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

April 7-10, 2021
A Virtual Conference
BREAKTHROUGH INCLUSIVE ACTION TOOL KIT

Version 1.0 (September 2020)

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NARST 94TH ANNUAL INTERNATIONAL CONFERENCE

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

April 7-10, 2021
A Virtual Conference

Acknowledgments

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

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# Table of Contents

5 General Information  
5 Information about NARST and NARST Mission Statement  
5 Member Benefits  
5 Code of Ethical Conduct  
7 Explanation of Paper Session Types  
8 Explanation of Program Session Formats  
8 Guidelines for Real-Time/Live Meeting Presenters  
8 Guidelines for Pre-recorded Meeting Presenters  
8 Guidelines for Poster Meeting Presenters  
9 Guidelines for Presiders and Discussants  
9 Networking Concurrent Sessions  
11 Research Interest Groups (RIGs) Information  
12 Strand Key  
12 NARST Leadership Team  
13 Strand Coordinators  
14 Program Proposal Reviewers  
17 NARST Presidents  
18 NARST Executive Directors  
18 JRST Editors  
18 NARST Emeritus Members  
19 NARST Awards  
19 Distinguished Contributions to Science Education through Research  
20 Outstanding Doctoral Research Award  
20 Early Career Research Award  
21 JRST Award  
22 The NARST Outstanding Paper Award  
23 Outstanding Master’s Thesis Award  
23 Classroom Applications Award  
24 NARST Leadership Team and Committees  
27 NARST Sessions at NSTA Engage ’21  
28 Future Meeting Dates  
28 Sponsors  
29 2022 NARST Annual International Conference  
30 Schedule at-a-Glance  
36 Annual Meeting Program by Date and Time  
121 Author Index

Please note that this program is subject to change. Check the addendum posted at the meeting and on the website for updates.
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 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.
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


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### Explanation of Paper Session Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>Paper Sessions Organized by the Program Committee:</td>
<td>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&amp;A.</td>
</tr>
<tr>
<td>Symposium</td>
<td>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.</td>
</tr>
<tr>
<td>Related Paper Sets</td>
<td>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.</td>
</tr>
<tr>
<td>Posters</td>
<td>This paper session type visually showcases the presenters’ work in a standard poster format.</td>
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</tbody>
</table>
Explanation of Program Session Formats

<table>
<thead>
<tr>
<th>Session</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Conference Workshops</td>
<td>Interactive working group sessions before the official Conference</td>
</tr>
<tr>
<td>Graduate Student Forum</td>
<td>Synchronous opportunity for graduate students to interact and learn.</td>
</tr>
<tr>
<td>Mentor-Mentee Session</td>
<td>Synchronous opportunity for first attendees to conference and early-career individuals to interact with more seasoned NARST members.</td>
</tr>
<tr>
<td>Poster Sessions</td>
<td>Traditional poster display activated for a 23-hour window with asynchronous interaction by way of chat during the 23 hours.</td>
</tr>
<tr>
<td>Author-Scheduled Presentations (all Strands)</td>
<td>These slots are scheduled by necessity. Authors prerecord and post presentations. In addition, authors schedule a 30-minute Q&amp;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.”</td>
</tr>
<tr>
<td>Networking/ Social Concurrent Sessions</td>
<td>Synchronous opportunities to interact with participants around a theme/topic/activity.</td>
</tr>
<tr>
<td>Concurrent Sessions</td>
<td>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&amp;A conducted in real-time.</td>
</tr>
</tbody>
</table>

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.
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.

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.
**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.

**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 alcofa (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

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

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) Alejandro J. Gallard, Georgia Southern University
(21) Senay Purzer, Purdue University
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(22) Noemi Waight, University of Buffalo
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(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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NSTA Representative:
(21) Cynthia Crockett, Harvard-Smithsonian Center for Astrophysics

JRST Editors:
(25) Troy Sadler, University of North Carolina at Chapel Hill
(25) Felicia Moore Mensah, Teachers College, Columbia University

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 Puvarajah, 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 Ogunola-Bandele, National Open University of Nigeria
Program Proposal Reviewers:

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### General Information

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Program Proposal Reviewers: (continued)

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

NARST Presidents:

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

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

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### JRST Editors:

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### Emeritus Members:

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<td>Wayne Welch</td>
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<td>William Holliday</td>
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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.

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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.

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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.

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### 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.

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<td>John R. Staver *</td>
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<td>Dorothy L. Gabel *</td>
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<td>Linda R. DeTure</td>
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<td>Lee Meadows</td>
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<td>Mary Ratcliffe</td>
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<td>Robert G. Good *</td>
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<td>C. W. J. M. Klassen</td>
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<td>Richard Duschl</td>
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<td>Harold J. Fletcher *</td>
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<td>P. L. Linjse</td>
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<td>F. David Boulanger</td>
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<td>Shirley Simon</td>
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<tr>
<td>1983</td>
<td>Jack A. Easley, Jr.</td>
<td>1998</td>
<td>Julie Bianchini</td>
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<td>1984</td>
<td>Marcia C. Linn</td>
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<td>Phillip M. Sadler</td>
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<td>Stephen Pulos</td>
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<td>Allan G. Harrison</td>
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<td>J. Grayson</td>
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<td>Julie P. Sanford</td>
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<td>David F. Treagust</td>
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<td>1986</td>
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<td>Michael J. Padilla</td>
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<td>Randy Yerrick</td>
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<td>Kenneth G. Tobin</td>
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<td>James J. Gallagher</td>
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<td>Jo Ellen Roseman</td>
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<td>Glen S. Aikenhead</td>
<td>2004</td>
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<td>Robin Millar</td>
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<td>Richard Duschl</td>
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</tbody>
</table>

* Multiple Awardees
## 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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
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<tbody>
<tr>
<td>1975</td>
<td>John J. Koran</td>
<td>1989</td>
<td>James J. Gallagher Armando Contreras</td>
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<td>Anton E. Lawson</td>
<td>1990</td>
<td>Patricia L. Hauslein Ronald G. Good Catherine Cummins</td>
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<td>1977</td>
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<td>1991</td>
<td>Nancy R. Romance Michael Vitale</td>
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<td>1978</td>
<td>Rita Peterson</td>
<td>1992</td>
<td>Patricia Heller Ronald Keith Scott Anderson</td>
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<td>Linda R. DeTure</td>
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<td>Wolff-Michael Roth</td>
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<td>William Capie Kenneth G. Tobin Margaret Boswell</td>
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<td>1987</td>
<td>Robert D. Sherwood</td>
<td>2001</td>
<td>Allan G. Harrison</td>
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<td>2004</td>
<td>Joanne K. Olson * Sharon J. Lynch * Joel Kuipers Curtis Pyke Michael Szcsze</td>
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<td>2005</td>
<td>Chi-Yan Tsui David Treagust</td>
<td>2006</td>
<td>Leema Kuhn Brian Reiser</td>
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<td>2008</td>
<td>Guy Ashkenazi Lana Tockus-Rappoport</td>
<td>2009</td>
<td>Jrene Rahm</td>
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<td>2010</td>
<td>Mark W. Winslow John R. Staver Lawrence C. Sharmann</td>
<td>2011</td>
<td>Matthew Kloser</td>
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<td>2014</td>
<td>Ying-Chih Chen Soonhye Park Brian Hand</td>
<td>2015</td>
<td>Lori M. Ihrig Michael P. Clough Joanne K. Olson</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Major Professor</th>
<th>Advisor</th>
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<tr>
<td>1995</td>
<td>Moreen K. Travis</td>
<td>Carol L. Stuessy</td>
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<td>1996</td>
<td>Lawrence T. Escalada</td>
<td>Dean A. Zollman</td>
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<tr>
<td>1997</td>
<td>C. Theresa Forsythe</td>
<td>Jeffrey W. Bloom</td>
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<td>1998</td>
<td>Renee D. Boyce</td>
<td>Glenn Clark</td>
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<td>1999</td>
<td>Andrew Gilbert</td>
<td>Randy K. Yerrick</td>
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<td>2000</td>
<td>Rola Fouad Kishfe</td>
<td>Fouad Abd-El-Khalick</td>
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<tr>
<td>2002</td>
<td>Laura Elizabeth Slocum</td>
<td>Marcy Hamby Towns</td>
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</tr>
</tbody>
</table>

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                  |
---   |--------------------------|
1980  | Livingston S. Schneider  |
1980  | John W. Renner           |
1980  | Heidi Kass               |
1980  | Allan Griffiths          |
1980  | Ramona Saunders          |
1980  | Russell H. Yeany         |
1980  | Joe Long                 |
1980  | James R. Okey            |
1980  | Russell H. Yeany         |
1980  | M. James Kozlow          |
1980  | Arthur L. White          |
1981  | Dorothy L. Gabel         |
1981  | Robert D. Sherwood       |
1981  | Larry G. Enochs          |
1981  | Dorothy L. Gabel         |
1981  | Robert D. Sherwood       |
1981  | Larry G. Enochs          |
1981  | Dorothy L. Gabel         |
1982  | Louise L. Gann           |
1982  | Seymour Fowler           |
1982  | Dorothy L. Gabel         |
1982  | Robert D. Sherwood       |
1982  | Thomas L. Russell        |
1982  | Joseph C. Cotham         |
1982  | Robert D. Sherwood       |
1982  | Larry G. Enochs          |
1982  | Dorothy L. Gabel         |
1983  | Mary Westerback          |
1983  | Clemencia Gonzales       |
1983  | Louis H. Primavera       |
1983  | Kenneth G. Tobin         |
1983  | Hanna J. Arzi            |
1983  | Ruth Ben-Zvi             |
1983  | Uri Ganiel               |
1983  | Charles Porter           |
1983  | Russell H. Yeany         |
1985  | Dan L. McKenzie          |
1985  | Michael J. Padilla       |
1985  | Margaret Walkosz         |
1985  | Russell H. Yeany         |
1985  | Kevin C. Wise            |
1985  | James R. Okey            |
1986  | Sarath Chandran          |
1986  | David F. Treagust        |
1986  | Kenneth G. Tobin         |
1986  | Darrell L. Fisher        |
1986  | Barry J. Fraser          |
1986  | Dorothy L. Gabel         |
1986  | Stanley L. Helgeson      |
1986  | Joseph D. Novak          |
1986  | John Butzow              |
1987  | Dorothy L. Gable         |
1987  | V. K. Samuel             |
1987  | Stanley L. Helgeson      |
1987  | Saundra McGuire          |
1987  | Joseph D. Novak          |
1987  | John Butzow              |
1988  | Uri Zoller               |
1988  | Ben Chaim                |
1989  | James D. Ellis           |
1989  | Paul J. Kuerbis          |
1990  | Dale R. Baker            |
1990  | Michael D. Piburn        |
1990  | Dale S. Niederhauser     |
1991  | David F. Jackson         |
1991  | Billie Jean Edwards      |
1991  | Carl F. Berger           |
General Information

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(21) Alejandro Gallard, Georgia Southern University

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(21) Justina Ogodo, Baylor University

Representative from the International Committee
(21) Jing Lin, Beijing Normal University

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

Members
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(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

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) Maria González-Howard, The University of Texas at Austin
(23) Paulette Vincent-Ruz, University of Michigan

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Ex Officio Members
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(23) Deb Morrison, Co-Chair, University of Washington

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(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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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
General Information

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Board Liaison
(22) Noemi Waight, University of Buffalo

Outstanding Doctoral Research Award
Committee Leadership
(21) Jay Fogelman, 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 Daniellson, 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

International Committee:

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

Members
(21) Peter Wulf, 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

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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René 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
General Information

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

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(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

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(23) Shakhrnoza Kayumova, Co-Chair, University of Massachusetts, Dartmouth

Members
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(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 H. Yeter, National Institute of Education (NIE), Nanyang Technological University (NTU), Singapore
(23) Tina Cheuk, Stanford University
(23) Dante Cisterna, Education Testing Service

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Board Liaison
(21) Jennifer D. Adams, University of Calgary

NARST Liaison to NSTA
(21) Michael Bowen, Mount Saint Vincent University

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(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) Rouollah Aghasaleh, Georgia State University
(23) Lori Andersen, University of Kansas
(23) Narendra Deshmukh, Tata Institution of Fundamental Research

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Board Liaison
(23) Christina Schwarz, Michigan State University

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

Members
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(22) Nazihan Ursavas, Erdogan University
(23) Sharona T. Levy, University of Haifa
(23) Jaclyn Murray, Augusta University
(23) Len Annetta, East Carolina University
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Conference</th>
<th>Dates</th>
<th>Location</th>
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<tbody>
<tr>
<td>2021</td>
<td>NARST</td>
<td>TBD</td>
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<td>NSTA</td>
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<td></td>
<td>AERA</td>
<td>April 8-12</td>
<td>Virtual</td>
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<tr>
<td>2022</td>
<td>NARST</td>
<td>March 27-30</td>
<td>Vancouver, BC</td>
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<td></td>
<td>NSTA</td>
<td>March 31-April 3</td>
<td>Houston, TX</td>
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</tbody>
</table>

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).
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
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

<table>
<thead>
<tr>
<th>Wednesday, March 31</th>
<th>Time (EDT)</th>
<th>Conference Event</th>
<th>Session</th>
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<tbody>
<tr>
<td>9:30 am - 11:30 am</td>
<td>NARST Board Meeting</td>
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<td>Real-Time/Live</td>
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<tr>
<td>1:30 pm - 3:30 pm</td>
<td>NARST Board Meeting</td>
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<td>Real-Time/Live</td>
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<tr>
<td>6:00 pm - 8:00 pm</td>
<td>NASRT Board Meeting</td>
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<td>Real-Time/Live</td>
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<th>Time (EDT)</th>
<th>Conference Event</th>
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<td>NARST Board Meeting</td>
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<td>Real-Time/Live</td>
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<tr>
<td>1:30 pm - 3:30 pm</td>
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<th>Time (EDT)</th>
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<th>Session</th>
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<tbody>
<tr>
<td>8:00 am - 12:00 pm</td>
<td>Pre-Conference Workshop 1</td>
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<td>Real-Time/Live</td>
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<tr>
<td></td>
<td>Rethinking How You Understand Your Data with R</td>
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<td></td>
<td>Pre-Conference Workshop 2</td>
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<tr>
<td></td>
<td>Early Career Faculty Forum</td>
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<tr>
<td>12:30 pm - 3:30 pm</td>
<td>Pre-Conference Workshop 3</td>
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<td>Real-Time/Live</td>
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<td>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</td>
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<td>12:30 pm - 4:30 pm</td>
<td>Pre-Conference Workshop 4</td>
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<td>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</td>
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<th>Time (EDT)</th>
<th>Conference Event</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am - 12:00 pm</td>
<td>Pre-Conference Workshop 5</td>
<td></td>
<td>Real-Time/Live</td>
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<tr>
<td></td>
<td>Pushing the Boundaries: Exploring the Potential of an Online Practice Suite to Support Elementary Science Teachers in Learning How to Engage Students in Argumentation</td>
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<td>Pre-Conference Workshop 6</td>
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<td></td>
<td>LARIG Pre-conference Workshop: Empowering Latinx Graduate Students, Early Career Educators and Scholars in Science Education (Multilingual Workshop)</td>
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<tr>
<td>12:30 pm - 4:00 pm</td>
<td>Pre-Conference Workshop 7</td>
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<td>Real-Time/Live</td>
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<tr>
<td></td>
<td>Equity and Ethics Pre-Conference Workshop</td>
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<tr>
<td>Time (EDT)</td>
<td>Conference Event</td>
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<tr>
<td>9:15 am – 11:30 am</td>
<td>Welcome, Plenary Speaker, &amp; Awards Citations</td>
<td>Real-Time/Live</td>
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<tr>
<td>11:30 am – 12:30 pm</td>
<td>Lunch Break</td>
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<tr>
<td>11:30 am – 11:45 am</td>
<td>Networking/Social Concurrent Sessions</td>
<td>Real-Time/Live</td>
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<td></td>
<td>Participate in the “Round Robin”</td>
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<td></td>
<td>Meet the leadership and find out more about three of the following:</td>
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<td></td>
<td>- Awards Committee</td>
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<td>- Elections Committee</td>
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<td>- External Policy and Relations Committee</td>
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<td>- Program Committee</td>
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<td>- Research Committee</td>
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<td>- Website Committee</td>
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<td></td>
<td>Please visit committees in 15-minute segments from 11:30 am – 12:15 pm.</td>
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<td></td>
<td>Please join the business meeting of a committee from 12:30 pm – 1:30 pm.</td>
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<tr>
<td>11:30 am – 11:45 am</td>
<td>Drop-In Committee Visit #1</td>
<td>Real-Time/Live</td>
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<tr>
<td>11:45 am – 12:00 pm</td>
<td>Drop-In Committee Visit #2</td>
<td>Real-Time/Live</td>
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<tr>
<td>12:00 pm – 12:15 pm</td>
<td>Drop-In Committee Visit #3</td>
<td>Real-Time/Live</td>
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<tr>
<td>12:30 pm – 1:30 pm</td>
<td>Business Meetings of Committees (listed above)</td>
<td>Real-Time/Live</td>
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<tr>
<td></td>
<td>(Except for Elections Committee, scheduled on Friday, April 9th from 8:30 am – 9:30 am)</td>
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<tr>
<td>12:30 pm – 1:30 pm</td>
<td>Continental and Diasporic Africa in Science Education</td>
<td>Real-Time/Live</td>
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<td></td>
<td>Contemporary Methods for Science Education Research</td>
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<tr>
<td>1:45 pm – 3:15 pm</td>
<td>Concurrent Session #1</td>
<td>Real-Time/Live</td>
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<tr>
<td>3:30 pm – 5:00 pm</td>
<td>Graduate Student Forum</td>
<td>Real-Time/Live</td>
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<tr>
<td>5:00 pm – 6:00 pm</td>
<td>Mentor-Mentee Session</td>
<td>Real-Time/Live</td>
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<tr>
<td>6:00 pm – 8:00 pm</td>
<td>Networking/Social Concurrent Sessions</td>
<td>Real-Time/Live</td>
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<td></td>
<td>Participate in the “Round Robin”</td>
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<td></td>
<td>Meet the leadership and find out more about three of the following:</td>
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<td>- Equity and Ethics Committee</td>
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<td>- Membership Committee</td>
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<td>- Publications Advisory Committee</td>
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<td>- Graduate Student Committee</td>
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<td>- International Committee</td>
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<td>Please visit committees in 15-minute segments from 6:00 pm – 6:45 pm.</td>
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<td>Please join the business meeting of a committee from 7:00 pm – 8:00 pm.</td>
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<tr>
<td>6:00 pm – 6:15 pm</td>
<td>Drop-In Visit #1</td>
<td></td>
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<tr>
<td>6:15 pm – 6:30 pm</td>
<td>Drop-In Visit #2</td>
<td></td>
<td></td>
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<tr>
<td>6:30 pm – 6:45 pm</td>
<td>Drop-In Visit #3</td>
<td></td>
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<tr>
<td>7:00 pm – 8:00 pm</td>
<td>Business Meetings of the Committees (listed above)</td>
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</tbody>
</table>
## Schedule at-a-Glance

