joseph S. Krajcik, Michigan State University

Developing Usable Scientific Knowledge through Community Inspired Project-Based Learning: A Step Towards Science-Based Citizenship
Idit Adler, Tel Aviv University
Consuelo J. Morales, Michigan State University
Irene S. Bayer, Michigan State University
Tali Tal, Technion
Joseph S. Krajcik, Michigan State University

Developing a Partnership Through a Community-Based Participatory Research Approach to Develop, Enact, and Sustain an Equitable and Inclusive Educational Innovation
Irene S. Bayer, Michigan State University
Idit Adler, Tel Aviv University
Consuelo J. Morales, Michigan State University
Ella Greene-Moton, University of Michigan
Stephen Modell, University of Michigan
Tali Tal, Technion
Toby Citrin, University of Michigan
Joseph S. Krajcik, Michigan State University

Why Don't the Irises Make Seeds? Protecting Rare Endangered Species in Our Community
Tali Tal, Technion
Hila Shefet, Technion
Nirit Lavie Alon, Technion

Comparing Three Elementary Teachers' Processes for Engaging with PBL Curriculum that Leverages Place
Emily C. Miller, University of Wisconsin Madison
Cory Susanne Miller, Michigan State University

Anchoring Project-Based Learning Around Our Community: Towards Relevant and Inclusive Science Learning for Elementary Students
Samuel Severance, University of California, Santa Cruz
Emily C. Miller, University of Wisconsin, Madison

STRAND 11: Cultural, Social, and Gender Issues

Learning from Minoritized Youths’ Experiences and Promoting Equitable Science Teaching through Research—Practice Partnership
1:45 PM – 3:15 PM
Salon H

Discussant:
Maria Varelas, University of Illinois at Chicago

Presider:
Hosun Kang, University of California, Irvine
Supporting Justice-Oriented STEM Teaching and Learning through Community-Engaged RPPs

Angela Calabrese-Barton, University of Michigan
Kathleen A. Schenkel, Michigan State University
Edna Tan, University of North Carolina at Greensboro

Understanding Minoritized Students’ Experience in High School Biology: The Use of Electronic Exit Tickets

Kerri Wingert, University of Colorado at Boulder
William R. Penuel, University of Colorado
Douglas A. Watkins, Denver Public School District

“We Need to Step It Up—We are Basically the Future”: Latinx Young Women doing Chemistry

Jasmine McBeath Nation, University of California, Irvine
Hosun Kang, University of California, Irvine

“Your Job is Always Take Care of Us”: Engaging in a STEM-focused RPP with Refugee Youth

Edna Tan, University of North Carolina at Greensboro
Aerin W. Benavides, The University of North Carolina at Greensboro
Ti’Era D. Worsley, University of North Carolina at Greensboro
Angela Calabrese-Barton, University of Michigan

STRAND 11: Cultural, Social, and Gender Issues
Reconceptualizing the Pathways and Experiences of Women of Color in STEM
1:45 PM – 3:15 PM
Salon G

Presider:
Catherine Quinlan, Howard University

A Tale of Two Tables: Wrestling with Belonging for Women of Color in STEM

Apriel K. Hodari, Eureka Scientific, Inc
Vanessa S Webb, George Mason University
Angela Johnson, St. Mary’s College of Maryland

Self-Efficacy of African American Female Undergraduates in STEM Disciplines

Carmen Bucknor, Oakwood University
Karen Benn Marshall, Oakwood University

Voices of Black Women in College Science Learning Spaces

Renee S. Schwartz, Georgia State University
Melissa Schoene, Georgia State University

Who’s Who: “Women of Color” in STEM Education Research

Monica L Ridgeway Miles
ReAnna S. Roby
Charlotte A Agger
Terrell R. Morton, University of Missouri, Columbia
STRAND 11: Cultural, Social, and Gender Issues
Storied-Identities as a Lens to Studying Science Identity
1:45 PM – 3:15 PM
Salon I

Storied-Identities as a Lens to Studying Science Identity
Amal Ibourk, Florida State University
Lucy Avraamidou, University of Groningen
Theila Smith, University of Groningen
Alison Mercier, University of North Carolina at Greensboro
Akira Harper, University of Massachusetts, Dartmouth
Paul Le, University of Colorado, Denver
Allison J. Gonsalves, McGill University
Anna T. Danielsson, Uppsala University
Henriette T. Holmegaard, University of Copenhagen
Jennifer D. Adams, University of Calgary

Rahmi Q. Aini, Kangwon National University
Jisun Park, Ewha Womans University
Minsu Ha, Kangwon National University
Jun-Ki Lee, Division of Science Education, Chonbuk National University

Investigating Science and Religious Education Teachers’ Perceptions of Argumentation
Sibel Erduran, University of Oxford
Liam Guilfoyle, University of Oxford
Wonyong Park, University of Oxford

STRAND 13: History, Philosophy, Sociology, and Nature of Science
NOS and Teachers’ Perceptions
1:45 PM – 3:15 PM
Portland

Entwining Scientific Facts and Moral Values in the Case of the Power of Words Experiment
Sein Shin, Chungbuk National University
Arif Rachmatullah, North Carolina State University

STRAND 15: Policy
Examining Models of Change in STEM Education
1:45 PM – 3:15 PM
Eugene

Critical Components of Inclusive STEM High Schools and STEM-Focused Elementary School: Opportunities for Vertical Articulation
Erin E. Peters-Burton, George Mason University
Ann House, SRI International
Vanessa L. Peters, Digital Promise
Julie Remold, SRI International
Losing Science: An Examination of NGSS and STEM in Elementary Schools
Joanne K. Olson, Texas A&M University
Jacob Pleasants, Keene State University

Supporting Diverse STEM Students’ University Transfer: Research-Informed Policy Recommendations for Postsecondary Institutions and Policymakers
Stephanie Kay Ramos, Oregon State University
Jana L. Bouwma-Gearhart, Oregon State University
Cindy A. Lenhart, Oregon State University
Rican Vue, University of California, Riverside

Translating Research into Classroom Practice: Examining the Use of Research in Science Education Practitioner Journals (SEPJs)
Joseph A. Taylor, University of Colorado, Colorado Springs
G. Michael Bowen, Mount Saint Vincent University
Patricia Patrick, Columbus State University
Ryan Summers, University of North Dakota
Marcus Kubsch, IPN–Leibniz Institute for Science and Mathematics Education
Abdirizak M. Warfa, University of Minnesota
Asli Sezen-Barrie, University of Maine
Selcen Guzey, Purdue University
Cathy P. Lachapelle, Museum of Science

Network Break
3:15 PM – 3:45 PM

Concurrent Session 6a
Roundtable Session
3:45 PM – 4:45 PM

STRAND 1:
Science Learning: Development of Student Understanding
Strand 1 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #5
Cutting-edge Evolution Research in the Hands of High-school Students: Students’ Views of Scientific Inquiry
Bat-Shahar Dorfman, Weizmann Institute of Science
Orna Dahan, Weizmann Institute of Science
Amir Mitchell, University of Massachusetts
Anat Yarden, Weizmann Institute of Science

TABLE #1
Emergence of Student Argumentation
Qingna Jin, University of Alberta
Mijung Kim, University of Alberta
Hye-Gyoung Yoon, Chuncheon National University of Education

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions
Strand 2 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #2
Student Experiences in a Problem-Solving Studio
Carmen A. Carrion, Georgia State University
Joseph Ledoux, Georgia Institute of Technology

MONDAY, MARCH 16, 2020
TABLE #3
Interacting with Luna: Scientific Characters and 3rd Graders’ Construction of Relationships with Science
Deborah Cotta, Universidade Federal de Minas Gerais
Danusa Munford, Universidade Federal do ABC
Elaine S. França, Centro Pedagógico (1-9 grades school) - Universidade Federal de Minas Gerais

TABLE #1
Variations in the Construction of Non-Planned Argumentation in Two Science Classrooms
Danusa Munford, Faculdade de Educacao–Universidade Federal de Minas Gerais
Ana Paula Souto Silva Teles, Faculdade de Educacao–Universidade Federal de Minas Gerais

TABLE #2
The Effects of Flipped Classrooms on Students’ Math and Science Achievement: A Systematic Review
Gary W. Wright, North Carolina State University
Soonhye Park, North Carolina State University

TABLE #2
Overcoming the Teacher-Student Script—Student Persistence in Light of Constraints on Epistemic Data Agency
Julio Jamarillo, University of California, Berkeley
Michelle H. Wilkerson, University of California, Berkeley
Lisette Lopez, University of California, Berkeley, Lawrence Hall of Science

STRAND 3:
Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies
Strand 3 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #3
Psychological Underpinning of Integrative-STEM Education Proposals
R. Bogdan Toma, Universidad de Burgos
Jesús Ángel Meneses Villagrá, Universidad de Burgos

TABLE #3
Just Playing or Future Engineers? Early Engineering and Self-Regulation Capabilities among Young Boys and Girls
Taly Shechter, Bar-Ilan University
Ornit Spektor-Levy, Bar-Ilan University

TABLE #4
Disjunctive Logic in the Language of Science
Shih-Wen Chen, Textbook Research Center, NAER
Chih-Hsiung Ku, National DongHwa University, NDHU
Chih-Chiang Yang, Nationa Ping-Tung University
Pei-Lun HAN, Textbook Research Center, NAER
STRAND 4:
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies
Strand 4 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #5
The House That STEM Built: Science, Technology, Engineering and Math in the Building/Construction Trades
  Grant Williams, St. Thomas University
  Eric Hanenberg, George Street Middle School
  Kayoe Stewart, Fredericton High School

TABLE #5
Implementation of Active-Learning During STEM Academy for Middle School Science Teachers
  Tiffini Pruitt-Britton, Southern Methodist University
  Elizabeth L. Adams, Southern Methodist University
  Leanne R. Ketterlin-Geller, Southern Methodist University

TABLE #6
Fostering Productive NGSS Crosscutting Concept Implementation through Professional Collaboration
  Jasmine Marckwordt, University of California, Santa Barbara
  Jonathan Boxerman, WestEd
  Ashley Iveland, WestEd
  Kimberly Nguyen, WestEd
  Edward D. Britton, WestEd

TABLE #6
Implementing Effective Group Work in a Middle School Science Class
  Massa Mafi, The University of New Mexico
  Kathryn Watkins, University of New Mexico
  Leila Flores-Duenas, University of New Mexico

TABLE #4
Unpacking the Meaning of Teaching Students to Do Science
  Salih Yousef Faraj, Technion–Israel Institute of Technology
  Amos Cohn, Oranim, Academic College of Education & Haifa University, and ‘Archimedes Fulcrum’–Academy of Teachers Researchers in Physics, ACHERET Center
  Shulamit Kapon, Technion–Israel Institute of Technology

TABLE #6
Teacher Planning with Authentic Data: How Do Secondary Science Teachers Integrate Analyzing and Interpreting Data?
  Karen Woodruff, Montclair State University
  Amanda M. Gunning, Mercy College
  Meghan E. Marrero, Mercy College

STRAND 5:
College Science Teaching and Learning (Grades 13-20)
Strand 5 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #20
The Success of Failure: Investigating Undergraduate Students’ Experiences of Scientific Failure through a Phenomenological Lens
  Sandhya Krishnan, University of Georgia
TABLE #7
Students’ Views on Science Learning Environments: Knowledge Generative vs. Knowledge Replicative
   Ercin Sahin, University of Iowa
   Ali Cikmaz, University of Iowa
   Fatma Yaman, Bozok University

TABLE #7
Understanding Biology Teaching Assistants’ Pedagogical Concerns: A Study of Undergraduate TAs Over One Academic Year
   Hillary A. Barron, University of Minnesota, Twin Cities
   Lorelei E. Patrick, Fort Hays State University
   Julie C. Brown, University of Florida
   Sehoya Cotner, University of Minnesota

TABLE #7
Sexual Selection Instruction: an Evaluation of Relationships Between Theory Pedagogy, Gender Self-stereotyping, and Student Misconceptions
   Sarah H. Spaulding, University of Louisville
   Linda C. Fuselier, University of Louisville
   Laura R. Novick, Vanderbilt University

TABLE #8
The Role of Making in Supporting Undergraduate STEM Education
   Edward G. Lyon, Sonoma State University

TABLE #8
Building Student Confidence through Micro-Internships at a Central California Community College
   Brae Salazar, BSCS Science Learning
   Zoe E. Buck Bracey, BSCS
   Mohammed Yahdi, Hartnell College

TABLE #8
Epistemic Analysis of Textbooks in Quantum Mechanics
   Ashwin Krishnan Mohan, Pennsylvania State University

STRAND 6:
Science Learning in Informal Contexts
Strand 6 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #9
Embedded Assessment Pursuits: Identifying Important, Relevant, Accessible but Hidden Skills of Citizen Scientists
   Cathlyn Stylinski, University of Maryland Center for Environmental Science
   Veronica Del Bianco, University of Maryland Center for Environmental Science
   Karen Peterman, Karen Peterman Consulting, Co.
   Andrea Wiggins, University of Nebraska at Omaha
   Rachel Becker-Klein, Two Roads Consulting
   Tina Phillips, Cornell University

TABLE #9
Brazilian Visitors’ Motivation to a Museum: Psychometric Properties of an Instrument Through Combination of Methods
   Ana Cláudia C. Kasseboehmer, University of São Paulo
   Rosana F. Martinhão, University of São Paulo
   Kenia N. Parra, Federal Institute of Education, Science and Technology of São Paulo
   Daniela M. L. Barbato, SEB Institute of Education
TABLE #9
Debating Socio-Scientific Issues on Social Media

Keren E. Dalyot, Technion–Israel Institute of Technology
Ayelet Baram-Tsabari, Technion–Israel Institute of Technology

TABLE #20
Staying in Science: An Examination of Persistence with STEM in Historically Under-Represented Youth

Rachel L. Chaffee, American Museum of Natural History
Preeti Gupta, American Museum of Natural History
Karen Hammerness, American Museum of Natural History
Timothy Podkul, SRI International
Kea Anderson, SRI International
Daniel Princiotta, SRI International
Alexandra Ball, SRI International
Daniela Saucedo, SRI International

STRAND 7: Pre-service Science Teacher Education

Strand 7 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #10
How to Give Effective Feedback to Pre-service Teachers about their Representational Competences?

Büsra Tonyali, University of Duisburg-Essen
Mathias Ropohl, University of Duisburg-Essen
Julia Schwanewedel, Humboldt University of Berlin

TABLE #11
Pre-service Teachers’ Ideas about What to assess in Modeling and Filters affecting Modeling-Based Assessment Planning

Young Ae Kim, University of Arizona
J. Steve Oliver, The University of Georgia

TABLE #11
Teaching Experiences for Undergraduates: Exploring Measures of Efficacy and Teaching Effectiveness

Maria S. Rivera Maulucci, Barnard College
Adam Stefanile, Teachers College, Columbia University
Alanna Gibbons, Teachers College, Columbia University

TABLE #11
Pre-service Teachers’ Successes and Challenges around Enacting a Social Justice Framework of Science Teaching

Jarod Kawasaki, University of California, Los Angeles
Deborah La Torre, National Center for Research on Evaluation, Standards, and Student Teaching (CRESST)
Imelda L. Nava, University of California, Los Angeles
Jaime Park, University of California, Los Angeles, Center X
Annamarie Francois, University of California, Los Angeles, Center X
TABLE #11
Compare Synchronous and Asynchronous Interaction for Online Science Teacher Preparation
Jianlan Wang, Texas Tech University
Yuanhua Wang, Texas Tech University

TABLE #12
Exploring Prospective Teachers’ Development of Knowledge for Teaching During their Practicum
Lu Wang, University of Georgia

TABLE #12
Using Multiple Levels of Representations to Teach Physical and Chemical Change in Science Classrooms
Funda Savasci-Acikalin, Istanbul University-Cerrahpasa
Meryem Demir-Guldal, Istanbul University-Cerrahpasa

TABLE #12
Pre-service Teachers’ Implementation of NGSS-Aligned and Social Justice-Oriented Science Teaching
Hildah K. Makori, Iowa State University
Gale A. Seiler, Iowa State University

TABLE #12
Recruiting and Preparing Diverse STEM Professionals to Become Highly Effective Teachers
Natalie S. King, Georgia State University
Christine D. Thomas, Georgia State University

TABLE #13
Community Engaged Scholarship: Mixed Methods Assessment of Self-Efficacy of PSTs in Informal STEM Microteaching PD
Jacqueline N. Ekeoba, University of Houston
Paige K. Evans, University of Houston
Leah Y. Alister-Shields, University of Houston
Mariam Manuel, University of Houston
Ramona C. Mateer, University of Houston

TABLE #13
Leveraging Community Asset Mapping in Pre-service Secondary Science Education
Kirsten K. Mawyer, University of Hawaii
Heather J. Johnson, Vanderbilt University

TABLE #13
Experiences in Science and Mathematics Methods Courses and Science Teaching Efficacy
Sheryl L. McGlamery, University of Nebraska at Omaha
Bridget A. Franks, University of Nebraska at Omaha
Saundra L. Shillingstad, University of Nebraska at Omaha

STRAND 8:
In-service Science Teacher Education
Strand 8 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #14
Knowing Your Coach’s Role: Navigating a Coaching Relationship at the Boundaries of STEM Integration
Justin R. McFadden, University of Louisville
### TABLE #14
**K-8 Teachers Planning for Supporting Sensemaking through Engineering Learning Cycles**

- Anna Maria Arias, Kennesaw State University
- Allison Antink-Meyer, Illinois State University

### TABLE #14
**The Role of Self-Talk in Supporting Teachers’ Implementation of Inquiry-Based Instruction in High-Need Urban Schools**

- Stacy Olitsky, Saint Joseph's University

### TABLE #15
**Teachers’ Interpretations and Enactments of Storyline Curriculum**

- Casandra Gonzalez, Boston College
- Katherine L. McNeill, Boston College

### TABLE #15
**U.S. and Japanese Middle and High School Science Teachers’ Conceptions of Inquiry-Based Learning Practices**

- Noemi Waight, University at Buffalo
- Koichi Furuya, Joetsu University of Education
- Melinda Whitford, University at Buffalo

### TABLE #15
**Linking Science & Literacy for All Learners**

- Rachel Lee Juergensen, University of Missouri, Columbia
- William L. Romine, Wright State University
- Jiyung Hwang, University of Missouri, Columbia
- Bill Folk, University of Missouri
- Amy Lannin, University of Missouri, Columbia
- Torrey Palmer
- Delinda van Garderen, University of Missouri, Columbia

### TABLE #16
**Revisiting the Impacts of Science Research Experiences: A Critical Review of RETs, CUREs, and UREs**

- Sanlyn Buxner, University of Arizona
- Jessica S. Krim, Southern Illinois University Edwardsville
- Laleh Cote, University of California, Berkeley
- Renee S. Schwartz, Georgia State University
- Elisa Stone, University of California, Berkeley
- Jessica Cleeves, The University of Utah
- Lawrence Horvath, San Francisco State University
- John Keller, University of Colorado
- SoonChun Lee, Wichita State University
- Bryan M. Rebar, University of Oregon

### TABLE #16
**Professional Learning for Leadership Development: Potential Impacts on Science Leadership Practices**

- Katy Nilsen, WestEd
- Joshua Valcarcel, WestEd
- Ashley Iveland, WestEd

### TABLE #16
**Multi-Year Study of Science Teachers PD through Classroom Observation**

- Hiya M. Almazroa, Princess Nourah Bint Abdulrahman University (PNU)
- Fahad S. Al-Shaya, University of Pittsburgh
- Eman M. Alrwthy, Alemam Mohammed Bin Saud University
TABLE #17
Teacher Beliefs and Practice within the Context of an Intensive Teacher STEM Professional Development
Elizabeth L. Adams, Southern Methodist University
Tryna Knox, Southern Methodist University
Cassandra Hatfield, Southern Methodist University
Leanne R. Ketterlin-Geller, Southern Methodist University

TABLE #17
Examining Teacher Leadership as a Model for Improvement in Science Education
Sheree Wilson, University of Mississippi
Brooke A. Whitworth, University of Mississippi
Shelby A. Watson, University of Mississippi

TABLE #18
Examining Teacher Leadership as a Model for Improvement in Science Education
Sheree Wilson, University of Mississippi
Brooke A. Whitworth, University of Mississippi
Shelby A. Watson, University of Mississippi

TABLE #18
Evaluating Intercultural STEAM Program in Australia-Korea Contexts: Teachers' Attitudes and Beliefs towards STEAM
Hye-Eun Chu, Macquarie University
Sonya N. Martin, Seoul National University

TABLE #18
Fiction, Faction and Action: A Pedagogic Fusion to Teaching Science
Deb J. McGregor, Oxford Brookes University

TABLE #18
Lived Experiences of Secondary Science Teachers: Grounding Science Education in the Host Culture and Place
Sheri Fitzgerald, University of Hawaii at Manoa

STRAND 9: Reflective Practice
Strand 9 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #1
Development of a Questionnaire on Teachers' Knowledge of Argument as an Epistemic Tool
William E. Hansen, University of Iowa
Jihyun Hwang
Chenchen Ding, The University of Iowa
Jee Kyung Suh, University of Alabama
Brian M. Hand, University of Iowa
Gavin W. Fulmer, University of Iowa

STRAND 10: Curriculum, Evaluation, and Assessment
Strand 10 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #19
Integrated STEM+ Computational Thinking Curriculum: Developments in an Underrepresented Community After-School Program for Girls
Henriette D. Burns, Washington State University
Samantha Murphy, Southern Illinois, University Edwardsville
Matt Johnson, SIUE STEM Center
Georgia Bracey, Southern Illinois University, Edwardsville
Mark McKenney, Southern Illinois University, Edwardsville
Ann Vogel, iBio Institute
Sharon Locke, Southern Illinois University, Edwardsville
### Table #19
Developing Thai Students' Understanding of Light and Color Using Formative Assessment and 6E Learning Cycle: Rasch Analysis

