



# NARST

A global organization for improving  
science education through research

## 2020

93<sup>RD</sup> ANNUAL  
INTERNATIONAL  
CONFERENCE

MARCH 15-18

PORTLAND, OR, USA

Portland Marriott  
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SCIENCE EDUCATION ACROSS PLACES AND CONTEXTS

# Science for Your Class, Science In Your Class

**NEW**

## The Educational Leader's Guide to Improvement Science

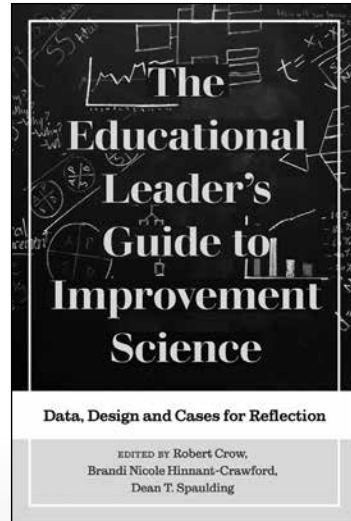
*Data, Design and Cases for Reflection*

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.

*Improvement Science in Education and Beyond Series*

Paper \$42.95 | E-Book \$42.95



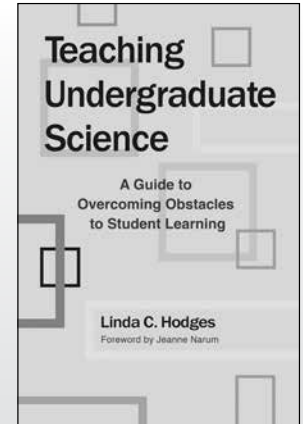
## Teaching Undergraduate Science

*A Guide to Overcoming Obstacles to Student Learning*

Linda C. Hodges

Foreword by Jeanne Narum

Paper \$29.95 | E-Book \$23.99



## Teaching Science Online

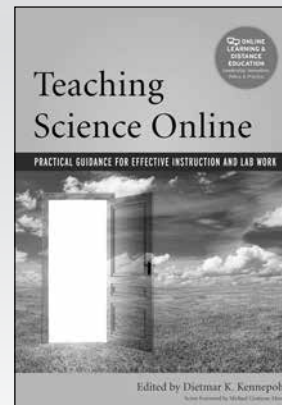
*Practical Guidance for Effective Instruction and Lab Work*

Edited by Dietmar Kennepohl

Foreword by Michael G. Moore

*Online Learning and Distance Education Series*

Paper \$35.00 | E-Book \$27.99



**FORTHCOMING TEXT**

## Improvement Science in Education

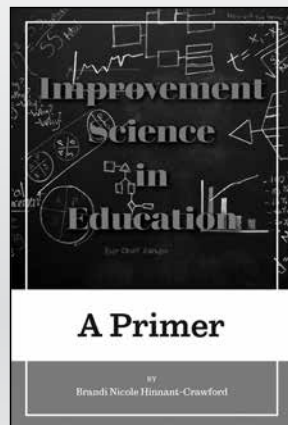
*A Primer*

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.

*Improvement Science in Education and Beyond Series*

Paper \$22.95 | E-Book \$22.95  
June 2020



**BESTSELLER**

## The New Science of Learning

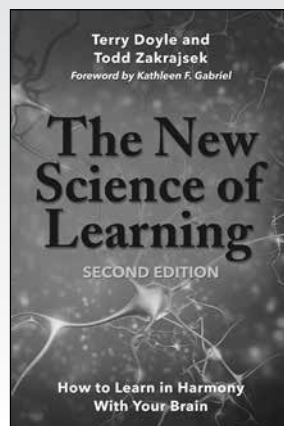
*How to Learn in Harmony With Your Brain*

SECOND EDITION

Terry Doyle and Todd D. Zakrajsek

Foreword by Kathleen F. Gabriel

Paper \$19.95 | E-Book \$15.99



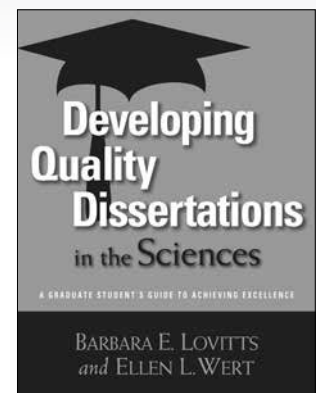
## Developing Quality Dissertations in the Sciences

*A Graduate Student's Guide to Achieving Excellence*

Barbara E. Lovitts and Ellen L. Wert

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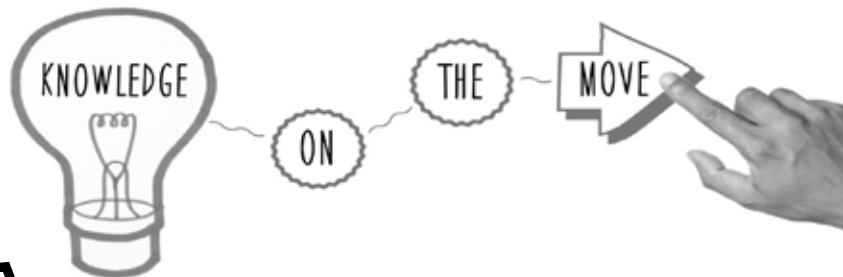
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## ACKNOWLEDGMENTS

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

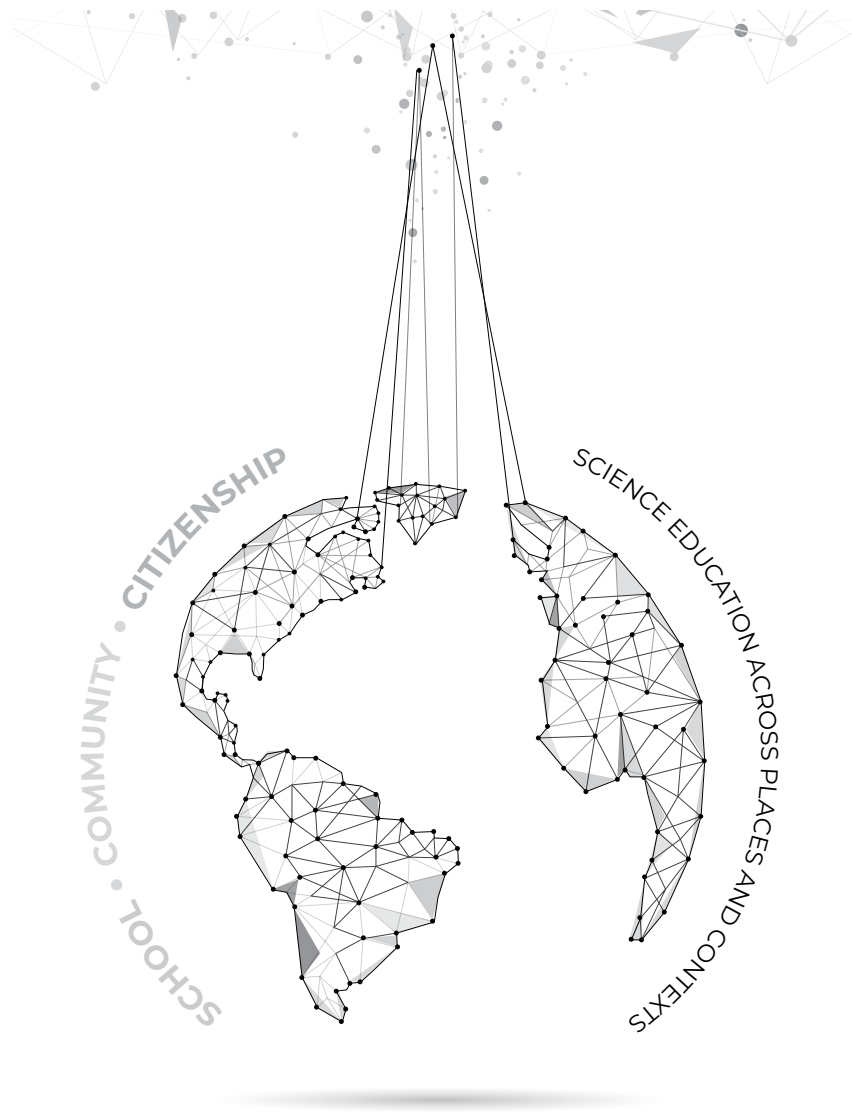
**Tali Tal**, President and  
Program Committee Co-Chair

**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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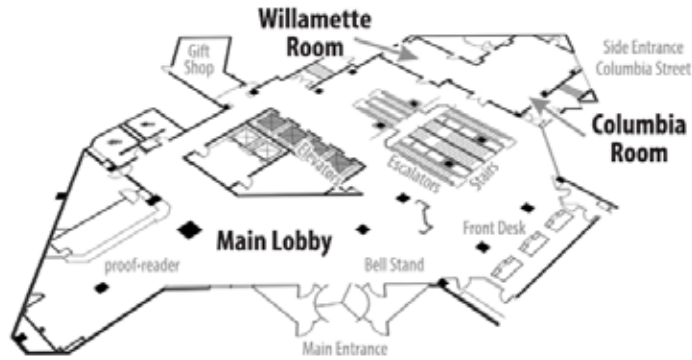
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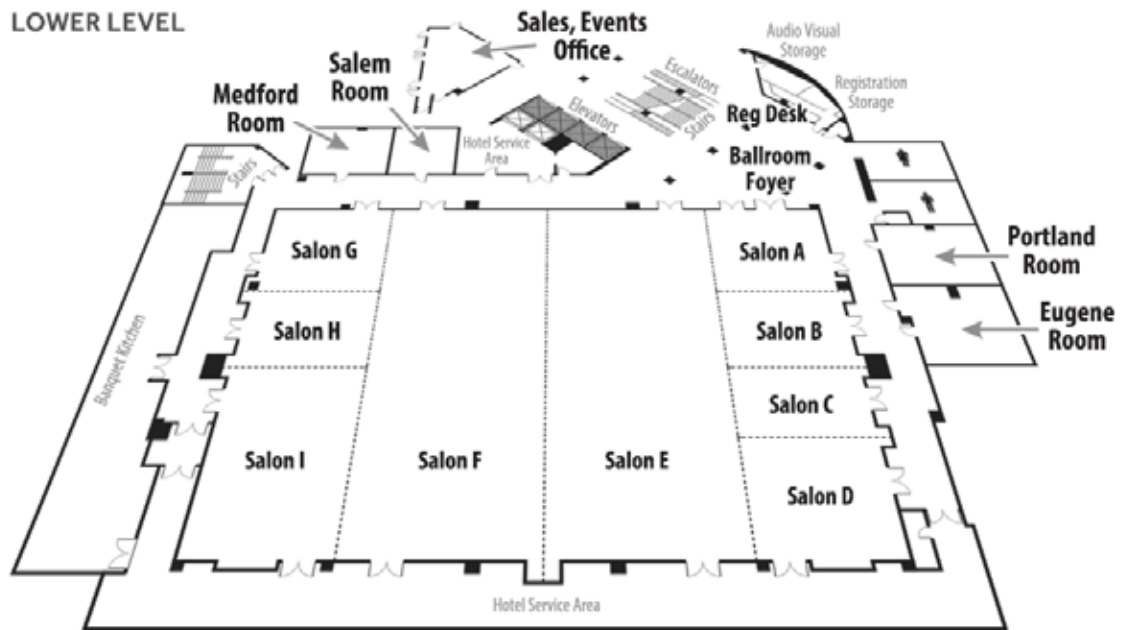


# FLOOR PLAN

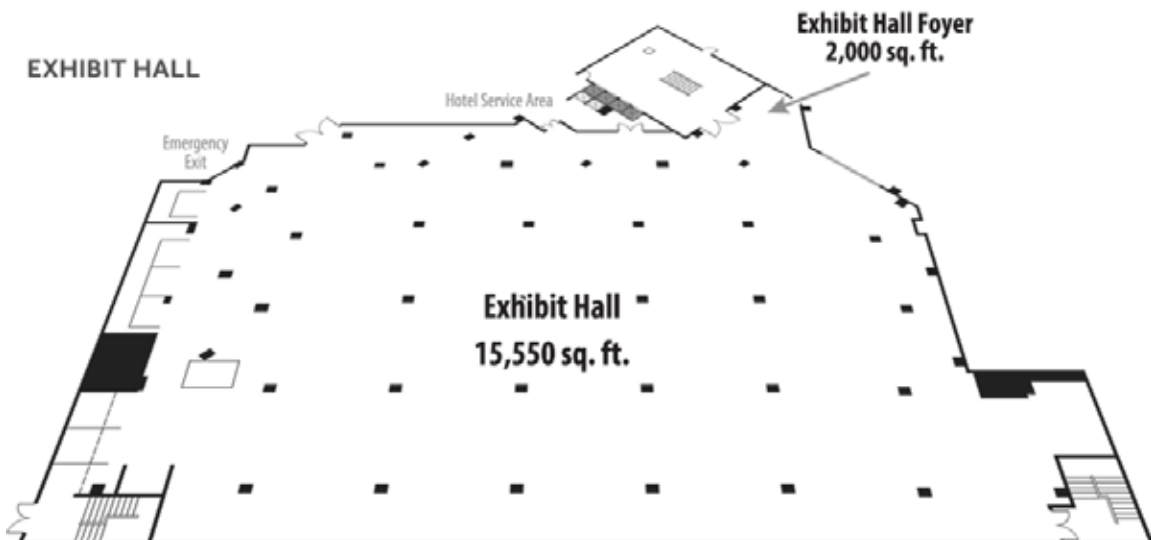
## LOBBY LEVEL



## LOWER LEVEL



## EXHIBIT HALL



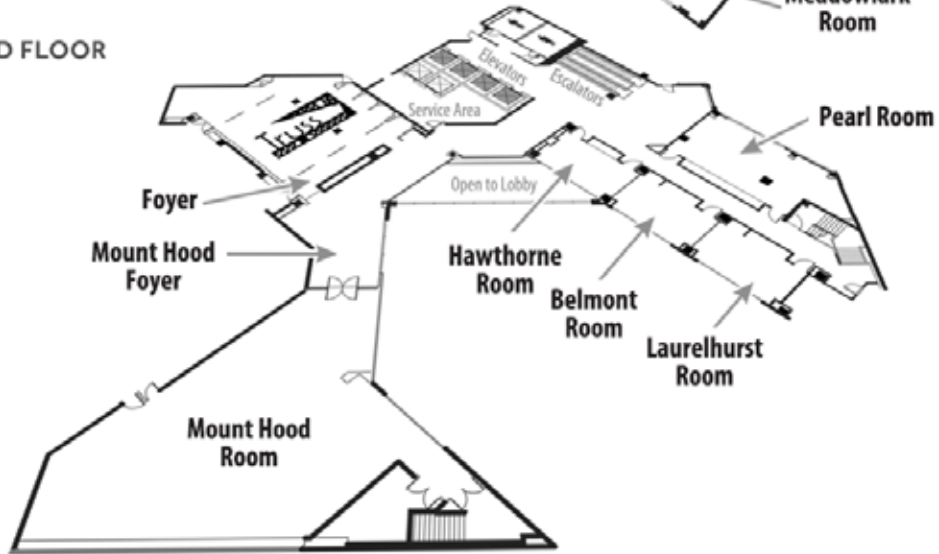


# FLOOR PLAN

## THIRD FLOOR



## SECOND FLOOR



# GENERAL INFORMATION

## Information about NARST

**The National Association for Research in Science Teaching (NARST)** was founded in 1928 for the purpose of promoting research in science education at all educational levels and disseminating the findings of this research in such ways as to improve science teaching and learning.

