



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*



Aging and Longevity  
Global Health  
Poverty  
Pandemics  
Food Insecurity  
Water Scarcity  
Sustainability

**April 7-10, 2021**  
A Virtual Conference

# BREAKTHROUGH

INCLUSIVE  
ACTION  
TOOL KIT





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**

### Acknowledgments

The following helped to prepare and to edit the 2021 NARST Annual International Conference Program Book:

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#### Program Committee

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**April 7-10, 2021**  
A Virtual Conference





## NARST 94<sup>TH</sup> ANNUAL INTERNATIONAL CONFERENCE

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**Please note that this program is subject to change.**

Check the addendum posted at the meeting and on the website for updates.



## NARST 94<sup>TH</sup> ANNUAL INTERNATIONAL CONFERENCE

### General Information

#### Information about NARST

NARST is a worldwide organization for improving 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.

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 global organization for improving science education through research.*

Research areas of interest to NARST members include, but are not limited to, curriculum and assessment, science learning in different contexts, teacher education, policy and reform, technology, equity studies, 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.

#### Member Benefits

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.

Members have access to the *JRST* online through Wiley InterScience. Members also have access to a listserv, an opportunity to connect with members from 40 different countries, and access to various initiatives. Visit [narst.org](http://narst.org) for more information.

#### Code of Ethical Conduct

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

## General Information

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

### **B. Integrity**

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

### **C. Professional and Scholarly Responsibility in Science Teaching, Learning, and Research**

Science education professionals have a responsibility to use research practice and policy to advance NARST members' understanding of the teaching and learning of science in all learning contexts— formal, informal, local, and global—through research, practice, and policy. They adhere to the highest scholarly and professional standards within their field of expertise and accept responsibility for adherence to those standards. Science

education professionals should regard the tutelage of graduate students and early career faculty as a trust conferred by the organization for which they work, as well as NARST, for the promotion of these individuals' learning and professional development.

Science education professionals understand that they form a community and show respect for other science education professionals even when they disagree on theoretical, methodological, or personal approaches to professional activities. In activities involving marginalized populations, it is essential that responsible science education professionals seek out the voices and experiences of members of these groups and treat them as critical to their scholarship. While always endeavoring to be collegial, science education professionals must never let the desire to be collegial outweigh their shared responsibility for ethical behavior. When appropriate, they consult with colleagues, NARST's Equity and Ethics Committee, or organizational entities such as their institutional review board in order to prevent, avoid, or challenge unethical conduct.

### **D. Respect for People's Rights, Dignity, and Diversity**

Science education professionals respect the rights, dignity, and worth of all people in their professional activities. They treat other professionals, students, research participants, and members of the organization fairly, respectfully, and without exploitation or harassment. Science education professionals acknowledge the rights of others to hold values, attitudes, and opinions that differ from their own and take reasonable steps to avoid harm to others in the conduct of their work. They learn with others, share ideas honestly, give credit for others' contributions, and encourage others to contribute their unique skills, knowledge, and interests in professional environments. Science education professionals are sensitive to cultural, individual, and role differences in teaching, studying, and providing service to groups of people with distinctive characteristics, as well as the power differential that might result from such differences.

Science education professionals carefully avoid discrimination and bias toward individuals and groups based on race, gender, age, religion, ethnicity, nationality, sexual orientation, gender expression, gender identity, presence of disabilities, educational background, socioeconomic status, or other personal attributes. They refrain from making biased assumptions about others and perpetuating demeaning attitudes and stereotypes. Science education professionals do not accept any forms of discrimination and actively challenge implicit and explicit forms of discrimination.

## General Information

### E. Social Responsibility

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

professionals should reasonably expect of themselves and others to be guided by a code of ethics that supports efforts to resolve ethical dilemmas.

#### References

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/>

### Explanation of Paper Session Types

Type	Description
Paper Sessions Organized by the Program Committee:	Stand-alone papers grouped by strand coordinators comprise this session. The session title in the conference program features a common thread among the grouped papers. In this session, a real-time/live presentation of no more than 15 minutes is provided for each paper with approximately 5 additional minutes used for Q&A.
Symposium	This paper session type emphasizes a theme or issue identified by the proposers. The symposium does not usually offer a slate of individual presentations; consequently, individual papers are not listed in the conference program and presenters are listed as a group. The proposer(s) of the symposium decide what transpires during the session.
Related Paper Sets	This paper session type features several related research papers reporting studies that originate from a common base of research. This session type allows for common elements of design or approach to be presented once rather than repetitively. The proposer(s) of the related papers sets decide what transpires during the session. Because these sessions are indistinguishable from the paper sessions organized by the Program Committee, these sessions are labeled "related paper set" in the PDF version of the 2021 conference program.
Posters	This paper session type visually showcases the presenters' work in a standard poster format.

# General Information

## Explanation of Program Session Formats

Session	Description
Pre-Conference Workshops	Interactive working group sessions before the official Conference
Graduate Student Forum	Synchronous opportunity for graduate students to interact and learn.
Mentor-Mentee Session	Synchronous opportunity for first attendees to conference and early-career individuals to interact with more seasoned NARST members.
Poster Sessions	Traditional poster display activated for a 23-hour window with asynchronous interaction by way of chat during the 23 hours.
Author-Scheduled Presentations (all Strands)	These slots are scheduled by necessity. Authors prerecord and post presentations. In addition, authors schedule a 30-minute Q&A (analogous to "office hours") with author-designated time and appropriate link posted in the conference program. Participants view the pre-recorded presentation in advance of the "office hours."
Networking/Social Concurrent Sessions	Synchronous opportunities to interact with participants around a theme/topic/activity.
Concurrent Sessions	Two session types:  Synchronous sessions in which multiple papers are presented and discussed.  Presentations are pre-recorded and viewed in advance by attendees with only a synopsis and Q&A conducted in real-time.

## Guidelines for Real-Time/Live Meeting Presenters

- ▶ Presenters join live sessions 10 minutes in advance of the session start time.
- ▶ Presenters will be co-host upon joining the Zoom meeting room.
- ▶ In paper sessions organized by the Program Committee, all papers are allotted 15 minutes for presentation followed by 5 minutes of Q&A. Presiders along with the presenters will determine if the Q&A occurs after each presentation or after all presentations have concluded.

- ▶ For the symposium, the proposer(s) manage what transpires in the session, with the assistance of a presider or discussant if the proposer(s) designated a person to serve in these roles at the time of the proposal submission. Presiders or discussants are inconsistently listed in the program for this session type.
- ▶ Presenter(s) should become familiar with the Zoom platform and practice using it, especially with the functions they may employ (e.g., screen share, breakout, mute/unmute, camera on/off).

## Guidelines for Pre-recorded Meeting Presenters

- ▶ Advanced Pre-recording Viewing & Live Q&A presentations are referred to as "On-Demand Playback + Live Q & A" in other materials; they are the same. Attendees are expected to view pre-recorded presentations in advance of the scheduled session. At the scheduled session held real-time/live, presenters will provide a verbal summary (no more than 5 minutes) of the research and engage attendees in Q&A and discussion. As in the case at an in-person conference, the exact proceedings of the 60-minute live session will be determined by the speakers and the presider of the session (e.g., Q&A after each presenter summary or Q&A after all presenter summaries).
- ▶ Presenters join live sessions 10 minutes in advance of the session start time.
- ▶ Presenters will be co-host upon joining the Zoom meeting room.
- ▶ Presenter(s) should become familiar with the Zoom platform and practice using it (e.g., mute/unmute, camera on/off).

## Guidelines for Poster Meeting Presenters

- ▶ This paper session type visually showcases the presenters' work in a standard poster format.
- ▶ The eposter is presented in the template provided by NARST. Because many posters will be displayed for attendees to peruse and read, a standardized template will enable attendees to focus more quickly on the content in lieu of navigating an array of formats—a tax on cognitive processing.
- ▶ The eposter template is standardized in terms of its size. Please do not change the overall size or increase the number of boxes/sections. Please feel free to change the color scheme, the header/title for boxes/sections, decrease the number of boxes/sections, and add any information (text, pictures, and graphs, etc.) you deem pertinent to your work.



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## General Information

### Guidelines for Presiders and Discussants

Presiders or discussants are listed for some, but not all, sessions in the conference program. For sessions without presiders or discussants, it is necessary for presenters to assume the essential duties and set aside time for discussion so that the audience participants can contribute to a discussion of the papers.

#### The role of the presider involves several functions. Guidance on fulfilling the role is as follows:

- ▶ Become familiar with the Zoom platform before the conference.
- ▶ Arrive 10 minutes prior to the start of the session.
- ▶ Check pronunciations of the names of the presenters and their institutions.
- ▶ For the sessions for which it is appropriate (e.g., paper sessions organized by the Program Committee), meet with presenters, and make a time plan, retaining the order of presenters in the program.
- ▶ It may be helpful to develop a power point title slide and “share screen” so attendees can see the session title as they enter the space.
- ▶ Enable Live Transcription/ Caption
- ▶ Start session promptly.
- ▶ Announce the session title to ensure attendees are in the space they intended.
- ▶ Remind the audience to mute their microphones by directing them to the microphone icon (usually located at the bottom, top, or side of the Zoom window).
- ▶ Remind the audience of the chat function for their use by directing them to the comment icon (usually located at the bottom, top, or side of the Zoom window).
- ▶ Introduce presenters and serve as timekeeper.
- ▶ For the sessions for which it is appropriate (e.g., paper sessions organized by the Program Committee), signal when presenters have 5, 3, and 1 minute remaining of a 15-minute presentation and 1 minute remaining of a 5-minute summary. It is important to end each presentation within the agreed allocated time to ensure fairness to all presenters and to end the session on time. One suggestion that may be followed: if someone begins to exceed the presentation’s allotted time, then politely interrupt and announce to the audience that further discussion directly with the author(s) is encouraged offline at the conclusion of the entire session.
- ▶ Facilitate discussion and manage Q&A, assuring equitable involvement of audience members.

- ▶ At the conclusion of the session, remind the audience to leave the virtual space and remind them of the time of the next session.

#### The role of the discussant primarily focuses on papers. Guidance is as follows:

- ▶ Read papers, provided by presenters, before the session.
- ▶ If a presider is not present, then perform presider duties as detailed in the guidance for presiders.
- ▶ After the presentation, make brief and cogent remarks on each paper with suggestions for future research.

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### Networking Concurrent Sessions: Together around the Globe

April 8th at 3:30 - 5:30 pm

#### *Aikido-(and Physics!) Inspired Breathing, Balance, Stretching, and Movement*

(duration: 30 min)

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

#### *CADASE Graduate Student Fireside Chat: Navigating Academe with Success*

(duration: 60 min)

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

#### *The CADASE Social: Intriguing Scenes from Movies and TV Shows*

(duration: 45 min)

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

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## General Information

### **Knitting Circle—All Levels Welcome**

(duration: 60 min)

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

### **Learning Science in the Schoolyard—Centering Equity**

(duration: 60 min)

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

### **Let's Escape Together!**

(duration: 60 min)

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

### **NSF Funding Programs and More**

(duration: 120 min)

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

### **NARST Fellows Award Program**

(duration: 45 min)

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

### **NARST Has Talent: An April FARSE**

(duration: 45 min)

A digital reincarnation of FARSE, this year's "Talent" show will feature a competition of creative 3-minute video products competing for "likes" to make it into the final online showcase sent out via the NARST listserv. A farcical look at academic life through the eyes of our members in the context of COVID-19, pets, children, backyard activities, new hobbies, exercise, musical ventures, and academic pursuits.

### **"PeTagogy": Meeting Pets of NARST Members**

(duration 30 min)

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

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### **April 9th at 8:30 - 9:30 am**

#### **Art-based Social Meet-up**

(duration: 30 min)

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

#### **Drop Your Research/Theory/Test tube like it's Hot**

(duration: 60 min)

This session will provide a space for informal community building. It will involve a jam session that will feature an eclectic musical lineup from all over the world. The goal here is to provide a space to connect with other NARST members, decompress, and dance the time away. Since the act of dancing is related to spatial awareness, raises the heart rate, and results in the release of endorphins, we hypothesize that dancing in community will inform positive vibes for NARST'ers.

## General Information

April 9th at 3:15 - 5:30 pm

### **Among Us Scholars**

(duration: 60 min)

Participants for this session will play the video game "Among us".

### **Enjoying or Enduring the Process of Tenure during the COVID-19 Pandemic**

(duration: 60 min)

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

### **Informal Music Sharing/Jamming Networking**

(duration: 60 min)

The session will start by networking fellow musicians within the NARST community. We will discuss common musical interests and any instruments we play (including vocals). This could lead to collaborations between annual meetings that could lead to fun live performances and or/ sing-a-longs at annual meetings. At the session, if time permits, we might even jam a little.

### **Mindfulness Practices for Stress Relief and Self Care in the Time of COVID**

(duration: 90 mins)

Organizer:

**Paula Huffman**, University of North Carolina at Chapel Hill, UNC Program on Integrative Medicine

This Mindfulness workshop will:

- ▶ Develop strategies for using Mindfulness Techniques that can be practiced anywhere, anytime.
- ▶ Practice techniques that help to cultivate the ability to respond from a calmer baseline to daily life events.
- ▶ Learn ways to slow the ruminating mind, thereby decreasing catastrophic thinking and its effect on our overall well-being.
- ▶ Enhance stress resiliency as we develop techniques for intentionally focusing on positive and pleasurable life events.

## Research Interest Groups (RIGs) Information

### **The Continental and Diasporic Africa in Science Education RIG (CADASE)**

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

### **Latino/a RIG (LARIG)**

The Latino/a research interest group supports social networks that further research agendas regarding Latino/a science learners. LARIG also serves as a support and mentoring alcoba (space) for Latin@s/Latino science educators and others interested in Latin@ science education.

### **Contemporary Methods for Science Education Research**

The broad purpose of this RIG is to advance the mission of NARST by maintaining the rigor of science education studies, as well as promoting more standardized research practices across the organization such that we are better able to learn from and synthesize each other's work. The intent is that these outcomes will, in turn, allow us to keep advancing the field and maintain the relevance of our research to improving science teaching and learning.

### **Engineering Education RIG (ENE-RIG)**

The purpose of the RIG in Engineering Education is to synergize research in science and engineering education, promote rigorous research in engineering education, and provide a collaboration and discussion space supporting intellectual and professional exchange and networking.

### **Indigenous Science Knowledge RIG (ISK-RIG)**

The purposes of ISK RIG is to bring together scholars, practitioners, policy makers, and community members who are interested and involved in Indigenous science education. The mission is to bring likeminded and eager science educators who are committed to providing science opportunities to better the lives of all Indigenous Tribes and peoples of the world.

# General Information

## Strand Key

<b>Strand 1:</b>	<b>Science Learning—Development of Student Understanding</b>	<b>Strand 7:</b>	<b>Pre-service Science Teacher Education</b>
<b>Strand 2:</b>	<b>Science Learning: Contexts, Characteristics, and Interactions</b>	<b>Strand 8:</b>	<b>In-service Science Teacher Education</b>
<b>Strand 3:</b>	<b>Science Teaching—Primary School Characteristics and Strategies</b> (Grades PreK-6)	<b>Strand 9:</b>	<i>Discontinued</i>
<b>Strand 4:</b>	<b>Science Teaching—Middle and High School Characteristics and Strategies</b> (Grades 5-12)	<b>Strand 10:</b>	<b>Curriculum and Assessment</b>
<b>Strand 5:</b>	<b>College Science Teaching and Learning</b> (Grades 13-20)	<b>Strand 11:</b>	<b>Cultural, Social, and Gender Issues</b>
<b>Strand 6:</b>	<b>Science Learning in Informal Contexts</b>	<b>Strand 12:</b>	<b>Technology for Teaching, Learning, and Research</b>
		<b>Strand 13:</b>	<b>History, Philosophy, Sociology, and Nature of Science</b>
		<b>Strand 14:</b>	<b>Environmental Education and Sustainability</b>
		<b>Strand 15:</b>	<b>Policy, Reform and Program Evaluation</b>

## 2020–2021 NARST Leadership Team

### Officers and Board of Directors:

President

**Eileen Carlton Parsons**, University of North Carolina at Chapel Hill

President-Elect

**Reneé Schwartz**, Georgia State University

Secretary-Treasurer

**Jerome Shaw**, University of California Santa Cruz

Immediate Past President

**Tali Tal**, Technion, Israel Institute of Technology

Executive Director

**Helen Schneider Lemay**

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(21) **Senay Purzer**, Purdue University

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(22) **Noemi Waight**, University of Buffalo

(22) **Bhaskar Upadhyay**, University of Minnesota

(22) **Sonya N. Martin** (International Coordinator), Seoul National University

(23) **Christina Schwarz**, Michigan State University

(23) **Knut Neumann**, IPN-Leibniz Institute for Science and Mathematics Education

(23) **Brooke Whitworth**, Clemson University



# General Information

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## **NARST Liaison to NSTA:**

(21) **G. Michael Bowen**, Mount Saint Vincent University

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## **NSTA Representative:**

(21) **Cynthia Crockett**, Harvard-Smithsonian Center for Astrophysics

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## **JRST Editors:**

(25) **Troy Sadler**, University of North Carolina at Chapel Hill

(25) **Felicia Moore Mensah**, Teachers College, Columbia University

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## **2020-2021 Strand Coordinators:**

### **Strand 1:**

#### **Science Learning–Development of Student Understanding**

(21) **Sarah J. Fick**, Washington State University

(22) **Bahadir Namdar**, Recep Tayyip Erdogan University

### **Strand 2:**

#### **Science Learning: Contexts, Characteristics and Interactions**

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

(22) **Edna Tan**, University of North Carolina-Greensboro

### **Strand 3:**

#### **Science Teaching–Primary School Characteristics and Strategies**

(Grades preK-6)

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

(22) **Ornit Spektor-Levy**, Bar Ilan University

### **Strand 4:**

#### **Science Teaching–Middle and High School Characteristics and Strategies**

(Grades 5-12)

(21) **Neta Shaby**, Oregon State University

(22) **Shannon Navy**, Kent State University

### **Strand 5:**

#### **College Science Teaching and Learning**

(Grades 13-20)

(21) **Jonah Firestone**, Washington State University Tri-Cities

(22) **Anne Emerson Leak**, High Point University

### **Strand 6:**

#### **Science Learning in Informal Contexts**

(21) **Anton Puvirajah**, University of Western Ontario

(22) **June Teisan**, Belle Isle Aquarium

### **Strand 7:**

#### **Pre-service Science Teacher Education**

(21) **Michelle A. Fleming**, Wright State University

(22) **Takumi Sato**, Virginia Tech

### **Strand 8:**

#### **In-service Science Teacher Education**

(21) **Nidaa Makki**, The University of Akron

(22) **Donna Governor**, University of North Georgia

### **Strand 10:**

#### **Curriculum and Assessment**

(21) **Elon Langbeheim**, Ben-Gurion University

(22) **Ke Li**, University of North Carolina at Chapel Hill

### **Strand 11:**

#### **Cultural, Social, and Gender Issues**

(21) **Cesar Delgado**, North Carolina State University

(22) **Terrell Morton**, University of Missouri

### **Strand 12:**

#### **Technology for Teaching, Learning, and Research**

(21) **Denise M. Bressler**, East Carolina University

(22) **Leigh Ann Haefner**, Penn State Altoona

### **Strand 13:**

#### **History, Philosophy, Sociology, and Nature of Science**

(21) **Alexandria K. Hansen**, Fresno State University

(22) **Alison Cullinane**, University of Oxford

### **Strand 14:**

#### **Environmental Education and Sustainability**

(21) **Idit Adler**, Tel Aviv University

(22) **Beth Covitt**, University of Montana

### **Strand 15:**

#### **Policy, Reform, and Program Evaluation**

(21) **Carrie D. Allen**, University of North Texas International

(22) **Mercy Ogunsola-Bande**, National Open University of Nigeria

# General Information

## Program Proposal Reviewers:

Adam Bennion	Austin Heil	Clarissa Keen	Elizabeth Watts
Adekunle Oladejo	Ayca Fackler	Claudia Fracchiolla	Elon Langbeheim
Adiv Gal	Ayelet Baram-Tsabari	Clausell Mathis	Emily Allen
Adolfo Obaya	Bashirah Ibrahim	Climant Khoza	Emily Dare
Aimee Fraulo	Ben Herman	Cody Smith	Emily Reigh
Alana Newell	Benjamin Archibeque	Cong Wang	Emine Sahin-Topalcengiz
Alexandra Race	Benjamin Ewing	Coralie Delhaye	Emmanuel Mushayikwa
Alexandria Muller	Benjamin Lowell	Corey Payne	Engin Karahan
Alfred Limbere	Benny Mart Hiwatig	Corinne Lardy	Eric Greenwald
Alice Langhans	Beth Powell	Cristian Merino	Erin Peters-Burton
Alicia Alonzo	Bhaskar Upadhyay	Daniel Pimentel	Estelle Blanquet
Alison Mercier	Bradley Davey	Danielle Dani	Eugene Judson
Alister Olson	Brandon Grossman	Danielle Vande Zande	Eunjin Bahng
Allison Metcalf	Brendan Callahan	David Fortus	Eve Manz
Amanda Benedict-Chambers	Brian Zamarripa Roma	David McKinney	Ezgi Yesilyurt
Amanda Obidike	Bridget Miller	David Owens	Faith Weeks
Amanda Peel	Brittany Smith	David Segura	FangFang Zhao
Amanda Tompkins	Brock Couch	Dawnne LePrete	Franz Bogner
Amber Cesare	Caitlin Kirby	Deborah Agbanimu	Frieda Reichsman
Amy Farris	Camila Amaral	Deena Gould	Frikkie George
Ana Valdmann	Cari Herrmann Abell	Denise Bressler	G. Bowen
Andrea Anderson	Carina Rebello	Devarati Bhattacharya	Gail Jones
Andrea Phillips	Carme Grimalt-Álvaro	Devasmita Chakraverty	Gary Holliday
Andrés Espinoza-Cara	Carmen Fies	Diane Wright	Gary Wright
Andrew Gilbert	Caroline Spurgin	Diego Rojas-Perilla	Gaye Ceyhan
Angela Chapman	Carrie-Anne Sherwood	Dina Tsybulsky	Gena Sbeglia
Anita Schuchardt	Cassie Quigley	Douglas Larkin	Georgia Hodges
Anna Beniermann	Cesar Delgado	Dustin Schiering	Gerald Tembrevilla
Anna MacPherson	ChangChia Liu	Edna Tan	Gianna Lopez-Colson
Anna Maria Arias	Charnell Long	Elaine Silva Mangiante	Gifty Asamani
Anne Emerson Leak	Chelsea Andrews	Elanur Yilmaz	Gili Marbach-Ad
Anupriya Karippadath	Chelsea Sexton	Eleanor Kenimer	Giulia Tasquier
April Holton	Christa Haverly	Eleonora Barelli	Gozde Tosun
Arif Rachmatullah	Christine Mcdonald	Elgin Leary	Grant Gardner
Ashley Iveland	Christopher Jadallah	Elizabeth De Los Santos	Greses Pérez
Ashlyn Pierson	Christopher Preece	Elizabeth Hufnagel	Guopeng Fu
	Cigdem Han Tosunoglu	Elizabeth Lewis	Gyeong-Geon Lee

## General Information

### Program Proposal Reviewers: *(continued)*

Hamza Malik	Jeanne Brunner	Karyn Housh	Lorraine Ramirez Villarin
Hannah Jardine	Jean-Philippe Ayotte-Beaudet	Kate Henson	Lu Wang
Harini Krishnan	Jeffrey Nordine	Kate Walker	Lucia Vazquez-Ben
Harleen Singh	Jeffrey Radloff	Katherine McCance	Lukas Becker
Heather Bergan-Roller	Jennifer Idema	Katherine Wade-Jaimes	Lulu Garah
Heather Johnson	Jennifer Maguire	Kathryn Bateman	Lutz Kasper
Heather Killen	Jennifer Pietros	Kelsey Metzger	Lynne Zummo
Heather Page	Jennifer Schellinger	Keren Dalyot	Lyrice Lucas
Heesoo Ha	Jennifer Tripp	Ketevan Kupatadze	Madison Scheer
Heidi Cian	Jessica Chen	Kevin Cherbow	Magdeline Stephen
Helena Aptyka	Jessica Dewey	Kevin Curry	Mai Lill Lunde
Henriette Burns	Jessica Karch	Kevin Fleming	Marcus Kubsch
Holger Weitzel	Jianlan Wang	Kimberly Staples	María González-Howard
Hye Sun You	Jie Yang	Kiran Purohit	Maria Wallace
Hye-Eun Chu	Jielan Hegazy	Kirsten Edwards	Marina Birkenstock
Hyun-Jung Cha	Jing Lin	Kraig Wray	Mark Newton
I-Chien Chen	John Ruppert	Kristen Larson	Martha Canipe
Idit Adler	Jonah Firestone	Kristie Gutierrez	Martin Schwichow
Ido Davidesco	Jonathan Hall	Kristina Kramarczuk	Mary Atwater
Ihsan Ghazal	Jonathan McCausland	Kübra Özmen	Matthew Johnson
Imran Tufail	Joni Lakin	Kyungjin Cho	Matthew Weinstein
Isha DeCoito	Jooyoung Jeon	Laura Carsten Conner	Maurina Aranda
Iyad Dkeidek	Joseph Brobst	Laura Peña	May Lee
J. Mesiner	Joseph Hardcastle	Laura Schneider	Megan Ennes
Jacob Pleasants	Joseph Wong	Laura Zangori	Megan McGinty
Jacqueline Nijenhuis-Voogt	Joshua Ellis	Lauren Madden	Megan McKinley-Hicks
Jacquelyn Chini	Joshua Reid	Len Annetta	Meghan Macias
Jaimie Miller-Friedmann	Judith Gouraige	Liam Guilfoyle	Melanie Kinskey
Jale Dursun	Juli Uhl	Lina Vinitzky-Pinsky	Melanie Shores
James Minogue	Julia Plummer	Lindsay Wheeler	Melissa Dancy
James Nyachwaya	Julia Woihte	Ling Liang	Melo-Jean Yap
Jamie Wallace	Justin Andersson	Lisa Borgerding	Mercy Ogunsola-Bandele
Janelle Bailey	Justina Ogodu	Lisa Lundgren	Merryn Cole
Jasmine Nation	K. C. Busch	Lisa Marco-Bujosa	Michael Adewusi
Jason May	Karin Lohwasser	Lisa Stinken-Rösner	Michail Kalogiannakis
Jason Morphew	Karl Jung	Lorelie Imperial	Michal Haskel Ittah
Jeanna Wieselmann		Lori Andersen	Michalis Livitziis

## General Information

### Program Proposal Reviewers: *(continued)*

Michelle Forsythe	Pedro Teixeira	Sakyiwaa Danso	Stanton Belford
Michelle Joyce	Peng He	Salih Faraj	Stefan Sorge
Mika Munakata	Peter Cormas	Sally Wu	Stefanie Marshall
Miri Barak	Peter Garik	Samantha Skrob	Stephanie Teeter
Mohammad Siddique	Peter Okebukola	Sandhya Krishnan	Stephen Burgin
Mohammed Estaiteyeh	Peter Wulff	Sanlyn Buxner	Stephen Thompson
Molly Stuhlsatz	Petra Kranzfelder	Sara Heredia	Stephen Witzig
Moriah Ariely	Phillip Boda	Sara Salisbury	Stina Krist
Mu-Yin Lin	Phyllis Katz	Sara Petchey	Suat Celik
Myunghwan Shin	Preetha Menon	Sara Salloum	Sugat Dabholkar
Nam-Hwa Kang	Preethi Titu	Sara Samiphak	Sulaiman Al-Balushi
Nancy Nasr	Priyanka Parekh	Sarah Carrier	Sule Aksoy
Nancy Staus	Qingna Jin	Sarah Frodsham	Susan Letourneau
Narendra Deshmukh	Rachael Gordon	Sarah Lilly	Susanna Hapgood
Narmin Ghalichi	Rachael Tawbush	Scott McDonald	Susannah Sandrin
Natalie Ahne	Rachel Askew	Shadi Asakle	Susie Cohen
Natalie King	Rachel Chaffee	Shahar Abramovitch	Sylvia James
Nazihan Ursavas	Rachel Ruggirello	Shakuntala Gopal	T.B.M. Chowdhury
Neha Anand	Radu Bogdan Toma	Shana Mcalexander	Takuya Matsuura
Neta Shaby	Ran Peleg	Shane Tutwiler	Tamara Pepper
Netta Perry	Raquib Khan	Shannon Davidson	Tamara Roth
Ngonidzashe Mushaikwa	Rea Lavi	Sharfun Islam Nancy	Tammy Lee
Ngozi Okafor	Rebecca Hite	Sharon Pelech	Taolane Bonnqe
Nicholas Bourke	Regina McCurdy	Sharona Lev	Tasneem Anwar
Nilay Ozturk	Regina Soobard	Shelley Rap	Teresa Leavens
Nitasha Mathayas	Remy Dou	Sheri Fitzgerald	Teresa Massey
Niva Wengrowicz	Renee Schwartz	Shreyashi Halder	Terrance Burgess
Noemi Waight	Richard Lamb	Sibel Telli	Terrell Morton
Orit Ben Zvi Assaraf	Robert Bennett	Sina Lenski	Theila Smith
Orit Hercovitz	Robert Idsardi	Siqi Li	Ti'Era Worsley
Ornit Spektor-Levy	Roberta Hunte	Sisi Han	Tina Vo
Ozgul Yilmaz-Tuzun	Ron Gray	Sissy Wong	Tingting Li
Ozlem Akcil Okan	Ross Nehm	Sonya Martin	Todd Hutner
Parth Soni	Saed Sabah	Soon Lee	Uchenna Emenaha
Patricia Patrick	Saeed Moshfeghyeganeh	Sophia Jeong	Valarie Akerson
Patrick Smith	Sahar Alameh	Sphamandla Zulu	Valarie Bogan
Paul Hamerski	Saiqa Azam	Stanley Lo	Vance Kite



## General Information

### Program Proposal Reviewers: *(continued)*

Victoria Corr	Wisam Sedawi	Ying-Yan Lu	Zac Patterson
Victoria Rodriguez-Operana	Won Kim	Yingzhi Zhang	Zehavit Kohen
Vivien Chabalengula	Wonyong Park	Yiwen Huang	Zeynep Akdemir
Wanja Gitari	Yael Feldman-Maggor	Yonghee Lee	Zoe Buck Bracey
Wardell Powell	Yael Shwartz	Yoonsung Choi	Zoubaida Dagher
William Matthew Reynolds	Ying-Chih Chen	Yvonne Thevenot	Zuway-R Hong

### NARST Presidents:

1928 W. L. Eikenberry	1952 Betty Lockwood	1976 Ronald D. Anderson	2000 David F. Treagust
1929 W. L. Eikenberry	1953 J. Darrell Barnard	1977 O. Roger Anderson	2001 Sandra K. Abell
1930 W. L. Eikenberry	1954 George G. Mallinson	1978 Roger G. Olstad	2002 Norman G. Lederman
1931 Elliot R. Downing	1955 Kenneth E. Anderson	1979 James R. Okey	2003 Cheryl L. Mason
1932 Elliot R. Downing	1956 W. C. Van Deventer	1980 John W. Renner	2004 Charles W. (Andy) Anderson
1933 Francis D. Curtis	1957 Waldo W. Blanchet	1981 Stanley L. Helgeson	2005 John R. Staver
1934 Ralph K. Watkins	1958 Nathan S. Washton	1982 Stanley L. Helgeson	2006 James A. Shymankys
1935 Archer W. Hurd	1959 Thomas P. Fraser	1983 Carl F. Berger	2007 Jonathan F. Osborne
1936 Gerald S. Craig	1960 Vaden W. Miles	1984 Ann C. Howe	2008 Penny J. Gilmer
1937 Walter G. Whitman	1961 Clarence H. Boeck	1985 Ertle Thompson	2009 Charlene M. Czerniak
1938 Hanor A. Webb	1962 Herbert A. Smith	1986 David P. Butts	2010 Richard A. Duschl
1939 John M. Mason	1963 Ellsworth S. Obourn	1987 James P. Barufaldi	2011 Dana L. Zeidler
1940 Otis W. Caldwell	1964 Cyrus W. Barnes	1988 Linda DeTure	2012 J. Randy McGinnis
1941 Harry A. Carpenter	1965 Frederic B. Dutton	1989 Patricia Blosser	2013 Sharon J. Lynch
1942 G. P. Cahoon	1966 Milton P. Pella	1990 William G. Holliday	2014 Lynn A. Bryan
1943 Florence G. Billig	1967 H. Craig Sipe	1991 Jane Butler Kahle	2015 Valarie L. Akerson
1944 Florence G. Billig	1968 John M. Mason	1992 Russell H. Yeany	2016 Mary M. Atwater
1945 Florence G. Billig	1969 Joseph D. Novak	1993 Emmett L. Wright	2017 Mei-Hung Chiu
1946 C. L. Thield	1970 Willard D. Jacobson	1994 Kenneth G. Tobin	2018 Barbara Crawford
1947 Earl R. Glenn	1971 Paul D. Hurd	1995 Dorothy L. Gabel	2019 Gail Richmond
1948 Ira C. Davis	1972 Frank X. Sutman	1996 Barry J. Fraser	2020 Tali Tal
1949 Joe Young West	1973 J. David Lockard	1997 Thomas R. Koballa, Jr.	2021 Eileen R. C. Parsons
1950 N. Eldred Bingham	1974 Wayne W. Welch	1998 Audrey B. Champagne	2022 Renéé Schwartz
1951 Betty Lockwood	1975 Robert E. Yager	1999 Joseph S. Krajcik	

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## General Information

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### **NARST Executive Directors:**

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

1975-1980	Paul Joslin	1990-1995	John Staver	2002-2007	John Tillotson
1980-1985	Bill Holliday	1995-2000	Art White	2007-2017	Bill Kyle
1985-1990	Glenn Markle	2000-2002	David Haury	2018-2021	Helen Schneider Lemay

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### **JRST Editors:**

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

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### **Emeritus Members:**

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

## General Information

### NARST Award Recipients:

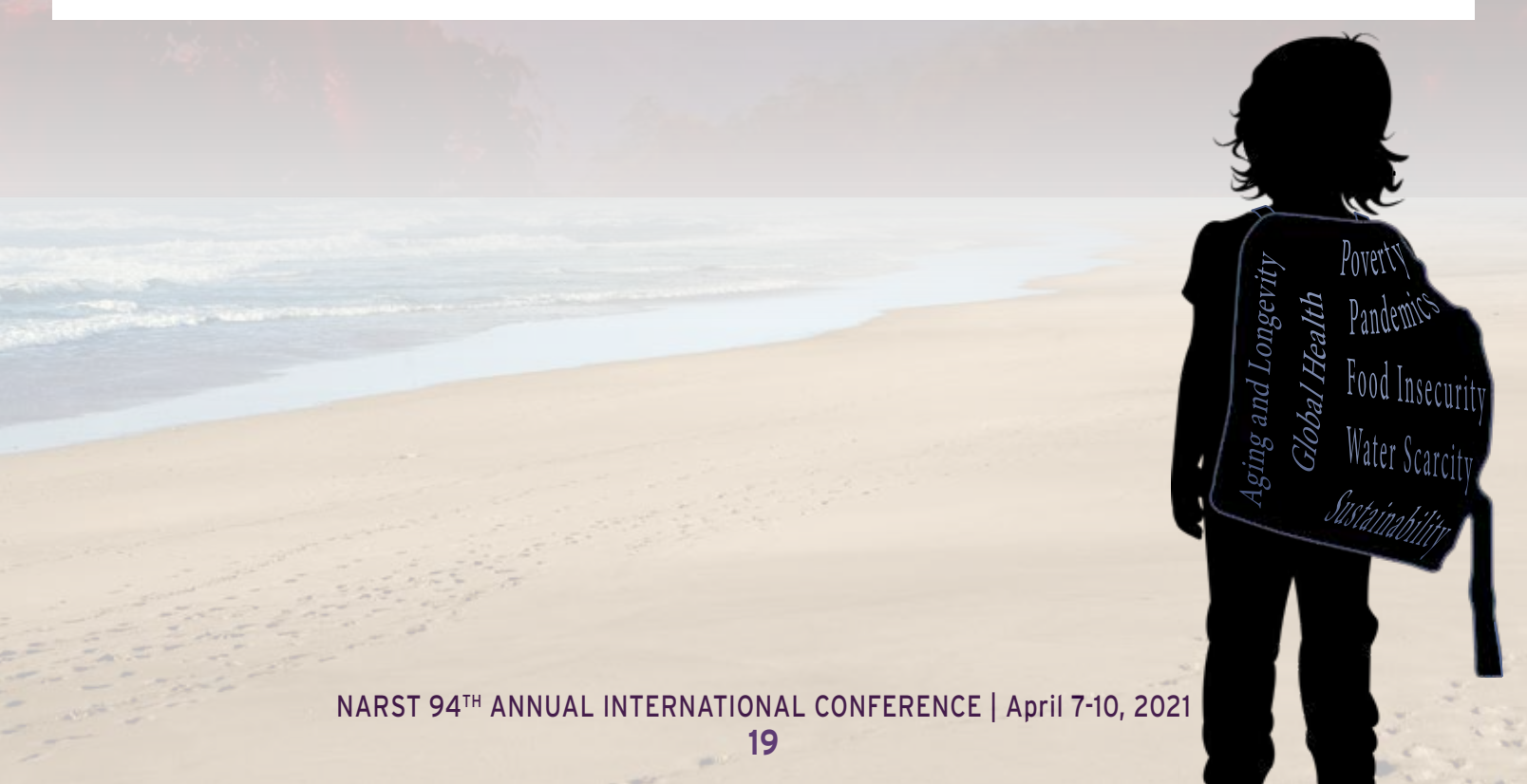
#### Distinguished Contributions to Science Education through Research Award