- Pongprapan Pongsophon, Kasetsart University
- Chatree Faikhamta, Kasetsart University
- Jeerawan Ketsing, Kasetsart University
- Chun-Yen Chang, National Taiwan Normal University
- Peiling Lin, National Taiwan Normal University

### Table #19
Rethinking the Impact of Inquiry-Based Instruction on Student Achievement: Evidence from PISA 2015

- Sara J. Dozier, Stanford University

### Table #21
Exploring the Lived Experiences and Narratives of the African American Gullah Geechee Peoples to Create Culturally Relevant STEM Curriculum

- Catherine Quinlan, Howard University, School of Education

### Table #24
Factors Influencing Biology Majors' Persistence in their Degree

- Jennifer L Idema, Texas State University
- Kristy L. Daniel, Texas State University
- Shetay Ashford, Texas State University
- Dana Garcia, Texas State University

### Table #20
"Big Ole Geeks": A Discourse of Black Female Representation in STEM Media

- Raven Baxter, University at Buffalo

### Table #21
Case Studies of High School Biology Science Teachers' Experiences Teaching about Race and Racism

- Bhaskar Upadhyay, University of Minnesota

### Table #22
Exploring the Impacts of Living Experiences on Students' Understanding

- Jonathan D. McCausland, The Pennsylvania State University

### Table #22
On Being a Person of Color in a STEM Graduate Program: Experiences of Assimilating into the Culture of Science

- Renee S. Schwartz, Georgia State University
- Megan Grunert Kowalske, Western Michigan University

### Table #22
Race-Oriented Lectures Study: Racial Socialization and Bias Preparation for Black Students

- Henry Hane, Indiana University–Purdue University, Indianapolis
- Jomo W. Mutegi, Indiana University–Purdue University, Indianapolis
- Lance Howard, Indiana University

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**STRAND 11: Science Learning: Development of Student Understanding**

**Strand 11 Roundtable Session**

**3:45 PM – 4:45 PM**

**Exhibit Hall**

**Table #20**
"Big Ole Geeks": A Discourse of Black Female Representation in STEM Media

- Raven Baxter, University at Buffalo

**Table #21**
Case Studies of High School Biology Science Teachers' Experiences Teaching about Race and Racism

- Bhaskar Upadhyay, University of Minnesota
TABLE #23
STEM Faculty Efforts in Pedagogical Innovations: An Example in Biology
Melo-Jean Yap, San Diego State University
Felisha Herrera, San Diego State University

TABLE #21
The Role of Indigenous Knowledge in Enhancing Science Concept Formation through Inquiry-Based Learning
Umesh Ramnarain, University of Johannesburg

TABLE #23
Translanguaging with Three Languages and Multimodal Interactions: English Learners’ Science Experiences at a STEM-Focused School
Jennifer Tripp, University at Buffalo
Noemi Waight, University at Buffalo

TABLE #24
Urban STEM Education Successes in the Bronx: Moving Away from the Deficit Model
Judith Gouraige, NYCDOE and Stony Brook University

TABLE #24
Words Matter: A Queer Theory Analysis of Anatomy/Physiology Textbooks
Harshini Sirvisetty, University of Louisville
Katherine E. Ray King, University of Louisville
Linda C. Fuselier, University of Louisville

STRAND 12:
Educational Technology
Strand 12 Roundtable Session
3:45 PM – 4:45 PM
Exhibit Hall

TABLE #25
Textbook and Virtual Reality as a Means to Promote Scientific Writing
Richard Lamb, East Carolina University
Jing Lin, Beijing Normal University
Brian M. Hand, University of Iowa
Amanda Kavner, University at Buffalo
Douglas Hoston, University at Buffalo

TABLE #25
Engineering Students Perceived Innovative Thinking and Actual Innovation in Face-to-Face and Online Settings
Maya Usher, Technion
Miri I. Barak, Technion–Israel Institute of Technology

TABLE #25
Supporting Chemistry Learning through Augmented-Reality—A Glimpse on Usability and Cognitive Load
Sebastian Keller, Universitiy of Duisburg-Essen
Stefan Rumann, University of Duisburg-Essen
### STRAND 13: History, Philosophy, Sociology, and Nature of Science

Strand 13 Roundtable Session  
**3:45 PM – 4:45 PM**  
**Exhibit Hall**

**TABLE #26**  
Analyzing Science Education as a “Construction Site for Science” Using Latour’s Collective of Humans and Non-Humans  
- **Donald J. Wink**, University of Illinois, Chicago

**TABLE #26**  
Visualizing Connections between Nature of Science and Engineering  
- **Jeffrey Radloff**, SUNY Cortland  
- **Brenda Capobianco**, Purdue University

**TABLE #26**  
Evidence and Rationale for Expanding The Views of Nature of Science Questionnaire  
- **Ryan Summers**, University of North Dakota  
- **Fouad Abd-El-Khalick**, University of North Carolina at Chapel Hill  
- **Jeanne Brunner**, University of Massachusetts, Amherst

**TABLE #17**  
Using Children’s literature in the Middle School Science Class to Teach Nature of Science: Pre-service Teachers’ Development of Sources  
- **Banu Avsar Erumit**, Recep Tayyip Erdogan University  
- **Valarie L. Akerson**, Indiana University

### STRAND 14: Environmental Education

Strand 14 Roundtable Session  
**3:45 PM – 4:45 PM**  
**Exhibit Hall**

**TABLE #13**  
Arts Integrated Environmental Education Professional Development  
- **Lauren Madden**, The College of New Jersey  
- **Louise Ammentorp**, The College of New Jersey  
- **Carolina Blatt**, The College of New Jersey  
- **Dana Kneis**, Ridgewood High School

### STRAND 15: Policy

Strand 15 Roundtable Session  
**3:45 PM – 4:45 PM**  
**Exhibit Hall**

**TABLE #23**  
STEM Education as a District-Wide Innovation: A Cross-Case Analysis of Three School Districts  
- **Tamara Holmlund**, Washington State University Vancouver  
- **Kristin S. Huggins**, Washington State University
Concurrent Session 6b
Poster Session
4:45 PM – 5:45 PM

STRAND 1:
Science Learning: Development of Student Understanding
Strand 1 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P1:
Ayca K. Fackler, The University of Georgia

P2:
Developing and Validating a Learning Progression for Computational Thinking in Earth and Environmental Systems
Beth A. Covitt, University of Montana, SpectrUM Discovery Area
Kristin L. Guncel, University of Arizona
John C. Moore, Colorado State University
Alan R. Berkowitz, Cary Institute of Ecosystem Studies
Bess Caplan, Cary Institute of Ecosystem Studies
Judith A. Cooper-Wagoner, University of Arizona
Michael Jahnke, University of Montana
Daniel L. Moreno, University of Arizona

P3:
Investigating Groundwater: 7th-Grade Students’ Mapping Models to Phenomena
Holly White, University of Nebraska, Lincoln
Diane Lally, University of Nebraska, Lincoln
Cory T. Forbes, University of Nebraska, Lincoln

P4:
Socio-Scientific Issues to Engage Students in Claims, Evidence and Reasoning
Sissy S. Wong, University of Houston
Jie Zhang, University of Houston
Jennifer Donze, University of Houston
Jackie Relyea, North Carolina State University
Ma Glenda Wui, University of Houston

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions
Strand 2 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P5:
Applying Conjecture Mapping to Analyze Children’s Use of Science Practices in Story-Driven Investigations
Kyungjin Cho, Pennsylvania State University
Julia Plummer, Pennsylvania State University

P6:
Youth Social Interactions in Informal Makerspaces: What are the Pedagogical Implications for Supporting Productive Collaborations?
Ti’Era D. Worsley, University of North Carolina at Greensboro
Edna Tan, University of North Carolina at Greensboro
Sara Heredia, The University of North Carolina Greensboro

P7:
Children Arguing in Science Lessons Over Time: The Discursive Construction of Evidence Use
Luiz Gustavo Franco Silveira, Universidade Federal de Minas Gerais (Brazil)
Danusa Munford, Universidade Federal de Minas Gerais
P8: Design-Based Lessons Foster Equity When Integrating Engineering Into Biology Classrooms

Tory H. Williams, University of Maryland, Baltimore County
Christopher R. Rakes, University of Maryland, Baltimore County
Jonathan Singer, University of Maryland, Baltimore County
Jacqueline Krikorian, University of Maryland, Baltimore County
Julie Ross, Virginia Tech


Vance J. Kite, North Carolina State University
Michelle Nugent, North Carolina State University
Soonhye Park, North Carolina State University
Roger Azevedo, University of Central Florida
Min Chi, North Carolina State University
Michelle Taub, University of Central Florida

P10: Examining the Integration of Science and Engineering: The Stickiness of Tinkering in an Elementary Classroom

Jennifer Schellinger, Florida State University
Lama Jaber, Florida State University
Sherry A. Southerland, Florida State University

P11: Multifaceted Effects of Self-efficacy on Taiwanese High School Students' Learning Engagement

Tzung-Jin Lin, National Taiwan Normal University

P12: Traces of Ambitious Science Teaching and Science and Engineering Practices in Teachers' Noticed Moments of Students' Thinking in a Science Classroom

Sahar Vali, West Virginia University
Melissa J. Luna, West Virginia University

P13: Threshold Concepts in Novices' and Experts' Evolutionary Explanations

Daniela Fiedler, IPN–Leibniz Institute for Science and Mathematics Education
Gena C. Sbeglia, Stony Brook University (SUNY)
Ute Harms, IPN – Leibniz Institute for Science and Mathematics Education
Ross H. Nehm, Stony Brook University (SUNY)

P14: Teaching and Learning in Makerspaces: Equipping Teachers to Become Equity Oriented Maker Educators

Sara C Heredia, The University of North Carolina Greensboro
Edna Tan, University of North Carolina at Greensboro
STRAND 3: Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies

Strand 3 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P15: Changing Stigma on Wild Animals: A Qualitative Assessment of Urban Pupils’ Pre- and Post-Lesson Drawing
Chi-Chang Liu, National Taiwan University
Meng Wu, National Taiwan University

P16: Exploring the Applicability of Scientific Creativity Assessment Formula: Comparison of Assessments by Subjects
Minju Kim, Seoul National University of Education
Chae-Seong Lim, Seoul National University of Education

P17: Metacognitive Scaffolds for Student Argumentation
Qingna Jin, University of Alberta

P19: Telling the Energy Story: Storytelling as a Resource in Science Learning
Panchompoo Wisittanawat, Vanderbilt University
Sara J. Lacy, TERC
Roger G. Tobin, Tufts University

STRAND 4: Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies

Strand 4 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P20: Assessing the Effectiveness of a Novel Microscopy Technique in Middle School Science Classrooms
Sara P. Raven, Texas A&M University
Emel Cevik, Texas A&M University

P21: Empowerment of a Diaspora Through Science Education: Perspectives from Tibetan Teachers
Ngawang Y. Gonsar, Gustavus Adolphus College

P22: Exploring Chilean In-service Science Teachers’ Understanding about Models and Modeling
Alexis Gonzalez, University of British Columbia
Carla Hernández, Universidad de Santiago de Chile
Damian Ruz

P23: Have the NGSS Changed Science Instruction to Include Engineering? A Review of the Literature
Stephanie D. Teeter, NC State University
P24:
Introducing Application Based Nanotechnology Modules to High School Students: Results from an Exploratory Pilot

Tejaswini S. Dalvi, University of Massachusetts
Martyna Laszcz, Graduate Student

P25:
Teachers’ Intersection of Computational Thinking and Data Practices to Support Student Data Analysis during Science Investigations

Erin E. Peters-Burton, George Mason University
Laura Laclede, George Mason University
Stephanie Stehle, George Mason University
Peter J. Rich, Brigham Young University
Anastasia Kitsantas, George Mason University
Timothy Cleary, Rutgers University
Kimberly Mcleod, George Mason University

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

Strand 5 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P26:
A Model to Assist in Combatting STEM Graduate Student Imposter Syndrome

Julianne A. Wenner, Boise State University
Paul Simmonds, Boise State University
Megan Frary, Boise State University
Donna Llewellyn, Boise State University

P27:
Characteristics of Effective Professional Development for Undergraduate Science Instructors: A Critical Review of the Literature

Katherine McCance, North Carolina State University
Soonhye Park, North Carolina State University

P28:
Chemistry Students' Understanding of Dissolving and Associated Phenomena: The Case of Sodium Chloride

James M. Nyachwaya, North Dakota State University
Krystal Grieger, North Dakota State University

P29:
College Students' Perceptions of STEM and Choices of Switching out of Initial STEM Majors

Youngjin Song, California State University, Long Beach
Lisa M. Martin-Hansen, California State University, Long Beach

P30:
Cultivating Water Literacy in Undergraduate STEM Education: Students' Socio-Scientific Reasoning about Socio-hydrologic Issues

David C. Owens, Georgia Southern University
Destini N. Petitt, University of North Carolina-Charlotte
Diane Lally, University of Nebraska, Lincoln
Cory T. Forbes, University of Nebraska, Lincoln
P31: Do International Teaching Assistants Negatively Impact Student Outcomes in Biology?: A Comparative Study
Zhigang Jia, Middle Tennessee State University
Lisa L. Walsh, University of Michigan

P32: Symbolic-Mathematical Model Comprehension in Physical Chemistry
Ines Komor, University of Duisburg-Essen
Helena Van Vorst, University of Cologne
Elke Sumfleth, University of Duisburg-Essen
Julian Roelle, Ruhr-Universität Bochum
Eckart Hasselbrink, University of Duisburg-Essen

P33: The Implications for STEM Retention and Career Aspirations Through a First-Year Biology Seminar
Krista Lucas, University of California, Santa Barbara
Danielle Boyd Harlow, University of California, Santa Barbara

STRAND 6: Science Learning in Informal Contexts
Strand 6 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P34: Family Interpretations of Conservation Messaging at an Aquarium Exhibit
Victoria J. Reyes, Texas State University
Jennifer L. Idema, Texas State University
Kristy L. Daniel, Texas State University

P35: Investigating Influences, Affordances & Challenges of a Summer Teen Program
Lara Smetana, Loyola University Chicago
David Bild, Chicago Academy of Sciences
Peggy Notebaert Nature Museum

P36: Linking Family Engagement Activities to Common Learning Outcomes at Touch Tank Exhibits
James F. Kisiel, California State University, Long Beach
Shawn M. Rowe, Oregon State University
Tamara Galvan, Facilities Director, Feiro Marine Life Center

P37: Pedagogical Structures and Student Agency: How do Teachers of After-School Science Clubs Strike a Balance?
David J. Schouweiler, University of North Carolina at Greensboro
Sara Heredia, The University of North Carolina Greensboro
Edna Tan, University of North Carolina at Greensboro

P38: Seeing Social Learning: Using Social Network Analysis to Operationalize Communities of Practice
K.C. Busch, North Carolina State University
Kathryn Green, University of Georgia
Lynn Chesnut, North Carolina State University
Kathryn T. Stevenson, North Carolina State University
STRAND 7: Pre-service Science Teacher Education
Strand 7 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P39:
A Bridge between Theory and Practice: Field-Based Experiences in Science Teacher Education Programs
Hatice Ozen-Tasdemir, University of Georgia
Julie A. Luft, University of Georgia

P40:
Analysis of Secondary Pre-service Science Teachers’ Questioning during Microteaching
Elsun Seung, Indiana State University
Eunmi Lee, DePaul University
Aeran Choi, Ewha Womans University
Jinhong Jung, North Carolina Central University

P41:
Elementary Pre-service Teachers’ Perceptions of Assessment Tasks to Measure Content Knowledge for Teaching about Matter
Dante Cisterna, Educational Testing Service
Jamie N. Mikeska, Educational Testing Service (ETS)
Allison Bookbinder, Teachers College, Columbia University
David L. Myers, University of Georgia
Heena R. Lakhani, University of Washington
Luronne Vaval, Teachers College, Columbia University

P43:
Lesson Study Preparing Pre-service Elementary Teachers for Science PBL and Working with Language Minority Children
Peter Rillero, Arizona State University
Ying-Chih Chen, Arizona State University

P44:
Learning to Teach for Promoting Cognitive Demand on Student Thinking in Science Classrooms
Miray Tekkumru Kisa, Florida State University
Ryan Coker, Florida State University
Sebnem Atabas, Florida State University

P45:
Impacting Pre-service Elementary Teachers through Physical Science Educative Curriculum Materials
Brooke A. Whitworth, University of Mississippi
Lauren Simpson, University of Mississippi
Whitney Jackson, University of Mississippi
Julie James, University of Mississippi
Alice Steimle, University of Mississippi

STRAND 8: In-service Science Teacher Education
Strand 8 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P46:
Challenges in Professional Development Programs Aiming at Teaching Inquiry Thinking Strategies
Elina Lustov
Anat Zohar, The Hebrew University of Jerusalem
P47: Engineering Teacher Pedagogy: Using INSPIRES to Support Integration of Engineering Design in HS Biology Classroom
Jonathan Singer, University of Maryland, Baltimore County
Jacqueline Krikorian, University of Maryland, Baltimore County
Tory H. Williams, University of Maryland, Baltimore County
Christopher Rakes, University of Maryland, Baltimore County
Julia Ross, Virginia Tech

Yicong Zhu, Stony Brook
Gregory Rushton, Middle Tennessee State University

P51: GST-Integrated PD to Promote Interdisciplinary Approaches to STEM Education
Wm. Matthew Reynolds, North Carolina State University
Soonhye Park, North Carolina State University
Eric Money, North Carolina State University
Kyle Bunds, North Carolina State University

STRAND 10: Curriculum, Evaluation, and Assessment
Strand 10 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall
P54:  
**Development and Validation of a Rating Scale to Assess Modeling Competence**  
Anna Beniermann, Humboldt University of Berlin; Institute for Biology  
Dirk Krueger, Freie Universitaet Berlin  
Annette Upmeier Zu Belzen, Humboldt-Universität Zu Berlin

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

**Strand 11 Poster Session**  
4:45 PM – 5:45 PM  
Exhibit Hall

P55:  
**Indonesian Biology Teachers’ Perceptions of the Theory Of Evolution: A Multiple-Case Study**  
Arif Rachmatullah, North Carolina State University  
Minsu Ha, Kangwon National University  
Jun-Ki Lee, Division of Science Education, Chonbuk National University  
Sein Shin, Chungbuk National University

P56:  
**Exploring Culturally Responsive Management and Disciplinary Practices in Pre-service Teachers’ Culturally Responsive Tasks**  
Sherry A. Southerland, Florida State University

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**STRAND 12: Educational Technology**

**Strand 12 Poster Session**  
4:45 PM – 5:45 PM  
Exhibit Hall

P57:  
**Computational Experimentation, a Novel Approach in Educational Technology: Analysis of the Science Writing Heuristic**  
Richard Lamb, East Carolina University  
Jing Lin, Beijing Normal University  
Brian M. Hand, University of Iowa  
Douglas Hoston, University at Buffalo  
Amanda Kavner, University at Buffalo  
Jonah B. Firestone, Washington State University, Tri-Cities

P58:  
**Pre-service Science Teachers’ Perceptions of Teaching and Learning After Using Augmented Reality Applications**  
Denise M. Bressler, University of Pennsylvania  
Len Annetta, East Carolina University  
Marina Shapiro, California State University, Bakersfield

P59:  
**Tracing the Development of a Haptically-enabled Science Simulation (HESSs) for Buoyancy**  
James Minogue, North Carolina State University  
David Borland, UNC–Chapel Hill (RENCI)  
Tabitha Peck, Davidson College  
Emily Jackson, North Carolina State University  
Kern Qi, Davidson College  
Niall Williams, University of Maryland, College Park
P60:
Using a Faculty-developed Documentary to Communicate Chemistry Research to a High School Audience via YouTube

Stephen R. Burgin, University of Arkansas
Michelle J. Childress, University of Arkansas
Hassan Beyzavi, University of Arkansas
Yoshie Sakamaki, University of Arkansas

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

Strand 13 Poster Session
4:45 PM – 5:45 PM
Exhibit Hall

P61:
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

A62:
Practices, Knowledge, and Nature—Engineering Educators’ Views of the Domains of Engineering Literacy

Brian D. Hartman, Walla Walla University
Randy L. Bell, Oregon State University

P63:
STEM-based NOS Teaching on 7th Grade Students’ NOS Views

Gunkut Mesci, Giresun University
Eda Erdas, Kastamonu University

P64:
Training the Trainer: An exploration of a Future Teacher Educator’s NOS and Related Pedagogical Understandings

Bridget K. Mulvey, Kent State University
Jennifer C. Parrish, University of Northern Colorado
Jeffrey L. Papa, Kent State University
Joshua Reid, Middle Tennessee State University

Graduate Student Forum
5:45 PM – 7:15 PM
Salon F – Lower Level

JRST Editorial Team Meeting/Dinner
6:00 PM – 8:30 PM
Portland – Lower Level
Sponsored by: Wiley-Blackwell
(By invitation only)

Research Interest Group (RIG) Meetings
6:00 PM – 7:30 PM

Latino/a RIG
Salon B – Lower Level
Engineering Education RIG
Salon C – Lower Level
Indigenous Science Knowledge (ISK) RIG
Salon H – Lower Level
Concurrent Session 7
8:00 AM – 9:30 AM

Publications Advisory Committee
Admin Symposium—How to Get Your Research Published in Science Education Journals PAC Symposium
8:00 AM – 9:30 AM
Salon I

How to Get Your Research Published in Science Education Journals PAC Symposium

Catherine E. Milne, New York University
Christina Siry, University of Luxembourg
Ross H. Nehm, Stony Brook University, SUNY
Gail Jones, North Carolina State University
Troy Sadler, University of North Carolina at Chapel Hill
Kent J. Crippen, University of Florida
Todd Campbell, University of Connecticut
Erin L. Dolan, University of Georgia
Geeta Verma, University of Colorado, Denver
Gail Richmond, Michigan State University
Ange Fitzgerald, University of Southern Queensland
Carla Johnson, Purdue University
Sibel Erduran, University of Oxford
Sherry Southerland, Florida State University
John Settlage, University of Connecticut
Lucy Avraamidou, University of Groningen
Sonya N. Martin, Seoul National University

Administrative Session
Sandra K. Abell Institute for Doctoral Students
8:00 AM – 9:30 AM
Hawthorne/Belmont/Laurelhurst

Discussants:
Julie A. Luft, University of Georgia
Anna S. Grinath, Idaho State University

Presiders:
Gregory Rushton, Middle Tennessee State University
Grant E. Gardner, Middle Tennessee State University

Developing the Framework on Categorizing Instructional Approaches of Mathematics Equations in Biology Classrooms

FangFang Zhao, University of Minnesota
Mentor: Stephen B. Witzig, University of Massachusetts, Dartmouth

Developing Knowledge: Sex/Gender Beliefs in Undergraduates and Implications for the Classroom

Katherine Ray King, University of Louisville
Mentor: Stephen B. Witzig, University of Massachusetts, Dartmouth

Navigating Climate Change: Science, Politics, and Learning for Youth

Lynne Zummo, Stanford University
Mentor: Stephen B. Witzig, University of Massachusetts, Dartmouth

How Instructors Model Abstraction in Physical Chemistry

Jessica Karch, University of Massachusetts, Boston
Mentor: Gillian H. Roehrig, University of Minnesota
The Patterns of Students’ Diagrams and Answers while Solving Force Problems

Judyanto Sirait, University of Leicester
Mentor: Gillian H. Roehrig, University of Minnesota

Examining the Cultural Specificity of Approaches to Learning Biology

Angela N. Google, Middle Tennessee State University
Mentor: Ross H. Nehm, Stony Brook University (SUNY)

An Investigation into the Factors Influencing Acceptance of Evolution across University Instruction

Ryan Dunk, Syracuse University
Mentor: Ross H. Nehm, Stony Brook University (SUNY)

Genetics Knowledge and Belief in Genetic Determinism of Biology and Nursing Students

Katie Humrick, University of Louisville
Mentor: Ross H. Nehm, Stony Brook University (SUNY)

The Effect of Participation in the Sandra K. Abell Institute on my Dissertation’s Theoretical Framing

Jessica Dewey, University of Minnesota
Mentor: Isha DeCoito, Western University

The Elephant in the CURE Classroom: What do we Know about CUREs Taught by Graduate Teaching Assistants?