The Association is incorporated as a non-profit corporation in the State of Minnesota. The official publication is the *Journal of Research in Science Teaching (JRST)*. NARST encourages presentations of a wide variety of investigations in all aspects of science education, including action, historical, philosophical, ethnographic, experimental, and evaluative research studies. Reports of empirical research, critical reviews, and theoretical works are encouraged. In October 2010, to reflect the Association's growing international focus and membership, the Board approved referring to the Association by its acronym only. At the April 2011 Board Meeting, the tagline for the Association was approved by the Board. Thus, the Association's name and tagline is:

*NARST—A worldwide organization for improving science teaching and learning through research.*

Research areas of interest to NARST members include curriculum development and organization, assessment and evaluation, learning theory, teacher education, programs for exceptional students (special needs and talents), equity studies, policy, and methods of teaching.

## 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 Benefit

» 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.

» 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.

# GENERAL INFORMATION

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.

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## References

- AERA Council. (2011). Code of ethics: American Educational Research Association. *Educational Researcher*, 40(3), 145-146.
- American Sociological Association. (1999). Code of ethics and policies and procedures of the ASA committee on professional ethics. Retrieved from <http://www.asanet.org/membership/code-ethics>
- American Psychological Association. (2017). Ethical principles of psychologists and code of conduct. Retrieved from <http://www.apa.org/ethics/code/>

# GENERAL INFORMATION

## 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 proposer.

### 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

Springer Nature  
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We acknowledge Wiley-Blackwell and their work as publisher of the *Journal of Research in Science Teaching – JRST*



# GENERAL INFORMATION

## 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 94<sup>TH</sup> 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

#### 2020

NSTA April 2 – 5 | Boston, MA  
AERA April 17 – 21 | San Francisco, CA

#### 2021

NARST April 7-10 | Orlando, FL  
NSTA April 8 – 11 | Chicago, IL  
AERA April 9 – 12 | Orlando, FL



**April 7-10, 2021**  
Hilton Orlando Hotel  
Orlando, Florida

# GENERAL INFORMATION

## NARST Sponsored Sessions at NSTA Conferences 2020

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### 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

#### NARST-SPONSORED SESSION:

##### **Students as Curriculum Critics, Reframing Issues of Motivation**

**12:30 PM – 1:30 PM**

**Room:** Flagship A, Seaport Hotel

Both teachers and researchers identify low motivation among students as a problem that prevents meaningful science learning. Emphasis will be placed on learning to look at and make sense of students' willingness to engage.

**Speaker:** Daniel Morales-Doyle

Assistant Profesor  
The University of Illinois at Chicago

**Session Topic:** General Science Education

**Session Type:** Hands-On Workshop

#### NARST-SPONSORED SESSION:

##### **An Equity Lens on NGSS-Focused Classroom-Embedded Assessments**

**2:00 PM – 3:00 PM**

**Room:** Flagship A, Seaport Hotel

This study examined the extent to which culturally relevant science teaching strategies were taken up by middle school science teachers as a result of a two-year professional development explicitly focused on meeting the NGSS.

**Speakers:** Sheron Mark

University of Louisville

Thomas Tretter

Professor of Science Education  
University of Louisville

**Session Topic:** General Science Education

**Session Type:** Presentation

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### 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)

### 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

### 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

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## 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

# GENERAL INFORMATION

## NARST Sponsored Sessions at NSTA Conferences 2020 (con't)

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



# GENERAL INFORMATION

## NARST Leadership Team 2020-2022

### Officers and Board of Directors:

PRESIDENT

**Tali Tal** (2021)

Technion, Israel Institute of Technology

PRESIDENT-ELECT

**Eileen Carlton Parsons** (2022)

The University of North Carolina at Chapel Hill

IMMEDIATE PAST PRESIDENT

**Gail Richmond** (2020)

Michigan State University

SECRETARY—TREASURER

**Greg Kelly** (2020)

Pennsylvania State University

EXECUTIVE DIRECTOR

**Helen Schneider Lemay**

The Schneider Group, Inc.

### Executive Board Members:

**Sonya N. Martin** (2022)

Seoul National University  
International Coordinator

**Bhaskar Upadhyay** (2022)

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 Ogoto**

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 Alkhaer Kibbutzim**  
College of Education

## **STRAND 15: Policy**

(21) **Audrey Msimanga**  
University of the Witwatersrand South Africa

(20) **Carrie Allen**  
SRI International

# GENERAL INFORMATION

## Program Proposal Reviewers

|                           |                           |                         |                      |
|---------------------------|---------------------------|-------------------------|----------------------|
| Fouad Abd-El-Khalick      | Gillian Bayne             | Devasmita Chakraverty   | Chenchen Ding        |
| Issam Abi-El-Mona         | Dürdane Bayram-Jacobs     | Katherine Chapman       | Iyad Dkeidek         |
| Katherine Acosta-Garcia   | Christina Baze            | Angela Chapman          | Katherine Doerr      |
| Claudia Aguirre-Mendez    | Orit Ben Zvi Assaraf      | Shu-Kang Chen           | Glenn Dolphin        |
| Michael Arove             | Pablo Bendiksen Gutierrez | Jessica Chen            | Remy Dou             |
| Rahmi Aini                | Adam Bennion              | Yihong Cheng            | Helen Douglass       |
| Valarie Akerson           | Devarati Bhattacharya     | Meng-Fei Cheng          | Irene Drymiotou      |
| Selin Akgün               | Patricia Bills            | Kevin Cherbow           | Ryan Dunk            |
| Olugbenga Akindoju        | Estelle Blanquet          | Gina Childers           | Rebecca Eagle-Malone |
| Sule Aksoy                | Sarah Boesdorfer          | Ying-Ting Chiu          | Elizabeth Edmondson  |
| Sahar Alameh              | Yurdagul Bogar            | Kyungjin Cho            | Kirsten Edwards      |
| Maram Alaqra              | Franz Bogner              | Tapashi Binte Chowdhury | Jacqueline Ekeoba    |
| Iris Alkahrer             | Lisa Borgerding           | Heidi Cian              | Nizar El Mehtar      |
| Emily Allen               | Adriana Bortoletto        | Ali Cikmaz              | Charlene Ellingson   |
| Carrie Allen              | Jana Bouwma-Gearhart      | Dante Cisterna          | Anne Emerson Leak    |
| Daniel Alston             | G. Bowen                  | Heather Clark           | Patrick Enderle      |
| Sage Andersen             | Allison Bradford          | Scott Cohen             | Mohammed Estaiteyeh  |
| Kea Anderson              | Denise Bressler           | Ryan Coker              | Gayle Evans          |
| Chelsea Andrews           | Julie Brown               | Merryn Cole             | Ayca Fackler         |
| Allison Antink-Meyer      | Till Bruckermann          | Mandi Collins           | Nannan Fan           |
| Helena Aptyka             | Jeanne Brunner            | Darrin Collins          | Amy Farris           |
| Erik Arevalo              | Zoe Buck Bracey           | Carlson Coogler         | Diana Fenton         |
| Anna Maria Arias          | Carmen Bucknor            | Peter Cormas            | Daniela Fiedler      |
| Mary Atwater              | Jason Buell               | Beth Covitt             | Jonah Firestone      |
| Lucy Avraamidou           | Stephen Burgin            | Kent Crippen            | Angela Fitzgerald    |
| Banu Avsar Erumit         | Henriette Burns           | Catherine Cullicott     | Michelle Forsythe    |
| Nayif Awad                | Jade Burris               | Tejaswini Dalvi         | David Fortus         |
| Jean-Philippe Ayotte      | K. C. Busch               | Keren Dalyot            | Michelle Friend      |
| Beaudet                   | Sanlyn Buxner             | Danielle Dani           | Sarah Frodsham       |
| Saiqa AzamNathália Helena | Yasemin Buyuksahin        | Emily Dare              | Gavin Fulmer         |
| Azevedo Pereira           | Scott Byrd                | Ido Davidesco           | Seok-Hyun Ga         |
| Yejun Bae                 | Ryan Cain                 | Shannon Davidson        | Adiv Gal             |
| Eunjin Bahng              | Brendan Callahan          | Amber Davis             | Dafna Gan            |
| Grace Baker               | Brenda Carpenter          | Elizabeth De Los Santos | Amity Gann           |
| Meena Balgopal            | Daniel Carpenter          | Isha DeCoito            | Peter Garik          |
| Senetta Bancroft          | Carmen Carrion            | Lillian Degand          | Jennifer Gauble      |
| Bongani Bantwini          | Ira Caspari               | Cesar Delgado           | Frikkie George       |
| Miri Barak                | Michael Cassidy           | Coralie Delhayé         | Maryam Ghadiri       |
| Hillary Barron            | Andy Cavagnetto           | Narendra Deshmukh       | Khanaposhtani        |
| Selina Bartles            | Amber Cesare              | Adam Devitt             | Michael Giamellaro   |
| Paul Bartlett             | Emel Cevik                | Jessica Dewey           | Dionysius Gnanakkan  |
| Kathryn Bateman           | Lucia Chacon-Diaz         | Michael Dias            | Amanda Gonczi        |



# GENERAL INFORMATION

|                        |                          |                      |                       |
|------------------------|--------------------------|----------------------|-----------------------|
| Casandra Gonzalez      | Gary Holliday            | Gretchen King        | Abraham Lo            |
| María González-Howard  | Zuway-R Hong             | James Kisiel         | David Long            |
| Rachael Gordon         | Meredith Houle-Vaughn    | Vance Kite           | Charnell Long         |
| Lucy Gordon            | Ana Houseal              | Timothy Klavon       | Douglas Lownsbey      |
| Deena Gould            | Karyn Housh              | Tormi Kotkas         | Lisa Lundgren         |
| Judith Gouraige        | Pei-Ling Hsu             | Jayma Koval          | Sharon Lynch          |
| Donna Governor         | Xiao Huang               | Susan Kowalski       | Xiaoxin Lyu           |
| Nicole Graulich        | Elizabeth Hufnagel       | Petra Kranzfelder    | Lauren Madden         |
| Ron Gray               | Todd Hutner              | Rishi Krishnamoorthy | Massa Mafi            |
| Kathryn Green          | Tracy Huziak-Clark       | Sandhya Krishnan     | Jennifer Maguire      |
| Day Greenberg          | Amal Ibourk              | Harini Krishnan      | Nidaa Makki           |
| Elizabeth Greive       | Robert Idsardi           | Marcus Kubsch        | Hamza Malik           |
| Anna Grinath           | Lorelie Imperial         | Mwenda Kudumu        | Lisa Marco-Bujosa     |
| Frederick Grinnell     | Kayahan Ince             | Diane Lally          | Stefanie Marshall     |
| Jonathon Grooms        | Tobias Irish             | Richard Lamb         | Kit Martin            |
| Gonzalo Guerrero       | David Jackson            | Elon Langbeheim      | Lloyd Mataka          |
| Liam Guilfoyle         | Ashley Jackson           | Keith Langenhoven    | Nitasha Mathayas      |
| Davut Gül              | Sylvia James             | Alice Langhans       | Takuya Matsuura       |
| Semiha Gun-Yildiz      | Sophia (Sun Kyung) Jeong | Corinne Lardy        | Rebecca Matz          |
| Kristin Gunckel        | Hannoori Jeong           | Katie Laux           | Maria Rivera Maulucci |
| Heesoo Ha              | Juan Jimenez             | Thanh Le             | Shana McAlexander     |
| Bobby Habig            | Hui Jin                  | Felicia Leammukda    | Jonathan McCausland   |
| Sebastian Habig        | Qingna Jin               | Judith Lederman      | Lucy McClain          |
| Jonathan Hall          | Bjørn Johannsen          | Min Jung Lee         | William McComas       |
| Soraya Hamed           | Matthew Johnson          | Gyeong-Geon Lee      | Lisa McDonald         |
| James Hancock          | Eugene Judson            | Eun Ah Lee           | Christine McDonald    |
| Jacqueline Handley     | Rachel Juergensen        | SoonChun Lee         | Justin McFadden       |
| Henry Hane             | Thomas Kamoski           | Dawnne LePrete       | Veronica McGowan      |
| Ute Harms              | Kostas Kampourakis       | Smadar Levy          | Deb McGregor          |
| Brian Hartman          | Nam-Hwa Kang             | Elizabeth Lewis      | Megan McKinley-Hicks  |
| Christa Haverly        | Jessica Karch            | Siqi Li              | David McKinney        |
| Kathryn Hayes          | Elliott Karetny          | Marie Liebetrau      | Felicity McLure       |
| Peng He                | Victor Kasper            | Sarah Lilly          | Preetha Menon         |
| Jordan Henley          | Ana Cláudia Kasseboehmer | Jing Lin             | Felicia Mensah        |
| Colin Hennessy Elliott | Amanda Kavner            | Tzung-Jin Lin        | Alison Mercier        |
| Sara Heredia           | Fatma Kaya               | Dani Lin Hunter      | Joi Merritt           |
| Ben Herman             | Clarissa Keen            | William Lindsay      | Gunkut Mesci          |
| Cari Herrmann Abell    | Eleanor Kenimer          | Karen Lionberger     | J. Mesiner            |
| Jenna Hicks            | Lisa Kenyon              | Megan Littrell       | Mark Meszaros         |
| Tom Higginbotham       | Won Kim                  | Chi-Chang Liu        | Katherine Miller      |
| Georgia Hodges         | Natalie King             | Shiang-Yao Liu       | Emily Miller          |

# GENERAL INFORMATION

## Program Proposal Reviewers (con't)

|                         |                         |                           |                        |
|-------------------------|-------------------------|---------------------------|------------------------|
| Catherine Milne         | Scott Pattison          | Kathleen Schenkel         | Nancy Staus            |
| Bratoljub Milosavljevic | Kelli Paul              | Kelly Schmid              | Molly Stuhsatz         |
| James Minogue           | Jose Pavez              | Laura Schneider           | Cathlyn Styliniski     |
| Ashwin Mohan            | Corey Payne             | Thilo Schramm             | Jason Sullivan         |
| Linda Morell            | Greses Pérez            | Anita Schuchardt          | Ryan Summers           |
| Daniel Moreno           | Matthew Perkins Coppola | Liron Schwartz            | Regina Suriel          |
| Terrell Morton          | David Perl Nussbaum     | Renee Schwartz            | Gina Svarovsky         |
| Alexandria Muller       | Erin Peters-Burton      | Martin Schwichow          | Rebecca Swanson        |
| Bridget Mulvey          | Mario Pickens           | Ying Ying Seah            | Tali Tal               |
| Frackson Mumba          | Takeshia Pierre         | Wisam Sedawi              | Kristina Tank          |
| Ashley Murphy           | Ashlyn Pierson          | Quentin Sedlacek          | Amy Tankersley         |
| Jaclyn Murray           | Daniel Pimentel         | David Segura              | Stephanie Teeter       |
| Jomo Mutegi             | Jacob Pleasants         | Amy Semerjian             | Ana Paula Teles        |
| Bahadir Namdar          | Pongprapan Pongsophon   | Samuel Severance          | Sibel Telli            |
| Amreen Nasim Thompson   | Merredith Portsmore     | Neta Shaby                | Jared Tenbrink         |
| Jasmine Nation          | Joshua Premo            | Meenakshi Sharma          | Ebony Terrell Shockley |
| Shannon Navy            | Tiffini Pruitt-Britton  | Aviv Sharon               | Meredith Thompson      |
| Alana Newell            | Kiran Purohit           | Katherine Sharp           | Stephen Thompson       |
| Hai Nguyen              | Senay Purzer            | Starlette Sharp           | Rüdiger Tiemann        |
| Stella Nicolaou         | Anton Puvirajah         | Paichi Shein              | Deborah Tippins        |
| Jayson Nissen           | Arif Rachmatullah       | Fan Shi                   | Preethi Titu           |
| Tara Nkrumah            | Jeffrey Radloff         | Mary Short                | Radu Bogdan Toma       |
| Jeffrey Nordine         | Stephanie Rafanelli     | Teresa Shume              | Apisit Tongchai        |
| James Nyachwaya         | Umesh Ramnarain         | Amanda Siebert-Evenstone  | Brit Toven-Lindsey     |
| Laura Ochs              | Miia Rannikmae          | Lucas Silva               | Brie Tripp             |
| Ella Ofek-Geva          | Carina Rebello          | Jonathan Singer           | Dina Tsybulsky         |
| Justina Ogodu           | Shalaunda Reeves        | Waralee Sinthuwa          | Eli Tucker-Raymond     |
| Meshach Ogunniyi        | Emma Refvem             | Judyanto Sirait           | Imran Tufail           |
| Peter Okebukola         | Joshua Reid             | Christina Siry            | Shane Tutwiler         |
| Stacy Olitsky           | Priit Reiska            | Emilie Siverling          | Mavreen Rose Tuvilla   |
| Joanne Olson            | Marissa Rollnick        | Amber Sizemore Davis      | Bhaskar Upadhyay       |
| Yann Shiou Ong          | Darcy Ronan             | Heather Skaza Acosta      | Katrin Vaino           |
| Renata Orofino          | Ranu Roy                | Patrick Smith             | Ana Valdmann           |
| Femi Otulaja            | Melody Russell          | Cody Smith                | Helena Van Vorst       |
| Olatunde Owolabi        | Ercin Sahin             | Theila Smith              | Emily Van Zee          |
| Ferah Ozer              | Emine Sahin-Topalcengiz | Tamara Smolek             | Kristin Van Wyngaarden |
| Kübra Özmen             | Sapir Salamander        | Virginia Snodgrass Rangel | Ann Varnedoe           |
| Heather Page            | Sara Salisbury          | Lindsey Snyder            | Lucia Vazquez-Ben      |
| Enrique Pareja          | Takumi Sato             | Regina Soobard            | Anthony Villa          |
| Wonyong Park            | Funda Savasci-Acikalın  | Stefan Sorge              | Tina Vo                |
| Soonhye Park            | Guan Saw                | David Sparks              | Katherine Wade-Jaimes  |
| Jennifer Parrish        | Dannah Schaffer         | Ornit Spektor-Levy        | Noemi Waight           |
| Alexis Patterson        | Jennifer Schellinger    | Hanna Stammes             | Wendy Wakefield        |