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
1986	Anton E. Lawson
1987	Paul DeHart Hurd
1988	John W. Renner
1989	Willard Jacobson
1990	Joseph D. Novak
1991	Robert L. Shrigley
1992	Pinchas Tamir
1993	Jack Easley, Jr.
1994	Marcia C. Linn
1995	Wayne W. Welch
1996	Carl F. Berger
1997	Rosalind Driver
1998	James J. Gallagher
1999	Peter J. Fensham
2000	Jane Butler Kahle
2001	John K. Gilbert

Year	Awardee
2002	Audrey B. Champagne
2003	Barry J. Fraser
2004	Robert E. Yager Paul Black
2005	John C. Clement
2006	David Treagust
2007	Kenneth Tobin
2008	Dorothy Gabel
2009	Peter W. Hewson Leonie Jean Rennie Wolff-Michael Roth
2010	Reinders Duit Joseph Krajcik
2011	Norman Lederman
2012	Charles W. (Andy) Anderson Larry Yore
2013	Dale R. Baker

Year	Awardee
2014	Glen Alkenhead Richard Gunstone Frances Lawrenz
2015	Richard A. Duschl Meshach Mobolaji Ogunniyi
2016	Lynn D. Dierking John N. Falk Dana L. Zeidler
2017	Avi Hofstein
2018	Marissa Rollnick Jonathan Osborne
2019	Mary M. Atwater Maria Pilar Jiménez-Aleixandre
2020	Judy Dori Saouma Bou Jaoude
2021	Valerie Akerson Greg Kelly



## 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	Advisor
1992	Rene Stofflett	Dale R. Baker
1993	Julie Gess-Newsome	Norman G. Lederman
1994	Carolyn W. Keys	Burton E. Voss
1995	Jerome M. Shaw	Edward Haertel
1996	Christine M. Cunningham	William L. Carlsen
1997	Jane O. Larson	Ronald D. Anderson
1998	Kathleen Hogan	Bonnie K. Nastasi
1999	Fouad Abd-El-Khalick	Norman G. Lederman
2000	Danielle Joan Ford	Annemarie S. Palinscar
2001	Iris Tabak	Brian Reiser
2002	Mark Girod	David Wong
2003	Hsin-Kai Wu	Joseph Krajcik
2004	David L. Fortus	Ronald Marx Joseph Krajcik
2005	Thomas Tretter	Gail M. Jones
2006	Stacy Olitsky	Kenneth Tobin
2007	Julia Plummer	Joseph S. Krajcik

Year	Awardee	Advisor
2008	Victor Sampson	Douglas Clark
2009	Lei Liu	Cindy E. Hmelo-Silver
2010	Heather Toomey	Phillip Bell Zimmerman
2011	Jeffrey J. Rozelle	Suzanne M. Wilson
2011	Catherine Eberbach	Kevin Crowley
2012	Melissa Braaten	Mark Windschitl
2013	Lori Fulton	Jian Wang
2014	Daniel Birmingham	Angela Calabrese Barton Anne-Lise Halvorsen
2015	Allison Godwin	Geoffrey Potvin
2016	Anna MacPherson	Jonathan Osborne
2017	Anita Schuchardt	Christian Schunn
2018	Katherine Wade-Jaimes	Renée Schwartz
2019	Anita S. Tseng	Jonathan F. Osborne
2020	Netta Shaby	Orit Ben Zvi-Assaraf
2021	Eben witherspoon	Christian D. Schunn

### 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.

Year	Awardee
1993	Wolff-Michael Roth
1994	Deborah J. Tippins
1995	Nancy B. Songer
1996	Mary B. Nakhleh
1997	Peter C. Taylor
1998	J. Randy McGinnis
1999	Craig W. Bowen Gregory J. Kelly
2000	Angela Calabrese Barton
2001	Julie A. Bianchini
2002	Alan G. Harrison

Year	Awardee
2003	Fouad Abd-El-Khalick
2004	Grady J. Venville
2005	Randy L. Bell
2006	Heidi Carlone
2007	Bryan A. Brown
2008	Hsin-Kai Wu
2009	Troy D. Sadler
2010	Thomas Tretter
2011	Katherine L. McNeill
2012	Victor Sampson
2013	Alandeom W. Oliveira

Year	Awardee
2014	Cory Forbes
2015	Benjamin C. Herman
2016	Richard L. Lamb
2017	Ying-Chih Chen David Stroupe
2018	Doug Lombardi
2019	Hosun Kang Eve Manz
2020	Brian Donovan Dana Vedder Weiss
2021	Lama Jaber

## 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.

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

\* Multiple Awardees

## 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
1975	John J. Koran
1976	Anton E. Lawson
1977	NO AWARD
1978	Rita Peterson
1979	Linda R. DeTure
1980	M. James Kozlow Arthur L. White
1981	William Capie Kenneth G. Tobin Margaret Boswell
1982	F. Gerald Dillashaw James R. Okey
1983	William C. Kyle, Jr. James A. Shymansky Jennifer Alport
1984	Darrell L. Fisher Barry J. Fraser
1985	Hanna J. Arzi * Ruth Ben-Zvi * Uri Ganiel * Russell H. Yeany Kueh Chin Yap Michael J. Padilla
1986	Barry J. Fraser * Herbert J. Walberg * Wayne W. Welch *
1987	Robert D. Sherwood
1988	Barry J. Fraser Kenneth G. Tobin

Year	Awardee
1989	James J. Gallagher Armando Contreras
1990	Patricia L. Hauslein Ronald G. Good Catherine Cummins
1991	Nancy R. Romance Michael Vitale
1992	Patricia Heller Ronald Keith Scott Anderson
1993	Wolff-Michael Roth
1994	Wolff-Michael Roth Michael Bowen
1995	Wolff-Michael Roth
1996	Nancy J. Allen
1997	NO AWARD
1998	Wolff-Michael Roth Reinders Duit Michael Komorek Jens Wilbers
1999	Lynn A. Bryan
2000	Joseph L. Hoffman Joseph S. Krajcik
2001	Allan G. Harrison
2002	Carolyn Wallace Keys Eun-Mi Yang Brian Hand Liesl Hohenshell

Year	Awardee
2003	Wolff-Michael Roth
2004	Joanne K. Olson * Sharon J. Lynch * Joel Kuipers Curtis Pyke Michael Szesze
2005	Chi-Yan Tsui David Treagust
2006	Leema Kuhn Brian Reiser
2007	Eugene L. Chiappetta Tirupalavanam G. Ganesh Young H. Lee Marianne C. Phillips
2008	Guy Ashkenazi Lana Tockus-Rappoport
2009	Jrene Rahm
2010	Mark W. Winslow John R. Staver Lawrence C. Sharmann
2011	Matthew Kloser
2012	Shelly R. Rodriguez Julie Gess-Newsome
2013	Edward G. Lyon
2014	Ying-Chih Chen Soonhye Park Brian Hand
2015	Lori M. Ihrig Michael P. Clough Joanne K. Olson

\* Multiple Awardees

## General Information

### Outstanding Master's 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	Advisor
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

### 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.

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

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# General Information

## NARST Leadership and Committees

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### Elections Committee:

#### Immediate Past President *(Ex Officio)*

(21) **Tali Tal**, Technion, Israel Institute of Technology

#### Board Liaison

(21) **Alejandro Gallard**, Georgia Southern University

#### Representative from Ethics and Equity Committee

(21) **Justina Ogodo**, Baylor University

#### Representative from the International Committee

(21) **Jing Lin**, Beijing Normal University

#### Committee Leadership

(21) **Regina Suriel**, Chair, Valdosta State University

(22) **Bridget Mulvey**, Co-Chair, Kent State University

#### Members

(21) **Ibrahim Delen**, USAK University

(22) **Mary Atwater**, University of Georgia

(22) **Jeanna R. Wieselmann** *(graduate student)*  
University of Minnesota

(23) **Melody Russell**, Auburn University

(23) **Nazan U. Bautista**, Miami University

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### Equity and Ethics Committee:

#### Board Liaison

(22) **Bhaskar Upadhyay**, University of Minnesota

#### Committee Leadership

(21) **Danielle Dani**, Chair, Ohio University

(22) **Justina Ogodo**, Co-Chair, Baylor University

#### Members

(21) **Sara Raven**, Texas A&M University

(21) **James Nyachwaya**, North Dakota State University

(21) **Tara Monique Nkrumah**, Arizona State University

(22) **Seema Rivera**, Clarkson University

(22) **April Holton**, Arizona State University

(22) **María González-Howard**, The University of  
Texas at Austin

(23) **Paulette Vincent-Ruz**, University of Michigan

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### External Policy and Relations Committee:

#### Board Liaison

(21) **Senay Purzer**, Purdue University

#### Ex Officio Members

(22) **Eileen Carlton Parsons**, President, University  
of North Carolina at Chapel Hill

(22) **Helen Schneider Lemay**, Executive Director

#### Committee Leadership

(22) **Remy Dou**, Chair, Florida International University

(23) **Deb Morrison**, Co-Chair, University of Washington

#### Members

(21) **Sarah Carrier**, North Carolina State University

(21) **Stefanie Marshall**, University of Minnesota,  
Twin Cities

(22) **Eugene Judson**, Arizona State University

(23) **Dürdane Bayram-Jacobs**, Eindhoven University  
of Technology

(23) **Henriette Burns**, Southern Illinois University  
Edwardsville

(23) **Peter Okebukola**, Lagos State University, Nigeria

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### Graduate Student Committee:

#### Ex Officio Member

(22) **René Schwartz**, President-Elect  
Georgia State University

#### Committee Leadership

(21) **Christa Haverly**, Chair & Graduate Student  
Coordinator, Northwestern University

(21) **Theila Smith**, Co-Chair, University of Groningen

(22) **Jordan Henley**, Co-Chair, University of Georgia

#### Members

(21) **Kathryn Green**, University of Georgia

(21) **Harini Krishnan**, Florida State University

(21) **Preethi Titu**, Kennesaw State University

(21) **Melanie Kinskey**, Sam Houston State University

(21) **Star Sharp**, Pennsylvania State University

(22) **Henry Hane**, Indiana University, Purdue  
University Indianapolis

(22) **Tim Klavon**, Temple University



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## General Information

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### Awards Committee:

#### Board Liaison

(22) **Noemi Waight**, University of Buffalo

#### Outstanding Doctoral Research Award

##### Committee Leadership

(21) **Jay Fogleman**, Chair, University of Rhode Island  
(22) **Dana Vedder Weiss**, Co-Chair, Ben Gurion University

##### Members

(21) **Patricia Bills**, Northern Kentucky University  
(21) **Eunjin Bahng**, Iowa State University  
(21) **Ellen Granger**, Florida State University  
(21) **Danielle Ferguson**, American Institute for Research  
(21) **Devasmita Chakraverty**, Washington State University  
(22) **Lisa Borgerding**, Kent State University  
(22) **Jamie Mikeska**, Educational Testing Service

#### Early Career Research Award

##### Committee Leadership

(21) **Erin Furtak**, Chair, University of Colorado, Boulder  
(22) **Kate McNeill** Co-Chair), Boston College

##### Members

(22) **Amelia Gotwals**, Michigan State University  
(22) **Anna Danielsson**, Uppsala University  
(22) **Judy Dori**, Technion-Israel Institute of Technology  
(22) **James Minogue**, North Carolina State University  
(23) **Matthew Weinstein**, University of Washington, Tacoma  
(23) **Jomo Mutegi**, Indiana University, Purdue University Indianapolis  
(23) **Femi Otulaja**, University of the Witwatersrand  
(23) **Anton Puvirajah**, University of Western Ontario  
(23) **Hsin-Kai Wu**, National Taiwan Normal University

#### Distinguished Contributions to Science Education through Research Award

##### Committee Leadership

(21) **Maria Varelas**, Chair, University of Illinois Chicago  
(22) **Marissa Rollnick**, Co-Chair, University of the Witwatersrand, South Africa

##### Members

(21) **Julie Luft**, University of Georgia  
(21) **Nasser Mansour**, University of Exeter  
(21) **Rachel Mamlok-Naaman**, Weizmann Institute of Science  
(21) **Sibel Erduran**, Oxford University  
(22) **John Falk**, Institute for Learning Innovation  
(22) **Okhee Lee**, New York University  
(23) **Malcolm Butler**, University of Central Florida

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### International Committee:

#### Committee Leadership

(22) **Sonya Martin**, Chair & International Coordinator  
Seoul National University  
(22) **Sara Wilmes**, Co-Chair, University of Luxemburg

#### Members

(21) **Peter Wulff**, University of Potsdam  
(21) **Jing Lin**, Beijing Normal University  
(22) **Mathias Ropohl**, University of Duisburg-Essen  
(23) **Allison Gonsalves**, McGill University  
(23) **Gavin Fulmer**, University of Iowa  
(23) **Sheron Mark**, University of Louisville  
(23) **Renata de Paula Orofino**, Federal University of ABC

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### Membership Committee:

#### Board Liaison

(23) **Brooke Whitworth**, Clemson University

#### Committee Leadership

(21) **Selina Bartels**, Chair, Valparaiso University  
(22) **ReAnna S. Roby**, Co-Chair, Vanderbilt University

#### Members

(21) **Alison Riley Miller**, Bowdoin College  
(21) **Felicia Moore Mensah**, Teachers College, Columbia University  
(22) **Shirly Avargil**, Technion-Israel Institute of Technology  
(22) **Mark Newton**, East Carolina University  
(22) **Sule Aksoy** (*graduate student*), Syracuse University  
(23) **K.C. Busch**, North Carolina State University  
(23) **Elizabeth de los Santos**, University of Nevada, Reno

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### Program Committee:

**Eileen Carlton Parsons**, Chair, University of North Carolina at Chapel Hill  
**Reneé Schwartz**, Co-Chair, Georgia State University

#### Ex Officio Member

**Helen Schneider Lemay**

#### Members

(21) **Sarah J. Fick**, Washington State University  
(21) **Julia Plummer**, Pennsylvania State University  
(21) **Ryan Nixon**, Brigham Young University  
(21) **Neta Shaby**, Oregon State University  
(21) **Lisa Kenyon**, Wright State University  
(21) **Anton Puvirajah**, University of Western Ontario  
(21) **Michelle Fleming**, Wright State University  
(21) **Nidaa Makki**, The University of Akron

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## General Information

- (21) **Elon Langbeheim**, Ben-Gurion University
- (21) **Cesar Delgado**, North Carolina State University
- (21) **Denise M. Bressler**, East Carolina University
- (21) **Alexandria Hansen**, Fresno State University
- (21) **Idit Adler**, Tel Aviv University
- (21) **Carrie Allen**, University of North Texas
- (22) **Bahadir Namdar**, Recep Tayyip Erdogan University
- (22) **Edna Tan**, University of North Carolina at Greensboro
- (22) **Ornit Spektor-Levy**, Bar Ilan University
- (22) **Shannon Navy**, Kent State University
- (22) **Anne Leak**, High Point University
- (22) **Takumi Sato**, Virginia Tech
- (22) **Donna Governor**, University of North Georgia
- (22) **Ke Li**, University of North Carolina at Chapel Hill
- (22) **Terrell Morton**, University of Missouri
- (22) **Leigh Ann Haefner**, Penn State Altoona
- (22) **Alison Cullinane**, University of Oxford
- (22) **Beth Covitt**, University of Montana
- (22) **Mercy Ogunsola-Bandele**, National Open University of Nigeria

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### Publications Advisory Committee:

#### Board Liaison

- (23) **Knut Neumann**, Leibniz Institute for Science and Mathematics Education

#### Ex Officio Members

- (20) **Cynthia Crockett**, NSTA Research Division Director, Harvard University
- (22) **Eileen Carlton Parsons**, President, University of North Carolina at Chapel Hill
- (25) **Troy Sadler**, *JRST* Editor, University of North Carolina at Chapel Hill
- (25) **Felicia Moore Mensah**, *JRST* Editor, Teachers College, Columbia University
- Helen Schneider Lemay**, Executive Director

#### Committee Leadership

- (21) **Deena Gould**, Co-Chair, University of New Mexico
- (23) **Shakhnoza Kayumova**, Co-Chair, University of Massachusetts, Dartmouth

#### Members

- (21) **Heidi Carlone**, Co-Chair, University of North Carolina, Greensboro
- (21) **Amanda (Mandi) Berry**, Monash University
- (21) **Jeanne Brunner**, University of Massachusetts, Amherst
- (22) **Allison Antink-Meyer**, Illinois State University
- (22) **Kyungjin Cho**, Pennsylvania State University

- (22) **Shuly Kapon**, Technion, Israel Institute of Technology
- (22) **Ibrahim Yeter**, Purdue University
- (23) **Tina Cheuk**, Stanford University
- (23) **Dante Cisterna**, Education Testing Service

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### Research Committee:

#### Board Liaison

- (21) **Jennifer D. Adams**, University of Calgary

#### NARST Liaison to NSTA

- (21) **Michael Bowen**, Mount Saint Vincent University

#### Committee Leadership

- (21) **Tina Vo**, Chair, University of Nevada, Las Vegas
- (22) **Asli Sezen-Barrie**, Co-Chair, University of Maine

#### Members

- (21) **Abdi Warfa**, University of Minnesota
- (21) **Carina Rebello**, Purdue University
- (21) **Banu Avsar Erumit**, Recep Tayyip Erdogan University
- (21) **Patricia Patrick**, Columbus State University
- (21) **Kelsey Lipsitz**, University of Missouri, Exploratorium
- (22) **Li Ke**, University of North Carolina at Chapel Hill
- (22) **Ling L. Liang**, La Salle University
- (22) **Yann Shiou Ong**, National Institute of Education, Nanyang Technological University
- (22) **Marcus Kubsch**, Kiel University
- (22) **S. Selcen Guzey**, Purdue University
- (23) **Rouhollah Aghasaleh**, Georgia State University
- (23) **Lori Andersen**, University of Kansas
- (23) **Narendra Deshmukh**, Tata Institution of Fundamental Research

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### Website Committee:

#### Board Liaison

- (23) **Christina Schwarz**, Michigan State University

#### Committee Leadership

- (21) **Katherine Wade-James**, Chair, University of Memphis
- (22) **Lisa Lundgren**, Co-Chair, Utah State University

#### Members

- (22) **Minjung Ryu**, Purdue University
- (22) **Nazihan Ursavas**, Erdogan University
- (23) **Sharona T. Levy**, University of Haifa
- (23) **Jaclyn Murray**, Augusta University
- (23) **Len Annetta**, East Carolina University

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## General Information

### **NARST Sessions at NSTA Engage '21**

In lieu of the cancelled face-to-face conferences in Fall '20 and Spring '21 NSTA is having a virtual conference this year. NSTA Engage '21 (<https://www.nsta.org/engage-spring-21>) is being offered over 4 weeks in April/May in evening sessions (4pm to 8pm EST) with presentations for different grade levels in each week.



## Future Meeting Dates for NARST, NSTA, and AERA

### 2021

NSTA	TBD	
AERA	April 8-12	Virtual

### 2022

NARST	March 27-30	Vancouver, BC
NSTA	March 31-April 3	Houston, TX

### A Special Thanks to our Sponsors and Exhibitors

- ▶ Springer Nature
- ▶ Association of American Colleges and Universities
- ▶ Science Friday
- ▶ Constructivist Press

We acknowledge **Wiley** and their work as publisher of the *Journal of Research in Science Teaching (JRST)*.





95th NARST International Conference  
March 27–30, 2022

# UNITY & INCLUSION for Global Scientific Literacy

INVITE as a community. UNITE as a community.



Vancouver, British Columbia, JW Marriott Parq

For a sneak peek at what Vancouver has to offer, visit:

<https://www.tripsavvy.com/what-is-vancouver-famous-for-4049389>



# NARST 94<sup>TH</sup> ANNUAL INTERNATIONAL CONFERENCE

## Schedule at-a-Glance

**Please note that this program is subject to change.**

Check the addendum posted at the meeting and on the website for updates after the program has been published.



## Schedule at-a-Glance

To help you determine your time, here is a tool to help:

<https://www.timeanddate.com/worldclock/converter-classic.htm>

Wednesday, March 31		
Time (EDT)	Conference Event	Session
9:30 am - 11:30 am	<b>NARST Board Meeting</b>	<i>Real-Time/Live</i>
1:30 pm - 3:30 pm	<b>NARST Board Meeting</b>	<i>Real-Time/Live</i>
6:00 pm - 8:00 pm	<b>NASRT Board Meeting</b>	<i>Real-Time/Live</i>

Thursday, April 1		
9:30 am - 11:30 am	<b>NARST Board Meeting</b>	<i>Real-Time/Live</i>
1:30 pm - 3:30 pm	<b>NARST Board Meeting</b>	<i>Real-Time/Live</i>

Monday, April 5		
8:00 am - 12:00 pm	<b>Pre-Conference Workshop 1</b>	<i>Real-Time/Live</i>
	Rethinking How You Understand Your Data with R	
	<b>Pre-Conference Workshop 2</b>	
	Early Career Faculty Forum	
12:30 pm - 3:30 pm	<b>Pre-Conference Workshop 3</b>	<i>Real-Time/Live</i>
	Integrating Computational Thinking (CT) into Elementary Science Online and Face-to-Face: How to Run a Successful PD for Pre-service and In-service Teachers with a Proven Framework, Tech Tools, and Strategies	
12:30 pm - 4:30 pm	<b>Pre-Conference Workshop 4</b>	<i>Real-Time/Live</i>
	Science Education, a Public Good for The Good of the Public: Indigenous Science Education and Research as Place-Based Knowledge in the Pandemics Era of COVID-19	

Tuesday, April 6		
8:00 am - 12:00 pm	<b>Pre-Conference Workshop 5</b>	<i>Real-Time/Live</i>
	Pushing the Boundaries: Exploring the Potential of an Online Practice Suite to Support Elementary Science Teachers in Learning How to Engage Students in Argumentation	
	<b>Pre-Conference Workshop 6</b>	
	LARIG Pre-conference Workshop: Empowering Latinx Graduate Students, Early Career Educators and Scholars in Science Education ( <i>Multilingual Workshop</i> )	
12:30 pm - 4:00 pm	<b>Pre-Conference Workshop 7</b>	<i>Real-Time/Live</i>
	Equity and Ethics Pre-Conference Workshop	

## Schedule at-a-Glance

Wednesday, April 7		
Time (EDT)	Conference Event	Session
9:15 am - 11:30 am	<b>Welcome, Plenary Speaker, &amp; Awards Citations</b>	Real-Time/Live
11:30 am - 12:30 pm	Lunch Break	
11:30 am - 1:30 pm	<b>Networking/Social Concurrent Sessions</b>  <b>Participate in the "Round Robin"</b> Meet the leadership and find out more about three of the following: <ul style="list-style-type: none"> <li>- Awards Committee</li> <li>- Elections Committee</li> <li>- External Policy and Relations Committee</li> <li>- Program Committee</li> <li>- Research Committee</li> <li>- Website Committee</li> </ul> <i>Please visit committees in 15-minute segments from 11:30 am - 12:15 pm.</i> <i>Please join the business meeting of a committee from 12:30 pm - 1:30 pm.</i>	Real-Time/Live
11:30 am - 11:45 am	<b>Drop-In Committee Visit #1</b>	Real-Time/Live
11:45 am - 12:00 pm	<b>Drop-In Committee Visit #2</b>	Real-Time/Live
12:00 pm - 12:15 pm	<b>Drop-In Committee Visit #3</b>	Real-Time/Live
12:30 pm - 1:30 pm	<b>Business Meetings of Committees</b> (listed above) (Except for Elections Committee, scheduled on Friday, April 9th from 8:30 am - 9:30 am)	Real-Time/Live
12:30 pm - 1:30 pm	<b>Continental and Diasporic Africa in Science Education</b>  <b>Contemporary Methods for Science Education Research</b>	Real-Time/Live
1:45 pm - 3:15 pm	<b>Concurrent Session #1</b>	Real-Time/Live
3:30 pm - 5:00 pm	<b>Graduate Student Forum</b>	Real-Time/Live
5:00 pm - 6:00 pm	<b>Mentor-Mentee Session</b>	Real-Time/Live
6:00 pm - 8:00 pm	<b>Networking/Social Concurrent Sessions</b>  <b>Participate in the "Round Robin"</b> Meet the leadership and find out more about three of the following: <ul style="list-style-type: none"> <li>- Equity and Ethics Committee</li> <li>- Membership Committee</li> <li>- Publications Advisory Committee</li> <li>- Graduate Student Committee</li> <li>- International Committee</li> </ul> <i>Please visit committees in 15-minute segments from 6:00 pm - 6:45 pm.</i> <i>Please join the business meeting of a committee from 7:00 pm - 8:00 pm.</i>	Real-Time/Live
6:00 pm - 6:15 pm	<b>Drop-In Visit #1</b>	
6:15 pm - 6:30 pm	<b>Drop-In Visit #2</b>	
6:30 pm - 6:45 pm	<b>Drop-In Visit #3</b>	
7:00 pm - 8:00 pm	<b>Business Meetings of the Committees</b> (listed above)	



## Schedule at-a-Glance

Thursday, April 8 - Saturday, April 10		
Time (EDT)	Conference Event	Session
THURS 8:00 am - FRI 7:00 am	<b>Poster Session #1</b>	23-hour window
	Poster Viewing & Asynchronous Chat	
FRI 8:00 am - SAT 1:00 pm	<b>Author-Scheduled 30-minute Q&amp;A Session</b> (All Strands)	29-hour window
	Advance Viewing of Pre-recorded Presentation	

Thursday, April 8		
8:00 am - 9:30 am	<b>Concurrent Session #2</b>	Real-Time/Live
9:45 am - 11:15 am	<b>Concurrent Session #3</b>	Real-Time/Live
11:30 am - 1:00 pm	<b>Concurrent Session #4</b>	Real-Time/Live
1:00 pm - 2:00 pm	Lunch Break	
2:00 pm - 3:00 pm	<b>Concurrent Session #5</b>	Real-Time/Live
	Advanced Viewing of Pre-recorded Sessions, Q&A	
3:15 pm - 4:15 pm	<b>Latino/a Research Interest Group</b>	Real-Time/Live
3:30 pm - 5:30 pm	<b>Networking/Social Concurrent Sessions</b>	Real-Time/Live
	Aikido-(and Physics!) Inspired Breathing, Balance, Stretching, and Movement (duration: 30 min)	
	The CADASE Social: Intriguing Scenes from Movies and TV Shows (duration: 45 min)	
	CADASE Graduate Student Fireside Chat: Navigating Academe with Success (duration: 60 min)	
	Knitting Circle (duration: 60 min) All Levels Welcome	
	Learning Science in the Schoolyard-Centering Equity (duration: 60 min)	
	Let's Escape Together! (duration: 60 min)	
	NARST Fellows Award Program (duration: 45 min)	
	NARST Has Talent: An April FARSE (duration: 45 min)	
	NSF Funding Programs and More (duration: 120 min)	
"PeTagogy": Meeting pets of NARST members (duration: 30 min)		
4:15 pm - 5:45 pm	<b>Publishing, Reviewing, and Writing for JRST</b>	Real-Time/Live

## Schedule at-a-Glance

Thursday, April 8 - Saturday, April 10		
Time (EDT)	Conference Event	Session
THURS 8:00 am - FRI 7:00 am	<b>Poster Session #2</b>	23-hour window
	Poster Viewing & Asynchronous Chat	
FRI 8:00 am - SAT 1:00 pm	<b>Author-Scheduled 30-minute Q&amp;A Session</b> (All Strands)	29-hour window
	Advance Viewing of Pre-recorded Presentation	

Friday, April 9		
8:30 am - 9:30 am	<b>Engineering Education Research Interest Group</b>	Real-Time/Live
	Indigenous Science Knowledge Research Interest Group	
8:30 am - 9:30 am	<b>Elections Committee Business Meeting</b>	Real-Time/Live
8:30 am - 9:30 am	<b>Networking/Social Concurrent Sessions</b>	Real-Time/Live
	Art-based Social Meet-Up (duration: 30 min)	
	Drop Your Research/Theory/Test Tube Like it's Hot (duration: 60 min)	
9:30 am - 10:30 am	<b>Concurrent Session #6</b>	Real-Time/Live
	Advanced Viewing of Pre-recorded Sessions, Q&A	
10:45 am - 11:45 am	<b>Concurrent Session #7</b>	Real-Time/Live
	Advanced Viewing of Pre-recorded Sessions, Q&A	
12:00 pm - 1:00 pm	Lunch Break	
12:00 pm - 1:00 pm	<b>NARST Annual Membership Meeting</b>	Real-Time/Live
1:15 pm - 2:45 pm	<b>Concurrent Session #8</b>	Real-Time/Live
3:15 pm - 5:30 pm	<b>Networking/Social Concurrent Sessions</b>	Real-Time/Live
	Among Us Scholars (duration: 60 min)	
	Enjoying or Enduring the Process of Tenure during the COVID-19 Pandemic (duration: 60 min)	
	Informal Music Sharing/Jamming Networking (duration: 60 min)	
	Mindfulness Practices for Stress Relief and Self Care in the Time of COVID (duration: 90 mins)	

## Schedule at-a-Glance

### Thursday, April 8 - Saturday, April 10

Time (EDT)	Conference Event	Session
THURS 8:00 am - SAT 1:00 pm	<b>Author-Scheduled 30-minute Q&amp;A Session (All Strands)</b>	Real-Time/Live
	<i>Advance viewing of pre-recorded presentation, author schedule, 30-minute Q&amp;A</i>	

### Saturday, April 10

8:00 am - 9:30 am	<b>Concurrent Session #9</b>	Real-Time/Live
9:45 am - 10:45 am	<b>Concurrent Session #10</b>	Real-Time/Live
	<i>Advanced viewing of pre-recorded sessions, Q&amp;A</i>	
11:00 am - 12:00 pm	<b>Concurrent Session #11</b>	Real-Time/Live
	<i>Advanced viewing of pre-recorded sessions, Q&amp;A</i>	
12:15 pm - 1:00 pm	<b>President Closing Remarks &amp; 2022 Conference</b>	Real-Time/Live
4:00 pm - 10:00 pm	<b>NARST Board Meeting</b>	Real-Time/Live

### Overview

Event	Description
<b>Pre-Conference Workshops</b>	Interactive working group sessions before the official Conference
<b>Graduate Student Forum</b>	Synchronous opportunity for graduate students to interact and learn
<b>Mentor-Mentee Session</b>	Synchronous opportunity for first attendees to conference and early-career individuals to interact with more seasoned NARST members
<b>Poster Sessions</b>	Traditional poster display activated for a 23-hour window with asynchronous interaction by way of chat during the 23 hours
<b>Author-Scheduled Presentations</b> <i>(All Strands)</i>	These slots are scheduled by necessity. Authors pre-record and upload presentations prior to conference and schedule a 30-minute Q&A (analogous to "office hours") with author-designated time and appropriate link posted in the conference program. Participants view the pre-recorded presentation in advance of the "office hours."
<b>Networking/Social Concurrent Sessions</b>	Synchronous opportunities to interact with participants around a theme/topic/activity.
<b>Concurrent Sessions</b>	<i>Two session types:</i> <ul style="list-style-type: none"> <li>- Synchronous sessions in which multiple papers are presented and discussed.</li> <li>- Presentations are pre-recorded and viewed in advance by attendees with only a synopsis and Q&amp;A conducted in real-time.</li> </ul>



# NARST 94<sup>TH</sup> ANNUAL INTERNATIONAL CONFERENCE

## Program

**Please note that this program is subject to change.**

Check the addendum posted at the meeting and on the website for updates after the program has been published.



## Program

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### Welcome, Plenary Speaker, & Awards Citations

9:15 am - 11:30 am | *Real-Time/Live*

#### 2021 Conference Welcome

Eileen Carlton Parsons, NARST President

#### Plenary

##### Beyond Buzzwords: Reimagining the Default Settings of Science and Society

Keynote Presenter:

**Ruha Benjamin**, Princeton University

Presenter Introduction:

**David Stroupe**, Michigan State University

Presiders:

**Terrell Morton**, University of Missouri

**Beth Covitt**, University of Montana

**Alison Cullinane**, University of Oxford

Plenary Abstract:

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

#### Award 2020 & 2021 DCRA Citations

Presider:

**Noemi Waight**, University of Buffalo

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### Networking/Social Sessions

11:30 am - 1:30 pm | *Real-Time/Live*

#### Participate in the "Round Robin"

Please visit committees in 15-minute segments from 11:30 am - 12:15 pm

Meet the leadership and find out more about any three of the following:

- Awards Committee
- Elections Committee
- External Policy and Relations Committee
- Program Committee
- Research Committee
- Website Committee

**Drop-In Visit #1: 11:30 am - 11:45 am**

**Drop-In Visit #2: 11:45 am - 12:00 pm**

**Drop-In Visit #3: 12:00 pm - 12:15 pm**

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

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### Lunch Break *(on your own)*

11:30 am - 12:30 pm

---

## Program

### Research Interest Groups (RIGs) Meetings

#### Continental and Diasporic Africa in Science Education (CADASE)

12:30 pm - 1:30 pm | *Real-Time/Live*

Presiders:

**Mary Atwater**, University of Georgia

**Rona Robinson-Hill**, Ball State University

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

#### Contemporary Methods for Science Education Research

12:30 pm - 1:30 pm | *Real-Time/Live*

Presiders:

**Robert Talbot**, University of Colorado Denver

**Joe Taylor**, University of Colorado Colorado Springs

At the 2021 Business Meeting, the RIG members will discuss current and future projects and identify folks interested in participating in these projects. We will also discuss RIG leadership positions in preparation for the upcoming election.