Emma Goodwin
Mentor: Isha DeCoito, Western University

Mentoring Structures and the Types of Support Provided to Early-Year Undergraduate Researchers

Gaye Defne Ceyhan
Mentor: Isha DeCoito, Western University

Sketching to Make Sense of Chemical Events at the Sub-Microscopic Levels

Heena Lakhani
Mentor: Femi Otulaja, University of the Witwatersrand

Investigating Science Teachers’ Practices on Assessing Students’ Understandings of Nature of Science

Wonyong Park, University of Oxford
Mentor: Femi Otulaja, University of the Witwatersrand

Teachers’ Indigenous Knowledge and the Possibilities of Integration into Life Sciences Teaching and Learning

Uchechi Agnes Ahanonye
Mentor: Femi Otulaja, University of the Witwatersrand

Trends In K-12 Teacher Agency Research: A Meta-analysis of 10 Years of Science Education Research

Anica Miller-Rushing
Mentor: Gail Richmond, Michigan State University


Alison Mercier, University of North Carolina at Greensboro
Mentor: Gail Richmond, Michigan State University
Middle Grade Science Teachers’ Learning Reform Based Practices in the Context of Their Physics Content Course
   Harleen Singh, University of Georgia
   Mentor: Gail Richmond, Michigan State University

History of Engineering and Engineering Education
   Ezgi Yesilyurt, University of Nevada, Las Vegas
   Mentor: Gregory Rushton, Middle Tennessee State University

Preparing STEM Graduate Students for Change: A Discursive Approach to the Study of Instructional Reform
   Francesca Williamson, Indiana University
   Mentor: Greg Rushton, Middle Tennessee State University

Increasing Retention in Graduate Education: Investigating Students’ Experiences of Departmental Supports
   Ntiana (Diana) Sachmpazidi, Western Michigan University
   Mentor: Greg Rushton, Middle Tennessee State University

Factors Influencing Group Interactions While Constructing Explanations Using the CEJ Framework in a Diverse Setting
   LaShawn McNeil, University of Georgia
   Mentor: Noemi Waight, University at Buffalo

The Conceptual Profile of Substance as a Powerful Tool to Characterize Shifts in Learning Chemistry in Student’s Ways of Speaking and Thinking about Substance
   Raul Orduna Picon
   Mentor: Noemi Waight, University at Buffalo

Relationships Between Students’ Scaffolded Small-Group Discussions and their Written Scientific Explanations
   Timothy G. Klavon, Temple University
   Mentor: Noemi Waight, University at Buffalo

STRAND 1:
Science Learning: Development of Student Understanding
New Approaches to Learning
8:00 AM – 9:30 AM
Salmon

Presider:
   Calvin S. Kalman, Concordia University

Comparison of Labatorials with Traditional Physics Laboratories
   Calvin S. Kalman, Concordia University
   Franco La Braca, Concordia University
   Mandana Sobhazadeh, Mount Royal University

Dialogical Argumentation and Assessment for Learning: Closing the Gap in the Science Classroom
   Frikkie George, Cape Peninsula University of Technology
   Keith R. Langenhoven, University of the Western Cape

Using Mind Maps to Determine Students Knowledge Dimensions on Disciplinary and Interdisciplinary Core Ideas
   Helen Semilarski, University of Tartu
   Regina Soobard, University of Tartu
   Miia Rannikmae, University of Tartu
STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Epistemic Aspects of Engagement in Novel Contexts of Learning Physics
8:00 AM – 9:30 AM
Mt Hood

Discussant:
Edit Yerushalmi, Weizmann Institute of Science, Israel
Presider:
Elon Langbeheim, Ben-Gurion University, Israel

Epistemic Aspects of Engagement in Novel Contexts of Learning Physics
Elon Langbeheim, Ben-Gurion University, Israel
Anna M. Phillips, Cornell University
Natasha G Holmes, Cornell University
David Brookes, Florida Internation
Shulamit Kapon, Technion-Israel Institute of Technology
Edit M. Yerushalmi, Weizmann Institute of Science, Israel
Samuel Safran, Weizmann Institute of Science, Israel
Maayan Schwartzer, Technion–Israel Institute of Technology

Early Childhood Engineering: Supporting Engineering Design Practices with Young Children and their Families
8:00 AM – 9:30 AM
Eugene

Discussant:
Monica Cardella, Purdue University
Presider:
Scott A. Pattison, TERC

Early Childhood Engineering: Supporting Engineering Design Practices with Young Children and Their Families
Scott A. Pattison, TERC
Monica E. Cardella, Purdue University
Hoda Ehsan, Purdue
Smirla Ramos-Montañez, Oregon Museum of Science and Industry
Gina Svarovsky, University of Notre Dame
Merredith D. Portsmore, Tufts University
Elissa Milto, Tufts University
Mary McCormick,
Chris San Antonio-Tunis, Museum of Science, Boston

STRAND 3:
Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies

Engaging Young Children in Science and Engineering Practices: Approaches to Research and Design
8:00 AM – 9:30 AM
Meadow Lark/Douglas Fir – 3rd Floor

Presider:
Eve Manz, Boston University Wheelock College of Education & Human Development

Dance-STEP: Collective Embodied Science Models and the Particulate Nature of Matter
Chris Georgen, Boston University Wheelock College of Education & Human Development
Using Iterative Co-Design to Develop Classroom Empirical Activity

Eve Manz, Boston University Wheelock College of Education & Human Development
Betsy Beckert, Boston University Wheelock College of Education & Human Development

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 V. Schwarz, Michigan State University
Eve Manz, Boston University Wheelock College of Education & Human Development

STRAND 4:
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies

Dialogic Instruction and Sense-Making of Science Concepts

8:00 AM – 9:30 AM
Salon E

Presider:
Tara M. Nkrumah, Arizona State University

Science Teaching at the Instructional Core: Opportunities for Students’ High-Level Thinking and Sensemaking

Miray Tekkumru Kisa, Florida State University
Ozlem Akcil Okan, Florida State University
Zahid Kisa, Florida State University

Teacher Learning and Planning for Epistemic Agency in Storyline Discussions

Kevin Cherbow, Boston College
Katherine L. McNeill, Boston College

Using Cogenerative Dialogues to Help Teachers Support Meaningful and Coherent Sensemaking through Consensus

Abraham Lo, BSCS Science Learning

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

The Impact of Chemistry Education Research on Theory Development, Classroom Improvements, and Pre-service Teacher Training

8:00 AM – 9:30 AM
Salon D

Discussant:
Anita Schuchardt, University of Minnesota

Modeling the Influence of a Constructivist Learning Environment in Diverse Chemistry Courses

Regis Komperda, San Diego State University
Anita Schuchardt, University of Minnesota

Understanding How Active Learning Catalyzes Students’ Attitudes and Understanding of Chemistry

Paulette Vincent-Ruz, Learning Research and Development Center
Christian D. Schunn, University of Pittsburgh
Anita Schuchardt, University of Minnesota
Measuring Theoretically Grounded Aspects of Chemistry Identity
Kathryn Hosbein, East Carolina University
Jack Barbera, Portland State University
Anita Schuchardt, University of Minnesota

What Can University Science Faculty Learn about Teaching through Engaging in Curriculum Design with K12 Teachers?
Jeffrey Spencer, University of Michigan at Ann Arbor
R. Charles Dershimer, Greenhills School
Ginger V. Shultz, University of Michigan at Ann Arbor
Anita Schuchardt, University of Minnesota

Assessment of Undergraduate Students Participation in the Science Practice in Transformed Laboratory Courses
Joi P. Walker, East Carolina University
Anita Schuchardt, University of Minnesota

How to Read the Tree of Life: Investigating Factors Influencing the Ability to Read Evolutionary Trees
Thilo Schramm, University Duisburg-Essen
Philipp Schmiemann, University of Duisburg-Essen–Biology Education

Moving Between Contexts: a Pedagogical Intervention’s Effects on Community College Biology Students
Kathryn Green, University of Georgia
Cesar Delgado, North Carolina State University
Brandon Foster, Wake Technical Community College

Students’ Perspectives on their Acceptance of Evolution
Ryan D. P. Dunk, Syracuse University
Jason R. Wiles, Syracuse University

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

Student Understandings and Perceptions of Evolution
8:00 AM – 9:30 AM
Salon C

Presider:
Grace Elizabeth Baker, Western Washington University

College Student Understanding of Extinction & Natural Selection in the Anthropocene
Yael Wyner, City College of New York, City University of New York, New York, NY
Rob DeSalle, American Museum of Natural History, New York, NY

STRAND 6:
Science Learning in Informal Contexts

Science Interest and Identity Formation in Informal Spaces
8:00 AM – 9:30 AM
Salon F

Presider:
Scott Byrd, Maine Mathematics and Science Alliance

DHH Students Making Connections across Gaps between Formal and Informal Science Learning Spaces
Scott Cohen, Georgia State University
Patrick J. Enderle, Georgia State University
Jessica Scott, Georgia State University
Maggie Renken, Georgia State University
I’m Fine With Just Collecting Data: Engagement Profiles Differ in Citizen Science

Till Bruckermann, IPN–Leibniz Institute for Science and Mathematics Education
Hannah Greving, Leibniz–Institut für Wissensmedien (IWM)
Ute Harms, IPN–Leibniz Institute for Science and Mathematics Education

Participating in the Scientific Publication Process: Expanding Students’ Perceptions of Scientific Inquiry and Identity

Sarah Fankhauser, Oxford College of Emory University
Gwendolynne Reid, Oxford College of Emory University
Gwendolyn Mirzoyan, Emory University
Clara Meaders, Cornell University
Olivia Ho-Shing, Harvard University

Reasons for Teenagers to Continuously Volunteer in an Informal Science Program

Sapir Salamander, Ben-Gurion University of the Negev, Israel
Orit Ben Zvi Assaraf, Ben-Gurion University of the Negev, Israel
Netzach Farbiash

Why Some Persist: A Case Study of Six Girls’ Development of Interest in Science

Stephanie Rafanelli, Stanford University Graduate School of Education

STRAND 7:
Pre-service Science Teacher Education

Informal Science Education and Socioscientific Issues
8:00 AM – 9:30 AM
Salon A

Presider:
Joanne K. Olson, Texas A&M University

Developing Practice across Contexts: Examining Long-Term Impacts of Pre-service Teacher Internships within an Informal Setting

James F. Kisiel, California State University, Long Beach

A Place-Based Education Analysis of Pre-service Teachers Images of Science Instruction in Informal Settings

Karthigeyan Subramaniam, University of North Texas
Christopher S. Long, University of North Texas
Pamela Harrell, University of North Texas

Elementary Pre-service Teachers’ Perceptions of Facilitating Socioscientific Issues

Melanie Kinskey, University of South Florida
Dana L. Zeidler, University of South Florida

Socio-Scientific Issues as Tools for Improving Environmental Knowledge, Skills, and Behavior in Pre-service Education

Anat Abramovich, Malam Headquarters Israeli Center for Scientific Technological Education Techn
Shirley Miedijensky, Technion–Israel Institute of Technology
Yael Shwartz, The Weizmann Institute of Science
STRAND 7: Pre-service Science Teacher Education

Shifting the Teaching Paradigm

8:00 AM – 9:30 AM
Salon B

Presider:
Claire Cesljarev, Indiana University

Pre-service Elementary Teachers’ Intensive Field Experience at a Science Summer Program: Effects on Self-Efficacy

Jacquelyn Duran, Teachers College, Columbia University
Alison Matthews, Teachers College, Columbia University
Allison Bookbinder, Teachers College, Columbia University
Min Jung Lee, Teachers College, Columbia University

Changes in Pre-service Teachers’ Orientations Towards Teaching—A Four-Year Case Study

Stefan Sorge, IPN–Leibniz Institute for Science and Mathematics Education, Kiel

Development of Beginning Teacher’s Understanding of Students, Learning and Assessment: A Longitudinal Study

Enrique Pareja, Truman State University

Development of Resident Teachers’ Noticing Skills Prior to Student Teaching

Amity F. Gann, Temple University, College of Education
Janelle M. Bailey, Temple University

STRAND 8: In-service Science Teacher Education

Professional Development using Computational Thinking and Robotics

8:00 AM – 9:30 AM
Pearl

Presider:
Todd L. Hutner, The University of Alabama

Engage Teachers as Active Co-Designers to Integrate Computational Thinking in STEM Classes

Sally PW Wu, Northwestern University
Gabriella Anton, Northwestern University
Connor Bain, Northwestern University
Amanda N. Peel, Northwestern University
Michael Horn, Northwestern University
Uri Wilensky, Northwestern University

Secondary Science Teachers Conceptualizations of Computational Thinking and Perceived Barriers to CT/Content Integration

Vance J. Kite, North Carolina State University
Soonhye Park, North Carolina State University

Teaching Science, Math, and Coding using Collective Argumentation: A Case Study of One Teacher’s Implementation

Anna Gillespie-Schneider, University of Georgia
Barbara A. Crawford, University of Georgia
AnnaMarie Conner, University of Georgia
ChanMin Kim, Pennsylvania State University
Roger Hill, University of Georgia
Timothy Foutz, University of Georgia
Sidney Thompson, University of Georgia
David F. Jackson, University of Georgia
Using Teacher Narratives of Integrating LEGO Robotics as Assessment Tools and Evidence of Professional Learning
Adam Devitt, California State University, Stanislaus

STRAND 10: Curriculum, Evaluation, and Assessment
Analysis and Evaluation of Science Curricula
8:00 AM – 9:30 AM
Columbia

Presider:
Gyeong-Geon Lee, Seoul National University

Evaluating Computational Modeling Curriculum through Students’ and Teachers’ Perspectives: Insight into Enacted and Experienced Curriculum
Arif Rachmatullah, North Carolina State University
Danielle C. Boulden, North Carolina State University
Jennifer Houchins, North Carolina State University
Bita Akram, North Carolina State University
Nicholas Lytle, North Carolina State University
Veronica Cateté, North Carolina State University
Tiffany Barnes, North Carolina State University
Eric N. Wiebe, North Carolina State University

Examining the Role of Curriculum in Supporting Literacy Demands in NGSS Instruction
Carrie D. Allen, University of North Texas
Rasha Elsayed, WestEd
Ryan Burke, WestEd

International Baccalaureate Biology Curriculum Analysis
Mohammed Estaiteyeh, Western University

Structural Causal Modeling of Science and General Core Competencies in Korean 2015 Revised National Curriculum
Gyeong-Geon Lee, Seoul National University
Hun-Gi Hong, Seoul National University
Yu-Jung Kim, Seoul National University
Wonhyeong Jang, Seoul National University

STRAND 11: Cultural, Social, and Gender Issues
Partnerships and STEM Learning Experiences Across (In)formal Contexts
8:00 AM – 9:30 AM
Salon H

Presider:
Eli Tucker-Raymond, TERC

Factors that Impact the Development of STEM Programming at a Newly Emerging STEM School
Felicia D. T. Leammukda, St. Cloud State University
Gillian H. Roehrig, University of Minnesota
Rightful Presence and Power: Examining Our Research-Practice and Youth-Adult Partnerships

Day W. Greenberg, University of Michigan
Angela Calabrese Barton, University of Michigan
Carmen Turner, The Boys and Girls Club of Lansing
Kaila Williams, The Boys and Girls Club of Lansing
Jaila Williams, The Boys and Girls Club of Lansing
Za’Mani Roper, The Boys and Girls Club of Lansing

Teacher Learning, Identity and Agency, and the Enactment of Informal Science Learning in Formal Classrooms

Jennifer Adams, University of Calgary

Teacher Perceptions as Key Role in Science Education Outcomes across all Places and Contexts

Takeshia Pierre, University of Florida
Julie C. Brown, University of Florida

Leveraging the Novelty of Virtual Reality to Challenge Students’ Initial Ideas of Cells

Meredith P. Thompson, MIT
Lucy Cho, MIT
Melat Anteneh, MIT
Cigdem Uz Bilgin, MIT

Developing Spatial Awareness in Novel Learning Environments

Cigdem Uz Bilgin, MIT
Melat Anteneh, MIT
Lucy Cho, MIT
Meredith P. Thompson, MIT

Good Learning Shouldn’t Be Novel: Individual Level Impact of Collaborative Learning in Mobile Augmented Reality on Student Learning

Denise M. Bressler, University of Pennsylvania
Shane Tutwiler, University of Rhode Island

STRAND 12: Educational Technology
Beyond the Novelty Effect—Examining Learning Affordances of XR Educational Technologies
8:00 AM – 9:30 AM
Salon G

Not all Novelty Effects are Created Equal: Differential Gains in Self-Efficacy and Online Behavior

Shane Tutwiler, University of Rhode Island
Jason Chen, William and Mary
Amy M. Kamarainen, Harvard Graduate School of Education
Shari J. Metcalf, Harvard University
Tina Grotzer, Harvard University
Christopher Dede, Harvard University

STRAND 13: History, Philosophy, Sociology, and Nature of Science
Teaching of NOS
8:00 AM – 9:30 AM
Portland

Presider:
Jennifer C. Parrish, University of Northern Colorado

Understanding Teachers’ Use of a Tool for Selecting Nature of Science Trade Books

Jeanne Brunner, University of Massachusetts, Amherst
Christine McGrail, University of Massachusetts, Amherst
Improving Students' Perceptions of NOS: An Experimental Study
Aysegul Cilekrenkli, Bogazici University
Ebru Kaya, Bogazici University

Promoting 4th Graders' NOS and Environmental Views through Bridging Formal and Informal Place-Based SSI Learning
Ben C. Herman, University of Missouri
Sarah V. Poor, University of Missouri
Robert T. Oertli, University of Missouri
Kristen Schulte, Missouri River Relief
Blake Romaker, University of Missouri

What Changes to Students' Ideas About Science When History of Science Stories Become Everyday Homework?
Shiang-Yao Liu, National Taiwan Normal University, Taiwan
Cyong-Huei Chen, Jingxing Junior High School, Taipei, Taiwan
Shih-Yeh Chen, Dali Senior High School, Taichung, Taiwan

NETWORKING BREAK
9:30 AM – 10:00 AM

Concurrent Session 8
10:00 AM – 11:30 AM

Awards Committee
Admin Symposium-Diverse Scholarly Trajectories in Science Education: Charting Pathways for Science Education Research
10:00 AM – 11:30 AM
Eugene

Diverse Scholarly Trajectories in Science Education: Charting Pathways for Science Education Research
Noemi Waight, University at Buffalo

Indigenous Science Knowledge-RIG (ISK-RIG)
Admin Symposium-School, Community, Citizenship: Indigenizing Science Education across Places and Contexts
10:00 AM – 11:30 AM
Salon I