### Thursday, April 8 – Saturday, April 10

<table>
<thead>
<tr>
<th>Time (EDT)</th>
<th>Conference Event</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>THURS 8:00 am - FRI 7:00 am</td>
<td>Poster Session #1</td>
<td>23-hour window</td>
</tr>
<tr>
<td></td>
<td>Poster Viewing &amp; Asynchronous Chat</td>
<td></td>
</tr>
<tr>
<td>FRI 8:00 am - SAT 1:00 pm</td>
<td>Author-Scheduled 30-minute Q&amp;A Session (All Strands)</td>
<td>29-hour window</td>
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<tr>
<td></td>
<td>Advance Viewing of Pre-recorded Presentation</td>
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</table>

### Thursday, April 8

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>8:00 am - 9:30 am</td>
<td>Concurrent Session #2 (Real-Time/Live)</td>
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<tr>
<td>9:45 am - 11:15 am</td>
<td>Concurrent Session #3 (Real-Time/Live)</td>
</tr>
<tr>
<td>11:30 am - 1:00 pm</td>
<td>Concurrent Session #4 (Real-Time/Live)</td>
</tr>
<tr>
<td>1:00 pm - 2:00 pm</td>
<td>Lunch Break</td>
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<tr>
<td>2:00 pm - 3:00 pm</td>
<td>Concurrent Session #5 (Real-Time/Live)</td>
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<tr>
<td>3:15 pm - 4:15 pm</td>
<td>Latino/a Research Interest Group (Real-Time/Live)</td>
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<tr>
<td>3:30 pm - 5:30 pm</td>
<td>Networking/Social Concurrent Sessions (Real-Time/Live)</td>
</tr>
</tbody>
</table>

_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)_

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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</thead>
<tbody>
<tr>
<td>4:15 pm - 5:45 pm</td>
<td>Publishing, Reviewing, and Writing for JRST (Real-Time/Live)</td>
</tr>
<tr>
<td>Time (EDT)</td>
<td>Conference Event</td>
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</tr>
<tr>
<td>THURS 8:00 am - FRI 7:00 am</td>
<td>Poster Session #2, Poster Viewing &amp; Asynchronous Chat</td>
</tr>
<tr>
<td>FRI 8:00 am - SAT 1:00 pm</td>
<td>Author-Scheduled 30-minute Q&amp;A Session (All Strands), Advance Viewing of Pre-recorded Presentation</td>
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</tbody>
</table>

**Friday, April 9**

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

### Thursday, April 8 – Saturday, April 10

<table>
<thead>
<tr>
<th>Time (EDT)</th>
<th>Conference Event</th>
<th>Session</th>
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<tbody>
<tr>
<td>THURS 8:00 am – SAT 1:00 pm</td>
<td><strong>Author-Scheduled 30-minute Q&amp;A Session (All Strands)</strong>&lt;br&gt;Advance viewing of pre-recorded presentation, author schedule, 30-minute Q&amp;A</td>
<td>Real-Time/Live</td>
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</table>

### Saturday, April 10

<table>
<thead>
<tr>
<th>Time (EDT)</th>
<th>Conference Event</th>
<th>Session</th>
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<tbody>
<tr>
<td>8:00 am - 9:30 am</td>
<td><strong>Concurrent Session #9</strong></td>
<td>Real-Time/Live</td>
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<tr>
<td>9:45 am - 10:45 am</td>
<td><strong>Concurrent Session #10</strong></td>
<td>Real-Time/Live</td>
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<tr>
<td></td>
<td>Advanced viewing of pre-recorded sessions, Q&amp;A</td>
<td>Real-Time/Live</td>
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<tr>
<td>11:00 am - 12:00 pm</td>
<td><strong>Concurrent Session #11</strong></td>
<td>Real-Time/Live</td>
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<td></td>
<td>Advanced viewing of pre-recorded sessions, Q&amp;A</td>
<td>Real-Time/Live</td>
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<tr>
<td>12:15 pm - 1:00 pm</td>
<td><strong>President Closing Remarks &amp; 2022 Conference</strong></td>
<td>Real-Time/Live</td>
</tr>
<tr>
<td>4:00 pm - 10:00 pm</td>
<td><strong>NARST Board Meeting</strong></td>
<td>Real-Time/Live</td>
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### Overview

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Pre-Conference Workshops</strong></td>
<td>Interactive working group sessions before the official Conference</td>
</tr>
<tr>
<td><strong>Graduate Student Forum</strong></td>
<td>Synchronous opportunity for graduate students to interact and learn</td>
</tr>
<tr>
<td><strong>Mentor-Mentee Session</strong></td>
<td>Synchronous opportunity for first attendees to conference and early-career individuals to interact with more seasoned NARST members</td>
</tr>
<tr>
<td><strong>Poster Sessions</strong></td>
<td>Traditional poster display activated for a 23-hour window with asynchronous interaction by way of chat during the 23 hours</td>
</tr>
<tr>
<td><strong>Author-Scheduled Presentations</strong></td>
<td>These slots are scheduled by necessity. Authors pre-record and upload presentations prior to conference and schedule a 30-minute Q&amp;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.”</td>
</tr>
<tr>
<td><strong>Networking/Social Concurrent Sessions</strong></td>
<td>Synchronous opportunities to interact with participants around a theme/topic/activity.</td>
</tr>
<tr>
<td><strong>Concurrent Sessions</strong></td>
<td>Two session types:</td>
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<td>- Synchronous sessions in which multiple papers are presented and discussed.</td>
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<tr>
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<td>- Presentations are pre-recorded and viewed in advance by attendees with only a synopsis and Q&amp;A conducted in real-time.</td>
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</tbody>
</table>
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.
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

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).

Lunch Break (on your own)
11:30 am - 12:30 pm
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 Mutegi, 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 Klawon, 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
Boni 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
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

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
Louisa Stark, University of Utah

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

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
Gill Marbach-Ad, University of Maryland
Kristen Miller, University of Georgia
Elisabeth Schussler, University of Tennessee, Knoxville

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
Gill Marbach-Ad, University of Maryland
Kristen Miller, University of Georgia
Elisabeth Schussler, University of Tennessee, Knoxville

Wednesday, April 7, 2021
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

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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

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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

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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 Petitt, University of Nebraska-Lincoln
Corey Forbes, University of Nebraska-Lincoln
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 Peffer, Pennsylvania Department of Education

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

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

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

Environmental Science Curriculum Development in Local Communities: A Cultural Historical Activity Theory Perspective
Xavier Fazio, Brock University

Strand 15:
Policy, Reform, and Program Evaluation
Science Teacher Resiliency, Commitments, and Disciplinary Sense-Making within Complex Systems
1:45 pm – 3:15 pm | Real-Time/Live

Presider:
Kathryn Bateman, Temple University

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

Disciplinary Conflation in Integrated Science and Engineering
Jacob Pleasants, Keene State College
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.
**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.*

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**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.

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**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
**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

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**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

Thursday, April 8, 2021

**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

**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

Elementary Teachers’ Verbal Supports Across Science, Engineering, and Computer Science Disciplines in an NGSS-Aligned Unit
Sarah Lilly, University of Virginia
Anne McAlistier, 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

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 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

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
Maximilian Göhner, Freie Universität Berlin
Tom Bielik, Freie Universität Berlin
Moritz Krell, Freie Universität Berlin

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
Maximilian 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

Nam-Hwa Kang, Korea National University of Education

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

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

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

Connections between Negative Academic Experiences and the Impostor Phenomenon in STEM
Devashmita 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 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

Devasmita Chakraverty, Indian Institute of Management, Ahmedabad

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
Thursday, April 8, 2021

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
Haqit 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

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 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 Ceslarev, 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

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

John Ruppert, Saint Peter’s University
Masiel Infante, Saint Peter’s University

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

Middle School Students’ Informal Reasoning and Argument Quality for Different SSI
Cansu Basak Uygun, Middle East Technical University
Ozgul Yilmaz-Tuzun, Middle East Technical University
**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:


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**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 Rumage, Oregon Department of Education
Philip Bell, University of Washington
Remy Dou, Florida International University
Deb Morrison, University of Washington

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**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

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**Strand 1:**
**Science Learning: Development of Student Understanding**
9:45 am - 11:15 am | *Real-Time/Live*

**Using Assessment to Characterize Student Knowledge**

Presider:
Cesar Delgado, North Carolina State University

Mapping Consensus and Dissensus in Perspectives on Learning Progressions Research: Past, Present, and Future Figurations
Michelle Wooten, University of Colorado Boulder
Scott McDonald, Pennsylvania State University
**Mind Wandering of Grade Five Students with High and Low Performance in TIMSS-like Science Test**  
Sulaiman Al-Balushi, Sultan Qaboos University  
Khadijah Al-Balushi, Ministry of Education, Oman  
Rashid Al-Mherzi, Sultan Qaboos University  
Ibrahim Al-Harthi, Sultan Qaboos University  
Abdullah 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

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**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

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**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
**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

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

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

Faculty Perceptions of College Students’ Preparedness to Use Quantitative Reasoning (QR) in Introductory Biology Courses
Anne Cleveland, Maine Maritime Academy
Asli Sezen-Barrie, University of Maine
Gilli 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 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 Role of Informal Science Learning Environments in Supporting Scientific Engagement
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

**Strand 6:**
**Science Learning in Informal Contexts**
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
Thursday, April 8, 2021

Program

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**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

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**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 Shwarts 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
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
Ngoziika Mbaijorgu, 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 Ebinin, 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 Assakle, Technion, Israel Institute of Technology
Miri Barak, Technion, Israel Institute of Technology

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 Villarin, University of North Georgia
Samantha Fowler, Florida Institute of Technology

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

**Community Science, Citizen Science, and Community Scientific Literacy: Opportunities and Challenges for Environmental Stewardship**
Christopher Jadallah, University of California, Davis
Alexis Patterson Williams, University of California, Davis
Heidi Ballard, University of California, Davis

**CONCURRENT SESSION #4**
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
Thursday, April 8, 2021

Program

**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

**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 Zygoris-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-Dieter, University of Central Florida

Fugitive Science Societies: Re-Envisioning Science Education for Black People during the Early 20th Century
- Charnell Chasten Long, University of Wisconsin, Madison

The STEM Impostor: A Comparative Study of Black Females in Two Global Contexts
- Marsha Simon, University of West Georgia

**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
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
**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
Thursday, April 8, 2021

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

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**

**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

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

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

Design Justice in Humanitarian Engineering Education
Brandon Reynante, Stanford University
**Strand 11: Cultural, Social, and Gender Issues**

**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
- Thella 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

**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

Presider:
- Maria Wallace, University of Southern Mississippi

Discussant:
- Sara Tolbert, University of Canterbury

Presenters:
- Maria Wallace, University of Southern Mississippi
- Sara Tolbert, University of Canterbury
- Matthew Weinstein, University of Washington, Tacoma
- Darrin Collins, University of Illinois at Chicago
- Chessa Adsit-Morris, University of California, Santa Cruz
- Lawrence Bencze, University of Ontario, Toronto
- Michelle Wooten, University of Colorado, Boulder
- Kathryn Ryker, University of South Carolina
- Travis Weiland, University of Houston
- Rachel Askew, Vanderbilt University
**Strand 14:**
**Environmental Education and Sustainability**

**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

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**Supporting 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

Lunch Break (on your own)
11:30 am - 12:30 pm

Strand 2: Science Learning: Contexts, Characteristics, and Interactions
Scientific Discourse and Argumentation
2:00 pm - 3:00 pm

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

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**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:**
Jacquleyn 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
**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 Lorde, Wissenschat im Diolog, Berlin, Germany
Jessie Jennewein, Natural History Museum of Los Angeles County
Annie Miller, California Academy of Sciences, San Francisco
Lila Higgins, Natural History Museum of Los Angeles County
Rebecca Johnson, California Academy of Sciences
Lucy Robinson, The Natural History Museum, London

**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

**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
Program

Thursday, April 8, 2021

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

Presider:
Noemi Waight, University of Buffalo

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

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

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

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

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

**Capitalizing on the Intersections of Pop Culture and Science**
2:00 pm - 3:00 pm
Advanced Pre-recorded Viewing and Live Q&A

Presider:
Denise Bressler, East Carolina University

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

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

- Using Flipgrid as a Reflection Tool to Capture Students’ Design Thinking in a Second-Grade Science Classroom
  Sarah Guffy, University of South Alabama
  Joe Gaston, University of South Alabama
  Angela Rand, University of South Alabama

- Imagining Robots of the Future: Examining Sixth-Graders’ Perceptions of Robots through Their Literary Products
  Changzhao Wang, University of Miami
  Ji Shen, University of Miami
  Hua Ran, University of Miami
Research Interest Groups (RIGs) Meetings
3:15 pm – 4:15 pm | Real-Time/Live

Latino/a (LARIG)

Presider: Regina Suriel, 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!
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 Waught, 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

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.

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
Thursday, April 8, 2021

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
Thursday, April 8, 2021

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
Chariene Czerneak, 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 Kloeser, 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 Vegas
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
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

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 Ghahchi, 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
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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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.
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

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**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**
Lyrica Lucas, University of Nebraska-Lincoln
Tomáš Helíkár, 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**
Heeso 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

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

**Special Time Slot** | 7:15 am - 8:15 am
**Informal Science Learning in Museums and other Places**

7:15 am - 8:15 am
**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

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**CONCURRENT SESSION #6**

9:30 am – 10:30 am

*Advance Viewing of Pre-recorded Presentations with 60-minute Real-Time/Live Q&A*

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**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
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

Interest, Motivation, and Critical Thinking in Science Learning
9:30 am - 10:30 am
Advanced Pre-recorded Viewing & Live Q&A

Presider:
Sara Samiphak, University of California, Berkeley

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

Examining the Predictors of Middle School Students’ Interests in Computationally Demanding Science Careers
Arif Rachmatullah, North Carolina State University
Madeline Hinckle, North Carolina State University
Danielle Boulden, North Carolina State University
Eric Wiebe, North Carolina State University
The Effects of Critique-driven Inquiry (CDI) Teaching Intervention on Primary and Secondary School Students' Critical Thinking and Scientific Inquiry Competency
Ying-Yan Lu, Kaohsiung Medical University
Zuway-R Hong, Kaohsiung Medical University
Huann-Shyang Lin, National Sun Yat-Sen University
Thomas Smith, Northern Illinois University
Wen-Yi Hsu, Kaohsiung Medical University

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

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
Presider:
Laura Zangori, University of Missouri

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

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

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

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

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

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

Presenters:
Adekunle Ibrahim Oladejo, Lagos State University
Ibukunolu Adebiyi Ademola, Lagos State University
Peter Okebukola, Lagos State University
Fred Awaah, University of Professional Studies, Ghana
Deborah Oluwatosin Agbanimu, Lagos State University
Franklin Onowugbeda, Lagos State University
Aderonke Foluso Ebisin, Ogun State Institute of Technology
Esther Oluwafunmilayo Peter, Lagos State University
Michael Adelani Adewusi, Lagos State University
Tokunbo Ola Odekeye, Lagos State University

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

Rethinking STEM College Course Designs
9:30 am - 10:30 am
Advanced Pre-recorded Viewing and Live Q&A

Presider:
Joshua Reid, Middle Tennessee State University

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

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

“I Wasn’t Aware, Until I was Aware”: Reflective Practices for Teacher Empowerment
Elanur Yilmaz, Middle East Technical University
Elif Sönmez, Kastamonu University

Persistence in a STEM Teaching Program: Examining the Effects of Disciplinary Identity and Teaching Identity
Ingelise Giles, Florida International University
Nicole Cook, Florida International University
Zahra Hazari, Florida International University
Maria Fernandez, Florida International University
Laird Kramer, Florida International University
The Role of Motivation in Pre-service Physics Teachers’ Learning to Notice Students’ Preconception
Martin Schwichow, PH Freiburg
Katharina Hellmann, University of Education, Freiburg

Strand 8: In-service Science Teacher Education
Teacher Engagement and Leadership
9:30 am - 10:30 am
Advanced Pre-recorded Viewing 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
### 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**

Presider:  
Lori Andersen, University of Hawai‘i, Manoa

- **Teachers’ perspectives of Three-dimensional Formative Assessments Embedded within a Curriculum: An Initial Study**
  - Consuelo Morales, Michigan State University
  - Jane Lee, Michigan State University
  - Idit Adler, Tel Aviv University
  - Irene Bayer, Michigan State University

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

- **Challenges in Assessing Chemistry Lab Reports Among Pre-service Teachers**
  - Yoram Zemel, Technion, Israel Institute of Technology
  - Gabriela Shwartz, Technion, Israel Institute of Technology
  - Shirly Avargil, Technion, Israel Institute of Technology

- **Educative Curriculum Materials for Teacher Educators: Building Preservice Teachers’ Content Knowledge for Teaching about Matter**
  - Deborah Hanuscin, Western Washington University
  - Emily Borda, Western Washington University
  - Josie Melton, Western Washington University
  - Jamie Mikeska, Educational Testing Service

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

**Virtual Rehearsal Simulations to Explore Elementary Pre-service Teachers’ Scientific Discourse Skills**

9:30 am - 10:30 am  
**Advanced Pre-recorded Viewing 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

**Teaching and Learning in the College Science Classroom**

9:30 am - 10:30 am  
**Advanced Pre-recorded Viewing and Live Q&A**

Presider:  
Sally Wu, Northwestern University

- **The Design Components of an Online Course in Research Ethics for Science and Engineering Students**
  - Miri Barak, Technion, Israel Institute of Technology

- **Interrelationship between Perceived Innovative Thinking and Actual Innovation, Online vs. Face-to-Face Learners**
  - 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
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, Afiyon Kocatepe University
Savas Pamuk, Akdeniz University
Yakup Saban, Afiyon 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
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
Lyrica Lucas, University of Nebraska–Lincoln
Amy Tankersley, University of Nebraska–Lincoln
Elizabeth Hasseler, University of Nebraska–Lincoln
Anna Rivero, Seattle University
Brandon Helding, University of Nebraska-Lincoln

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.
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

Presider:
Karin Lohwasser, University of California, Santa Barbara

Examining Asset and Deficit Perspectives of Preservice Science Teachers' Knowledge and Learning
Ron Gray, Northern Arizona University
Scott McDonald, Pennsylvania State University
David Stroupe, Michigan State University