### CONCURRENT SESSION #1

1:45 pm - 3:15 pm | *Real-Time/Live*

### Administrative Sponsored Session

#### Strand 11:

#### Cultural, Social, and Gender Issues

#### *Engaging Science Education Research and Praxis for the Good of the "Public" Amid Global Pandemics*

1:45 pm - 3:15 pm | *Real-Time/Live*

Presenters:

**Bryan Brown**, Stanford University

**Angela Calabrese-Barton**, University of Michigan

**Natalie King**, Georgia State University

**Okhee Lee**, New York University

**Jomo Muteji**, Indiana University, IUPUI

**Vanessa Grady**, Georgia State University

**Laura Peña**, Georgia State University

**Elizabeth Davis**, University of Michigan

**Day Greenberg**, Michigan State University

### Administrative Sponsored Session Graduate Student Committee

#### *Graduate Student Research Symposium*

1:45 pm - 3:15 pm | *Real-Time/Live/Posters*

Presiders:

**Christa Haverly**, Northwestern University

**Kathryn Green**, University of Georgia

**Melanie Kinskey**, Sam Houston State University

**Theila Smith**, University of Groningen

**Timothy Klavon**, Temple University

**Lindsay Lightner**, Washington State University

**Jessica Karch**, University of Massachusetts, Boston

**Chelsea Sexton**, University of Georgia

**Klaudja Causi**, University of Massachusetts, Boston

**Ayca Fackler**, University of Georgia

## Program

**Effects of Preservice Biology Teachers' Conceptions of Purpose on Engagement of Learners' Funds of Knowledge**

**Matthew Shackley**, University of California, Santa Barbara

**Engaging in Sensemaking for Equity: STEM Teacher Professional Development in Core Practices**

**Karen Woodruff**, Montclair State University

**Investigating Perceptions, Experiences, and Collectivism within Interdisciplinary Collaborations: A National Survey**

**Katie McCance**, North Carolina State University

**The Girl Boat: Shifting Marginalized Mexican Students' Identities, Participation, and Agency through Community Conservation**

**Kelsie Fowler**, University of Washington

**Opportunities for Sense-making in Science for Students with Learning Disabilities/Difficulties: A Mixed Methods Study**

**Rachel Juergensen**, University of Missouri, Columbia

**Towards a Conceptual Profile of Chemical Control**

**Klaudja Caushi**, University of Massachusetts, Boston

**Biology Methods: A Course in Need of a Catalogue**

**Cole Entress**, Columbia University

**A Portrait of Identity and Context: Manifestation of Postsecondary STEM Teaching**

**Sule Aksoy**, Syracuse University

**Going Virtual: Underrepresented Student Experiences in a Virtual Computing Camp**

**Kristina Kramarczuk**, University of Maryland, College Park

**Intersectionality of Black Male College Students: Their Science Identity, Science Learning, and Science Profession Decisions**

**Regina McCurdy**, University of Central Florida

**An Investigation of Undergraduate Students' Spatial Thinking about Groundwater**

**Holly White**, University of Nebraska, Lincoln

**Tracking Elementary Pre-service Teachers' Teaching Efficacy and Attitudes Towards Stem After Engagement with Nanotechnology Basics**

**Martyna Laszcz**, University of Massachusetts, Boston

**Elementary Teachers' Verbal Support of Disciplinary Integration in an NGSS-Aligned Unit**

**Sarah Lilly**, University of Virginia

**Exploring Epistemic Practices of Middle School Students in Collaborative Contexts**

**Ramya Sivaraj**, University of Minnesota

**Informal Education Outreach to Combat Deficit SciComm Training in University STEM Students**

**Brenda Guerrero**, Florida International University

**How Do Young Children Learn Science through Narrative, Embodiment, and Play?**

**Kyungjin Cho**, Pennsylvania State University

**An Exploration of Urban Latinx Youth Growth Mindsets in a Middle School Science Classroom**

**Mark Waka**, University of Buffalo

**What are the Sources of Teaching Self-efficacy for International Graduate Students? A Survey Study**

**Zhigang Jia**, Middle Tennessee State University

## Program

### **Administrative Sponsored Session Indigenous Science Knowledge Research Interest Group**

*Science Education, a Public Good for  
the Good of the Public? Contributing  
Indigenous Methodologies to Teaching,  
Learning and Research*

1:45 pm - 3:15 pm | *Real-Time/Live*

Presenters:

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

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

*Ethics and Decision-making in  
Science Education*

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Amy Farris**, Pennsylvania State University

**Developing and Using Multiple Models to  
Promote Scientific Literacy**

**Li Ke**, University of North Carolina at Chapel Hill

**Troy Sadler**, University of North Carolina at  
Chapel Hill

**Laura Zangori**, University of Missouri, Columbia

**Patricia Friedrichsen**, University of Missouri,  
Columbia

**Consideration of Participatory Ethics when Eliciting  
Etic and Emic Perspectives of Learning**

**Sarah Frodsham**, Oxford Brookes University

**Deb McGregor**, Oxford Brookes University

**Defining Skills Required in the Decision-Making  
Process around Socioscientific Issues**

**Caitlin Kirby**, University of Nebraska, Lincoln

**Amanda Sorensen**, Michigan State University

**Jenny Dauer**, University of Nebraska, Lincoln

### **Strand 2:**

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

*Contexts, Characteristics, and Interactions  
in Science Education*

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Susanna Hapgood**, University of Toledo

**Sounds of Science Sensemaking: Interrogating  
the Norms of Learning Spaces with Acoustemology  
and Critical Frames**

**Michelle Brown**, Pennsylvania State University

**Frances Nebus Bose**, Pennsylvania State University

**Carla Zembal-Saul**, Pennsylvania State University

**The Influence of Teacher Questioning Approaches  
on Students' Productive Thinking**

**Anne Emerson Leak**, High Point University

**Corrie Bruce**, High Point University

**Selcen Guzey**, Purdue University

**Defining the Future and Standing Apart:  
Opportunity Structures at an Urban, Inclusive  
STEM-Focused High School**

**Jennifer Tripp**, University of Buffalo

**Noemi Waight**, University of Buffalo

**What's the Point?: Student Perspectives  
on Computation in Physics Class**

**Paul Hamerski**, Michigan State University

**Daryl McPadden**, Michigan State University

**Marcos Caballero**, Michigan State University

**Paul Irving**, Michigan State University



## Program

### Strand 3:

#### Science Teaching—Primary School

(Grades preK-6)

#### Related Paper Set

##### *Engaging Young Children in Science and Engineering Practices: A Conversation about Approaches to Research and Design*

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Eve Manz**, Boston University

##### *Dance-STEP: Collective Embodied Science Models and the Particulate Nature of Matter*

**Chris Georgen**, Boston University

##### *Using Iterative Co-design to Develop Classroom Empirical Activity*

**Eve Manz**, Boston University

**Betsy Beckert**, Boston University

##### *Kindergarten Playground Collisions: Reconceptualizing Gravity as a Necessary Intellectual Resource*

**Michelle Salgado**, University of Washington

**David Phelps**, University of Washington

##### *Considerations when Engaging Young Learners in Scientific Modeling for Sense-Making*

**Christina Schwarz**, Michigan State University

**Eve Manz**, Boston University

### Strand 4:

#### Science Teaching—Middle and High School

(Grades 5-12)

##### *Curricular Sensemaking and Implementation*

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Magdeline Stephen**, University of Witwatersrand

##### *Changing Teacher Practice at Scale through Instructional Routines: Findings from a Field Test of High School Materials*

**Kiran Purohit**, New Visions for Public Schools

**Elizabeth Chatham**, New Visions for Public Schools

##### *Teacher Planning for Epistemic Agency in Discussion-Based, Storyline Unit Lessons*

**Kevin Cherbow**, Boston College

**Katherine McNeill**, Boston College

##### *Secondary Science Teachers Implementation of a Curricular Intervention when Teaching with Global Climate Models*

**Kimberly Carroll Steward**, University of Nebraska, Lincoln

**Devarati Bhattacharya**, University of Nebraska, Lincoln

**Cory Forbes**, University of Nebraska, Lincoln

**Mark Chandler**, Columbia University

##### *3D Alignment between Curriculum and Assessments Matters: Results from a New Genetics Curriculum Field Test*

**Ann Lambert**, University of Utah

**Dina Drits-Esser**, University of Utah

**Sheila Homburger**, University of Utah

**Kristin Fenker**, University of Utah

**Molly Malone**, University of Utah

**Louisa Stark**, University of Utah

### Strand 5:

#### College Science Teaching and Learning

(Grades 13-20)

##### *Intersection of Sociocultural Factors and College STEM*

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Andy Cavagnetto**, Washington State University

##### *BioTAP: Barriers and Supports to Conducting Science Education Research on Graduate Student Teaching Development Practices*

**Grant Gardner**, Middle Tennessee State University

**Judith Ridgway**, Ohio State University

**Gili Marbach-Ad**, University of Maryland

**Kristen Miller**, University of Georgia

**Elisabeth Schussler**, University of Tennessee, Knoxville

## Program

### Facilitating First-Generation College Student Persistence in STEM Majors

Lisa Marco-Bujosa, Villanova University  
Lauren Baker, Villanova University

### Using Cultural-Historical Activity Theory to Understand an Interdisciplinary Team's Co-Development of High School Lab Activities

Katherine McCance, North Carolina State University  
Stephanie Teeter, North Carolina State University  
Margaret Blanchard, North Carolina State University  
Richard Vanditti, North Carolina State University

### Productive Patterns of Overcoming Struggle during Undergraduate Chemistry Laboratory Activities

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

### Strand 6:

#### Science Learning in Informal Contexts

##### Youth Centered Informal Science

1:45 pm - 3:15 pm | *Real-Time/Live*

##### A Mixed Methods Study of Youths' STEM Interests in an After-School Club

Deena Gould, University of New Mexico  
Ian Gould, Arizona State University

##### Adding Narrative Elements to Engineering Activities Evokes Empathy and Supports Girls' Use of Engineering Practices

Susan Letourneau, New York Hall of Science  
Dorothy Bennett, New York Hall of Science  
Chang Chia Liu, New York Hall of Science  
Yessenia Argudo, New York Hall of Science  
Dana Schloss, New York Hall of Science  
Amelia Merker, New York Hall of Science  
Satbir Multani, New York Hall of Science  
Katherine Culp, New York Hall of Science

### Hearing the Engineering in Children's Talk

Ron Skinner, MOXI, The Wolf Museum of Exploration and Innovation

Danielle Harlow, University of California at Santa Barbara

Alexandria Muller, University of California at Santa Barbara

### Strand 7:

#### Pre-service Science Teacher Education

##### Equity-Driven Approaches Among Pre-service Teachers

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

Scott Cohen, Georgia State University

##### Examining Relevance in Pre-service Science Teacher Lesson Plans

Kirby Whittington, Gooru.Org

Sherry Southerland, Florida State University

Miray Tekkumru Kisa, Florida State University

##### Pre-service Science Teachers' Development of Equitable and Just Approaches to Practice in University Methods Coursework

Rachel Gordon, University of Michigan

##### 'Staying with the Trouble': Praxis Crisis in Science Teacher Education for Emergent Bilingual Learners

Sara Tolbert, Te Whare Wananga o Waitaha University of Canterbury

Caroline Spurgin, University of California- Santa Cruz

Doris Ash, University of California- Santa Cruz

##### "Others Have it, Why Can't They?" Leveraging Collaborative Inquiry in Science Teacher Education

Christina Macias, California State University, Fresno

Myunghwan Shin, California State University, Fresno

## Program

### **Strand 8:**

#### **In-service Science Teacher Education**

##### **Approaches to PD Supporting Teacher Learning**

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Elizabeth Lewis**, University of Nebraska, Lincoln

##### **Comparing Contexts for Professional Development: Student Work Analysis and Video Club**

**Heather Johnson**, Vanderbilt University

**Andrea Henrie**, Vanderbilt University

**Bethany Daniel**, Vanderbilt University

**Ashlyn Pierson**, Ohio State University

**Danielle Kiefert**, University of North Texas

##### **Elementary Science Teachers' Purposes and Practices for Connecting Multiple Representations**

**Ashlyn Pierson**, Ohio State University

**Danielle Kiefert**, University of North Texas

**Sarah Lee**, Vanderbilt University

**Heather Johnson**, Vanderbilt University

**Andrea Henrie**, Vanderbilt University

##### **Supporting Science Instruction with Vertical Teams: Teachers' Perceptions of Mixed Grade-Band Professional Learning Communities**

**Daniel Pimentel**, Stanford University

**Tammy Moriarty**, Stanford University

**Janet Carlson**, Stanford University

##### **Preparing Science Educators for Contextualized Instruction**

**Kassandra L'Heureux**, Université de Sherbrooke

**Michael Giamellaro**, Oregon State University

**Marie-Claude Beaudry**, Université de Sherbrooke

**Jean-Philippe Ayotte-Beaudet**, Université de Sherbrooke

**Cory Buxton**, Oregon State University

**Talal Alajmi**, Oregon State University

### **Strand 10:**

#### **Curriculum and Assessment**

##### **NGSS Aligned Assessment and Instruction**

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Marcus Kubsch**, Leibniz Institute for Science and Mathematics Education

##### **Noticing-Sensemaking-Modeling: A Framework for the Crosscutting Concepts**

**Lori Andersen**, University of Hawaii at Manoa

##### **A Three-dimensional Integrated Learning Progression and Aligned Assessments to Monitor Middle School Student Proficiency of Energy, Modeling and Cause and Effect**

**Namsoo Shin**, Michigan State University

**Peng He**, Michigan State University

**Tingting Li**, CREATE for STEM Institute

**Joseph Krajcik**, Michigan State University

##### **Bridging the Gap: Evaluating a Design Approach for Curriculum-neutral NGSS Benchmark Assessments in Middle School**

**Maia Binding**, University of California Berkeley, Lawrence Hall of Science

**Lauren Brodsky**, University of California Berkeley, Lawrence Hall of Science

##### **Validating a Claim-Evidence-Science Idea-Reasoning (CESR) Framework for use in NGSS Assessment Tasks**

**Joseph Hardcastle**, American Association for the Advancement of Science

**Cari Herrmann Abell**, BSCS Science Learning

**George De Boer**, American Association for the Advancement of Science

## Program

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

#### **Science Identity**

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**ReAnna Roby**, Vanderbilt University

#### **Figured Worlds of Successful Women in Science during Their School Years**

**Jonathan Hall**, University of West Florida

#### **Novice to Expert: Science Identity Development in Academically Proficient Students at an HBCU**

**Karen Marshall**, Oakwood University

**Carmen Bucknor**, Oakwood University

**Sylvia James**, National Science Foundation

**Christyn Byrd**, Oakwood University

**Tatiana Fowler**, Oakwood University

#### **Promoting Scientific Literacy for All in the Classroom**

**Gianna Lopez-Colson**, University of Texas Rio Grande Valley

**Miriam Ortiz**, University of Texas Rio Grande Valley

#### **Afterschool STEM Program as a Transformative Space for Teachers to Support Relationship Building with Students**

**Ti'Era Worsely**, University of North Carolina at Greensboro

**Sara Heredia**, University of North Carolina at Greensboro

### **Strand 12:** **Technology for Teaching, Learning, and Research**

#### **Reconstructing Reality through Simulations to Enable Classroom Enactment of Science Practices**

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

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

Discussant:

**Scott McDonald**, Pennsylvania State University

Presenters:

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

**Scott McDonald**, Pennsylvania State University

**Amy Pallant**, The Concord Consortium

**Chris Lore**, The Concord Consortium

**Jie Chao**, The Concord Consortium

**Gey-Hong Gweon**, Physics Front

**Charles Conner**, University of South Florida

**Trudi Lord**, The Concord Consortium

**Lisa Hardy**, The Concord Consortium

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

#### **Socioscientific Issues**

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Shaghig Chaparian**, American University of Beirut

#### **University Biology Students' Pandemic Decisions: The Role of COVID-19 Science Beliefs and Sociocultural Membership**

**Benjamin Herman**, Texas A&M University

**Michael Clough**, Texas A&M University

**Asha Rao**, Texas A&M University

**Joanne Olson**, Texas A&M University

**Alister Olson**, Texas A&M University

**Alex Sobota**, Texas A&M University

**Sarah Poor**, Texas A&M University

#### **Exploring Undergraduates' Breadth of Socio-Scientific Reasoning through Domains of Knowledge**

**David Owens**, Georgia Southern University

**Troy Sadler**, University of North Carolina at Chapel Hill

**Destini Pettitt**, University of Nebraska-Lincoln

**Corey Forbes**, University of Nebraska-Lincoln

## Program

**Changes in NOS Understandings after Engaging in Reflective Discussions and Information Evaluation about Socio-Scientific Issues**

**Shaghig Chaparian**, American University of Beirut  
**Saouma Boujaoude**, American University of Beirut

**Reviving the Orchard: Visions of Reclaiming Science Education for Nicaragua**

**Kelsie Fowler**, University of Washington

**Strand 14:**  
**Environmental Education and Sustainability**  
***Sociocultural and Situated Perspectives of Environmental Science Education***

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Tamara Pepper**, Pennsylvania Department of Education

**An Inclusive Model of Theoretical Rigor in Environmental Education**

**Roberta Hunter**, Michigan State University  
**Gail Richmond**, Michigan State University

**Productive Disciplinary Engagement in Three-dimensional Agriscience Instruction**

**Craig Kohn**, Michigan State University

**A Situated Learning Approach for Designing and Implementation Educational Escape Games about Healthy Nutrition**

**Miri Barak**, Technion, Israel Institute of Technology  
**Tal Yachin**, Technion, Israel Institute of Technology

**Environmental Science Curriculum Development Inlocal Communities: A Cultural Historical Activity Theory Perspective**

**Xavier Fazio**, Brock University

**Strand 15:**

**Policy, Reform, and Program Evaluation**

***Science Teacher Resiliency, Commitments, and Disciplinary Sense-Making within Complex Systems***

1:45 pm - 3:15 pm | *Real-Time/Live*

Presider:

**Kathryn Bateman**, Temple University

**Self-efficacy and Commitment of Mid and Late Career High School Science Teachers**

**Dorothy Holley**, West Johnston High School  
**Soonhye Park**, North Carolina State University

**Disciplinary Conflation in Integrated Science and Engineering**

**Jacob Pleasants**, Keene State College  
**Iliana De La Cruz**, Texas A&M University

**Are the Best and Brightest High School Students Interested in Science or Mathematics Teaching Careers?**

**Travis Fuchs**, University of British Columbia  
**Gerhard Sonnert**, Harvard Smithsonian  
**Sandra Scott**, University of British Columbia  
**Philip Sadler**, Harvard Smithsonian

**Perceptions of Coherence: Learning about Systems and Structures through Participatory Redesign and Implementation**

**William Lindsay**, University of Colorado Boulder

## Program

### **Administrative Sponsored Session** **Graduate Student Committee**

#### **Graduate Student Forum**

**3:30 pm - 5:00 pm** | *Real-Time/Live*

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

### **Administrative Sponsored Session** **Membership Committee**

#### **Mentor-Mentee Nexus**

**5:00 pm - 6:00 pm** | *Real-Time/Live*

Presiders:

**ReAnna Roby**, Vanderbilt University

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

**Sule Aksoy**, Syracuse University

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

### **Networking/Social Sessions**

**6:00 pm - 8:00 pm** | *Real-Time/Live*

#### **Participate in the "Round Robin."**

*Please visit committees in 15-minute segments from 6:00 pm - 6:45 pm*

#### **Meet the leadership and find out more about any three of the following:**

- Equity and Ethics Committee
- Membership Committee
- Publications Advisory Committee
- Graduate Student Committee
- International Committee

**Drop-In Visit #1:** 6:00 pm - 6:15 pm

**Drop-In Visit #2:** 6:15 pm - 6:30 pm

**Drop-In Visit #3:** 6:30 pm - 6:45 pm

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



## Program

### POSTER SESSION #1

THURSDAY, 8:00 am - FRIDAY, 7:00 am

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

*For a complete listing of Thursday's posters, please refer to the end of the Thursday schedule.*

### Author-Scheduled 30-Minute Q&A Sessions

Presenters pre-record their presentations and schedule a 30-minute block (like "office hours") for Q&A. Attendees view the recorded presentations in advance of the Q&A. Scheduled times for Q&A are listed at the end of the conference program on page 120. If not listed, then please consult program addendum/changes.

### Administrative Sponsored Session International Committee

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

6:30 am - 8:00 am | *Real-Time/Live*

Chair:

**Sonya Martin**, Seoul National University, Republic of Korea

Discussant:

**Sara Wilmes**, University of Luxembourg, Luxembourg

Presenters:

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

### CONCURRENT SESSION #2

8:00 am - 9:30 am | *Real-Time/Live*

### Administrative Sponsored Session Awards Committee

***DCRA: On a Continuum of the Professional Scholarly Trajectories in Science Education: The Urgent Questions for the Next Generation of Science Education Research***

8:00 am - 9:30 am | *Real-Time/Live*

Presenters:

**Noemi Waight**, University at Buffalo

### Strand 1:

**Science Learning: Development of Student Understanding**

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Sharona Levy**, University of Haifa

**Modeling-Based Inquiry Instruction for Promoting 10th Graders' Modeling Competence and Conceptual Understanding of the Periodic Table**

**Mei-Hung Chiu**, National Taiwan Normal University

**Mao-Ren Zeng**, National Taiwan Normal University and Municipal Dazhi High School, Taipei

**Shiao-Lan Chung**, New Taipei Municipal and New Taipei Senior High School

**Jing-Ping Jong**, New Taipei Municipal Jinhe High School

**Enhancing Student Modeling within an Integrated Chemistry and Earth Science Curriculum**

**Jonathan Grooms**, George Washington University

**Kevin Fleming**, George Washington University

**Alan Berkowitz**, Cary Institute of Ecosystem Studies

**Bess Caplan**, Cary Institute of Ecosystem Studies

**Climate Education in Secondary Science:**

**Comparison of Model-Based and Non-Model-Based Investigations of Global Climate Data**

**Devarati Bhattacharya**, University of Nebraska

**Kimberly Carroll Steward**, University of Nebraska, Lincoln

**Corey Forbes**, University of Nebraska, Lincoln

## Program

### Strand 2:

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

##### Community & Social Factors in Identity, Motivation, and Learning

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Cesar Delgado**, North Carolina State University

##### Factors Contributing to Career Aspirations: Access to Science Resources and People

**M. Gail Jones**, North Carolina State University

**Katherine Chesnutt**, North Carolina State University

**Megan Ennes**, University of Florida

**Emily Cayton**, Campbell University

##### Health in Our Hands: A Community-Inspired Project-based Learning Approach to Support Social and Emotional Learning

**Idit Adler**, Tel Aviv University

**Consuelo Morales**, Michigan State University

**Irene Bayer**, Michigan State University

**Tali Tal**, Technion, Israel Institute of Technology

**Joseph Krajcik**, Michigan State University

##### Gender Differences in STEM Classroom Emotional

**Felicity McLure**, Curtin University

**Barry Fraser**, Curtin University

**Rekha Koul**, Curtin University

##### Capturing Chemical Control Speaking, Thinking and Doing

**Klaudja Caushi**, University of Massachusetts, Boston

**Hannah Sevian**, University of Massachusetts, Boston

### Strand 2:

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

##### Related Paper Set

##### Studying Contestations of Hegemonic Science Education as Public Good

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Daniel Morales-Doyle**, University of Illinois at Chicago

##### Rejecting Narrow Definitions: Reimagining Equitable Science Classroom Discourse

**Enrique Suarez**, University of Massachusetts, Amherst

##### Children's Play in Making as Contestations and Moves to Sociopolitical Elsewhere(s)

**Natalie Davis**, Georgia State University

**Shirin Vossoughi**, Northwestern University

##### Repurposing the Physics Classroom for Environmental Justice

**Jasmine Jones**, University of Illinois at Chicago

##### Co-Designing Professional Development to Support Science Teachers Transdisciplinary Learning

**Daniel Morales-Doyle**, University of Illinois at Chicago

**Alejandra Frausto**, Chicago Public Schools

**Mindy Chappell**, University of Illinois at Chicago

**Tiffany Childress Price**, University of Illinois at Chicago

**Abel Farias**, University of Illinois at Chicago

### Strand 3:

#### Science Teaching—Primary School

(Grades preK-6)

##### Engaging Students in Science and Engineering Practices

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Anna Maria Arias**, Kennesaw State University

##### Teaching Evolution in a 5th Grade Spanish Classroom: "Why Do We Have Different Skin Colours?"

**Lucia Vazquez-Ben**, Universidade da Coruña, Spain

**Anxela Bugallo-Rodriguez**, Universidade da Coruña, Spain

##### An Exploratory Study on Computational Thinking in Elementary Science

**Jennifer Pietros**, University of Rhode Island

**Sara Sweetman**, University of Rhode Island



## Program

### Elementary Teachers' Verbal Supports Across Science, Engineering, and Computer Science Disciplines in an NGSS-Aligned Unit

Sarah Lilly, University of Virginia  
Anne McAlister, University of Virginia  
Sarah Fick, Washington State University  
Jennifer Chiu, University of Virginia

### Implementation of NGSS Scientific Practices in Elementary Science Classrooms: A Comparative Study of Video Analysis

Peter Hu, University of Pittsburgh  
Ling Liang, La Salle University  
Ying-Chih Chen, Arizona State University  
Takeshi Terada, Arizona State University

### Strand 4:

#### Science Teaching—Middle and High School

(Grades 5-12)

#### Model-Based Teaching and Learning

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

Zac Patterson, The Ohio State University

#### High School Science Teachers' Integration of Computational Thinking into Data Practices to Support Student Investigations

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

#### A Preliminary Study to Explore In-service Science Teachers Assessment Literacy in MBT

Alexis Gonzalez-Donoso, University of British Columbia  
Samia Khan, University of British Columbia

#### Engaging Secondary School Students in Model-Based Reasoning for Conceptual Understanding

Shingo Uchinokura, Kagoshima University

### Scientific Simulations as Educational Tools for the Post-Pandemic Era: the Case of the Susceptible-Infectious-Removed Model

Eleonora Barelli, University of Bologna  
Olivia Levrini, University of Bologna

### Strand 5:

#### College Science Teaching and Learning

(Grades 13-20)

#### Scaffolding and Support for College STEM Learning

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

Robert Idsardi, Eastern Washington University

#### Vygotskian Professional Development for Biology Instructors Focusing on Student Thinking

Sophia (Sun Kyung) Jeong, Ohio State University  
Jakayla Clyburn, University of North Carolina at Greensboro  
Paula Lemons, University of Georgia

#### Mentoring Early-year Undergraduate Researchers: Structures and Support Mechanisms

Gaye Ceyhan, Bogazici University  
John Tillotson, Syracuse University

#### A Framework Situating Failure in Developing Scientific Understanding: Investigating Students' Scientific Failures in Undergraduate Research

Sandhya Krishnan, University of Georgia

#### Investigating the Relationship between Self-efficacy and Approach to Teaching in Undergraduate and Graduate Teaching Assistants

Cody Smith, University of Nebraska, Lincoln  
Annette Wierzbicki, University of Nebraska, Lincoln  
Jenny Dauer, University of Nebraska, Lincoln

## Program

### Strand 6:

#### Science Learning in Informal Contexts

*From 'Physical to Digital': How Institutions of Informal Science Education Adapt to an Online Presence during the COVID-19 Crisis (and Beyond)*

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

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

Discussant:

**Ran Peleg**, University of Southampton

Presenters:

**Ran Peleg**, University of Southampton

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

**Carys Hughes**, University of Southampton

**Sarah Funk**, Science Center Network

**Claudia Sodini**, K-productions

**Nancy Staus**, Oregon State University

**Victoria Bonebrake**, University of Washington

**Ann Astroga**, University of Washington

**Elena Janniello**, Università di Pisa

**Antonella Gioli**, Università di Pisa

### Strand 7:

#### Pre-service Science Teacher Education

*Making a Case for Emphasizing Modeling and Engineering*

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Jianlan Wang**, Texas Tech University

*Results of Elementary Preservice Teachers' Promotion of Norms of Interaction for Engineering Design*

**Elaine Silva Mangiante**, Salve Regina University

**Kaitlin Gabriele-Black**, Salve Regina University

*Developing Preservice Science Teachers' Conceptions of Engineer and Engineering through an Elective STEM Course*

**Nilay Ozturk**, Kirsehir Ahi Evran University

**Meltem Irmak**, Gazi University

*Preservice Elementary Teachers Making Sense of Scientific Modeling: A Longitudinal Study*

**Adam Bennion**, University of Michigan

**Elizabeth Davis**, University of Michigan

*Dimensions of Modeling: Knowledge, Practice and Product*

**Maximillian Göhner**, Freie Universität Berlin

**Tom Bielik**, Freie Universität Berlin

**Moritz Krell**, Freie Universität Berlin

### Strand 8:

#### In-service Science Teacher Education Curriculum and Assessment

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Ashley Iveland**, WestEd

*Assessment for Learning: High School Science Teachers' Performance Assessment Practices during Integrated Science Teaching*

**Nam-Hwa Kang**, Korea National University of Education

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

**Senetta Bancroft**, Southern Illinois University Carbondale

**Harvey Henson**, Southern Illinois University Carbondale

**Daniel Brown**, Illinois State Board of Education

**Angela Box**, Southern Illinois University Carbondale

**Yanyan Sheng**, University of Chicago

**Jennifer Rhodes**, Southern Illinois University Carbondale

*Growth in STEM Teachers' Formative Assessment Practices as Teachers Remain in High-need Districts*

**Shahar Abramvotich**, University of Massachusetts, Boston

**Hannah Sevia**, University of Massachusetts, Boston

*Expectations Regarding Students' Knowledge and Teachers' Content Knowledge in Particle Physics: A Comparative Study*

**Anja Kranjc Horvat**, CERN & University of Potsdam

**Gerfried Wiener**, CERN

**Sascha Schmeling**, CERN

**Andreas Borowski**, University of Potsdam

## Program

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

#### ***Learning Progression Assessments and Teachers' Classroom Enactments of Curricula***

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Joseph Krajcik**, Michigan State University

Discussant:

**Knut Neumann**, Leibniz Institute for Science and Mathematics Education

Presenters:

**Elon Langbeheim**, Ben-Gurion University of the Negev

**David Fortus**, Weizmann Institute of Science

**Jeffery Nordine**, Leibniz Institute for Science and Mathematics Education

**Knut Neumann**, Leibniz Institute for Science and Mathematics Education

**Joseph Krajcik**, Michigan State University

**Hui Jin**, Educational Testing Service

**Hyo-Jeong Shin**, Educational Testing Service

**Dante Cisterna**, Educational Testing Service

**Erin Furtak**, University of Colorado

**Clarissa Deverel-Rico**, University of Colorado, Boulder

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

#### ***Context, Gender, and Guidance***

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Charnell Long**, University of Wisconsin, Madison

#### **Connections between Negative Academic Experiences and the Impostor Phenomenon in STEM**

**Devasmita Chakraverty**, Indian Institute of Management, Ahmedabad

#### **Can the Culturo-Techno-Contextual Approach (CTCA) Dissolve the Barriers of African Students to Learning Difficult Concepts in Biology?**

**Peter Okebukola**, Lagos State University

**Franklin Onowugbeda**, Lagos State University

**Oluseyi Ajayi**, Lagos State University

**Tokunbo Odekeye**, Lagos State University

**Deborah Agbanimu**, Lagos State University

**Esther Peter**, Lagos State University

**Aderonke Ebisin**, Lagos State University

**Fred Awaah**, University of Professional Studies Accra

#### **Exploring Gender Issues in Higher Secondary Science Classroom**

**Mohammad Siddique**, University of Dhaka

**Anina Mahmud**, University of Dhaka

#### **How Biology and Physics Faculty Guide Female and URM Faculty toward Leadership, Research, and Teaching**

**Eugene Judson**, Arizona State University

**Lydia Ross**, Arizona State University

### **Strand 12:** **Technology for Teaching, Learning, and Research**

#### ***Modeling Tools that Support Thinking and Learning***

8:00 am - 9:30 am | *Real-Time/Live*

Presider: **Megan Silander**, Center for Children and Technology

#### **The World as a Lab: Real-Life Data in STEM Projects**

**Lutz Kasper**, University of Education Schwaebisch Gmuend

**Patrik Vogt**, Institute of Teacher Training, Mainz

## Program

### Students' Development of Mental Models when Constructing Particle-Based Computational Models of Electric Conductors

Elon Langbeheim, Ben Gurion University of the Negev

Sharona Levy, University of Haifa

Hagit Hel-Or, University of Haifa

Janan Saba, University of Haifa

### Learning about Photosynthesis and Cellular Respiration in Plants with Cell-based Emergent Models (CEM)

Sharona Levy, University of Haifa

Shani Goldstein, University of Haifa

Hana Anutza Almog, University of Haifa

Anat Yarden, Weizmann Institute of Science

### Strand 13:

#### History, Philosophy, Sociology, and Nature of Science

##### Nature of Science in K-12 Education

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

Alison Cullinane, University of Oxford

##### Indiana Third/Fourth Grade Students' Conceptions of the Nature of Scientific Inquiry

Valarie Akerson, Indiana University

Claire Cesljarjev, Indiana University

Conghui Liu, Indiana University

Judith Lederman, Illinois Institute of Technology

Norman Lederman, Illinois Institute of Technology

##### Formative Assessment of Nature of Science in a Grade 10 Lesson on Paradigm Shift

Wonyong Park, University of Oxford

Sibel Erduran, University of Oxford

Judith Hillier, University of Oxford

##### Exploring the Nature of Science in the Italian Physics Curriculum

Alison Cullinane, University of Oxford

Martina Caramaschi, University of Bologna

Olivia Levrini, University of Bologna

Sibel Erduran, University of Oxford

### NOS and Science Identity: "I Learned I Didn't Know How to do Science"

Robert Bennett, Georgia State University

Emily Turner, Georgia State University

Reneé Schwartz, Georgia State University

### Strand 14:

#### Environmental Education and Sustainability

##### Engaging with Socioscientific Issues

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

Bryan Nichols, Florida Atlantic University

##### Problematizing Intuitive Universals in Socio-Scientific Reasoning: Using Meta-Epistemic Reasoning Practices to Link Mechanisms to Context

John Ruppert, Saint Peter's University

Masiel Infante, Saint Peter's University

##### Doing Battle with the Dragons of Inaction: Place-Based SSI and Pro-Environmental Behaviors

Mark Newton, East Carolina University

Benjamin Herman, Texas A&M University

Dana Zeidler, University of South Florida

##### Doing Battle with the Dragons of Inaction: Place-Based SSI and Pro-Environmental Behaviors

Mark Newton, East Carolina University

Benjamin Herman, Texas A&M University

Dana Zeidler, University of South Florida

##### Middle School Students' Informal Reasoning and Argument Quality for Different SSI

Cansu Basak Uygun, Middle East Technical University

Ozgul Yilmaz-Tuzun, Middle East Technical University

## Program

### CONCURRENT SESSION #3

9:45 am - 11:15 am | *Real-Time/Live*

#### Administrative Sponsored Session Publications Advisory Committee

9:45 am - 11:15 am

#### *NSTA's Annual Research Worth Reading Recognition*

Presenters:

**Deena Gould**, Arizona State University

**Shakhnoza Kayumova**, University of Massachusetts, Dartmouth

**Michael Bowen**, National Science Teacher Association

**Cynthia Crockett**, Harvard-Smithsonian Center for Astrophysics, Science Education Department, Cambridge, Massachusetts

**Knut Neumann**, Leibniz Institute for Science Education

Selected Papers :

Visintainer, T. (2020). "I think at first glance people would not expect me to be interested in science": Exploring the racialized science experiences of high school students of color. *Journal of Research in Science Teaching*, 57(3), 393- 422.

Wieselmann, J.R, Dare, E.A, Ring-Whalen, E.A, & Roehrig, G.H. (2020). "I just do what the boys tell me": Exploring small group student interactions in an integrated STEM unit. *Journal of Research in Science Teaching*, 57(1), 112- 144.