Developing Indigenous Students' STEM identities through a Phenomenon-Based Approach: Integrating a Stream Curriculum in the Elementary Classroom
Julie Robinson, University of North Dakota
Joshua Hunter, University of North Dakota
Bonni Gourneau, University of North Dakota
Anna Bahnson, United Tribes Technical College

Indigenizing High School Science Curriculum: A Case of Indigenous Local School Board in Nepal
Mahesh Tharu Chaudhary, Shree Jagadamba Higher Secondary School
Dinesh Gautam, Shree Jagadamba Higher Secondary School
Bhaskar Upadhyay, University of Minnesota
**Equity and Ethics Committee**

**Jhumki Basu Poster Symposium—Equity In Science Education Across Places and Contexts**

**10:00 AM – 11:30 AM**

**Hawthorne/Belmont/Laurelhurst**

Organizers:

**Gillian U. Bayne**, Lehman College of CUNY

**Stephanie Eldridge**, University of Georgia

**Althea Hoard**, Relay Graduate School of Education

**Tara M. Nkrumah**, Arizona State University

**James M. Nyachwaya**, North Dakota State University

Presider:

**Catherine Quinlan**, Howard University

**White Teachers and Diverse STEM Students’ Learning Progressions Towards or Away From Culturally Relevant STEM Education**

**Amelia A. Brown**, University of Tennessee, Knoxville

“**Judgment Free**” Space in Supporting African American Girls’ Identity in STEM

**Faith Freeman**, Guilford County Schools/University of North Carolina at Greensboro

**Identities in Crisis?**: Understanding the Identity Work of Elementary Students of Color

**Terrance Burgess**, Syracuse University

**Supporting Student Interest Development and Transformative Learning in Geoscience: The Testing of a Socio-Cognitive Pedagogical Model**

**Shondricka Burrell**, Duquesne University

**Do Students Gain Scientific Inquiry Knowledge and Practices by Participating in a School Garden Inquiry Unit**

**Carmen Angelica Carrion**

**Does Systematic Professional Development (PD) for Science Teachers of English Language Learners (ELLs) Meet Their Professional Needs and What is the Relationship Between Perceptions of PD and Self-Efficacy to Teach Science to ELLs?**

**Lillian Hau-Degand**, Illinois Institute of Technology

**Students Know the Language Boundaries in Science: Challenges and Opportunities of Translanguaging in Engineering Learning**

**Greses Anabell Perez**, Stanford University

**Active Learning in Large STEM Classes: Perceptions from Undergraduate and Graduate Students**

**Ngawang Y. Gonsar**, Gustavus Adolphus College

**Lorelai Patrick**, University of Minnesota

**Sehoya Cotner**, Gustavus Adolphus College

**Exploring Pre-service Teachers' Developing Understandings of Equitable Pedagogies for Engaging Elementary Students in Science Practices**

**María González-Howard**, The University of Texas at Austin

**Tia Madkins**, The University of Texas at Austin

**Tatiane Russo-Tait**, The University of Texas at Austin

**Maximilan Sherard**, The University of Texas at Austin
Approaches to Learning Biology of Women of Color: The Intersectionality of Gender, Race, and Science Identity
Angela N. Google, Middle Tennessee State University
Anna S. Grinath, Idaho State University
Grant E. Gardner, Middle Tennessee State University

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

Revealing the Queer-spectrum in STEM: Undergraduate Student Responses to Diverse Gender Identity and Sexual Orientation Demographics Questions
A.M. Aramati Casper
Katherine Ray King
Rebecca A. Atadero
Linda C. Fuselier

Othermothering in Science Education: When Leading Transcends Walls
Stefanie LuVenia Marshall, University of Minnesota

Urban Students’ perspectives on Advanced Placement Enrollment
Justina Ogodo, Baylor University School of Education

Indonesian Pre-service Biology Teachers’ and Biology Education Professors’ Views on Evolution: Religious, Socio-Cultural, and Dilemma of Teaching and Learning Evolution
Arif Rachmatullah, North Carolina State University

Joys and Traumas of Black Female Science Teachers, a Phenomenological Study
Alexis Riley, Teachers College, Columbia University

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

Power at Play: The Social, Political, and Cultural Mechanisms of Digital Game-Based Learning in Science
Ora D. Tanner, University of South Florida

Girls Prefer Biology, Boys Physics: Gender Differences in School Science Content Interest
Radu Bogdan Toma, Universidad de Burgos
Jesus Ángel Meneses Villagrá

Becoming a Teacher: Reflective Practice as a Way of Exploring Secondary Science Teacher Beliefs And Practices
Preethi Titu, University of Minnesota

Examining Elementary Students’ Images of Engineers and Interests in Engineering Careers
Ezgi Yesilyurt, University of Nevada, Las Vegas

Re-Novicing to Teach Science: The Case of an Experienced Elementary Teacher
Lu Wang, University of Georgia
Hui Tang
STRAND 1:
Science Learning: Development of Student Understanding

Student Learning
10:00 AM – 11:30 AM
Salmon

Presider:
Jonathan Shemwell, University of Alabama

Joseph T. Wong, University of California, Irvine
Sage Andersen, University of California - Irvine
Michael Corrigan, MDED Inc
Doug Grove, MDED Inc.
Brad Hughes, University of California, Irvine

Examining Middle School Students’ Knowledge and Beliefs of Earthquake and Tsunami
Douglas S. Lownsbery, Oregon State University
Lawrence B. Flick, Oregon State University

Learning Progression of Students’ Reasoning about Life Cycles
Hayat Hokayem, Texas Christian University
Ihsan Ghazal, Modern Community School
Fady Maalouf, Modern Community School
Savannah Graham, Texas Christian University
Hui Jin, Educational Testing Service

Student Learning of Emergent Science Processes Using the PAIR-C Framework
Brandon VanBibber, University High School
Polly K Lai, Queensland University
Lu Ding
Josh Adams
Michelene Chi, Arizona State University

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Disrupting Science Education Across Contexts: K-12 Learning, Teaching & Local Communities
10:00 AM – 11:30 AM
Mt Hood

Immersive Science Learning Using the Eco Challenge App
Michelle Williams, Michigan State University
Manju Lind, Williams Learning Solutions

Making Assessments Essential to Elicit Student Thinking: Emphasis on Crosscutting Concepts
Dante Cisterna, Educational Testing Service
Lei Lui, Educational Testing Service

Elementary Principals as Boundary Spanners: How One’s Social Network Impacts Decision-Making for Science
Stefanie Marshall, University of Minnesota

Centering Critical Race Epistemology in the Learning to Teach of Science
Christina Restrepo Nazar, California State University, Los Angeles
STRAND 2:
Science Learning: Contexts, Characteristics and Interactions
Teacher Perspectives, Contexts, Networks, & Roles
10:00 AM – 11:30 AM
Meadow Lark/Douglas Fir – 3rd Floor

Presider:
Xiaoxin Lyu, Teachers College Columbia University

Leveraging Networks to Achieve Change at Scale: Identifying Capacity for Science Professional Learning in Schools
Thomas "TJ" McKenna, Boston University
Todd Campbell, University of Connecticut

Rattlesnakes with Vision: Teacher Perspectives of Administrative Affordances and Constraints to District-Wide STEM
Michael Giamellaro, Oregon State University - Cascades
Debbie Siegel, Institute for Learning Innovation
Benjamin Ewing, Oregon State University

Caregiver-Child Interactions during a Family Making Program: Our Role as Facilitators and Researchers
Jing Yang, Indiana University
Amber M. Simpson, Binghamton University
Adam V. Maltese, Indiana University
Euisuk Sung, Indiana University

STRAND 4:
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies
Formative Assessment tools and practices
10:00 AM – 11:30 AM
Salon E

Presider:
Jonathon Grooms, George Washington University

Analytical Framework of Influences on Science Teachers’ Formative Assessment (FA) Practices
Ira Caspari, University of Massachusetts, Boston
Hannah Sevian, University of Massachusetts, Boston

Qualitative Analysis to Elicit Features of Epistemic Knowledge When Middle School Students Engaged in Dialogical Argumentation
Getachew T Zegeye, Addis Ababa University
Jonathan Francis Osborne, Stanford Graduate School of Education
Mesfin Tadesse Beshah, University of Addis Ababa

Using Design Drawings to Formatively Assess Design-Based Science Learning
Hanna Stammes, Delft University of Technology
Ineke Henze-Rietveld, Delft University of Technology
Erik Barendsen, Radboud University & Open University
Marc de Vries, Delft University of Technology
STRAND 5: College Science Teaching and Learning (Grades 13-20)

Developing Students’ Contemporary Practices

10:00 AM – 11:30 AM

Salon D

Presider:
Lisa Kenyon, Wright State University

Moral Reasoning About Human Genetic Enhancement Using CRISPR

Katie Humrick, University of Louisville
Linda C. Fuselier, University of Louisville

Patterns of Disengagement: How Students Avoid Discussing Ethics

Eun Ah Lee, University of Texas at Dallas
Nicholas Gans, University of Texas at Arlington
Magdalena Grohman, University of Texas at Dallas
Marco Tacca, University of Texas at Dallas
Matthew J. Brown, University of Texas at Dallas

STEM Graduate Students’ Development at the Intersection of Research, Innovation, and Leadership

Cindy A. Lenhart, Oregon State University
Jana L. Bouwma-Gearhart, Oregon State University
Judith Giordan, Oregon State University
Rich Carter, Oregon State University

STRAND 6: Science Learning in Informal Contexts

Examining Under-Represented Young Women’s STEM Identities

10:00 AM – 11:30 AM

Salon C

Using a Storied-Identity Lens to Understand How Under-represented Women Become a STEM Person

Amal Ibourk, Florida State University
Roxanne M. Hughes, Center for Integrating Research and Learning, NHMFL / FL State University
Clausell Mathis, Florida State University

Exploring Intersectionality and Rightful Presence in Girls’ Engineering Experiences in Middle School Science

Edna Tan, University of North Carolina at Greensboro
Aerin W. Benavides, The University of North Carolina at Greensboro
Angela Calabrese Barton, University of Michigan, Ann Arbor

Positioning Girls of Color as Future Scientists: The Implications for Identity Research

Semiha Gun-Yildiz, University of Massachusetts Dartmouth
Shakhnoza Kayumova, University of Massachusetts-Dartmouth
Akira Harper, University of Massachusetts, Dartmouth

Weaving In- and Out-of-School Experiences to Craft STEM Identities

Carrie D. Allen, University of North Texas
STRAND 6: Science Learning in Informal Contexts
Learning Science in Informal Science Clubs and Camps
10:00 AM – 11:30 AM
Salon F

Presider:
Heidi Cian, Florida International University

An Exploration of Youth Approaches to Community Engineering Problem Definition
Jacqueline Handley, University of Michigan
Elizabeth B. Moje, University of Michigan

Understanding Quality Learning and Teaching in STEM clubs: What Does the Evidence Base Tell Us?
Angela Fitzgerald, University of Southern Queensland
Kate Davis, University of Southern Queensland
Tania Leach, University of Southern Queensland
Neil Martin, University of Southern Queensland
Shelley Dunlop, Queensland Museum

Using Place as a Primary Resource for Youth Independent Projects at a Wilderness Summer Camp
Eleanor Kenimer, Michigan State University

What Happens after edTPA? New Teachers' Views of the Value of edTPA Experiences
Meghan E. Marrero, Mercy College
Jessica Riccio, Teachers College, Columbia University
Amanda M. Gunning, Mercy College
Latanya Brandon, University of Connecticut

STRAND 7: Pre-service Science Teacher Education
Making Instructional Decisions: Assessment and edTPA
10:00 AM – 11:30 AM
Salon A

Presider:
Amity F. Gann, Temple University, College of Education

Increasing Candidate Success on the edTPA Through an NGSS-Aligned Science Methods Course
Wm. Matthew Reynolds, North Carolina State University
Soonhye Park, North Carolina State University
K. C. Busch, North Carolina State University
Gary W. Wright III, North Carolina State University

What Happens after edTPA? New Teachers' Views of the Value of edTPA Experiences
Meghan E. Marrero, Mercy College
Jessica Riccio, Teachers College, Columbia University
Amanda M. Gunning, Mercy College
Latanya Brandon, University of Connecticut

Fostering Informed Design Decision-Making Using Argumentation
Ying Ying Seah, Purdue University
Alejandra J. Magana, Purdue University
Carina M. Rebello, Purdue University
STRAND 8: In-service Science Teacher Education

In-service Science Teacher Education

10:00 AM – 11:30 AM

Pearl

Presider: Wonyong Park, University of Oxford

Comparing Teacher and Professional Developer Artifacts to Assess Perceptions of Key Aspects of Argument-Based Inquiry

Andrea Ash, University of Iowa
Mark A. McDermott, University of Iowa

Cross-Subject Collaboration about Argumentation between Science and Religious Education Teachers in England: A Case Study

Wonyong Park, University of Oxford
Sibel Erduran, University of Oxford
Liam Guilfoyle, University of Oxford

Professional Development for Science Teachers on Socioscientific Argumentation: Examining the Change in Teachers’ Knowledge

Bahadir Namdar, Recep Tayyip Erdogan University
Hasan Bag, Recep Tayyip Erdogan University

Understanding the Impact of Short-Term Professional Development on Secondary Science Teacher’s Conceptions of Argumentation Pedagogy

Karen Woodruff, Montclair State University

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STRAND 8: In-service Science Teacher Education

Looking Beyond Routines to Study How Teachers Develop Adaptive Expertise with Epistemic Tools

10:00 AM – 11:30 AM

Salon B

Discussant: Andy Cavagnetto, Washington State University

Presider: Gavin W. Fulmer, University of Iowa

Looking beyond Routine Pedagogy to the Development of Adaptive Expertise for Immersive Argument-Based Inquiry

Brian Hand, University of Iowa
Gavin W. Fulmer, University of Iowa
Jee Suh, University of Alabama

Developing Teacher Instruments and Protocol to Study Teachers’ Knowledge of Language, Argument, and Dialogic Interaction as Epistemic Tools

Gavin W. Fulmer, University of Iowa
Jee Suh, University of Alabama
Brian Hand, University of Iowa
Jihyun Hwang, University of Iowa
Chenchen Ding, University of Iowa
William Hansen, University of Iowa

Developing Adaptive Expertise through a Three-year Professional Development Program: Evaluation of the First Year Program

Jee Suh, University of Alabama
Brian Hand, University of Iowa
Gavin W. Fulmer, University of Iowa
Jale Ercan Dursun, University of Alabama
Krystal Flantroy, University of Alabama
Elementary Teachers’ Understandings and Concerns about Epistemic Tools and Adaptiveness: Preliminary Findings from Case Studies

Krystal Flantroy, University of Alabama
Catherine Lammert, University of Iowa
Jee Suh, University of Alabama
Brian Hand, University of Iowa
Gavin W. Fulmer, University of Iowa
Jale Ercan Dursun, University of Alabama
Yejun Bae, University of Iowa
Andrea Malek Ash, University of Iowa

Preliminary Baseline Results of Teachers’ Epistemic Orientation and Knowledge of Epistemic Tools

Jihyun Hwang, University of Iowa
Gavin W. Fulmer, University of Iowa
Brian Hand, University of Iowa
Jee Suh, University of Alabama

STRAND 10:
Curriculum, Evaluation, and Assessment

Analyzing Real-world Data
10:00 AM – 11:30 AM
Columbia

Presider:
Molly Stuhlsatz, BSCS

An Exploration of Everyday Contexts of Energy through Online News Article Text Mining

Nam-Hwa Kang, Korea National University of Education
Chi Yeong Oh, Korea National University of Education

Making Expertise Visible: Transferring the Control-of-Variables Strategy Across Disciplinary Contexts

Martin Schwichow, PH Freiburg
Johanna Kranz, Biology Education, University of Viena
Martina Brandenburger, PH Freiburg
Andreas Nehring, Leibniz Universität Hannover
Peter Edelsbrunner, ETH Zürich
Andrea Moeller, University of Viena, Biology Education

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
Brian M. Donovan, BSCS Science Learning
Jeffrey Snowden, BSCS Science Learning
Louise Mead, Michigan State University

What do Data-Based Questions Really Test: Insights from Pre-service Physics Teachers’ Think Aloud Interviews

Yann S Ong, National Institute of Education, Nanyang Technological University
**STAND 11: Cultural, Social, and Gender Issues**

**Centering Race, Whiteness, and Cultural Responsiveness in Science Education**

10:00 AM – 11:30 AM

Salon H

Presider:

*Mario Pickens*, Georgia State University

Critical Race Theory & Critical Whiteness Studies: Unpacking Pre-service Science Teachers’ Conceptualizations of Equity

*Amber C. Davis*, University of Michigan

Stories from the Field: Exploring Culturally Responsive Science Teaching in a Pilot Study

*Jamie Wallace*, American Museum of Natural History

*Elaine V. Howes*, American Museum of Natural History Richard Gilder Graduate School

The Policing Presence of Whiteness in Science Education

*Jonathan D. McCausland*, The Pennsylvania State University

Upbringing: An Equity Issue in Science Teacher Recruitment

*Mumiah Rasmusen*, University College Copenhagen

*Bjørn Friis Johannsen*, University College Copenhagen

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

Using Critical Frameworks to Disrupt Deficit Perspectives of Latinx Teachers, Students, and Communities

10:00 AM – 11:30 AM

Salon G

Presider:

*Greses Pérez*, Stanford University

Cultivating and Characterizing the Development of STEM Interest Through the Lens of Intersectionality

*Deena Gould*, Arizona State University

*Priyanka Parekh*, Transylvania University

Disparities in Biology Teachers’ Expectations for a Student Science Writing Activity

*Quentin C. Sedlacek*, California State University, Monterey Bay

Interrupting Deficit Perspectives with Elementary Teachers in a Latinx Community: Reflections from a Collaborative Ethnography

*Michele Brown*, Penn State University

Using Autobiographies of Latinx Pre-service Teachers (LPTs) to Build a Culturally Relevant Instruction

*Noushin Nouri*, University of Texas, Rio Grande Valley

*Jair Aguilar*, The University of Texas, Rio Grande Valley

*Patricia Ramirez-Biondolillo*, The University of Texas, Rio Grande Valley

*Vero G. Frady*, The University of Texas, Rio Grande Valley
STRAND 13:
History, Philosophy, Sociology, and Nature of Science

SSI and NOS
10:00 AM – 11:30 AM
Portland

Presider:
Renee S. Schwartz, Georgia State University

Compassion as a Framework for Understanding and Responding to Socioscientific Issues
David C. Owens, Georgia Southern University
Dana L. Zeidler, University of South Florida

Identifying Socioscientific Orientations in the Context of Socioscientific Issues
Dana L. Zeidler, University of South Florida
Ben C. Herman, University of Missouri
Melanie Kinskey, University of South Florida
Michael Mitchell, University of South Florida
Selene Y. Willis, University of South Florida
Karrie A. Wikman, University of South Florida
Tara M. Nkrumah, Arizona State University
Scott M. Applebaum, University of South Florida
Eunhang Lee, University of South Florida

Promoting Active Informed Citizenry through Science Education: A Stage beyond SSI
Tapashi Binte Mahmud Chowdhury, University of Tartu
Jack B. Holbrook, University of Tartu
Miia Rannikmae, University of Tartu

Socioscientific Topics or Issues, and Why This Distinction Matters: A Critical Review
Nannan Fan, East China Normal University
Sihan Xiao, East China Normal University
Li Ke, University of North Carolina, Greensboro

NARST ANNUAL MEMBERSHIP MEETING
11:30 AM – 12:30 PM
Salon I – Lower Level

LUNCH
11:30 AM – 12:30 PM
On Your Own
PLENARY SESSION 2
12:30 PM – 1:45 PM
Salon E & F – Lower Level

Announcement of 2021 Venue & Passing of the Gavel

Philip Bell, University of Washington

Philip Bell is Professor and Chair of Learning Sciences & Human Development in the College of Education at the University of Washington where he holds the Shauna C. Larson Endowed Chair in Learning Sciences. His current research focuses on understanding and resourcing equity improvements in PK-12 science education. He has worked with families and communities in their home settings and neighborhoods, in classrooms and informal education programs, and across districts and national networks with teachers and educational leaders. Since 2008 he has directed the UW Institute for Science & Math Education focused on promoting equity and justice in PK-12 STEM education through partnerships between the university, community organizations, and educational institutions. Bell edits a popular collection of professional learning resources called STEM Teaching Tools. He has a background in human cognition and development, science education, computer science, and electrical engineering.

Making Science Education Matter in a Damaged and Unjust World

Abstract: Whose interests are being served through contemporary efforts in science education? In what ways are researchers responsible for promoting equity and justice? Through this presentation I continue a conversation in our field about the multiple ways in which science education should engage in justice projects. I use this focus to explore how our work can promote a thriving world at a time of ecological crisis and social turmoil. By leveraging insights from a range of research and development efforts, I highlight how our field might go about infrastructuring specific equity and justice projects. I argue for collectively deliberating on and enacting social imaginaries for science education that center diverse sense-making; coordinate science learning directly with civic, family, and community life; and work in solidarity with the interests of communities experiencing systemic oppression and marginalization. From this stance, I call upon our community to continue exploring how we might organize ourselves and our efforts to enact science-related justice projects within and across institutions and organizations to better support thriving and just futures.