Reflective Practice in Microteaching: An Analysis of Preservice Secondary STEM Teachers' Video-Vased 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 10: Curriculum and Assessment
Curricular innovations in High School Biology
10:45 am - 11:45 am
Advanced Pre-recorded Viewing and Live Q&A

Presider:
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
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
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 Systematic Review of the Conceptual Framework of Attitude Toward Science Instruments
Radu Bogdan Toma, Universidad de Burgos
Jesús Ángel Meneses Villagrán, 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

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
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

**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
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
Erdogan Kaya, George Mason University

Differences and Interrelations between Science and Engineering—Stereotypes and Experts’ Perceptions
Lior Keren, Technion, Israel Institute of Technology
Shulamit Kapon, Technion, Israel Institute of Technology

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

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

Administrative Sponsored Session
Publications Advisory Committee
How to Get Your Research Published in Science Education Journals
1:15 pm – 2:45 pm | Real-Time/Live

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

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

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

**Evolution: Education and Outreach**
Ross Nehm, Stony Brook University

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

**Journal of Research in Science Teaching**
Felicia Mensah, Columbia University
Troy Sadler, University of North Carolina 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

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**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
Mark Duço, Johnson C. Smith University

Applying the Ecosystem Services Framework to Engage African American Undergraduate Students in Environmental Sciences
Oluwafunke Ogunya, Florida State University

Through Rated Responses to Cognitive Resources and Equity: Nigerian Students’ Productive Beginnings through Science Inquiry Responses
Mark Akubo, 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
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 García, 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

Presider:
Veronique Merritt, Columbia University

Group Interaction Patterns during Argument-Based Data Interpretation Tasks in Undergraduate Biology
Andrè Cavagnetto, Washington State University
Olivia Prestis, Washington State University
Aydén 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

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

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

Friday, April 9, 2021

Program

Related Paper Set
The Roles and Uses of Crosscutting Concepts in Elementary Teaching
1:15 pm – 2:45 pm | Real-Time/Live

Presider:
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
Asthα 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
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
Experiencing Student Engagement with ST and CT through Modeling in a Science Classroom
Jonathan Bowers, Michigan State University
Characterizing Students Progression Patterns in CT and ST through Modeling
Emil Eidin, Michigan State University
Israel Touitou, Michigan State University
Validation of a Rating Scale to Assess Learners’ Meta modeling Knowledge using the Argument-Based Approach
Paul Engelschalt, Humboldt University of Berlin
Anna Beniermann, Humboldt University of Berlin
Annette Umepeier 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
Presider:
Jennifer Maguire, Virginia Tech University
Experiences in Science Methods Courses and Science Teaching Efficacy
Sheryl McGlamery, University of Nebraska Omaha
Bridget Franks, University of Nebraska at Omaha
Saundra Shillingstad, University of Nebraska at Omaha
Influence of 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
Weeraphat Suksiri, University of California, Berkeley
Mark Wilson, University of California, Berkeley
Jonathan Osborne, Stanford University

Rethinking Assessments for Systems
Karyn Housh, Indiana University
Abeerah 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
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
Tatiané Russo-Tait, University of Texas at Austin
Katherine Doerr, University of Texas at Austin
Catherine Riegle-Crumb, University of Texas at Austin
Ursula Nguyen, University of Texas at Austin

Motivational Factors Mediating Attitudes Toward STEM Careers Amongst a National Sample of Middle School Students
Elif Oz, University of Notre Dame
Matthew Kloser, University of Notre Dame

Making Explicit Latinx Female Physics Students’ Goal Contents
Brian Zamarripa Roman, University of Central Florida
Jacqueline Chini, University of Central Florida

Strand 12: Technology for Teaching, Learning, and Research
Alternate Avenues of Assessment
1:15 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
Perceptions of Environmental Literacy Preparedness: An Intrastate Systemic Analysis of Districts’ Environmental Literacy Plan Implementation
Tamara Peffer, Pennsylvania Department of Education
Ann Gaudino, Millersville University
Nanette Marcum-Dietrich, Millersville University
Steven Kerlin, Stroud Water Research Center

Strand 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)
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.
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.

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.

Strand 8: POSTERS

Moving Beyond Providing Resources: A Multi-system Analysis of Science Teacher Leadership
Rachel Ruggirello, Washington University St. Louis
Allison 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
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 Fergusson, 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

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

Strand 10: POSTERS

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

Exploring Science Teacher Educators’ Evaluation of a Score Report to Support Content Knowledge for Teaching
Dante Cisterna, Educational Testing Service
Jamie Mikeska, Educational Testing Service
Katherine Castellano, Educational Testing Service
Jennifer Lentini, Educational Testing Service
How does Integrated STEM Life Sciences Unit Affect Middle School Students' Engagement and Academic Success?
Zeynep Akdemir, Purdue University
Saira Anwar, University of Florida
Muhsin Menekse, Purdue University
Selcen Guzey, Purdue University

Investigating students' performance on explanations, developing and using model via the use of Next Generation Science Assessment (NGSA)
Mao-Ren Zeng, National Taiwan Normal University
Mei-Hung Chiu, National Taiwan Normal University
Peng He, Michigan State University
Joseph Krajcik, Michigan State University

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

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

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

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

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

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

Building Antiracist Science Teachers for Indigenous Schools: Lessons from a Science Professional Development Workshop
Bhaskar Upadhyay, University of Minnesota

Maintaining Critical Virtual Counterspaces for Minoritized Communities in the COVID-19 Pandemic
Ann Varnedoe, Vanderbilt University
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
María Rodríguez, 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
Alexis Dunekack, East Carolina University

Strand 11: POSTERS
STEM Career Transformation: Influences to the Pathways of Community College Women of Color
Mel-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

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
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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
Alexis Dunekack, East Carolina University
Teacher Perceptions about an Engineering Argumentation Discussion within a Simulated Classroom after Feedback and Practice
Jamie Mikeska, Educational Testing Service
Pamela Lottero-Perdue, Towson University
Debra Brockway, Educational Testing
Dante Igor, Cisterna-Alburquerque, Pontificia Universidad Católica de Chile
Samira Sackety, Educational Testing Service
Joseph Ciolfalo, 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
Dawnne LePretre, Illinois Institute of Technology
Norman Lederman, Illinois Institute of Technology

Exploring School Students’ Ability to Recognise Warrants in Interdisciplinary Argumentation between Science and Religious Education
Liam Guilfoyle, University of Oxford
Sibel Erduran, University of Oxford

How Scientists Perceive and Value Communicating the Nature of Science to the Public
Sarah Poor, Texas A&M University
Benjamin Herman, Texas A&M University
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

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

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 Kahriman-Pamuk, Mersin University
Gelengul Haktanir, Ankara University

Strand 14: POSTERS

A Multi-Perspective Reflection of High School Science Students on Environmental Issues
Mercy Nyamekye, University of Education of Winneba, Ghana
Sakyiwaan 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
Program

**Strand 15: POSTERS**

Translating Research into Classroom Practice: Who is Publishing in Science Education Practitioner Journals (SEPJs)?
Joseph A. Taylor, University of Colorado, Colorado Springs
G. Michael Bowen, Mount Saint Vincent University
Marcus 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 Bogoqdan Toma, University of Burgos

Teaching Practices in Large STEM Classes: Perception from Undergraduate and Graduate Students
Ngawang Gonsar, University of Minnesota and Gustavus Adolphus College
Lorelai Patrick, Fort Hays State University
Sehoya Cotner, University of Minnesota

2018 Basu Scholars

Supporting Multilingual Students’ Engagement in Science Practices: A Case for Fostering 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

Friday, April 9, 2021
**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 Levri, University of Bologna
Shulamit Kapon, Technion, Israel Institute of Technology
Maayan Schwartzer, Technion, Israel Institute of Technology
Tal Peer, Acheret Center, Israel
Wonyong Park, University of Oxford
Jen-Li Wu, National Taiwan Normal University
Sharona Levy, University of Haifa
Asnat Zoharm, University of Haifa
Ilana Dubovi, Ben-Gurion University

**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:
Aysegul Oguz Namdar, Recep Tayyip Erdogan University

Presenters:
Sami Kahn, Princeton University
Wardell Powell, Framingham State University
Aysegul Oguz Namdar, Recep Tayyip Erdogan University
Hyunok Lee, Seoul National University
Mark Newton, East Carolina University
Dilek Karisan, Adnan Menderes University
Gillian Roehrig, University of Minnesota
Benzegül Durak, Duzce University
Li Ke, University of North Carolina at Chapel Hill
Dana Zeidler, University of South Florida

**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 Waigh, University at Buffalo

**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

**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?
  - Christoph 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 Touitou, Michigan State University
  - Sarah Maestrales, Michigan State University
  - Joseph Krajcik, Michigan State University
**Strand 14:**
**Environmental Education and Sustainability**

*Traditional Ecological Knowledge (TEK): Water Stories, Sustainability, Models, and Evidence*

8:00 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 Sukinarhmicc, Indigenous People Cultural Development Center
Femi Otulaja, University of the Witwatersrand

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**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

**Presenters:**
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

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**CONCURRENT SESSION #10**

9:45 am – 10:45 am

**Advance Viewing of Pre-recorded Presentations with 60-minute Real-Time/Live Q&A**

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**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 Morpheus, 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

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**Saturday, April 10, 2021**

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 Wiesemmann, 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

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Saturday, April 10, 2021
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

Presider:
John Holmquist, Florida Institute of Technology

An Analysis of Secondary Student Views of Quantum Physics
Zac Patterson, Ohio State University
Lin Ding, Ohio State University

Enhancing Students' Interest in Science and STEM Careers: The Role of Career-based Scenarios
Irene Drymiotou, University of Cyprus and University of Groningen
Lucy Avraamidou, University of Groningen
Constantinos Constantinou, University of Cyprus

Enacting Rigorous Science Lessons: Leveraging Students' Ideas for Enhancing Demand on Student Thinking Problem
Ozlem Akcil Oka’n, 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

Presider:
Gregory Banks, University of Massachusetts, Boston

Teacher Emphasis and What It Reveals about Chemical Ideas and Practices
Gregory Banks, University of Massachusetts, Boston
Hannah Sevian, University of Massachusetts, Boston

What Epistemological Resources Affect Chemistry Teachers’ Sense of “What Worked”
Adam Schafer, University of Wisconsin, Madison
Ryan Stowe, University of Wisconsin, Madison

Expanding the STEM Teacher Pool: A History Teacher’s Experience Teaching a High School Engineering Course
Adam Carberry, Arizona State University
Medha Dalal, Arizona State University
Malay Nagda, Arizona State University
Brendan McCarthy, College Park Academy

Challenges and Supports for Secondary Science and Mathematics Teacher Retention
Christine Lotter, University of South Carolina
Jennifer Crooks-Monastra, University of South Carolina
Greysi Irdam, University of South Carolina
Jan Yow, University of South Carolina

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

Authentic Learning Inside and Outside the Classroom
9:45 am – 10:45 am
Advanced Pre-recorded Viewing and Live Q&A

Presider:
Jorge Solis, University of Texas at San Antonio

Exploring Students' Values and Classroom Experiences across a Consortium of Four Universities
Gill Marbach-Ad, University of Maryland
Patrick Sheehan, University of Maryland
Katerina Thompson, University of Maryland
Lindsay Wheeler, University of Virginia
Cindy Ghent, Towson University
Jackie Bortiatynski, Pennsylvania State University
Establishing a Baseline of Science Communication Skills
Heather Bergan-Roller, Northern Illinois University
Rashmi Shivni, Northern Illinois University
Christin Cline, Northern Illinois University
Morgan Newport, Northwestern University
Shupei 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 Aquilera, 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 Rolnick, 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

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

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
Psychologist

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
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 Realty 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
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

Non-traditional Adult Learners as Legitimate Participants in Undergraduate STEM Outreach Programs
Hannah Huvard, University of Colorado, Denver
Robert Talbot, University of Colorado, Denver
Michael Ferrara, National Science Foundation

Creating Communities of Support at Two-Year HSIs: Serving Underrepresented Students in STEM
Victoria Rodriguez-Operana, San Diego State University
Gabriela Kovats Sánchez, San Diego State University
Felisha Herrera, San Diego State University
Marlena Wolfgramm, San Diego State University

Strand 6: Science Learning in Informal Contexts
Informal Educator Experiences
11:00 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

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
**Parent-Child Science Talk to Support Children’s Informal Learning at Home**  
Wahyu Setioko, Ohio State University  
Lin Ding, Ohio State University

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**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 Kooken, West Virginia University  
Jennifer Murray, West Virginia University  
Melissa Luna, West Virginia University

**Students as Informed Citizens: Constructing Socioscientific Arguments in an Elementary After-School Program**  
Melissa Cieto, University of Massachusetts, Dartmouth  
Stephen Witzig, University of Massachusetts, Dartmouth

**“A Leg Up”: Accelerating High School Students’ Career Trajectories through Informal STEM Programs**  
Kathryn Rende, North Carolina State University  
Emma Refvem, North Carolina State University  
M. Gail Jones, North Carolina State University  
Sarah Carrier, North Carolina State University  
Megan Ennes, University of Florida  
Julianna Nieuwsma, North Carolina State University

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**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  
Gül Unal Coban, Dokuz Eylül 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
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 Opisbo

Critical Events as Catalysts for Cultivating Teachers' Understandings about Science through Firsthand Research Experiences
Shannon Davidson, Florida State University
Lama Jaber, Florida State University
Sherry Southerland, Florida State University

Designing Professional Learning Experiences to Support Teachers' Computational Thinking, Learning and Confidence
Amanda Peel, Northwestern University
Jacob Kelter, Northwestern University
Michael Horn, Northwestern University
Uri Wilensky, Northwestern University

The Efficacy of SciWorld in Solving the Transfer Problem and Supporting Teacher Enactment of the Next Generation Science Standards
Darby Feldwinn, University of California, Santa Barbara
Sarah Hough, University of California, Santa Barbara
Sammi Lambert, University of California, Santa Barbara
Vanessa Woods, University of California, Santa Barbara

Strand 8: In-service Science Teacher Education

Teacher Self-efficacy and Perceptions
11:00 am - 12:00 pm

Advanced Pre-recorded Viewing 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

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 Kerathamkul, 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 Vladimirsky, Achva Academic College, Israel
  Igal Galili, Hebrew University of Jerusalem, Israel

- Student Facets of Thinking in Parallel Contexts
  Philip Hernandez, Stanford University
  Jim Minstrell, FACET Innovations, LCC
  Maria Araceli Ruiz-Primo, Stanford University
  Min Li, University of Washington
  Klint Kanopka, Stanford University
  Ruth Anderson, FACET Innovations, LLC
  Dongsheng Dong, University of Washington
  Xiaoming Zhai, Michigan State University

- Analyzing the Use of Educative Curriculum Materials in Physics Teaching
  Judith Breuer, Universität Paderborn
  Christoph Vogelsang, Universität Paderborn
  Peter Reinhold, Universität Paderborn
Strand 11: Cultural, Social, and Gender Issues

**Students and STEM**

11:00 am – 12:00 pm  
Advanced Pre-recorded Viewing and Live Q&A

_**Presider:**_ Maria Wallace, University of Southern Mississippi

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**“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

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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

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**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

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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
Developing STEM Identities in Students in the “Big Middle”. Connections between Identity and Socioeconomic Level
Carme Grimalt-Álvaro, Universitat Rovira i Virgili
Digna Couso, Crecim-Universitat Autonoma De Barcelona

Examining the Intersection of Spirituality Religiousness, Race/Ethnicity, and Gender on the Physics Career Choices
Saeed Moshfeghyeganeh, Florida International University
Amanda Smith, Florida International University
Zahra Hazari, Florida International University

Who is a STEM Person?: Analysis of Criteria Used to Define and Differentiate STEM People
Elizabeth Palma-D’Souza, Florida International University
Remy Dou, Florida International University
Heidi Cian, Florida International University

Strand 12: Technology for Teaching, Learning, and Research
Digital Tools to Support Inservice and Pre-service Teachers’ Professional Learning
11:00 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

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 Ogodo, Baylor University
Marsha Simon, University of West Georgia
Dana Morris, Baylor University
Mark Akubo, Florida State University

Learning Experience and Instructional Design Efforts Promoting Self-efficacy and Task-Value in Undergraduate Science Online Courses
Joseph Wong, University of California, Irvine
Brad Hughes, University of California, Irvine
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
## Author Index