Navy, S.L, Nixon, R.S, Luft, J.A, & Jurkiewicz, M.A. (2020). Accessed or latent resources? Exploring new secondary science teachers' networks of resources. *Journal of Research in Science Teaching*, 57(2), 184- 208

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

9:45 am - 11:15 am | *Real-Time/Live*

#### *Beyond Policies and Statements: Towards Equity in STEM Education*

Presenters:

**Maya Garcia**, Colorado Department of Education

**André DeLeón**, Nevada Department of Education

**Jamie Ramage**, Oregon Department of Education

**Philip Bell**, University of Washington

**Remy Dou**, Florida International University

**Deb Morrison**, University of Washington

#### Administrative Sponsored Session Research Committee

9:45 am - 11:15 am | *Real-Time/Live*

#### *2019 Sandra K. Abell Institute for Doctoral Students*

Presenters:

**Gregory Rushton**, Middle Tennessee State University

**Grant Gardner**, Middle Tennessee State University

**Julie Luft**, University of Georgia

**Anna Grinath**, Idaho State University

#### Strand 1:

#### Science Learning: Development of Student Understanding

9:45 am - 11:15 am | *Real-Time/Live*

#### *Using Assessment to Characterize Student Knowledge*

Prsider:

**Cesar Delgado**, North Carolina State University

#### Mapping Consensus and Dissensus in Perspectives on Learning Progressions Research: Past, Present, and Future Figurations

**Michelle Wooten**, University of Colorado Boulder

**Scott McDonald**, Pennsylvania State University

## Program

### Mind Wandering of Grade Five Students with High and Low Performance in TIMSS-like Science Test

Sulaiman Al-Balushi, Sultan Qaboos University  
Khadijah Al-Balushi, Ministry of Education, Oman  
Rashid Al-Mherzi, Sultan Qaboos University  
Ibrahim Al-Harathi, Sultan Qaboos University  
Abdullah Ambusaidi, Ministry of Education, Oman  
Khalid Al-Saadi, Sultan Qaboos University  
Mohammed Al-Aghbari, Sultan Qaboos University

### Characterization of Undergraduate Students' and Instructors' Knowledge Integration of Cellular Biology Concepts

Sharleen Flowers, Purdue University  
Stephanie Gardner, Purdue University

### Strand 2:

### Science Learning: Contexts, Characteristics and Interactions

#### *Eliciting and Supporting Students Doing Science*

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

Andy Cavagnetto, Washington State University

#### Strategies to Manage Uncertainty in Scientific Argumentation

Ying-Chih Chen, Arizona State University

#### Factors Impacting Teachers' Understanding and Experiences Supporting Student Epistemic Agency during STEM Design Challenges

Maria González-Howard, University of Texas at Austin

Victor Sampson, University of Texas at Austin

Christina Baze, University of Texas at Austin

#### Uncertainty and Cognitive Demand on Students' Thinking in Science Classrooms

Danielle Vande Zande, Florida State University

Ozlem Akcil Okan, Florida State University

Miray Tekkumru Kisa, Florida State University

### Strand 3:

### Science Teaching—Primary School

(Grades preK-6)

#### *Science Education in Preschool*

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

Alison Mercier, University of Wyoming

#### Developing Preschool-age Children's Spatial Sensemaking Practices through a Story-driven Investigation

Kyungjin Cho, Pennsylvania State University

Madison Botch, Pennsylvania State University

Julia Plummer, Pennsylvania State University

#### Culturally Responsive Teaching in an Elementary Science Enrichment Class

Misty Thomas, Academic Venture Teacher

Melody Russell, Auburn University

#### Introducing a Lab Center in the Classroom—Promoting Preschoolers' Inquiry Practices and Science Preferences

Netta Perry, Bar Ilan University

Ronit Fridman, Bar Ilan University

Ornit Spektor-Levy, Bar Ilan University

#### Modeling-Based Learning through Distance Education: The Case of Pre-School Children Investigating Snails during COVID-19 Quarantine

Loucas Luca, European University, Cyprus

## Program

### Strand 4:

#### Science Teaching—Middle and High School

(Grades 5-12)

#### Curriculum Integration

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Zehavit Kohen**, Technion, Israel Institute of Technology

#### An Exploratory Study of the Goals Science Teachers' Achieve by Integrating Engineering into Science Class

**Todd Hutner**, University of Alabama

**Victor Sampson**, University of Texas at Austin

**Lawrence Chu**, University of Texas at Austin

**Christina Baze**, University of Texas at Austin

**Richard Crawford**, University of Texas at Austin

#### The Effects of Integrated STEM Teaching on Students' STEM Literacy: A Meta-Analysis

**Waralee Sinthuwa**, Kasetsart university

**Chatree Faikhamta**, Kasetsart University

**Pongprapan Pongsophon**, Kasetsart University

#### A Methodological Framework for Analyzing an Integrated STEM Curriculum and its Enactment

**Chelsey Dankenbring**, Purdue University

**Selcen Guzey**, Purdue University

**Lynn Bryan**, Purdue University

#### Teacher Change during Integrated Curriculum Reform as Evidenced by Episodes of Pedagogical Reasoning

**Kevin Fleming**, George Washington University

**Jonathon Grooms**, George Washington University

**Alan Berkowitz**, Cary Institute of Ecosystem Studies

**Bess Caplan**, Cary Institute of Ecosystem Studies

### Strand 5:

#### College Science Teaching and Learning

(Grades 13-20)

#### Innovative Techniques in College STEM Instruction

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Jonah Firestone**, Washington State University, Tri-Cities

#### The Effects of Scaling Up the Flipped Classroom Approach

**Robert Idsardi**, Eastern Washington University

**Luis Matos**, Eastern Washington University

#### Understanding the Emergence of Abstraction in Physical Chemistry Problem Solving

**Jessica Karch**, University of Massachusetts, Boston

**Hannah Sevia**, University of Massachusetts, Boston

#### Faculty Perceptions of College Students' Preparedness to Use Quantitative Reasoning (QR) in Introductory Biology Courses

**Anne Cleveland**, Maine Maritime Academy

**Asli Sezen-Barrie**, University of Maine

**Gili Marbach-Ad**, University of Maryland

#### Out of Sight, Out of Mind? Effects of Using Concept Mapping in a Retrieval Setting

**Lukas Becker**, University of Cologne

**Virginia Welter**, University of Cologne

**Steffen Tröbst**, Kiel University

**Ellen Aschermann**, University of Cologne

**Jörg Großschedl**, University of Cologne

### Strand 6:

#### Science Learning in Informal Contexts

#### The Role of Informal Science Learning Environments in Supporting Scientific Engagement

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Orit Ben Zvi Assaraf**, Ben-Gurion University of the Negev

Discussant:

**Eleni Kyza**, Cyprus University of Technology

Presenters:

**Tali Tal**, Technion, Israel Institute of Technology

**Merav Shreiber**, Netaim School, Ramat Gan

**Tom Bielik**, Berlin Freie Universität

**Patricia Patrick**, Columbus State University

**Neta Shaby**, Ben-Gurion University of the Negev

**Orit Ben Zvi Assaraf**, Ben-Gurion University of the Negev

**Michael Reiss**, University of London

**Eleni Kyza**, Cyprus University of Technology

## Program

### Strand 7:

#### Pre-service Science Teacher Education

##### *Coherent and Current Approaches in Science Teacher Preparation*

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Richard Lamb**, East Carolina University

##### *Promoting Coherent Science Teaching through Coherent Science Teacher Education: A Model Framework for Program Design*

**Jeffrey Nordine**, Leibniz Institute for Science and Mathematics Education

**Stefan Sorge**, Leibniz Institute for Science and Mathematics Education

**Ibrahim Delen**, Usak University

**Robert Evans**, University of Copenhagen

**Kalle Juuti**, University of Helsinki

**Jari Lavonen**, University of Helsinki

**Pernilla Nilsson**, Halmstad University

**Mathias Ropohl**, University of Duisburg-Essen

**Matthias Stadler**, University of Bergen

##### *Teacher Discourse Practices Supporting Student Progressive Discourse in an Ambitious Science Classroom*

**Kraig Wray**, Pennsylvania State University

**Madison Botch**, Pennsylvania State University

**Scott McDonald**, Pennsylvania State University

**Amy Pallant**, The Concord Consortium

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

##### *Investigating Preservice Teachers' Conceptualizations on Teaching Engineering: A Sequential Explanatory Design*

**Rebekah Hammack**, Montana State University

**Tina Vo**, University of Nevada, Las Vegas

### Strand 8:

#### In-service Science Teacher Education

##### *Computational Thinking and STEM Integration*

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Stephen Witzig**, University of Massachusetts, Dartmouth

##### *The Effects of Teacher Professional Development in STEM Education: A Meta-Analysis*

**Hye Sun You**, Arkansas Tech University

**Sunyoung Park**, California Lutheran University

**Minju Hong**, University of Georgia

##### *STEM as Pakistani Teachers View It: A Case of Contextually Relevant Curricular Units*

**Tasneem Anwar**, The Aga Khan University

##### *Help Me Understand CT: Science Teachers' Perceived Barriers to CT Integration and Professional Support Needs*

**Vance Kite**, North Carolina State University

**Soonhye Park**, North Carolina State University

##### *Integrating Computational Thinking into Elementary Inquiry-Based Science Instruction: Affordances of a Community of Practice Model*

**Heather Killen**, University of Maryland, College Park

**Merijke Coenraad**, University of Maryland, College Park

**Lautaro Cabrera**, University of Maryland, College Park

**Virginia Byrne**, Morgan State University

**Diane Ketelhut**, University of Maryland



## Program

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

#### ***Linguistic and Cultural Aspects of Science Curricula***

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Peng He**, Michigan State University

#### ***Exploring Plurality in Students' Ways of Knowing with Learning Progression-Based Assessments of Computational Thinking***

**Beth Covitt**, University of Montana

**Carolyn Staudt**, The Concord Consortium

**Dale Cope**, Independent Education Consultant

**Joyce Massicotte**, The Concord Consortium

**Nathan Kimball**, The Concord Consortium

#### ***Authentic Literacy and Language (ALL) for Science: Evaluating a Curriculum to Develop Elementary Disciplinary Literacy***

**Nancy Moreno**, Baylor College of Medicine

**Alana Newell**, Baylor College of Medicine

**Misty Sailors**, University of North Texas

#### ***Culturally Relevant or More of the Same? Unpacking Standards-Aligned Elementary Science Curriculum Materials***

**Terrance Burgess**, Michigan State University

#### ***Evaluating Educative Features for Emergent Multilingual Learners' Opportunities to Learn and Support for Three-dimensional Science and Language instruction***

**Samuel Lee**, Boston College

**Sage Andersen**, University of Texas at Austin

**Karina Mendez Perez**, University of Texas at Austin

**Katherine McNeill**, Boston College

### **Strand 11:** **Cultural, Social, and Gender Issues** ***Physical Sciences and Equity***

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Bhaskar Upadhyay**, University of Minnesota

#### ***Scientists' Perspectives: Choosing an Academic Career in Chemistry***

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

**Daphna Shwartz Asher**, Technion, Israel Institute  
of Technology

**Shari Reiss**, Technion, Israel Institute of Technology

**Yehudit Judy Dori**, Technion, Israel Institute of

Technology and Samuel Neaman Institute for  
National Policy Research

#### ***Experiences in Freshman Chemistry: Using Cogenerative Dialogues to Identify Critical Issues Impacting African American Females***

**Natasha Johnson**, University of Toledo

**David Jackson**, University of Georgia

**Deborah Tippins**, University of Georgia

**Ji Shen**, University of Miami

#### ***Examining English Learners' Perceptions of Native Language Use in a Physical Science Classroom***

**Rebecca Robertson Konz**, University of Minnesota,  
Twin Cities

**Felicia Dawn Leammukda**, Saint Cloud State University

**Preethi Titu**, Kennesaw State University

**Gillian Roehrig**, University of Minnesota

#### ***Israeli Arab Students' Participation in Authentic Physics Inquiry in School***

**Lulu Garah**, Technion, Israel Institute of Technology

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

## Program

### Strand 12:

#### Technology for Teaching, Learning, and Research

##### *Using Technology to Improve Students' Scientific Thinking*

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Jonah Firestone**, Washington State University, Tri-Cities

##### **CAI on Adaptation in Organisms and Biological Mechanism among Igbo Senior Secondary School Students**

**Ngozika Mbajiorgu**, Enugu State University of Science and Technology, Nigeria

**Patrick Ugwu**, Enugu State University of Science and Technology, Nigeria

##### **Framing in Gesture-Augmented Simulations: How Differing Student Frames Impacts Their Sensemaking** **Nitasha Mathayas**, Indiana University

##### **Opening the Gate of Logic Gate as a Difficult Topic in Computer Studies in Nigerian Secondary Schools: Can CTCA be the Key?**

**Deborah Agbanimu**, Lagos State University, Nigeria

**Peter Okebukola**, Lagos State University, Nigeria

**Esther Peter**, Lagos State University, Nigeria

**Aderonke Ebin**, Lagos State University, Nigeria

**Franklin Onowugbeda**, Lagos State University, Nigeria

**Adewale Adesina**, National Open University of Nigeria

##### **The Generation of Location-based Questions as means for Promoting Scientific Thinking among Middle School Students**

**Shadi Asakle**, Technion, Israel Institute of Technology

**Miri Barak**, Technion, Israel Institute of Technology

### Strand 12:

#### Technology for Teaching, Learning, and Research

##### *Inservice Teachers' Needs and Uses of Digital Tools and Resources*

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Alpaslan Sahin**, Harmony Public Schools

##### **Elementary Teachers' Adaptations of Technology for Knowledge Generation: Do Their Epistemic Orientations Make a Difference?**

**Jale Ercan-Dursun**, University of Alabama

**Krystal Flantroy**, University of Alabama

**Jee Keyung Suh**, University of Alabama

**Brian Hand**, University of Iowa

**Gavin Fulmer**, University of Iowa

##### **Computer-Supported Collaborative Learning (CSCL): Pedagogical Design Framework**

**Irit Sasson**, Tel-Hai College

##### **The Use of Simulations in Science Education**

**Lisa Stinken-Rösner**, Leuphana Universität Lüneburg

##### **Design Principles and Evaluation of an Online Nanotechnology Professional Development Course for Teachers**

**Yael Feldman-Maggor**, Weizmann Institute of Science

**Inbal Tuvi-Arad**, The Open University of Israel

**Ron Blonder**, Weizmann Institute of Science

### Strand 13:

#### History, Philosophy, Sociology, and Nature of Science

##### *Acknowledging African American Scientists and Scientific Research*

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

**Shari Watkins**, American University

Discussant:

**Brian McGowan**, American University

Presenters:

**Shari Watkins**, American University

**Melody Russell**, Auburn University

**Willie Pearson**, Georgia Institute of Technology

**Ronald Mickens**, Clark Atlanta University

**Christopher Williams**, National Museum of African

American History and Culture

**Brian McGowan**, American University

## Program

### Strand 14:

#### Environmental Education and Sustainability

##### Education in Place and Community

9:45 am - 11:15 am | *Real-Time/Live*

Presider:

Devarati Bhattacharya, University of Nebraska

**Indigenous Education and Behavior Modification Strategies for HIV/AIDS Management in Mining Communities in Zimbabwe: A Case Study**

Emmanuel Mushayikwa, University of the Witwatersrand  
Ledwina Hungwe, University of the Witwatersrand

**The Impact of Place Attachment in Socio-Scientific Reasoning of Puerto Rican High School Students**

Lorraine Ramirez Villarín, University of North Georgia  
Samantha Fowler, Florida Institute of Technology

**Bridging Home Culture and School Science Culture through Ethnic Education in Indigenous Community**

Mu-Yin Lin, University of Georgia

**Community Science, Citizen Science, and Community Scientific Literacy: Opportunities and Challenges for Environmental Stewardship**

Christopher Jadallah, University of California, Davis  
Alexis Patterson Williams, University of California, Davis  
Heidi Ballard, University of California, Davis

### CONCURRENT SESSION #4

11:30 am - 1:00 pm | *Real-Time/Live*

#### Administrative Sponsored Session

11:30 am - 1:00 pm

### Strand 6:

#### Science Learning in Informal Contexts

##### Learning in the Informal Context

11:30 am - 1:00 pm | *Real-Time/Live*

**Examining the Nature of Science Understanding through Canadians' Tweets about COVID-19**

Samantha Jewett, University of Western Ontario  
Anton Puvirajah, University of Western Ontario  
Mohammad Azzam, University of Western Ontario  
Jingrui Jiang, University of Western Ontario

**Multimodal Analysis of Engagement in a Science Museum: The Role of the Body**

Dana Vedder-Weiss, Ben Gurion University of the Negev  
Neta Shaby, Ben-Gurion University of the Negev

**Leveraging Acts of Authentication to Engage Recent Immigrant Children in Informal STEM**

Anton Puvirajah, University of Western Ontario  
Mina Sedaghatjou, Alfred University  
Mohammad Azzam, University of Western Ontario

**Engaging Learners in Computer Modeling and Flight Simulation to Create STEM Pathways**

Geeta Verma, University of Colorado Denver

**"I feel Like I know everything about ants"**

**–How Youth Navigate a Learning Ecosystem?**

Neta Shaby, Ben-Gurion University of the Negev  
Nancy Staus, Oregon State University  
Lynn Dierking, Oregon State University  
John Falk, Oregon State University

**Minoritized Teens' Communication Competency as a Proxy to STEM Identification: A Science Center Context**

Anton Puvirajah, University of Western Ontario  
Todd Campbell, University of Connecticut  
Geeta Verma, University of Colorado Denver

## Program

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### **Administrative Sponsored Session** **Research Committee**

Real-Time/Live

#### ***A Retrospective of the Abell Institute for Doctoral Students: Mentorship within the NARST Community***

11:30 am - 1:00 pm | *Real-Time/Live*

Presenters:

Tina Vo, University of Nevada, Las Vegas

Asli Sezen-Barrie, University of Maine

Li Ke, University of North Carolina at Chapel Hill

Joshua Reid, Middle Tennessee State University

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

#### ***Basu Symposium***

11:30 am - 1:00 pm | *Real-Time/Live*

#### ***Understanding International Graduate Students' Teaching Experience in Science Classroom through the Lens of Cultural Competence: An Exploratory Study***

Zhigang Jia, Middle Tennessee State University

Grant E. Gardner, Middle Tennessee State University

#### ***Access Points that Facilitate Preservice Teachers' Sense-Making about Systemic Issues within a Field Experience***

Victor Kasper, Florida State University

Shannon Davidson, Florida State University

Lama Jaber, Florida State University

#### ***Virtual Mentoring and Epistemic Justice***

Deena L. Gould, University of New Mexico

Priyanka Parekh, Transylvania University

Eduardo Jose Nuñez Cruz, University of New Mexico

#### ***Learning to Integrate Science-Specific Literacy in Science Teaching: A Study of Elementary Preservice Teachers***

Regina McCurdy, University of Central Florida

Su Gao, University of Central Florida

Vassiliki Zygouris-Coe, University of Central Florida

Katherine Cruz-Dieter, University of Central Florida

Rebeca Grysko, University of Central Florida

#### ***Examining Assessments in a Technology-Enhanced Active Learning Science Classroom***

Lucía B. Chacón-Díaz, The Ohio State University

#### ***Case Study Pedagogy and Learning Outcomes: A Framework for Teaching Biology with Narratives***

Ally Hunter, University of Massachusetts at Amherst

Melissa Zwick, Stockton University

#### ***Creating Nuance for Black Girls' Science Alignment Using the CLIC Framework***

Ashley Jackson, University of Michigan

#### ***A Critical Race Perspective of African American Elementary Teachers of Science***

Mario Pickens, University of North Florida

#### ***Exploring Pre-service Teachers Science Teaching Identity and Agents of Change***

Katherine Cruz-Deiter, University of Central Florida

#### ***Fugitive Science Societies: Re-Envisioning Science Education for Black People during the Early 20th Century***

Charnell Chasten Long, University of Wisconsin, Madison

#### ***The STEM Impostor: A Comparative Study of Black Females in Two Global Contexts***

Marsha Simon, University of West Georgia

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### **Strand 2:**

#### ***Science Learning: Contexts, Characteristics and Interactions***

#### ***Related Paper Set***

#### ***Engaging Science Teachers in Socio-Scientific Implementation for Global Citizenship***

11:30 am - 1:00 pm | *Real-Time/Live*

#### ***Science Teachers' Pedagogical Content Knowledge Development during Enactment of Socio-Scientific Curriculum Materials***

Dürdane Bayram-Jacobs, Eindhoven University of Technology

#### ***Relation between SSI and Scientific Knowledge, According to a Group of Secondary School Science Teachers from Spain***

Silvia Alcaraz-Dominguez, Universitat de Barcelona

## Program

### **Tension and Conflict in Implementing SSI as Reflected in Teachers' Beliefs and Implementation**

Emil Eidin, Michigan State University

Yael Shwartz, Weizmann Institute of Science

### **Socio-scientific Issues as Tools for Improving Environmental Knowledge, Skills, and Behavior in Pre-service Education**

Anat Abramovich, Gordon Teachers College

### **Strand 2:**

### **Science Learning: Contexts, Characteristics and Interactions**

### **Science Teaching, Learning, & Social Justice**

11:30 am - 1:00 pm | *Real-Time/Live*

Presider:

Sameer Honwad, SUNY Buffalo

### **Tools for Learning or Tools for Power? Middle School Students' Use of Engineering Tools**

Jeanna Wieselmann, Southern Methodist University

Khomson Keratithamkul, University of Minnesota

Emily Dare, Florida International University

Elizabeth Ring-Whalen, St. Catherine University

Gillian Roehrig, University of Minnesota

### **Let's Count the Flowers: How Emergent Bilinguals' Collaboration Leads to Productive Disciplinary Engagement**

Sara Lee, Vanderbilt University

### **Science Citizenship through Secondary Agricultural Education**

Rosalind Gawryla, Onondaga Central Schools

Kevin Curry

### **Strand 5:**

### **College Science Teaching and Learning**

(Grades 13-20)

### **Supporting 21st Century Students and Faculty**

11:30 am - 1:00 pm | *Real-Time/Live*

Presider:

Anne Emerson Leak, High Point University

### **Suddenly Online: Exploring Postsecondary Teaching, Attitudes, Technology, and Faculty Mental Well Being in Spring 2020**

Emily Walter, California State University, Fresno

Makayla Bailey, California State University, Fresno

Patricia Fernandez, California State University, Fresno

Arashnoor Gill, California State University, Fresno

### **Investigating Instructional and Discourse Practices of College STEM Instructors Across Instructor Types, Disciplines, Years of Teaching Experiences, and Class Sizes**

Petra Kranzfelder, University of California Merced

Jourjina Alkhouri, University of California Merced

Cristie Donham, University of California Merced

Téa Pusey, University of California Merced

Alexander Stivers, University of California Merced

Adriana Signorini, University of California Merced

### **Exploring the Role of Peer Learning Assistants in Supporting Student Learning in College Biology Courses**

Brittney Ferrari, University of Georgia

Peyton LeBonte, University of North Carolina Greensboro

Julie Kittleson, University of Georgia

### **Developing 21st Century Skills through Teaching and Learning Methods: Perceptions of STEM Students and Alumni**

Marina Tal, Technion, Israel Institute of Technology

Rea Lavi, Massachusetts Institute of Technology

Yehudit Judy Dori, Technion, Israel Institute of

Technology and Samuel Neaman Institute for

National Policy Research

## Program

### Strand 7:

#### Pre-service Science Teacher Education

##### *Examining Empathy and Emotions in Science Education*

11:30 am - 1:00 pm | *Real-Time/Live*

Presider:

Jennifer Mesa, University of West Florida

##### *The Role of Epistemic Empathy in Teachers' Learning and Responsiveness to Students' Experiences in Science*

Lama Jaber, Florida State University

##### *Design Thinking for Making: Preservice Teachers' Learning to Teach Human-Centered Making*

Myunghwan Shin, California State University, Fresno

Trang Phan, California State University, Fresno

##### *Experiencing Science through Wonder: Incorporating Aesthetics in Pre-service Teacher Science Education*

Sharon Pelech, University of Lethbridge

David Blades, University of Victoria

##### *Preservice Teacher Emotions in Teaching Science and Math*

Mihwa Park, Texas Tech University

Raymond Flores, Texas Tech University

### Strand 8:

#### In-service Science Teacher Education

##### Related Paper Set

##### *The Influence of Networks on Teachers' Professional Development and Retention: Insights from Examining Communities of Practice through a Lens of Social Networks*

11:30 am - 1:00 pm | *Real-Time/Live*

##### *Teacher Perceptions of Belonging in Communities of Practice: What are you Belonging to?*

Rebecca Konz, University of Minnesota, Twin Cities

Jessica Doering, University of Kentucky

Gillian Roehrig, University of Minnesota

Margaret Schroeder, University of Kentucky

Michael Beeth, University of Wisconsin, Oshkosh/COEHS

##### *Science and Mathematics Teacher Communities of Practice: Social Influences on Discipline-Based Identity and Self-efficacy Beliefs*

Samuel Polizzi, Georgia Highlands College

Joshua Reid, Middle Tennessee State University

Yicong Zhu, Stony Brook University

Gregory Rushton, Middle Tennessee State University

##### *Early Career Teachers: Social Networks in Schools Affect Job Satisfaction and Career Commitment*

Gregory Rushton, Middle Tennessee State University

Samuel Polizzi, Georgia Highlands College

Yicong Zhu, Stony Brook University

Joshua Reid, Middle Tennessee State University

##### *Perceived Network Bridging Influences the Retention Decisions of Early Career Teachers*

Gillian Roehrig, University of Minnesota

Yicong Zhu, Stony Brook University

Samuel Justin Polizzi, Georgia Highlands College

Joshua Reid, Middle Tennessee State University

Greg Rushton, Middle Tennessee State University

### Strand 10:

#### Curriculum and Assessment

##### Related Paper Set

##### *Automated Assessment of Argumentation in School Science: Developments and Challenges*

11:30 am - 1:00 pm | *Real-Time/Live*

##### *Assessing Higher Order Thinking of Complex Skill using Selected Response Items*

Linda Morrell, University of California, Berkeley

Sara Dozier, Stanford University

Weerephat Suksiri, University of California, Berkeley

Jonathan Osborne, Stanford University

Mark Wilson, University of California, Berkeley

## Program

### Developing Automated Analysis for a Learning Progression to Assess Scientific Argumentation in Middle School Students

**Christopher Wilson**, BSCS Science Learning  
**Molly Stuhlsatz**, BSCS Science Learning  
**Brian Donovan**, BSCS Science Learning  
**Zoe Buck Bracey**, BSCS Science Learning  
**April Gardner**, BSCS Science Learning  
**Jonathan Osborne**, Stanford University  
**Tina Cheuk**, Stanford University  
**Kevin Haudek**, Michigan State University  
**Xiaoming Zhai**, Michigan State University

### Automated Feedback to Support Students' Revision of Scientific Arguments Based on Data from Simulations

**Hee-Sun Lee**, The Concord Consortium  
**Gey-Hong Sam Gweon**, Physics Front  
**Amy Pallant**, The Concord Consortium

### Exploring Bias in Automated Scoring of Student Argumentation

**Zoe Buck Bracey**, BSCS Science Learning  
**Molly Stuhlsatz**, BSCS Science Learning  
**Tina Cheuk**, Stanford University  
**Marisol Mercado Santiago**, Michigan State University  
**Christopher Wilson**, BSCS Science Learning  
**Jonathan Osborne**, Stanford University  
**Kevin Haudek**, Michigan State University  
**Brian Donovan**, BSCS Science Learning  
**April Gardner**, BSCS Science Learning

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

#### **Teachers and Justice**

11:30 am - 1:00 pm | *Real-Time/Live*

Presider:

**Mary Atwater**, University of Georgia

#### **Teachers of Color Negotiating Positionality in Implementing Justice-Centered Science Pedagogy**

**David Segura**, Beloit College  
**Maria Varelas**, University of Illinois at Chicago  
**Daniel Morales-Doyle**, University of Illinois at Chicago

### Leadership Professional Development for Diversifying the K-12 STEM Teaching Workforce

**Hyunju Lee**, Smithsonian Science Education Center  
**Katie Gainsback**, Smithsonian Science Education Center  
**Amy D'Amico**, Smithsonian Science Education Center

### Is it Possible to Teach Just Science? Designing Professional Development for Justice-oriented Science Education

**Lenora Crabtree**, University of North Carolina, Charlotte

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

#### Related Paper Set

#### ***Towards a Socially Just Society: Creating Learning Environments for Dignity and Equity in Engineering Education***

11:30 am - 1:00 pm | *Real-Time/Live*

#### **An Identity Resources Approach for Supporting Teachers-of-Engineering for Minoritized Young People**

**Christopher Wright**, Drexel University  
**Bryan Brown**, Stanford University  
**Rasheda Likely**, Drexel University  
**Mikhail Miller**, Drexel University

#### **Centering Social Justice in Engineering: The Transformative Power of Learning about Diversity and Equity in Design**

**Greses Pérez**, Stanford University  
**Shannon Gilmartin**, Stanford University  
**Carol Muller**, Stanford University  
**Patrick Danner**, Technical University of Munich  
**Sheri Sheppard**, Stanford University

#### **Becoming Part of an Engineering Community of Practice: How Students Across Lines of Difference Find Their Place in a Makerspace**

**Eric Reynolds Brubaker**, Stanford University  
**Chielo Mbaezue**, Stanford University

#### **My Life's Work: Re-Engineering Education for Black Boys**

**James Holly, Jr.**, Wayne State University

#### **Design Justice in Humanitarian Engineering Education**

**Brandon Reynante**, Stanford University

## Program

### Strand 11:

#### Cultural, Social, and Gender Issues

##### *Storied-Identities as a Lens to Studying Science Identity*

11:30 am - 1:00 pm | *Real-Time/Live*

Presenters:

**Amal Ibourk**, Florida State University  
**Lucy Avraamidou**, University of Groningen  
**Theila Smith**, University of Groningen  
**Alison Mercier**, University of North Carolina at Greensboro  
**Shakhnoza Kayumova**, University of Massachusetts, Dartmouth  
**Allison Gonsalves**, McGill University  
**Anna Danielsson**, Uppsala University  
**Katia Nielsen**, University of Copenhagen  
**Jennifer Adams**, University of Calgary

### Strand 12:

#### Technology for Teaching, Learning, and Research

##### Related Paper Set

##### *Integrating Computational Thinking in Science Curricula: Teacher Professional Development and Student Assessment*

11:30 am - 1:00 pm | *Real-Time/Live*

##### Positioning Teachers as Co-designers to Integrate CT Practices in STEM

**Sally Wu**, Northwestern University  
**Amanda Peel**, Northwestern University  
**Michael Horn**, Northwestern University  
**Uri Wilensky**, Northwestern University

##### Teachers' Sensemaking of CT Integration and Pedagogical Approaches

**Marissa Levy**, Northwestern University  
**Sally Wu**, Northwestern University  
**Sugat Dabholkar**, Northwestern University  
**Michael Horn**, Northwestern University  
**Uri Wilensky**, Northwestern University

##### Teachers' Perceptions of the Contribution of Computational Thinking to Science and Math Classrooms

**Arnon Hershkovitz**, Tel Aviv University  
**Connor Bain**, Northwestern University  
**Jacob Kelter**, Northwestern University  
**Michael Horn**, Northwestern University  
**Uri Wilensky**, Northwestern University

##### Identifying Evidence of Student Engagement in CT via Automated Response Analysis

**Connor Bain**, Northwestern University  
**Arnon Hershkovitz**, Tel Aviv University  
**Sugat Dabholkar**, Northwestern University  
**Michael Horn**, Northwestern University  
**Uri Wilensky**, Northwestern University

##### Students' Attitudinal Change after Participating in a CT integrated Biology Unit

**Sugat Dabholkar**, Northwestern University  
**Susan Tran**, Northwestern University  
**Michael Horn**, Northwestern University  
**Uri Wilensky**, Northwestern University

### Strand 13:

#### History, Philosophy, Sociology, and Nature of Science

##### *Reimagining Science Education in the Anthropocene*

11:30 am - 1:00 pm | *Real-Time/Live*

Presenter:

**Maria Wallace**, University of Southern Mississippi

Discussant:

**Sara Tolbert**, University of Canterbury

Presenters:

**Maria Wallace**, University of Southern Mississippi  
**Sara Tolbert**, University of Canterbury  
**Matthew Weinstein**, University of Washington, Tacoma  
**Darrin Collins**, University of Illinois at Chicago  
**Chessa Adsit-Morris**, University of California, Santa Cruz  
**Lawrence Bencze**, University of Ontario, Toronto  
**Michelle Wooten**, University of Colorado, Boulder  
**Kathryn Ryker**, University of South Carolina  
**Travis Weiland**, University of Houston  
**Rachel Askew**, Vanderbilt University



## Program

### Strand 14:

#### Environmental Education and Sustainability

##### Related Paper Set

##### *Models for Place-Based Science Education in Schools*

11:30 am - 1:00 pm | *Real-Time/Live*

##### Investigating Local Environmental Issues and Fostering Youth Agency through a Place-based Participatory Science Model

Erin Bird, University of California, Davis

Heidi Ballard, University of California, Davis

##### Centering Power, Historicity, and Nature-Culture Relations in Place-Based Science Education

Megan Bang, University of Washington

Carrie Tzou, University of Washington Bothell

Sharon Siehl, Tilth Alliance

Charlene Nolan, Western Washington University, Bremerton

Priya Pugh, University of Washington

Jordan Sherry-Wagner, University of Washington

Christine Benita, Seattle Public Schools

Leah Bricker, Spencer Foundation and Northwestern University

Veronica McGowan, University of Washington

##### A National-Scale Curriculum Adaptation Model to Incorporate Local Phenomena

Katahdin Cook Whitt, Maine Mathematics and Science Alliance

Emily Harris, BSCS Science Learning

Lindsay Mohan, BSCS Science Learning

##### Place-based Storyline Design: Selecting an Anchoring Problem for Engineering in the Garden

Emily Harris, BSCS Science Learning

Lindsay Mohan, BSCS Science Learning

Whitney Cohen, Life Lab

Sara Severance, Life Lab

Jeffery Snowden, BSCS Science Learning

##### Discussion of Models for Place-based Science in School

Déana Scipio, Islandwood Graduate Program

### Strand 14:

#### Environmental Education and Sustainability

##### Related Paper Set

##### *Supporting Climate and Data Literacy in Rural Communities by Incorporating Authentic Experiences in Formal and Informal Settings*

11:30 am - 1:00 pm | *Real-Time/Live*

##### Iterating a Scientifically Authentic Data-rich Informal Learning Experience to Empower the Next Generation of Climate Stewards

Leigh Peake, Gulf of Maine Research Institute

Andrew Pershing, Gulf of Maine Research Institute

Jeff Bate, Gulf of Maine Research Institute

Jacqueline DeLisi, Education Development Center, Inc.