Concurrent Session 9
2:00 PM – 3:30 PM

International Committee
Admin Symposium-International Perspectives on Science Education in Multicultural and Multilingual Contexts
2:00 PM – 3:30 PM

Eugene

International Perspectives on Science Education in Multicultural and Multilingual Contexts

Mariona Espinet, Autonomous University of Barcelona, Spain
Audrey Msimanga, Sol Plaatje University, South Africa
Saouma B. Boujaoude, American University of Beirut, Lebanon
Alberto J Rodríguez, Purdue University, USA
Sonya N. Martin, Seoul National University, Republic of Korea
Maurício Pietrocola, Universidade de Sao Paulo, Brasil
CADASE RIG
Admin Symposium-The African Diaspora Context: School, Community, and Citizenship in Science Education
2:00 PM – 3:30 PM
Hawthorne/Belmont/Laurelhurst

The African Diaspora Context: School, Community, and Citizenship in Science Education
Mary M. Atwater, University of Georgia
Rona M. Robinson-Hill, Ball State University
Terrell R. Morton, University of Missouri, Columbia

Contemporary Methods RIG
Admin Symposium-Supporting and Advancing Science Education Research Practice through Community Discussions
2:00 PM – 3:30 PM
Salon I

Stanley M. Lo, University of California, San Diego
Francesca Williamson, Indiana University
Glenn Dolphin, University of Calgary
Joe Taylor, University of Colorado, Colorado Springs
Ayca K. Fackler, The University of Georgia
Christa Haverly, Northwestern University
Harini Krishnan, Florida State University

STRAND 1:
Science Learning: Development of Student Understanding
Student Understandings about Energy and Light
2:00 PM – 3:30 PM
Salmon

Presider:
Cari F. Herrmann Abell, BSCS Science Learning

A Little Knowledge is a Dangerous Thing: Diffraction Vs. Understanding of Rectilinear Propagation of Light
Estelle Blanquet, LACES, ESPE d’Aquitaine, University of Bordeaux (France)
Violette Blé, Lycée de Langon, Bordeaux (France)
Claire Darraud, XLIM, University of Limoges (France)
Fabienne Goldfarb, Aime Cotton Laboratory, university Paris Sud (France)
Manuela Miron, University of Iasi (Romania)
Eric Picholle, Inphyni, CNRS-Université de Nice Sophia-Antipolis membre Université Côte d’Azur (France)

An Elementary Student’s Journey to Improved Understanding of Energy
Sara J. Lacy, TERC
Roger G. Tobin, Tufts University
Sally Crissman, TERC
Nick Haddad, TERC
Developing Energy, Systems, and Fields in Middle School—In Praise of Modest Goals

Marcus Kubsch, IPN–Leibniz Institute for Science and Mathematics Education
Sebastian T. Opitz, IPN–Leibniz Institute for Science and Mathematics Education
Jeffrey Nordine, IPN–Leibniz Institute for Science and Mathematics Education
David L. Fortus, Weizmann Institute of Science
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel
Joseph S. Krajcik, Michigan State University

Following Students’ Conceptualizations of Refraction

Yaron Schur, David Yellin Academic College, Jerusalem, Israel
Ainat Guberman, David Yellin Academic College, Jerusalem, Israel
Svetlana Ovsyannikov, David Yellin Academic College, Jerusalem, Israel

Shifting Towards NGSS Instruction: Epistemic Agents in Middle School Classrooms

Katy Nilsen, WestEd
Jacklyn Powers, WestEd
Ashley Iveland, WestEd

Developing Epistemic Agency: Students’ Perspectives on and Experiences with Argumentation During STEM Design Challenges

Maria González-Howard, University of Texas at Austin
Victor D. Sampson, University of Texas at Austin
Christina L. Baze, University of Texas at Austin
Lawrence Chu, The University of Texas at Austin
Todd L. Hutner, The University of Alabama
Richard Crawford, The University of Texas at Austin

A Marginalized Student’s Epistemic Agency and Associated Conflicts in Small-Group Argumentation in a Science Classroom

Heesoo Ha, Seoul National University
Heui-Baik Kim, Seoul National University

STRAND 2: Science Learning: Contexts, Characteristics and Interactions

Agency

2:00 PM – 3:30 PM
Mt Hood

Presider:
Heesoo Ha, Seoul National University

Student Opportunities to Enact Epistemic Agency Through Engagement with the NGSS Science and Engineering Practices

Meghan Macias, University of California, Santa Barbara
Elizabeth Arnett, WestEd
Alexis Spina, University of California, Santa Barbara
Ashley Iveland, WestEd
Ted Britton, WestEd

STRAND 3: Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies

Factors Influencing Early Elementary Teachers’ Integration of Science and Engineering Practices in Their Classrooms

2:00 PM – 3:30 PM
Meadow Lark/Douglas Fir – 3rd Floor

Discussant:
Katherine McNeill, Boston College
The Role of Context in the Development of Elementary Science Teachers

Elizabeth Davis, University of Michigan
Adam Bennion, University of Michigan
Amber Bismack, University of Michigan

Teacher Learning in a Professional Development for Scientific Sense-Making

Amelia Wenk Gotwals, Michigan State University
Kirsten Edwards, Michigan State University
Lisa Domke, Michigan State University
Arianna Pikus, Michigan State University
Blythe Anderson, Michigan State University
Tanya S. Wright, Michigan State University

The Influence of Curriculum Conditions on Teachers’ Use of Informational Books in Teaching Science

Alison K. Billman, University of California, Berkeley
Bryce Becker, University of California, Berkeley
Marjorie Rowe, University of California, Berkeley
P. David Pearson, University of California, Berkeley

Integrating Scientific Modeling in Elementary Classrooms: Why a PD May Work for Some but not Others

Christa Haverly, Northwestern University

Physics Teachers’ Interpretation of Scientific Literacy in China

Guopeng Fu, East China Normal University

Science and Religious Education Teachers’ Views of the Comparison of Argumentation in Science and Religion

Liam Guilfoyle, University of Oxford
Sibel Erduran, University of Oxford
Wonyong Park, University of Oxford

Teaching Students with LD and English Learners to Write Mechanistic Explanations

Yewon Lee, University of Maryland, College Park
Susan De La Paz, University of Maryland, College Park
Daniel M. Levin, University of Maryland, College Park

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

Tools and Frameworks to Measure Students’ Success and Struggles

2:00 PM – 3:30 PM
Salon C

Defining Dimensions of Student Struggle in Undergraduate General Chemistry Lab Activities

Clarissa Keen, University of Massachusetts, Boston
Hannah Sevian, University of Massachusetts, Boston

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STRAND 4:
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies

Science across contexts

2:00 PM – 3:30 PM
Salon E

Presider:
Melody Russell, Auburn University
Innovative Thinking in Science and Engineering Education: The Validity and Reliability of a Modified Tool
Abeer M. Watted, Al-Qasemi Academic College of Education
Miri I. Barak, Technion–Israel Institute of Technology

Measuring Student Success as a Latent Variable in Undergraduate Biology Courses
Hannah Huvard, University of Colorado, Denver
Courtney Donovan, University of Colorado, Denver
Robert M. Talbot, University of Colorado, Denver
Chelsey Grassie, University of Colorado, Denver

Testing the Impacts of Data Sources, Magnitudes, and Methods for Developing Biology Early Warning Systems
Roberto Bertolini, Stony Brook University, SUNY
Stephen J. Finch, Stony Brook University, SUNY
Ross H. Nehm, Stony Brook University, SUNY

Which Components of Evidence-Based Teaching Impact Student Learning?: Insights from using PORTAAL for Classroom Observations
Sungmin Moon, University of Washington Seattle
Mallory Jackson, University of Washington, Seattle
Jennifer H. Doherty, University of Washington
Mary Pat Wenderoth, University of Washington, Seattle

STRAND 5:
College Science Teaching and Learning (Grades 13-20)
Contemporary Instructional Approaches in Postsecondary STEM
2:00 PM – 3:30 PM
Salon D

Presider:
Jayson M. Nissen, California State University, Chico

Regardless of Major, Undergraduates Learn When Participating in Citizen Science
Lisa Lundgren, North Carolina State University
Caren B. Cooper, North Carolina State University
Bradley Allf, North Carolina State University
Lincoln R. Larson, North Carolina State University
Brianna L. Johns, North Carolina State University
Sara E. Futch, North Carolina State University

Student Outcomes in an Concentrated Chemistry Laboratory Course for Online Students
Ara C. Austin, Arizona State University
Deena Gould, Arizona State University
Smitha Pillai, Arizona State University
Mary Zhu, Arizona State University
Ian R. Gould, Arizona State University

Students' Epistemological Views of Socialization and Teacher Support in the Undergraduate Physics Laboratory
Drew J. Rosen, Stony Brook University
Angela M. Kelly, Stony Brook University
Thomas Hemmick, Stony Brook University
The Effects of Instructor Classroom Talk on Student Engagement and Reasoning
Abdirizak M. Warfa, University of Minnesota
Petra Kranzfelde, University of California, Merced
Marin Melloy, University of Minnesota

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STRAND 7:
Pre-service Science Teacher Education
Pre-service Teacher Recruitment
2:00 PM – 3:30 PM
Salon A

Presider:
Meredith P. Thompson, MIT

The Missing Link in Science Teacher Recruitment: STEM Faculty
Elana B. Worth, University of Georgia
Julie A. Luft, University of Georgia
Dorothy Y. White, University of Georgia
Paula Lemons, University of Georgia
Julia E. Przybyla-Kuchek, University of Georgia
Hatice Ozen Tasdemir, University of Georgia

Evaluating Pre-service Science Teachers' Commitment to Science Teaching
Ashley N. Coon, University of Maryland

Understanding the Factors Influencing Pre-service Science Teachers' Decisions to Pursue Teaching as a Profession
Christine V. Mcdonald, Griffith University

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STRAND 8:
In-service Science Teacher Education
Equity and Elementary Science Teaching & Learning
2:00 PM – 3:30 PM
Salon B

Equity and Elementary Science Teaching & Learning
Jessica J. Thompson, University of Washington
Carla Zembal-Saul, Pennsylvania State University
Christina V. Schwarz, Michigan State University
Heather J. Johnson, Vanderbilt University
Gail Richmond, Michigan State University
Shakhnoza Kayumova, University of Massachusetts-Dartmouth
Melissa Braaten, University of Colorado, Boulder
Déana A. Scipio, IslandWood
Kristin L. Gunckel, University of Arizona
Jessica Lee Chen, Teachers College, Columbia University

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STRAND 8:
In-service Science Teacher Education
Professional Learning Communities
2:00 PM – 3:30 PM
Pearl

Presider:
Wisam Sedawi, Ben Gurion University

Exploring Secondary Science Teachers' Engagement Within a Professional Learning Community During Instruction on Evolution
Margaret M. Lucero, Santa Clara University
Keeping it Going: Roles Teachers Take on to Support Ongoing Science Professional Development

Julianne A. Wenner, Boise State University
Sara Hagenah, Boise State University

Science Teachers’ Professional Vision of Students’ Motivation to Learn: Assessment and Implications

Wisam Sedawi, Ben-Gurion University of the Negev, Israel
Dana Vedder-Weiss, Ben-Gurion University of the Negev, Israel
Hasida Yakobov, Ben-Gurion University of the Negev, Israel

Teachers’ Learning Communities as a Framework for Promoting Changes in the Instructional Physics Lab

Smadar Levy, Weizmann Institute of Science
Zehorit Kapah, Weizmann Institute of Science
Esther Magen, Weizmann Institute of Science
Edit M. Yerushalmi, Weizmann Institute of Science

Ben Koo, University of California, San Francisco
Rebecca Smith, University of California, San Francisco
Mark R. Wilson, University of California, Berkeley

Are Science Education Attitude Instruments Conceptually Robust? A Systematic Review of 2004-2018 Literature

Radu Bogdan Toma, Universidad of Burgos
Norman G. Lederman, Illinois Institute of Technology
Jesús Ángel Menéndez Villagra, Universidad of Burgos

Assessment of Attitudes Towards Evolution and Understanding of Evolutionary Processes and Concepts Across Europe

Anna Beniermann, Humboldt University of Berlin; Institute for Biology
Paul Kuschmierz, Justus Liebig University of Giessen; Institute for Biology Education
Dittmar Graf, Justus Liebig University of Giessen; Institute for Biology Education

Measuring Students’ STEM Identity: Adaptation of an Engineering Identity Survey to the Broader Context of STEM

Kelli Paul, Indiana University
Adam V. Maltese, Indiana University

STRAND 10: Curriculum, Evaluation, and Assessment

Attitudes, Beliefs, Motivation, and Identity in Science Learning

2:00 PM – 3:30 PM
Columbia

Presider: Claire Cesljarev, Indiana University

A 12-Item Survey to Measure

Linda Morell, University of California, Berkeley
Shruti Bathia, University of California, Berkeley

STRAND 11: Cultural, Social, and Gender Issues

Commitment to Equity & Social Justice for Girls and Women of Color in STEM

2:00 PM – 3:30 PM
Salon H

Presider: Felicia Moore Mensah, Teachers College, Columbia University
Black Girls as Activists and Civil Agents: Promoting STEM for Social Justice
   Natalie S. King, Georgia State University

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

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

Talking about Systemic Racism in Science Teacher Education
   Felicia M. Mensah, Teachers College, Columbia University

STRAND 12: Educational Technology
Technology-Enhanced Framing of Data to Facilitate Classroom Enactment of Science Practices
2:00 PM – 3:30 PM
Salon G

Small Group Reasoning about Unexpected Sensor Readings When Scaffolded (or Not): One Physics Lesson, Four Teachers
   A. Lynn Stephens, The Concord Consortium
   Tom Farmer, The Concord Consortium
   Daniel N. Damelin, The Concord Consortium

Computer-aided Collaborative Learning
   Paul Horwitz, The Concord Consortium
   Cynthia McIntyre, The Concord Consortium
   Jessica Andrews-Todd, Educational Testing Service

Can a Pedagogy of Learner Agency and the Internet of Things Improve Science Classroom Learning and Culture?
   Sarah Haavind, The Concord Consortium
   Sherry H. Hsi, The Concord Consortium

STRAND 14: Environmental Education
Fostering Young Learners' Socioecological Systems Reasoning and Decision-Making through Family and Community Supported Field-Based Science
2:00 PM – 3:30 PM
Portland

Tracking Students' Data Collection from a Simulation Model: Teacher Framing and Student Variations
   Gey-Hong Gweon, Physics Front
   Hee-Sun Lee, The Concord Consortium
   Scott McDonald, Pennsylvania State University
Complex Socioecological Systems, Nature—Culture Relations, and Field-Based Science: A Model for Early Childhood Science Education

Megan Bang, Northwestern University
Carrie Tzou, University of Washington, Bothell
Christine Benita, Seattle Public Schools
Mary Margaret Welch, Seattle Public Schools
Sharon Siehl, Tilth Alliance

An Analysis of Young Children’s Socioecological Sensemaking

Priya Pugh, University of Washington
Megan Bang, Northwestern University
Carrie Tzou, University of Washington, Bothell
Jordan D. Sherry-Wagner, University of Washington
Leah A. Bricker, Northwestern University

Wondering in Places: Culture, Ethics, and Complexity in Early Science Education

Jordan D. Sherry-Wagner, University of Washington
Megan Bang, Northwestern University
Carrie Tzou, University of Washington, Bothell

Leveraging Place-Based Science to Mediate and Transform Teacher, Family, and Student Relationships

Charlene LaDawn Montaño Nolan, Western Washington University
Megan Bang, Northwestern University
Carrie Tzou, University of Washington, Bothell

Concurrent Session 10
3:45 PM – 5:15 PM

Research Committee
Admin Symposium-Impacting Practice through Science Education Research: Communicating Within and Across Places, Contexts, and Communities

Carrie D. Allen, University of North Texas
Mary M. Atwater, University of Georgia
Anne E. Emerson Leak, High Point University
Norman G. Lederman, Illinois Institute of Technology
Stanley M. Lo, University of California, San Diego
Stefanie Marshall, University of Minnesota
David C. Owens, Georgia Southern University
Christina Siry, University of Luxembourg

International Committee
Admin Symposium-Promoting an International Focus on Research and Science Teacher Education to Improve Science and Special Education

3:45 PM – 5:15 PM
Eugene

NETWORKING BREAK
3:30 PM – 3:45 PM
Concurrent Session Rooms
Promoting an International Focus on Research and Science Teacher Education to Improve Science and Special Education

Sonya N. Martin, Seoul National University, Republic of Korea
Ileana M Greca, Universidad de Burgos, Spain
Eva Silfver, Umeå University, Sweden
Ying-Ting Chiu, The Ohio State University
Da Yeon Kang, Seoul National University, Republic of Korea
Sungmin Im, Daegu University, Republic of Korea
Jeongho Daniel Cha, Daegu University, Republic of Korea
Scott Cohen, Georgia State University
Patrick J. Enderle, Georgia State University
Renee S. Schwartz, Georgia State University

Graduate Student Committee

Admin Symposium-Graduate Student Research Symposium
3:45 PM – 5:15 PM
Hawthorne/Belmont/Laurelhurst

Graduate Student Research Symposium

Ayca K. Fackler, University of Georgia
Christa Haverly, Northwestern University
Kathryn Green, University of Georgia
Melanie Kinskey, University of South Florida
Sina J. Fakoyede, University of Witwatersrand
Jessica Karch, University of Massachusetts, Boston
Timothy Klavon, Temple University
Jose Pavez, University of Georgia
Shelby Watson, University of Mississippi
Klaudja Caushi, University of Massachusetts, Boston
Caroline T Spurgin, University of California, Santa Cruz

TUESDAY, MARCH 17, 2020
3:45 PM – 5:15 PM

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Argumentation & Sense-Making
3:45 PM – 5:15 PM
Mt Hood

Presider:
Andy Cavagnetto, Washington State University

Examining Dynamics that Contribute to the Initiation and Sustenance of Sensemaking in Science

Harini Krishnan, Florida State University
Lama Jaber, Florida State University
Jennifer Schellinger, Florida State University
Sherry A. Southerland, Florida State University
Use of Evidence in Arguments about Scientific and Near-Scientific Issues

Minghui Zhu, East China Normal University
Sihan Xiao, East China Normal University

Elementary Students’ Epistemic Processes on the Earth Revolution and Apparent Motion of Constellations: Practical Epistemology Analysis

Seungho Maeng, Seoul National University of Education

Influence and Characteristics of Small Group Argumentative Dialogue in Large Lecture Biology

Andy Cavagnetto, Washington State University
Erika Offerdahl, Washington State University
Jessie Arneson, Washington State University
Larry Collins, Washington State University
Jacob Woodbury, Washington State University
William B. Davis, Washington State University

Educational Media’s Impact on Preschool Children’s Perceptions of Science and Engineering

Kelly Jean Shea, University of Rhode Island
Sara B. Sweetman, University of Rhode Island

Divergent Paths to Building Understanding of Science and Engineering: A Comparative Case Study

Beth Rubin Holland, The University of Rhode Island
Sara B. Sweetman, University of Rhode Island

The Effects of Media on Children’s Language to Describe Scientists

Susan Trostle Brand, University of Rhode Island
Kelly Jean Shea, University of Rhode Island
Sara B. Sweetman, University of Rhode Island

STRAND 3:
Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies

The Effects of Children’s Media on Preschoolers Language, Understanding, and Perceptions of Science and Engineering

3:45 PM – 5:15 PM
Meadow Lark/Douglas Fir – 3rd Floor

Children’s Media as a Model of Three Dimensional Science Learning

Sara B. Sweetman, University of Rhode Island
Kelly Jean Shea, University of Rhode Island

STRAND 4:
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies

NGSS—Practices and Implementation

3:45 PM – 5:15 PM
Medford

Investigating Explicitness in Teaching the NGSS Crosscutting Concepts

Kimberly Nguyen, WestEd
Maya Salcido White, WestEd
Ashley Iveland, WestEd
Jonathan Boxerman, Northwestern University
Middle School Science Teachers’ Conceptions of Motivation Supports in NGSS Instruction

David McKinney, University of Nevada, Las Vegas
Pei Pei Liu, Michigan State University
Katy Nilsen, WestEd
Nonye M. Alozie, SRI International
Christopher J. Harris, WestEd
Lisa Linnenbrink-Garcia, Michigan State University
Gwen Marchand, University of Nevada, Las Vegas
Jennifer A. Schmidt, Michigan State University

NGSS Instructional Practice and Impact on Student Classroom Experience: A Comparative Case Study

Maya Salcido White, WestEd
Ashley Iveland, WestEd
Katy Nilsen, WestEd
Alexis Spina, University of California, Santa Barbara
Edward D. Britton, WestEd

Teachers’ Understanding and Implementation of Equitable Instructional Strategies with the NGSS

Alexis Spina, University of California, Santa Barbara
Meghan Macias, University of California, Santa Barbara
Ashley Iveland, WestEd
Ted Britton, WestEd

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

Diverse Student Perceptions, Positioning, and Retention in STEM

3:45 PM – 5:15 PM
Salon D

Presider:
Melo-Jean Yap, San Diego State University

"Makes Me Think More": Student Perceptions of Learning in a Student-Centered Classroom

Ashley N. Harlow, University of California, Irvine
Brian Sato, University of California, Irvine

Educational Debts in Students’ Physics Beliefs Incurred by Racism and Sexism

Jayson M. Nissen, California State University, Chico
Ian Her Many Horses, University of Colorado, Boulder
Ben Van Dusen, California State University, Chico

Impact of PBL Chemistry Laboratory Curriculum on Persistence of Traditionally at-Risk Students Majoring in Engineering

Corey A. Payne, University of Florida
Kent J. Crippen, University of Florida
Lorelie Imperial, University of Florida

Institutional Context and Identity of Black Undergraduates Pursuing STEM Degrees

Eileen Carlton Parsons, University of North Carolina at Chapel Hill
STRAND 6: Science Learning in Informal Contexts

Science Learning in Museums and Zoos

3:45 PM – 5:15 PM
Salon E & F

Presider:
Reanna S. Roby, Michigan State University

Designing Complementary Activities for Learning in Classrooms and Fieldtrips to an Interactive Science Center

Danielle Boyd Harlow, University of California at Santa Barbara
Ron Skinner, Ron.Skinner@moxi.org
Alexandria Muller, University of California, Santa Barbara

How Students Interact with a Model Scale in a Science Museum Lab Activity?