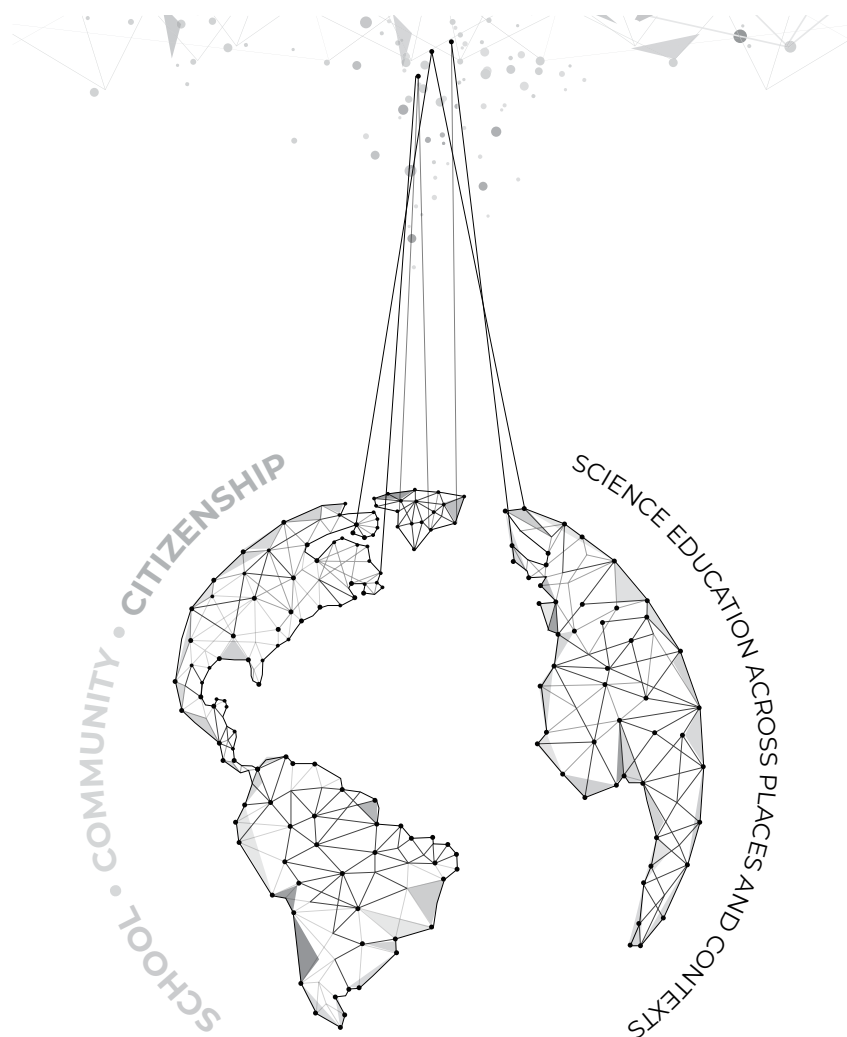
# GENERAL INFORMATION

Kate Walker  
Lu Wang  
Xuehui Wang  
Jianlan Wang  
Yan Wang  
Cong Wang  
Abdirizak Warfa  
Gary Weiser  
Kristen Wendell  
Niva Wengrowicz  
Jill Wertheim

Melinda Whitford  
Jeanna Wieselmann  
Jennifer Wilhelm  
Michelle Wilkerson  
Tory Williams  
Grant Williams  
Sara Wilmes  
Dionne Wilson  
Kerri Wingert  
Donald Wink  
Panchompoo Wisittanawat

Stephen Witzig  
Karen Woodruff  
Ti'Era Worsley  
Elana Worth  
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



# GENERAL INFORMATION

## NARST Presidents:

|      |                    |      |                     |      |                        |      |                            |
|------|--------------------|------|---------------------|------|------------------------|------|----------------------------|
| 1928 | W. L. Eikenberry   | 1952 | Betty Lockwood      | 1976 | Ronald D. Anderson     | 1999 | Joseph S. Krajcik          |
| 1929 | W. L. Eikenberry   | 1953 | J. Darrell Barnard  | 1977 | O. Roger Anderson      | 2000 | David F. Tregust           |
| 1930 | W. L. Eikenberry   | 1954 | George G. Mallinson | 1978 | Roger G. Olstad        | 2001 | Sandra K. Abell            |
| 1931 | Elliot R. Downing  | 1955 | Kenneth E. Anderson | 1979 | James R. Okey          | 2002 | Norman G. Lederman         |
| 1932 | Elliot R. Downing  | 1956 | W. C. Van Deventer  | 1980 | John W. Renner         | 2003 | Cheryl L. Mason            |
| 1933 | Francis D. Curtis  | 1957 | Waldo W. Blanchet   | 1981 | Stanley L. Helgeson    | 2004 | Charles W. (Andy) Anderson |
| 1934 | Ralph K. Watkins   | 1958 | Nathan S. Washton   | 1982 | Stanley L. Helgeson    | 2005 | John R. Staver             |
| 1935 | Archer W. Hurd     | 1959 | Thomas P. Fraser    | 1983 | Carl F. Berger         | 2006 | James A. Shymanksy         |
| 1936 | Gerald S. Craig    | 1960 | Vaden W. Miles      | 1984 | Ann C. Howe            | 2007 | Jonathan F. Osborne        |
| 1937 | Walter G. Whitman  | 1961 | Clarence H. Boeck   | 1985 | Ertle Thompson         | 2008 | Penny J. Gilmer            |
| 1938 | Honor A. Webb      | 1962 | Herbert A. Smith    | 1986 | David P. Butts         | 2009 | Charlene M. Czerniak       |
| 1939 | John M. Mason      | 1963 | Ellsworth S. Obourn | 1987 | James P. Barufaldi     | 2010 | Richard A. Duschl          |
| 1940 | Otis W. Caldwell   | 1964 | Cyrus W. Barnes     | 1988 | Linda DeTure           | 2011 | Dana L. Zeidler            |
| 1941 | Harry A. Carpenter | 1965 | Frederic B. Dutton  | 1989 | Patricia Blosser       | 2012 | J. Randy McGinnis          |
| 1942 | G. P. Cahoon       | 1966 | Milton P. Pella     | 1990 | William G. Holliday    | 2013 | Sharon J. Lynch            |
| 1943 | Florence G. Billig | 1967 | H. Craig Sipe       | 1991 | Jane Butler Kahle      | 2014 | Lynn A. Bryan              |
| 1944 | Florence G. Billig | 1968 | John M. Mason       | 1992 | Russell H. Yeany       | 2015 | Valarie L. Akerson         |
| 1945 | Florence G. Billig | 1969 | Joseph D. Novak     | 1993 | Emmett L. Wright       | 2016 | Mary M. atwater            |
| 1946 | C. L. Thield       | 1970 | Willard D. Jacobson | 1994 | Kenneth G. Tobin       | 2017 | Mei-Hung Chiu              |
| 1947 | Earl R. Glenn      | 1971 | Paul D. Hurd        | 1995 | Dorothy L. Gabel       | 2018 | Barbara Crawford           |
| 1948 | Ira C. Davis       | 1972 | Frank X. Sutman     | 1996 | Barry J. Fraser        | 2019 | Gail Richmond              |
| 1949 | Joe Young West     | 1973 | J. David Lockard    | 1997 | Thomas R. Koballa, Jr. | 2020 | Tali Tal                   |
| 1950 | N. Eldred Bingham  | 1974 | Wayne W. Welch      | 1998 | Audrey B. Champagne    | 2021 | Eileen Parsons             |
| 1951 | Betty Lockwood     | 1975 | Robert E. Yager     |      |                        |      |                            |

## NARST Executive Directors:

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

|             |                     |             |                 |             |                       |
|-------------|---------------------|-------------|-----------------|-------------|-----------------------|
| 1975 – 1980 | Paul H. Joslin      | 1990 – 1995 | John R. Staver  | 2002 – 2007 | John W. Tillotson     |
| 1980 – 1985 | William G. Holliday | 1995 – 2000 | Arthur L. White | 2007 – 2018 | William C. Kyle Jr.   |
| 1985 – 1990 | Glenn C. Markle     | 2000 – 2002 | David L. Haury  | 2018 –      | Helen Schneider Lemay |

## JRST Editors:

|             |                       |             |  |             |   |
|-------------|-----------------------|-------------|--|-------------|---|
| 1963 – 1966 | J. Stanley Marshall   | 1990 – 1993 | Ronald G. Good   | 2006 – 2010 | J. Randy McGinnis and Angelo Collins          |
| 1966 – 1968 | H. Craig Sipe         | 1994 – 1999 | William C. Kyle, Jr.                                     | 2011 – 2015 | Joseph S. Krajcik and Angela Calabrese Barton |
| 1969        | James T. Robinson     | 1999 – 2001 | Charles W. (Andy) Anderson and James J. Gallagher August | 2016 – 2020 | Fouad Abd-El-Khalick and Dana L. Zeidler      |
| 1970 – 1974 | O. Roger Anderson     | 2002 – 2005 | Dale R. Baker and Michael D. Piburn                      | 2021-2025   | Troy Dow Sadler and Felicia Mensah            |
| 1975 – 1979 | David P. Butts        |             |  |             |   |
| 1980 – 1984 | James A. Shymansky    |             |  |             |   |
| 1985 – 1989 | Russell H. Yeany, Jr. |             |  |             |   |

# GENERAL INFORMATION

## NARST Emeritus Members

|                    |                   |                       |                  |
|--------------------|-------------------|-----------------------|------------------|
| Agin, Michael      | Feher, Elsa       | Mallinson, Jacqueline | Rose, Ryda       |
| Andersen, Hans     | Ganiel, Uri       | Markle, Glenn         | Schmidt, Donald  |
| Anderson, Ronald   | Haney, Richard    | McCormack, Alan       | Sequeira, Manuel |
| Angell, Carl       | Haury, David      | McFadden, Charles     | Sherwood, Robert |
| Arzi, Hanna        | Helgeson, Stanley | Niaz, Mansoor         | Simmons, Ellen   |
| Baker, Dale        | Hewson, Peter     | Nous, Albert          | Simonis, Doris   |
| Barnes, Marianne   | Hill, Todd        | Novak, Joseph         | Smith, Edward    |
| Bartlett, Guilford | Holliday, William | Olstad, Roger         | Swift, J. Nathan |
| Berkheimer, Glenn  | Jaffarian, Bill   | Padilla, Michael      | Thier, Herbert   |
| Bethel, Lowell     | Joslin, Paul      | Pak, Sung Jae         | Thier, Marlene   |
| Christopher, John  | Kahle, Jane       | Pedemonte, Gian       | Van Den Berg, Ed |
| Dahncke, Helmut    | Kennedy, David    | Piburn, Michael       | Walding, Richard |
| De Jong, Onno      | Krockover, Gerald | Poth, James           | Welch, Wayne     |
| Dehaan, Robert     | Lemke, Jay        | Prather, J.           | Williams, Robert |
| Doran, Rodney      | Lindauer, Ivo     | Rennie, Leonie        | Yore, Larry      |
| Enochs, Larry      | Lunetta, Vincent  | Riechard, Donald      |                  |

## 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.

| Year | Awardee            | Year | Awardee   | Year | Awardee   |
|------|--------------------|------|---|------|---|
| 1986 | Anton E. Lawson    | 2002 | Audrey B. Champagne   | 2014 | Glen Alkenhead,<br>Richard Gunstone, and<br>Frances Lawrenz |
| 1987 | Paul DeHart Hurd   | 2003 | Barry J. Fraser   | 2015 | Richard A. Duschl and<br>Meshach Mobolaji Ogunniyi          |
| 1988 | John W. Renner     | 2004 | Robert E. Yager and<br>Paul Black                                 | 2016 | Lynn D. Dierking,<br>John N. Falk, and<br>Dana L. Zeidler   |
| 1989 | Willard Jacobson   | 2005 | John C. Clement   | 2017 | Avi Hofstein  |
| 1990 | Joseph D. Novak    | 2006 | David Treagust  | 2018 | Marissa Rollnick, and<br>Jonathan Osborne                   |
| 1991 | Robert L. Shrigley | 2007 | Kenneth Tobin   | 2019 | Mary M. Atwater and<br>Maria Pilar Jiménez-<br>Aleixandre   |
| 1992 | Pinchas Tamir      | 2008 | Dorothy Gabel   | 2020 | Judy Dori and<br>Saouma Bou Jaoude                          |
| 1993 | Jack Easley, Jr.   | 2009 | Peter W. Hewson,<br>Leonie Jean Rennie, and<br>Wolff-Michael Roth |      |   |
| 1994 | Marcia C. Linn     | 2010 | Reinders Duit and<br>Joseph Krajcik                               |      |   |
| 1995 | Wayne W. Welch     | 2011 | Norman Lederman   |      |   |
| 1996 | Carl F. Berger     | 2012 | Charles W. (Andy) Anderson and<br>Larry Yore                      |      |   |
| 1997 | Rosalind Driver    | 2013 | Dale R. Baker   |      |   |
| 1998 | James J. Gallagher |      |   |      |   |
| 1999 | Peter J. Fensham   |      |   |      |   |
| 2000 | Jane Butler Kahle  |      |   |      |   |
| 2001 | John K. Gilbert    |      |   |      |   |