##### Developing Data- and Climate-focused Classroom Curriculum

Erin Bardar, Education Development Center

Amy Busey, Education Development Center

Patrick McDeed, Education Development Center

Randy Kochevar, Education Development Center

##### Got Data? Developing an Online, Choice-based Assessment of Data Literacy Skills

Doris Chin, Stanford University

Rachel Wolf, Stanford University

Kristin Blair, Stanford University

Daniel Schwartz, Stanford University

##### Supporting Student Learning and Interest in Climate and Data through a Formal-Informal Connection

Jacqueline DeLisi, Education Development Center

Janna Kook, Education Development Center

Una MacDowell, Education Development Center

Peter Tierney-Fife, Education Development Center

Virginia Fitzhugh, Education Development Center

##### Building a Data-focused Science Center Community of Practice

Virginia Fitzhugh, Education Development Center

Jeff Bate, Gulf of Maine Research Institute

Leigh Peake, Gulf of Maine Research Institute

## Program

### Strand 15:

#### Policy, Reform, and Program Evaluation

##### *Theorizing and Envisioning More Equitable Science Education*

11:30 am - 1:00 pm | *Real-Time/Live*

Presider:

**Stefanie Marshall**, University of Minnesota

##### *The Impact of Neoliberal Ideologies on Elementary Science Education Policy: A Case Study*

**Stefanie Marshall**, University of Minnesota

##### *Using Assemblage Theory to Develop New Ideas for Science Teacher Learning*

**Kathryn Bateman**, Temple University

**Scott McDonald**, Pennsylvania State University

##### *Using an Ecological Model to Study Novice STEM Teacher Professional Resilience during the COVID-19 Pandemic*

**Diane Wright**, Colorado State University

**Meena Balgopal**, Colorado State University

**Laura Sample McMeeking**, Colorado State University

**Andrea Weinberg**, Arizona State University

##### *How State Leaders Would Change Their State Systems of Science Education*

**Abby Rhinehart**, University of Washington

**William Penuel**, University of Colorado

**Kathleen Arada**, University of Washington

**Maya Garcia**, Colorado Department of Education

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### Lunch Break *(on your own)*

11:30 am - 12:30 pm

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### CONCURRENT SESSION #5

2:00 pm - 3:00 pm

*Advance Viewing of Pre-recorded Presentations with 60-minute Real-Time/Live Q&A*

### Strand 2:

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

##### *Scientific Discourse and Argumentation*

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**David McKinney**, University of Nevada, Las Vegas

##### *Towards Improving Science Discussions: A Framework to Guide Instructional Decision Making*

**Emily Reigh**, Stanford University

**Jonathan Osborne**, Stanford University

##### *Using a Discussion Types Framework to Support Collective Sensemaking*

**Benjamin Lowell**, Boston College

**Kevin Cherbow**, Boston College

**Katherine McNeill**, Boston College

##### *Students' Argument Evaluation as an Epistemic and Cognitive Practice*

**Qingna Jin**, University of Alberta

**Mijung Kim**, University of Alberta

##### *Supporting Progressive Discourse in Epistemically Authentic Geoscience Investigations*

**Scott McDonald**, Pennsylvania State University

**Kraig Wray**, Pennsylvania State University

**Jonathan McCausland**, Pennsylvania State University

**Kathryn Bateman**, Temple University

**Amy Pallant**, The Concord Consortium

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

## Program

### Strand 2:

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

##### Related Paper Set

##### **Constructing and Receiving Peer Feedback on Engineering Designs: Student Engagement and Pedagogical Supports**

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

##### **Exploring Peer-Observers' Feedback on Engineering Communication Challenges**

Michelle Jordan, Arizona State University

Mia DeLaRosa, Arizona State University

##### **"I'm Like a Scientist:" Critique Sessions as Spaces of Learning and Identity in Urban Classrooms**

Rasheda Likely, Drexel University

Christopher Wright, Drexel University

Mikhail Miller, Drexel University

##### **Structures of Interaction in Elementary Engineering Peer-to-Peer Feedback**

Nicole Batrouny, Tufts University

##### **Elementary Teachers' Responsiveness to Supporting Students' Engineering Design Feedback**

Jeffrey Radloff, SUNY Cortland

Brenda Capobianco, Purdue University

##### **Towards a More Expansive Framing of Feedback in Elementary Engineering: The Social and Affective Benefits of Asking for and Giving Advice**

Chelsea Andrews, Tufts University

Kristen Wendell, Tufts University

### Strand 3:

#### Science Teaching—Primary School

(Grades preK-6)

##### **Elementary Teachers' Agency, Confidence, and Knowledge**

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

##### **Variations in Rural Elementary Teachers' Confidence and Experience with Computer Science Integration by Teacher Type**

Joseph Brobst, Old Dominion University

Jennifer Maeng, University of Virginia

Joanna Garner, Old Dominion University

##### **What is Necessary beyond Knowledge? Exploring Epistemic Orientation as a Critical Element for Adaptive Expertise**

Jee Kyung Suh, University of Alabama

Jale Dursun, University of Alabama

Catherine Lammert, University of Iowa

Krystal Flantroy, University of Alabama

Eric Akuoko, University of Iowa

Brian Hand, University of Iowa

Gavin Fulmer, University of Iowa

##### **Agency of In-service Elementary Science Teachers during a Global Pandemic**

Anica Miller-Rushing, University of Maine

##### **Science as Thinkable and Doable: The Nature of Elementary Teachers' Professional Agency in High-Needs Schools**

Alison Mercier, University of Wyoming

## Program

### Strand 3:

#### Science Teaching—Primary School

(Grades preK-6)

#### Implementing Elementary Science New Curricula

2:00 pm - 3:00 pm

Advanced Pre-recorded Viewing and Live Q&A

Presider:

**Susanna Hapgood**, University of Toledo

#### STEAM Curriculum Design and Implementation: Understanding Curricular Changes in an Elementary School

**Cassie Quigley**, University of Pittsburgh

**Dani Herro**, Clemson University

**Holly Plank**, University of Pittsburgh

#### Framing Participant Structures for NGSS Teaching: Exploring Tenuous Terrain

**Laura Zangori**, University of Missouri

**Rachael Pinnow**, University of Missouri

#### How Teacher Practices Influence Elementary Students' Social Emotional Learning

**I-Chien Chen**, Michigan State University

**Cory Miller**, Michigan State University

**Tingting Li**, Michigan State University

**Kayla Bartz**, Michigan State University

**Joseph Krajcik**, Michigan State University

**Barbara Schneider**, Michigan State University

#### First Grade Teachers' Uptake of an Integrated Science-Literacy Curriculum in Support of NGSS Instruction

**Ashley Iveland**, WestEd

**Robert Murphy**, RAND

**Alison Billman**, University of California, Berkeley

**Melissa Rego**, WestEd

**Christopher Harris**, WestEd

### Strand 4:

#### Science Teaching—Middle and High School

(Grades 5-12)

#### Pedagogical Content Knowledge

2:00 pm - 3:00 pm

Advanced Pre-recorded Viewing and Live Q&A

Presider:

**Henriette Burns**, Washington State University

#### Biology Teachers' Pedagogical Content Knowledge of Argumentation in China through Rasch Analysis

**Yingzhi Zhang**, Capital Normal University

**Chenyan Liu**, Taiyuan Normal University

#### Interactions between Science Teachers' Pedagogical Content Knowledge and Skills in Their Chemistry Teaching Practice

**Imran Tufail**, University of Waikato

**Chris Eames**, University of Waikato

**Maurice Cheng**, University of Waikato

#### Pedagogical Content Knowledge of Computer Science Teachers for Teaching Algorithms

**Jacqueline Nijenhuis-Voogt**, Radboud University, Nijmegen

**Dürdane Bayram-Jacobs**, Eindhoven University of Technology

**Paulien Meijer**, Radboud University, Nijmegen

**Erik Barendsen**, Radboud University & Open University



## Program

### Strand 4:

#### Science Teaching—Middle and High School

(Grades 5-12)

#### Related Paper Set

#### *How Teachers Navigate Tensions between Enacting Coherent Curriculum Materials and Supporting Students' Epistemic Agency*

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Stina Krist**, University of Illinois at Urbana, Champaign

Discussant:

**Andy Elby**, University of Maryland

#### *Designing Materials for Student Coherence, then Revising for Epistemic Agency: A Case for Epistemic Agency as an Explicit Design Focus*

**Mon Lin Ko**, University of Illinois Chicago

**Barbara Hug**, University of Illinois at Urbana, Champaign

**Stina Krist**, University of Illinois at Urbana, Champaign

#### *Variations in One Teacher's Conceptualization and Support of Students' Epistemic Agency within and Across Instructional Moments*

**Soo-Yean Shim**, University of Illinois

**Susan Kelly**, University of Illinois

**Daniel Voss**, Northwestern University

**Jacqueline Chis**, University of Illinois at Urbana, Champaign

#### *"Shutting Down" Now to "Open Up" Later: Temporal Tensions in Pedagogical Strategies for Supporting Epistemic Agency*

**Stina Krist**, University of Illinois at Urbana, Champaign

**Nitasha Mathayas**, Indiana University

**Nessrine Machaka**, University of Illinois at Urbana, Champaign

#### *Coordinating Strategic Responsiveness: Building on Student Thinking Over Time through Instructional Design*

**Elizabeth Dyer**, Middle Tennessee State University

### Strand 5:

#### College Science Teaching and Learning

(Grades 13-20)

#### *Educational Reform for Justice and Access*

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Jacquelyn Chini**, University of Central Florida

#### *Teaching- and Research-Focused Faculty: Exploring STEM Instructional Reform in Higher Education*

**Melo-Jean Yap**, San Diego State University

**Felisha Herrera**, San Diego State University

**Gabriela Kovats Sánchez**, San Diego State University

#### *Helping Students Rise to Their Full Potential through a Research Immersive Scholastic Experience in Biology*

**Brittany Smith**, Minnesota State University, Mankato

**David Sharlin**, Minnesota State University, Mankato

**Rachel Cohen**, Minnesota State University, Mankato

**Allison Land**, Minnesota State University, Mankato

#### *Supporting Transfer Students Career Development through Science/Engineering Internships: A Narrative Case Study*

**Shana Mcalexender**, North Carolina State University

**Margaret Blanchard**, North Carolina State University

**Richard Venditti**, North Carolina State University

#### *An Exploration of Perceptions of Justice in a Career-Forward Problem-Based Chemistry Laboratory*

**Corey Payne**, University of Florida

**Kent Crippen**, University of Florida

## Program

### **Strand 6:**

#### **Science Learning in Informal Contexts**

##### **Social Justice and Citizen Science**

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Ayelet Baram-Tsabari**, Technion, Israel  
Institute of Technology

##### **Developing Sense of Place in Urban Youth through Citizen Science**

**Cornelia Harris**, University at Albany, SUNY  
**Alandeom Oliveira**, University at Albany, SUNY  
**James Wager**, University at Albany, SUNY

##### **The Impacts of Informal Science Education on the Science Identity of Students of Color**

**Roya Heydari**, Columbia University  
**Felicia Mensah**, Columbia University

##### **Examining Youth Perceptions of Citizen Science and Their Agency with Science during Citizen Science Programs**

**Maryam Ghadiri**, University of California-Davis  
**Heidi Ballard**, University of California-Davis  
**Ana Benavides Lahnstein**, The Natural History Museum, London, UK  
**Sasha Pratt-Taweh**, The Natural History Museum, London, UK  
**Julia Lorke**, Wissenschaft im Dialog, Berlin, Germany  
**Jessie Jennewein**, Natural History Museum of Los Angeles County  
**Annie Miller**, California Academy of Sciences, San Francisco  
**Lila Higgins**, Natural History Museum of Los Angeles County  
**Rebecca Johnson**, California Academy of Sciences  
**Lucy Robinson**, The Natural History Museum, London

##### **Youth-Initiated Moments Seeking Justice: Making Visible Youth's Imaginaries for STEM Learning**

**Won Kim**, Michigan State University  
**Angela Calabrese-Barton**, University of Michigan  
**Sinead Brien**, Michigan State University  
**Louise Archer**, University College London

### **Strand 7:**

#### **Pre-service Science Teacher Education**

##### **Culture and Language Considerations in Pre-service Programs**

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Justina Ogodo**, Baylor University

##### **Proposing Translanguaging Pedagogical Competencies for Enhancing Science Learning for Bilingual Students: A Meta-Synthesis Approach**

**Noushin Nouri**, University of Texas Rio Grande Valley  
**Alma Rodriguez**, University of Texas Rio Grande Valley  
**Maryam Saberi**, University of Shiraz

##### **Secondary Science Pre-service Teachers' Enactment of Language- and Literacy-Integrated Science Instruction in Linguistically Diverse Classrooms**

**Alexis Rutt**, University of Virginia  
**Frackson Mumba**, University of Virginia

##### **Virtual STEM Microteaching Experiences for Pre-service Teachers: A Community Cultural Wealth Approach**

**Vanessa Grady**, Georgia State University  
**Natalie King**, Georgia State University

### **Strand 7:**

#### **Pre-service Science Teacher Education**

##### **Early Childhood and Elementary Pre-service Teachers**

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Stephen Thompson**, University of South Carolina

## Program

### **Pinterest as a Resource for Elementary Science Teachers: A Comparison of Two Science Topics**

**Ryan Nixon**, Brigham Young University  
**Shannon Navy**, Kent State University

### **Developing Perceptions about Science in Pre-service Early Childhood Educators**

**Bridget Miller**, University of South Carolina  
**Benjamin Wiles**, Clemson University

### **Engineering Practices as Fertile Ground for Pre-service Teachers' Development of Pedagogical Beliefs**

**Gozde Tosun**, Pennsylvania State University  
**Amy Farris**, Pennsylvania State University

### **"Can We Add A Goal?" Examining Unintended Teacher Learning within an Instructional Coaching Partnership**

**Amanda Tompkins**, University of South Florida  
**Karl Jung**, University of South Florida

## **Strand 8:**

### **In-service Science Teacher Education**

#### **Related Paper Set**

#### ***In-service Teachers Engaging in Science and Engineering Practices***

**2:00 pm - 3:00 pm**

*Advanced Pre-recorded Viewing and Live Q&A*

#### **Changes in Teacher Self-efficacy and Beliefs: The Impact of an Engineering Research Experience for Teachers (RET) Program on Science Teachers**

**Tiffany Lewis**, Pennsylvania State University  
**Amber Cesare**, Pennsylvania State Center for Science and the Schools  
**Kathleen Hill**, Pennsylvania State University

#### **Supporting Teachers to MASTER Developing Practices-Based Curriculum**

**Jennifer Jackson**, Pennsylvania State University  
**Kathleen Hill**, Pennsylvania State University

### **Advancing Teachers' Curricular Integration of Mathematics and Computational Thinking through a Research Experience Program**

**Amber Cesare**, Pennsylvania State Center for Science and the Schools  
**Kathleen Hill**, Pennsylvania State University  
**Tiffany Lewis**, Pennsylvania State University  
**Amy Farris**, Pennsylvania State University  
**Courtney Nagle**, Pennsylvania State University, Behrend

### **K-12 Teachers use Authentic STEM Practices in the Classroom Based on Research Immersion Experiences**

**Matthew Johnson**, Pennsylvania State University  
**Kathleen Hill**, Pennsylvania State University

## **Strand 10:**

### **Curriculum and Assessment**

#### **Related Paper Set**

#### ***Design, Development, and Testing of a Media-Rich Three-dimensional Middle School Science Unit***

**2:00 pm - 3:00 pm**

*Advanced Pre-recorded Viewing and Live Q&A*

#### **Developing a unit designed for NGSS: Successes and Lessons Learned in the Development Process**

**Lindsey Mohan**, BSCS Science Learning

#### **Developing a Media-Rich Digital Unit to Support 3D Teaching and Learning**

**Catherine Stimac**, Oregon Public Broadcasting  
**Heather Young**, Oregon Public Broadcasting

#### **Professional Development: Moving Beyond the Curriculum**

**Betty Stennett**, BSCS Science Learning

#### **A Quasi-experimental Study of the Efficacy of a Designed-for-NGSS Unit and PD**

**Susan Kowalski**, BSCS Science Learning  
**Jeffrey Snowden**, BSCS Science Learning  
**Lisa Carey**, BSCS Science Learning

## Program

### Strand 11:

#### **Cultural, Social, and Gender Issues** **Culturally Responsive Instruction**

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Noemi Waight**, University of Buffalo

#### **A Case Study of a Teacher Attempting to Introduce a Culturally Relevant Approach to Physics**

**Clausell Mathis**, University of Washington

**Sherry Southerland**, Florida State University

#### **Science Education in a Diaspora Refugee Community: Perspectives from Two Tibetan Science Teachers**

**Ngawang Gonsar**, Gustavus Adolphus College, University of Minnesota

#### **The Relationship between Secondary Science Teachers' Self-efficacy for Culturally Responsive Instruction and their Observed Practices**

**Zachary Stepp**, University of Florida

**Julie Brown**, University of Florida

#### **The Emphasis on Culturally Responsive Instruction in NSTA Science Scope and The Science Teacher Journals**

**Michelle Joyce**, University of Florida

**Julie Brown**, University of Florida

### Strand 12:

#### **Technology for Teaching, Learning, and Research**

#### **Capitalizing on the Intersections of Pop Culture and Science**

2:00 pm - 3:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Denise Bressler**, East Carolina University

#### **Forecasting Community Development and Sustainability on Social Media with Topic Modeling**

**Lisa Lundgren**, Utah State University

**Richard Bex**, University of Florida

**Kent Crippen**, University of Florida

**Jennifer Bauer**, University of Michigan

#### **Visual Literacy in Chemistry: Infographic vs. Comic Book**

**Christopher Preece**, University of Kentucky

#### **Using Flipgrid as a Reflection Tool to Capture Students' Design Thinking in a Second-Grade Science Classroom**

**Sarah Guffy**, University of South Alabama

**Joe Gaston**, University of South Alabama

**Angela Rand**, University of South Alabama

#### **Imagining Robots of the Future: Examining Sixth-Graders' Perceptions of Robots through Their Literary Products**

**Changzhao Wang**, University of Miami

**Ji Shen**, University of Miami

**Hua Ran**, University of Miami



## Program

### Research Interest Groups (RIGs) Meetings

3:15 pm - 4:15 pm | *Real-Time/Live*

#### Latino/a (LARIG)

Presider:

**Regina Surriel**, LARIG Chair, Valdosta State University

During our business meeting, we seek to plan future presentation formats, themes associated with presentations and online discussions, establish a system for collaborating on paper sets and workshops, update member contact lists, and discuss leadership roles and budget.

### NETWORKING/SOCIAL CONCURRENT SESSIONS

3:30 pm - 5:30 pm | *Real-Time/Live*

#### ***Aikido–(and Physics!) Inspired Breathing, Balance, Stretching, and Movement***

*(duration: 30 min)*

Organizer:

**Cathy Cullicott**, Arizona State University

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

#### ***CADASE Graduate Student Fireside Chat: Navigating Academe with Success***

*(duration: 60 min)*

Organizer:

**Olayinka Mohorn**, University of Illinois Chicago

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

#### ***The CADASE Social: Intriguing Scenes from Movies and TV Shows***

*(duration: 45 min)*

Organizer:

**Shari Watkins**, American University

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

#### ***Knitting Circle (all levels welcome)***

*(duration: 60 min)*

Organizer:

**Erin Furtak**, University of Colorado Boulder

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

#### ***Learning Science in the Schoolyard—Centering Equity***

*(duration: 60 min)*

Organizer:

**Roberta Howard Hunter**, Michigan State University

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

## Program

### **Let's Escape Together!**

(duration: 60 min)

Organizer:

**Denise Bressler**, East Carolina University

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

### **NSF Funding Programs and More**

(duration: 120 min)

Organizer:

**Xiufeng Liu**, National Science Foundation

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

### **NARST Fellows Award Program**

(duration: 45 min)

Organizer:

**Noemi Waight**, University at Buffalo

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

### **NARST Has Talent: An April FARSE**

(duration: 45 min)

Organizers:

**Meg Blanchard**, NC State University

Sherry Southerland, Florida State University

A digital reincarnation of FARSE, this year's "Talent" show will feature a competition of creative 3-minute video products competing for "likes" to make it into the final online showcase sent out via the NARST listserv. A farcical look at academic life through the eyes of our members in the context of COVID-19, pets, children, backyard activities, new hobbies, exercise, musical ventures, and academic pursuits.

### **"PeTagogy": Meeting pets of NARST members**

(duration 30 min)

Organizer:

**Sahar Alameh**, University of Kentucky

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

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

#### **Publishing, Reviewing, and Writing for JRST**

**4:15 pm - 5:45 pm | Real-Time/Live**

Presenters:

**Felicia Mensah**, Teachers College, Columbia University

**Troy Sadler**, University of North Carolina, Chapel Hill

**Doug Lombardi**, University of Maryland, College Park

**Christine McDonald**, Griffith University

## Program

### POSTER SESSION #1

Thursday 8:00 am - Friday 7:00 am

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

#### Strand 1: POSTERS

##### Consistency and Contradiction

**Cesar Delgado**, North Carolina State University  
**Gary Wright**, North Carolina State University

##### Socioscientific Issues to Engage Middle School Students in Claims, Evidence and Reasoning

**Sissy Wong**, University of Houston  
**Jie Zhang**, University of Houston  
**Jennifer Donze**, University of Houston  
**Ma Glenda Wui**, University of Houston  
**Jackie Relyea**, University of North Carolina  
**Araceli Enriquez**, University of Houston

##### The Role of Confusion in Conceptual Change Scenarios for Pre-service Science Teachers

**Hye-Eun Chu**, Macquarie University  
**Mariya Pachman**, Florida University  
**Lori Lockyer**, University of Technology Sydney

#### Strand 2: POSTERS

##### Negotiation to Consensus: Argumentation about Climate Change Evidence and Explanations

**Donna Governor**, University of North Georgia  
**Doug Lombardi**, University of Maryland, College Park  
**Catie Duffield**, Temple University

##### Metacognitive Knowledge of Science University Students: The Relationship with Critical Thinking Skills

**Takuya Matsuura**, Hiroshima University

##### Introduce a Coding Instrument for the Quantitative Analysis of Teachers' Questioning Chains

**Jianlan Wang**, Texas Tech University  
**Yuanhua Wang**, West Virginia University  
**Lu Guo**, Texas Tech University  
**Yanhong Guo**, Texas Tech University  
**Stacey Sneed**, Texas Tech University  
**Kyle Wipfli**, Texas Tech University

##### Computational Thinkers in Unplugged Pre-K Science Classrooms

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

##### The Effects of Flipped Classrooms on K-16 Students' Science and Math Achievement: a Systematic Review

**Gary Wright**, North Carolina State University  
**Soonhye Park**, North Carolina State University

##### Using Social Network Analysis to Understand Longitudinal Change in Small Groups

**Brock Couch**, Middle Tennessee State University  
**Grant Gardner**, Middle Tennessee State University

##### Students' Understandings and Experiences of Creativity and Risk in Science Learning

**Claire Paton**, University of Calgary  
**Jennifer Adams**, University of Calgary  
**Kristal Turner**, University of Calgary

##### Impact of Argumentation on Students' Informal Reasoning about Socio-Scientific Issues

**Ihsan Ghazal**, Texas Christian University  
**Saouma Boujaoude**, American University of Beirut

## Program

### **When an NGSS-Friendly Genetics Curriculum Unit Goes Online: A Naturalistic Study**

**Ann Lambert**, University of Utah  
**Dina Drits-Esser**, University of Utah  
**Sheila Homburger**, University of Utah  
**Kristin Fenker**, University of Utah  
**Molly Malone**, University of Utah  
**Louisa Stark**, University of Utah

### **Translanguaging from the Perspective of Disciplinary Science**

**Ashlyn Pierson**, Ohio State University  
**Scott Grapin**, University of Miami

### **Strand 3: POSTERS**

#### **Engaging Students in PBL in Science Classrooms: The Challenges for Chinese Primary Teachers**

**Jing Lin**, Beijing Normal University  
**Liang Zeng**, Beijing Normal University  
**Huilei Han**, Beijing Normal University  
**David Fortus**, Weizmann Institute of Science  
**Knut Neumann**, Leibniz-Institute for Science and Mathematics Education

#### **Declarative Knowledge about the NGSS Among Early Childhood Educators Across a Year of Professional Development**

**Susanna Hapgood**, The University of Toledo  
**Grant Wilson**, The University of Toledo  
**Jeanna Heuring**, Keene State College  
**Charlene Czerniak**, The University of Toledo

#### **Science Visual Literacy Practices of Current Elementary Teachers**

**Michele Colandene**, George Mason University

#### **Using Online Interventions to Address Summer Learning Loss in Rising Sixth-Graders**

**Bob Shaw**, Mary Institute and St. Louis Country Day School  
**Scott Osborne**, Clayton School District

### **Strand 4: POSTERS**

#### **A Storied Discipline: Exploring a Place for Narrative in Science Education**

**Matthew Kloser**, University of Notre Dame  
**Michael Szopiak**, University of Notre Dame  
**Catherine Wagner**, University of Notre Dame

#### **Characteristics of Science Instructional Practices used by Arab Science Teachers in Israel**

**Iyad Dkeidek**, Al-Qasimi Academic College for Teachers and Al-Quds University  
**Nael Eysa**, Al-Qasimi Academic College for Teachers

#### **Teacher Impacts on Middle School Students' Understanding of Lunar Phases: A Quantitative Inquiry**

**Merryn Cole**, University of Nevada Las  
**Jennifer Wilhelm**, University of Kentucky

#### **The Progression of Preservice and In-service Science Teachers' Abilities to Teach Inquiry-Based Science**

**Jeanette Bartley**, Illinois Institute of Technology  
**Judith Lederman**, Illinois Institute of Technology

#### **Evaluating intercultural STEAM Program in Australia-Korea Contexts: Teachers' Attitudes and Beliefs Towards STEAM**

**Hye-Eun Chu**, Macquarie University  
**Sonya Martin**, Seoul National University

#### **The MakerSTEM Project: Building Secondary Educator's Capacity Engage Youth in Independent, Place and Community-Based, Scientific Inquiry**

**Judith Lemus**, University of Hawaii at Manoa  
**Tara O'Neill**, University of Hawaii at Manoa

#### **Revisiting the Relationship between Science Teaching Practice and Scientific Literacy from a Global Perspective**

**Hye Sun You**, Arkansas Tech University  
**Sunyoung Park**, California Lutheran University

#### **Investigating Groundwater: 7th-Grade Students' Mapping Models to Phenomena**

**Holly White**, University of Nebraska, Lincoln  
**Cory Forbes**, University of Nebraska, Lincoln

## Program

### **Exploring the Intersection of Data Practices and Computational Thinking: A Literature Review**

**Laura Laclede**, George Mason University

### **Knowledge Transfer: Instructional Approaches for Helping Students Understand the Deep Structure of Scientific Problems**

**Hong Tran**, University of Georgia

**Deborah Tippins**, University of Georgia

### **Involvement of Industry in STEM Education in South Africa**

**Magdeline Stephen**, Wits School of Education

**Emmanuel Mushayikwa**, University of the Witwatersrand

## **Strand 5: POSTERS**

### **Manifestation of Antisocial and Prosocial Power: Teacher Authority in Undergraduate Student Research Field Study Experiences**

**Patricia Patrick**, Columbus State University

### **Designing Professional Development of Higher Education Science Faculty Which Impacts Student Learning**

**Peter Cormas**, California University of Pennsylvania

**Louise Nicholson**, California University of Pennsylvania

**Kyle Fredrick**, California University of Pennsylvania

**Gregg Gould**, California University of Pennsylvania

### **The Impact of Biology Instruction on Evolution Acceptance and Conflict in Underrepresented Minority Undergraduates**

**Gena Sbeglia**, Stony Brook University

**Ross Nehm**, Stony Brook University

### **Training Scientists to Teach: Lessons Learned from Course Participant Reflections**

**Sara Petchey**, University of Zurich

**Kai Niebert**, University of Zurich

### **Examining the Reasons Women Choose and Stay in a Geology Major: A Qualitative Multi-Case Analysis**

**Ron Gray**, Northern Arizona University

**Alexis Riche**, Northern Arizona University

**Isabel Shinnick-Gordon**, Northern Arizona University

**James C. Sample**, Northern Arizona University

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

**James Nyachwaya**, North Dakota State University

**Krystal Grieger**, North Dakota State University

### **Everything is Connected: Building Preservice Elementary Teachers' Content Knowledge through Educative Curriculum Materials**

**Brooke Whitworth**, Clemson University

**Lauren Simpson**, Center for Mathematics & Science Education

**Whitney Jackson**, University of Mississippi

**Julie James**, University of Mississippi

**Alice Steimle**, University of Mississippi

### **Examining Pre-service Teachers' Scientific Reasoning Skills when Learning to Attend to Students' Scientific Thinking**

**Andrea Phillips**, Indiana University, Bloomington

**Meredith Park Rogers**, Indiana University

### **Undergraduate Engineering Students' Value Beliefs for Modeling Problems in Chemistry**

**Lorelie Imperial**, University of Florida

**Kent Crippen**, University of Florida

**Charlotte Bolch**, University of Florida

**Corey Payne**, University of Florida

### **Building Student Confidence through Micro-Internships at a Central California Community College**

**Zoe Buck Bracey**, BSCS Science Learning

**Monica Weindling**, BSCS Science Learning

**Mohammed Yahdi**, Hartnell Community College

### **Emergency Response Teaching Online: STEM Faculty Perceptions and the Zone of Proximal Development**

**Lynn Tashiro**, California State University, Sacramento

**Mary McCarthy Hintz**, Sacramento State University

**Judith Kusnick**, California State University, Sacramento

### **Distinct Role of Peer Effects and Sense of Belonging in Student Socialization and College Success**

**Narmin Ghalichi**, Bowling Green State University

**Clare Barratt**, Bowling Green State University

**Moira Van Staaden**, Bowling Green State University

## Program

### Strand 6: POSTERS

#### **Navigating a STEM Learning Ecosystem: Obstacles and Opportunities**

**Neta Shaby**, Oregon State University  
**Nancy Staus**, Oregon State University  
**Lynn Dierking**, Oregon State University  
**John Falk**, Institute for Learning Innovation

#### **Who has a Ruler? Parent and Youth Perceptions of Family Science Capital**

**Megan Ennes**, University of Florida  
**M. Gail Jones**, North Carolina State University  
**Gina Childers**, Texas Tech University  
**Katherine Chesnutt**, North Carolina State University  
**Emily Cayton**, Campbell University

#### **Exploring the Presentation of Climate Change through Virtual Aquarium Exhibits**

**Dominique Ocampo**, Texas State University  
**Jenn Idema**, Texas State University  
**Kristy Daniel**, Texas State University

#### **Peer-Learning Research Community: An Investigation into the Effects on High School Students' Identity in Research**

**Ben Koo**, University of California, Berkeley  
**Shruti Bathia**, University of California, Berkeley  
**Linda Morell**, University of California, Berkeley  
**Perman Gochyyev**, University of California, Berkeley  
**Mark Wilson**, University of California, Berkeley  
**Rebecca Smith**, University of California, San Francisco

#### **Parents Attitudes Towards Wi-Fi In Schools: The Role of Education in Engagement with Real-Life SSIs**

**Keren Dalyot**, Technion, Israel Institute of Technology  
**Ayelet Baram-Tsabari**, Technion, Israel Institute of Technology

#### **The Weight of Motivational Factors on Undergraduate Students' Decision to Join Stem Youth-Based Programming**

**Alexandria Muller**, University of California, Santa Barbara  
**Kassandra Ortega**, University of California, Santa Barbara  
**Devon Christman**, University of California, Santa Barbara  
**Diana Arya**, University of California, Santa Barbara  
**Sarah Hirsch**, University of California, Santa Barbara

#### **Informal Learning in Social Media? Comparing a Popular COVID-19 Podcast with its YouTube Comments**

**Anna Beniermann**, Humboldt-Universität zu Berlin  
**Alexander Bergmann**, Leipzig University  
**Alexander Büssing**, Leibniz University Hannover; Institute of Natural Science Education

#### **Identity Across the STEM Ecosystem**

**Katie Wade-Jaimes**, University of Nevada, Las Vegas  
**Kate Ayers**, St. Jude Children's Research Hospital  
**Robyn Penella**, St. Jude Children's Research Hospital

#### **Exploring the Relationship between Personal Scientific Epistemologies and Free-Choice Learning Experiences**

**Allison Metcalf**, Florida State University  
**Katrina Roseler**, Chaminade University  
**Sherry Southerland**, Florida State University

### Strand 7: POSTERS

#### **Revisiting the Elementary Science Partnership: Adjusting to Shifting Challenges in a Pre-service School-University Collaboration**

**Jerome Shaw**, University of California, Santa Cruz  
**Samuel Severance**, University of California, Santa Cruz

#### **Mapping Community Assets in Preservice Secondary Science Education**

**Kirsten Mawyer**, University of Hawaii  
**Heather Johnson**, Vanderbilt University

#### **Researching Teacher Self-efficacy: Linking Self-efficacy to Teacher Effectiveness, Persistence and Retention**

**Sarah Haines**, Towson University  
**Deepika Menon**, University of Nebraska, Lincoln  
**Jeanna Wieselmann**, Southern Methodist University  
**Sumreen Asim**, Indiana University Southeast

#### **Preservice Teachers' Unpacking Community Cultural Wealth with 5th Graders Learning about the COVID-19**

**Christina Restrepo Nazar**, California State University, Los Angeles  
**Jamie Marsh**, California State University, Los Angeles  
**Socorro Orozco**, California State University, Los Angeles

Thursday, April 8, 2021

## Program

### **Convergence of Scientific and Mathematical Modeling: Investigating Elementary Pre-service Teacher Interest and Confidence in STEM**

Andrew Gilbert, George Mason University  
Jennifer Suh, George Mason University

### **Linking Pedagogical Content Knowledge and Teaching Practice in Science Teacher Education: A Systematic Literature Review**

Lukas Mientus, University of Potsdam  
Anne Hume, University of Waikato  
Peter Wulff, University of Potsdam  
Andreas Borowski, University of Potsdam

### **How Effective Is Feedback regarding Pre-service Teachers' Representational Competence?**

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

### **Examining PCK Readiness from Participating in a Co-plan, Co-teach, and Co-reflect Early Practicum Experience**

Steven Newman, Indiana University  
Meredith Park Rogers, Indiana University

### **Exploring Teacher Candidates' Knowledge of Assessment through Science Journals**

E.J. Bahng, Iowa State University

### **Learning to Listen: Cultivating Pre-service Teachers' Attunement and Responsiveness to Student Thinking**

Shannon Davidson, Florida State University  
Lama Jaber, Florida State University  
Allison Metcalf, Florida State University

### **Perspectivization: Empowering, Evoking and Revolutionizing Science Teacher Education for Social Justice**

Christina Restropo Nazar, California State University, Los Angeles  
Jose Martinez Hinestroza, Texas State University

## I DO, AND I UNDERSTAND

Helping Young Children Discover  
Science and Mathematics



**Robert Louisell**

with special guest chapters by  
**Stephen Hornstein and Peter Frost**

I hear, and I forget.  
I see, and I remember.  
I do, and I understand.

\*Ancient Asian Proverb.



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## Program

### POSTER SESSION #2

FRIDAY, 8:00 am - SATURDAY, 7:00 am

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

### Author-Scheduled, 30-minute Q&A Sessions #2

Presenters pre-record their presentations and schedule a 30-minute block (like "office hours") for Q&A. Attendees view the recorded presentations in advance of the Q&A. Scheduled times for Q&A are listed at the end of the conference program on page 120. If not listed, then please consult program addendum/changes.

### Research Interest Groups (RIGs) Meetings

8:30 am - 9:30 am | *Real-Time/Live*

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

At the 2021 Business Meeting, the RIG members will discuss the following items: a) Updates on membership (100+ members), listserv, website; b) Discussion on NARST strands and involvement of the ENE-RIG; c) Plans for collaborative paper sets, symposiums, and panels; and d) Updates on leadership team, elections, roles, and budget.

Presiders:

**Kristina Tank**, Iowa State University

**Anne Leak**, High Point University

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

At the 2021 business meeting, ISK members will discuss the following items: developing ideas and activities to engage with Indigenous Tribes and the NARST, developing ideas and activities to promote visions and missions of the ISK RIG more globally, developing priorities on how to use funds donated to

ISK by NARST members, update on the edited book series on ISK, and any other ISK RIG related business the membership needs to discuss.

Presiders:

**Bhaskar Upadhyay**, University of Minnesota

**Stacey Britton**, University of West Georgia

**Sharon Nelson-Barber**, WestEd

**Rouhollah Aghasaleh**, Humboldt State University

### NETWORKING/SOCIAL CONCURRENT SESSIONS

8:30 am - 9:30 am | *Real-Time/Live*

#### Art-Based Social Meet-Up

(duration: 30 min)

Organizer:

**Katia Kromann Nielsen**, University of Copenhagen

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

#### Drop Your Research/Theory/Test Tube Like it's Hot

(duration: 60 min)

Organizers:

**Noemi Waight**, University at Buffalo

**Jennifer Adams**, University at Calgary

This session will provide a space for informal community building. It will involve a jam session that will feature an eclectic musical lineup from all over the world. The goal here is to provide a space to connect with other NARST members, decompress, and dance the time away. Since the act of dancing is related to spatial awareness, raises the heart rate, and results in the release of endorphins, we hypothesize that dancing in community will inform positive vibes for NARST'ers.