Orit Ben Zvi Assaraf, Ben-Gurion University of the Negev, Israel
Neta Shaby, Ben-Gurion University of the Negev, Israel
Nicole Pillemer, Ben-Gurion University of the Negev, Israel

Study of Influence the Museum Model on High School Students’ Chemistry Learning

Ana Carolina Steola
Franciani Cássia Sentanin
Patricia Silva
Ana Cláudia C. Kasseboehmer, University of São Paulo

Development of Environmental Science Agency in Youth Participating in Natural History Museum-Led Citizen Science Programs

Maryam Ghadiri Khanaposhtani, University of California, Davis
Heidi Ballard, University of California, Davis
Julia Lorke, Natural History Museum
Lucy Robinson, Natural History Museum
Jessie Jennewein, Natural History Museum of Los Angeles County
Annie E. Miller, California Academy of Sciences
Sasha Pratt-Taweh, The Natural History Museum
Lila Higgins, Natural History Museum of Los Angeles County
Rebecca Johnson, California Academy of Sciences
Alison Young, California Academy of Sciences

STRAND 6: Science Learning in Informal Contexts

Storybooks and STEM: Using Books as a Tool to Support Early Childhood Family STEM Learning

3:45 PM – 5:15 PM
Salon C

Discussant:
Phyllis Katz, University of Maryland
Presider:
Scott A. Pattison, TERC

National Survey Results on the Use of Children’s Books to Support STEM Learning

Scott A. Pattison, TERC
Gina Svarovsky, University of Notre Dame
Phyllis Katz, University of Maryland

Julia Plummer, Pennsylvania State University
Kyungjin Cho, Pennsylvania State University

Impacts of Connecting Children's Storybooks and Science to Increase Educator Knowledge, Confidence, and Skills Leading STEM Programs

Tara Cox, The Franklin Institute
Julia B. Skolnik, The Franklin Institute
Karen Peterson, National Girls Collaborative Project
Erin Stafford, Education Development Center
Sara Greller, Education Development Center

STRAND 7: Pre-service Science Teacher Education

Practice-Based Science Teaching

3:45 PM – 5:15 PM
Salon A

Presider:
Jacqueline N. Ekeoba, University of Houston

Hybridizing Equity-Focused, Field-Based Theory and Practice for Pre-service Science Teachers

Alexandra I. Race, University of California, Santa Cruz
Doris B. Ash, University of California, Santa Cruz

Practice-based Approaches to Elementary Science Teacher Preparation: Examination of an Immersed Methods Course Model

Stephen L. Thompson, University of South Carolina

How Do Secondary Science Teacher Candidates' Noticing Skills Develop in the Context of their Methods Courses?

Rebecca McNall Krall, University of Kentucky
Brett A. Criswell, West Chester University of Pennsylvania
Samantha Ringl, University of Kentucky


Daniel L. Moreno, University of Arizona
Austin R. Cruz, University of Arizona
Sanlyn Buxner, University of Arizona
John M. Keller, University of Colorado, Boulder
Lawrence Horvath, San Francisco State University
Deidre B. Sessoms, California State University, Sacramento
Dermott Donnelly-Hermosillo, California State University, Fresno
Elsa K. Bailey, San Francisco State University
Bo Zhu, American Institutes for Research
**STRAND 8: In-service Science Teacher Education**

**Scaling an Effective Analysis-of-Practice PD Program in Two High-Needs Districts: Impacts, Successes, and Challenges**

3:45 PM – 5:15 PM

**Salon B**

Discussant: **Gillian H. Roehrig**, University of Minnesota

Presider: **Kathleen J. Roth**, California State Polytechnic University, Pomona

**Developing Elementary Analysis-of-Practice PD Teacher Leaders in an Urban District: Teacher and Student Impact**

**Paul M. Beardsley**, California State Polytechnic University, Pomona

**Joseph A. Taylor**, University of Colorado, Colorado Springs

**Kathleen J. Roth**, California State Polytechnic University, Pomona


**Nicole Wickler**, California State Polytechnic University, Pomona

**Christopher Wilson**, BSCS Science Learning

**Stacey L. Carpenter**, University of California, Santa Barbara

**Factors that Support and Challenge Scaling of Videobased Analysis-of-Practice PD through K-6 Teacher Leader Development**

**Nicole Wickler**, California State Polytechnic University, Pomona


**Kathleen J. Roth**, California State Polytechnic University, Pomona

**Stephanie Baker**, Pomona Unified School District

**A Video-Based, Analysis-of-Practice PD Program in High School Biology: Results for Students, Teachers, and TLs**

**Jody Bintz**, BSCS Science Learning

**Connie Hvidsten**, BSCS Science Learning

**Christopher Wilson**, BSCS Science Learning

**Molly Stuhlsatz**, BSCS Science Learning

**April L. Gardner**, BSCS Science Learning

**Cynthia Gay**, BSCS Science Learning

**Factors in Scaling a Videobased, Analysis-of-Practice PD Program through Development of High School Biology TLs**

**Christopher Wilson**, BSCS Science Learning

**Jody Bintz**, BSCS Science Learning

**Connie Hvidsten**, BSCS Science Learning

**Molly Stuhlsatz**, BSCS Science Learning

**April L. Gardner**, BSCS Science Learning

**Cynthia Gay**, BSCS Science Learning

**Gillian H. Roehrig**, University of Minnesota
STRAND 8: In-service Science Teacher Education
Student Achievement
3:45 PM – 5:15 PM
Pearl

Presider:
Darrin Collins

Effects of Professional Development and Classroom Learning Environment on Student Science Achievement
Siqi Li, State University of New York at Buffalo (SUNY)
Xiufeng Liu, State University of New York at Buffalo (SUNY)

Out-of-Field Physics Teaching in Urban, Suburban, and Rural Contexts
Robert Krakehl, Stony Brook University
Angela M. Kelly, Stony Brook University
Keith Sheppard, Stony Brook University
Linda Padwa, Stony Brook University

School Counseling and the Preparation of Pre-College Students for STEM Careers
Richard Gearns, Stony Brook University
Angela M. Kelly, Stony Brook University
Monica Bugallo, Stony Brook University

STRAND 10: Curriculum, Evaluation, and Assessment
Assessing Scientific Concepts across Disciplines
3:45 PM – 5:15 PM
Columbia

Presider:
Peng He, Michigan State University

Mei-Hung Chiu, National Taiwan Normal University
Rachel Mamlok-Naaman, The Weizmann Institute of Science
Jan Apotheker, Faculty of Science and Engineering University of Groningen, The Netherlands

Measuring Interdisciplinary Application of the Energy Conservation Principle: A Physics/Chemistry Instrument Pair
Emily J. Borda, Western Washington University
Todd Haskell, Western Washington University
Andrew Boudreaux, Western Washington University

Learning Progressions in Science Assessments
Karyn Housh, Indiana University
Abeera P. Rehmat, Purdue University
Cindy E. Hmelo-Silver, Center for Research on Learning & Technology
Dante Cisterna, Educational Testing Service
Lei Liu, Educational Testing Service

Developing an Integrated Learning Progression and Assessments to Measure Middle School Student Proficiency of Energy
Peng He, Michigan State University
Namsoo Shin, Michigan State University
Tingting Li, Michigan State University
Joseph S. Krajcik, Michigan State University
STRAND 10:
Curriculum, Evaluation, and Assessment

Automated Scoring of Complex Performances

3:45 PM – 5:15 PM
Salmon

Discussant:
James Pellegrino, University of Illinois at Chicago

Presider:
Charles W. Anderson, Michigan State University

Automated Scoring of Complex Performances

Charles W. Anderson, Michigan State University
Xiaoming Zhai, Michigan State University
Karen Draney, University of California, Berkeley
Jay Thomas, Act Inc.
Karen D Wang
Jill A. Wertheim, Stanford University
Brian W. Riordan, ETS
James Pellegrino, University of Illinois at Chicago

Examining the Effect of Counterspaces on Undergraduate Women in Physics

Zahra Hazari, Florida International University
Idaykis Rodriguez, Florida International University
Eric Brewe, Drexel University
Renee-Michelle Goertzen, American Physical Society
Theodore Hodapp, American Physical Society
Monica Plisch, American Physical Society

Girls Constructing Engineering Identities through STEM Design Challenges

Christina L. Baze, University of Texas at Austin
Todd L. Hutner, The University of Alabama
Victor D. Sampson, University of Texas at Austin
Maria González-Howard, University of Texas at Austin
Catherine Riegel-Crumb, University of Texas at Austin
Richard H. Crawford, The University of Texas at Austin

Identity Work of Successful Women in Science During Their School Years

Jonathan L. Hall, University of West Florida
Malcolm B. Butler, University of Central Florida

Seeing Women’s Science and Engineering Experiences: The Affordance of a Visual Methodology in Understanding Context

Helen Douglass, University of Tulsa
Geeta Verma, University of Colorado, Denver
Bryan Shao-Chang Wee, University of Colorado, Denver

STRAND 11:
Cultural, Social, and Gender Issues

Considerations for Girls & Women in Science and Engineering

3:45 PM – 5:15 PM
Salon H

Presider:
Melody Russell, Auburn University

Examining the Effect of Counterspaces on Undergraduate Women in Physics

Zahra Hazari, Florida International University
Idaykis Rodriguez, Florida International University
Eric Brewe, Drexel University
Renee-Michelle Goertzen, American Physical Society
Theodore Hodapp, American Physical Society
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Seeing Women’s Science and Engineering Experiences: The Affordance of a Visual Methodology in Understanding Context

Helen Douglass, University of Tulsa
Geeta Verma, University of Colorado, Denver
Bryan Shao-Chang Wee, University of Colorado, Denver
STRAND 12: Educational Technology
Breakthroughs in Online Learning
3:45 PM – 5:15 PM
Salon G

Building Community in an Online Asynchronous PD Course: Designing for Social Capital Development
Katherine Miller, University of Pennsylvania
Susan Yoon, University of Pennsylvania
Denise M. Bressler, University of Pennsylvania
Daniel Wendel, Massachusetts Institute of Technology
Ilana Schoenfeld, Massachusetts Institute of Technology
Emma Anderson, Massachusetts Institute of Technology

Modeling with Real-Time Informative Feedback: Implementation and Assessment of a New MOOC Component
Niva Wengrowicz, Technion–Israel Institute of Technology Levinsky College–Research & Development Authority MOFET Institute–School of Professional Development
Rea Lavi, Technion–Israel Institute of Technology
Daniel Gluskin, Technion–Israel Institute of Technology
Uri Shani, Technion–Israel Institute of Technology
Hanan Kohen, Technion–Israel Institute of Technology
Dov Dori, Technion–Israel Institute of Technology

Online Ethics Education: Expectations, Views, and the Design Components that May Foster Ethical Practices
Miri I. Barak, Technion–Israel Institute of Technology

STRAND 14: Environmental Education
Modelling, Assessment, and Promotion of Climate Literacy
3:45 PM – 5:15 PM
Portland

Discussant:
Hui Jin, Educational Testing Service
Presider:
Ute Harms, IPN–Leibniz Institute for Science and Mathematics Education

Modelling, Assessment, and Promotion of Climate Literacy
Ute Harms, IPN–Leibniz Institute for Science and Mathematics Education
Hui Jin, Educational Testing Service

Towards a Heuristic Model for the Development of Climate Literacy
Ute Harms, IPN–Leibniz Institute for Science and Mathematics Education
Dirk S. Mittenzwei, IPN–Leibniz Institute for Science and Mathematics Education
Hanno Michel, IPN–Leibniz Institute for Science and Mathematics Education

Exploring the Epistemic Orientations of Eighth Graders in a Unit on Weather & Climate
Nathan Quarderer, University of Iowa
Gavin W. Fulmer, University of Iowa
Assessing Climate Literacy—Development and Implementation of a Multidimensional Assessment Instrument Subject

Dirk S. Mittenzwei, IPN—Leibniz Institute for Science and Mathematics Education
Hanno Michel, IPN—Leibniz Institute for Science and Mathematics Education
Ute Harms, IPN—Leibniz Institute for Science and Mathematics Education

Fostering Secondary Students' Evidence-Based Reasoning about Earth's Climate with Models

Devarati Bhattacharya, University of Nebraska, Lincoln
Kimberly Carroll Steward, University of Nebraska, Lincoln
Cory T. Forbes, University of Nebraska, Lincoln
Mark A. Chandler, Columbia University

STRAND MEETINGS

5:15 PM – 6:15 PM
Concurrent Session Rooms

EQUITY & ETHICS DINNER

6:30 PM – 9:30 PM
Off-site
Conference Registration
7:30 AM – 4:30 PM
Ballroom Foyer – Lower Level

Concurrent Session 11
8:30 AM – 10:00 AM

NSTA
Admin Symposium-Translating your Research into Forms that are Useful to K-12 Science Educators
8:30 AM – 10:00 AM
Eugene
Discussant:
Norman G. Lederman, Illinois Institute of Technology

Valarie L. Akerson, Indiana University
David Crowther, University of Nevada, Reno
Judith Lederman, Illinois Institute of Technology
Victor D. Sampson, University of Texas at Austin
Kathy Trundle, Utah State University

STRAND 1:
Science Learning: Development of Student Understanding
Understanding of Climate and Natural Systems
8:30 AM – 10:00 AM
Salmon
Presider:
Asli Sezen-Barrie, University of Maine

Assessment of Students' Explanatory Models for Conceptual and Epistemic Quality: The Case of Ocean Acidification (OA) and Its Impacts on Oysters
Asli Sezen-Barrie, University of Maine
Mary K. Stapleton, Towson University
Anica Miller-Rushing, University of Maine

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
Cory T. Forbes, University of Nebraska, Lincoln
Mark Chandler, Columbia University

Making Community Experiences and Knowledge Visible in Modeling Local Climate Systems
Heather F. Clark, University of California, Los Angeles
William A. Sandoval, University of California, Los Angeles

Preschool Children's Understandings of Food Webs Throughout a Summer Camp Experience
Lisa A. Borgerding, Kent State University
Fatma Kaya, Kent State University

Students' Plausibility Shifts and Knowledge Gains When Evaluating Competing Explanatory Models about Freshwater Resource Availability
Timothy Klavon, Temple University
Janelle M. Bailey, Temple University
Doug Lombardi, University of Maryland, College Park
Archana Dobaria, Temple University
STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Motivating Youth Engagement
8:30 AM – 10:00 AM
Hawthorne/Belmont/Laurelhurst

Presider:
Jonathan Shemwell, University of Alabama

Influences of Worldview and Knowledge on Climate Change Discourse: Evidence for Ideologically-Motivated Reasoning among Youth
Lynne Zummo, Stanford University
Brian M. Donovan, BSCS
K. C. Busch, North Carolina State University

Social Interdependence of Young Adolescents during a Smart-Greenhouse Project in a Required Science Class
David W. Jackson, Boston College
Pablo Bendiksen Gutierrez, Boston College
Amy R. Semerjian, Boston College

"Integrating" Investigations into Science Teaching: What Are Essential?
Lin Zhang, Providence College
Jennifer Van Reet, Providence College

Characterizing Epistemic Messages that Support the Development of Student Intellectual Authority in the Classroom
Susan B. Kelly, University of Illinois
Stina Krist, University of Illinois at Urbana, Champaign

Developing and Teaching Science Textbooks’ Content According to STEM Education Approach: The Centralized Educational System Context
Mohammed A. Aljallal, Riyadh Educational Administration, Ministry of Education, Saudi Arabia. Excellence Research Center of Science and Mathematics Education ECSME, King Saud University.
Saeed M. Alshamrani, Department of Curriculum & Instruction, College of Education, King Saud University. Excellence Research Center of Science and Mathematics Education ECSME, King Saud University

Experience Characteristics and Knowledge Sharing Interactions in a Field-Based Paleontology Social Network
Richard T. Bex, University of Florida
Corey A. Payne, University of Florida
Jennifer E Bauer, University of Florida & University of Michigan
Kent J. Crippen, University of Florida
Jeanette Pirlo, Florida Museum of Natural History

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Characteristics of the Learning Environment
8:30 AM – 10:00 AM
Mt Hood

Presider:
Jeanna R. Wieselmann, Southern Methodist University

"Integrating" Investigations into Science Teaching: What Are Essential?
Lin Zhang, Providence College
Jennifer Van Reet, Providence College

Characterizing Epistemic Messages that Support the Development of Student Intellectual Authority in the Classroom
Susan B. Kelly, University of Illinois
Stina Krist, University of Illinois at Urbana, Champaign

Developing and Teaching Science Textbooks’ Content According to STEM Education Approach: The Centralized Educational System Context
Mohammed A. Aljallal, Riyadh Educational Administration, Ministry of Education, Saudi Arabia. Excellence Research Center of Science and Mathematics Education ECSME, King Saud University.
Saeed M. Alshamrani, Department of Curriculum & Instruction, College of Education, King Saud University. Excellence Research Center of Science and Mathematics Education ECSME, King Saud University

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Jennifer E Bauer, University of Florida & University of Michigan
Kent J. Crippen, University of Florida
Jeanette Pirlo, Florida Museum of Natural History
STRAND 3:  
Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies  

**Early Childhood Scientific Thinking**

8:30 AM – 10:00 AM  
Meadow Lark/Douglas Fir – 3rd Floor  

Presider:  
Emily C. Miller, University of Wisconsin, Madison  

*A Study of the Impact of an Early Childhood Intervention on STEM Learning*  
Charlene M. Czerniak, University of Toledo  
Peter Paprzycki, University of Toledo  
Grant Wilson, The University of Toledo  
Jeanna Heuring, The University of Toledo  
Susanna Hapgood, The University of Toledo  
Joan Kaderavek, University of Toledo  
Scott Molitor, The University of Toledo  

*Kindergarten Students' Emerging Particle Models of Matter*  
Alaina Pearl Glidden, Purdue University, Department of Curriculum and Instruction  
Bima Sapkota, Purdue University, Department of Curriculum and Instruction  
Krista Hook, Purdue University, Department of Curriculum and Instruction  
Lynn A. Bryan, Purdue University, Center for Advancing the Teaching and Learning of STEM  
Ala Samarapungavan, Purdue University, Department of Educational Studies  

*To What Extent Does The Lab Center Influence Preschoolers' Inquiry, Self-Regulation, and Metacognitive Capabilities?*  
Ornit Spektor-Levy, The School of Education Bar-Ilan University Israel  
Ronit Fridman, The School of Education Bar-Ilan University Israel  
Netta Perry, The School of Education Bar-Ilan University Israel

STRAND 4:  
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies  

**Intersecting Earth Science and Engineering Concept in the Classroom**

8:30 AM – 10:00 AM  
Salon E  

Presider:  
Matthew Johnson, Pennsylvania State University  

*Impact of Engineering Design Integrated Science on Student Learning Outcomes*  
Laura O. Pottmeyer, Carnegie Mellon University  
Frackson Mumba, University of Virginia  

*Instructional Differences in the Support of System-Level Mechanistic Models of Plate Tectonics*  
Scott McDonald, Pennsylvania State University  
Kathryn M. Bateman, Temple University  
Arzu Tanis Ozcelik, Aydin Adnan Menderes University  

*Middle School Students' Understanding of Lunar Phases: A Quasi-Experimental Study*  
Merryn Cole, University of Nevada Las Vegas  
Jennifer A. Wilhelm, University of Kentucky
Science Teachers' Goal Conflicts when Integrating Engineering into Science Classes

Todd L. Hutner, The University of Alabama
Victor D. Sampson, University of Texas at Austin
Christina L. Baze, University of Texas at Austin
Lawrence Chu, The University of Texas at Austin
Richard H Crawford, The University of Texas at Austin

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

Using Representations to Learn Science
8:30 AM – 10:00 AM
Salon F

Presider:
Nicole Graulich, Justus-Liebig Universität Giessen

Development of a Framework for Studying Abstraction in Undergraduate Physical Chemistry

Jessica Karch, University of Massachusetts, Boston
Hannah Sevian, University of Massachusetts, Boston

Effects of Dynamic and Static Cueing in Instructional Videos on Students' Conceptual Understanding in Chemistry

Nicole Graulich, Institute of Chemistry Education, Justus-Liebig Universität Giessen
Sascha Bernholt, IPN–Leibniz Institute for Science and Mathematics Education, Kiel, Germany

Marc Rodemer, IPN–Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Julia Eckhard, Institute of Chemistry Education, Justus-Liebig Universität Giessen

Exploring Student Strategic Flexibility: System Choices for Energy Analysis in Physics

Grace Elizabeth Baker, Seattle University
Thanh K. Le, Western Washington University

Investigating Simulation Use on Student Learning Outcomes in Introductory Physics

Emily C. Allen, Boston University
Andrew Duffy, Boston University
Manher Jariwala, Boston University

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

Empowering Emerging Postsecondary Educators
8:30 AM – 10:00 AM
Salon D

Presider:
Robert Idsardi, Eastern Washington University

An Exploration of Biology Graduate Students Ambivalent Perceptions of the Research—Teaching Ecology

Joshua W. Reid, Middle Tennessee State University
Grant E. Gardner, Middle Tennessee State University
Engaging Undergraduate Learning Assistants in Formative Assessment in Large STEM Classes

Young Ae Kim, University of Arizona
Katelyn Southard, University of Arizona
Jonathan Cox, University of Arizona
Lisa Elfring, University of Arizona
Paul Blowers, University of Arizona
Vicente A. Talanquer, University of Arizona

Exploring Sources of And Changes In Graduate Teaching Assistant Teacher Efficacy Throughout A Semester

Cody Smith, University of Nebraska-Lincoln
Cesar Delgado, North Carolina State University

Opportunities for Graduate Teaching Assistants to Make Epistemic Shifts in the Laboratory

Justin McFadden, University of Louisville
Linda C. Fuselier, University of Louisville

STRAND 6: Science Learning in Informal Contexts

Science Learning through Non-Traditional ISL Experiences

8:30 AM – 10:00 AM
Salon C

Presider:
Angela Fitzgerald, University of Southern Queensland

Can Laypeople Identify and Judge Scientific Expertise in the Context of Vaccines?