# GENERAL INFORMATION

## 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.

| Year | Awardee                 | Major Professor                | Year | Awardee                  | Major Professor                                 |
|------|-------------------------|--------------------------------|------|--------------------------|---|
| 1992 | Rene Stofflett          | Dale R. Baker                  | 2007 | Julia Plummer            | Joseph S. Krajcik                               |
| 1993 | Julie Gess-Newsome      | Norman G. Lederman             | 2008 | Victor Sampson           | Douglas Clark                                   |
| 1994 | Carolyn W. Keys         | Burton E. Voss                 | 2009 | Lei Liu                  | Cindy E. Hmelo-Silver                           |
| 1995 | Jerome M. Shaw          | Edward Haertel                 | 2010 | Heather Toomey Zimmerman | Phillip Bell                                    |
| 1996 | Christine M. Cunningham | William L. Carlsen             | 2011 | Jeffrey J. Rozelle       | Suzanne M. Wilson                               |
| 1997 | Jane O. Larson          | Ronald D. Anderson             | 2011 | Catherine Eberbach       | Kevin Crowley                                   |
| 1998 | Kathleen Hogan          | Bonnie K. Nastasi              | 2012 | Melissa Braaten          | Mark Windschitl                                 |
| 1999 | Fouad Abd-El-Khalick    | Norman G. Lederman             | 2013 | Lori Fulton              | Jian Wang                                       |
| 2000 | Danielle Joan Ford      | Annemarie S. Palinscar         | 2014 | Daniel Birmingham        | Angela Calabrese Barton and Anne-Lise Halvorsen |
| 2001 | Iris Tabak              | Brian Reiser                   | 2015 | Allison Godwin           | Geoffrey Potvin                                 |
| 2002 | Mark Girod              | David Wong                     | 2016 | Anna MacPherson          | Jonathan Osborne                                |
| 2003 | Hsin-Kai Wu             | Joseph Krajcik                 | 2017 | Anita Schuchardt         | Christian Schunn                                |
| 2004 | David L. Fortus         | Ronald Marx and Joseph Krajcik | 2018 | Katherine Wade-Jaimes    | Renée Schwartz                                  |
| 2005 | Thomas Tretter          | Gail M. Jones                  | 2019 | Anita S. Tseng           | Jonathan F. Osborne                             |
| 2006 | Stacy Olitsky           | Kenneth Tobin                  | 2020 | Neta Shaby               | Orit Ben Zvi-Assaraf                            |

## 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.

| Year | Awardee                            | Year | Awardee              | Year | Awardee                            |
|------|------------------------------------|------|----------------------|------|------------------------------------|
| 1993 | Wolff-Michael Roth                 | 2002 | Alan G. Harrison     | 2012 | Victor Sampson                     |
| 1994 | Deborah J. Tippins                 | 2003 | Fouad Abd-El-Khalick | 2013 | Alandeom W. Oliveira               |
| 1995 | Nancy B. Songer                    | 2004 | Grady J. Venville    | 2014 | Cory Forbes                        |
| 1996 | Mary B. Nakhleh                    | 2005 | Randy L. Bell        | 2015 | Benjamin C. Herman                 |
| 1997 | Peter C. Taylor                    | 2006 | Heidi Carlone        | 2016 | Richard L. Lamb                    |
| 1998 | J. Randy McGinnis                  | 2007 | Bryan A. Brown       | 2017 | Ying-Chih Chen<br>David Stroupe    |
| 1999 | Craig W. Bowen<br>Gregory J. Kelly | 2008 | Hsin-Kai Wu          | 2018 | Doug Lombardi                      |
| 2000 | Angela Calabrese Barton            | 2009 | Troy D. Sadler       | 2019 | Hosun Kang<br>Eve Manz             |
| 2001 | Julie A. Bianchini                 | 2010 | Thomas Tretter       | 2020 | Brian Donovan<br>Dana Vedder Weiss |
|      |                                    | 2011 | Katherine L. McNeill |      |                                    |

# GENERAL INFORMATION

## 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.

| <b>Year</b> | <b>Awardee</b>   | <b>Year</b> | <b>Awardee</b>  | <b>Year</b> | <b>Awardee</b>  |
|-------------|--|-------------|---|-------------|---|
| 1974        | Donald E. Riechard and Robert C. Olson   |             | Emmett L. Wright  | 2006        | Troy D. Sadler and Dana L. Zeidler  |
| 1975        | Mary Budd Rowe   | 1991        | E. P. Hart and I. M. Robottom   | 2007        | Jerome Pine, Pamela Aschbacher, Ellen Roth, Melanie Jones, Cameron McPhee, Catherine Martin, Scott Phelps, Tara Kyle, and Brian Foley |
| 1976        | Marcia C. Linn and Herbert C. Thier  | 1992        | John R. Baird, Peter J. Fensham, Richard E. Gunstone, and Richard T. White      | 2008        | Christine Chin  |
| 1977        | Anton E. Lawson and Warren T. Wollman  | 1993        | Nancy R. Romance and Michael R. Vitale  | 2009        | Kihyun Ryoo and Bryan Brown   |
| 1978        | Dorothy L. Gabel and J. Dudley Herron  | 1994        | E. David Wong   | 2010        | Helen Patrick, Panayota Mantzicopoulos, and Ala Samarapungavan  |
| 1979        | Janice K. Johnson and Ann C. Howe  | 1995        | Stephen P. Norris and Linda M. Phillips   | 2011        | Daphne Minner, Jeanne Century, and Abigail Jurist Levy  |
| 1980        | John R. Staver and Dorothy L. Gabel (tie) Linda R. DeTure  | 1996        | David F. Jackson, Elizabeth C. Doster, Lee Meadows, and Teresa Wood             | 2012        | Julie A. Luft, Jonah B. Firestone, Sissy S. Wong, Irasema Ortega, Krista Adams, and EunJin Bang                                       |
| 1981        | William C. Kyle, Jr.   | 1997        | C. W. J. M. Klassen and P. L. Linjse  | 2013        | Edys S. Quellmalz, Michael J. Timms, Matt D. Silberglitt, and Barbara C. Buckley  |
| 1982        | Robert G. Good and Harold J. Fletcher (tie) F. David Boulanger   | 1998        | Julie Bianchini   | 2014        | Joseph Taylor, Susan Kowalski, Christopher Wilson, Stephen Getty, and Janet Carlson   |
| 1983        | Jack A. Easley, Jr.  | 1999        | Phillip M. Sadler   | 2015        | Matthew Kloser  |
| 1984        | Marcia C. Linn, Cathy Clement, and Stephen Pulos   | 2000        | Allan G. Harrison, J. Grayson, and David F. Treagust                            |             |   |
| 1985        | Julie P. Sanford   | 2001        | Fouad Abd-El-Khalick and Norman G. Lederman                                     |             |   |
| 1986        | Anton E. Lawson  | 2002        | Andrew Gibert and Randy Yerrick   |             |   |
| 1987        | Russell H. Yeany, Kueh Chin Yap, and Michael J. Padilla  | 2003        | Sofia Kesidou and Jo Ellen Roseman  |             |   |
| 1988        | Kenneth G. Tobin and James J. Gallagher  | 2004        | Jonathan Osborne, Sue Collins, Mary Ratcliffe, Robin Millar, and Richard Duschl |             |   |
| 1988        | (tie) Robert D. Sherwood, Charles K. Kinzer, John D. Bransford, Jeffrey J. Franks, and Anton E. Lawson | 2005        | Jonathan Osborne, Sibel Erduran, and Shirley Simon                              |             |   |
| 1989        | Glen S. Aikenhead  |             |   |             |   |
| 1990        | Richard A. Duschl and  |             |   |             |   |



# GENERAL INFORMATION

## 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.

| Year | Awardee   | Year | Awardee   | Year | Awardee  |
|------|---|------|---|------|--|
| 1975 | John J. Koran   | 1990 | Patricia L. Hauslein,<br>Ronald G. Good,<br>and Catherine Cummins             | 2004 | Joanne K. Olson<br>(tie) Sharon J. Lynch,<br>Joel Kuipers,<br>Curtis Pyke, and<br>Michael Szesze |
| 1976 | Anton E. Lawson   | 1991 | Nancy R. Romance and<br>Michael Vitale  | 2005 | Chi-Yan Tsui and<br>David Treagust   |
| 1977 | NO AWARD  | 1992 | Patricia Heller,<br>Ronald Keith, and<br>Scott Anderson                       | 2006 | Leema Kuhn and<br>Brian Reiser   |
| 1978 | Rita Peterson   | 1993 | Wolff-Michael Roth  | 2007 | Eugene L. Chiappetta,<br>Tirupalavanam G. Ganesh,<br>Young H. Lee, and<br>Marianne C. Phillips   |
| 1979 | Linda R. DeTure   | 1994 | Wolff-Michael Roth and<br>Michael Bowen                                       | 2008 | Guy Ashkenazi and<br>Lana Tockus-Rappoport   |
| 1980 | M. James Kozlow and<br>Arthur L. White  | 1995 | Wolff-Michael Roth  | 2009 | Jrene Rahm   |
| 1981 | William Capie,<br>Kenneth G. Tobin, and<br>Margaret Boswell   | 1996 | Nancy J. Allen  | 2010 | Mark W. Winslow,<br>John R. Staver, and<br>Lawrence C. Sharmann                                  |
| 1982 | F. Gerald Dillashaw and<br>James R. Okey  | 1997 | NO AWARD  | 2011 | Matthew Kloser   |
| 1983 | William C. Kyle, Jr.,<br>James A. Shymansky, and<br>Jennifer Alport   | 1998 | Wolff-Michael Roth,<br>Reinders Duit,<br>Michael Komorek, and<br>Jens Wilbers | 2012 | Shelly R. Rodriguez and<br>Julie Gess-Newsome  |
| 1984 | Darrell L. Fisher and<br>Barry J. Fraser  | 1999 | Lynn A. Bryan   | 2013 | Edward G. Lyon   |
| 1985 | Hanna J. Arzi, Ruth Ben-Zvi,<br>and Uri Ganiel (tie)<br>Russell H. Yeany,<br>Kueh Chin Yap, and<br>Michael J. Padilla | 2000 | Joseph L. Hoffman and<br>Joseph S. Krajcik                                    | 2014 | Ying-Chih Chen,<br>Soonhye Park, and<br>Brian Hand   |
| 1986 | Barry J. Fraser,<br>Herbert J. Walberg,<br>and Wayne W. Welch (tie)   | 2001 | Allan G. Harrison   | 2015 | Lori M. Ihrig,<br>Michael P. Clough, and<br>Joanne K. Olson                                      |
| 1987 | Robert D. Sherwood  | 2002 | Carolyn Wallace Keys,<br>Eun-Mi Yang,<br>Brian Hand, and<br>Liesl Hohenshell  |      |  |
| 1988 | Barry J. Fraser and<br>Kenneth G. Tobin   | 2003 | Wolff-Michael Roth  |      |  |
| 1989 | James J. Gallagher and<br>Armando Contreras   |      |   |      |  |

## 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.

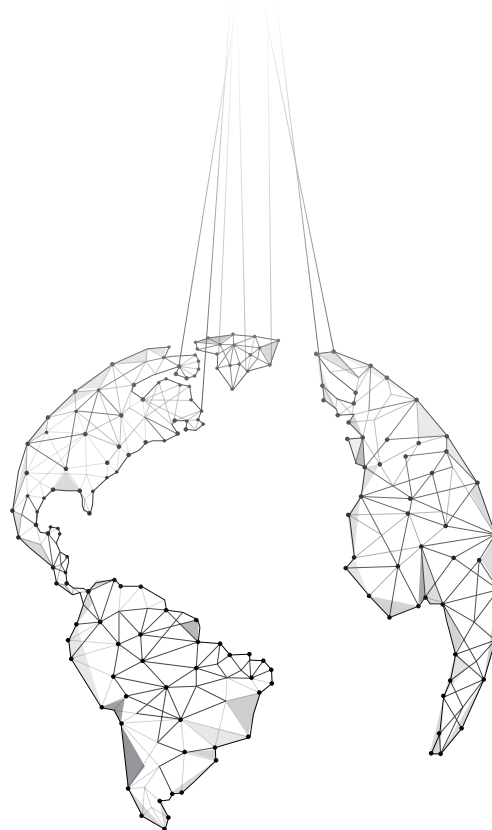
| Year | Awardee                | Major Professor      |
|------|------------------------|----------------------|
| 1995 | Moreen K. Travis       | Carol L. Stuessy     |
| 1996 | Lawrence T. Escalada   | Dean A. Zollman      |
| 1997 | C. Theresa Forsythe    | Jeffrey W. Bloom     |
| 1998 | Renee D. Boyce         | Glenn Clark          |
| 1999 | Andrew Gilbert         | Randy K. Yerrick     |
| 2000 | Rola Fouad Khishfe     | Fouad Abd-El-Khalick |
| 2002 | Laura Elizabeth Slocum | Marcy Hamby Towns    |

# GENERAL INFORMATION

## 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.

| <b>Year</b> | <b>Awardee</b>   | <b>Year</b> | <b>Awardee</b>   | <b>Year</b> | <b>Awardee</b>  |
|-------------|--|-------------|--|-------------|---|
| 1980        | <i>(Five Equal Awards)</i><br>Livingston S. Schneider and<br>John W. Renner<br>Heidi Kass and<br>Allan Griffiths<br>Ramona Saunders and<br>Russell H. Yeany<br>Joe Long,<br>James R. Okey, and<br>Russell H. Yeany<br>M. James Kozlow and<br>Arthur L. White | 1984        | <i>(Four Equal Awards)</i><br>Mary Westerback,<br>Clemencia Gonzales,<br>and Louis H. Primavera<br>Kenneth G. Tobin,<br>Hanna J. Arzi,<br>Ruth Ben-Zvi, and<br>Uri Ganiel<br>Charles Porter and<br>Russell H. Yeany  | 1987        | Dorothy L. Gabel,<br>V. K. Samuel,<br>Stanley L. Helgeson,<br>Saundra McGuire,<br>Joseph D. Novak, and<br>John Butzow |
| 1981        | <i>(Four Equal Awards)</i><br>Dorothy L. Gabel,<br>Robert D. Sherwood, and<br>Larry G. Enochs<br>Wayne Welch,<br>Ronald D. Anderson, and<br>Harold Pratt<br>Mary Ellen Quinn and<br>Carolyn Kessler<br>P. Ann Miller and<br>Russell H. Yeany                 | 1985        | <i>(Three Equal Awards)</i><br>Dan L. McKenzie and<br>Michael J. Padilla<br>Margaret Walkosz and<br>Russell H. Yeany<br>Kevin C. Wise and<br>James R. Okey   | 1988        | Uri Zoller and<br>Ben Chaim   |
| 1982        | <i>(Four Equal Awards)</i><br>Louise L. Gann and<br>Seymour Fowler<br>Dorothy L. Gabel and<br>Robert D. Sherwood<br>Thomas L. Russell<br>Joseph C. Cotham  | 1986        | <i>(Four Equal Awards)</i><br>Sarith Chandran,<br>David F. Treagust, and<br>Kenneth G. Tobin<br>Darrell L. Fisher and<br>Barry J. Fraser<br>Dorothy L. Gabel,<br>Stanley L. Helgeson,<br>Joseph D. Novak,<br>John Butzow, and<br>V. K. Samuel<br>Linda Cronin,<br>Meghan Tweist, and<br>Michael J. Padilla | 1989        | James D. Ellis and<br>Paul J. Kuerbis   |
| 1983        | Robert D. Sherwood,<br>Larry G. Enochs, and<br>Dorothy L. Gabel  |             |  | 1990        | Dale R. Baker,<br>Michael D. Piburn, and<br>Dale S. Niederhauser  |
|             |  |             |  | 1991        | David F. Jackson,<br>Billie Jean Edwards, and<br>Carl F. Berger   |



# GENERAL INFORMATION

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## Elections Committee

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### Immediate Past President (Ex Officio)

|      |               |                           |
|------|---------------|---------------------------|
| 2020 | Gail Richmond | Michigan State University |
|------|---------------|---------------------------|

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### Board Member Liaison

|      |                   |                             |
|------|-------------------|-----------------------------|
| 2021 | Alejandro Gallard | Georgia Southern University |
|------|-------------------|-----------------------------|

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### Representative from Ethics and Equity Committee

|      |                   |                   |
|------|-------------------|-------------------|
| 2020 | Catherine Quinlan | Howard University |
|------|-------------------|-------------------|

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### Representative from the International Committee

|      |             |                      |
|------|-------------|----------------------|
| 2020 | Hye-Eun Chu | Macquarie University |
|------|-------------|----------------------|