## Program

### CONCURRENT SESSION #6

**Special Time Slot** | 7:15 am - 8:15 am

*Advance Viewing of Pre-recorded Presentations with 60-minute Real-Time/Live Q&A*

#### Strand 5:

#### College Science Teaching and Learning

(Grades 13-20)

**Special Time Slot** | 7:15 am - 8:15 am

#### **Pedagogy and Partnerships for the Modern STEM College Classroom**

7:15 am - 8:15 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Emily Walter**, California State University, Fresno

#### **Revision as an Essential Step in Modeling Cellular Respiration System Dynamics**

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

**Tomáš Helikar**, University of Nebraska-Lincoln

**Joseph Dauer**, University of Nebraska-Lincoln

#### **Impacts of Inquiry-Based Teaching on Undergraduate Students' Engagement in Science and Environmental Awareness**

**Ya-Chun Chen**, National Chiao Tung University

**Zuway-R Hong**, Kaohsiung Medical University

**Huann-Shyang Lin**, National Sun Yat-Sen University;  
Australian Catholic University

#### **Enacting a Persona Strategy in Knowledge Construction to Elicit Epistemic Goals and Support Epistemic Agency**

**Heesoo Ha**, Seoul National University

#### **Comparing Learning Assistant and Professor Instructional Moves in an Undergraduate Engineering Science Class**

**Isabella Stuopis**, Tufts University

**Kristen B. Wendell**, Tufts University

**Hoda Koushyar**, Tufts University

#### Strand 6:

#### Science Learning in Informal Contexts

**Special Time Slot** | 7:15 am - 8:15 am

#### **Informal Science Learning in Museums and other Places**

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Ran Peleg**, University of Southampton

#### **Assessing Participant Learning Outcomes in Science Museums: Building Capacity for Collective Evaluation**

**K. C. Busch**, North Carolina State University

**Lynn Chesnut**, North Carolina State University

**Regina Ayala Chavez**, North Carolina State University

**Lincoln Larson**, North Carolina State University

**Kathryn Stevenson**, North Carolina State University

**Charles Yelton**, North Carolina Museum of Natural Sciences

**Nicole Coscolluela**, North Carolina Museum of Natural Sciences

#### **Online Learning in Museums and the influence of COVID-19 Museum Closures**

**Megan Ennes**, University of Florida

#### **Characteristics of Students' Abductive Reasoning According to Scientific and Historical Knowledge in Deoksugung Palace, Korea**

**Jooyoung Jeon**, Ewha Womans University

**Donghee Shin**, Ewha Womans University

#### **Empowering Publics to Engage with Socio-Scientific Issues in Science Exhibitions: Mental Health-Mind Matters**

**Ana Maria Navas Iannini**, University of Los Andes

**Erminia Pedretti**, University of Toronto

**Kristen Schaffer**, University of Toronto

**Daniel Atkinson**, University of Toronto

## Program

### Strand 10:

#### Curriculum and Assessment

*Special Time Slot* | 7:15 am - 8:15 am

#### *Automated Scoring and Machine Learning in Science Assessment*

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Shahar Abramovitch**, University of Massachusetts, Boston

#### *When Can Multinomial Logistic Regression Best Classify Pre-service Physics Teachers' Written Reflections?*

**Peter Wulff**, University of Potsdam  
**David Buschhüter**, University of Potsdam  
**Anna Nowak**, University of Potsdam  
**Andreas Borowski**, University of Potsdam

#### *Towards Automated Formative Assessment of Students' Scientific Explanations in Biology Using Natural Language Processing*

**Moriah Ariely**, Weizmann Institute of Science  
**Tanya Nazaretsky**, Weizmann Institute of Science  
**Giora Alexandron**, Weizmann Institute of Science

#### *Automated Scoring of Chinese Grades 7-9 Students' Competence in Interpreting and Arguing from Evidence*

**Cong Wang**, Beijing Normal University  
**Xiufeng Liu**, State University of New York at Buffalo  
**Lei Wang**, Beijing Normal University  
**Ying Sun**, State University of New York at Buffalo  
**Jian Wang**, Beijing Normal University  
**Shan Lin**, Beijing Normal University

#### *Applying Machine Learning to Automatically Evaluate Student Scientific Modeling Competence*

**Xiaoming Zhai**, Michigan State University  
**Jie Yang**, Beijing Normal University  
**Tingting Li**, CREATE for STEM Institute  
**Peng He**, Michigan State University  
**Joseph Krajcik**, Michigan State University

### CONCURRENT SESSION #6

9:30 am - 10:30 am

*Advance Viewing of Pre-recorded Presentations with 60-minute Real-Time/Live Q&A*

### Strand 1:

#### Science Learning: Development of Student Understanding

#### *Multiple Ways of Representing Knowledge*

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Anita Schuchardt**, University of Minnesota

#### *A Framework to Foster Knowledge Acquisition Processes in STEM and Computing Education*

**Burkhard Priemer**, Humboldt-Universität zu Berlin  
**Annette Upmeier Zu Belzen**, Humboldt-Universität zu Berlin

#### *Writing in Science: A Tool for Personal and Three-dimensional Sensemaking*

**Kirsten Edwards**, Michigan State University  
**Charles Anderson**, Michigan State University

#### *A New Perspective on Multimodality in Science Learning and Teaching*

**Ayca Fackler**, University of Georgia

## Program

### Strand 1:

#### Science Learning: Development of Student Understanding

##### *Student Thinking about Genetics and Evolution*

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Cari Herrmann Abell**, BSCS Science Learning

##### **Mechanistic Reasoning about Gene Environment Interactions**

**Michal Haskel Ittah**, Weizmann Institute of Science  
**Ravit Golan Duncan**, Rutgers University

##### **Teleology and Essentialism in the Context of Genetics: A Fresh Look at Students' Conceptions**

**Florian Stern**, University of Geneva  
**Kostas Kampourakis**, University of Geneva  
**Marine Delaval**, Université de Lille  
**Andreas Mueller**, University of Geneva

##### **Learning about Evolution: An Intervention Study on the Elucidation of Misconceptions and Context-Related Surface Features**

**Helena Aptyka**, University of Cologne  
**Victoria Hollmann**, University of Cologne  
**Daniela Fiedler**, Kiel University  
**Jörg Großschedl**, University of Cologne

##### **Characterizing Students' Use of Mechanistic Reasoning to Explain Allele Relationships**

**Gur Livni Alcasid**, Weizmann Institute of Science  
**Michal Haskel Ittah**, Weizmann Institute of Science

### Strand 2:

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

##### *Research of Primary Science Teaching and Learning in China—The Past and the Future*

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Yang Yang**, Beijing Normal University

Discussant:

**Siqi Li**, Beijing Normal University

Presenters:

**Yang Yang**, Beijing Normal University  
**Siqi Li**, Beijing Normal University  
**Yajie Xin**, Qingdao University  
**Zongfang Zhang**, Qingdao University  
**Yueyuan Meng**, Qingdao University  
**Xinhui Zhou**, Qingdao University

### Strand 2:

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

##### *Interest, Motivation, and Critical Thinking in Science Learning*

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing & Live Q&A*

Presider:

**Sara Samiphak**, University of California, Berkeley

##### **Elementary Student Latent Expectancy-Value-Cost Science Motivation Classes and Their Association with Science Achievement**

**David McKinney**, University of Nevada, Las Vegas

##### **Examining the Predictors of Middle School Students' Interests in Computationally Demanding Science Careers**

**Arif Rachmatullah**, North Carolina State University  
**Madeline Hinckle**, North Carolina State University  
**Danielle Boulden**, North Carolina State University  
**Eric Wiebe**, North Carolina State University

## Program

### **The Effects of Critique-driven Inquiry (CDI) Teaching Intervention on Primary and Secondary School Students' Critical Thinking and Scientific Inquiry Competency**

**Ying-Yan Lu**, Kaohsiung Medical University  
**Zuway-R Hong**, Kaohsiung Medical University  
**Huann-Shyang Lin**, National Sun Yat-Sen University  
**Thomas Smith**, Northern Illinois University  
**Wen-Yi Hsu**, Kaohsiung Medical University

### **An Exploration of Multilevel Effects of Student- and School- Factors on Elementary Students' Attitudes towards Science**

**Shuchen Guo**, Nanjing Normal University  
**Enshan Liu**, Beijing Normal University

### **Strand 3:**

#### **Science Teaching—Primary School**

(Grades preK-6)

#### **Engineering Education in the Primary Grades**

**9:30 am - 10:30 am**

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Laura Zangori**, University of Missouri

#### **To What Extent Does Construction Play Enhance Engineering Thinking and Self-Regulation Capabilities?**

**Ornit Spektor-Levy**, Bar-Ilan University  
**Taly Shechter**, Bar-Ilan University

#### **Elementary Teachers' Scaffolding of Engineering Practices: Issues with "The Engineering Design Process" as Instructional Model**

**Jacob Pleasants**, Keene State College  
**Joanne Olson**, Texas A&M University

#### **Examining Changes in Practitioner Journals Pre- and Post-Covid as a Worked Example**

**Brandi Kamp**, Clemson University  
**Daniel Alston**, University of North Carolina at Charlotte

### **Elementary Teacher Beliefs, Understandings, and Confidence to Integrate Engineering: Implications and Opportunities**

**Whitney McCoy**, University of Virginia  
**Jennifer Maeng**, University of Virginia  
**Amanda Gonczi**, Michigan Technological University  
**Robert Handler**, Michigan Technological University

### **Strand 4:**

#### **Science Teaching—Middle and High School**

(Grades 5-12)

#### **In Search of New Tools for Meaningful Learning in Chemistry—We Stumbled on Culturo-Techno-Contextual-Approach**

**9:30 am - 10:30 am**

*Advanced Pre-recorded Viewing and Live Q&A*

Presenters:

**Adekunle Ibrahim Oladejo**, Lagos State University  
**Ibukunolu Adebisi Ademola**, Lagos State University  
**Peter Okebukola**, Lagos State University  
**Fred Awaah**, University of Professional Studies, Ghana  
**Deborah Oluwatosin Agbanimu**, Lagos State University  
**Franklin Onowugbeda**, Lagos State University  
**Aderonke Foluso Ebisin**, Ogun State Institute of Technology  
**Esther Oluwafunmilayo Peter**, Lagos State University  
**Michael Adelani Adewusi**, Lagos State University  
**Tokunbo Ola Odekeye**, Lagos State University

### **Strand 5:**

#### **College Science Teaching and Learning**

(Grades 13-20)

#### **Rethinking STEM College Course Designs**

**9:30 am - 10:30 am**

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Joshua Reid**, Middle Tennessee State University

#### **Integrating a Real-Life Software Project into a Model-Based Systems Engineering MOOC**

**Hanan Kohan**, Technion, Israel Institute of Technology  
**Niva Wengrowicz**, Technion, Israel Institute of Technology  
**Dov Dori**, Technion, Israel Institute of Technology

## Program

### **Students' and Instructors' Conceptions of Scientific Hypotheses and Predictions: A Case for Closer Scrutiny**

Anupriya Karippadath, Purdue University  
Perion Sharp, Purdue University  
Aya Elhag, Purdue University  
Stephanie Gardner, Purdue University

### **Partnering with Undergraduates to Redesign an Introductory Chemistry Laboratory Course**

Hannah Jardine, The Catholic University of America  
Elizabeth Griffith, University of Maryland

### **How Does the Lack of Effective Training Impact Biology GTAs? A Descriptive Study**

Santiago Ojeda-Ramírez, Universidad de los Andes  
Stephanie Toro, Universidad de los Andes  
Catalina Zuluaga-Arias, Universidad de los Andes

## **Strand 6:**

### **Science Learning in Informal Contexts**

#### **Related Paper Set**

### **Scaling an Effective Analysis-of-Practice PD Program in Four Contexts: Development, Successes, and Challenges**

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

### **Translating and Scaling a Face-to-Face, Video-Based Elementary Science PD Program to an Online Environment**

Susan Kowalski, Biological Science Curriculum Study  
Amy Belcastro, Biological Science Curriculum Study  
Connie Hvidsten, Biological Science Curriculum Study  
Angelina Constantine, University of Minnesota  
Farah Faruqi, University of Minnesota  
Karen Askinas, Biological Science Curriculum Study  
Renee DeVaul, Biological Science Curriculum Study  
Gillian Roehrig, University of Minnesota

### **Adapting and Scaling a Videobased, Analysis-of-Practice PD Program for High School Biology Teachers**

Jody Bintz, Biological Science Curriculum Study  
Connie Hvidsten, Biological Science Curriculum Study  
Cynthia Gay, Biological Science Curriculum Study  
Lacey Eckels, Jefferson County KY Public Schools  
Christopher Wilson, Biological Science Curriculum Study  
Molly Stuhlsatz, Biological Science Curriculum Study

### **Adapting and Scaling the LAST PD Program Conceptual Framework in Preservice Teacher Education Programs**

Abraham Lo, Biological Science Curriculum Study  
Betty Stennett, Biological Science Curriculum Study  
Connie Hvidsten, Biological Science Curriculum Study  
Karen Askinas, Biological Science Curriculum Study

### **Factors that Support and Challenge Scaling of Videobased Analysis-of-Practice PD through K-6 Teacher Leader Development**

Kathleen Roth, Cal Poly Pomona Foundation  
Nicole Wickler, Cal Poly Pomona  
Rebecca Eddy, Cobblestone Applied Research and Evaluation, Inc.

## **Strand 7:**

### **Pre-service Science Teacher Education**

### **Identity Development in Science Teachers**

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

Frackson Mumba, University of Virginia

### **Challenges in Representing Science Teacher Identity in Classroom-Based Science Formative Assessments**

Kristen Larson, Columbia University  
Felicia Mensah, Columbia University  
Jessica Riccio, Columbia University

### **"I Wasn't Aware, Until I was Aware": Reflective Practices for Teacher Empowerment**

Elanur Yilmaz, Middle East Technical University  
Elif Sönmez, Kastamonu University

### **Persistence in a STEM Teaching Program: Examining the Effects of Disciplinary Identity and Teaching Identity**

Ingelise Giles, Florida International University  
Nicole Cook, Florida International University  
Zahra Hazari, Florida International University  
Maria Fernandez, Florida International University  
Laird Kramer, Florida International University

## Program

**The Role of Motivation in Pre-service Physics Teachers' Learning to Notice Students' Preconception**

**Martin Schwichow**, PH Freiburg  
**Katharina Hellmann**, University of Education, Freiburg

**Strand 8:**  
**In-service Science Teacher Education**  
**Teacher Engagement and Leadership**

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Douglas Larkin**, Montclair State University

**Which Hat Should I Wear? Examining Teacher Positioning and Engagement in Professional Development**

**Patrick Enderle**, Georgia State University  
**Jennifer Schellinger**, Florida State University  
**Ozlem Akcil Okan**, Florida State University  
**Claudia Hagan**, Georgia State University  
**Samantha Skrob**, Florida State University  
**Ellen Granger**, Florida State University  
**Todd Bevis**, Florida State University

**Pushing Against the Tides: How Engaging in Research Promotes Teacher Leadership Development**

**Joshua Reid**, Middle Tennessee State University  
**Allison Hardee**, Middle Tennessee State University  
**Brett Criswell**, West Chester University  
**Gregory Rushton**, Middle Tennessee State University

**Curriculum-Based Professional Development to Support Teachers' Vision of Recent Shifts in Science Instruction**

**Katherine McNeill**, Boston College  
**Renee Affolter**, Boston College  
**Benjamin Lowell**, Boston College  
**Casandra Gonzalez**, Boston College  
**Kevin Cherbow**, Boston College

**Job Embeddedness and Professional Support: A Case Study of Science Teacher Retention in One District**

**Douglas Larkin**, Montclair State University  
**Liz Carletta**, Montclair State University  
**Suzanne Poole Patzelt**, Montclair State University  
**Khadija Ahmed**, The Center for Research and Evaluation on Education and Human Services

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

**Opportunities and Challenges of Facilitating Educators' Understanding and Use of the Next Generation Science Standards**

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Discussant:

**Annemarie Palincsar**, University of Michigan

Presenters:

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

## Program

### Strand 10:

#### Curriculum and Assessment

##### *Teacher Observation and Attitudes Towards Science Evaluation*

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Lori Andersen**, University of Hawai'i, Manoa

##### *Teachers' perspectives of Three-dimensional Formative Assessments Embedded within a Curriculum: An Initial Study*

**Consuelo Morales**, Michigan State University

**Jane Lee**, Michigan State University

**Idit Adler**, Tel Aviv University

**Irene Bayer**, Michigan State University

##### *Empirical Validation of a STEM Observation Instrument Using Exploratory Factor Analysis*

**Joshua Ellis**, Florida International University

**Emily Dare**, Florida International University

**Mark Rouleau**, Michigan Technological University

**Elizabeth Ring-Whalen**, St. Catherine University

**Benny Mart Hiwatig**, University of Minnesota, Twin Cities

**Khomson Keratithamkul**, University of Minnesota

**Feng Li**, Florida International University

**Farah Faruqi**, University of Minnesota

**Preethi Titu**, Kennesaw State University

**Gillian Roehrig**, University of Minnesota

##### *Challenges in Assessing Chemistry Lab Reports Among Pre-service Teachers*

**Yoram Zemel**, Technion, Israel Institute of Technology

**Gabriela Shwartz**, Technion, Israel Institute of Technology

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

##### *Educative Curriculum Materials for Teacher Educators: Building Preservice Teachers' Content Knowledge for Teaching about Matter*

**Deborah Hanuscin**, Western Washington University

**Emily Borda**, Western Washington University

**Josie Melton**, Western Washington University

**Jamie Mikeska**, Educational Testing Service

### Strand 12:

#### Technology for Teaching, Learning, and Research

##### *Virtual Rehearsal Simulations to Explore Elementary Pre-service Teachers' Scientific Discourse Skills*

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Discussant:

**Tammy Lee**, East Carolina University

Presenters:

**Carrie Lee**, East Carolina University

**Mark Newton**, East Carolina University

**Paul Vos**, East Carolina University

**Jennifer Gallagher**, East Carolina University

**Daniel Dickerson**, East Carolina University

### Strand 12:

#### Technology for Teaching, Learning, and Research

##### *Teaching and Learning in the College Science Classroom*

9:30 am - 10:30 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Sally Wu**, Northwestern University

##### *The Design Components of an Online Course in Research Ethics for Science and Engineering Students*

**Miri Barak**, Technion, Israel Institute of Technology

##### *Interrelationship between Perceived Innovative Thinking and Actual Innovation, Online vs. Face-to-Face Learners*

**Miri Barak**, Technion, Israel Institute of Technology

**Maya Usher**, Technion, Israel Institute of Technology

##### *Computational Practices in Science Disciplines*

**Claudia Fracchiolla**, University College Dublin

**Claire Mullen**, University College Dublin

**Maria Mehaan**, University College Dublin

## Program

### Investigating Students' Engagement with Science

#### Videos: An EEG Study

Ido Davidesco, University of Connecticut  
Or Dagan, New York University

### Strand 14:

#### Environmental Education and Sustainability

#### Approaches to Education for Sustainability and Sustainable Development

9:30 am - 10:30 am

Advanced Pre-recorded Viewing and Live Q&A

Presider:

**Shelley Rap**, Weizmann Institute of Science

#### "Speak to Me in Numbers"—Interdisciplinary Teaching of Sustainable Development Goals

**Shelley Rap**, Weizmann Institute of Science  
**Ayshi Sindiani**, Weizmann Institute of Science  
**Moran Bodas**, Sheba Medical Center, Tel Aviv University  
**Sherman Rosenfeld**, Weizmann Institute of Science  
**Alex Friedlander**, Weizmann Institute of Science  
**Ron Blonder**, Weizmann Institute of Science

#### Science Comics for the Public Good: Enhancing Environmental Literacy in/of the Anthropocene

**Katherine Bruna**, Iowa State University  
**Lyric Bartholomay**, University of Wisconsin, Madison  
**Sara Erickson**, Iowa State University

#### Sustainable Development Practices: Impacts of Significant Life Experiences, Knowledge, and Attitudes by Controlling School Environment

**Ridvan Elmas**, Afyon Kocatepe University  
**Savas Pamuk**, Akdeniz University  
**Yakup Saban**, Afyon Kocatepe University

### CONCURRENT SESSION #7

10:45 am - 11:45 am

Advance Viewing of Pre-recorded Presentations with 60-minute Real-Time/Live Q&A

### Strand 2:

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

#### COVID & Social Justice

10:45 am - 11:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presider:

**Gianna Lopez-Colson**, University of Texas, Rio Grande Valley

#### STEM Teachers' Curriculum Practices in Online Teaching during the Covid-19 Pandemic: A Canadian Context

**Isha DeCoito**, Western University  
**Mohammed Estaiteyeh**, University of Western Ontario

#### Empowering K-12 Science Teachers as Equity Advocates and Designers of Transformative Justice-Centered Science Learning Communities

**Tammie Visintainer**, San José State University

#### Ideological Practice in Science Learning: Navigating Complex Terrain of Climate and Politics in U.S. Classrooms

**Lynn Zummo**, University of Utah

#### Has COVID-19 left 3D Science in Elementary School on Life Support?

**Sally Crissman**, TERC  
**Roger Tobin**, Tufts University  
**Sara Lacy**, TERC



## Program

### **Strand 4:**

#### **Science Teaching—Middle and High School**

(Grades 5-12)

#### **Teaching Practices**

10:45 am - 11:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Todd Hutner**, University of Alabama

#### **Testing Two Teacher Preparation Programs for Effective Science Teaching**

**Elizabeth Lewis**, University of Nebraska-Lincoln

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

**Amy Tankersley**, University of Nebraska-Lincoln

**Elizabeth Hasseler**, University of Nebraska-Lincoln

**Anna Rivero**, Seattle University

**Brandon Holding**, University of Nebraska-Lincoln

#### **Evoking Meaning and Connection: Using Awe to Teach Science**

**Julianna Nieuwsma**, North Carolina State University

**Gail Jones**, North Carolina State University

**Kathryn Rende**, North Carolina State University

**Emma Refvem**, North Carolina State University

**Sarah Carrier**, North Carolina State University

**Jill Grifenhagen**, North Carolina State University

**Cesar Delgado**, North Carolina State University

**Pamela Huff**, North Carolina State University

#### **Exploring Interactions between Urban Science Teachers' Epistemological Beliefs and their Understanding of Argumentation**

**Teresa Massey**, Georgia State University

**Patrick Enderle**, Georgia State University

**Desmond Lee**, Georgia State University

**Claudia Hagan**, Georgia State University

### **Strand 6:**

#### **Science Learning in Informal Contexts**

#### **STEM Interest Development**

10:45 am - 11:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Susan Letourneau**, New York Hall of Science

#### **Authentic STEM research, practices of science, and interest development in an informal science education program**

**Bobby Habig**, American Museum of Natural History

**Preeti Gutpa**, American Museum of Natural History

#### **Content, Context, and Structure of Family STEM Conversations and Their Influence on STEM Identity**

**Heidi Cian**, Florida International University

**Remy Dou**, Florida International University

#### **Parent Gender as a Contributing Factor in the Development of College Students' STEM Identity**

**Sheila Castro**, Florida International University

**Heidi Cian**, Florida International University

**Remy Dou**, Florida International University

#### **Integrating Authentic Learning with Career Role Models to Promote Student Interest in Biosciences**

**Stephanie Couch**, Massachusetts Institute of Technology

**Melanie Kalainoff**, Kalainoff Consulting and Research, LLC

**Leigh Estabrooks**, Lemelson-MIT Program

**Helen Zhang**, Boston College

**Anthony Perry**, Lemelson-MIT Program

**Alazar Ayele**, Biogen Community Lab, Biogen Inc.

**Amanda Marvelle**, Biogen Community Lab, Biogen Inc.

**Connor Hanley**, Biogen Community Lab, Biogen Inc.

**Alex Cameron**, Biogen Community Lab, Biogen Inc.

## Program

### Strand 7:

#### Pre-service Science Teacher Education

##### *Development of Pedagogy and Practice of Pre-service Teachers*

10:45 am - 11:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Karin Lohwasser**, University of California, Santa Barbara

##### *Examining Asset and Deficit Perspectives of Preservice Science Teachers' Knowledge and Learning*

**Ron Gray**, Northern Arizona University  
**Scott McDonald**, Pennsylvania State University  
**David Stroupe**, Michigan State University

##### *Reflective Practice in Microteaching: An Analysis of Preservice Secondary STEM Teachers' Video-Based Reflections*

**Deepika Menon**, University of Nebraska-Lincoln  
**Rosetta Ngugi**, Towson University

##### *Employing Distinctiveness as a Framework to Understand Teacher Noticing*

**Lu Wang**, Indiana University Kokomo

##### *From Fractured to Structured: Examining the Characteristics of Preservice Science Teachers' PCK and PCK Development*

**William Reynolds**, North Carolina State University  
**Soonhye Park**, North Carolina State University  
**Mwenda Kudumu**, North Carolina State University

### Strand 7:

#### Pre-service Science Teacher Education

##### *Taking Up Socioscientific Issues*

10:45 am - 11:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Stephen Witzig**, University of Massachusetts, Dartmouth

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

##### *Pre-service Teachers' Experiences and Perceptions of Learner-Learner Talk: A Lens into Future Teaching Methods*

**Nomfundo Radebe**, University of Witwatersrand  
**Emmanuel Mushayikwa**, University of the Witwatersrand

##### *Influence of a COVID-19 SSI Unit on Elementary Teachers' Trust in Science and Scientists*

**Lisa Borgerding**, Kent State University  
**Bridget Mulvey**, Kent State University

### Strand 10:

#### Curriculum and Assessment

##### *Curricular innovations in High School Biology*

10:45 am - 11:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presenter:

**Cari Herrmann Abell**, BSCS Science Learning

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

**Molly Stuhlsatz**, BSCS Science Learning  
**Melissa Kjelvik**, Michigan State University  
**Elizabeth Schultheis**, Michigan State University  
**Jeffrey Snowden**, BSCS Science Learning  
**Brian Donovan**, BSCS Science Learning  
**Louise Mead**, Michigan State University

##### *Teacher Decision-Making in High School Biology Curriculum Co-Design: A Comparative Case Study Analysis*

**Elizabeth Chatham**, New Visions for Public Schools  
**Kiran Purohit**, New Visions for Public Schools

## Program

### Teaching an SSI Unit in an Inclusive Secondary Biology Classroom

Rachel Juergensen, University of Missouri, Columbia  
Laura Zangori, University of Missouri  
Patricia Friedrichsen, University of Missouri, Columbia  
Tanner Oertli, University of Missouri, Columbia  
Troy Sadler, University of North Carolina at Chapel Hill

### Strand 10: Curriculum and Assessment

#### In-service Teachers Engaging in Science and Engineering Practices

10:45 am - 11:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

#### Changes in Teacher Self-efficacy and Beliefs: The Impact of an Engineering Research Experience for Teachers (RET) Program on Science Teachers

Tiffany Lewis, Pennsylvania State University  
Amber Cesare, Pennsylvania State Center for Science and the Schools  
Kathleen Hill, Pennsylvania State University

#### Supporting Teachers to MASTER Developing Practices-Based Curriculum

Jennifer Jackson, Pennsylvania State University

#### Advancing Teachers' Curricular Integration of Mathematics and Computational Thinking through a Research Experience Program

Amber Cesare, Pennsylvania State Center for Science and the Schools  
Kathleen Hill, Pennsylvania State University  
Tiffany Lewis, Pennsylvania State University  
Amy Farris, Pennsylvania State University  
Courtney Nagle, Pennsylvania State University, Behrend

#### K-12 Teachers use Authentic STEM Practices in the Classroom Based on Research Immersion Experiences

Matthew Johnson, Pennsylvania State University  
Kathleen Hill, Pennsylvania State University

### Strand 10: Curriculum and Assessment

#### Evaluating Science Identity, Attitudes, and Career Aspirations

10:45 am - 11:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:  
Xiaoming Zhai, Michigan State University

#### A Survey to Measure Secondary School Students' Identity in Research (IR-SH)

Linda Morrell, University of California, Berkeley  
Shruti Bathia, University of California, Berkeley  
Ben Koo, University of California, Berkeley  
Perman Gochyyev, University of California, Berkeley  
Mark Wilson, University of California, Berkeley  
Rebecca Smith, University of California, San Francisco

#### A Systematic Review of the Conceptual Framework of Attitude Toward Science Instruments

Radu Bogdan Toma, Universidad de Burgos  
Jesús Ángel Meneses Villagrà, Universidad de Burgos  
Norman Lederman, Illinois Institute of Technology

#### Career Aspirations in Elementary Students: A Comparison of Three Measures

Kelli Paul, Indiana University  
Adam Maltese, Indiana University  
Merredith Portsmore, Tufts University  
Karen Miel, Tufts University  
Jungsun Kim, Indiana University

#### Reproducing Oppression: Identifying How Four Levels of Oppression are Reproduced within the Science Classroom

Khanh Tran, Purdue University  
Selcen Guzey, Purdue University

## Program

### Strand 11:

#### Cultural, Social, and Gender Issues

##### Science Education Research in Culturally and Linguistically Diverse Contexts: Critical Views and Emerging Questions

10:45 am - 11:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presiders:

**Sara Wilmes**, University of Luxembourg  
**Christina Siry**, University of Luxembourg

Discussant:

**Maria Varelas**, University of Illinois at Chicago

Presenters:

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

### Strand 12:

#### Technology for Teaching, Learning, and Research

##### STEM Capital

10:45 am - 11:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presider:

**Cassie Quigley**, University of Pittsburgh

##### Constructing "STEM Identity": Test of an Expanded Identity Model

**Remy Dou**, Florida International University  
**Heidi Cian**, Florida International University

##### Gender Differences in Early STEM Capital: A Focus on K-4 STEM Experiences

**Susie Cohen**, Florida International University  
**Zahra Hazari**, Florida International University  
**Gerhard Sonnert**, Harvard Smithsonian  
**Philip Sadler**, Harvard Smithsonian

##### 'It Was a Completely Different Change in Environment': Contribution of Immigration History to STEM Identity

**Alexandra Martinez**, Florida International University  
**Remy Dou**, Florida International University  
**Heidi Cian**, Florida International University

##### Building Community and Leveraging Cultural Resources: Black & Latina Girls in a Virtual STEM Camp

**Laura Peña**, Georgia State University  
**Natalie King**, Georgia State University

### Strand 12:

#### Technology for Teaching, Learning, and Research

##### Related Paper Set

##### Leveraging Mixed-reality Classroom Simulators for Professional Development to Support Student-centered STEM Learning Environments

10:45 am - 11:45 am

Advanced Pre-recorded Viewing and Live Q&A

##### Using TeachLivE Mathematics Diagnosis Simulations with Pre-service Elementary Teachers

**Enrique Ortiz**, University of Central Florida

##### How Do GTAs Conceptualize and Utilize Error Framing in a Mixed-Reality Classroom Simulator

**Ashley Geraets**, University of Central Florida  
**Constance Doty**, University of Central Florida  
**Andrew Chesire**, University of Central Florida  
**Tong Wan**, Westminster College  
**Jacqueline Chini**, University of Central Florida  
**Erin Saitta**, University of Central Florida

## Program

### Impact of GTA Practice with Questioning Strategies Using a Mixed-Reality Simulator

Constance Doty, University of Central Florida  
Ashley Geraets, University of Central Florida  
Tong Wan, Westminster College  
Erin Saitta, University of Central Florida  
Jacqueline Chini, University of Central Florida

### Mixed Reality Integrated Learning Environment for Teaching Training of STEM Teaching Assistants

Fengfeng Ke, Florida State University  
Zhaihuan Dai, Florida State University  
Chih-Pu Dai, Florida State University  
Luke West, Florida State University  
Xin Yuan, Florida State University

### Strand 13:

### History, Philosophy, Sociology, and Nature of Science

#### *The Nature of Science & Engineering Practices*

10:45 am - 11:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presider:

Sahar Alameh, University of Kentucky

#### The Nature of Scientific Explanation (NOSE):

#### Examining the Quality and 'Goodness' of Explanation among Students, Teachers, and Scientists

Sahar Alameh, University of Kentucky  
Fouad Abd-El-Khalick, University of North Carolina at Chapel Hill  
David Brown, University of Illinois

#### County Science Specialists' Views of Aligning Historical and Experimental Sciences with NGSS Science Practices

Laura Schneider, St. Mary's College of Maryland  
Julie Kittleson, University of Georgia

#### Epistemic Aspects of Engineering for K-12 Education

Ezgi Yesilyurt, Weber State University  
Hasan Denzi, University of Nevada, Las Vegas  
Erdoğan Kaya, George Mason University

### Differences and Interrelations between Science and Engineering—Stereotypes and Experts' Perceptions

Lior Keren, Technion, Israel Institute of Technology  
Shulamit Kapon, Technion, Israel Institute of Technology

### NARST Membership Meeting

12:00 pm - 1:00 pm

Presider:

Eileen Carlton Parsons, NARST President

### Lunch Break *(on your own)*

12:00 pm - 1:00 pm

### CONCURRENT SESSION #8

1:15 pm - 2:45 pm | *Real-Time/Live*

### Administrative Sponsored Session Equity and Ethics Committee

#### *Making the Case to Empower, Evoke, and Revolutionize the Culture of Science for Social Equity*

1:15 pm - 2:45 pm | *Real-Time/Live*

Presenters:

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

### Administrative Sponsored Session Publications Advisory Committee

#### *How to Get Your Research Published in Science Education Journals*

1:15 pm - 2:45 pm | *Real-Time/Live*

Presiders:

Shakhnoza Kayumova, University of Massachusetts, Dartmouth  
Tina Cheuk, Stanford University  
Dante Cisterna, Educational Testing Service

## Program

Presenters:

### **Asia-Pacific Science Education**

Sonya Martin, Seoul National University

### **Cultural Studies of Science Education**

Catherine Milne, New York University

Christina Siry, University of Luxembourg

### **Evolution: Education and Outreach**

Ross Nehm, Stony Brook University

### **International Journal of Science Education**

Gail Jones, North Carolina State University

### **Journal of Research in Science Teaching**

Felicia Mensah, Columbia University

Troy Sadler, University of North Carolina at Chapel Hill

### **Journal of Science Education and Technology**

Kent Crippen, University of Florida, Gainesville

### **Journal of Science Teacher Education**

Geeta Verma, University of Colorado, Denver

Todd Campbell, University of Connecticut

### **Journal of Teacher Education**

Gail Richmond, Michigan State University

### **Research in Science Education**

Angela Fitzgerald, University of Southern Queensland

### **Science Education**

Sherry Southerland, Florida State University

### **Science & Education**

Sibel Erduran, University of Oxford

### **Studies in Science Education**

Lucy Avraamidou, University of Groningen

Justin Dillon, University of Exeter

### **CBE-Life Science Education**

Kimberly Tanner, San Francisco State University

Jeff Schinske, Foothill College

### **School Science and Mathematics**

Bridget Miller, University of South Carolina

Christie Martin, University of South Carolina

## **Administrative Sponsored Session Continental and Diasporic Africa in Science Education (CADASE) RIG**

### **CADASE RIG: Educative STEM Materials that Use and Evoke African American Capital**

1:15 pm - 2:45 pm | *Real-Time/Live*

Going beyond Ceremony: Creating Educative  
STEM Materials that Use and Evoke African American  
Capital

Catherine Quinlan, Howard University

### **CADASE Posters**

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

Applying the Ecosystem Services Framework to  
Engage African American Undergraduate Students in  
Environmental Sciences

Mark Dugo, Johnson C. Smith University

Through Rated Responses to Cognitive Resources  
and Equity: Nigerian Students' Productive Beginnings  
through Science Inquiry Responses

Mark Akubo, Florida State University

Oluwafunke Ogunya, Florida State University

Collegiate Student Perspectives on Coastal  
Environmental Conservation

Stanton Belford, Martin Methodist College

eNvision: A Collaborative Redesign of Pre-service  
Teacher Candidates and Faculty Experiences through  
a Professional Development School Partnership

Rona Robinson-Hill, Ball State University, Muncie, IN

## Program

### **Administrative Sponsored Session President**

#### ***National Academies of Sciences (NAS) Board of Science Education (BOSE) Contribution to Science Education as a Public Good***

1:15 pm - 2:45 pm | *Real-Time/Live*

Presenters:

**Heidi Schweingruber**, National Academies of Science, BOSE

**Kenne Dibner**, The National Academies of Sciences, Engineering and Medicine

**Megan Bang**, Northwestern University

**Maya Garcia**, Colorado Department of Education

**William Penuel**, University of Colorado

### **Strand 2:**

#### **Science Learning: Contexts, Characteristics, and Interactions**

#### ***Social Factors in College Science***

1:15 pm - 2:45 pm | *Real-Time/Live*

Prsider:

**Veronique Merritt**, Columbia University

#### **Group Interaction Patterns during Argument-Based Data Interpretation Tasks in Undergraduate Biology**

**Andy Cavagnetto**, Washington State University

**Olivia Prestis**, Washington State University

**Ayden Hackett**, Washington State University

**Larry Collins**, Washington State University

**Jessie Arneson**, Washington State University

**Jacob Woodbury**, Washington State University

**William Davis**, Washington State University

**Erika Offerdahl**, Washington State University

#### **What Professors Say during Collaborative Tasks: Facilitation in a POGIL Chemistry Class**

**Shaghayegh Fateh**, Middle Tennessee State University

**Zubeyde Demet Kirbulut**, Harran University

**Amy Phelps**, Middle Tennessee State University

**Joshua Reid**, Middle Tennessee State University

**Gregory Rushton**, Middle Tennessee State University

#### **Should High School Biology Teachers Relate to Students' Religious Faith during Evolution Class?**

**Reut Stahi-Hitin**, Weizmann Institute of Science

**Anat Yarden**, Weizmann Institute of Science

#### **Disparities in Mentoring Experiences and Academic/Career Outcomes of STEM**

#### **Undergraduates during the COVID-19 Pandemic**

**Guan Saw**, Claremont Graduate University

**Chi-Ning Chang**, University of Kansas

**Paul Hernandez**, Texas A&M University

### **Strand 3:**

#### **Science Teaching—Primary School**

(Grades preK-6)