Aviv J. Sharon, Technion–Israel Institute of Technology
Ayelet Baram-Tsabari, Technion–Israel Institute of Technology

Engaging Students in Learning about Climate Change through Filmmaking: A Transformative Educational Experience

Megan K. Littrell, CIRES Education & Outreach University of Colorado, Boulder
Erin Leckey, CIRES Education & Outreach University of Colorado, Boulder
Anne U. Gold, CIRES Education & Outreach University of Colorado, Boulder
Kelsey Tayne, CIRES Education & Outreach University of Colorado, Boulder
Christine Okochi, CIRES Education & Outreach University of Colorado, Boulder
Kristin L. K. Koskey, The University of Akron
Toni A. Sondergeld, Drexel University

Exploring Science in a Science Fiction Convention Community: Convention attendees' Perceptions of Science

Gina Childers, Texas Tech University
Donna Governor, University of North Georgia
Kania Greer, Georgia Southern University
Vaughan S. James, University of Florida

Situated Escape Games: Facilitating Knowledge and Awareness about Healthy Nutrition

Tal Yachin, Technion–Israel Institute of Technology
Miri I. Barak, Technion–Israel Institute of Technology

Thinking Beyond the Conference: Fan Conventions as Places to Communicate Science

Donna Governor, University of North Georgia
Gina Childers, Texas Tech University
Kania Greer, Georgia Southern University
Vaughan S. James, University of Florida

Can Laypeople Identify and Judge Scientific Expertise in the Context of Vaccines?
### STRAND 7: Pre-service Science Teacher Education

**Pre-service Teacher Journaling and Reflection**  
8:30 AM – 10:00 AM  
Salon A

- **Presider:** Felicia Moore Mensah, Teachers College, Columbia University

- **The Effect of Interactive Science Journals on Pre-service Teachers' Planning and Teaching**  
  Christine Schnittka, Auburn University  
  Mark Brenneman, Auburn University

- **Nascent Impacts of Engaging Pre-service Elementary Teachers with Wonder**  
  Christie C. Byers, George Mason University  
  Andrew B. Gilbert, George Mason University

- **Developing Shared Conception of STEM Education among Pre-service Elementary Teachers: How Effective is Short Intervention?**  
  Mounir R. Saleh  
  Hanan Abdo  
  Faris Alsuliman  
  Adam AlZayer  
  Reem Saleh

### STRAND 8: In-service Science Teacher Education

**Supporting Authentic Science Practices**  
8:30 AM – 10:00 AM  
Pearl

- **Presider:** Laura Zeller, University of Illinois at Chicago

- **Developing and Sustaining Lines of Inquiry to Improve Modeling-based Teaching in a Professional Learning Community**  
  Soo-Yean Shim, University of Washington  
  Jessica J. Thompson, University of Washington

- **Examining how Professional Development with Educative Curriculum Materials Supports Teachers' Modeling Knowledge and Pedagogical Design Capacity**  
  Karen Lionberger, University of Georgia  
  Julie M. Kittleson, University of Georgia

- **Changes In Middle School STEM Teachers' Drawn Mental Models of STEM Education Over Time**  
  Matthew Wilsey, Stanford University  
  Matthew Kloser, University of Notre Dame

### STRAND 8: In-service Science Teacher Education

**Teachers' Beliefs, Perceptions and Knowledge of Socioscientific Issues for Global Citizenship**  
8:30 AM – 10:00 AM  
Salon B

- **Discussant:** Troy Sadler, University of North Carolina at Chapel Hill
Science Teachers’ Pedagogical Content Knowledge Development during Enactment of Socioscientific Curriculum Materials

Durdane Bayram-Jacobs, Department of Science Education, Radboud University, Nijmegen, The Netherlands
Ineke Henze, Radboud University, Nymegen
Maria Evagorou, University of Nicosia
Yael Shwartz, The Weizmann Institute of Science
Elin Leirvoll Aschim, Department of Mathematics and Science Education, University of South-Eastern Norway, Horten, Norway
Silvia Alcaraz-Dominguez, Universitat de Barcelona
Mario Barajas, Universitat de Barcelona
Etty Dagan, Darcaa School Gedera, Israel

Teacher Perceptions about Using SSI to Teach Scientific Knowledge

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, The Weizmann Institute of Science

The Design and impact of SSI Professional Development program

Yael Shwartz, The Weizmann Institute of Science
Emil Eidin, Michigan State University

Discussion

Troy Sadler, University of North Carolina at Chapel Hill

STRAND 9: Reflective Practice
Teacher Efficacy, Ownership, and Practice
8:30 AM – 10:00 AM
Salon I

Presider:
Lisa M. McDonald, Teachers College, Columbia University

Cross-Curricular Planning to Enhance Faculty Practice: An Analysis of Graduate-Level STEM and Diversity Course Instruction

Ebony Terrell Shockley, University of Maryland, College Park
Deborah Roberts-Harris, University of New Mexico
Natalie Harr Ylizarde, University of Maryland, College Park
Cachanda K. Orellana, University of Maryland, College Park
Kristina Kramarczuk, University of Maryland, College Park

Improving Teacher Efficacy in a Chinese School: A Case Study of Professional Learning Community

Daniel Carpenter, Researcher and Educational Consultant
Qing Gao, Science Teacher and Administrator, Shenzhen China
Brenda L. Carpenter, National Science Foundation

Teacher Ownership for the Proposed Teaching Approaches

Ana Valdmann, University of Tartu
Jack B. Holbrook, University of Tartu
Miia Rannikmae, University of Tartu
**STRAND 10: Curriculum, Evaluation, and Assessment**

*Design, Development, and Testing of a Media-Rich Three-dimensional Middle School Science Unit*

8:30 AM – 10:00 AM

*Columbia*

Discussant:
Katherine McNeill, Boston College

*Developing a Unit Designed for NGSS: Successes and Lessons Learned in the Development Process*

Lindsey Mohan, BSCS Science Learning
Susan M. Kowalski, BSCS
Betty Stennett, BSCS
Mark Bloom, BSCS
Catherine Stimac, Oregon Public Broadcasting
Heather Young, Oregon Public Broadcasting
Lisa Carey, BSCS Science Learning
Jeffrey Snowden, BSCS Science Learning

**Paper 2: Developing a Media-Rich Digital Unit to Support 3D Teaching and Learning**

Catherine Stimac, Oregon Public Broadcasting
Heather Young, Oregon Public Broadcasting
Susan M. Kowalski, BSCS
Betty Stennett, BSCS
Lindsey Mohan, BSCS Science Learning
Mark Bloom, BSCS
Jeffrey Snowden, BSCS Science Learning
Lisa Carey, BSCS Science Learning

**Professional Development for A Medical Mystery: Moving Beyond the Curriculum**

Betty Stennett, BSCS
Susan M. Kowalski, BSCS
Lindsey Mohan, BSCS Science Learning
Mark Bloom, BSCS
Catherine Stimac, Oregon Public Broadcasting
Heather Young, Oregon Public Broadcasting
Lisa Carey, BSCS Science Learning
Jeffrey Snowden, BSCS Science Learning

**A Quasi-experimental Study of the Efficacy of a Designed-for-NGSS Unit and PD**

Susan M. Kowalski, BSCS
Jeffrey Snowden, BSCS Science Learning
Lisa Carey, BSCS Science Learning
Betty Stennett, BSCS
Lindsey Mohan, BSCS Science Learning
Mark Bloom, BSCS
Heather Young, Oregon Public Broadcasting
Catherine Stimac, Oregon Public Broadcasting

**Designing, Developing, and Testing Curriculum and PD for the NGSS: Discussant Remarks**

Katherine L. McNeill, Boston College

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**STRAND 10: Curriculum, Evaluation, and Assessment**

*Investigation of Teacher Knowledge*

8:30 AM – 10:00 AM

*Portland*

Presider:
Jamie N. Mikeska, Educational Testing Service (ETS)
Knowledge in Use: Examining Elementary Teachers’ Content Knowledge for Teaching about Matter using Scenario-Based Assessments

Jamie N. Mikeska, Educational Testing Service (ETS)
Dante Cisterna, Educational Testing Service
Heena R. Lakhani, University of Washington
Luronne Vaval, Teachers College, Columbia University
Allison Bookbinder, Teachers College, Columbia University
David L. Myers, University of Georgia

Investigating Teacher Knowledge of NGSS Through Developing 3D Science Assessments

Elizabeth X. De Los Santos, University of Nevada, Reno
Candice R. Guy-Gaytán, University of Nevada

Assessing Professional Vision of Oral Scientific Argumentation Using Video Annotations

April B. Holton, Arizona State University
J. Bryan Henderson, Arizona State University
Eric Greenwald, University of California, Berkeley, Lawrence Hall of Science
Nicole Zillmer, Authentic Connections
Megan Goss, University of California, Berkeley, Lawrence Hall of Science
Christina Morales, University of California, Berkeley, Lawrence Hall of Science
Lisette Lopez, University of California, Berkeley, Lawrence Hall of Science
P. David Pearson, University of California, Berkeley

Development of a Questionnaire on Teachers’ Knowledge of Language as an Epistemic Tool

Chenchen Ding, University of Iowa
Gavin W. Fulmer, University of Iowa
Jihyun Hwang, University of Iowa
Brian M. Hand, University of Iowa
Jee Kyung Suh, University of Alabama
William Hansen, University of Iowa

STRAND 11: Cultural, Social, and Gender Issues

Exploring Feminism and Materialism in Science Education
8:30 AM – 10:00 AM
Salon H

Presider:
David M. Sparks, University of Texas at Arlington

Implications of Materialism Feminism for Chemistry Teaching and Students’ Learning

Kathryn Scantlebury, University of Delaware
Catherine E. Milne, New York University
Anita Hussenius, Uppsala University, Centre for Gender Research

Learning to Use "The Mill": Material-Embodied STEM Learning in High School Robotics

Colin H. Hennessy Elliott, NYU

South Korean Students’ and Teachers’ Views of Gender in Science

Hannoori Jeong, University of Maryland, College Park

Using Scientific Practice to Address the Girls’ Crisis: Designing Science Education From a Feminist Perspective

Heather B. Page, New York University
STRAND 12: Educational Technology
New Methods of Measurement and Analysis to Move the Field Forward
8:30 AM – 10:00 AM
Salon G

Presider: Richard Lamb, East Carolina University

An Emotional-Cognitive Approach to Holistically Assessing Computational Thinking and Emotional Constructs for Classrooms and Researchers
Amy R Semerjian, Boston College
Mike Barnett, Boston College

Analyzing Girls’ Flow Experience in an AR Game: Regularized Bayesian Regression in Design-Based Research
Shane Tutwiler, University of Rhode Island
Denise M. Bressler, University of Pennsylvania

Development, Validity and Reliability of an Educational Robotics Based Technological Pedagogical Science Knowledge Self-Efficacy Scale
Hilal Yanis, Gazi University
Nejla Yürük, Gazi University

STRAND 14: Environmental Education
Environmental and Social Responsibility
8:30 AM – 10:00 AM
Medford

Presider: Elliott Karetny, Timber Creek High School

Action Research in a Rural Afro-Ecuadorian School and Community: El Problema de la Basura
Daniel M. Levin, University of Maryland, College Park
Carolina Napp-Avellii, University of Maryland, College Park
Carlos Vieira, The Onzole River Project
Callie Herring, Teachers2Teachers-Global
Sebastian Fernandez-Napp, University of Maryland, College Park
Jenny McGlone, Teachers2Teachers-Global
Chadd McGlone, Teachers2Teachers-Global

Infusing Social Responsibility in Higher Education through Education for Sustainable Development
Heba El-deghaidy, American University in Cairo

Motivating High School Environmental Science Students through the Lens of Environmental Justice
Elliott J Karetny, Rowan University
Issam H. Abi-El-Mona, Rowan University

Youth as Conservationists, Altruists, Inventors, and Investigators: Designing for Multi-Faceted Disciplinary Identities
Heidi B. Carlone, The University of North Carolina at Greensboro
Michelle Lovett, The University of North Carolina at Greensboro
Alison Mercier, The University of North Carolina at Greensboro
Dearing Blankmann, The University of North Carolina at Greensboro
Ti’Era D. Worsley, University of North Carolina at Greensboro

NETWORKING BREAK
10:00 AM – 10:30 AM
Concurrent Session 12  
10:30 AM – 12:00 PM

Publications Advisory Committee
Admin Symposium-NSTA’s Annual Research Worth Reading Recognition

10:30 AM – 12:00 PM
Eugene

NSTA’s Annual Research Worth Reading Recognition

Hayat Hokayem, Texas Christian University
G. Michael Bowen, Mount Saint Vincent University
Emily G. Schoerning, Anshe Emet
Christina Siry, University of Luxembourg

Selected Papers:


STRAND 1: Science Learning: Development of Student Understanding

Understandings about Genetics, Evolution, and Natural Selection

10:30 AM – 12:00 PM
Salmon

Presider:
Nonye M. Alozie, SRI International

Fostering the Use of Key Concepts in Natural Selection

Helena Aptyka, Institute for Biology Education, University of Cologne
Victoria Hollmann, Institute for Biology Education, University of Cologne
Daniela Fiedler, IPN–Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Jörg Großschedl, Institute for Biology Education, University of Cologne

Generating a Comprehensive, Context-Sensitive Framework for Evolution Cognition

Cesar Delgado, North Carolina State University
Kathryn Green, University of Georgia

Improving Student Knowledge of Multifactorial Genetics Could Reduce Racial Prejudice

Brian M. Donovan, BSCS
Monica Weindling, BSCS Science Learning
Brae Salazar, BSCS Science Learning

Scaffolding Secondary Students’ Natural Selection Transfer Through Computational Thinking

Amanda N. Peel, Northwestern University
Golnaz Arastoopour Irgens, Clemson University
STRAND 2: Science Learning: Contexts, Characteristics and Interactions

Complexity, Cognition, & the Human Experience
10:30 AM – 12:00 PM
Mt Hood

- Presider:
  Sihan Xiao, East China Normal University

Does Class Size Really Matter in a Metacognitive Biology Classroom?

- Ngozika M. Mbajorgu, Enugu State University of Science and Technology
- Chinenyre P Nwobodo, Enugu State University of Science and Technology
- Chidinma A Ezeano, Enugu State University of Science and Technology
- Conatance E Idoko, Enugu State University of Science and Technology

Toward a Conception of Humanizing Science Learning

- Takumi Sato, Virginia Tech
- Daniel Birmingham, Colorado State University

Can Elementary School Students Understand The Complexity of The Lesser Kestrel's Ecological System?

- Dafna Gan, Kibbutzim College of Education and the Arts, Israel
- Adiv Gal, Kibbutzim College of Education and the Arts, Israel
- Orit Ben Zvi Assaraf, Ben-Gurion University of the Negev, Israel

STRAND 2: Science Learning: Contexts, Characteristics and Interactions

Perceptional & Conceptual Change
10:30 AM – 12:00 PM
Hawthorne/Belmont/Laurelhurst

- Presider:
  David McKinney, University of Nevada, Las Vegas

Comparing Pre-service Teachers' Perception of Learning Between Conceptual Change Inquiry Curriculum and Traditional Lecture Approaches

- Lloyd M. Mataka, Lewis-Clark State College
- Rex N. Taibu, Queensborough CC: City University of New York

The Role of Confusion in Conceptual Change Scenarios for Pre-service Science Teachers

- Mariya Pachman, Florida State University
- Hye-Eun Chu, Macquarie University, Sydney
- Lori Lockyer, University of Technology Sydney

The Impact of a Rich Classroom Epistemic Climate: Students' Perceptual Changes and Cognitive Growth

- Yejun Bae, University of Iowa
- Seohee Park, University of Iowa
- Brian M. Hand, University of Iowa
STRAND 3:  
Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies

Integration in the Elementary Curriculum
10:30 AM – 12:00 PM
Meadow Lark/Douglas Fir – 3rd Floor

Arts-Integrated Science Instruction: Exploring the Impacts of Instructional Order Effects on Earth Science Learning Gains

Sage Andersen, University of California, Irvine
Joseph T. Wong, University of California, Irvine
Michael Corrigan, MDED Inc
Doug Grove, MDED Inc.
Brad Hughes, University of California, Irvine

Elementary Teachers' Conceptions of Successful Science and Literacy Integration

Leigh K. Smith, Brigham Young University
Ryan Nixon, Brigham Young University
Kendra Hall-Kenyon, Brigham Young University

Linking literacy and Science in Elementary through Project-based Learning

Joi Merritt, James Madison University
Sarah Lupo, James Madison University

Talking and Writing Three-Dimensional Science: Examining Productive Language Demands of the NGSS Elementary Standards

Karl G. Jung, University of South Florida

STRAND 4:  
Science Teaching—Middle and High School (Grades 5-12): Characteristics and Strategies

Inquiry-Based Instruction and Explorative Science Practices
10:30 AM – 12:00 PM
Salon E

Presider: Mohammed Estaiteyeh, University of Western Ontario

Inquiry-Based Science Instruction and Student Science Achievement in PISA 2015

Cory T. Forbes, University of Nebraska, Lincoln
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel
Anja Schiepe-Tiska, Technische Universität München TUM School of Education Zentrum für Internationale Bildungsvergleichsstudien (ZIB) e.V.

Matter Matters: Exploring the Role of Materiality in the Science Classroom

Rishi (Shruti) Krishnamoorthi, New York University

The Progression of Pre-service and In-service Science Teachers’ Abilities to Teach Inquiry-based Science

Jeanette Bartley, Illinois Institute of Technology
Judith S. Lederman, Illinois Institute of Technology
STRAND 5: College Science Teaching and Learning (Grades 13-20)

Engaging Students' Interdisciplinary Connections
10:30 AM – 12:00 PM
Salon D

Presider:
Renata P. Orofino, Universidade Federal do ABC

Connecting Ideas Across Courses: Relating Energy, Bonds, and How ATP Hydrolysis can Power a Molecular Motor
Abigail I. Green, Michigan State University
Kristin N. Parent, Michigan State University
Sonia M. Underwood, Florida International University
Rebecca L. Matz, Michigan State University

Creating and Testing an Assessment of Interdisciplinary Connections: Entropy to Osmosis
Brianna L. Martinez, Michigan State University
Kristin N. Parent, Michigan State University
Sonia M. Underwood, Florida International University
Rebecca L. Matz, Michigan State University

When Differences Don't Divide: Graduate Students' Perceptions of Participating in an Interdisciplinary Collaboration
Katherine McCance, North Carolina State University
Margaret R. Blanchard, North Carolina State University

STRAND 6: Science Learning in Informal Contexts

Measuring the Long-Term Effects of Informal Education Experiences: An Interactive Research Symposium
10:30 AM – 12:00 PM
Salon C

Discussant:
Aaron Price, Museum of Science and Industry, Chicago, Neta Shaby, Oregon State University

Presider:
John H. Falk, Institute for Learning Innovation

Measuring the Long-Term Effects of Informal Education Experiences: An Interactive Research Symposium
John H. Falk, Institute for Learning Innovation
Adam V. Maltese, Indiana University
Lynn D. Dierking, Oregon State University
Nancy L. Staus, Oregon State University
Angela Skeele-Worley, University of Virginia
Neta Shaby, Oregon State University
Aaron Price, Museum of Science and Industry, Chicago
David Meier, Institute for Learning Innovation

STRAND 7: Pre-service Science Teacher Education

Pre-service Teachers Perceptions of Engineering
10:30 AM – 12:00 PM
Salon F

Presider:
Heesoo Ha, Seoul National University
Looking across Multiple Practice-Based Science Methods Courses to Empirically Ground the Draw-an-Engineering-Teacher Test (DAETT)

Rebekah Hammack, Montana State University
Tina Vo, University of Nevada, Las Vegas

Using Epistemic Network Analysis to Explore Pre-service Teachers’ Connections among Nature of Engineering Ideas

Jennifer C. Parrish, University of Northern Colorado
Jacob Pleasants, Keene State College
Joshua W. Reid, Middle Tennessee State University
Bridget K. Mulvey, Kent State University
Erin E. Peters-Burton, George Mason University

Pre-service Elementary Teachers’ Conceptions of Engineering and their Future Teaching Practice

Amy V. Farris, Penn State University

Integrating Learning of Science with Engineering Design in a Physics Course for Elementary Pre-service Teachers

Sanjay Rebello, Purdue University

The Impact of Engineering Design on Student Achievement in Science

Selcen Guzey, Purdue University
Richard Lie, Purdue University

Conceptualizing Modeling as a Situated Engineering Practice within Pre-service Teachers’ Learning of Science and Design

Richard J. Aleong, Purdue University
Robin Adams, Purdue University

Elementary Pre-service Teachers’ Trajectories in Learning to Teach Science Ambitiously through Engineering Design

Brenda M. Capobianco, Purdue University
Jeffrey Radloff, SUNY Cortland
Kristen B. Wendell, Tufts University
Brenda M. Capobianco, Purdue University