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### Co-Chairs

|      |                          |                           |
|------|--------------------------|---------------------------|
| 2020 | Leon Walls (Chair)       | University of Vermont     |
| 2021 | Regina Suriel (Co-Chair) | Valdosta State University |

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### Members

|      |                    |                       |
|------|--------------------|-----------------------|
| 2020 | Ornit Spektor-Levy | Bar Ilan University   |
| 2021 | Ibrahim Delen      | Usak University       |
| 2022 | Mary Atwater       | University of Georgia |
| 2022 | Nazan U. Bautista  | Miami University      |
| 2022 | Bridget Mulvey     | Kent State University |

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## Equity and Ethics Committee

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### Final Year Board Liaison

|      |              |                                 |
|------|--------------|---------------------------------|
| 2020 | Femi Otulaja | University of the Witwatersrand |
|------|--------------|---------------------------------|

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### Chairs of Subcommittees

|      |                   |                                  |
|------|-------------------|----------------------------------|
| 2020 | Catharine Quinlan | Howard University                |
| 2021 | Sara Raven        | Texas A&M University             |
| 2020 | Irasema Ortega    | University of Alaska – Anchorage |

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### Members

|      |                      |                                  |
|------|----------------------|----------------------------------|
| 2020 | Lillian H. Degand    | Illinois Institute of Technology |
| 2020 | Sheron Mark          | University of Louisville         |
| 2021 | Tara Monique Nkrumah | University of South Florida      |

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# GENERAL INFORMATION

## Equity and Ethics Committee Members (continued)

|      |                       |                                   |
|------|-----------------------|-----------------------------------|
| 2021 | Danielle Dani         | Ohio University                   |
| 2021 | James Nyachwaya       | North Dakota State University     |
| 2022 | Seema Rivera          | Clarkson University               |
| 2022 | Justina Ogodo         | The Ohio State University         |
| 2022 | April Holton          | Arizona State University          |
| 2022 | María González-Howard | The University of Texas at Austin |

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## External Policy and Relations Committee

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### Final Year Board Liaison

|      |              |                   |
|------|--------------|-------------------|
| 2022 | Senay Purzer | Purdue University |
|------|--------------|-------------------|

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### Chair

|      |                   |                           |
|------|-------------------|---------------------------|
| 2021 | Stefanie Marshall | Michigan State University |
|------|-------------------|---------------------------|

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### Members

|      |                   |                                  |
|------|-------------------|----------------------------------|
| 2020 | Sharon Lynch      | George Washington University     |
| 2020 | Stacy Olitsky     | Saint Joseph's University        |
| 2020 | Margaret M Lucero | Santa Clara University           |
| 2021 | Kadir Demir       | Georgia State University         |
| 2021 | Sarah Carrier     | North Carolina State University  |
| 2022 | Tom Bielik        | The Weizmann Institute           |
| 2022 | Eugene Judson     | Arizona State University         |
| 2022 | Remy Dou          | Florida International University |

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## Graduate Student Committee

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### Final Year Board Liaison

|      |                 |                                  |
|------|-----------------|----------------------------------|
| 2020 | Judith Lederman | Illinois Institute of Technology |
|------|-----------------|----------------------------------|

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### Chair

|      |                  |                         |
|------|------------------|-------------------------|
| 2021 | Christa Haverely | Northwestern University |
|------|------------------|-------------------------|

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### Members

|      |                     |                                  |
|------|---------------------|----------------------------------|
| 2020 | Emmanuel Jaff       | Morgan State University          |
| 2020 | Ayca Karasahinoglu  | University of Georgia            |
| 2020 | Margaretann Connell | Illinois Institute of Technology |
| 2021 | Kathryn E Green     | North Carolina State University  |
| 2021 | Harini Krishnan     | Florida State University         |

# GENERAL INFORMATION

## Graduate Student Committee Members (continued)

|      |                      |                             |
|------|----------------------|-----------------------------|
| 2021 | Preethi Titu         | University of Minnesota     |
| 2021 | Sina Joshua Fakoyede | University of Witwatersrand |
| 2021 | Melanie Kinskey      | University of South Florida |
| 2021 | Star Sharp           | Penn State University       |
| 2021 | Theila Smith         | University of Groningen     |

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## International Committee

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### Final Year Chair — International Coordinator

|      |              |                                      |
|------|--------------|--------------------------------------|
| 2022 | Sonya Martin | University of Groningen, Netherlands |
|------|--------------|--------------------------------------|

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### Members

|      |                     |                                    |
|------|---------------------|------------------------------------|
| 2020 | Andri Christodoulou | University of Southampton, UK      |
| 2020 | Hye-Eun Chu         | Macquarie University               |
| 2020 | Ravinder Koul       | The Pennsylvania State University  |
| 2020 | Rea Lavi            | Technion                           |
| 2021 | Peter Wulff         | Leibniz Institute, Kiel University |
| 2022 | Saramma Chandy      | University of Mumbai               |
| 2022 | Jing Lin            | Beijing Normal University          |
| 2022 | Sara Wilmes         | University of Luxemburg            |
| 2022 | Allison Gonsalves   | McGill University                  |

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## Membership Committee

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### Final Year Board Liaison

|      |                  |                                  |
|------|------------------|----------------------------------|
| 2020 | Judith Lederman  | Illinois Institute of Technology |
| 2022 | Baskhar Upadhyay | University of Minnesota          |

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### Chairs

|      |                  |                             |
|------|------------------|-----------------------------|
| 2020 | Brooke Whitworth | Northern Arizona University |
| 2021 | Selina Bartels   | Valparaiso University       |

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### Members

|      |                      |                                       |
|------|----------------------|---------------------------------------|
| 2020 | Gary Holliday        | University of Akron                   |
| 2020 | Amanda Peel          | University of Missouri                |
| 2021 | Alison Riley Miller  | Bowdoin College                       |
| 2021 | Felicia Moore Mensah | Teachers College, Columbia University |

# GENERAL INFORMATION

## Membership Committee Members (continued)

|      |                |   |
|------|----------------|---|
| 2022 | Shirly Avargil | Technion  |
| 2022 | Reanna S Roby  | Michigan State University   |
| 2022 | Knut Neuman    | Leibniz Institute for Science and Mathematics Education at the University of Kiel |

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## Program Committee

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### Co-Chairs

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

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### Members (Strand Co-Coordinators)

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

|                    |                        |
|--------------------|------------------------|
| (21) Sarah J. Fick | University of Virginia |
| (20) Calvin Kalman | Concordia University   |

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

|                    |                               |
|--------------------|-------------------------------|
| (21) Julia Plummer | Pennsylvania State University |
| (20) David Owens   | University of Missouri        |

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

|                           |                                       |
|---------------------------|---------------------------------------|
| (21) Ryan Nixon           |                                       |
| (20) Carrie-Anne Sherwood | Southern Connecticut State University |

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#### 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              |

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

|                           |                         |
|---------------------------|-------------------------|
| (21) Lisa Kenyon          | Wright State University |
| (20) Jana Bouwma-Gearhart | Oregon State University |

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

|                      |                               |
|----------------------|-------------------------------|
| (21) Anton Puvirajah | University of Western Ontario |
| (20) Nancy Staus     | Oregon State University       |

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

|                       |                         |
|-----------------------|-------------------------|
| (21) Michelle Fleming | Wright State University |
| (20) Shannon Sung     | Spelman College         |

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# GENERAL INFORMATION

## Program Committee Members (continued)

### **Strand 8: In-service Science Teacher Education**

|                         |                                |
|-------------------------|--------------------------------|
| (21) Nidaa Makki        | The University of Akron        |
| (20) Tracy Huziak-Clark | Bowling Green State University |

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### **Strand 9: Reflective Practice**

|                   |                             |
|-------------------|-----------------------------|
| (21) Heather Page | New York University         |
| (20) Pei-Ling Hsu | University of Texas-El Paso |

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### **Strand 10: Curriculum, Evaluation, and Assessment**

|                      |                                  |
|----------------------|----------------------------------|
| (21) Elon Langbeheim | The Weizmann Institute of Israel |
| (20) Hun Jin         | Educational Testing Service      |

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

|                    |                                 |
|--------------------|---------------------------------|
| (21) Cesar Delgado | North Carolina State University |
| (20) Natalie King  | Georgia State University        |

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### **Strand 12: Educational Technology**

|                         |                                     |
|-------------------------|-------------------------------------|
| (21) Denise M. Bressler | Rutgers University                  |
| (20) Jonah Firestone    | Washington State University-Tricity |

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

|                        |   |
|------------------------|---|
| (21) Alexandria Hansen | Fresno State University                 |
| (20) Dina Tsybulsky    | Technion-Israel Institute of Technology |

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### **Strand 14: Environmental Education**

|                   |                                |
|-------------------|--------------------------------|
| (21) Idit Adler   | Michigan State University      |
| (20) Isis Alkaher | Kibbutzim College of Education |

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### **Strand 15: Policy**

|                      |  |
|----------------------|--|
| (21) Audrey Msimanga | University of the Witwatersrand South Africa |
| (20) Carrie Allen    | SRI International                            |

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### **Ex Officio**

Helen Schneider Lemay

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# GENERAL INFORMATION

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## The Publications Advisory Committee

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### Final Year Board Liaison

|      |                |                          |
|------|----------------|--------------------------|
| 2020 | Christina Siry | University of Luxembourg |
|------|----------------|--------------------------|

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### Research for Practitioners and Policymakers Sub Committee

|      |                            |                            |
|------|----------------------------|----------------------------|
| 2020 | Hayat Alhokayem (Co-Chair) | Texas Christian University |
|------|----------------------------|----------------------------|

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### Scholarship Sub Committee

|      |                            |                          |
|------|----------------------------|--------------------------|
| 2020 | Justin McFadden (Co-Chair) | University of Louisville |
|------|----------------------------|--------------------------|

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### Pre-Conference Workshop and Sponsored Symposium Sub Committee

|      |                          |  |
|------|--------------------------|--|
| 2021 | Heidi Carlone (Co-Chair) | University of North Carolina, Greensboro |
|------|--------------------------|--|

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### Members

|      |                       |  |
|------|-----------------------|--|
| 2020 | Greses Perez Gonzalez | Stanford University                      |
| 2021 | Amanda (Mandi) Berry  | Monash University                        |
| 2021 | Jeanne Brunner        | University of Massachusetts, Amherst     |
| 2021 | Deena Gould           | Arizona State University                 |
| 2022 | Allison Antink-Meyer  | Illinois State University                |
| 2022 | Kyungjin Cho          | Pennsylvania State University            |
| 2022 | Shuly Kapon           | Technion, Israel Institute of Technology |
| 2022 | Ibrahim Yeter         | Purdue University                        |

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## Research Committee

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### Final Year Board Liaison

|      |                   |                       |
|------|-------------------|-----------------------|
| 2022 | Jennifer D. Adams | University of Calgary |
|------|-------------------|-----------------------|

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### Chairs

|      |                      |                                |
|------|----------------------|--------------------------------|
| 2020 | Ryan Summers (Chair) | University of North Dakota     |
| 2021 | Tina Vo (Co-Chair)   | University of Nebraska-Lincoln |

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### Members

|      |                  |                            |
|------|------------------|----------------------------|
| 2020 | Vanashri Nargund | New Jersey City University |
| 2020 | Joe Taylor       | BSCS Science Learning      |
| 2021 | Abdi Warfa       | University of Minnesota    |
| 2021 | Carina Rebello   | Purdue University          |

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# GENERAL INFORMATION

## Research Committee Members (continued)

|      |                   |   |
|------|-------------------|---|
| 2021 | Banu Avsar Erumit | Recep Tayyip Erdogan University (Turkey)                            |
| 2021 | Patricia Patrick  | Columbus State University   |
| 2020 | George Turner     | Auburn University   |
| 2020 | Jennifer Parrish  | University of Northern Colorado                                     |
| 2021 | Kelsey Lipsitz    | University of Missouri, Exploratorium                               |
| 2022 | Li Ke             | University Of North Carolina, Greensboro                            |
| 2022 | Ling L. Liang     | La Salle University   |
| 2022 | Yann Shiou Ong    | National Institute of Education<br>Nanyang Technological University |
| 2022 | Asli Sezen-Barrie | University of Maine   |
| 2022 | Marcus Kubsch     | Kiel University   |
| 2022 | S. Selcen Guzey   | Purdue University   |

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## Website Committee

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### Final Year Board Liaison

|  |                         |                               |
|--|-------------------------|-------------------------------|
|  | Greg Kelly (Ex Officio) | Pennsylvania State University |
|--|-------------------------|-------------------------------|

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### Chairs

|      |                                    |                       |
|------|------------------------------------|-----------------------|
| 2020 | Scott McDonald (Chair)             | Penn State University |
| 2021 | Katherine Wade-James<br>(Co-Chair) | University of Memphis |

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### Members

|      |                  |                                 |
|------|------------------|---------------------------------|
| 2020 | Jennifer Weible  | Central Michigan University     |
| 2020 | Jennifer Oramous | University of Arkansas          |
| 2021 | Sandhya Krishnan | University of Georgia           |
| 2022 | Nazihan Ursavas  | Erdogan University Turkey       |
| 2022 | Lisa Lundgren    | North Carolina State University |
| 2022 | Minjung Ryu      | Purdue University               |

# SCHEDULE AT A GLANCE

2020

93<sup>RD</sup> ANNUAL  
INTERNATIONAL  
CONFERENCE

MARCH 15-18

PORTLAND, OR, USA

Portland Marriott  
Downtown Waterfront



## SCHEDULE AT A GLANCE

| SATURDAY, MARCH 14 |  |                                       |
|--------------------|--|---------------------------------------|
| 8:00 AM - 5:00 PM  | <b>NARST Executive Board Meeting #1</b>  | Meadow Lark/ Douglas Fir<br>3rd Floor |
| 2:00 PM - 5:00 PM  | <b>Conference Registration</b>   | Ballroom Foyer - Lower Level          |
| SUNDAY, MARCH 15   |  |                                       |
| 7:30 AM - 4:30 PM  | <b>Conference Registration</b>   | Ballroom Foyer - Lower Level          |
| 8:00 AM - 11:45 AM | <b>NARST Executive Board Meeting #1</b> <i>(continued)</i>   | Meadow Lark/ Douglas Fir<br>3rd Floor |
| 8:00 AM - 11:45 AM | <b>PRE-CONFERENCE WORKSHOPS</b><br><i>NOTE: You MUST register for Pre-Conference Workshops with you advance conference registration. You may only register for ONE Workshop.</i>             |                                       |
| 8:00 AM - 10:00 AM | <b>Pre-Conference Workshop #1:<br/>Membership Committee</b><br><i>Cost: Free   Maximum attendance: 50</i>  | Salon C - Lower Level                 |
|                    | Title: <b>Early Career Faculty Forum</b>   |                                       |
|                    | Presenters: <b>Brooke Whitworth</b> , University of Mississippi<br><b>Alison Miller</b> , Bowdoin College<br><b>Shirly Avargil</b> , Technion - Israel Institute of Technology               |                                       |
| 8:00 AM - 11:45 AM | <b>Pre-Conference Workshop #2:<br/>Research Committee</b><br><i>Cost: Free   Maximum attendance: 30</i>  | Salon A - Lower Level                 |
|                    | Title: <b>Next Generation Labs for Next Generation Science Standards:<br/>Mobile Sensing as an Example</b>   |                                       |
|                    | Presenters: <b>Charles Xie</b><br><b>Shannon Sung</b><br><b>Xudong Huang</b><br><b>Guanhua Chen</b>  |                                       |
| 8:00 AM - 11:45 AM | <b>Pre-Conference Workshop #3:<br/>Membership Committee</b><br><i>Cost: Free   Maximum attendance: 60</i>  | Salon B - Lower Level                 |
|                    | Title: <b>Writing in Community: NARST Membership Committee Writing Retreat</b>   |                                       |
|                    | Presenters: <b>Knut Neuman</b> , Leibniz Institute for Science Education<br><b>Felicia Mensah</b> , Columbia University<br><b>Shirly Avergil</b> , Technion - Israel Institute of Technology |                                       |