### A

<table>
<thead>
<tr>
<th>Author</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abd-El-Khalick, Fouad</td>
<td>18, 23, 93</td>
</tr>
<tr>
<td>Abdullah, Ambusaidi</td>
<td>117</td>
</tr>
<tr>
<td>Abramovich, Anat</td>
<td>61</td>
</tr>
<tr>
<td>Abramovitch, Shahar</td>
<td>16, 82</td>
</tr>
<tr>
<td>Adams, Jennifer</td>
<td>64, 75, 80</td>
</tr>
<tr>
<td>Adesina, Adewale</td>
<td>58</td>
</tr>
<tr>
<td>Adewusi, Michael</td>
<td>15</td>
</tr>
<tr>
<td>Adler, Idit</td>
<td>13, 15, 26, 48, 87</td>
</tr>
<tr>
<td>Adsit-Morris, Chessa</td>
<td>64</td>
</tr>
<tr>
<td>Affolter, Renee</td>
<td>86</td>
</tr>
<tr>
<td>Agbanimu, Deborah</td>
<td>14, 51, 58</td>
</tr>
<tr>
<td>Aghasaleh, Rouhollah</td>
<td>26, 80, 108</td>
</tr>
<tr>
<td>Aguilera, Earl</td>
<td>111</td>
</tr>
<tr>
<td>Ahmed, Khadija</td>
<td>86</td>
</tr>
<tr>
<td>Ajayi, Oluseyi</td>
<td>51</td>
</tr>
<tr>
<td>Akcil Okan, Ozlem</td>
<td>16, 54, 86, 110</td>
</tr>
<tr>
<td>Akdemir, Zeynep</td>
<td>17, 102</td>
</tr>
<tr>
<td>Akerson, Valerie</td>
<td>16, 52</td>
</tr>
<tr>
<td>Akgun, Selin</td>
<td>102, 104</td>
</tr>
<tr>
<td>Akubo, Mark</td>
<td>94, 119</td>
</tr>
<tr>
<td>Akuoko, Eric</td>
<td>67</td>
</tr>
<tr>
<td>Al-Aghbari, Mohammed</td>
<td>54</td>
</tr>
<tr>
<td>Alajmi, Talal</td>
<td>43</td>
</tr>
<tr>
<td>Alameh, Sahar</td>
<td>16, 74, 93</td>
</tr>
<tr>
<td>Al-Balushi, Khadijah</td>
<td>54</td>
</tr>
<tr>
<td>Al-Balushi, Sulaiman</td>
<td>16, 54</td>
</tr>
<tr>
<td>Alcaraz-Dominguez, Silvia</td>
<td>60</td>
</tr>
<tr>
<td>Alexandron, Giora</td>
<td>82</td>
</tr>
<tr>
<td>Al-Harithi, Ibrahim</td>
<td>54</td>
</tr>
<tr>
<td>Alkhourz, Jourjina</td>
<td>61</td>
</tr>
<tr>
<td>Almazroa, Hiya</td>
<td>100</td>
</tr>
<tr>
<td>Al-Mherzi, Rashid</td>
<td>54</td>
</tr>
<tr>
<td>Alonzo, Alicia</td>
<td>14, 98, 107</td>
</tr>
<tr>
<td>Alotaihi, Wadha</td>
<td>100</td>
</tr>
<tr>
<td>Al-Saad, Khalid</td>
<td>54</td>
</tr>
<tr>
<td>Alston, Daniel</td>
<td>84</td>
</tr>
<tr>
<td>Ambusaidi, Abdullah</td>
<td>54</td>
</tr>
<tr>
<td>Andersen, Lori</td>
<td>15, 26, 43, 87</td>
</tr>
<tr>
<td>Andersen, Sage</td>
<td>57, 105</td>
</tr>
<tr>
<td>Anderson, Andrew</td>
<td>14</td>
</tr>
<tr>
<td>Anderson, Charles</td>
<td>82</td>
</tr>
<tr>
<td>Anderson, Kea</td>
<td>112</td>
</tr>
<tr>
<td>Anderson, Ruth</td>
<td>117</td>
</tr>
<tr>
<td>Andrews, Chelsea</td>
<td>14, 67</td>
</tr>
<tr>
<td>Annetta, Len</td>
<td>15, 26, 102, 113</td>
</tr>
<tr>
<td>Antonenko, Pavlo</td>
<td>98</td>
</tr>
<tr>
<td>Anutza Almoog, Hana</td>
<td>52</td>
</tr>
<tr>
<td>Anwar, Saira</td>
<td>102</td>
</tr>
<tr>
<td>Anwar, Tasneem</td>
<td>16, 56</td>
</tr>
<tr>
<td>Apytyka, Helena</td>
<td>15, 83</td>
</tr>
<tr>
<td>Arada, Kathleen</td>
<td>66</td>
</tr>
<tr>
<td>Archer, Louise</td>
<td>70</td>
</tr>
<tr>
<td>Archibeque, Ben</td>
<td>98</td>
</tr>
<tr>
<td>Argudo, Yessenia</td>
<td>42</td>
</tr>
<tr>
<td>Arias, Anna Maria</td>
<td>14, 27, 48, 95, 96</td>
</tr>
<tr>
<td>Ariely, Moriah</td>
<td>16, 82</td>
</tr>
<tr>
<td>Arneson, Jessie</td>
<td>95</td>
</tr>
<tr>
<td>Arnett, Elizabeth</td>
<td>106</td>
</tr>
<tr>
<td>Arya, Diana</td>
<td>78</td>
</tr>
<tr>
<td>Asakle, Shadi</td>
<td>16, 58</td>
</tr>
<tr>
<td>Ascherenmann, Ellen</td>
<td>55</td>
</tr>
<tr>
<td>Ash, Andrea</td>
<td>101</td>
</tr>
<tr>
<td>Ash, Doris</td>
<td>18, 42</td>
</tr>
<tr>
<td>Ashford-Hanserd, Shetay</td>
<td>118</td>
</tr>
<tr>
<td>Asim, Sumreen</td>
<td>78</td>
</tr>
<tr>
<td>Askew, Rachel</td>
<td>16, 23, 116</td>
</tr>
<tr>
<td>Askinas, Karen</td>
<td>85</td>
</tr>
<tr>
<td>Astrogia, Ann</td>
<td>50</td>
</tr>
</tbody>
</table>

### B

<table>
<thead>
<tr>
<th>Author</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bae, Yejun</td>
<td>97</td>
</tr>
<tr>
<td>Baek, John</td>
<td>98</td>
</tr>
<tr>
<td>Bahng, E. J.</td>
<td>79</td>
</tr>
<tr>
<td>Bahndon, Anna</td>
<td>40</td>
</tr>
<tr>
<td>Bailey, Elsa</td>
<td>116</td>
</tr>
<tr>
<td>Bailey, Janelle</td>
<td>15, 109</td>
</tr>
<tr>
<td>Bailey, Makayla</td>
<td>61</td>
</tr>
<tr>
<td>Bain, Connor</td>
<td>64</td>
</tr>
</tbody>
</table>

---

**Note:** The page numbers indicate the range of pages where the author is mentioned, with entries in bold indicating the page numbers where they are the primary author or contributor.
<table>
<thead>
<tr>
<th>Author</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baker, Lauren</td>
<td>42</td>
</tr>
<tr>
<td>Baldwin, Brian</td>
<td>116</td>
</tr>
<tr>
<td>Balgopal, Meena</td>
<td>66, 104</td>
</tr>
<tr>
<td>Ball, Becky</td>
<td>104</td>
</tr>
<tr>
<td>Ballard, Heidi</td>
<td>59, 65, 70</td>
</tr>
<tr>
<td>Banack, Hartley</td>
<td>120</td>
</tr>
<tr>
<td>Bancroft, Senetta</td>
<td>50</td>
</tr>
<tr>
<td>Bang, Megan</td>
<td>65, 95</td>
</tr>
<tr>
<td>Banks, Gregory</td>
<td>110</td>
</tr>
<tr>
<td>Barak, Miri</td>
<td>16, 45, 58, 87, 119</td>
</tr>
<tr>
<td>Baram-Tsabari, Ayelet</td>
<td>14, 70, 78, 112</td>
</tr>
<tr>
<td>Bardar, Erin</td>
<td>65</td>
</tr>
<tr>
<td>Barelli, Eleonora</td>
<td>14, 49</td>
</tr>
<tr>
<td>Barendsen, Erik</td>
<td>68</td>
</tr>
<tr>
<td>Barratt, Clare</td>
<td>77</td>
</tr>
<tr>
<td>Barron, Hillary</td>
<td>114</td>
</tr>
<tr>
<td>Bartholomay, Lyric</td>
<td>88</td>
</tr>
<tr>
<td>Bartley, Jeanette</td>
<td>76</td>
</tr>
<tr>
<td>Bartz, Kayla</td>
<td>68, 107</td>
</tr>
<tr>
<td>Bate, Jeff</td>
<td>65</td>
</tr>
<tr>
<td>Bateman, Kathryn</td>
<td>15, 45, 66</td>
</tr>
<tr>
<td>Bathia, Shruti</td>
<td>78, 91</td>
</tr>
<tr>
<td>Batrouny, Nicole</td>
<td>67</td>
</tr>
<tr>
<td>Bauer, Jennifer</td>
<td>72</td>
</tr>
<tr>
<td>Bayer, Irene</td>
<td>48, 87</td>
</tr>
<tr>
<td>Bayram-Jacobs, Dürdane</td>
<td>24, 60, 68</td>
</tr>
<tr>
<td>Baze, Christina</td>
<td>54, 55</td>
</tr>
<tr>
<td>Beaudry, Marie-Claude</td>
<td>43, 120</td>
</tr>
<tr>
<td>Becker, Lukas</td>
<td>15, 55</td>
</tr>
<tr>
<td>Beckert, Betsy</td>
<td>41</td>
</tr>
<tr>
<td>Beeth, Michael</td>
<td>62</td>
</tr>
<tr>
<td>Belcastro, Amy</td>
<td>85</td>
</tr>
<tr>
<td>Bell, Philip</td>
<td>53</td>
</tr>
<tr>
<td>Bell, Randy</td>
<td>118</td>
</tr>
<tr>
<td>Ben Zvi Assaraf, Orit</td>
<td>16, 55</td>
</tr>
<tr>
<td>Benavides Lahnstein, Ana</td>
<td>70</td>
</tr>
<tr>
<td>Bencze, Lawrence</td>
<td>64</td>
</tr>
<tr>
<td>Benedict-Chambers, Amanda</td>
<td>95</td>
</tr>
<tr>
<td>Benieermann, Anna</td>
<td>14, 78, 96, 101, 102</td>
</tr>
<tr>
<td>Benita, Christine</td>
<td>65</td>
</tr>
<tr>
<td>Benjamin, Ruha</td>
<td>37</td>
</tr>
<tr>
<td>Bennett, Dorothy</td>
<td>42</td>
</tr>
<tr>
<td>Bennett, Robert</td>
<td>16, 52</td>
</tr>
<tr>
<td>Bennion, Adam</td>
<td>14, 50</td>
</tr>
<tr>
<td>Bergan-Roller, Heather</td>
<td>15, 111</td>
</tr>
<tr>
<td>Bergmann, Alexander</td>
<td>78</td>
</tr>
<tr>
<td>Berkowitz, Alan</td>
<td>47, 55</td>
</tr>
<tr>
<td>Berry, Maria</td>
<td>97</td>
</tr>
<tr>
<td>Bevis, Todd</td>
<td>86</td>
</tr>
<tr>
<td>Bex, Richard</td>
<td>72</td>
</tr>
<tr>
<td>Bhattacharya, Devarati</td>
<td>14, 41, 47, 59</td>
</tr>
<tr>
<td>Bielik, Tom</td>
<td>50, 55, 96</td>
</tr>
<tr>
<td>Billman, Alison</td>
<td>68</td>
</tr>
<tr>
<td>Binding, Maia</td>
<td>43</td>
</tr>
<tr>
<td>Bintz, Jody</td>
<td>85</td>
</tr>
<tr>
<td>Bird, Erin</td>
<td>65</td>
</tr>
<tr>
<td>Björnhammer, Sebastian</td>
<td>108</td>
</tr>
<tr>
<td>Blades, David</td>
<td>62</td>
</tr>
<tr>
<td>Blanchard, Margaret</td>
<td>42, 69, 113</td>
</tr>
<tr>
<td>Blonder, Ron</td>
<td>58, 88, 112, 119</td>
</tr>
<tr>
<td>Bodas, Moran</td>
<td>88</td>
</tr>
<tr>
<td>Bogan, Valerie</td>
<td>16, 102</td>
</tr>
<tr>
<td>Bogner, Franz</td>
<td>14, 109</td>
</tr>
<tr>
<td>Bolch, Charlotte</td>
<td>77</td>
</tr>
<tr>
<td>Boldyreva, Elena</td>
<td>103</td>
</tr>
<tr>
<td>Bondaryk, Genevieve</td>
<td>97</td>
</tr>
<tr>
<td>Bonebrake, Victoria</td>
<td>50</td>
</tr>
<tr>
<td>Borda, Emily</td>
<td>87</td>
</tr>
<tr>
<td>Borgerding, Lisa</td>
<td>15, 25, 90, 104</td>
</tr>
<tr>
<td>Borland, David</td>
<td>103</td>
</tr>
<tr>
<td>Borowski, Andreas</td>
<td>50, 79, 82</td>
</tr>
<tr>
<td>Bortiatynski, Jackie</td>
<td>110</td>
</tr>
<tr>
<td>Botch, Madison</td>
<td>54, 56</td>
</tr>
<tr>
<td>Boujaoude, Saouma</td>
<td>45, 75, 113</td>
</tr>
<tr>
<td>Boulden, Danielle</td>
<td>83</td>
</tr>
<tr>
<td>Bowen, G.</td>
<td>14</td>
</tr>
<tr>
<td>Bowen, Michael</td>
<td>13, 26, 27, 53, 105</td>
</tr>
<tr>
<td>Bowers, Jonathan</td>
<td>96</td>
</tr>
<tr>
<td>Box, Angela</td>
<td>50</td>
</tr>
<tr>
<td>Boxerman, Jonathan</td>
<td>107, 108</td>
</tr>
<tr>
<td>Branchetti, Laura</td>
<td>106</td>
</tr>
<tr>
<td>Brand, Brenda</td>
<td>109</td>
</tr>
<tr>
<td>Brandon, Latanya</td>
<td>116</td>
</tr>
<tr>
<td>Bressler, Denise</td>
<td>3, 14, 72, 74, 113</td>
</tr>
<tr>
<td>Breuer, Judith</td>
<td>117</td>
</tr>
<tr>
<td>Bricker, Leah</td>
<td>65</td>
</tr>
<tr>
<td>Brien, Sinead</td>
<td>70</td>
</tr>
<tr>
<td>Britton, Stacey</td>
<td>80</td>
</tr>
<tr>
<td>Brobst, Joseph</td>
<td>15, 67, 109</td>
</tr>
<tr>
<td>Brockhouse, Alison</td>
<td>100</td>
</tr>
<tr>
<td>Brockway, Debra</td>
<td>103</td>
</tr>
<tr>
<td>Brodsky, Lauren</td>
<td>43</td>
</tr>
<tr>
<td>Brown, Bryan</td>
<td>38, 63</td>
</tr>
<tr>
<td>Brown, Daniel</td>
<td>50</td>
</tr>
<tr>
<td>Brown, David</td>
<td>93</td>
</tr>
<tr>
<td>Brown, Julie</td>
<td>72, 114</td>
</tr>
<tr>
<td>Brown, Michelle</td>
<td>40</td>
</tr>
<tr>
<td>Bruce, Corrie</td>
<td>40</td>
</tr>
<tr>
<td>Bruna, Katherine</td>
<td>88</td>
</tr>
<tr>
<td>Bruner, Jeanne</td>
<td>15, 26, 103</td>
</tr>
<tr>
<td>Brunsen, Emily</td>
<td>103</td>
</tr>
<tr>
<td>Bryan, Lynn</td>
<td>55</td>
</tr>
<tr>
<td>Buber, Ayse</td>
<td>115</td>
</tr>
<tr>
<td>Buck Bracey, Zoe</td>
<td>17, 63, 77, 109</td>
</tr>
<tr>
<td>Author Name</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Bucknor, Carmen</td>
<td>44</td>
</tr>
<tr>
<td>Bugallo-Rodriguez, Anxela</td>
<td>48</td>
</tr>
<tr>
<td>Burgess, Terrance</td>
<td>16, 57</td>
</tr>
<tr>
<td>Burke, Lydia</td>
<td>115</td>
</tr>
<tr>
<td>Burns, Henriette</td>
<td>15, 24, 68, 108</td>
</tr>
<tr>
<td>Busch, K. C.</td>
<td>15, 81</td>
</tr>
<tr>
<td>Buschhüter, David</td>
<td>82</td>
</tr>
<tr>
<td>Büssing, Alexander</td>
<td>78</td>
</tr>
<tr>
<td>Buxner, Sanlyn</td>
<td>16, 109, 112, 116</td>
</tr>
<tr>
<td>Buxton, Cory</td>
<td>43</td>
</tr>
<tr>
<td>Byrd, Christyn</td>
<td>44</td>
</tr>
<tr>
<td>Byrd, Stephanie</td>
<td>102</td>
</tr>
<tr>
<td>Byrne, Virginia</td>
<td>56</td>
</tr>
<tr>
<td>Caballero, Marcos</td>
<td>40</td>
</tr>
<tr>
<td>Cabrera, Lautaro</td>
<td>56</td>
</tr>
<tr>
<td>Calabrese-Barton, Angela</td>
<td>38, 70</td>
</tr>
<tr>
<td>Callahan, Brendan</td>
<td>14, 96</td>
</tr>
<tr>
<td>Cameron, Alex</td>
<td>89</td>
</tr>
<tr>
<td>Campbell, Todd</td>
<td>59, 94</td>
</tr>
<tr>
<td>Canipe, Martha</td>
<td>15, 112</td>
</tr>
<tr>
<td>Caplan, Bess</td>
<td>47, 55</td>
</tr>
<tr>
<td>Capobianco, Brenda</td>
<td>67, 104</td>
</tr>
<tr>
<td>Caramaschi, Martina</td>
<td>52</td>
</tr>
<tr>
<td>Carberry, Adam</td>
<td>110</td>
</tr>
<tr>
<td>Carey, Lisa</td>
<td>71</td>
</tr>
<tr>
<td>Carletta, Liz</td>
<td>86</td>
</tr>
<tr>
<td>Carlson, Janet</td>
<td>43</td>
</tr>
<tr>
<td>Carrier, Sarah</td>
<td>16, 24, 89, 115</td>
</tr>
<tr>
<td>Carroll Steward, Kimberly</td>
<td>41, 47</td>
</tr>
<tr>
<td>Carsten Conner, Laura</td>
<td>15, 118</td>
</tr>
<tr>
<td>Casteliano, Katherine</td>
<td>101</td>
</tr>
<tr>
<td>Castro, Sheila</td>
<td>89</td>
</tr>
<tr>
<td>Caushi, Klaudja</td>
<td>39, 48</td>
</tr>
<tr>
<td>Cavagnetto, Andy</td>
<td>41, 54, 95</td>
</tr>
<tr>
<td>Cayton, Emily</td>
<td>48, 78</td>
</tr>
<tr>
<td>Cesare, Amber</td>
<td>14, 71, 91</td>
</tr>
<tr>
<td>Ceslarev, Claire</td>
<td>52</td>
</tr>
<tr>
<td>Ceyhan, Gaye</td>
<td>14, 49</td>
</tr>
<tr>
<td>Cha, Daniel</td>
<td>47</td>
</tr>
<tr>
<td>Chabalengula, Vivien</td>
<td>17</td>
</tr>
<tr>
<td>Chaffee, Rachel</td>
<td>16, 112</td>
</tr>
<tr>
<td>Chakraverty, Devasmita</td>
<td>14, 25, 51</td>
</tr>
<tr>
<td>Chan, Yun-Wen</td>
<td>114</td>
</tr>
<tr>
<td>Chandler, Mark</td>
<td>41</td>
</tr>
<tr>
<td>Chang, Chi-Ning</td>
<td>95</td>
</tr>
<tr>
<td>Chao, Jie</td>
<td>44</td>
</tr>
<tr>
<td>Chaparian, Shaghig</td>
<td>44, 45</td>
</tr>
<tr>
<td>Chappell, Mindy</td>
<td>48</td>
</tr>
<tr>
<td>Chastenay, Pierre</td>
<td>120</td>
</tr>
<tr>
<td>Chatham, Elizabeth</td>
<td>41, 90</td>
</tr>
<tr>
<td>Chau, Linh</td>
<td>111</td>
</tr>
<tr>
<td>Chavez-Reilly, Michael</td>
<td>112</td>
</tr>
<tr>
<td>Chen, I-Chien</td>
<td>15, 68, 107</td>
</tr>
<tr>
<td>Chen, Jessica</td>
<td>15, 117</td>
</tr>
<tr>
<td>Chen, Ya-Chun</td>
<td>81</td>
</tr>
<tr>
<td>Chen, Ying-Chih</td>
<td>17, 49, 54</td>
</tr>
<tr>
<td>Cheng, Maurice</td>
<td>68</td>
</tr>
<tr>
<td>Cheng, Meng-Fei</td>
<td>104</td>
</tr>
<tr>
<td>Cherbow, Kevin</td>
<td>15, 41, 66, 86</td>
</tr>
<tr>
<td>Chesire, Andrew</td>
<td>92</td>
</tr>
<tr>
<td>Chesnut, Lynn</td>
<td>81</td>
</tr>
<tr>
<td>Chesnutt, Katherine</td>
<td>48, 78</td>
</tr>
<tr>
<td>Cheuk, Tina</td>
<td>26, 63, 93</td>
</tr>
<tr>
<td>Childers, Gina</td>
<td>78, 103</td>
</tr>
<tr>
<td>Childress Price, Tiffany</td>
<td>48</td>
</tr>
<tr>
<td>Chin, Doris</td>
<td>65</td>
</tr>
<tr>
<td>Chini, Jacquelyn</td>
<td>15</td>
</tr>
<tr>
<td>Chinn, Pauline</td>
<td>40, 108</td>
</tr>
<tr>
<td>Chis, Jacqueline</td>
<td>69</td>
</tr>
<tr>
<td>Chiu, Jennifer</td>
<td>49, 95, 114</td>
</tr>
<tr>
<td>Chiu, Mei-Hung</td>
<td>47, 102</td>
</tr>
<tr>
<td>Chiu, Ying-Ting</td>
<td>47</td>
</tr>
<tr>
<td>Cho, Kyungjin</td>
<td>15, 26, 39, 54</td>
</tr>
<tr>
<td>Christensen, Julia</td>
<td>107</td>
</tr>
<tr>
<td>Christman, Devon</td>
<td>78</td>
</tr>
<tr>
<td>Chu, Hye-Eun</td>
<td>15, 75, 76</td>
</tr>
<tr>
<td>Chu, Lawrence</td>
<td>55</td>
</tr>
<tr>
<td>Chung, Shiao-Lan</td>
<td>47</td>
</tr>
<tr>
<td>Cian, Heidi</td>
<td>15, 89, 92, 119</td>
</tr>
<tr>
<td>Cieto, Melissa</td>
<td>115</td>
</tr>
<tr>
<td>Ciftci, Ayse</td>
<td>108</td>
</tr>
<tr>
<td>Ciofalo, Joseph</td>
<td>103</td>
</tr>
<tr>
<td>Cisterna, Dante</td>
<td>26, 51, 93, 97, 101</td>
</tr>
<tr>
<td>Cleary, Timothy</td>
<td>49</td>
</tr>
<tr>
<td>Cline, Christin</td>
<td>111</td>
</tr>
<tr>
<td>Clough, Michael</td>
<td>44</td>
</tr>
<tr>
<td>Clyburn, Jakayla</td>
<td>49, 117</td>
</tr>
<tr>
<td>Coenraad, Merijke</td>
<td>56</td>
</tr>
<tr>
<td>Cohen Nissan, Orit</td>
<td>120</td>
</tr>
<tr>
<td>Cohen, Rachel</td>
<td>69</td>
</tr>
<tr>
<td>Cohen, Scott</td>
<td>42, 47, 111</td>
</tr>
<tr>
<td>Cohen, Susie</td>
<td>16, 92</td>
</tr>
<tr>
<td>Cohen, Whitney</td>
<td>65</td>
</tr>
<tr>
<td>Colandene, Michele</td>
<td>76</td>
</tr>
<tr>
<td>Cole, Merryn</td>
<td>15, 76</td>
</tr>
<tr>
<td>Collier, Karen</td>
<td>113</td>
</tr>
<tr>
<td>Collins, Darrin</td>
<td>64</td>
</tr>
<tr>
<td>Collins, Larry</td>
<td>95</td>
</tr>
<tr>
<td>Conner, Charles</td>
<td>44</td>
</tr>
<tr>
<td>Constantine, Angelina</td>
<td>85</td>
</tr>
<tr>
<td>Constantinou, Constantinos</td>
<td>110</td>
</tr>
<tr>
<td>Cook Whitt, Katahdin</td>
<td>65</td>
</tr>
<tr>
<td>Cook, Nicole</td>
<td>85</td>
</tr>
</tbody>
</table>
# Author Index