STRAND 7: Pre-service Science Teacher Education

Using Principles of Engineering Design to Advance Elementary Science Teacher Preparation

10:30 AM – 12:00 PM
Salon A

Discussant: Kristen Wendell, Tufts University
Presider: Brenda M. Capobianco, Purdue University

STRAND 8: In-service Science Teacher Education

Approaches to PD to Support Science Teaching

10:30 AM – 12:00 PM
Salon B

Presider: Lisa M. McDonald, Teachers College, Columbia University,

A Model for Teacher-Initiated STEM Project-Based Learning

Bryan M. Rebar, University of Oregon
Talbot Bielefeldt, Clearwater Program Evaluation
Dean Livelybrooks, University of Oregon
From Doing Science to Teaching Science: Enhancing Instruction by Engaging Teachers in Extended Scientific Inquiry
Lama Jaber, Florida State University
Vesal Dini, Tufts University

Motivating Change: Meeting Teachers' Needs in Science Professional Development
Brit Toven-Lindsey, California State University, East Bay
Kathryn N. Hayes, California State University, East Bay
Christine L Bae, Virginia Commonwealth University
Dawn O’Connor, Alameda County Office of Education
Jeffery Seitz, California State University, East Bay

Impact of Beginning Career Science Teachers' Social Networks and Self-Efficacy on Retention
Meltem Alemdar, Georgia Institute of Technology
Christopher Cappelli, Georgia Institute of Technology
Jessica Gale, Georgia Institute of Technology

The Impact of Induction on Aspects of Culturally Responsive Instruction
Zachary Stepp, University of Florida
Julie C. Brown, University of Florida

The Professional Learning of Secondary Science Teachers: The First-Five Years
Julie A. Luft, University of Georgia
Sissy S. Wong, University of Houston
Kathleen Hill, Pennsylvania State University

STRAND 8: In-service Science Teacher Education
Professional Development to Support Induction of New Science Teachers
10:30 AM – 12:00 PM
Medford

Presider:
Ryan Coker, Florida State University

Beginning Secondary Science Teachers’ Contextualized and Decontextualized Inquiry Implementation: A Randomized Controlled Trial
Shannon L. Navy, Kent State University
Jennifer L. Maeng, University of Virginia
Randy L. Bell, Oregon State University
Fatma Kaya, Kent State University

Analysis of AP Chemistry Teachers' Online Interaction on Facebook
Shaghayegh Fateh, Middle Tennessee State University
Gregory Rushton, Middle Tennessee State University
David Yaron, Carnegie Mellon University
Chinmay Kulkarni, Carnegie Mellon University

STRAND 8: In-service Science Teacher Education
Teacher Learning in the Physical Sciences
10:30 AM – 12:00 PM
Pearl

Presider:
Kelly Riedinger, Oregon State University

WEDNESDAY, MARCH 18, 2020
10:30 AM – 12:00 PM
AP Chemistry Teachers' Online Professional Learning Platform: A Design Perspective

Samuel G. Karanja, Middle Tennessee State University
Gregory Rushton, Middle Tennessee State University–Tennessee Science, Technology, Engineering and Mathematics Education Center (TSEC)
David Yaron, Carnegie Mellon University
Chinmay Kulkarni, Carnegie Mellon University
Amanda Perez, Research Associate, Carnegie Mellon University

Factors Related to Reform in Science Teaching through Teacher Professional Development

Dennis Sunal, University of Alabama
Cynthia Szymanski Sunal, University of Alabama
Marilyn Maxwell Stephens, University of Alabama
Marsha Simon, University of West Georgia
Rachael L. Tawbush, The University of Alabama
Haley Harville-York, University of Alabama
Sabrina Stanley, University of Alabama

Assessing Novelty and Model-Based Systems Thinking in Solutions to Design Problems

Dov Dori, Technion
Rea Lavi, Technion–Israel Institute of Technology
Judy Yehudit Dori, Technion

Validating a Learning Progression for 'Mathematization' of Science

Dante Cisterna, Educational Testing Service
Hui Jin, Educational Testing Service
Shin Hyo Jeong, Educational Testing Service

Grade 12 Students' Conceptual Understanding of Core Ideas in Biology

Helin Semilarski, University of Tartu
Anne Laius, University of Tartu

Developing an Appropriate Measurement Model for the State-Level NGSS Science Assessment in Michigan

Tamara J. Smolek, Michigan State University
Ji Zeng, Michigan Department of Education

Incorporate Science Concepts in the Process of Generating Scientific Explanations

Xiaoxin Lyu, Teachers College Columbia University
Anna C. MacPherson, American Museum of Natural History
STRAND 11: Cultural, Social, and Gender Issues
Counterspaces and Critical Considerations in University Settings
10:30 AM – 12:00 PM
Salon H

Presider:
Tara M. Nkrumah, Arizona State University

"Maybe on the Spectrum": Physical Science Pedagogy and Gender Performativity at a Major Research University
Katherine Doerr

Creating a Virtual Counterspace for Marginalized Communities in STEM
Ann Varnedoe, Vanderbilt
William Robinson
Monica L. Ridgeway, Vanderbilt University
Dara Naphan-Kingery
Ebony McGee

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

Sexism, Hostile Work Environment, and the Impostor Phenomenon
Devasmita Chakraverty, Indian Institute of Management Ahmedabad

STRAND 12: Educational Technology
Digital Tools: Research and Demonstration Showcase
10:30 AM – 12:00 PM
Salon G

Presider:
Denise M. Bressler, University of Pennsylvania

Digital Curation for Promoting Personalized Science Learning
Dina Tsybulsky, Technion–Israel Institute of Technology

Examining High School Students' Scientific Practices during an Augmented Thermal Perception Lab
Shannon H. Sung, The Concord Consortium
Guanhua Chen, The Concord Consortium
Ji Shen, University of Miami
Xudong Huang, The Concord Consortium
Joyce Massicotte, The Concord Consortium
Changzhao Wang, University of Miami
Charles Xie, The Concord Consortium
Elena Sereiviene, The Concord Consortium

Exploring Middle School Students' Epistemological Framings of a Gesture-Augmented Computer Simulation Depicting Thermal Conduction
Nitasha Mathayas, University of Illinois at Urbana–Champaign
Robb Lindgren, University of Illinois at Urbana, Champaign
STRAND 14:
Environmental Education

Traditional Ecological Knowledge (TEK): Water Stories, Sustainability, Models, and Evidence

10:30 AM – 12:00 PM
Portland

Presider:
Bhaskar Upadhyay, University of Minnesota

Indigenous Science Agency: Water, Local Knowledge, and Politics

Mahesh Tharu, Jagadamba Higher Secondary School
Bhaskar Upadhyay, University of Minnesota

Indigenous Mapping: Culturally Relevant, Technology-Enhanced Teaching Strategies for Indigenous Learners Across Places and Contexts

Sharon Nelson-Barber, WestEd
Jonathan Boxerman, WestEd
Matt Siberglitt, WestEd
Zanette Johnson, Intrinsic Impact Consulting
Sean O’Connor, BSCS

Indigenous Education for Sustainable Development Rooted in Traditional Ecological Knowledge

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 Sukinahrhimicc, Indigenous People Cultural Development Center

Traditional Environmental Knowledge: What can we Learn from Folk Tales?
Rouhollah Aghasaleh, Georgia State University

Community Mapping: A Strategy to Build Knowledge of Place, STEM, and Culture
Pauline W. U. Chinn, University of Hawaii at Manoa

LUNCH
12:00 PM – 1:00 PM
On Your Own

Concurrent Session 13
1:00 PM – 2:30 PM

STRAND 2:
Science Learning: Contexts, Characteristics and Interactions

Constructing and Receiving Peer Feedback on Engineering Designs: Student Engagement and Pedagogical Supports

1:00 PM – 2:30 PM
Eugene

Presider:
Chelsea Joy Andrews, Tufts University

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 G. Wright, Drexel University
Mikhail Miller, Drexel University

Towards a more Expansive Framing of Feedback in Elementary Engineering: The Social and Affective Benefits of Asking for and Giving Advice

Chelsea Joy Andrews, Tufts University
Kristen B. Wendell, Tufts University

Structures of Interaction in Elementary Engineering Peer-to-Peer Feedback

Nicole A. Batrouny, Tufts University Center for Engineering Education and Outreach

Elementary Teachers’ Responsiveness to Supporting Students’ Engineering Design Feedback

Jeffrey Radloff, Purdue University
Brenda M. Capobianco, Purdue University

"When I do Hands-on Things I will Remember": Authentic Inquiry Supporting Ninth Graders’ Science Identities

Jennifer Tripp, University at Buffalo
Noemi Waight, University at Buffalo

Supporting Students’ Autonomy throughout an Open Inquiry Process

Liron Schwartz
Idit Adler, CREATE for STEM Institute
Michal Zion, Bar-Ilan University
Nir Madjar, Bar-Ilan University

STRAND 2: Science Learning: Contexts, Characteristics and Interactions

Students & STEM Careers

1:00 PM – 2:30 PM
Hawthorne/Belmont/Laurelhurst

Stepping Into the Shoes of STEM Professionals- the Results from Longitudinal Intervention Promoting Career Awareness

Tormi Kotkas, University of Tartu
Jack B. Holbrook, University of Tartu
Miia Rannikmae, University of Tartu

Developing an Intervention Course to Raise Middle School Students Science-Related Career Awareness

Regina Soobard, University of Tartu
Moonika Teppo, University of Tartu
Aet Möllits, Tallinn University
Miia Rannikmae, University of Tartu
How an Independent Engineering Fair Project Can Affect Student Perceptions of Science

Kelly Feille, University of Oklahoma
Annie Wildes, University of Oklahoma

The Effect of STEM Workshops on STEM Career Aspirations Amongst Middle School Students: A Longitudinal Study

Isha DeCoito, Western University
Ahmad Khanlari, OISE/UT
Stephanie L. Florence, York University

STRAND 3:
Science Teaching—Primary School (Grades PreK-6): Characteristics and Strategies

Teacher Instructional Practices for Equity in the NGSS

1:00 PM – 2:30 PM
Meadow Lark/Douglas Fir – 3rd Floor

Presider:
Anna Maria Arias, Kennesaw State University

An Examination of Teacher Questioning within Science and Engineering NGSS-Aligned Classrooms

Christopher Dittrick, University of Virginia
Sarah J. Fick, University of Virginia
Anne McAlister, The University of Virginia
Jennifer Chiu, University of Virginia
Kevin W. McElhaney, SRI International

Changes in One Teacher’s Instructional Practices to Support Elementary Students in Making Sense of Phenomena

Cory Susanne Miller, Michigan State University
I-Chien Chen, Michigan State University
Joseph S. Krajcik, Michigan State University

Rural Elementary Teachers’ Perceptions about Incorporating Representations into their Science Teaching

Celeste Nicholas, Indiana University
Meredith Park Rogers, Indiana University
Joshua Danish, Indiana University
Cindy E. Hmelo-Silver, Indiana University
Qiu Zhong, Indiana University
Christina Stiso, Indiana University
Andrea Phillips, Indiana University
Jessica McClain, Indiana University
Alex Gerber, Indiana University

Teaching Evolution in a 5th Grade Spanish Classroom

Lucia Vazquez-Ben, Universidade da Coruña, Spain
Anxela Bugallo-Rodriguez, Universidade da Coruña, Spain

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

Faculty Positioning and Partnerships to Support Teaching

1:00 PM – 2:30 PM
Salon D

Presider:
Anna S. Grinath, Idaho State University

A Social Network Analysis of Lecturers with Security of Employment

Daniel Z. Grunspan, Arizona State University
Stanley M. Lo, University of California, San Diego
Brian Sato, University of California, Irvine
Naneh Apkarian, Western Michigan University
Partners in Community College Science Education Reform: A Phenomenographic Study of Faculty and Graduate Students
Song Wang, University of California, San Diego
Nicole Suarez, University of California, San Diego
Stacey Brydges, University of California, San Diego
Stanley M. Lo, University of California, San Diego

Professional Development for Biology Instructors Focusing on Student Thinking
Paula Lemons, University of Georgia
Sophia (Sun Kyung) Jeong, University of Georgia
Jakayla Clyburn, University of North Carolina, Greensboro

STRAND 6: Science Learning in Informal Contexts
Professional Development Opportunities for Informal STEM Learning Professionals
1:00 PM – 2:30 PM
Salon C

Presider:
Rebecca D. Swanson, Tufts University

Professional Development Opportunities for Informal STEM Learning Professionals
Martin Storksdieck, Oregon State University
Jill K Stein, JKS Consulting
Rebecca D. Swanson, Tufts University
Lynn Uyen Tran, University of California, Berkeley
Preeti Gupta, American Museum of Natural History

Ardice Hartry, University of California, Berkeley
Danielle B. Harlow, University of California, Santa Barbara
Ron Skinner, MOXI, The Wolf Museum of Exploration + Innovation
Sinead Brien, Michigan State University
Micaela Balzer, Impression 5 Science Center

STRAND 7: Pre-service Science Teacher Education
Pre-service Teacher as Scholars and Professionals
1:00 PM – 2:30 PM
Salon F

Creating Academic STEM Teacher Scholars: Research Experiences for Undergraduates
Jennifer A. Wilhelm, University of Kentucky
Molly Fisher, University of Kentucky

Tensions in Student Teaching: Can they be Productive?
Jennifer E Mesiner, University of Maryland, College Park
Daniel M. Levin, University of Maryland, College Park

Pre-service Science Teachers’ Epistemological Beliefs
Gunkut Mesci, Giresun University
Busra Tuncay-Yuksel, Giresun University
STRAND 8: In-service Science Teacher Education
Research Experiences for Teachers
1:00 PM – 2:30 PM
Salon B

Presider:
Matthew Johnson, Pennsylvania State University

Experience with Authentic Practice in an Engineering RET: Perceptions of Teachers, Mentors and Independent Observation
Kent J. Crippen, University of Florida
Gayle Nelson Evans, University of Florida
Christine Garand Scherer, University of Florida
Courtney M. Spillman, University of Florida

K-12 Teachers using Authentic STEM Practices in the Classroom Based on Research Immersion Experiences
Matthew Johnson, Pennsylvania State University
Kathleen Hill, Pennsylvania State University

Personally-Relevant Critical Events as Catalysts for Shifts in Teachers’ Disciplinary Understandings about Science
Shannon G. Davidson, Florida State University
Lama Jaber, Florida State University
Sherry A. Southerland, Florida State University

STRAND 8: In-service Science Teacher Education
Teacher Learning in the Biological/Environmental Sciences
1:00 PM – 2:30 PM
Pearl

Presider:
Mohammed Estaiteyeh, University of Western Ontario

Assessment of Professional Development Supports for Teaching Bioinformatics in High School Biology: Benefits and Challenges
Susan Yoon, University of Pennsylvania
Denise M. Bressler, University of Pennsylvania
Jooeun Shim, University of Pennsylvania
Katherine Miller, University of Pennsylvania
Blanca Himes, University of Pennsylvania
Ryan Urbanowicz, University of Pennsylvania
Michael Gonzalez, University of Pennsylvania
Beth Twiss Houting, The Historical Society of Pennsylvania

From Pockets of Implementation to Embedded Practice: A Case of Teacher Learning across Contexts
Casandra Gonzalez, Boston College
Megan McKinley-Hicks, Boston College
Mike Barnett, Boston College

Investigating Teacher Concerns about Climate Change: Identifying Concerns Before and after a Professional Development Experience
Susan Gomez Zwiep, California State University, Long Beach
Jill Grace, K12 Alliance@WestEd
Teachers' Challenges Learning to Teach Coherent NGSS Storylines

Jarod Kawasaki, University of California, Los Angeles
Heather F. Clark, University of California, Los Angeles
William A. Sandoval, University of California, Los Angeles

STRAND 9: Reflective Practice
Teachers’ Beliefs and Identity in their Reflective Practices
1:00 PM – 2:30 PM

Presider:
Lisa M. McDonald, Teachers College, Columbia University

Exploring Pre-service Teachers’ Beliefs about Effective Science Teaching through their Collaborative Oral Reflections
Valarie L. Akerson, Indiana University
Mina Min, Appalachian State University
Fetiye Aydeniz, Indiana University

Exploring Secondary Science Teachers’ Identity Development Through Reflective Practice
Preethi Titu, University of Minnesota
Gillian H. Roehrig, University of Minnesota
Joshua A. Ellis, Florida International University

Toward more Agentic Reflection: Analyzing Beginning Science Teacher Narratives of Professional Growth
Anton Puvirajah, University of Western Ontario
Michael Dias, Kennesaw State University
Laurie Brantley-Dias

STRAND 10: Curriculum, Evaluation, and Assessment
Integration of STEM Disciplines
1:00 PM – 2:30 PM
Columbia

Presider:
Emilie A. Siverling, Minnesota State University, Mankato

Seventh-Grade Students’ Use of Heat Transfer Conceptions During an Engineering Design-Based STEM Integration Curriculum
Emilie A. Siverling, Minnesota State University, Mankato
Tamara J. Moore, Purdue University

Does STEM Education Work?: A Data-Driven Rethinking of STEM Education in China’s Basic Education
Jing Lin, Collaborative innovation center of assessment toward basic education quality, Beijing Normal University
Richard Lamb, East Carolina University
Ping-Han Cheng, Science Education Center, National Taiwan Normal University
Yu-hsuan Chen, Science Education Center, National Taiwan Normal University
Chun-Yen Chang, Science Education Center, National Taiwan Normal University
Xiaoyu Shi

Toward Integrated STEM Practices: Exploring the Intersections of Science, Engineering, and Mathematical Practice
Daniel Pimentel, Stanford University
Megan Selbach-Allen, Stanford University
Brandon Reynanate, Stanford university
A Model for Argumentation in Integrated STEM Curriculum

Carina M. Rebello, Purdue University
Yuri B. Piedrahita Uruena, Purdue University
Paul Asunda, Purdue University
Hui-Hui Wang, Purdue University

STRAND 10:
Curriculum, Evaluation, and Assessment

What is the Science Curriculum of Today and the Future?
1:00 PM – 2:30 PM
Medford

Presider:
Jan H. Van Driel, University of Melbourne

What is the Science Curriculum of Today and the Future?

Jan H. Van Driel, University of Melbourne
Victoria Millar, University of Melbourne
Michael J. Reiss, University of London
Dana L. Zeidler, University of South Florida
Sami Kahn, Princeton University
Richard A. Duschl, Southern Methodist University
Jonathan Francis Osborne, Stanford Graduate School of Education
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel
Troy Sadler, University of North Carolina at Chapel Hill
Justin Dillon, University of Exeter

STRAND 11:
Cultural, Social, and Gender Issues

Embracing Indigenous Knowledge of the African Diaspora and Tribal Communities
1:00 PM – 2:30 PM
Salon H

Presider:
Michael A. Ahove, Lagos State University

Culture, Context and Scientific Explanations by Biology Students: An African Case Study

Peter A. Okebukola, Africa Centre of Excellence in Innovative and Transformative STEM Education Lagos State University, Lagos, Nigeria
Tunde Owolabi, Africa Centre of Excellence in Innovative and Transformative STEM Education Lagos State University, Lagos, Nigeria
Michael A. Ahove, Africa Centre of Excellence in Innovative and Transformative STEM Education Lagos State University, Lagos, Nigeria
Akeem Akintoye, Africa Centre of Excellence in Innovative and Transformative STEM Education Lagos State University, Lagos, Nigeria

For the Next Seven Generations: the Hopes and Needs of Pottawatomi Parents for their Children

Jared Tenbrink, University of Michigan

The Pull from Both Sides: Analyzing the Bicultural Experiences of 1.5-Generation Nigerian-American Female STEM Students

David M. Sparks, University of Texas at Arlington
U.S. and Ghana: Exploring Cross-Cultural Perspectives on Engagement in Science for Underrepresented Students
Tara M. Nkrumah, Arizona State University

STRAND 12: Educational Technology
Teaching with Technology
1:00 PM – 2:30 PM
Salon G
Presider:
Jonah B. Firestone, Washington State University Tri-Cities

Co-Teaching with Digital Games: Cultivating Effective Teacher-Game Partnerships in Science Classrooms
Karen Mutch-Jones, TERC
Santiago Gasca, TERC
Danielle C. Boulden, North Carolina State University
Eric N. Wiebe, North Carolina State University

Examining Professional Development Designed to Support Geospatial Inquiry
Brooke A. Whitworth, University of Mississippi
Eric Nolan, Northern Arizona University
Lori Rubino-Hare, Northern Arizona University
Mark Manone, Northern Arizona University
Nena Bloom, Northern Arizona University

Understanding the Perceived Usefulness of Mobile Technology in Physics Learning: A Pedagogical Perspective
Lehong Shi, East Lansing
Xiaoming Zhai, Michigan State University

STRAND 14: Environmental Education
Citizen Engagement: Between Attitudes and Behavior
1:00 PM – 2:30 PM
Portland
Presider:
Dani Lin Hunter, Colorado State University

Adult Food Waste and the Effectiveness of a Video Intervention on Increasing Intended Pro-Environmental Behaviors
Kathleen A. Fadigan, Pennsylvania State University
Zeltnetta Clark, Pennsylvania State University
Jaclyn Bolton, Pennsylvania State University
Amira Spikes, Pennsylvania State University
Visalakshi Vaithianathan, Pennsylvania State University

Citizen Scientist or Citizen Technician: How we Talk about Volunteer Tasks and Who's Benefiting
Danielle Lin Hunter, Colorado State University
Gregory Newman, Colorado State University
Meena M. Balgopal, Colorado State University

Environmental Attitudes/Values and Concern — Two Constructs with One Aim
Gregor Torkar, Professor, University of Lubljana
Franz X. Bogner, University of Bayreuth

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