## SCHEDULE AT A GLANCE

|                    |  |                       |
|--------------------|--|-----------------------|
| 8:00 AM - 11:45 AM | <b>Pre-Conference Workshop #4:<br/>Research Committee</b><br><i>Cost: Free   Maximum attendance: 60</i>  | Salon D - Lower Level |
|                    | Title: <b>How to Access Learners' Connections Across Nature of Science Aspects:<br/>Using Card Sorts and Epistemic Network Analysis</b>  |                       |
|                    | Presenters: <b>Bridget K. Mulvey<br/>Jennifer C. Parrish<br/>Erin Peters-Burton</b>  |                       |
| 8:00 AM - 11:45 AM | <b>Pre-Conference Workshop #5:<br/>Equity and Ethics Committee</b><br><i>Cost: Free   Maximum attendance: 100</i>  | Salon I - Lower Level |
|                    | Title: <b>Equity and Ethics Pre-conference Workshop</b>  |                       |
|                    | Presenters: <b>Sara Raven<br/>Danielle Dani<br/>Seema Rivera<br/>Sheron Mark<br/>Saiqa Azam<br/>Jordan Henley</b>  |                       |
| 8:00 AM - 11:45 AM | <b>Pre-Conference Workshop #6:<br/>Research Committee</b><br><i>Cost: Free   Maximum attendance: 30</i>  | Salon G - Lower Level |
|                    | Title: <b>An Observation Protocol for Integrated STEM Instruction in K-12 Science<br/>and Engineering Classes</b>  |                       |
|                    | Presenters: <b>Emily A. Dare</b> , Assistant Professor of Science Education at Florida<br>International University<br><b>Joshua A. Ellis</b> , Assistant Professor of Science Education at Florida<br>International University<br><b>Elizabeth A. Ring-Whalen</b> , Assistant Professor of Education, Coordinator for the<br>EcoSTARS and Elementary STEM Certificate programs, and Director of the National<br>Center for STEM Elementary Education at St. Catherine University<br><b>Gillian H. Roehrig</b> , Professor of STEM Education at the University of Minnesota–<br>Twin Cities |                       |
| 8:00 AM - 11:45 AM | <b>Pre-Conference Workshop #7:<br/>Research Committee</b><br><i>Cost: Free   Maximum attendance: 50</i>  | Salon H - Lower Level |
|                    | Title: <b>Clarifying the Role(s) of the Crosscutting Concepts in Science<br/>and Engineering Learning</b>  |                       |
|                    | Presenters: <b>Sarah J. Fick<br/>Jeffrey Nordine</b>   |                       |

## SCHEDULE AT A GLANCE

|                         |  |   |
|-------------------------|--|---|
| 10:00 AM - 11:00 AM     | <b>Pre-Conference Workshop #8:<br/>National Science Foundation</b><br><i>Cost: Free / Maximum attendance: 50</i> | Salon C - Lower Level                     |
|                         | Title: <b>Work at the National Science Foundation as a Rotater/IPA/Program Officer. Is it right for me?</b>      |   |
|                         | Presenters: <b>Rob Ochsendorf<br/>Sharon Lynch<br/>Monica Cardella<br/>Gavin Fulmer</b>                          |   |
| 11:45 AM - 1:00 PM      | <b>Lunch</b>   | On Your Own                               |
| 1:00 PM - 2:15 PM       | <b>Conference Welcome &amp; Plenary Session 1</b>  | Salon E & F - Lower Level                 |
|                         | Title: <b>Migrating Birds Know No Boundaries: The Scientific and Educational Dimension</b>                       |   |
|                         | Speaker: <b>Dr. Yossi Leshem, Tel Aviv University</b>  |   |
| 2:15 PM - 2:40 PM       | <b>Networking Break</b>  |   |
| 2:40 PM - 4:10 PM       | <b>CONCURRENT SESSION #1</b>   | Concurrent Session Rooms                  |
| 4:20 PM - 5:50 PM       | <b>CONCURRENT SESSION #2</b>   | Concurrent Session Rooms                  |
| 6:00 PM - 7:00 PM       | <b>Mentor/Mentee Nexus</b>   | Mt. Hood                                  |
| 6:00 PM - 7:00 PM       | <b>Research Interest Group (RIG) Meetings</b>  |   |
|                         | <b>Continental and Diasporic Africa in Science Education (CADASE) RIG</b>  | Salon I - Lower Level                     |
|                         | <b>Contemporary Methods for Science Education Research RIG</b>   | Salon H - Lower Level                     |
| 7:00 PM - 9:30 PM       | <b>Award Ceremony and Presidential Reception</b><br><i>Light appetizers will be served. Cash bar.</i>            | Salon E & F<br>Lower Level/Ballroom Foyer |
| <b>MONDAY, MARCH 16</b> |  |   |
| 6:00 AM - 7:15 AM       | <b>Mind and Sole</b><br><i>This event is not sponsored or endorsed by NARST</i>                                  | Off-site                                  |
| 8:00 AM - 4:30 PM       | <b>Conference Registration</b>   | Ballroom Foyer - Lower Level              |
| 8:30 AM - 10:00 AM      | <b>CONCURRENT SESSION #3</b>   | Concurrent Session Rooms                  |
| 10:00 AM - 10:30 AM     | <b>Networking Break</b>  |   |
| 10:30 AM - 12:00 PM     | <b>CONCURRENT SESSION #4</b>   | Concurrent Session Rooms                  |
| 12:00 PM - 1:45 PM      | <b>Committee Meetings</b>  | Concurrent Session Rooms                  |
| 12:00 PM - 1:45 PM      | <b>Lunch</b>   | On Your Own                               |

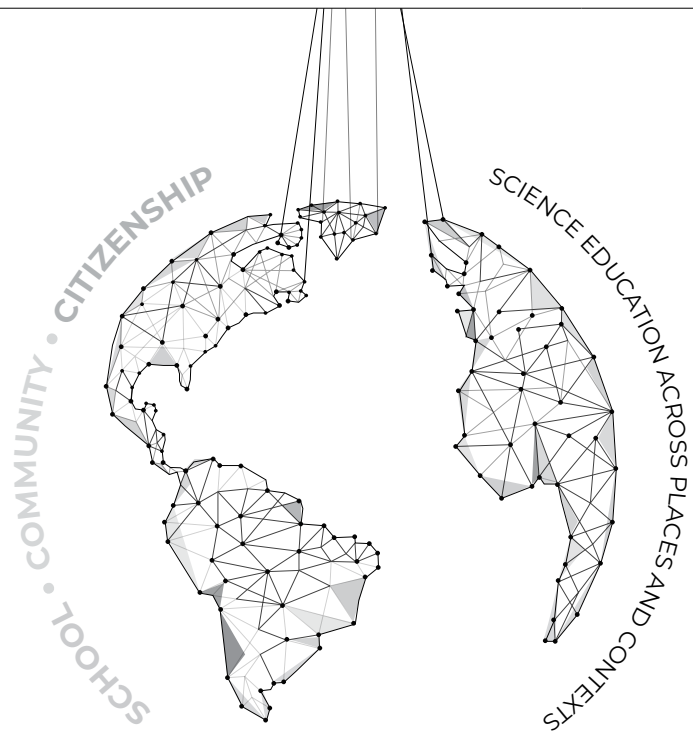


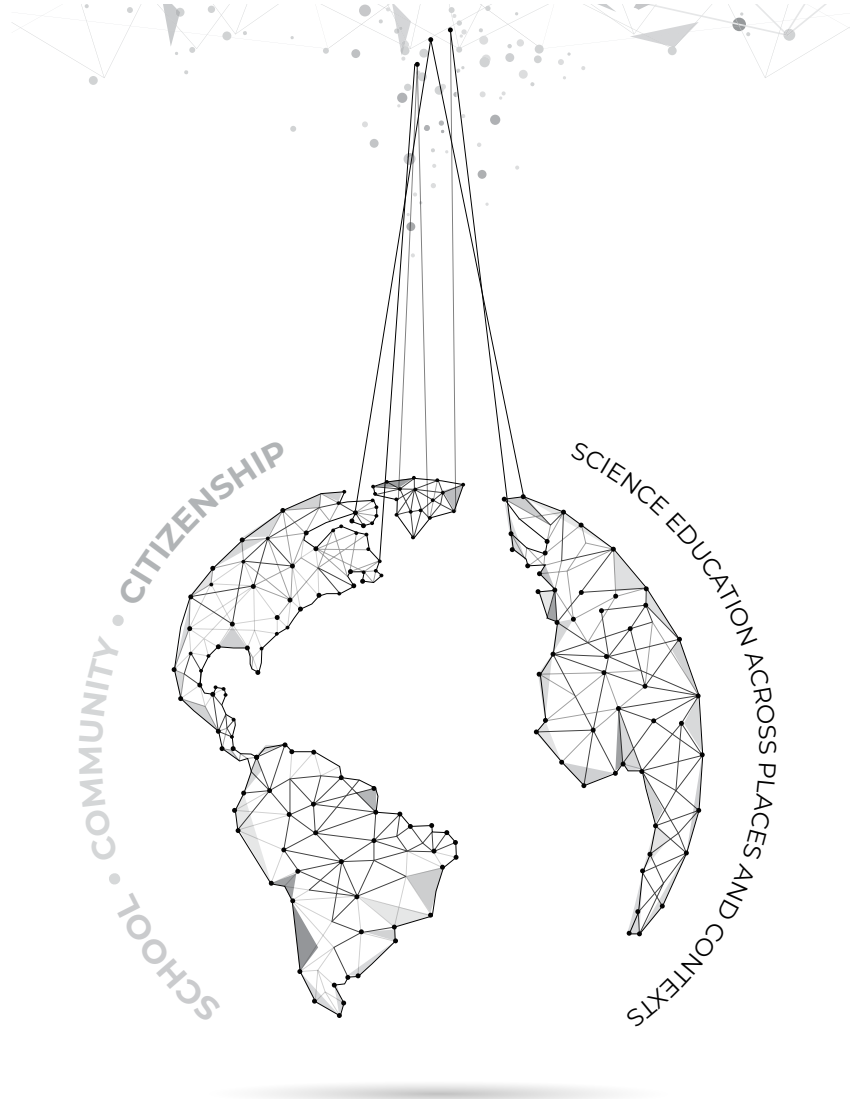
## SCHEDULE AT A GLANCE

|                          |  |                              |
|--------------------------|--|------------------------------|
| 1:45 PM - 3:15 PM        | <b>CONCURRENT SESSION #5</b>   | Concurrent Session Rooms     |
| 3:15 PM - 3:45 PM        | <b>Networking Break</b>  |                              |
| 3:45 PM - 4:45 PM        | <b>CONCURRENT SESSION #6A:<br/>Roundtable Session</b>  | Exhibit Hall                 |
| 4:45 PM - 5:45 PM        | <b>CONCURRENT SESSION #6B:<br/>Poster Session</b>  | Exhibit Hall                 |
| 5:45 PM - 7:15 PM        | <b>Graduate Student Forum</b>  | Salon F - Lower Level        |
| 6:00 PM - 8:30 PM        | <b>JRST Editorial Team Meeting/Dinner</b><br><i>Sponsored by: Wiley-Blackwell (by invitation only)</i> | Portland - Lower Level       |
| 6:00 PM - 7:30 PM        | <b>Research Interest Group (RIG) Meetings</b>  |                              |
|                          | <b>Latino/a RIG</b>  | Salon B - Lower Level        |
|                          | <b>Engineering Education RIG</b>   | Salon C - Lower Level        |
|                          | <b>Indigenous Science Knowledge (ISK) RIG</b>  | Salon H - Lower Level        |
| <b>TUESDAY, MARCH 17</b> |  |                              |
| 7:30 AM - 4:30 PM        | <b>Registration</b>  | Ballroom Foyer - Lower Level |
| 8:00 AM - 9:30 AM        | <b>CONCURRENT SESSION #7</b>   | Concurrent Session Rooms     |
| 9:30 AM - 10:00 AM       | <b>Networking Break</b>  |                              |
| 10:00 AM - 11:30 AM      | <b>CONCURRENT SESSION #8</b>   | Concurrent Session Rooms     |
| 11:30 AM - 12:30 PM      | <b>NARST Annual Membership Meeting</b>   | Salon I - Lower Level        |
| 11:30 AM - 12:30 PM      | <b>Lunch</b>   | On Your Own                  |
| 12:30 PM - 1:45 PM       | <b>Announcement of 2021 Venue &amp; Passing the Gavel &amp; Plenary Session 2</b>                      | Salon E & F - Lower Level    |
|                          | Title: <b>Making Science Education Matter in a Damaged and Unjust World</b>                            |                              |
|                          | Speaker: <b>Philip Bell</b> , University of Washington   |                              |
| 2:00 PM - 3:30 PM        | <b>CONCURRENT SESSION #9</b>   | Concurrent Session Rooms     |
| 3:30 PM - 3:45 PM        | <b>Networking Break</b>  |                              |
| 3:45 PM - 5:15 PM        | <b>CONCURRENT SESSION #10</b>  | Concurrent Session Rooms     |

# SCHEDULE AT A GLANCE

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





SCHOOL • COMMUNITY • CITIZENSHIP

SCIENCE EDUCATION ACROSS PLACES AND CONTEXTS

# PROGRAM

2020

93<sup>RD</sup> ANNUAL  
INTERNATIONAL  
CONFERENCE

MARCH 15-18

PORTLAND, OR, USA

Portland Marriott  
Downtown Waterfront

**SATURDAY, MARCH 14, 2020**



## **NARST Executive Board Meeting #1**

7:30 AM – 5:00 PM

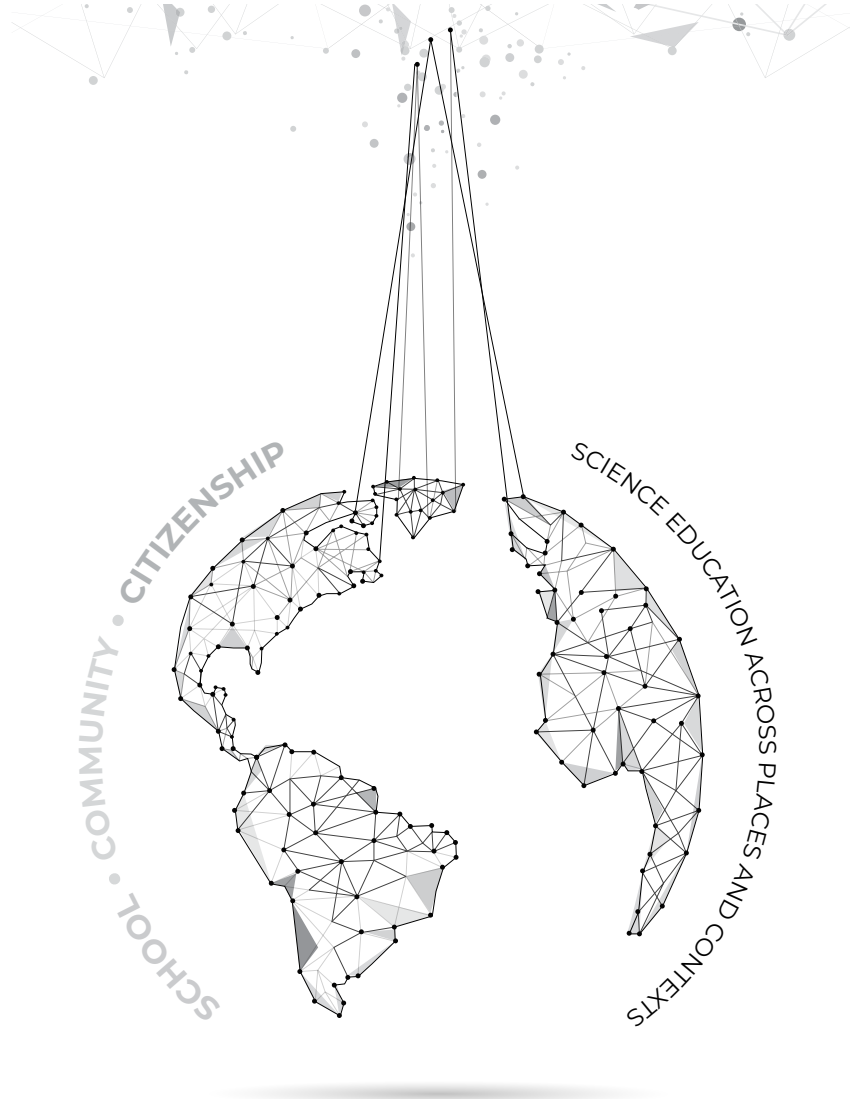
Meadow Lark/Douglas Fir  
– 3rd Floor

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## **Conference Registration**