<table>
<thead>
<tr>
<th>Author</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cope, Dale</td>
<td>57</td>
</tr>
<tr>
<td>Cormas, Peter</td>
<td>16, 77</td>
</tr>
<tr>
<td>Coscolluela, Nicole</td>
<td>81</td>
</tr>
<tr>
<td>Cotner, Sehoya</td>
<td>105, 114</td>
</tr>
<tr>
<td>Couch, Brock</td>
<td>14, 75</td>
</tr>
<tr>
<td>Couch, Stephanie</td>
<td>89</td>
</tr>
<tr>
<td>Cosso, Digna</td>
<td>119</td>
</tr>
<tr>
<td>Covitt, Beth</td>
<td>13, 26, 37, 57</td>
</tr>
<tr>
<td>Crabtree, Lenora</td>
<td>63</td>
</tr>
<tr>
<td>Craker, Bradley</td>
<td>118</td>
</tr>
<tr>
<td>Craven, Laura</td>
<td>109</td>
</tr>
<tr>
<td>Crawford, Richard</td>
<td>55</td>
</tr>
<tr>
<td>Crippen, Kent</td>
<td>69, 72, 77, 94</td>
</tr>
<tr>
<td>Crissman, Sally</td>
<td>88</td>
</tr>
<tr>
<td>Criswell, Brett</td>
<td>86</td>
</tr>
<tr>
<td>Crockett, Cynthia</td>
<td>13, 26, 53</td>
</tr>
<tr>
<td>Crooks-Monastra, Jennifer</td>
<td>110</td>
</tr>
<tr>
<td>Cruz-Deiter, Katherine</td>
<td>60</td>
</tr>
<tr>
<td>Cullinane, Alison</td>
<td>13, 26, 37, 52</td>
</tr>
<tr>
<td>Culp, Katherine</td>
<td>42</td>
</tr>
<tr>
<td>Currey, Barb</td>
<td>104</td>
</tr>
<tr>
<td>Curry, Kevin</td>
<td>15, 61</td>
</tr>
<tr>
<td>Czerniak, Charlene</td>
<td>76, 86</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td></td>
</tr>
<tr>
<td>Dabholkar, Sugat</td>
<td>16, 64</td>
</tr>
<tr>
<td>Dagan, Or</td>
<td>88</td>
</tr>
<tr>
<td>Dagher, Zoubeida</td>
<td>17, 103</td>
</tr>
<tr>
<td>Dai, Chih-Pu</td>
<td>93</td>
</tr>
<tr>
<td>Dai, Zhaihuan</td>
<td>93</td>
</tr>
<tr>
<td>Dalal, Medha</td>
<td>110</td>
</tr>
<tr>
<td>Dalyot, Keren</td>
<td>15, 78, 112</td>
</tr>
<tr>
<td>Dancy, Melissa</td>
<td>15, 97</td>
</tr>
<tr>
<td>Dani, Danielle</td>
<td>14, 24, 113</td>
</tr>
<tr>
<td>Daniel, Bethany</td>
<td>43, 101</td>
</tr>
<tr>
<td>Daniel, Kristy</td>
<td>78, 118</td>
</tr>
<tr>
<td>Danielsson, Anna</td>
<td>25, 64</td>
</tr>
<tr>
<td>Dankenbring, Chelsey</td>
<td>55</td>
</tr>
<tr>
<td>Danner, Patrick</td>
<td>63</td>
</tr>
<tr>
<td>Danso, Sakyiwa</td>
<td>16, 104</td>
</tr>
<tr>
<td>Dare, Emily</td>
<td>14, 61, 87, 117</td>
</tr>
<tr>
<td>Dauer, Jenny</td>
<td>40, 49</td>
</tr>
<tr>
<td>Dauer, Joseph</td>
<td>81</td>
</tr>
<tr>
<td>Davidesco, Ido</td>
<td>15, 88</td>
</tr>
<tr>
<td>Davidson, Shannon</td>
<td>16, 60, 79, 116</td>
</tr>
<tr>
<td>Davis, Elizabeth</td>
<td>38, 50</td>
</tr>
<tr>
<td>Davis, Natalie</td>
<td>48</td>
</tr>
<tr>
<td>Davis, Virginia</td>
<td>102</td>
</tr>
<tr>
<td>Davis, William</td>
<td>95</td>
</tr>
<tr>
<td>Dayan, Efrat</td>
<td>120</td>
</tr>
<tr>
<td>De Boer, George</td>
<td>43</td>
</tr>
<tr>
<td>De La Cruz, Ilana</td>
<td>45</td>
</tr>
<tr>
<td>De Leon, Joe</td>
<td>102</td>
</tr>
<tr>
<td>Deaton, Cynthia</td>
<td>96</td>
</tr>
<tr>
<td>DeCoito, Isha</td>
<td>15, 88</td>
</tr>
<tr>
<td>DeLaRosa, Mia</td>
<td>67</td>
</tr>
<tr>
<td>Delaval, Marine</td>
<td>83</td>
</tr>
<tr>
<td>Degen, Ibrahim</td>
<td>24, 56</td>
</tr>
<tr>
<td>DeLeón, André</td>
<td>53</td>
</tr>
<tr>
<td>Delgado, Cesar</td>
<td>13, 14, 26, 48, 53, 75, 89, 117</td>
</tr>
<tr>
<td>DeLisi, Jacqueline</td>
<td>65</td>
</tr>
<tr>
<td>Desjarlais, Estelle</td>
<td>120</td>
</tr>
<tr>
<td>Devaul, Renee</td>
<td>85</td>
</tr>
<tr>
<td>Deverel-Rico, Clarissa</td>
<td>51</td>
</tr>
<tr>
<td>Dewey, Jessica</td>
<td>15, 97, 111</td>
</tr>
<tr>
<td>Dias, Michael</td>
<td>96</td>
</tr>
<tr>
<td>Dibner, Kenne</td>
<td>95</td>
</tr>
<tr>
<td>Dickerson, Daniel</td>
<td>87</td>
</tr>
<tr>
<td>Dierking, Lynn</td>
<td>59, 78</td>
</tr>
<tr>
<td>Dillon, Justin</td>
<td>94</td>
</tr>
<tr>
<td>Ding, Lin</td>
<td>110, 111, 115</td>
</tr>
<tr>
<td>Dkeidek, Iyad</td>
<td>15, 76</td>
</tr>
<tr>
<td>Dobbs, Bonelli</td>
<td>97</td>
</tr>
<tr>
<td>Doering, Jessica</td>
<td>62</td>
</tr>
<tr>
<td>Doerr, Katherine</td>
<td>98</td>
</tr>
<tr>
<td>Dong, Dongsheng</td>
<td>117</td>
</tr>
<tr>
<td>Donham, Cristie</td>
<td>61</td>
</tr>
<tr>
<td>Donnelly-Hermosillo, Dermot</td>
<td>116</td>
</tr>
<tr>
<td>Donovan, Brian</td>
<td>63, 90, 101</td>
</tr>
<tr>
<td>Donze, Jennifer</td>
<td>75</td>
</tr>
<tr>
<td>Dori, Dov</td>
<td>84, 101, 119</td>
</tr>
<tr>
<td>Dori, Yehudit Judy</td>
<td>57, 61, 101, 103</td>
</tr>
<tr>
<td>Doty, Constance</td>
<td>92, 93</td>
</tr>
<tr>
<td>Dou, Remy</td>
<td>16, 24, 53, 89, 92, 119</td>
</tr>
<tr>
<td>Douglass, Helen</td>
<td>92</td>
</tr>
<tr>
<td>Dozier, Sara</td>
<td>62, 97</td>
</tr>
<tr>
<td>Drits-Esser, Dina</td>
<td>41, 76</td>
</tr>
<tr>
<td>Drymiotou, Irene</td>
<td>110</td>
</tr>
<tr>
<td>Du, Adele</td>
<td>97</td>
</tr>
<tr>
<td>Dubovi, Ilana</td>
<td>106</td>
</tr>
<tr>
<td>Duffield, Catie</td>
<td>75</td>
</tr>
<tr>
<td>Dunekack, Alexis</td>
<td>102, 113</td>
</tr>
<tr>
<td>Dunk, Ryan</td>
<td>114</td>
</tr>
<tr>
<td>Durak, Benzegül</td>
<td>106</td>
</tr>
<tr>
<td>Dursun, Jale</td>
<td>15, 67</td>
</tr>
<tr>
<td>Dyer, Elizabeth</td>
<td>69</td>
</tr>
</tbody>
</table>

---

**E**

<table>
<thead>
<tr>
<th>Author</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eames, Chris</td>
<td>68</td>
</tr>
<tr>
<td>Ebenezer, Jazlin</td>
<td>119</td>
</tr>
<tr>
<td>Ebisin, Aderonke</td>
<td>51, 58</td>
</tr>
<tr>
<td>Eckels, Lacey</td>
<td>85</td>
</tr>
<tr>
<td>Eddy, Rebecca</td>
<td>85</td>
</tr>
<tr>
<td>Edmondson, Elizabeth</td>
<td>97</td>
</tr>
<tr>
<td>Edwards, Kirsten</td>
<td>15, 82</td>
</tr>
<tr>
<td>Eicher, Laura</td>
<td>96</td>
</tr>
<tr>
<td>Author</td>
<td>Pages</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Eidin, Emil</td>
<td>61, 96</td>
</tr>
<tr>
<td>Elby, Andy</td>
<td>69</td>
</tr>
<tr>
<td>Elkana, Maia</td>
<td>100</td>
</tr>
<tr>
<td>Ellis, Joshua</td>
<td>15, 87, 105</td>
</tr>
<tr>
<td>Ellis, Rebecca</td>
<td>97</td>
</tr>
<tr>
<td>Elmas, Ridvan</td>
<td>88, 104</td>
</tr>
<tr>
<td>Emerson Leak, Anne</td>
<td>13, 14, 40, 61</td>
</tr>
<tr>
<td>Enderle, Patrick</td>
<td>47, 86, 89</td>
</tr>
<tr>
<td>Engelschalt, Paul</td>
<td>96</td>
</tr>
<tr>
<td>Ennes, Megan</td>
<td>15, 48, 78, 81, 115</td>
</tr>
<tr>
<td>Enriquez, Araceli</td>
<td>75</td>
</tr>
<tr>
<td>Entress, Cole</td>
<td>39</td>
</tr>
<tr>
<td>Ercan-Dursun, Jale</td>
<td>58</td>
</tr>
<tr>
<td>Erduran, Sibel</td>
<td>25, 52, 94, 103</td>
</tr>
<tr>
<td>Erickson, Sara</td>
<td>88</td>
</tr>
<tr>
<td>Estabrooks, Leigh</td>
<td>89</td>
</tr>
<tr>
<td>Estaiteyeh, Mohammed</td>
<td>16, 88</td>
</tr>
<tr>
<td>Evans, Robert</td>
<td>56</td>
</tr>
<tr>
<td>Eysa, Nael</td>
<td>76</td>
</tr>
<tr>
<td>Fackler, Ayca</td>
<td>14, 38, 82, 104</td>
</tr>
<tr>
<td>Faikhamta, Chatree</td>
<td>55</td>
</tr>
<tr>
<td>Falk, John</td>
<td>25, 59, 78</td>
</tr>
<tr>
<td>Fantini, Paola</td>
<td>98</td>
</tr>
<tr>
<td>Faraj, Salih</td>
<td>16</td>
</tr>
<tr>
<td>Farias, Abel</td>
<td>48</td>
</tr>
<tr>
<td>Farris, Amy</td>
<td>14, 40, 71, 91</td>
</tr>
<tr>
<td>Faruqi, Farah</td>
<td>85, 87</td>
</tr>
<tr>
<td>Fateh, Shaghayegh</td>
<td>95</td>
</tr>
<tr>
<td>Fazio, Xavier</td>
<td>45</td>
</tr>
<tr>
<td>Feldman, Allan</td>
<td>97</td>
</tr>
<tr>
<td>Feldman-Maggor, Yae</td>
<td>17, 58, 119</td>
</tr>
<tr>
<td>Feldwin, Darby</td>
<td>116</td>
</tr>
<tr>
<td>Fenker, Kristin</td>
<td>41, 76</td>
</tr>
<tr>
<td>Ferguson, Susan</td>
<td>101</td>
</tr>
<tr>
<td>Fernandez, Maria</td>
<td>85</td>
</tr>
<tr>
<td>Fernandez, Patricia</td>
<td>61</td>
</tr>
<tr>
<td>Ferrara, Michael</td>
<td>114</td>
</tr>
<tr>
<td>Ferrari, Brittney</td>
<td>61</td>
</tr>
<tr>
<td>Fick, Sarah</td>
<td>27, 49, 95</td>
</tr>
<tr>
<td>Fiedler, Daniela</td>
<td>83</td>
</tr>
<tr>
<td>Firestone, Jonah</td>
<td>13, 15, 55, 58</td>
</tr>
<tr>
<td>Fitzgerald, Angela</td>
<td>94</td>
</tr>
<tr>
<td>Fitzgerald, Sheri</td>
<td>16, 104</td>
</tr>
<tr>
<td>Fitzhugh, Virginia</td>
<td>65</td>
</tr>
<tr>
<td>Flantroy, Krystal</td>
<td>58, 67</td>
</tr>
<tr>
<td>Fleming, Kevin</td>
<td>15, 27, 47, 55</td>
</tr>
<tr>
<td>Flores, Raymond</td>
<td>62</td>
</tr>
<tr>
<td>Flowers, Sharleen</td>
<td>54</td>
</tr>
<tr>
<td>Fogleman, Jay</td>
<td>25, 100</td>
</tr>
<tr>
<td>Forbes, Cory</td>
<td>41, 76, 111</td>
</tr>
<tr>
<td>Forsythe, Michelle</td>
<td>16, 114</td>
</tr>
<tr>
<td>Fortus, David</td>
<td>14, 51, 76, 98</td>
</tr>
<tr>
<td>Fowler, Kelsie</td>
<td>39, 45</td>
</tr>
<tr>
<td>Fowler, Samantha</td>
<td>59</td>
</tr>
<tr>
<td>Fowler, Tatiana</td>
<td>44</td>
</tr>
<tr>
<td>Fracchiolla, Claudia</td>
<td>14, 87</td>
</tr>
<tr>
<td>Franks, Bridget</td>
<td>96</td>
</tr>
<tr>
<td>Fraser, Barry</td>
<td>48</td>
</tr>
<tr>
<td>Fraulo, Aimee</td>
<td>14, 108</td>
</tr>
<tr>
<td>Frausto, Alejandra</td>
<td>48</td>
</tr>
<tr>
<td>Fredrick, Kyle</td>
<td>77</td>
</tr>
<tr>
<td>Fridman, Ronit</td>
<td>54</td>
</tr>
<tr>
<td>Friedrichsen, Patricia</td>
<td>40, 91</td>
</tr>
<tr>
<td>Frodsham, Sarah</td>
<td>16, 40</td>
</tr>
<tr>
<td>Fuchs, Travis</td>
<td>45</td>
</tr>
<tr>
<td>Fulmer, Gavin</td>
<td>25, 58, 67, 86, 101, 107</td>
</tr>
<tr>
<td>Funk, Sarah</td>
<td>50</td>
</tr>
<tr>
<td>Furtak, Erin</td>
<td>25, 51, 73</td>
</tr>
<tr>
<td>Gabriele-Black, Kaitlin</td>
<td>50</td>
</tr>
<tr>
<td>Gainsback, Katie</td>
<td>63</td>
</tr>
<tr>
<td>Galili, Igal</td>
<td>117</td>
</tr>
<tr>
<td>Gallagher, Jennifer</td>
<td>87</td>
</tr>
<tr>
<td>Gao, Su</td>
<td>60</td>
</tr>
<tr>
<td>Garah, Lulu</td>
<td>15, 57</td>
</tr>
<tr>
<td>García, Dana</td>
<td>118</td>
</tr>
<tr>
<td>Garcia, Maya</td>
<td>53, 66, 95</td>
</tr>
<tr>
<td>Gardner, April</td>
<td>63</td>
</tr>
<tr>
<td>Gardner, Grant</td>
<td>14, 41, 53, 75, 103, 105, 114</td>
</tr>
<tr>
<td>Gardner, Stephanie</td>
<td>54, 85</td>
</tr>
<tr>
<td>Garner, Joanna</td>
<td>67</td>
</tr>
<tr>
<td>Gaston, Joe</td>
<td>72</td>
</tr>
<tr>
<td>Gaudino, Ann</td>
<td>99</td>
</tr>
<tr>
<td>Gautam, Dinesh</td>
<td>40</td>
</tr>
<tr>
<td>Gawryla, Rosalind</td>
<td>61</td>
</tr>
<tr>
<td>Gay, Cynthia</td>
<td>85</td>
</tr>
<tr>
<td>Gee, Elisabeth</td>
<td>111</td>
</tr>
<tr>
<td>George, Frikkie</td>
<td>14</td>
</tr>
<tr>
<td>Georgen, Chris</td>
<td>41</td>
</tr>
<tr>
<td>Geraets, Ashley</td>
<td>92, 93</td>
</tr>
<tr>
<td>Ghadiri, Maryam</td>
<td>70</td>
</tr>
<tr>
<td>Ghalichi, Narmin</td>
<td>16, 77</td>
</tr>
<tr>
<td>Ghazal, Ihsan</td>
<td>15, 75</td>
</tr>
<tr>
<td>Ghent, Cindy</td>
<td>110</td>
</tr>
<tr>
<td>Giamellaro, Michael</td>
<td>43, 120</td>
</tr>
<tr>
<td>Gilbert, Andrew</td>
<td>14, 23, 79, 97</td>
</tr>
<tr>
<td>Giles, Ingelise</td>
<td>85</td>
</tr>
<tr>
<td>Gill, Arashnoor</td>
<td>61</td>
</tr>
<tr>
<td>Gillette, Erika</td>
<td>114</td>
</tr>
<tr>
<td>Gillis, Alexandra</td>
<td>99</td>
</tr>
<tr>
<td>Gilmartin, Shannon</td>
<td>63</td>
</tr>
<tr>
<td>Ginosar, Avshalom</td>
<td>112</td>
</tr>
<tr>
<td>Gioli, Antonella</td>
<td>50</td>
</tr>
</tbody>
</table>
## Author Index