#### **Related Paper Set**

#### ***The Roles and Uses of Crosscutting Concepts in Elementary Teaching***

1:15 pm - 2:45 pm | *Real-Time/Live*

Prsider:

**Anna Maria Arias**, Kennesaw State University

#### **Co-Occurring Crosscutting Concept Use in Elementary Preservice Teachers' Lesson Plans to Support Ambitious Teaching and Three-dimensional Science Learning**

**Amanda Benedict-Chambers**, Missouri State University

**Carrie-Ann Sherwood**, Southern Connecticut State University

#### **A Comparative Case Study of Preservice and Inservice Teachers' Implicit Use of CCCs in Lesson Planning**

**Tina Vo**, University of Nevada, Las Vegas

**Nicole Thomas**, University of Nevada, Las Vegas

**Astha Metha**, University of Nevada, Las Vegas

#### **Exploring Relationships among Educative Materials and Elementary Teachers' Use of CCCs in NGSS-Based Instruction**

**Sarah Fick**, Washington State University

**Jennifer Chiu**, University of Virginia

## Program

### Inservice Elementary Teachers' Successes and Challenges in Using the Crosscutting Concepts in Three-dimensional Learning

Anna Maria Arias, Kennesaw State University  
Brendan Callahan, Kennesaw State University  
Michael Dias, Kennesaw State University  
Karen Kuhel, Kennesaw State University  
Deborah Hanuscin, Western Washington University

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

#### Related Paper Set

#### *Investigating Aspects of the Modeling Competence: Practices and Metaknowledge*

1:15 pm - 2:45 pm | *Real-Time/Live*

#### Examining Student Engagement with ST and CT through Modeling in a Science Classroom

Jonathan Bowers, Michigan State University

#### Characterizing Students Progression Patterns in CT and ST through Modeling

Emil Eidin, Michigan State University  
Israel Tuitou, Michigan State University

#### Validation of a Rating Scale to Assess Learners' Meta modeling Knowledge using the Argument-Based Approach

Paul Engelschalt, Humboldt University of Berlin  
Anna Beniermann, Humboldt University of Berlin  
Annette Upmeier Zu Belzen, Humboldt-Universität Zu Berlin  
Dirk Krueger, Freie Universitaet Berlin

#### Evaluating Pre-service Science Teachers' Metacognitive Knowledge of the Modeling Process

Tom Bielik, Freie Universitaet Berlin  
Moretz Krell, Freie Universitaet Berlin  
Dirk Krueger, Freie Universitaet Berlin

### Strand 7:

#### Pre-service Science Teacher Education

#### *Beliefs and Efficacy Among Pre-service Teachers*

1:15 pm - 2:45 pm | *Real-Time/Live*

President:

Jennifer Maguire, Virginia Tech University

#### Experiences in Science Methods Courses and Science Teaching Efficacy

Sheryl McGlamery, University of Nebraska Omaha  
Bridget Franks, University of Nebraska at Omaha  
Saundra Shillingstad, University of Nebraska at Omaha

#### Influence of Pre-service Science Teachers' Beliefs and Goals in the Learning Tasks They Design

Diego Rojas-Perilla, Columbia University

#### Changes in Pre-service Elementary Teachers' Science Teaching Self-efficacy and Reformed-Based Science Teaching and Learning Beliefs

Laura Eicher, Clemson University  
Cynthia Deaton, Clemson University

#### To Teach or not to Teach: Examining Persistence of Interest in Mathematics and Science Teaching

Andrew Marichal, Florida International University  
Zahra Hazari, Florida International University  
Gerhard Sonnert, Harvard Smithsonian  
Philip Sadler, Harvard Smithsonian

### Strand 8:

#### In-service Science Teacher Education

#### *Handbook of Research on Science Teacher Education*

1:15 pm - 2:45 pm | *Real-Time/Live*

Discussant:

Michele Koomen, Gustavus Adolphus College



## Program

Presenters:

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

### Strand 10:

#### Curriculum and Assessment

##### *Assessing Student Reasoning in the Context of Systems and Processes*

1:15 pm - 2:45 pm | *Real-Time/Live*

Presider:

**Molly Stuhlsatz**, BSCS

##### *Improving Student's Understanding of Biological Variation in Experimental Design and Analysis through a Curricular Intervention*

**Anita Schuchardt**, University of Minnesota  
**Jessica Dewey**, University of Minnesota  
**Jenna Hicks**, University of Minnesota

##### *Uncovering Students' Developing Understanding of Interdependent Relationships in Ecosystems*

**Sara Dozier**, Stanford University  
**Anna MacPherson**, American Museum of Natural History  
**Linda Morell**, University of California, Berkeley  
**Weerephat Suksiri**, University of California, Berkeley  
**Mark Wilson**, University of California, Berkeley  
**Jonathan Osborne**, Stanford University

##### *Rethinking Assessments for Systems*

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

##### *High School Students' Ability to Connect Biological Processes when Studying Evolution*

**Rebecca Ellis**, Michigan State University  
**Louise Mead**, Michigan State University  
**Frieda Reichsman**, The Concord Consortium  
**Jim Smith**, Michigan State University  
**Kiley McElroy-Brown**, The Concord Consortium  
**Genevive Bondaryk**, Brandeis University  
**Maria Berry**, Michigan State University  
**Pete White**, Michigan State University

### Strand 11:

#### Cultural, Social, and Gender Issues

##### *Whiteness*

1:15 pm - 2:45 pm | *Real-Time/Live*

Presider:

**Natalie King**, Georgia State University

##### *The Power of Faculty Learning Communities on the development of Inclusive Teaching in STEM Learning Environments*

**Mojtaba Khajeloo**, University of Missouri, Columbia  
**Marcelle Siegel**, University of Missouri, Columbia  
**Yejun Bae**, University of Missouri, Columbia  
**Terrell Morton**, University of Missouri, Columbia  
**Charles Nilon**, University of Missouri, Columbia  
**Johannes Schul**, University of Missouri, Columbia  
**Courtney Ngai**, University of Missouri, Columbia  
**Adele Du**, University of Missouri, Columbia

##### *STEM Schools as a Property of Whiteness in Urban Areas*

**Katie Wade-Jaimes**, University of Nevada, Las Vegas  
**Bonelli Dobbs**, University of Memphis

##### *Hear and Listen: Experiences of Adult Black Women in Science Classes*

**Reneé Schwartz**, Georgia State University  
**Melissa Schoene**, Georgia State University

##### *Discourses White Men Use to Maintain White and Male Supremacy in Physics*

**Melissa Dancy**, Dancy Consulting  
**Apriel Hodari**, Eureka Scientific Inc

## Program

### Strand 11:

#### Cultural, Social, and Gender Issues

##### Motivation and Under-Representation

1:15 pm - 2:45 pm | *Real-Time/Live*

##### Analyzing Discussions of Under-Representation in a High School Classroom

Ben Archibeque, Florida International University

Geoff Potvin, Florida International University

Zahra Hazari, Florida International University

Robynne Lock, Texas A&M Commerce

##### Individualistic or Systemic? High School Girls Make Sense of Gender Inequality in Engineering

Tatiane Russo-Tait, University of Texas at Austin

Katherine Doerr, University of Texas at Austin

Catherine Riegler-Crumb, University of Texas at Austin

Ursula Nguyen, University of Texas at Austin

##### Motivational Factors Mediating Attitudes Toward STEM Careers Amongst a National Sample of Middle School Students

Elif Oz, University of Notre Dame

Matthew Kloser, University of Notre Dame

##### Making Explicit Latinx Female Physics Students' Goal Contents

Brian Zamarripa Roman, University of Central Florida

Jacqueline Chini, University of Central Florida

### Strand 12:

#### Technology for Teaching, Learning, and Research

##### Alternate Avenues of Assessment

1:15 pm - 2:45 pm | *Real-Time/Live*

Presider:

Jamie Mikeska, Educational Testing Service

##### Exploring the Effect of Construct Complexity on Machine Learning Assessments of Argumentation

Kevin Haudek, Michigan State University

Xiaoming Zhai, Michigan State University

##### Comparing two Task Analysis Guides in Science: Examination of Cognitive Demand

Richard Lamb, East Carolina University

Troy Sadler, University of North Carolina at Chapel Hill

Knut Neumann, Leibniz Institute for Science Education

David Fortus, Weizmann Institute of Science

Pavlo Antonenko, University of Florida

Amanda Kavner, East Carolina University

Douglas Hoston, East Carolina University

##### Integrating Flipgrid for Science Formative Assessment: A Case Study of an Elementary Preservice Teacher's Learning

Sharfun Islam Nancy, University of South Florida

Karl Jung, University of South Florida

### Strand 14:

#### Environmental Education and Sustainability

##### Education for Environmental Science Literacy

1:15 pm - 2:45 pm | *Real-Time/Live*

Presider:

May Lee, University of Groningen

##### Secondary Students' Sense-Making of Graphs Related to Climate Change

May Lee, University of Groningen

Alicia Alonzo, Michigan State University

##### Unifying Formal Academic and Environmental Education Priorities: Student Outcomes Framework for Environmental Literacy Education

Amy Green, University of Maryland, College Park

John Baek, NOAA Education

##### Reimagining Open Schooling as a Sustainable Goal in the Pandemic Era

Giulia Tasquier, University of Bologna

Olivia Levrini, University of Bologna

Paola Fantini, University of Bologna

Erik Knain, University of Oslo

Alfredo Jornet Gil, University of Oslo

## Program

**Perceptions of Environmental Literacy  
Preparedness: An Intrastate Systemic Analysis  
of Districts' Environmental Literacy Plan  
Implementation**

**Tamara Pepper**, Pennsylvania Department of Education  
**Ann Gaudino**, Millersville University  
**Nanette Marcum-Dietrich**, Millersville University  
**Steven Kerlin**, Stroud Water Research Center

**Strand 14:  
Environmental Education and Sustainability  
Designing Learning for Just and Resilient  
Climate Action**

**1:15 pm - 2:45 pm | Real-Time/Live**

**Presider:**  
**Rachel Han**, University of Washington

**Discussant:**  
**Alberto Saldamando**, Indigenous Environmental  
Network

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

### **NETWORKING/SOCIAL CONCURRENT SESSIONS**

**3:15 pm - 5:30 pm | Real-Time/Live**

#### **Among Us Scholars**

*(duration: 60 min)*

*Participants for this session will play the video game  
"Among us".*

**Organizer:**  
**Karina Del Carmen Mendez Perez**, University  
of Texas at Austin

#### **Enjoying or Enduring the Process of Tenure during the COVID-19 Pandemic**

*(duration: 60 min)*

**Organizer:**  
**Justina Ogodo**, Baylor University

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

#### **Informal Music Sharing/Jamming Networking**

*(duration: 60 min)*

**Organizer:**  
**Joseph Taylor**, University of Colorado,  
Colorado Springs

The session will start by networking fellow musicians within the NARST community. We will discuss common musical interests and any instruments we play (including vocals). This could lead to collaborations between annual meetings that could lead to fun live performances and or/ sing-a-longs at annual meetings. At the session, if time permits, we might even jam a little.

## Program

### **Mindfulness Practices for Stress Relief and Self Care in the Time of COVID**

(duration: 90 mins)

Organizer:

**Paula Huffman**, University of North Carolina at Chapel Hill  
UNC Program on Integrative Medicine

This Mindfulness workshop will:

- Develop strategies for using Mindfulness Techniques that can be practiced anywhere, anytime.
- Practice techniques that help to cultivate the ability to respond from a calmer baseline to daily life events.
- Learn ways to slow the ruminating mind, thereby decreasing catastrophic thinking and its effect on our overall well-being.
- Enhance stress resiliency as we develop techniques for intentionally focusing on positive and pleasurable life events.

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### **POSTER SESSION #2**

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

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#### **Strand 8: POSTERS**

##### **Moving Beyond Providing Resources: A Multi-system Analysis of Science Teacher Leadership**

**Rachel Ruggirello**, Washington University St. Louis  
**Alison Brockhouse**, Washington University St. Louis  
**Maia Elkana**, Washington University St. Louis  
**Derek Scott**, Wentzville School District

##### **PD for Elementary Teachers' Instruction for Space-Sciences Lessons Focusing on Crosscutting Concepts**

**Soon Lee**, Kennesaw State University

##### **Evaluating a Network Improvement Community Program: A Cohort-Based Study of Longitudinal Student STEM Outcomes**

**Jessica Richardi**, University of Rhode Island  
**Shane Tutwiler**, University of Rhode Island  
**Jay Fogleman**, University of Rhode Island  
**Sara Sweetman**, University of Rhode Island

##### **Science Teachers' Discourse and Professional Vision of Student Motivation**

**Wisam Sedawi**, Ben-Gurion University of the Negev  
**Livat Eshchar-Netz**, Ben-Gurion University of the Negev  
**Hasida Yakobov**, Ben-Gurion University of the Negev  
**Dana Vedder-Weiss**, Ben-Gurion University of the Negev

##### **Developing Ambitious Instruction through Pedagogical Reasoning with Peers**

**Kimberly Lebak**, Stockton University

##### **A Review of Intervention Studies to improve Teacher 21st Century Skills**

**Hiya Almazroa**, Princess Nourah Bint Abdulrahman University  
**Wadha Alotaibi**, Princess Nourah Bint Abdulrahman University

##### **Invested Students are Engaged Students: Science Teachers' Focus on Student Behavior and Student-Centered Teaching**

**Vance Kite**, North Carolina State University  
**Megan Polzin**, North Carolina State University  
**Wm. Matthew Reynolds**, North Carolina State University  
**Soonhye Park**, North Carolina State University

##### **"That's not Evidence!": Teacher's Navigating Conceptual and Pedagogical Dilemmas in Earth Science Teaching**

**Jonathan McCausland**, Pennsylvania State University  
**Jennifer Jackson**, Pennsylvania State University  
**Scott McDonald**, Pennsylvania State University  
**Amy Pallant**, The Concord Consortium  
**Hee-Sun Lee**, The Concord Consortium

##### **From Being a Science Teacher to a Science Teacher Leader: A Review of the Literature**

**Hatice Ozen Tasdemir**, University of Georgia  
**Julie Luft**, University of Georgia

## Program

### **A Study of Teacher Sensemaking about Productive Student Talk in Science Classrooms Problem**

**Danielle Vande Zande**, Florida State University  
**Miray Tekkumru Kisa**, Florida State University

### **District Science Coordinators and Science Teaching-Research Officers: A Review of the Literature Comparing Science Teacher Leaders in the United States and Mainland China**

**Yuxi Huang**, University of Georgia  
**Julie Luft**, University of Georgia

### **Supporting Novice STEM Teachers through the Noyce Buddy Program**

**Sarah Guffey**, University of South Alabama  
**Susan Ferguson**, University of South Alabama  
**Andre Green**, University of South Alabama

### **Talking about English Learners: Integrating Language and Content in Inquiry Science**

**Bethany Daniel**, Vanderbilt University

### **Exploring Experienced Science Teachers' Vision for Science Teaching**

**Alfred Limbere**, Montclair State University  
**Mika Munakata**, Montclair State University  
**Emily Klein**, Montclair State University  
**Monica Taylor**, Montclair State University

## **Strand 10: POSTERS**

### **Developing Assessment Tasks to Measure Model-Based Reasoning in Biology**

**Cari Herrmann Abell**, BSCS Science Learning  
**Brian Donovan**, BSCS Science Learning  
**Emily Harris**, BSCS Science Learning  
**Jeffery Snowden**, BSCS Science Learning  
**Molly Stuhlsatz**, BSCS Science Learning  
**Christopher Wilson**, BSCS Science Learning

### **Exploring Science Teacher Educators' Evaluation of a Score Report to Support Content Knowledge for Teaching**

**Dante Cisterna**, Educational Testing Service  
**Jamie Mikeska**, Educational Testing Service  
**Katherine Castellano**, Educational Testing  
**Jennifer Lentini**, Educational Testing Service

### **Challenges of Prospective Science Teacher Educators when Designing Science Methods Courses: Analysis through a PCK Lens**

**Jose Pavez**, University of Georgia

### **Conceptual Models of Technological Solutions: Assessing Graduate Engineering Students' Novelty and Model-Based Systems Thinking**

**Rea Lavi**, Massachusetts Institute of Technology  
**Yehudit Judy Dori**, Technion, Israel Institute of Technology; Samuel Neaman Institute for National Policy Research  
**Dov Dori**, Technion, Israel Institute of Technology; Massachusetts Institute of Technology

### **Does the Term "Argument" make it Harder to Measure Argument? Item Difficulty After Revised Wording**

**Andrea Ash**, University of Iowa  
**Gavin Fulmer**, University of Iowa  
**Brian Hand**, University of Iowa  
**Jihyun Hwang**, University of Iowa  
**Jee Kyung Suh**, University of Alabama

### **Assessing Algorithmic Thinking Skills in Early Primary School Amid Environmental Studies**

**Kalliopi Kanaki**, University of Crete  
**Michail Kalogiannakis**, University of Crete  
**Emmanouil Poulakis**, University of Thessaly  
**Panagiotis Politis**, University of Thessaly

### **Evolution Acceptance and Knowledge in Europe: A Systematic Review of the State of Research**

**Anna Beniermann**, Humboldt-Universität zu Berlin  
**Paul Kuschmierz**, Justus Liebig University Giessen; Institute for Didactics of Biology  
**Andra Meneganzin**, Università degli Studi di Padova  
**Rianne Pinxten**, University of Antwerp; Antwerp  
**Telmo Pievani**, Università degli Studi di Padova  
**Dragana Cvetkovi**, University of Belgrade  
**Evangelia Mavrikaki**, National and Kapodistrian University of Athens  
**Dittmar Graf**, Justus Liebig University Giessen; Institute for Didactics of Biology

## Program

### **How does Integrated STEM Life Sciences Unit Affect Middle School Students' Engagement and Academic Success?**

**Zeynep Akdemir**, Purdue University  
**Saira Anwar**, University of Florida  
**Muhsin Menekse**, Purdue University  
**Selcen Guzey**, Purdue University

### **Investigating students' performance on explanations, developing and using model via the use of Next Generation Science Assessment (NGSA)**

**Mao-Ren Zeng**, National Taiwan Normal University  
**Mei-Hung Chiu**, National Taiwan Normal University  
**Peng He**, Michigan State University  
**Joseph Krajcik**, Michigan State University

### **Diversity in Knowledge, Conformity in Acceptance of Evolution? Lessons From a Cross-European Evolution Assessment**

**Paul Kuschmierz**, Justus Liebig University Giessen; Institute for Didactics of Biology  
**Anna Beniermann**, Humboldt University of Berlin  
**Dittmar Graf**, Justus Liebig University Giessen; Institute for Didactics of Biology

### **The Effect of Teacher Talk on Student Engagement during an Integrated Unit**

**Valarie Bogan**, Purdue University  
**Selcen Guzey**, Purdue University

### **Assessment of Student Learning in Integrated STEM Education: A Descriptive Study**

**Benny Mart Hiwatig**, University of Minnesota, Twin Cities  
**Gillian Roehrig**, University of Minnesota

## **Strand 11: POSTERS**

### **STEM Career Transformation: Influences to the Pathways of Community College Women of Color STEM Majors**

**Melo-Jean Yap**, San Diego State University

### **Preparing Culturally Responsive Elementary Science Teachers: The SCI-Bridge Model**

**Brian Williams**, Georgia State University  
**Nancy Schafer**, Georgia State University  
**Diane Truscott**, Georgia State University  
**Ana Solana-Campos**, Georgia State University  
**Stephanie Byrd**, Georgia State University

### **Introducing Engineering as an Altruistic STEM Career to Broaden Participation**

**Joni M Lakin**, University of Alabama  
**Edward W Davis**, Auburn University  
**Zahra Karimi**, Auburn University  
**Lindsay Norris**, Auburn University  
**Virginia Davis**, Auburn University

### **Transnational Ph.D. Students' Learning Trajectories with the Lens of Identity Resources**

**Selin Akgun**, Michigan State

### **Factors Affecting High School Students' Stem Career Interest: Findings from A 4-Year Study**

**Alpasian Sahin**, Harmony Public Schools  
**Hersh Waxman**, Texas A&M University, College Station

### **Building Antiracist Science Teachers for Indigenous Schools: Lessons from a Science Professional Development Workshop**

**Bhaskar Upadhyay**, University of Minnesota

### **Maintaining Critical Virtual Counterspaces for Minoritized Communities in the COVID-19 Pandemic**

**Ann Varnedoe**, Vanderbilt University  
**William Robinson**, Vanderbilt University  
**Ebony McGee**, Vanderbilt University

### **Factors Affecting Science Academic Achievement of Women and Girls of Color: A Meta-Synthesis**

**Joe De Leon**, University of Texas Rio Grande Valley  
**Maria Rodriguez**, University of Texas Rio, Grande Valley

## **Strand 12: POSTERS**

### **In Their Words: How Students Discuss Motivation, Success, and Learning After Designing STEM Video Games**

**Denise M. Bressler**, East Carolina University  
**Len Annetta**, East Carolina University  
**Richard Lamb**, East Carolina University  
**Alexis Dunekack**, East Carolina University

## Program

### **Teacher Perceptions about an Engineering Argumentation Discussion within a Simulated Classroom after Feedback and Practice**

**Jamie Mikeska**, Educational Testing Service  
**Pamela Lottero-Perdue**, Towson University  
**Debra Brockway**, Educational Testing  
**Dante Igor**, Cisterna-Albuquerque, Pontificia Universidad Católica de Chile  
**Samira Sackietey**, Educational Testing Service  
**Joseph Ciofalo**, Educational Testing Service

### **Developing Online Assignments: Chemistry Teachers' Knowledge and Perceptions**

**Orit Hercovitz**, Technion, Israel Institute of Technology  
**Merav Versano**, Technion, Israel Institute of Technology  
**Yehudit Judy Dori**, Technion, Israel Institute of Technology; Samuel Neaman Institute for National Policy Research, Haifa

### **Development of Representational Competence through a Sequence with Augmented Reality for the Learning of Chromatography**

**Cristian Merino**, Pontificia Universidad Católica de Valparaíso  
**Ainoa Marzabal**, Pontificia Universidad Católica de Chile  
**Waldo Quiroz**, Pontificia Universidad Católica de Valparaíso  
**Sonia Pino**, Pontificia Universidad Católica de Valparaíso  
**Brant Miller**, University of Idaho

### **Technological Pedagogical Content Knowledge in Biology Education: Educational Technologies in Secondary and Post-Secondary Classrooms a Systematic Literature Review**

**Olena James**, Middle Tennessee State University  
**Grant Gardner**, Middle Tennessee State University

### **Exploring User Actions while Engaged with a Haptically-Enabled Science Simulation (HESSs) for Teaching about Buoyancy**

**James Minoque**, North Carolina State University  
**Emily Brunsen**, North Carolina State  
**Kern Qi**, Davidson College  
**Tabitha Peck**, Davidson College  
**David Borland**, University of North Carolina at Chapel Hill

### **Describing Perceptions of Presence Among Students with ADHD in Using Emerging Technologies for Science Learning**

**Rebecca Hite**, Texas Tech University  
**Gina Childers**, Texas Tech University  
**Gail Jones**, North Carolina State University  
**Elysa Corin**, Institute for Learning Innovation  
**Mariana Pereyra**, Universidad De La República Uruguay

### **A CSCL Approach for Learning Communities: Supporting Development of Students' Scientific Competencies and STEM Identities**

**Elena Boldyreva**, University of Toronto  
**James Slotta**, University of Toronto

## **Strand 13: POSTERS**

### **Empowering Informed Action Using an Integrated Nature of Science and Socio-Scientific Reasoning Framework**

**Zoubeida Dagher**, University of Delaware

### **Upper Elementary Students' Interactions with Nature of Science Read-Alouds**

**Jeanne Brunner**, University of Massachusetts, Amherst  
**Christine McGrail**, University of Massachusetts, Amherst  
**Kathleen Mahoney**, University of Massachusetts, Amherst

### **The Most Common Ideas Secondary Students Considered when Making Decisions Across Socioscientific Issue Topics**

**Dawne LePretre**, Illinois Institute of Technology  
**Norman Lederman**, Illinois Institute of Technology

### **Exploring School Students' Ability to Recognise Warrants in Interdisciplinary Argumentation between Science and Religious Education**

**Liam Guilfoyle**, University of Oxford  
**Sibel Erduran**, University of Oxford

### **How Scientists Perceive and Value Communicating the Nature of Science to the Public**

**Sarah Poor**, Texas A&M University  
**Benjamin Herman**, Texas A&M University

## Program

### **Investigating University Students' Perceptions of the Nature of Science**

**Selin Akgun**, Michigan State University  
**Ebru Kaya**, Bogazici University

### **New Directions in Socioscientific Issues Research**

**Dana Zeidler**, University of South Florida  
**Benjamin Herman**, Texas A&M University  
**Troy Sadler**, University of North Carolina at Chapel Hill

### **Illustrating Linkages between Natures of Science and Engineering**

**Jeffrey Radloff**, SUNY Cortland  
**Brenda Capobianco**, Purdue University

### **Selecting Parts of History of Developing and Using Models: Are Modeling Practices Really New Generation?**

**Ayca Fackler**, University of Georgia

### **Exploring Physicist, Chemist, and Biologist Views of Scientific Models**

**Yi-Wen Huang**, National Changhua University of Education  
**Meng-Fei Cheng**, National Changhua University of Education

### **Exploring Physicists' Views of Scientific Models**

**Meng-Fei Cheng**, National Changhua University of Education  
**Yi-Wen Huang**, National Changhua University of Education  
**Chien-Yu Lin**, National Changhua University of Education

## **Strand 14: POSTERS**

### **A Multi-Perspective Reflection of High School Science Students on Environmental Issues**

**Mercy Nyamekye**, University of Education of Winneba, Ghana  
**Sakyiwaa Danso**, University of the Witwatersrand, Johannesburg

### **Art and Travel Abroad: Influencing Student Goals, Environmental Interests and Conceptions of Science**

**Susannah Sandrin**, Arizona State University  
**Becky Ball**, Arizona State University  
**Richard Lerman**, Arizona State University

### **Caring about Where We are: Exploring Philosophical and Pedagogical Perspectives of Place**

**Sara Salisbury**, Middle Tennessee State University

### **How do Faculty at a Business School Conceptualize Environmental Issues and Incorporate these Issues in their Classrooms?**

**Hamza Malik**, University of Massachusetts, Dartmouth  
**Stephen Witzig**, University of Massachusetts, Dartmouth

### **Relationships between College Students' Epistemological Beliefs about Climate Science and Attitudes toward Climate Change**

**Lisa Borgerding**, Kent State University  
**Jeff Papa**, Kent State University  
**Barb Currey**, Kent State University

### **Seeing Stuff Differently: Inquiry Science Didn't Change the Environmental Worldview of Preservice Teachers But...**

**Jean-Philippe Ayotte-Beaudet**, Université De Sherbrooke  
**Bryan Nichols**, Florida Atlantic University

### **Climate Change Education in Rural Spaces**

**Jean-Philippe Ayotte-Beaudet**, Université De Sherbrooke  
**Madison Scheer**, Colorado State University  
**Meena Balgopal**, Colorado State University

### **Science Education Contexts of Culture, Land, and Community: An 'Aina-Based Model Supporting Teacher Eco-Identity Development**

**Sheri Fitzgerald**, Pacific American Foundation

### **Turkish Preschool Teachers' Professional Development Needs: A Joint Collaboration Project on Education for Sustainability**

**Tulin Guler Yildiz**, Hacettepe University  
**Ridvan Elmas**, Afyon Kocatepe University  
**Savas Pamuk**, Akdeniz University  
**Deniz Kahrیمان-Pamuk**, Mersin University  
**Gelengul Haktanir**, Ankara University



## Program

### Strand 15: POSTERS

#### **Translating Research into Classroom Practice: Who is Publishing in Science Education Practitioner Journals (SEPs)?**

**Joseph A. Taylor**, University of Colorado, Colorado Springs

**G. Michael Bowen**, Mount Saint Vincent University

**Marcus Kubsch**, Leibniz Institute for Science and Mathematics Education

**Ryan Summers**, University of North Dakota

**Patricia Patrick**, Columbus State University

**Abdirizak Warfa**, University of Minnesota

**Cathy Lachapelle**, Boston College

**Asli Sezen-Barrie**, University of Maine

**Selcen Guzey**, Purdue University

#### **Spectacle and Policy: STEM in the Early Trump Administration**

**Matthew Weinstein**, University of Washington, Tacoma

### BASU SCHOLARS POSTERS

#### **2019 Basu Scholars**

#### **Examining Elementary Students' Images of Engineers and Interests in Engineering Careers**

**Ezgi Yesilyurt**, Weber State University

#### **Minority STEM Undergraduates: A Comprehensive Model for STEM Identity and Self-efficacy**

**Kelly Shepard**, Illinois Institute of Technology

**Ivan Mutis**, Illinois Institute of Technology

#### **Urban Science Teacher Education Across Contexts: An Examination of Teacher Learning through the Lenses of Identity and Agency**

**Lisa Marco-Bujosa**, Villanova University

#### **A Case Study of How Science and Mathematics Teachers' Knowledge and Beliefs Influence Their Implementation of a Problem and Project-Based Curriculum**

**Mary Nyaema**, University of Iowa

#### **Approaches to Learning Biology of Women of Color: The Intersectionality of Gender, Race, and Science Identity**

**Angela Google**, Middle Tennessee State University

**Anna Grinath**, Idaho State University

**Grant Gardner**, Middle Tennessee State University

#### **How a "Judgement Free" Space Influences African American Girls Sisterhood and STEM Identity**

**Faith Freeman**, Guilford County Schools

**Edna Tan**, University of North Carolina at Greensboro

#### **Gendered Preferences for Science Education Disciplines in Elementary Grades**

**Radu Bogdan Toma**, University of Burgos

#### **Teaching Practices in Large STEM Classes: Perception from Undergraduate and Graduate Students**

**Ngawang Gonsar**, University of Minnesota and Gustavus Adolphus College

**Lorelai Patrick**, Fort Hays State University

**Sehoya Cotner**, University of Minnesota

### BASU SCHOLARS POSTERS

#### **2018 Basu Scholars**

#### **Supporting Multilingual Students' Engagement in Science Practices: A Case for Fostering Translanguaging Science Classrooms**

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

**Karina Mendez Perez**, University of Texas at Austin

**Sage Andersen**, University of Texas at Austin

#### **Becoming a Teacher: Reflective Practice as a Way of Exploring Secondary Science Teacher Beliefs and Practices**

**Preethi Titu**, Kennesaw State University

**Gillian Roehrig**, University of Minnesota

**Joshua Ellis**, Florida International University

#### **Science for Our Children: Othermothering within an Elementary Science Network**

**Stefanie Marshall**, University of Minnesota, Twin Cities

**Jessica Forrester**, University of Minnesota, Twin Cities

## Program

### CONCURRENT SESSION #9

8:00 am - 9:30 am | *Real-Time/Live*

#### Administrative Sponsored Session International Committee

##### *ESERA: Crossing Boundaries: Examining and Problematizing Interdisciplinarity in Science Educations*

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Sonya Martin**, Seoul National University

Discussant:

**Sibel Eduran**, University of Oxford

Presenters:

**Laura Branchetti**, University of Parma, Italy

**Olivia Levrini**, University of Bologna

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

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

**Tal Peer**, Acheret Center, Israel

**Wonyong Park**, University of Oxford

**Jen-Li Wu**, National Taiwan Normal University

**Sharona Levy**, University of Haifa

**Asnat Zoharm**, University of Haifa

**Ilana Dubovi**, Ben-Gurion University

#### Administrative Sponsored Sessions Awards Committee

##### *ODRA and ECRA: On a Continuum of the Professional Scholarly Trajectories in Science Education: The Urgent Questions for the Next Generation of Science Education Research*

8:00 am - 9:30 am | *Real-Time/Live*

Presenter:

**Noemi Waight**, University at Buffalo

#### Strand 2:

##### **Science Learning: Contexts, Characteristics, and Interactions**

##### *Socio-Scientific Issues-Based Instruction for Scientific Literacy Development*

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Wardell Powell**, Framingham State University

Discussant:

**Aysequel Oguz Namdar**, Recep Tayyip Erdogan University

Presenters:

**Sami Kahn**, Princeton University

**Wardell Powell**, Framingham State University

**Aysequel Oguz Namdar**, Recep Tayyip Erdogan University

**Hyunok Lee**, Seoul National University

**Mark Newton**, East Carolina University

**Dilek Karisan**, Adnan Menderes University

**Gillian Roehrig**, University of Minnesota

**Benzegül Durak**, Duzce University

**Li Ke**, University of North Carolina at Chapel Hill

**Dana Zeidler**, University of South Florida

#### Strand 4:

##### **Science Teaching—Middle and High School**

(Grades 5-12)

##### *NGSS Practices and Implementation*

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Teresa Massey**, Georgia State University

##### *Impacts of COVID-19 on Science Instruction and NGSS Enactment in Grades 6-8*

**Meghan Macias**, University of California, Santa Barbara

**Ashley Iveland**, WestEd

**Elizabeth Arnett**, WestEd

**Melissa Rego**, WestEd

**Maya Salcido White**, WestEd

## Program

### Teachers' Use of the Next Generation Science Standards for Alignment of Instructional Materials

Jamie Tanas, University of Iowa  
Gavin Fulmer, University of Iowa

### How Middle-School Science Teachers Enact Phenomena in NGSS Classrooms

Jonathan Boxerman, WestEd  
Kimberly Nguyen, WestEd  
Jasmine Marckwordt, University California Santa Barbara  
Ashley Iveland, WestEd

### The Effect of 5E Instructional Model-Based Class on Students' Understanding of Crosscutting Concepts

Dongxue Jin, Beijing Normal University  
Enshan Liu, Beijing Normal University

## Strand 7:

### Pre-service Science Teacher Education

#### Related Paper Set

#### *Pre-service Teachers' Use of Learning Progressions to Inform Classroom Instruction*

8:00 am - 9:30 am | *Real-Time/Live*

#### How Do Pre-service Teachers Use Learning Progressions when Interpreting Student Thinking in Mechanics?

Cristoph Münster, Justus Liebig University, Giessen  
Claudia Von Aufschnaiter, Justus Liebig University, Giessen

#### Investigating How Pre-service Teachers Draw on Their Understanding of Student Ideas to Elicit Student Thinking

James Hancock, Alma College  
Alicia Alonzo, Michigan State University

#### Pre-service Teachers' Use of Learning Progressions when Responding to Students' Ideas

Sisi Han, Beijing Normal University  
Alicia Alonzo, Michigan State University

#### A Pre-service Teacher's Use of Learning Progressions when Planning Instruction in Two Contexts

Julia Christensen, Michigan State University  
Sisi Han, Beijing Normal University  
Alicia Alonzo, Michigan State University

## Strand 10:

### Curriculum and Assessment

#### *Learning and Assessment in Project-based and Problem-based Curricula*

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

Jeffery Nordine, Leibniz Institute for Science and Mathematics Education

#### Integrating Computer Science in Science Classrooms: Learning Computational Thinking and Expanding Perceptions of Computer Science

Eric Greenwald, University of California, Berkeley  
Ari Krakowski, University of California, Berkeley

#### The Performance and Assessment of Students' Collaborative Problem Solving in Project-Based Learning

Yanan Zhao, Beijing Normal University  
Lei Wang, Beijing Normal University

#### Examining the Relationships between Post-unit Assessments and Summative Assessment in Elementary Project-Based Science Classrooms

Tingting Li, CREATE for STEM Institute  
I-Chien Chen, Michigan State University  
Emily Miller, University of Wisconsin Madison  
Kayla Bartz, Michigan State University  
Joseph Krajcik, Michigan State University

#### Tracking the Progress of High School Students' Modeling Proficiencies Across Sequential Project-Based Learning Chemistry Curriculum: A Longitudinal Study

Peng He, Michigan State University  
I-Chien Chen, Michigan State University  
Israel Tuitou, Michigan State University  
Sarah Maestrales, Michigan State University  
Joseph Krajcik, Michigan State University

## Program

### Strand 14:

#### Environmental Education and Sustainability

##### *Traditional Ecological Knowledge (TEK): Water Stories, Sustainability, Models, and Evidence*

8:00 am - 9:30 am | *Real-Time/Live*

Presider:

**Bhaskar Upadhyay**, University of Minnesota

Discussant:

**Femi Otulaja**, University of the Witwatersrand

Presenters:

**Rouhollah Aghasaleh**, Humboldt State University

**Bhaskar Upadhyay**, University of Minnesota

**Sharon Nelson-Barber**, WestEd

**Pauline Chinn**, University of Hawaii at Manoa

**Jonathan Boxerman**, WestEd

**Paichi Shein**, National Sun Yat-sen University

**Kai-Lung Wang**, National Sun Yat-sen University

**Wei-Ting Li**, Taichung Municipal Sha-Lu Junior  
High School

**Peresang Sukinarhimicc**, Indigenous People Cultural  
Development Center

**Femi Otulaja**, University of the Witwatersrand

### CONCURRENT SESSION #10

9:45 am - 10:45 am

*Advance Viewing of Pre-recorded Presentations  
with 60-minute Real-Time/Live Q&A*

### Strand 1:

#### Science Learning: Development of Student Understanding

##### *Students' Understanding of Physical Science Concepts*

9:45 am - 10:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Jennifer Tripp**, University at Buffalo

**Experience Doesn't Matter but the Direction Does:  
Differential Accuracy in Relative Motion Problems**  
**Jason Morpew**, Purdue University

**Mapping the Territory: The Development of  
Students' Repertoires of Ideas about Energy**  
**Marcus Kubsch**, Leibniz Institute for Science and  
Mathematics Education

**The Development of Middle School Students'  
Conceptual Learning on Energy Transformations  
through Design Thinking**  
**Ayse Ciftci**, Mus Alparslan University  
**Mustafa Topcu**, Yildiz Technical University

**The Process of Doing Science—A Study of Three  
Students Exploring Sound and Light**  
**Sebastian Björnhammer**, Stockholm University  
**Jakob Gyllenpalm**, Stockholm University  
**Iann Lundegård**, Stockholm University

### Strand 2:

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

##### *Contextual, Socio-Emotional, and Attitudinal Factors across K-12 Education*

9:45 am - 10:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Henriette Burns**, Washington State University

**The Efficacy of Project-based Learning Science  
on Supporting Students' Learning Energy in  
No-Western Classroom**

**Jie Yang**, Beijing Normal University

**Sisi Han**, Beijing Normal University

**Jian-Xin Yao**, National Institute for Curriculum and  
Textbook Research, P. R. China

**Yu-Ying Guo**, Beijing Normal University

**Joseph S. Krajcik**, Michigan State University

**Addressing the Affective Dimension of Learning  
through Biophilia in Classroom Gardening**

**Aimee Fraulo**, North Carolina State University

## Program

### **The Trade-Off between STEM Knowledge Acquisition and Language Learning in Short-Scale Bilingual Implementations**

**Tamara Roth**, University of Bayreuth  
**Franz Bogner**, University of Bayreuth

### **Strand 2:**

### **Science Learning: Contexts, Characteristics and Interactions**

#### ***Epistemic & Disciplinary Engagement in Middle and Secondary School***

**9:45 am - 10:45 am**

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Zoe Buck Bracey**, BSCS

#### ***Small Teacher Moves with Big Impacts in Shaping Students' Sensemaking and Intellectual Authority in Science***

**Jennifer Schellinger**, Florida State University  
**Sierra Morandi**, Florida State University  
**Sherry Southerland**, Florida State University  
**Lama Jaber**, Florida State University  
**Miray Tekkumru Kisa**, Florida State University  
**Harini Krishnan**, Florida State University

#### ***"Dude... Just Put a Mirror Here": Examining Epistemic Practices in Middle School Collaborative Engineering Contexts***

**Ramya Sivaraj**, University of Minnesota  
**Jeanna Wieselmann**, Southern Methodist University  
**Gillian Roehrig**, University of Minnesota

#### ***Finding Alignment in Framing: Dynamics of Collaborative Disciplinary Engagement in Science***

**Harini Krishnan**, Florida State University  
**Lama Jaber**, Florida State University  
**Jennifer Schellinger**, Florida State University  
**Sherry Southerland**, Florida State University

### **Anchoring Epistemic Agency and Participation within Place-based Learning Progressions**

**Lezly Taylor**, Virginia Polytechnic Institute and State University

**Brenda Brand**, Virginia Tech University

**George Glasson**, Virginia Polytechnic Institute and State University

### **Strand 4:**

### **Science Teaching—Middle and High School**

(Grades 5-12)

#### ***Socioscientific Issues in the Science Classroom***

**9:45 am - 10:45 am**

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Joseph Brobst**, Old Dominion University

#### ***Teaching Science during a Pandemic: A National Study of Teacher Decision Making***

**Patrick Smith**, Horizon Research, Inc.  
**Peggy Trygstad**, Horizon Research, Inc.  
**Laura Craven**, Horizon Research, Inc.