2:00 PM – 5:00 PM

Ballroom Foyer  
Lower Level



SCHOOL • COMMUNITY • CITIZENSHIP

SCIENCE EDUCATION ACROSS PLACES AND CONTEXTS



# PROGRAM

2020

93<sup>RD</sup> ANNUAL  
INTERNATIONAL  
CONFERENCE

MARCH 15-18

PORTLAND, OR, USA

Portland Marriott  
Downtown Waterfront

**SUNDAY, MARCH 15, 2020**



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**Conference Registration**  
**7:30 AM – 4:30 PM**  
**Ballroom Foyer – Lower Level**

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**NARST Executive Board Meeting #1**  
*(continued)*

**8:00 AM – 11:45 AM**  
**Meadow Lark/Douglas Fir – 3rd Floor – 3rd Floor**

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**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.*

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**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 Avargil**, Technion - Israel Institute of Technology

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**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**

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**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 Avargil**, Technion - Israel Institute of Technology

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**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**

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**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**

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**PRE-CONFERENCE WORKSHOPS****8:00 AM – 11:45 AM** (cont)

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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**

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**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  
Offi er. 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 UniversityYossi 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 BirdMigration. 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 migra-  
tion and raptor breeding ecology for 5 decades. His  
doctoral research at Tel Aviv University, conducted  
in cooperation with the Israel Air Force, reduced air-  
craft-bird collisions by 76%, thus saving the national  
budget \$1.5 billion. Yossi developed an educational  
online science program ([www.birds.org.il](http://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, signifi-  
cantly 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](http://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).

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## **NETWORKING BREAK**

**2:15 PM – 2:40 PM**

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## Concurrent Session 1

### 2:40 PM – 4:10 PM

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#### 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

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#### 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

*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  
**Ute Harms**, Leibniz Institute for Science and  
 Mathematics Education (IPN)  
**Kostas Kampourakis**, University of Geneva

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**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

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**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



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**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**

President:  
**Joi 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. Kookan**, 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**

President:  
**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

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**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

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**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

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**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

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

**Pre-service Teachers' Self-Efficacy in Engineering**

2:40 PM – 4:10 PM

Salon B

President:

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

**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

**STRAND 8:  
In-service Science Teacher Education**

**Assessment to Support NGSS Implementation**

2:40 PM – 4:10 PM

Pearl

President:

Kerri Wingert, University of Colorado at Boulder

**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

### ***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 Kilbarda, Iowa Department of Education

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### **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

### ***Automated Real-Time Argument-Text and Model-Interaction Feedback to Support Secondary School Students' Revision of Scientific Arguments***

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

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### **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**

Discussant:

**Bryan Brown**, Stanford University

**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

**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

**Design Justice in Humanitarian Engineering Education**

**Brandon Reynante**, Stanford 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

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## **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

### **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

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## **STRAND 14: 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 Alkaber**, 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

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

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**STRAND 1:  
Science Learning, Understanding and Conceptual Change**

**Recent Trends in Genetics Education Research**

**4:20 PM – 5:50 PM  
Salmon**

President:  
**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

**High School Students' Causal Attributions of Features of the Body and the Mind: Genes, Environment and Individual Will**

**Marcus Hammann**, Münster University

**Supporting the Development of Genomics Literacy Could Significantly Reduce Cognitive Forms of Racial Prejudice During Adolescence**

**Monica Weindling**, BSCS Science Learning  
**Brae Salazar**, BSCS Science Learning  
**Brian M. Donovan**, BSCS

**Measuring Students' Teleological and Essentialist Conceptions in the Context of Genetics: A Comparison of Explicit and Implicit Measures**

**Florian J. Stern**, University of Geneva  
**Kostas Kampourakis**, University of Geneva  
**Marine Delaval**, University of Geneva  
**Andreas Mueller**, JUFE, University of Geneva

**Defining Epigenetic Literacy for School Biology—A Delphi Study**

**Niklas M. Gericke**, Department of Environmental and Life Sciences  
**Birgitta McEwen**, Department of Environmental and Life Sciences, Karlstad University  
**Karin Thörne**, Department of Environmental and Life Sciences, Karlstad University

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**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**

President:  
**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

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**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

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**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

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**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

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**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

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**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

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**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

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**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 Beckam**, 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

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**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  
 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**

Prsident:  
 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**

Prsident:  
 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

**Understanding External Expert Review of Design Artifacts in Design-Based Research: A Guide for the Perplexed**

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 Sanguenza, 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

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

*Learning of NOS*  
**4:20 PM – 5:50 PM**  
**Portland**

President:  
 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

**Undergraduates' Grounded Critique of Knowledge Claims in Socioscientific Decision Making**

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

**STRAND 14: Environmental Education**

**Environmental Education—Learner's Perspective**

**4:20 PM – 5:50 PM**  
**Eugene**

President:  
 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

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**Mentor/Mentee Nexus**

6:00 PM – 7:00 PM  
Mt. Hood

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**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*

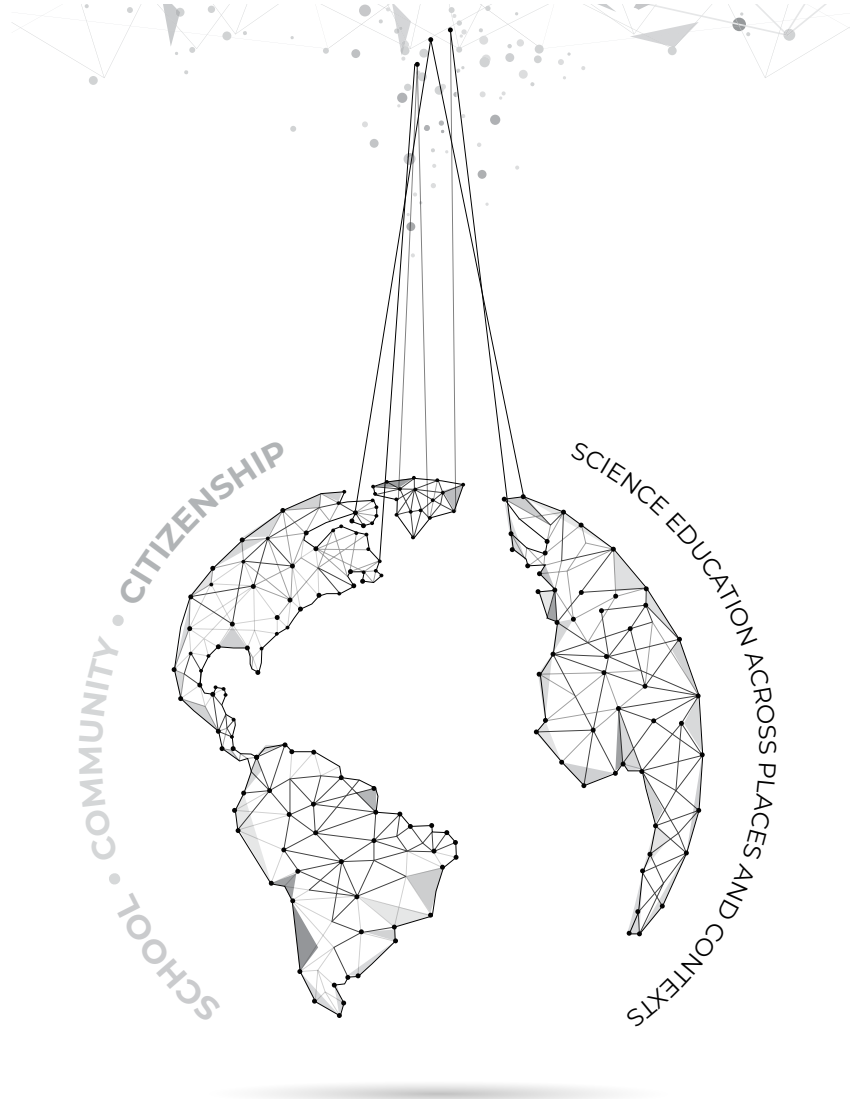
**Salon H – Lower Level**

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**Award Ceremony & Presidential Reception**

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

*Light appetizers will be served. Cash bar.*



# PROGRAM

2020

93<sup>RD</sup> ANNUAL  
INTERNATIONAL  
CONFERENCE

MARCH 15-18

PORTLAND, OR, USA

Portland Marriott  
Downtown Waterfront

**MONDAY, MARCH 16, 2020**



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**Mind and Sole**  
**6:00 AM – 7:15 AM**  
**Off-site**

*This event is not sponsored or endorsed by NARST*

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

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

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

*Supporting Understanding with  
 Mathematics and Computational  
 Thinking*

**8:30 AM – 10:00 AM**  
**Columbia**

- President:  
**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

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**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.

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**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

President:  
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 Jituafoa, 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

**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

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**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

Presenter:

**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

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

*Retaining Pre-service Physics Teachers*

**8:30 AM – 10:00 AM**  
**Salon B**

Presenter:

**Angela Fitzgerald**, University of Southern Queensland

*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

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**STRAND 8:  
In-service Science Teacher Education  
Context in Professional Development**

**8:30 AM – 10:00 AM  
Pearl**

Presider:  
**Casandra Gonzalez**, Boston College

***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

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

**Jessica Lee Chen**, Teachers College, Columbia University

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

- Patricia S. Bills**, Oakland University
- Madhura Kulkarni**, Center for Intergrative Natural Science & Mathematics, Northern Kentucky University

***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

***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

President:  
**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 Wolfram, 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-Beudet, 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  
 Cassandra 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

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**NETWORKING BREAK**

**10:00 AM – 10:30 AM**

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**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

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

*Engineering Framework*

**10:30 AM – 12:00 PM  
Salmon**

President:  
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 Riegler-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

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**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 Tuitou**, 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 Tuitou**, 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

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

**Motivation & Self-Efficacy**

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

President:  
**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

**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

**Lyrice 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

**Lyrice 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

**Lyrice Lucas**, University of Nebraska, Lincoln

**Brandon Holding**, Boulder Learning, Inc.

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**STRAND 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**

**Lyrice 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 Holding**, 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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**STRAND 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**

President:

**Heidi Cian**, Florida International University



**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 curriculum 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**

President:  
**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

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**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

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**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

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

*Pre-service Teaching Practices*

**10:30 AM – 12:00 PM**

**Salon B**

President:  
**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

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**STRAND 8:  
In-service Science Teacher Education**

*Meeting the Content Needs of STEM  
Educators*

**10:30 AM – 12:00 PM**

**Pearl**

President:  
**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:  
 Vaile 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  
 Vaile M. Dawson, University of Western Australia

**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

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**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

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**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**

*Admin Symposium-Publishing, Reviewing and Writing for the Journal of Research in Science Teaching: Lessons Learned and New Visions*

**1:45 PM – 3:15 PM  
Mt Hood**

*Publishing, Reviewing and Writing for the Journal of Research in Science Teaching: Lessons Learned and New Visions*

**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 Concepcion

**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**

President:

**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. Portsmouth**, 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



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**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.

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**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

Presenter:

**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  
 Carbon TIME*

**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

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**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

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**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

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**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

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**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

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**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

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**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**

President:  
**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

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**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  
President:  
**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**

President:  
**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



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**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

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

*NOS and Teachers' Perceptions*

**1:45 PM – 3:15 PM  
Portland**

- Presider:  
Christine V. McDonald, Griffith University

*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

- 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

*Using History of Science (HOS) to Communicate Nature of Science: Multiple Cases of Instructors' Perspectives*

- William F. McComas, University of Arkansas
- Noushin Nouri, University of Texas, Rio Grande Valley

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**STRAND 15:  
Policy**

*Examining Models of Change in STEM Education*

**1:45 PM – 3:15 PM  
Eugene**

- Presider:  
Sharon J. Lynch, The George Washington University

*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

**NETWORKING 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

**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 Menéses Villagrà**, Universidad of 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

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**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 Ruitt-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 Ma**, 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

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**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

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**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

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

**Strand 7 Roundtable Session**

**3:45 PM – 4:45 PM**  
**Exhibit Hall**

**TABLE #10**  
**FAVSTE: A Framework for Analyzing Video in Science Teacher Education**

**Michelle Forsythe**, Texas State University  
**Brett Criswell**, West Chester University

**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. McAlister-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

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**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. Alrwythy**, 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

**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

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 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

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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 #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 #22

**Noticing Whiteness in Science Education: Using Critical Whiteness Scholarship to Achieve Equity in Science**

**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

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 Mode**

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

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**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, University of Duisburg-Essen  
Stefan Rumann, University of Duisburg-Essen

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**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

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**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

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**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

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**Concurrent Session 6b  
Poster Session  
4:45 PM – 5:45 PM**

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

*Strand 1 Poster Session*

**4:45 PM – 5:45 PM  
Exhibit Hall**

P1:  
*A Review of Empirical Literature: Cognitive  
Processes Framing Modeling Practices in  
Science Education*

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. Gunckel**, 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 o 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

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**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

P9:

***What Does Engagement Look Like? Secondary Science Teachers' Reported Evidence of Student Engagement*****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

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Portland Marriott  
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**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

P18:

*Pre-service Early Childhood Teachers' Views and Suggestions about Successful Implementation of STEM-based Lessons*

Ayşe Ciftçi, Mus Alparslan University  
Mustafa S. Topcu, Yıldız Technical University

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 Sumflet**, 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

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**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

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**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

P42:

*Examining Elementary Pre-service Teachers'  
Understanding of Natural Selection Through  
Technology*

Nicole Juliana Thomas, University of  
Nevada, Las Vegas  
Tina Vo, University of Nevada, Las Vegas

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

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**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

P48:

**Teachers' Beliefs about the Importance and Value of the NGSS Science Practices**

**Soonhye Park**, North Carolina State University

**Gary W. Wright**, North Carolina State University

**Vance J. Kite**, North Carolina State University

P49:

**Collaborative Pedagogical Reasoning of Beginning Science Teachers in a Professional Learning Community**

**Aeran Choi**, Ewha Womans University

**Soonhye Park**, North Carolina State University

**Elsun Seung**, Indiana State University

P50:

**Exploring Relationships amongst Node-Level Variables and Teachers' Social Networks**

**Sara L. Salisbury**, Middle Tennessee State University

**Brock Couch**, Middle Tennessee State University

**Samuel J. Polizzi**, Middle Tennessee State University

**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

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

**Strand 10 Poster Session**

**4:45 PM – 5:45 PM**

**Exhibit Hall**

P52:

**Assesment of K-12 Students' Science and Literacy Knowledge**

**Claire Cesljarev**, Indiana University

**Valarie L. Akerson**, Indiana University

P53:

**Designing Educative Curriculum Materials for Teacher Educators: Supporting Elementary Teachers' Content Knowledge for Teaching about Matter**

**Deborah L. Hanuscin**, Western Washington University

**Emily J. Borda**, Western Washington University

**Josie Melton**, Western Washington University

**Jamie N. Mikeska**, Educational Testing Service (ETS)

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

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**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

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**Graduate Student Forum**

**5:45 PM – 7:15 PM**  
**Salon F – Lower Level**

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**JRST Editorial Team Meeting/Dinner**