<table>
<thead>
<tr>
<th>Author</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gitari, Wanja</td>
<td>17</td>
</tr>
<tr>
<td>Glasson, George</td>
<td>109</td>
</tr>
<tr>
<td>Gochyyev, Perman</td>
<td>78, 91</td>
</tr>
<tr>
<td>Goldstein, Shani</td>
<td>52</td>
</tr>
<tr>
<td>Gonczi, Amanda</td>
<td>84</td>
</tr>
<tr>
<td>Gonsalves, Allison</td>
<td>25, 64</td>
</tr>
<tr>
<td>Gonsar, Ngawang</td>
<td>72, 105</td>
</tr>
<tr>
<td>Gonzalez, Casandra</td>
<td>86</td>
</tr>
<tr>
<td>Gonzalez-Donoso, Alexis</td>
<td>49</td>
</tr>
<tr>
<td>González-Howard, María</td>
<td>15, 24, 105</td>
</tr>
<tr>
<td>Google, Angela</td>
<td>105, 114</td>
</tr>
<tr>
<td>Gopal, Shakuntala</td>
<td>16</td>
</tr>
<tr>
<td>Gordon, Rachael</td>
<td>16</td>
</tr>
<tr>
<td>Gould, Deena</td>
<td>14, 26, 42, 53</td>
</tr>
<tr>
<td>Gould, Gregg</td>
<td>77</td>
</tr>
<tr>
<td>Gould, Ian</td>
<td>42</td>
</tr>
<tr>
<td>Gourneau, Bonni</td>
<td>40</td>
</tr>
<tr>
<td>Governor, Donna</td>
<td>13, 26, 75</td>
</tr>
<tr>
<td>Grady, Vanessa</td>
<td>38, 70</td>
</tr>
<tr>
<td>Graf, Dittmar</td>
<td>101, 102</td>
</tr>
<tr>
<td>Granger, Ellen</td>
<td>25, 86</td>
</tr>
<tr>
<td>Grapin, Ellen</td>
<td>76</td>
</tr>
<tr>
<td>Gray, Ron</td>
<td>16, 77, 90</td>
</tr>
<tr>
<td>Greca, Ileana</td>
<td>47</td>
</tr>
<tr>
<td>Green, Amy</td>
<td>98</td>
</tr>
<tr>
<td>Green, Andre</td>
<td>101</td>
</tr>
<tr>
<td>Green, Kathryn</td>
<td>24, 38</td>
</tr>
<tr>
<td>Greenberg, Day</td>
<td>38</td>
</tr>
<tr>
<td>Greenwald, Eric</td>
<td>14, 107</td>
</tr>
<tr>
<td>Grieber, Krystal</td>
<td>77</td>
</tr>
<tr>
<td>Grifenhagen, Jill</td>
<td>89</td>
</tr>
<tr>
<td>Griffith, Elizabeth</td>
<td>85</td>
</tr>
<tr>
<td>Grimalt-Álvaro, Carme</td>
<td>14, 119</td>
</tr>
<tr>
<td>Grinath, Anna</td>
<td>53, 105, 114</td>
</tr>
<tr>
<td>Grooms, Jonathon</td>
<td>27, 55</td>
</tr>
<tr>
<td>Großschedl, Jörg</td>
<td>55, 83, 110</td>
</tr>
<tr>
<td>Grysko, Rebeca</td>
<td>60</td>
</tr>
<tr>
<td>Guerrero, Brenda</td>
<td>39</td>
</tr>
<tr>
<td>Guevara, Christina</td>
<td>99</td>
</tr>
<tr>
<td>Guffey, Sarah</td>
<td>101</td>
</tr>
<tr>
<td>Guilfoyle, Liam</td>
<td>15, 103</td>
</tr>
<tr>
<td>Guler Yildiz, Tulin</td>
<td>104</td>
</tr>
<tr>
<td>Guler, Zeynep</td>
<td>117</td>
</tr>
<tr>
<td>Gunning, Amanda</td>
<td>116</td>
</tr>
<tr>
<td>Gun-Yildiz, Semiha</td>
<td>75</td>
</tr>
<tr>
<td>Guo, Lu</td>
<td>75</td>
</tr>
<tr>
<td>Guo, Shuchen</td>
<td>84</td>
</tr>
<tr>
<td>Guo, Yanhong</td>
<td>75</td>
</tr>
<tr>
<td>Guo, Yu-Ying</td>
<td>108</td>
</tr>
<tr>
<td>Gupta, Preeti</td>
<td>112</td>
</tr>
<tr>
<td>Gutierrez, Kristie</td>
<td>15, 112</td>
</tr>
<tr>
<td>Guzey, Selcen</td>
<td>26, 40, 55, 91, 102, 105</td>
</tr>
<tr>
<td>Gweon, Gey-Hong</td>
<td>44</td>
</tr>
<tr>
<td>Gweon, Gey-Hong Sam</td>
<td>63</td>
</tr>
<tr>
<td>Gyllenpalm, Jakob</td>
<td>108</td>
</tr>
<tr>
<td>H</td>
<td></td>
</tr>
<tr>
<td>Ha, Heesoo</td>
<td>15, 81</td>
</tr>
<tr>
<td>Habig, Bobby</td>
<td>89</td>
</tr>
<tr>
<td>Habig, Sebastian</td>
<td>113</td>
</tr>
<tr>
<td>Hackett, Ayden</td>
<td>95</td>
</tr>
<tr>
<td>Hadley Long, Caroline</td>
<td>116</td>
</tr>
<tr>
<td>Hagan, Claudia</td>
<td>86, 89</td>
</tr>
<tr>
<td>Haines, Sarah</td>
<td>78</td>
</tr>
<tr>
<td>Haktanir, Gelengul</td>
<td>104</td>
</tr>
<tr>
<td>Hall, Jonathan</td>
<td>15, 44</td>
</tr>
<tr>
<td>Hamerski, Paul</td>
<td>16, 40</td>
</tr>
<tr>
<td>Hammack, Rebekah</td>
<td>56</td>
</tr>
<tr>
<td>Hammersness, Karen</td>
<td>112</td>
</tr>
<tr>
<td>Han Tosunoglu, Cigdem</td>
<td>14</td>
</tr>
<tr>
<td>Han, Huilei</td>
<td>76, 109</td>
</tr>
<tr>
<td>Han, Rachel</td>
<td>99</td>
</tr>
<tr>
<td>Han, Sisi</td>
<td>16, 107, 108</td>
</tr>
<tr>
<td>Hancock, James</td>
<td>107</td>
</tr>
<tr>
<td>Hand, Brian</td>
<td>58, 67, 86, 101</td>
</tr>
<tr>
<td>Handler, Robert</td>
<td>84</td>
</tr>
<tr>
<td>Hanley, Connor</td>
<td>89</td>
</tr>
<tr>
<td>Hanuscin, Deborah</td>
<td>87, 96</td>
</tr>
<tr>
<td>Hapgood, Susanna</td>
<td>16, 40, 68, 76, 86</td>
</tr>
<tr>
<td>Hardcastle, Joseph</td>
<td>15, 43</td>
</tr>
<tr>
<td>Hardee, Allison</td>
<td>86</td>
</tr>
<tr>
<td>Hardy, Lisa</td>
<td>44</td>
</tr>
<tr>
<td>Harlow, Ashley</td>
<td>114</td>
</tr>
<tr>
<td>Harlow, Danielle</td>
<td>42</td>
</tr>
<tr>
<td>Harris, Christopher</td>
<td>68</td>
</tr>
<tr>
<td>Harris, Cornelia</td>
<td>70</td>
</tr>
<tr>
<td>Harris, Emily</td>
<td>65, 101</td>
</tr>
<tr>
<td>Haskel Ittah, Michal</td>
<td>15, 83</td>
</tr>
<tr>
<td>Hasseler, Elizabeth</td>
<td>89</td>
</tr>
<tr>
<td>Haudek, Kevin</td>
<td>63, 98, 111</td>
</tr>
<tr>
<td>Haverly, Christa</td>
<td>12, 14, 24, 38</td>
</tr>
<tr>
<td>Hawkins, Joshua</td>
<td>119</td>
</tr>
<tr>
<td>Hay, Molly</td>
<td>114</td>
</tr>
<tr>
<td>Hazari, Zahra</td>
<td>85, 92, 96, 98, 119</td>
</tr>
<tr>
<td>He, Peng</td>
<td>16, 43, 57, 82, 102, 107</td>
</tr>
<tr>
<td>Helding, Brandon</td>
<td>89</td>
</tr>
<tr>
<td>Helikar, Tomáš</td>
<td>81</td>
</tr>
<tr>
<td>Hellmann, Katharina</td>
<td>86</td>
</tr>
<tr>
<td>Hel-Or, Hagit</td>
<td>52</td>
</tr>
<tr>
<td>Henrie, Andrea</td>
<td>43</td>
</tr>
<tr>
<td>Henson, Harvey</td>
<td>50</td>
</tr>
<tr>
<td>Hercovitz, Orit</td>
<td>16, 103</td>
</tr>
<tr>
<td>Heredia, Sara</td>
<td>16, 44, 117</td>
</tr>
<tr>
<td>Herman, Benjamin</td>
<td>44, 52, 103, 104</td>
</tr>
<tr>
<td>Author</td>
<td>Page(s)</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Hernandez, Paul</td>
<td>95</td>
</tr>
<tr>
<td>Hernandez, Philip</td>
<td>117</td>
</tr>
<tr>
<td>Hernández-Campos, Mónica</td>
<td>117</td>
</tr>
<tr>
<td>Herrera, Felisha</td>
<td>69, 114</td>
</tr>
<tr>
<td>Herrmann Abell, Cari</td>
<td>14, 43, 83, 90, 101</td>
</tr>
<tr>
<td>Herro, Dani</td>
<td>68</td>
</tr>
<tr>
<td>Hershkovitz, Arnon</td>
<td>64</td>
</tr>
<tr>
<td>Heuring, Jeanna</td>
<td>76</td>
</tr>
<tr>
<td>Heydari, Roya</td>
<td>70</td>
</tr>
<tr>
<td>Hicks, Jenna</td>
<td>97</td>
</tr>
<tr>
<td>Higgins, Lila</td>
<td>70</td>
</tr>
<tr>
<td>Hill, Kathleen</td>
<td>71, 91</td>
</tr>
<tr>
<td>Hillier, Judith</td>
<td>52</td>
</tr>
<tr>
<td>Hinckle, Madeline</td>
<td>83</td>
</tr>
<tr>
<td>Hirsch, Sarah</td>
<td>78</td>
</tr>
<tr>
<td>Hite, Rebecca</td>
<td>16, 103</td>
</tr>
<tr>
<td>Hiwatig, Benny Mart</td>
<td>14, 87, 102, 117</td>
</tr>
<tr>
<td>Hmelo-Silver, Cindy</td>
<td>97</td>
</tr>
<tr>
<td>Hodari, Apriel</td>
<td>97</td>
</tr>
<tr>
<td>Holder, Ashley</td>
<td>113</td>
</tr>
<tr>
<td>Holley, Dorothy</td>
<td>45</td>
</tr>
<tr>
<td>Holliday, Gary</td>
<td>14, 120</td>
</tr>
<tr>
<td>Hollmann, Victoria</td>
<td>83</td>
</tr>
<tr>
<td>Holmquist, John</td>
<td>110</td>
</tr>
<tr>
<td>Homberg, Sheila</td>
<td>41, 76</td>
</tr>
<tr>
<td>Hong, Minju</td>
<td>56</td>
</tr>
<tr>
<td>Hong, Zuyay-R</td>
<td>17, 81, 84</td>
</tr>
<tr>
<td>Honwad, Sameer</td>
<td>61, 111</td>
</tr>
<tr>
<td>Horn, Michael</td>
<td>64, 116</td>
</tr>
<tr>
<td>Horvath, Larry</td>
<td>116</td>
</tr>
<tr>
<td>Hoston, Douglas</td>
<td>98</td>
</tr>
<tr>
<td>Hough, Sarah</td>
<td>116</td>
</tr>
<tr>
<td>Housh, Karyn</td>
<td>15, 97</td>
</tr>
<tr>
<td>Hsu, Wen-Yi</td>
<td>84</td>
</tr>
<tr>
<td>Hu, Peter</td>
<td>49</td>
</tr>
<tr>
<td>Huang, Yi-Wen</td>
<td>104</td>
</tr>
<tr>
<td>Huang, Yuxi</td>
<td>101, 118</td>
</tr>
<tr>
<td>Huff, Pamela</td>
<td>89</td>
</tr>
<tr>
<td>Hufnagel, Elizabeth</td>
<td>14</td>
</tr>
<tr>
<td>Hug, Barbara</td>
<td>69</td>
</tr>
<tr>
<td>Hughes, Brad</td>
<td>119</td>
</tr>
<tr>
<td>Hughes, Carys</td>
<td>50</td>
</tr>
<tr>
<td>Hume, Anne</td>
<td>79</td>
</tr>
<tr>
<td>Hungwe, Ledwina</td>
<td>59</td>
</tr>
<tr>
<td>Hunter, Ally</td>
<td>27, 60</td>
</tr>
<tr>
<td>Hunter, Joshua</td>
<td>40</td>
</tr>
<tr>
<td>Hunter, Roberta</td>
<td>45, 99</td>
</tr>
<tr>
<td>Hutner, Todd</td>
<td>16, 55, 89</td>
</tr>
<tr>
<td>Huvard, Hannah</td>
<td>114</td>
</tr>
<tr>
<td>Hvidsten, Connie</td>
<td>85</td>
</tr>
<tr>
<td>Hwang, Jihyoun</td>
<td>101</td>
</tr>
<tr>
<td>Ibou, Amal</td>
<td>64</td>
</tr>
<tr>
<td>Ibrahim, Bashirah</td>
<td>14, 111</td>
</tr>
<tr>
<td>Idema, Jenn</td>
<td>78</td>
</tr>
<tr>
<td>Idsardi, Robert</td>
<td>16, 49, 55</td>
</tr>
<tr>
<td>Im, Sungmin</td>
<td>47</td>
</tr>
<tr>
<td>Infante, Masiel</td>
<td>52</td>
</tr>
<tr>
<td>Irdam, Greysi</td>
<td>110</td>
</tr>
<tr>
<td>Irmak, Meltem</td>
<td>50</td>
</tr>
<tr>
<td>Irving, Paul</td>
<td>40</td>
</tr>
<tr>
<td>Iveland, Ashley</td>
<td>14, 50, 68, 106, 107</td>
</tr>
<tr>
<td>Jaber, Lama</td>
<td>60, 62, 79, 109, 116</td>
</tr>
<tr>
<td>Jackson, Ashley</td>
<td>60</td>
</tr>
<tr>
<td>Jackson, David</td>
<td>57</td>
</tr>
<tr>
<td>Jackson, Jennifer</td>
<td>71, 91, 100</td>
</tr>
<tr>
<td>Jackson, Whitney</td>
<td>77</td>
</tr>
<tr>
<td>Jadallah, Christopher</td>
<td>14, 59</td>
</tr>
<tr>
<td>James, Julie</td>
<td>77</td>
</tr>
<tr>
<td>James, Olena</td>
<td>103</td>
</tr>
<tr>
<td>James, Sylvia</td>
<td>16, 44</td>
</tr>
<tr>
<td>Janniello, Elena</td>
<td>50</td>
</tr>
<tr>
<td>Jardine, Hannah</td>
<td>15, 85</td>
</tr>
<tr>
<td>Jennewein, Jessie</td>
<td>70</td>
</tr>
<tr>
<td>Jeon, Jooyoun</td>
<td>15, 81</td>
</tr>
<tr>
<td>Jeong, Sophia (Sun Kyung)</td>
<td>49</td>
</tr>
<tr>
<td>Jewett, Samantha</td>
<td>59</td>
</tr>
<tr>
<td>Jia, Zhiqiang</td>
<td>39, 60</td>
</tr>
<tr>
<td>Jiang, Jingrui</td>
<td>59</td>
</tr>
<tr>
<td>Jin, Dongxue</td>
<td>107</td>
</tr>
<tr>
<td>Jin, Hui</td>
<td>51</td>
</tr>
<tr>
<td>Jin, Qingna</td>
<td>16, 66</td>
</tr>
<tr>
<td>Johnson, Heather</td>
<td>15, 43, 78</td>
</tr>
<tr>
<td>Johnson, Matthew</td>
<td>15, 71, 91, 117</td>
</tr>
<tr>
<td>Johnson, Natasha</td>
<td>57</td>
</tr>
<tr>
<td>Johnson, Rebecca</td>
<td>70</td>
</tr>
<tr>
<td>Jone, Gail</td>
<td>14, 48, 78, 89, 94, 97, 103, 115</td>
</tr>
<tr>
<td>Jones, Gail</td>
<td>14, 48, 78, 89, 94, 97, 103, 115</td>
</tr>
<tr>
<td>Jones, Jasmine</td>
<td>48</td>
</tr>
<tr>
<td>Jones, M. Gail</td>
<td>48, 78, 115</td>
</tr>
<tr>
<td>Jong, Jing-Ping</td>
<td>47</td>
</tr>
<tr>
<td>Jordan, Michelle</td>
<td>67</td>
</tr>
<tr>
<td>Jornet Gil, Alfredo</td>
<td>98</td>
</tr>
<tr>
<td>Joyce, Michelle</td>
<td>16, 72</td>
</tr>
<tr>
<td>Judson, Eugene</td>
<td>14, 24, 51</td>
</tr>
<tr>
<td>Juergensen, Rachel</td>
<td>39, 91</td>
</tr>
<tr>
<td>Jung, Karl</td>
<td>15, 71, 98</td>
</tr>
<tr>
<td>Juuti, Kalle</td>
<td>56</td>
</tr>
<tr>
<td>Kahn, Sami</td>
<td>93, 106</td>
</tr>
<tr>
<td>Kaipa, Krishna</td>
<td>112</td>
</tr>
<tr>
<td>Kalogiannakis, Michail</td>
<td>15, 101</td>
</tr>
<tr>
<td>Author Name</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Kamp, Brandi</td>
<td>84</td>
</tr>
<tr>
<td>Kampourakis, Kostas</td>
<td>83</td>
</tr>
<tr>
<td>Kamdu, Bhamini</td>
<td>111</td>
</tr>
<tr>
<td>Kanaki, Kalliope</td>
<td>101</td>
</tr>
<tr>
<td>Kang, Da Yeon</td>
<td>47</td>
</tr>
<tr>
<td>Kang, Nam-Hwa</td>
<td>16, 50</td>
</tr>
<tr>
<td>Kanopka, Klint</td>
<td>117</td>
</tr>
<tr>
<td>Kapon, Shulamit</td>
<td>57, 93, 106</td>
</tr>
<tr>
<td>Karch, Jessica</td>
<td>15, 38, 55</td>
</tr>
<tr>
<td>Karimi, Zahra</td>
<td>102</td>
</tr>
<tr>
<td>Karippadath, Anupriya</td>
<td>14, 85</td>
</tr>
<tr>
<td>Karisan, Dilek</td>
<td>106</td>
</tr>
<tr>
<td>Kasper, Lutz</td>
<td>15, 51</td>
</tr>
<tr>
<td>Kasper, Victor</td>
<td>60</td>
</tr>
<tr>
<td>Katz, Phyllis</td>
<td>16, 111</td>
</tr>
<tr>
<td>Kavner, Amanda</td>
<td>98</td>
</tr>
<tr>
<td>Kaya, Ebru</td>
<td>104</td>
</tr>
<tr>
<td>Kaya, Erdogan</td>
<td>93</td>
</tr>
<tr>
<td>Kaya, Fatma</td>
<td>118</td>
</tr>
<tr>
<td>Kayumova, Shakhnoza</td>
<td>26, 53, 64, 92, 93</td>
</tr>
<tr>
<td>Ke, Fengfeng</td>
<td>93</td>
</tr>
<tr>
<td>Ke, Li</td>
<td>26, 40, 60, 106</td>
</tr>
<tr>
<td>Keen, Clarissa</td>
<td>14, 42</td>
</tr>
<tr>
<td>Keller, John</td>
<td>116</td>
</tr>
<tr>
<td>Keller, Sebastian</td>
<td>113</td>
</tr>
<tr>
<td>Kelly, Susan</td>
<td>69</td>
</tr>
<tr>
<td>Kelter, Jacob</td>
<td>64, 116</td>
</tr>
<tr>
<td>Keratithamkul, Khomson</td>
<td>61, 87, 117</td>
</tr>
<tr>
<td>Keren, Lior</td>
<td>93</td>
</tr>
<tr>
<td>Kerlin, Steven</td>
<td>99</td>
</tr>
<tr>
<td>Kessner, Taylor</td>
<td>111</td>
</tr>
<tr>
<td>Ketelhut, Diane</td>
<td>56</td>
</tr>
<tr>
<td>Khajeloo, Mojtaba</td>
<td>97</td>
</tr>
<tr>
<td>Khan, Samia</td>
<td>49</td>
</tr>
<tr>
<td>Kidd, Jennifer</td>
<td>112</td>
</tr>
<tr>
<td>Killen, Heather</td>
<td>15, 56</td>
</tr>
<tr>
<td>Kim, Jungsun</td>
<td>91</td>
</tr>
<tr>
<td>Kim, Mijung</td>
<td>66</td>
</tr>
<tr>
<td>Kim, Won</td>
<td>17, 70</td>
</tr>
<tr>
<td>King, Natalie</td>
<td>16, 38, 70, 92, 97</td>
</tr>
<tr>
<td>Kinskey, Melanie</td>
<td>15, 24, 38, 90</td>
</tr>
<tr>
<td>Kirbulut, Zubeyde Demet</td>
<td>95</td>
</tr>
<tr>
<td>Kirby, Caitlin</td>
<td>14, 40</td>
</tr>
<tr>
<td>Kite, Vance</td>
<td>16, 56, 100</td>
</tr>
<tr>
<td>Kitsantas, Anastasia</td>
<td>49</td>
</tr>
<tr>
<td>Kittleson, Julie</td>
<td>61, 93</td>
</tr>
<tr>
<td>Kjelvik, Melissa</td>
<td>90</td>
</tr>
<tr>
<td>Klavon, Timothy</td>
<td>38</td>
</tr>
<tr>
<td>Klein, Emily</td>
<td>101</td>
</tr>
<tr>
<td>Kloser, Matthew</td>
<td>76, 98</td>
</tr>
<tr>
<td>Knain, Erik</td>
<td>98</td>
</tr>
<tr>
<td>Knobloch, Neil</td>
<td>117</td>
</tr>
<tr>
<td>Ko, Mon Lin</td>
<td>69</td>
</tr>
<tr>
<td>Kochevar, Randy</td>
<td>65</td>
</tr>
<tr>
<td>Kohen, Hanan</td>
<td>84, 119</td>
</tr>
<tr>
<td>Kohen, Zehavit</td>
<td>17, 55, 120</td>
</tr>
<tr>
<td>Kohn, Craig</td>
<td>45</td>
</tr>
<tr>
<td>Konz, Rebecca</td>
<td>62</td>
</tr>
<tr>
<td>Koo, Ben</td>
<td>78, 91</td>
</tr>
<tr>
<td>Kook, Janna</td>
<td>65</td>
</tr>
<tr>
<td>Kooken, Ashley</td>
<td>115</td>
</tr>
<tr>
<td>Koomen, Michele</td>
<td>96, 97</td>
</tr>
<tr>
<td>Koun, Rekha</td>
<td>48</td>
</tr>
<tr>
<td>Koushyar, Hoda</td>
<td>81</td>
</tr>
<tr>
<td>Kovats Sánchez, Gabriela</td>
<td>69, 114</td>
</tr>
<tr>
<td>Kowalski, Susan</td>
<td>71, 85</td>
</tr>
<tr>
<td>Krajcik, Joseph</td>
<td>43, 48, 51, 68, 82, 102, 107</td>
</tr>
<tr>
<td>Krakowski, Ari</td>
<td>107</td>
</tr>
<tr>
<td>Kramarczuk, Kristina</td>
<td>15, 39</td>
</tr>
<tr>
<td>Kramer, Laird</td>
<td>85</td>
</tr>
<tr>
<td>Kranjc Horvat, Anja</td>
<td>50</td>
</tr>
<tr>
<td>Kranfelder, Petra</td>
<td>16, 61, 114</td>
</tr>
<tr>
<td>Krell, Moritz</td>
<td>50</td>
</tr>
<tr>
<td>Krishnan, Harini</td>
<td>15, 24, 109</td>
</tr>
<tr>
<td>Krishnan, Sandhya</td>
<td>16, 49</td>
</tr>
<tr>
<td>Krist, Stina</td>
<td>16, 69</td>
</tr>
<tr>
<td>Krueger, Dirk</td>
<td>96</td>
</tr>
<tr>
<td>Kubsch, Marcus</td>
<td>15, 26, 43, 105, 108</td>
</tr>
<tr>
<td>Kudumu, Mwenda</td>
<td>90</td>
</tr>
<tr>
<td>Kuhel, Karen</td>
<td>96</td>
</tr>
<tr>
<td>Kuschmierz, Paul</td>
<td>101, 102</td>
</tr>
<tr>
<td>Kusnick, Judith</td>
<td>77</td>
</tr>
<tr>
<td>Kyza, Eleni</td>
<td>55</td>
</tr>
<tr>
<td>Lachapelle, Cathy</td>
<td>105</td>
</tr>
<tr>
<td>Lachman, Ella</td>
<td>112</td>
</tr>
<tr>
<td>Laclede, Laura</td>
<td>49, 77</td>
</tr>
<tr>
<td>Lacy, Sara</td>
<td>88</td>
</tr>
<tr>
<td>Laherto, Antti</td>
<td>120</td>
</tr>
<tr>
<td>Lakin, Joni</td>
<td>15</td>
</tr>
<tr>
<td>Lamb, Richard</td>
<td>16, 56, 98, 102, 113</td>
</tr>
<tr>
<td>Lambert, Ann</td>
<td>41, 76</td>
</tr>
<tr>
<td>Lambert, Sammi</td>
<td>116</td>
</tr>
<tr>
<td>Lammert, Catherine</td>
<td>67</td>
</tr>
<tr>
<td>Land, Allison</td>
<td>69</td>
</tr>
<tr>
<td>Langbeheim, Elon</td>
<td>13, 14, 26, 51, 52</td>
</tr>
<tr>
<td>Larkin, Douglas</td>
<td>14, 86</td>
</tr>
<tr>
<td>LaRose, Sarah</td>
<td>117</td>
</tr>
<tr>
<td>Larson, Kristen</td>
<td>15, 85, 116</td>
</tr>
<tr>
<td>Larson, Lincoln</td>
<td>81</td>
</tr>
<tr>
<td>Laszcz, Martyna</td>
<td>39</td>
</tr>
<tr>
<td>Lavi, Rea</td>
<td>16, 61, 101</td>
</tr>
<tr>
<td>Lavonen, Jari</td>
<td>56</td>
</tr>
<tr>
<td>Leammukda, Felicia Dawn</td>
<td>57</td>
</tr>
</tbody>
</table>
Author Index