#### ***The Most Challenges and Needs for Teachers to Engaging Students in SSI Learning***

**Jing Lin**, Beijing Normal University  
**Huilei Han**, Beijing Normal University  
**Liang Zeng**, Beijing Normal University  
**Troy Sadler**, University of North Carolina at Chapel Hill  
**Knut Neumann**, Leibniz Institute for Science and Mathematics Education

#### ***Teaching Controversial Socio-Scientific Issues: Challenges and Affordances***

**Janelle Bailey**, Temple University  
**Ananya Matewos**, St. Norbert College  
**Sanlyn Buxner**, Planetary Science Institute, University of Arizona

## Program

### Strand 4:

#### Science Teaching—Middle and High School

(Grades 5-12)

##### Student Thinking and Interest in Science

9:45 am - 10:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presenter:

John Holmquist, Florida Institute of Technology

##### An Analysis of Secondary Student Views of Quantum Physics

Zac Patterson, Ohio State University

Lin Ding, Ohio State University

##### Enhancing Students' Interest in Science and STEM Careers: The Role of Career-based Scenarios

Irene Drymiotou, University of Cyprus and University of Groningen

Lucy Avraamidou, University of Groningen

Constantinos Constantinou, University of Cyprus

##### Enacting Rigorous Science Lessons: Leveraging Students' Ideas for Enhancing Demand on Student Thinking Problem

Ozlem Akcil Okan, Florida State University

Miray Tekkumru Kisa, Florida State University

##### Concept Maps in Learning Biology: Concept Mapping from Memory is more Beneficial than from Text

Sina Lenski, University of Cologne

Jörg Großschedl, University of Cologne

### Strand 4:

#### Science Teaching—Middle and High School

(Grades 5-12)

##### Teacher Learning through Practice

9:45 am - 10:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presenter:

Gregory Banks, University of Massachusetts, Boston

##### Teacher Emphasis and What It Reveals about Chemical Ideas and Practices

Gregory Banks, University of Massachusetts, Boston

Hannah Sevia, University of Massachusetts, Boston

##### What Epistemological Resources Affect Chemistry Teachers' Sense of "What Worked"

Adam Schafer, University of Wisconsin, Madison

Ryan Stowe, University of Wisconsin, Madison

##### Expanding the STEM Teacher Pool: A History Teacher's Experience Teaching a High School Engineering Course

Adam Carberry, Arizona State University

Medha Dalal, Arizona State University

Malay Nagda, Arizona State University

Brendan McCarthy, College Park Academy

##### Challenges and Supports for Secondary Science and Mathematics Teacher Retention

Christine Lotter, University of South Carolina

Jennifer Crooks-Monastra, University of South Carolina

Greysi Irdam, University of South Carolina

Jan Yow, University of South Carolina

### Strand 5:

#### College Science Teaching and Learning

(Grades 13-20)

##### Authentic Learning Inside and Outside the Classroom

9:45 am - 10:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presenter:

Jorge Solis, University of Texas at San Antonio

##### Exploring Students' Values and Classroom Experiences across a Consortium of Four Universities

Gili Marbach-Ad, University of Maryland

Patrick Sheehan, University of Maryland

Katerina Thompson, University of Maryland

Lindsay Wheeler, University of Virginia

Cindy Ghent, Towson University

Jackie Bortiatynski, Pennsylvania State University

## Program

### Establishing a Baseline of Science Communication Skills

Heather Bergan-Roller, Northern Illinois University  
Rashmi Shivni, Northern Illinois University  
Christin Cline, Northern Illinois University  
Morgan Newport, Northwestern University  
Shupeí Yuan, Northern Illinois University

### How Different Course-Based Undergraduate Research Experience Models Impact Student Perceptions of the Scientific Research Culture

Jessica Dewey, University of Minnesota  
Anita Schuchardt, University of Minnesota

### Strand 5:

### College Science Teaching and Learning

(Grades 13-20)

### Reasoning and Thinking about STEM

9:45 am - 10:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presider: **Scott Cohen**, Georgia State University

### Students' Visual Patterns in Solving Synthesis Physics Tasks

Bashirah Ibrahim, University of Bahrain  
Lin Ding, Ohio State University

### Student Explanations about Molecular Processes in Information Flow and Transfer in Biology

Juli Uhl, Michigan State University  
Kevin Haudek, Michigan State University

### An Investigation of Undergraduate Students' Spatial Thinking about Groundwater

Holly White, University of Nebraska, Lincoln  
Cory Forbes, University of Nebraska, Lincoln

### Sensemaking Opportunities for Mathematical Equations Differ Across Instructors Teaching the Same Scientific Phenomenon

FangFang Zhao, NanJing Normal University  
Linh Chau, University of Minnesota  
Anita Schuchardt, University of Minnesota

### Strand 6:

### Science Learning in Informal Contexts

### Creating in Informal Science

9:45 am - 10:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presider:

**Elgin Leary**, University of Georgia

### Once Upon a Time We Had to Stay at Home: STEM Stories and Phone Photos in My (or Any) Family Culture

**Phyllis Katz**, University of Maryland, College Park

### Making Board Games as Building Models: What are Some Implications for Environmental Science Education?

**Priyanka Parekh**, Transylvania University  
**Elisabeth Gee**, Arizona State University  
**Kelly Tran**, High Point University  
**Earl Aguilera**, California State University, Fresno  
**Taylor Kessner**, Arizona State University  
**Luis E. Pérez Cortés**, Arizona State University  
**Sinem Siyahhan**, California State University, San Marcos

### Creating Comics about COVID-19 to Understand the Intersections between Science, Community, and Equity

**Shakuntala Devi Gopal**, SUNY Buffalo  
**Anthony White**, SUNY Buffalo  
**Jessica Scates**, SUNY Buffalo  
**Sameer Honwad**, SUNY Buffalo  
**Ryan Rish**, SUNY Buffalo

### Photo-elicitation as a Technique for Identifying Triggers of Situational Interest during a Nature Reserve Visit

**Bhamini Kamudu**, University of Witwatersrand  
**Marissa Rollnick**, University of Witwatersrand  
**Eunice Nyamupangedengu**, University of Witwatersrand

## Program

### Strand 6:

#### Science Learning in Informal Contexts

##### Experiences in Informal Science

9:45 am - 10:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Henry James Evans**, University of Copenhagen

##### A Mixed Blessing: High School Students' Visiting a University: Self-Reported Experience and a Wishlist

**Efrat Nativ Ronen**, Technion, Israel Institute of Technology

**Tali Tal**, Technion, Israel Institute of Technology

##### An Authentic Experience with a SEM as Enacting Endogenous Science for Capacity Building

**Ella Yonai**, Weizmann Institute of Science

**Ron Blonder**, Weizmann Institute of Science

### Strand 6:

#### Science Learning in Informal Contexts

##### Informal Science in Media and Society

9:45 am - 10:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Sanlyn Buxner**, University of Arizona

##### Supports and Challenges during Educational Crisis: Examining the Impact of the Pandemic on Youth Pathways

**Rachel Chaffee**, American Museum of Natural History

**Preeti Gupta**, American Museum of Natural History

**Karen Hammerness**, American Museum of Natural History

**Timothy Podkul**, SRI International

**Anna MacPherson**, American Museum of Natural History

**Michael Chavez-Reilly**, American Museum of Natural History

**Kea Anderson**, SRI International

**Daniel Princiotta**, SRI International

**Daniela Saucedo**, SRI International

##### Gendered Engagement with Posts Authored by Female Scientists on Facebook

**Keren Dalyot**, Technion, Israel Institute of Technology

**Yael Rozenblum**, Technion, Israel Institute of Technology

**Ella Lachman**, Little Big Science

**Ayelet Baram-Tsabari**, Technion, Israel Institute of Technology

##### Science News Websites: Making Science Accessible for All

**Ifat Zimmerman**, Technion, Israel Institute of Technology

**Tali Tal**, Technion, Israel Institute of Technology

**Avshalom Ginosar**, The Academic College of Emek Yezreel

##### Depression and Test Anxiety in Science Stream High Schoolers: Influence of Dummy Schools in India

**Parth Soni**, Indian Institute of Management Ahmedabad

**Kathan Shukla**, Indian Institute of Management, Ahmedabad

### Strand 7:

#### Pre-service Science Teacher Education

##### COVID and Course Design

9:45 am - 10:45 am

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Elizabeth Lewis**, University of Nebraska, Lincoln

##### Emergency Remote Teaching of Science Methods Courses during the COVID-19 Pandemic

**Martha Canipe**, Northern Arizona University

##### Ed+gineering Teams of Undergraduate Education and Engineering Students Transition Online to Teach Elementary Students Engineering

**Kristie Gutierrez**, Old Dominion University

**Orlando Ayala**, Old Dominion University

**Jennifer Kidd**, Old Dominion University

**Pilar Pazos**, Old Dominion University

**Stacie Ringleb**, Old Dominion University

**Krishna Kaipa**, Old Dominion University



## Program

### Supporting Preservice Elementary Teachers' Development of Science Concepts and Practices in an Online Course

Nidaa Makki, The University of Akron  
Danielle Dani, Ohio University  
Andrea Maria Anderson, Ohio University

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

#### Sociocultural Perspectives on Teacher Learning and Classroom Practice

9:45 am - 10:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presider:

Jennifer Maguire, Virginia Tech

#### Opportunities for Reflecting on Opposition to Learning Evolution during a Teacher Training Course

Merav Siani, Weizmann Institute of Science and Herzog College

Reut Stahi-Hitin, Weizmann Institute of Science  
Anat Yarden, Weizmann Institute of Science

#### Analyzing whether Teachers' Task Values Influenced Their Implementation of Bioeconomy-focused Lessons: A Pilot Study

Margaret Blanchard, North Carolina State University

Karen Collier, North Carolina State University

Aparajita Rajwade, North Carolina State University

Katherine McCance, North Carolina State University

Shana McAlexander, North Carolina State University

Richard Venditti, North Carolina State University

#### Formative Interventions for Expansive Teacher Learning in Multilingual Science Education: Change Laboratories for Transformation of Practice

Sara Salloum, University of Balamand

Saouma Boujaoude, American University of Beirut

### Strand 13:

#### History, Philosophy, Sociology, and Nature of Science

#### Using Augmented Reality and Mixed Reality to Enhance Science Learning

9:45 am - 10:45 am

Advanced Pre-recorded Viewing and Live Q&A

Presider:

Richard Lamb, East Carolina University

#### Working as Intended? How Procedural Fidelity and Flow Impact Learning in a Game-Based Science Curriculum

Shane Tutwiler, University of Rhode Island

Denise Bressler, East Carolina University

Len Annetta, East Carolina University

#### Using Augmented-Reality to Reduce Cognitive Load while Learning Organic Chemistry

Sebastian Keller, University of Duisburg, Essen

Stefan Rumann, University of Duisburg, Essen

Sebastian Habig, University of Duisburg-Essen

#### A Study of Mixed Reality Technology on Elementary School Students Reading of Science Expository Text

Len Annetta, East Carolina University

Denise Bressler, East Carolina University

Ashley Holder, Fayetteville State University

Alexis Dunekack, East Carolina University

### CONCURRENT SESSION #11

11:00 am - 12:00 pm

Advance Viewing of Pre-recorded Presentations with 60-minute Real-Time/Live Q&A

### Strand 5:

#### College Science Teaching and Learning

(Grades 13-20)

#### Buttress and Barriers to Constructing College Cultures of STEM

11:00 am - 12:00 pm

Advanced Pre-recorded Viewing and Live Q&A

Presider:

Shana McAlexander, North Carolina State University

## Program

### Approaches to Learning Biology of Women of Color: The Intersectionality of Gender, Race, and Science-Identity

**Angela Google**, Middle Tennessee State University  
**Anna Grinath**, Idaho State University  
**Grant Gardner**, Middle Tennessee State University  
**Eshan Patel**, Middle Tennessee State University

### A Qualitative Investigation of Students' Acceptance of Evolution

**Ryan Dunk**, University of Northern Colorado  
**Jason Wiles**, Syracuse University

### Culturally Responsive Teaching in Undergraduate Science Learning Spaces

**Hillary Barron**, University of Minnesota, Twin Cities  
**Julie Brown**, University of Florida  
**Sehoya Cotner**, University of Minnesota

### Physical Science Doctoral Students' Perspectives on Obstacles and Opportunities for Identity Development in Graduate School

**Anne McAlister**, University of Virginia  
**Sarah Lilly**, University of Virginia  
**Jennifer Chiu**, University of Virginia

## Strand 5: College Science Teaching and Learning

(Grades 13-20)

### Alternative Routes to College STEM

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Petra Kranzfelder**, University of California, Merced

### Nature of Uncertainty in Undergraduate Non-Majors Biology Labs: Face-to-Face vs. Online Formats

**Samantha Skrob**, Florida State University  
**Sherry Southerland**, Florida State University

### "In the End, You Actually Remember Learning Stuff": First-Generation College Undergraduates Perspectives of Student-Centered Instruction

**Ashley Harlow**, University of California, Irvine  
**Brian Sato**, University of California, Irvine

### Non-traditional Adult Learners as Legitimate Participants in Undergraduate STEM Outreach Programs

**Hannah Huvad**, University of Colorado, Denver  
**Robert Talbot**, University of Colorado, Denver  
**Michael Ferrara**, National Science Foundation

### Creating Communities of Support at Two-Year HSIs: Serving Underrepresented Students in STEM

**Victoria Rodriguez-Operana**, San Diego State University  
**Gabriela Kovats Sánchez**, San Diego State University  
**Felisha Herrera**, San Diego State University  
**Marlena Wolfram**, San Diego State University

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

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Clausell Mathis**, University of Washington

### Preservice Elementary Teachers' Perspectives of Informal Science Spaces

**Michelle Forsythe**, Texas State University  
**Yun-Wen Chan**, Texas State University

### Teaching Science to Refugees: A Multi-Site Case Study of Volunteer Educators in Non-Formal Education Settings

**Erika Gillette**, College of Mount Saint Vincent

### Informal Science Educators' Perceptions of Effective Facilitation Practices

**Alexandria Muller**, University of California, Santa Barbara  
**Kyle Van Loon**, University of California, Santa Barbara  
**Molly Hay**, University of California, Santa Barbara  
**Jasmine Marckwordt**, University of California, Santa Barbara  
**Ron Skinner**, MOXI, The Wolf Museum of Exploration and Innovation  
**Danielle Boyd Harlow**, University of California, Santa Barbara

## Program

### Parent-Child Science Talk to Support Children's Informal Learning at Home

Wahyu Setioko, Ohio State University  
Lin Ding, Ohio State University

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

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Alpaslan Sahin**, Harmony Public Schools

### **Bridging Formal and Informal Education in an Afterschool Science Club for Children from Low Income Communities**

**Megan Pham-Quan**, University of Toronto  
**Lydia Burke**, University of Toronto  
**Novella Ricotti**, University of Toronto  
**Natalie Marentic**, University of Toronto

### **Investigating How 4-H Project Manuals Engage Children in Science & Engineering Practices**

**Ashley Kookan**, West Virginia University  
**Jennifer Murray**, West Virginia University  
**Melissa Luna**, West Virginia University

### **Students as Informed Citizens: Constructing Socioscientific Arguments in an Elementary After-School Program**

**Melissa Cieto**, University of Massachusetts, Dartmouth  
**Stephen Witzig**, University of Massachusetts, Dartmouth

### **"A Leg Up": Accelerating High School Students' Career Trajectories through Informal STEM Programs**

**Kathryn Rende**, North Carolina State University  
**Emma Refvem**, North Carolina State University  
**M. Gail Jones**, North Carolina State University  
**Sarah Carrier**, North Carolina State University  
**Megan Ennes**, University of Florida  
**Julianna Nieuwsma**, North Carolina State University

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

### **Development of Pre-service Teacher Knowledge and Practice**

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Bridget Miller**, University of South Carolina

### **Fostering the TPACK of Science Teacher Students in a Pedagogical Makerspace**

**Anna-Lisa Max**, PH Weingarten  
**Sarah Lukas**, PH Weingarten  
**Holger Weitzel**, PH Weingarten

### **The Effects of Modeling Based STEM Education on Alternative Nature of Science Understandings of Pre-service Science Teachers**

**Ayse Buber**, Dokuz Eylul University  
**Gul Unal Coban**, Dokuz Eylul University

### **Impact of Professional Learning Communities on Preservice Teacher Usage of Reformed Teaching Practices**

**Rachael Tawbush**, University of Alabama  
**Dennis Sunal**, University of Alabama

### **Towards a Deeper Understanding—The Impact of Cognitive Support on Pre-service Teachers' Content Knowledge**

**Dustin Schiering**, Leibniz Institute for Science and Mathematics Education  
**Stefan Sorge**, Leibniz Institute for Science and Mathematics Education  
**Knut Neumann**, Leibniz Institute for Science and Mathematics Education

## Program

### **Strand 7:**

#### **Pre-service Science Teacher Education**

##### ***Expanding the Toolkit for Pre-service Teachers***

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Imran Tufail**, University of Waikato

##### **Opportunities and Tensions when Teaching for the edTPA**

**Karin Lohwasser**, University of California, Santa Barbara

**Soo-Yean Shim**, University of Washington

**Caroline Hadley Long**, University of Washington

**Mark Windschitl**, University of Washington

##### **Lessons from Using PAR as Pedagogy in Science Methods with Elementary Pre-service Teachers**

**Rachel Askew**, Vanderbilt University

##### **Engaging International Emerging Teachers in Coauthoring Tools through a TAS Framework**

**Moyu Zhang**, New York University

##### **How Practice-Oriented Teacher-Training Modules Affect Pre-service Biology Teachers' Views on Inclusive Science Education**

**Elizabeth Watts**, Friedrich Schiller Universität Jena

### **Strand 8:**

#### **In-service Science Teacher Education**

##### ***Teacher Engagement in Science Practices***

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Nidaa Makki**, The University of Akron

##### **Research Experience Enriches Teachers' Classroom Practices Related to Science and Engineering Practices and STEM Careers**

**Sanlyn Buxner**, University of Arizona

**Daniel Moreno**, University of Arizona

**Larry Horvath**, San Francisco State University

**John Keller**, University of Colorado

**Melissa Yisak**, American Institutes for Research

**Bo Zhu**, American Institutes for Research

**Deidre Sessoms**, Sacramento State University

**Dermot Donnelly-Hermosillo**, Fresno State

**Elsa Bailey**, San Francisco State University

**Stamatis Vokos**, Cal Poly, San Luis Obispo

##### **Critical Events as Catalysts for Cultivating Teachers' Understandings about Science through Firsthand Research Experiences**

**Shannon Davidson**, Florida State University

**Lama Jaber**, Florida State University

**Sherry Southerland**, Florida State University

##### **Designing Professional Learning Experiences to Support Teachers' Computational Thinking, Learning and Confidence**

**Amanda Peel**, Northwestern University

**Jacob Kelter**, Northwestern University

**Michael Horn**, Northwestern University

**Uri Wilensky**, Northwestern University

##### **The Efficacy of SciWorld in Solving the Transfer Problem and Supporting Teacher Enactment of the Next Generation Science Standards**

**Darby Feldwinn**, University of California, Santa Barbara

**Sarah Hough**, University of California, Santa Barbara

**Sammi Lambert**, University of California, Santa Barbara

**Vanessa Woods**, University of California, Santa Barbara

### **Strand 8:**

#### **In-service Science Teacher Education**

##### ***Teacher Self-efficacy and Perceptions***

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Elizabeth Lewis**, University of Nebraska, Lincoln

##### **Supporting Elementary Teachers in High-Need Schools to Teach STEM**

**Amanda Gunning**, Mercy College

**Meghan Marrero**, Mercy College

**Elena Nitecki**, Mercy College

**Latanya Brandon**, SUNY New Paltz

**Kristen Larson**, Mercy College

**Brian Baldwin**, Kean University

# Program

## Teachers' Self-efficacy Beliefs for Teaching Science as Inquiry: A Large National Sample in Oman

Mohamed Shahat, Sultan Qaboos University  
Ambusaidi Abdullah, Sultan Qaboos University  
David Treagust, Curtin University

## A Comparative Analysis of High School Science Teachers' Perceived Approach and Efficacy Teaching Problem-Solving

Bryanna Nelson, Purdue University  
Hui-Hui Wang, Purdue University  
Neil Knobloch, Purdue University  
Sarah LaRose, Purdue University

## Strand 8: In-service Science Teacher Education Approaches to STEM Implementation

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

Matthew Johnson, Pennsylvania State University

## Exploring Science Teacher Noticing in Informal Science Settings

Sara Heredia, University of North Carolina, Greensboro  
Ti'Era Worsley, University of North Carolina, Greensboro  
Jakayla Clyburn, University of North Carolina, Greensboro

## Digging Deeper into Conceptions of Integrated STEM: Focusing on 21st Century Skills and STEM Careers

Emily Dare, Florida International University  
Khomson Keratithamkul, University of Minnesota  
Benny Mart Hiwatig, University of Minnesota  
Feng Li, Florida International University

## Engaging Agency to Teach Science: Examining Elementary Teachers' Participation and Enactment of School-Based Professional Development

Jessica Chen, Columbia University

## Enhancement of the Pedagogy of Scientific Argumentation and Supporting Teacher Agency in the Secondary Classroom

Zeynep Guler, University College London

## Strand 10: Curriculum and Assessment

## Curriculum and Assessment in the Context of Physics

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

Ya-nan Zhao, Beijing Normal University

## Analysis of the Spanish-Language Force Concept Inventory: Lost in Translation?

Cesar Delgado, North Carolina State University  
Hye Sun You, Arkansas Tech University  
Natalia Murillo-Quirós, Instituto Tecnológico de Costa Rica  
Mónica Hernández-Campos, Instituto Tecnológico de Costa Rica

## Subject Matter as a Discipline-culture a New Curricular Organization for Improving Understanding in Learning Science

Lina Vinitsky-Pinsky, Achva Academic College, Israel  
Irena Vladimirovsky, Achva Academic College, Israel  
Igal Galili, Hebrew University of Jerusalem, Israel

## Student Facets of Thinking in Parallel Contexts

Philip Hernandez, Stanford University  
Jim Minstrell, FACET Innovations, LCC  
Maria Araceli Ruiz-Primo, Stanford University  
Min Li, University of Washington  
Klint Kanopka, Stanford University  
Ruth Anderson, FACET Innovations, LLC  
Dongsheng Dong, University of Washington  
Xiaoming Zhai, Michigan State University

## Analyzing the Use of Educative Curriculum Materials in Physics Teaching

Judith Breuer, Universität Paderborn  
Christoph Vogelsang, Universität Paderborn  
Peter Reinhold, Universität Paderborn

## Program

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

#### **Students and STEM**

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Maria Wallace**, University of Southern Mississippi

#### **“It Just Represents, You Know, Me”: Latinx Students Developing Identities as Engineers-in-Training**

**Jasmine McBeath Nation**, California Polytechnic University

**Francesca Sen**, Youth and Family Services, Santa Barbara YMCA

#### **Science Practices as an Opportunity for Student Language Development: Affordances, Tensions, and Ideological Contradictions**

**Emily Reigh**, Stanford University

#### **Shifting Stereotypes: Low-stakes Assignments Highlighting Counterstereotypical Scientists Alter Students’ Perceptions of and Relatability to Scientists**

**Kelsey Metzger**, University of Minnesota, Rochester

**Bradley Craker**, University of Minnesota, Rochester

**Yuefei Shen**, University of Minnesota, Twin Cities

#### **Influences on Historically Underrepresented Minority Students’ Decisions to Enroll and Persist in STEM Majors**

**Shetay Ashford-Hanserd**, Texas State University

**Kristy Daniel**, Texas State University

**Dana García**, Texas State University

**Yasiry Lerma**, Texas State University

**Rosio Pedroso**, Texas State University

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

#### **Teacher Leadership and Engagement in PD**

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Kimberly Staples**, Kansas State University

#### **Science Teachers’ Process Skills, Inquiry, and Problem-Based Learning during Induction: A Randomized Controlled Trial**

**Shannon Navy**, Kent State University

**Jennifer Maeng**, University of Virginia

**Randy Bell**, Oregon State University

**Fatma Kaya**, Kent State University

#### **Experiences of School Science Coordinators during the COVID-19 Pandemic: An International Perspective**

**Harleen Singh**, University of Georgia

**Hong Tran**, University of Georgia

**Hatice Ozen Tasdemir**, University of Georgia

**Yuxi Huang**, University of Georgia

**Julie Luft**, University of Georgia

#### **Science Teacher Engagement in Professional Learning**

**Irit Vivante**, Ben Gurion University of the Negev

**Dana Vedder-Weiss**, Ben-Gurion University of the Negev

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

#### **STEM Identity**

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

#### **STEM Identities, First-Generation College Students, and Family Influence**

**Megan McGinty**, University of Alaska Fairbanks

**Laura Carsten Conner**, University of Alaska Fairbanks

## Program

### Developing STEM Identities in Students in the “Big Middle”. Connections between Identity and Socioeconomic Level

**Carme Grimalt-Álvaro**, Universitat Rovira I Virgili  
**Digna Couso**, Crecim-Universitat Autònoma De Barcelona

### Examining the Intersection of Spirituality Religiousness, Race/Ethnicity, and Gender on the Physics Career Choices

**Saeed Moshfeghyeganeh**, Florida International University  
**Amanda Smith**, Florida International University  
**Zahra Hazari**, Florida International University

### Who is a STEM Person?: Analysis of Criteria Used to Define and Differentiate STEM People

**Elizabeth Palma-D’Souza**, Florida International University  
**Remy Dou**, Florida International University  
**Heidi Cian**, Florida International University

### Strand 12:

#### Technology for Teaching, Learning, and Research

### Digital Tools to Support Inservice and Pre-service Teachers’ Professional Learning

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Yael Feldman-Maggor**, Weizmann Institute of Science

### Promote Computational Thinking of Middle School Teachers through Sparc-Integrated Science Instruction

**Jianlan Wang**, Texas Tech University  
**Yuanlin Zhang**, Texas Tech University  
**Joshua Hawkins**, Texas Tech University  
**Monica Romero**, Texas Tech University

### Elementary Pre-service Teachers’ Learning of Content Knowledge: A Qualitative Research Using Top Hat Digital Platform

**Samantha Lynch**, Wayne State University  
**Jazlin Ebenezer**, Wayne State University

### Different Teaching Experience: How Teachers Personalized a Teaching Unit in an Online Chemistry Learning System

**Ehud Aviran**, Weizmann Institute of Science  
**Ron Blonder**, Weizmann Institute of Science

### Strand 12:

#### Technology for Teaching, Learning, and Research

### Teaching and Learning with Technology through the COVID-19 Pandemic

11:00 am - 12:00 pm

*Advanced Pre-recorded Viewing and Live Q&A*

Presider:

**Miri Barak**, Technion, Israel Institute of Technology

### The COVID-19 Pandemic Implications on a Flipped Project-Based MBSE Course

**Niva Wengrowicz**, Technion, Israel Institute of Technology

**Hanan Kohen**, Technion, Israel Institute of Technology

**Dov Dori**, Technion, Israel Institute of Technology

### Uncharted Territories: Teaching Science Virtually in the Era of COVID-19

**Justina Ogoto**, Baylor University

**Marsha Simon**, University of West Georgia

**Dana Morris**, Baylor University

**Mark Akubo**, Florida State University

### Learning Experience and Instructional Design Efforts Promoting Self-efficacy and Task-Value in Undergraduate Science Online Courses

**Joseph Wong**, University of California, Irvine

**Brad Hughes**, University of California, Irvine

## Program

### Strand 14:

#### Environmental Education and Sustainability

##### Learning Out of Doors

11:00 am - 12:00 pm

Advanced Pre-recorded Viewing and Live Q&A

Presider:

Sara Salisbury, Middle Tennessee State University

##### Engaging the Urban Classroom with the Natural World: Lessons Learned during a Pandemic

Gary Holliday, The University of Akron

Lara Roketenetz, The University of Akron

##### Impacts of Contextualized Outdoor Education on What and How Elementary Students Learn about Ecosystem Relationships

Jean-Philippe Ayotte-Beaudet, Université De Sherbrooke

Pierre Chastenay, Université du Québec à Montréal

Alain Paquette, Université du Québec à Montréal

Michael Giamellaro, Oregon State University

Marie-Claude Beaudry, Université de Sherbrooke

Kassandra L'Heureux, Université de Sherbrooke

Estelle Desjarlais, Université du Québec à Montréal

##### Pre-service Teachers' Perceptions and Practices of Outdoor Learning: A Case Study of Time Spent Outdoors

Gerald Tembrevilla, University of British Columbia, Vancouver

Hartley Banack, University of British Columbia

### CLOSING SESSION

12:15 pm - 1:00 pm | Real-Time/Live

Presidential Closing Remarks

2022 Conference Information

### Author-Scheduled Presentations Day and Time

Day and Time to be determined by authors.

If not listed here, then please consult program addendum/changes.

#### Science Teachers' Perceptions Regarding Digital Curation as a Personalized Learning Activity that Promotes Professional Learning

Thursday, April 8 | 8:00 am - 8:30 am

Efrat Dayan, Technion, Israel Institute of Technology

Dina Tsybulsky, Technion, Israel Institute of Technology

#### STEM Teachers' Professional Learning Community during the COVID-19 Pandemic

Thursday, April 8 | 11:30 am - 12:00 pm

Zehavit Kohen, Technion, Israel Institute of Technology

Orit Cohen Nissan, Technion, Israel Institute of Technology

#### Fostering Transformative Agency in Science Education: Students Imagining Technological Futures

Friday, April 9 | 9:00 am - 9:30 am

Antti Laherto, University of Helsinki

Tapio Rasa, University of Helsinki

Elina Palmgren, University of Helsinki







## NARST 94<sup>TH</sup> ANNUAL INTERNATIONAL CONFERENCE

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All elections policies (and other policies) are found on the NARST website  
[https://narst.org/sites/default/files/2021-01/Policies\\_Procedures\\_12-20\\_0.pdf](https://narst.org/sites/default/files/2021-01/Policies_Procedures_12-20_0.pdf)  
in the NARST Policies and Procedures manual.







# NARST

A global organization for improving  
science education through research

## GET INVOLVED

Help NARST achieve its mission

**“to help all learners  
achieve science literacy”**

by taking an active role in leadership.

---

### **Run for the Board of Directors:**

Self-nominate or nominate a colleague

- The Call for Nominations will be emailed to NARST members in **May 2021**.
- Nominees need **10** NARST member endorsements.
  - Collect them at the conference!
  - Note: An email “I support x’s nomination” will suffice.
- Complete and submit nomination package by **June 2021** deadline (details included in the Call).

**For more details, talk with  
Board or Elections Committee members**

All elections policies (and other policies) are found on the NARST website [https://narst.org/sites/default/files/2021-01/Policies\\_Procedures\\_12-20\\_0.pdf](https://narst.org/sites/default/files/2021-01/Policies_Procedures_12-20_0.pdf) in the NARST Policies and Procedures manual.