**6:00 PM – 8:30 PM**  
**Portland – Lower Level**

*Sponsored by: Wiley-Blackwell  
 (By invitation only)*

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**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**

# PROGRAM

2020

93<sup>RD</sup> ANNUAL  
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MARCH 15-18

PORTLAND, OR, USA

Portland Marriott  
Downtown Waterfront

**TUESDAY, MARCH 17, 2020**





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**Conference Registration**  
**7:30 AM – 4:30 PM**  
**Ballroom Foyer – Lower Level**

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**Concurrent Session 7**  
**8:00 AM – 9:30 AM**

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**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

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**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 LeicesterMentor: **Gillian H. Roehrig**, University of Minnesota***Examining the Cultural Specificity of Approaches to Learning Biology*****Angela N. Google**, Middle Tennessee State UniversityMentor: **Ross H. Nehm**, Stony Brook University (SUNY)***An Investigation into the Factors Influencing Acceptance of Evolution across University Instruction*****Ryan Dunk**, Syracuse UniversityMentor: **Ross H. Nehm**, Stony Brook University (SUNY)***Genetics Knowledge and Belief in Genetic Determinism of Biology and Nursing Students*****Katie Humrick**, University of LouisvilleMentor: **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 MinnesotaMentor: **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 OxfordMentor: **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***What Makes Science Thinkable in High-Needs Elementary Classrooms? Conceptualizations of Elementary Science Teacher Professional Agency*****Alison Mercier**, University of North Carolina at GreensboroMentor: **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**

President:

**Calvin S. Kalman**, Concordia University

***Comparison of Laboratories with Traditional Physics Laboratories***

**Calvin S. Kalman**, Concordia University

**Franco La Braca**, Concordia University

**Mandana Sobhanzadeh**, 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 Semilariski**, University of Tartu

**Regina Soobard**, University of Tartu

**Miia Rannikmae**, University of Tartu

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**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 International

**Shulamit Kapon**, Technion-Israel Institute  
of Technology

**Edit M. Yerushalmi**, Weizmann Institute  
of Science, Israel

**Samuel Safran**, Weizmann Institute  
of Science, Israel

**Maayan Schwartz**, Technion-Israel  
Institute of Technology

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

*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

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**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**

Presenter:  
**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

**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

**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 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 Issue***

**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

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

*Shifting the Teaching Paradigm*

**8:00 AM – 9:30 AM**

**Salon B**

President:  
**Claire Cesljar**, 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

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**STRAND 8:  
In-service Science Teacher Education**

*Professional Development using Computational Thinking and Robotics*

**8:00 AM – 9:30 AM**

**Pearl**

President:  
**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

***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

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**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

***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

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**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

**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

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

*Teaching of NOS*

**8:00 AM – 9:30 AM**  
**Portland**

- President:
- 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

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**NETWORKING BREAK**

**9:30 AM – 10:00 AM**

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**Concurrent Session 8  
10:00 AM – 11:30 AM**

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**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

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**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

President:

**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**



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

*Student Learning*

**10:00 AM – 11:30 AM**

**Salmon**

Presider:  
**Jonathan Shemwell**, University of  
Alabama

*Arts-Integrated Impact on Earth Science  
Misconceptions: Exploring instructional  
Order Effects in Elementary School Science*

**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. Lownsbey**, 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

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**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

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**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

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**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 Adesse 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**

President:  
**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

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**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

*Working Towards Community-Responsive Science Club Programs in Low-Income Communities*

**Lydia Burke**, OISE, University of Toronto

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**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**

*Argumentation in STEM 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

**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

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

***Analyzing Real-world Data***

**10:00 AM – 11:30 AM  
 Columbia**

President:  
**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 Vienna  
**Martina Brandenburger**, PH Freiburg  
**Andreas Nehring**, Leibniz Universität Hannover  
**Peter Edelsbrunner**, ETH Zürich  
**Andrea Moeller**, University of Vienna, Biology Education

***Measuring the Efficacy of an Approach to Integrating Quantitative Reasoning in High School Biology***

**Molly Stuhlsatz**, BSCS Science Learning  
**Melissa Kjellvik**, 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



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

*Centering Race, Whiteness, and Cultural Responsiveness in Science Education*

**10:00 AM – 11:30 AM  
Salon H**

Presenter:  
**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* [DOWNLOAD](#)

**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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**STRAND 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**

Presenter:  
**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*

**Michelle 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



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

*SSI and NOS*

**10:00 AM – 11:30 AM  
Portland**

President:  
**Renee S. Schwartz**, Georgia State  
University

***Compassion as a Framework for  
Understanding and Responding to  
Socioscientific Issue***

**David C. Owens**, Georgia Southern  
University  
**Dana L. Zeidler**, University of South Florida

***Identifying Socioscientific Orientations  
in the Context of Socioscientific Issue***

**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 Rannikmaa**, 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

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**NARST ANNUAL MEMBERSHIP MEETING**

**11:30 AM – 12:30 PM  
Salon I – Lower Level**

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**LUNCH**

**11:30 AM – 12:30 PM  
On Your Own**

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**PLENARY SESSION 2****12:30 PM – 1:45 PM****Salon E & F – Lower Level**

Announcement of 2021 Venue &amp; Passing of the Gavel

**Philip Bell**, University of Washington

Philip Bell is Professor and Chair of Learning Sciences &amp; 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 &amp; 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.

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**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

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**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

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**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

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**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

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**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

**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**

**María 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

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**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

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**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

**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**

Presenter:  
 Melody Russell, Auburn 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**

Presenter:  
 Sanlyn Buxner, University of Arizona

***Defining Dimensions of Student Struggle in Undergraduate General Chemistry Lab Activities***

Clarissa Keen, University of Massachusetts, Boston  
 Hannah Sevia, University of Massachusetts, Boston

***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 Huvad**, 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**

President:

**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 Allif**, 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 Kranzfelder, University of California, Merced  
 Marin Melloy, University of Minnesota

**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

**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

**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

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

***Attitudes, Beliefs, Motivation, and Identity in Science Learning***

**2:00 PM – 3:30 PM**

**Columbia**

Presider:

**Claire Cesljar**, Indiana University

***A 12-Item Survey to Measure***

**Linda Morell**, University of California, Berkeley

**Shruti Bathia**, University of California, Berkeley

**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 Menéses Villagrà**, 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

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**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 GreensboroEdna Tan, University of North Carolina  
at Greensboro**Talking about Systemic Racism in Science  
Teacher Education**Felicia M. Mensah, Teachers College,  
Columbia University

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**STRAND 12:  
Educational Technology****Technology-Enhanced Framing of Data  
to Facilitate Classroom Enactment of  
Science Practices****2:00 PM – 3:30 PM  
Salon G**

Discussant:

**Scott McDonald**, Pennsylvania State  
University

Presider:

**Hee-Sun Lee**, The Concord Consortium**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**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

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**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**

Discussant:

**Sarah Stapleton**, University of Oregon

Presider:

**Leah A. Bricker**, Northwestern  
University and The Spencer Foundation

**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  
**MaryMargaret 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 Montañó Nolan**, Western  
 Washington University  
**Megan Bang**, Northwestern University  
**Carrie Tzou**, University of Washington,  
 Bothell

**NETWORKING BREAK**

**3:30 PM – 3:45 PM**  
**Concurrent Session Rooms**

**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**

**3:45 PM – 5:15 PM**  
**Salon I**

**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**

**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

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**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

**Daniel Pimentel**, Stanford University

**Anne McAlister**, University of Virginia

**Jordan Bader**, University of New Hampshire

**Stephanie Eldridge**, University of Georgia

**Kirsten Edwards**, Michigan State University

**Mohammed Estaiteyeh**, Western University

**Chelsea Sexton**, University of Georgia

**Hannah Huvad**, University of Colorado Denver

**Scott Cohen**, Georgia State University

**Johannah Crandall**, Washington State University

**Sarah Lilly**, University of Virginia

**Caitlin Fine**, University of Colorado, Boulder

**Clarissa Keen**, University of Massachusetts, Boston

**Catherine Cullicott**, Arizona State University

**Anna Gillespie-Schneider**, University of Georgia

**Laura Zeller**, University of Illinois at Chicago

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**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 Issue**

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

**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

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

***NGSS—Practices and Implementation***  
**3:45 PM – 5:15 PM  
Medford**

President:  
Heesoo Ha, Seoul National University

***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



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**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**  
**Patrícia 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

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**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



***A Cross-Storybook Analysis of How Story-Driven Investigations Engage Preschool-Age Children in Science Practices***

**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

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

***Practice-Based Science Teaching***

**3:45 PM – 5:15 PM**

**Salon A**

Presenter:

**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

***Activity Theory and Identity: A Framework for Investigating Teacher Research Experiences and Classroom Practices***

**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

**Rebecca Eddy**, Cobblestone Applied Research & Evaluation, Inc.

**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

**Rebecca Eddy**, Cobblestone Applied Research & Evaluation, Inc.

**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 TEs***

**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 TEs***

**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

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**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 Gears**, Stony Brook University  
**Angela M. Kelly**, Stony Brook University  
**Monica Bugallo**, Stony Brook University

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

**Assessing Scientific Concepts across Disciplines**

**3:45 PM – 5:15 PM**

**Columbia**

Presider:  
**Peng He**, Michigan State University

*Systems Thinking Theory and Practice in Chemistry Education—Three International Case Studies*

**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

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**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

Presenter:

**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

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

*Considerations for Girls & Women in Science and Engineering*

**3:45 PM – 5:15 PM**  
**Salon H**

Presenter:

**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

**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

**María González-Howard**, University of Texas at Austin

**Catherine Riegle-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

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**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–Israeli Institute of Technology Levinsky College–Research & Development Authority MOFET Institute–School of Professional Development

**Rea Lavi**, Technion–Israeli 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

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**STRAND 14:  
Environmental Education**

*Modelling, Assessment, and Promotion of Climate Literacy*

**3:45 PM – 5:15 PM**

**Portland**

Discussant:

**Hui Jin**, Educational Testing Service

President:

**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

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**STRAND MEETINGS**

**5:15 PM – 6:15 PM**  
**Concurrent Session Rooms**

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**EQUITY & ETHICS DINNER**

**6:30 PM – 9:30 PM**  
**Off-site**

# PROGRAM

2020

93<sup>RD</sup> ANNUAL  
INTERNATIONAL  
CONFERENCE

MARCH 15-18

PORTLAND, OR, USA

Portland Marriott  
Downtown Waterfront

**WEDNESDAY, MARCH 18, 2020**





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**Conference Registration**  
**7:30 AM – 4:30 PM**  
**Ballroom Foyer – Lower Level**

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**Concurrent Session 11**  
**8:30 AM – 10:00 AM**

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**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

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

*Understanding of Climate and Natural Systems*

**8:30 AM – 10:00 AM**  
**Salmon**

President:  
**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 Dobarra**, Temple University

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

*Motivating Youth Engagement*

**8:30 AM – 10:00 AM  
Hawthorne/Belmont/Laurelhurst**

President:  
**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

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

*Characteristics of the Learning  
Environment*

**8:30 AM – 10:00 AM  
Mt Hood**

President:  
**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

*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

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**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**

Presenter:  
**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

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**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**

Presenter:  
**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

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**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 Sevia**, 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

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**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

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**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

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**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**

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**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

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**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 Schwartz**, 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 Schwartz**, The Weizmann Institute of Science

**The Design and impact of SSI Professional Development program**

**Yael Schwartz**, 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

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**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**

President:  
**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

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**STRAND 12:  
Educational Technology**

*New Methods of Measurement and Analysis to Move the Field Forward*

**8:30 AM – 10:00 AM  
Salon G**

President:  
**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

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**STRAND 14:  
Environmental Education**

*Environmental and Social Responsibility*

**8:30 AM – 10:00 AM  
Medford**

President:  
**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-Avelli**, 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

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**NETWORKING BREAK**

**10:00 AM – 10:30 AM**

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## Concurrent Session 12

### 10:30 AM – 12:00 PM

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#### 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. Schoernig**, Anshe Emet

**Christina Siry**, University of Luxembourg

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#### **Selected Papers:**

Ryoo, K., & Bedell, K. (2019). Supporting linguistically diverse students' science learning with dynamic visualizations through discourse-rich practices, *JRST* 56, p. 270-301

Peel, A., Sadler, T. & Friedrichsen (2019). Learning natural selection through computational thinking: Unplugged design of algorithmic explanations. *JRST*, 56, p. 983-1007

Rouse, A. & Rouse, R. (2019) – 3rd graders' use of writing to facilitate learning of engineering concepts. *JRST*, 56, 1406-1430.

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## 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. Mbajiorgu**, Enugu State University of Science and Technology

**Chinenye 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**

*Perceptual & 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



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**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

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**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**

President:  
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 Vergleichsstudien  
(ZIB) e.V.

*Matter Matters: Exploring the Role of  
Materiality in the Science Classroom*

Rishi (Shruti) Krishnamoorthy, 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



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**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

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**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 Skeeles-Worley**, University of Virginia

**Neta Shaby**, Oregon State University

**Aaron Price**, Museum of Science and Industry, Chicago

**David Meier**, Institute for Learning Innovation

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**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

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**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

**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

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**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

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**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

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**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

***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

***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

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**STRAND 10:  
Curriculum, Evaluation, and Assessment*****Dynamic Relationships between Practices and Knowledge in Science Assessment*****10:30 AM – 12:00 PM  
Columbia**

Presenter:  
**Xiaoxin Lyu**, Teachers College  
Columbia University

***Assessing Novelty and Model-Based Systems Thinking in Solutions to Design Problems***

**Dov Dori**, Technion

**Rea Lavi**, Technion–Israeli 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 Sereviene**, 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

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**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 Sukinarhimicc**, 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

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**LUNCH**

**12:00 PM – 1:00 PM  
On Your Own**

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**Concurrent Session 13  
1:00 PM – 2:30 PM**

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**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

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

***Inquiry Science Learning***

**1:00 PM – 2:30 PM  
 Mt Hood**

Presider:  
 Zuway-R Hong, National Sun Yat-Sen University

***Designing a Learning Sequence for Inquiry: Students' Perspectives***

David Perl Nussbaum, Weizmann Institute of Science  
 Edit M. Yerushalmi, Weizmann Institute of Science

**"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

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

***Students & STEM Careers***

**1:00 PM – 2:30 PM  
 Hawthorne/Belmont/Laurelhurst**

Presider:  
 Isha DeCoito, Western University

***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

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**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

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**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

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**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

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**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

**Joeun 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

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### **STRAND 9: Reflective Practice**

#### **Teachers' Beliefs and Identity in their Reflective Practices**

**1:00 PM – 2:30 PM  
Salmon**

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**

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### **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

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

#### ***What is the Science Curriculum of Today and the Future?***

**1:00 PM – 2:30 PM**  
**Medford**

President:  
**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

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### **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**

President:  
**Michael A. Arove**, 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. Arove**, 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 Pottawatommi 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  
**Zelnetta 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

**NARST BOARD MEETING #2**

**4:00 PM – 9:00 PM**  
**Pearl – 2nd Floor**

2020

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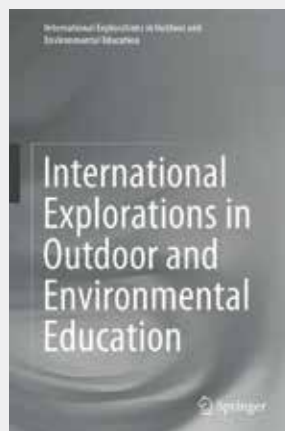
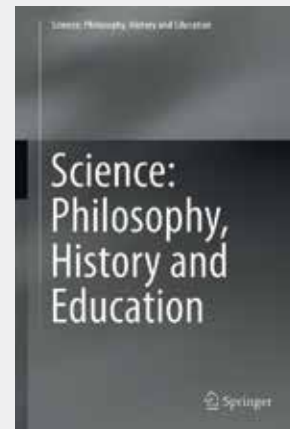
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