Leary, Elgin
14, 111
Lebak, Kimberly
100
Lederman, Judith
52, 76
Lederman, Norman
52, 91, 103
Lee, Carrie
87
Lee, Desmond
89
Lee, Hee-Sun
44, 63, 66, 100
Lee, Hyunju
63
Lee, Hyunok
106
Lee, Jane
87
Lee, May
15, 98
Lee, Okhee
25, 38
Lee, Samuel
57
Lee, Sarah
43
Lee, Soon
16, 100
Lee, Tammy
16, 87
Lehman, Elizabeth
86
Lemons, Paula
49
Lemus, Judith
76
Lenski, Sina
16, 110
Lentini, Jennifer
101
LePretre, Dawnne
14, 103
Lerma, Yasiry
118
Lerman, Richard
104
Letourneau, Susan
16, 42, 89
Levrini, Olivia
49, 52, 98, 106
Levy, Marissa
64
Levy, Sharona
47, 52, 106
Lewis, Elizabeth
14, 43, 89, 112, 116
Lewis, Tiffany
71, 91
Li, Feng
87, 117
Li, Min
117
Li, Siqi
16, 83
Li, Tingting
16, 43, 68, 82, 107
Li, Wei-Ting
108
Liang, Ling
15, 49
Lightner, Lindsay
38
Likely, Rasheda
63, 67
Lilly, Sarah
16, 39, 49, 114
Limbere, Alfred
14, 101
Lin, Chien-Yu
104
Lin, Huann-Shyang
81, 84
Lin, Jing
15, 24, 25, 76, 109
Lin, Mu-Yin
16, 59
Lin, Shan
82
Lindsay, William
45
Lipsitz, Kelsey
26
Liu, ChangChia
14
Liu, Chenyan
68
Liu, Conghui
52
Liu, Enshan
84, 107
Liu, Lei
97
Liu, Xiufeng
74, 82
Livni Alcasid, Gur
83
Lo, Abraham
85
Lock, Robynne
98
Lockyer, Lori
75
Lohwasser, Karin
15, 90, 116
Lombardi, Doug
74, 75
Long, Charnell
14, 51
Long, David
99
Lopez-Colson, Gianna
14, 44, 88
Lord, Trudi
44
Lore, Chris
44
Lorke, Julia
70
Lotter, Christine
110
Lottero-Perdue, Pamela
103
Lowell, Benjamin
14, 66, 86
Lu, Ying-Yan
17, 84
Lucas, Lyrica
15, 81, 89
Luft, Julie
25, 53, 97, 100, 101, 118
Lukas, Sarah
115
Luna, Melissa
115
Lundegård, Iann
108
Lundgren, Lisa
15, 26, 72
Lynch, Samantha
119

M
MacDowell, Una
65
Machaka, Nessrine
69
Macias, Christina
42
Macias, Meghan
15, 106
MacPherson, Anna
14, 97, 112
Maeng, Jennifer
67, 84, 118
Maestrales, Sarah
107
Maquire, Jennifer
15, 96, 113
Mahmud, Anina
51
Mahoney, Kathleen
103
Makki, Nidaa
3, 13, 25, 113, 116
Malik, Hamza
15, 104
Malone, Molly
41, 76
Maltese, Adam
91
Mansour, Nasser
25
Manz, Eve
14, 41, 97
Marbach-Ad, Gili
14, 41, 55, 110
Markwordt, Jasmine
107, 114
Marco-Bujosa, Lisa
15, 42, 105
Marcum-Dietrich, Nanette
99
Marentic, Natalie
115
Marichal, Andrew
96
Marrero, Meghan
116
Marsh, Jamie
78
Marshall, Karen
44
<table>
<thead>
<tr>
<th>Author Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marshall, Stefanie</td>
</tr>
<tr>
<td>16, 24, 66, 93, 105</td>
</tr>
<tr>
<td>Martin, Sonya</td>
</tr>
<tr>
<td>16, 25, 47, 76, 94, 106</td>
</tr>
<tr>
<td>Martinez Hinestroza, Jose</td>
</tr>
<tr>
<td>79</td>
</tr>
<tr>
<td>Martinez, Alexandra</td>
</tr>
<tr>
<td>92</td>
</tr>
<tr>
<td>Marvelle, Amanda</td>
</tr>
<tr>
<td>89</td>
</tr>
<tr>
<td>Marzabal, Ainoa</td>
</tr>
<tr>
<td>103</td>
</tr>
<tr>
<td>Massey, Teresa</td>
</tr>
<tr>
<td>16, 89, 106</td>
</tr>
<tr>
<td>Massicotte, Joyce</td>
</tr>
<tr>
<td>57</td>
</tr>
<tr>
<td>Matewos, Ananya</td>
</tr>
<tr>
<td>109</td>
</tr>
<tr>
<td>Mathayas, Nitasha</td>
</tr>
<tr>
<td>16, 58, 69</td>
</tr>
<tr>
<td>Mathis, Clausell</td>
</tr>
<tr>
<td>14, 72, 114</td>
</tr>
<tr>
<td>Matos, Luis</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>Matsuura, Takuya</td>
</tr>
<tr>
<td>16, 75</td>
</tr>
<tr>
<td>Mavrikaki, Evangelia</td>
</tr>
<tr>
<td>101</td>
</tr>
<tr>
<td>Mawyer, Kirsten</td>
</tr>
<tr>
<td>78</td>
</tr>
<tr>
<td>Max, Anna-Lisa</td>
</tr>
<tr>
<td>115</td>
</tr>
<tr>
<td>Mbaezue, Chielo</td>
</tr>
<tr>
<td>63</td>
</tr>
<tr>
<td>Mbajiorgu, Ngozika</td>
</tr>
<tr>
<td>58</td>
</tr>
<tr>
<td>Mcalexander, Shana</td>
</tr>
<tr>
<td>16, 113</td>
</tr>
<tr>
<td>McAlister, Anne</td>
</tr>
<tr>
<td>49, 114</td>
</tr>
<tr>
<td>McCance, Katherine</td>
</tr>
<tr>
<td>15, 42, 113</td>
</tr>
<tr>
<td>McCance, Katie</td>
</tr>
<tr>
<td>39</td>
</tr>
<tr>
<td>McCarthy Hintz, Mary</td>
</tr>
<tr>
<td>77</td>
</tr>
<tr>
<td>McCarthy, Brendan</td>
</tr>
<tr>
<td>110</td>
</tr>
<tr>
<td>McCausland, Jonathan</td>
</tr>
<tr>
<td>15, 66, 100</td>
</tr>
<tr>
<td>McCoy, Whitney</td>
</tr>
<tr>
<td>84</td>
</tr>
<tr>
<td>Menon, Deepika</td>
</tr>
<tr>
<td>78, 90</td>
</tr>
<tr>
<td>Mercier, Alison</td>
</tr>
<tr>
<td>14, 54, 64, 67</td>
</tr>
<tr>
<td>Merker, Amelia</td>
</tr>
<tr>
<td>42</td>
</tr>
<tr>
<td>Mesa, Jennifer</td>
</tr>
<tr>
<td>62</td>
</tr>
<tr>
<td>Metzger, Kelsey</td>
</tr>
<tr>
<td>15, 118</td>
</tr>
<tr>
<td>Miel, Karen</td>
</tr>
<tr>
<td>91</td>
</tr>
<tr>
<td>Mikeska, Jamie</td>
</tr>
<tr>
<td>25, 87, 98, 101, 103</td>
</tr>
<tr>
<td>Miller, Brant</td>
</tr>
<tr>
<td>103</td>
</tr>
<tr>
<td>Miller, Cory</td>
</tr>
<tr>
<td>68</td>
</tr>
<tr>
<td>Miller, Kristen</td>
</tr>
<tr>
<td>41</td>
</tr>
<tr>
<td>Miller-Rushing, Anica</td>
</tr>
<tr>
<td>67</td>
</tr>
<tr>
<td>Minogue, James</td>
</tr>
<tr>
<td>15, 25, 103</td>
</tr>
<tr>
<td>Minstrell, Jim</td>
</tr>
<tr>
<td>117</td>
</tr>
<tr>
<td>Mohan, Lindsey</td>
</tr>
<tr>
<td>48, 87</td>
</tr>
<tr>
<td>Morales-Doyle, Daniel</td>
</tr>
<tr>
<td>48, 63</td>
</tr>
<tr>
<td>Morell, Linda</td>
</tr>
<tr>
<td>78, 97</td>
</tr>
<tr>
<td>Moreno, Nancy</td>
</tr>
<tr>
<td>57</td>
</tr>
<tr>
<td>Morphew, Jason</td>
</tr>
<tr>
<td>15, 108</td>
</tr>
<tr>
<td>Morrison, Deb</td>
</tr>
<tr>
<td>24, 53, 99</td>
</tr>
<tr>
<td>Moshfeghyeganeh, Saeed</td>
</tr>
<tr>
<td>16, 119</td>
</tr>
<tr>
<td>Mueller, Andreas</td>
</tr>
<tr>
<td>83</td>
</tr>
<tr>
<td>Mullen, Claire</td>
</tr>
<tr>
<td>87</td>
</tr>
<tr>
<td>Muller, Satbir</td>
</tr>
<tr>
<td>42</td>
</tr>
<tr>
<td>Mumba, Frackson</td>
</tr>
<tr>
<td>70, 85</td>
</tr>
<tr>
<td>Munakata, Mika</td>
</tr>
<tr>
<td>16, 101</td>
</tr>
<tr>
<td>Murillo-Quirós, Natalia</td>
</tr>
<tr>
<td>117</td>
</tr>
<tr>
<td>Murphy, Jennifer</td>
</tr>
<tr>
<td>115</td>
</tr>
<tr>
<td>Mushayikwa, Emmanuel</td>
</tr>
<tr>
<td>25, 38</td>
</tr>
</tbody>
</table>
N
Nagda, Malay 110
Nagle, Courtney 71, 91
Nancy, Sharfun Islam 16, 98
Nation, Jasmine 15
Nativ Ronen, Efrat 112
Navas Iannini, Ana Maria 81
Navy, Shannon 13, 26, 71, 97, 118
Nazaretsky, Tanya 82
Nebus Bose, Frances 40
Nehm, Ross 16, 77, 94
Nelson, Bryanna 117
Nelson-Barber, Sharon 80, 108
Neumann, Knut 12, 26, 51, 53, 76, 98, 109, 115
Newell, Alana 14, 57
Newman, Steven 79
Newport, Morgan 111
Newton, Mark 15, 25, 52, 87, 106
Ngai, Courtney 97
Ngugi, Rosetta 90
Nguyen, Kimberly 107
Nguyen, Ursula 98
Nichols, Bryan 52, 104
Nicholson, Louise 77
Niebert, Kai 77
Nielsen, Katia 64

Nieuwsma, Julianna 89, 115
Nijenhuis-Voogt, Jacqueline 15, 68
Nilson, Charles 97
Nilsson, Pernilla 56
Nitecki, Elena 116
Nixon, Ryan 13, 25, 71
Nolan, Charlene 65
Nordine, Jeffrey 15, 56
Nouri, Noushin 70
Nowak, Anna 82
Nuñez Cruz, Eduardo Jose 60
Nyachwaya, James 15, 24, 77
Nyamekye, Mercy 104
Nyamupangedengu, Eunice 111

O
Odekeye, Tokunbo 51
Oertli, Tanner 91
Offerdahl, Erika 95
Ogodo, Justina 15, 24, 70, 99, 119
Oguz Namdar, Aysegul 106
Ojeda-Ramírez, Santiago 85
Okafor, Ngozi 16
Okebukola, Peter 16, 18, 24, 51, 58, 84
Oladejo, Adekunle 14
Oliveira, Alandeom 70
Olson, Ailser 14, 44
Olson, Joanne 44, 84
Onowugbeda, Franklin 51, 58, 84
Orzo, Socorro 78
Ortega, Kassandra 78
Ortiz, Enrique 92
Ortiz, Miriam 44
Osborne, Jonathan 62, 63, 66, 97
Osborne, Scott 76
Otulaja, Femi 25, 108
Owens, David 14, 44
Oz, Elif 98
Ozen Tasdemir, Hatice 100, 118
Ozturk, Nilay 16, 50

P
Pachman, Mariya 75
Palincsar, Annemarie 86
Pallant, Amy 44, 56, 63, 66, 100
Palmgren, Elina 120
Pamuk, Savas 88, 104
Papa, Jeff 104
Paquette, Alain 120
Parekh, Priyanka 16, 60, 111
Park Rogers, Meredith 77, 79
Park, Mihwa 62
Park, Soonhye 45, 56, 75, 90, 100
Park, Sunyoung 56, 76
Park, Wonyong 17, 52, 106
Patel, Eshan 114
Paton, Claire 75
Patrick, Patricia 16, 26, 55, 77, 105
Patterson Williams, Alexis 59
Patterson, Zac 17, 49, 110
Paul, Kelli 91
Pavez, Jose 101
Payne, Corey 14, 69, 77
Pazos, Pilar 112
Peake, Leigh 65
Pearson, Willie 58
Pedretti, Erminia 81
Pedroso, Rosio 118
Peel, Amanda 14, 64, 116
Peer, Tal 106
Peffer, Tamara 16, 45, 99
Pelech, Sharon 16, 62
Peleg, Ran 16, 50, 81
Peña, Laura 15, 38, 92
Penella, Robyn 78
Penuel, William 66, 95
Pérez, Greses 14, 63
Perry, Anthony 89
Perry, Netta 16, 54
Pershing, Andrew 65
Author Index

Petchey, Sara
16, 77

Peter, Esther
51, 58

Peters-Burton, Erin
14, 49

Petitt, Destini
44

Pham-Quan, Megan
115

Phan, Tranq
62

Phelps, Amy
95

Phelps, David
41

Phillips, Andrea
14, 77

Pickens, Mario
60

Pierson, Ashlyn
14, 43, 76

Pietros, Jennifer
15, 48

Plevani, Telmo
101

Pimentel, Daniel
14, 43

Pinxten, Rianne
101

Plank, Holly
68

Pleasants, Jacob
15, 45, 84

Plummer, Julia
3, 13, 15, 25, 54

Podkul, Timothy
112

Politis, Panagiotis
101

Polizzi, Samuel
62

Polzin, Megan
100

Pongsophon, Pongprapan
55

Poole Patzelt, Suzanne
86

Poor, Sarah
44, 103

Portsmore, Merredith
91

Potvin, Geoff
98

Poulakis, Emmanouil
101

Powell, Wardell
17, 106

Pratt-Taweh, Sasha
70

Preece, Christopher
14, 72

Prestis, Olivia
95

Priemer, Burkhard
82

Princiotto, Daniel
112

Purohit, Kiran
15, 41, 90

Pusey, Téa
61

Puvirajah, Anton
13, 25, 59

Q

Qi, Kern
103

Quigley, Cassie
14, 68, 92

Quiroz, Waldo
103

R

Race, Alexandra
14

Rachmatullah, Arif
14, 83

Radebe, Nomfundo
90

Radloff, Jeffrey
15, 67, 104

Rajwade, Aparajita
113

Ramirez Villarin, Lorraine
15, 59

Ran, Hua
72

Rand, Angela
72

Rao, Asha
44

Rap, Shelley
16, 88

Rasa, Tapio
120

Rebelo, Carina
14, 26

Refvem, Emma
89, 115

Rego, Melissa
68, 106

Rehm, Abeera
97

Reichsman, Frieda
14, 97

Reid, Joshua
15, 60, 62, 84, 86, 95

Reigh, Emily
14, 66, 118

Reinhold, Peter
117

Reiss, Michael
55, 97

Reiss, Shari
57

Rende, Kathryn
115

Restrepo Nazar, Christina
78

Reynante, Brandon
63

Reynolds Brubaker, Eric
63

Reynolds, William Matthew
17

Rhinehart, Abby
66

Rhodes, Jennifer
50

Riccio, Jessica
85

Rich, Peter
49

Richardi, Jessica
100

Riche, Alexis
77

Richmond, Gail
45, 94

Ricotti, Novella
115

Ridgway, Judith
41

Riegle-Crumb, Catherine
98

Ringleb, Stacie
112

Ring-Whalen, Elizabeth
61, 87

Rish, Ryan
111

Robertson Konz, Rebecca
57

Robinson, Julie
40

Robinson, Lucy
70

Robinson-Hill, Rona
38, 94

Roby, ReAnna
44, 46

Rodriguez, Maria
102

Rodriguez-Operana, Victoria
17, 114

Roehrig, Gillian
27, 57, 61, 62, 85, 87, 102, 105, 106, 109

Rojas-Perilla, Diego
14, 96

Rollnick, Marissa
25, 111

Romero, Monica
119

Ropohl, Mathias
25, 56, 79

Roseler, Katrlna
78

Rosenfeld, Sherman
88

Ross, Lydia
51

Roth, Kathleen
85

Roth, Tamara
16, 109

Rouleau, Mark
87

Rozenblum, Yael
112

Ruggirello, Rachel
16, 100

Ruíz-Primo, María Araceli
117
### Author Index

<table>
<thead>
<tr>
<th>Author</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rumage, Jamie</td>
<td>53</td>
</tr>
<tr>
<td>Rumann, Stefan</td>
<td>113</td>
</tr>
<tr>
<td>Ruppert, John</td>
<td>15, 52</td>
</tr>
<tr>
<td>Rushton, Greg</td>
<td>62</td>
</tr>
<tr>
<td>Rushton, Gregory</td>
<td>53, 62, 86, 95</td>
</tr>
<tr>
<td>Russell, Melody</td>
<td>24, 54, 58</td>
</tr>
<tr>
<td>Russo-Tait, Tatiane</td>
<td>98</td>
</tr>
<tr>
<td>Rutt, Alexis</td>
<td>70</td>
</tr>
<tr>
<td>Ryu, Minjung</td>
<td>26, 92</td>
</tr>
<tr>
<td>Saba, Janan</td>
<td>52</td>
</tr>
<tr>
<td>Saban, Yakup</td>
<td>88</td>
</tr>
<tr>
<td>Saberi, Maryam</td>
<td>70</td>
</tr>
<tr>
<td>Sackietey, Samira</td>
<td>103</td>
</tr>
<tr>
<td>Sadler, Philip</td>
<td>45, 92, 96</td>
</tr>
<tr>
<td>Sadler, Troy</td>
<td>13, 26, 40, 44, 74, 91, 94, 98, 104, 109</td>
</tr>
<tr>
<td>Sahin, Alpaslan</td>
<td>58, 115</td>
</tr>
<tr>
<td>Sailors, Misty</td>
<td>57</td>
</tr>
<tr>
<td>Saitta, Erin</td>
<td>92, 93</td>
</tr>
<tr>
<td>Salcido White, Maya</td>
<td>106</td>
</tr>
<tr>
<td>Salda\mpando, Alberto</td>
<td>99</td>
</tr>
<tr>
<td>Salgado, Michelle</td>
<td>41</td>
</tr>
<tr>
<td>Salisbury, Sara</td>
<td>16, 104, 120</td>
</tr>
<tr>
<td>Salloun, Sara</td>
<td>16, 92, 113</td>
</tr>
<tr>
<td>Samiphak, Sara</td>
<td>16, 83</td>
</tr>
<tr>
<td>Sample McMeeking, Laura</td>
<td>66</td>
</tr>
<tr>
<td>Sampson, Victor</td>
<td>54, 55</td>
</tr>
<tr>
<td>Sandrin, Susannah</td>
<td>16, 104</td>
</tr>
<tr>
<td>Santiago, Marisol Mercado</td>
<td>63</td>
</tr>
<tr>
<td>Sasson, Irit</td>
<td>58</td>
</tr>
<tr>
<td>Sato, Brian</td>
<td>114</td>
</tr>
<tr>
<td>Saucedo, Daniela</td>
<td>112</td>
</tr>
<tr>
<td>Saw, Guan</td>
<td>95</td>
</tr>
<tr>
<td>Sbeglia, Gena</td>
<td>14, 77</td>
</tr>
<tr>
<td>Scates, Jessica</td>
<td>111</td>
</tr>
<tr>
<td>Schafer, Adam</td>
<td>110</td>
</tr>
<tr>
<td>Schafer, Nancy</td>
<td>102</td>
</tr>
<tr>
<td>Schafer, Kristen</td>
<td>81</td>
</tr>
<tr>
<td>Scheer, Madison</td>
<td>15, 104</td>
</tr>
<tr>
<td>Schellinger, Jennifer</td>
<td>15, 86, 109</td>
</tr>
<tr>
<td>Schiering, Dustin</td>
<td>14, 115</td>
</tr>
<tr>
<td>Schloss, Dana</td>
<td>42</td>
</tr>
<tr>
<td>Schmeling, Sascha</td>
<td>50</td>
</tr>
<tr>
<td>Schneider, Barbara</td>
<td>68</td>
</tr>
<tr>
<td>Schneider, Laura</td>
<td>15, 93</td>
</tr>
<tr>
<td>Schoene, Melissa</td>
<td>97</td>
</tr>
<tr>
<td>Schroeder, Margaret</td>
<td>62</td>
</tr>
<tr>
<td>Schuchardt, Anita</td>
<td>14, 82, 97, 111</td>
</tr>
<tr>
<td>Schul, Johannes</td>
<td>97</td>
</tr>
<tr>
<td>Schultheis, Elizabeth</td>
<td>90</td>
</tr>
<tr>
<td>Schussler, Elisabeth</td>
<td>41</td>
</tr>
<tr>
<td>Schwartz, Maayan</td>
<td>106</td>
</tr>
<tr>
<td>Schwandewald, Julia</td>
<td>79</td>
</tr>
<tr>
<td>Schwartz, Daniel</td>
<td>65</td>
</tr>
<tr>
<td>Schwartz, Renée</td>
<td>3, 12, 16, 17, 20, 24, 25, 47, 52, 97</td>
</tr>
<tr>
<td>Schwarz, Christina</td>
<td>12, 26, 41</td>
</tr>
<tr>
<td>Schweingruber, Heidi</td>
<td>95</td>
</tr>
<tr>
<td>Schwichow, Martin</td>
<td>15, 86</td>
</tr>
<tr>
<td>Scott, Derek</td>
<td>100</td>
</tr>
<tr>
<td>Scott, Sandra</td>
<td>45</td>
</tr>
<tr>
<td>Sedaghatjou, Mina</td>
<td>59</td>
</tr>
<tr>
<td>Sedawi, Wisam</td>
<td>17, 100</td>
</tr>
<tr>
<td>Segura, David</td>
<td>14, 63</td>
</tr>
<tr>
<td>Sessoms, Deidre</td>
<td>116</td>
</tr>
<tr>
<td>Setioko, Wahyu</td>
<td>115</td>
</tr>
<tr>
<td>Severance, Samuel</td>
<td>78</td>
</tr>
<tr>
<td>Severance, Sara</td>
<td>65</td>
</tr>
<tr>
<td>Sevian, Hannah</td>
<td>42, 48, 50, 55, 110</td>
</tr>
<tr>
<td>Sexton, Chelsea</td>
<td>14, 38</td>
</tr>
<tr>
<td>Sezen-Barrie, Asli</td>
<td>26, 55, 60, 99, 105</td>
</tr>
<tr>
<td>Shaby, Neta</td>
<td>13, 16, 25, 50, 55, 59, 78</td>
</tr>
<tr>
<td>Shackley, Matthew</td>
<td>39</td>
</tr>
<tr>
<td>Shahat, Mohamed</td>
<td>117</td>
</tr>
<tr>
<td>Sharlin, David</td>
<td>69</td>
</tr>
<tr>
<td>Shaw, Bob</td>
<td>76</td>
</tr>
<tr>
<td>Shaw, Jerome</td>
<td>12, 78</td>
</tr>
<tr>
<td>Shechter, Taly</td>
<td>84</td>
</tr>
<tr>
<td>Sheehan, Patrick</td>
<td>110</td>
</tr>
<tr>
<td>Shein, Paichi</td>
<td>40, 108</td>
</tr>
<tr>
<td>Shen, Ji</td>
<td>57, 72</td>
</tr>
<tr>
<td>Shen, Yuefei</td>
<td>118</td>
</tr>
<tr>
<td>Sheng, Yanyan</td>
<td>50</td>
</tr>
<tr>
<td>Sheppard, Sheri</td>
<td>63</td>
</tr>
<tr>
<td>Sherry-Wagner, Jordan</td>
<td>65</td>
</tr>
<tr>
<td>Sherwood, Carrie-Anne</td>
<td>14</td>
</tr>
<tr>
<td>Shillingstad, Saundra</td>
<td>96</td>
</tr>
<tr>
<td>Shim, Soo-Yean</td>
<td>69, 116</td>
</tr>
<tr>
<td>Shin, Donghee</td>
<td>81</td>
</tr>
<tr>
<td>Shin, Hyo-Jeong</td>
<td>51</td>
</tr>
<tr>
<td>Shin, Myunghwan</td>
<td>16, 42, 62</td>
</tr>
<tr>
<td>Shin, Namsoo</td>
<td>43</td>
</tr>
<tr>
<td>Shinnick-Gordon, Isabel</td>
<td>77</td>
</tr>
<tr>
<td>Shivni, Rashmi</td>
<td>111</td>
</tr>
<tr>
<td>Shreiber, Merav</td>
<td>55</td>
</tr>
<tr>
<td>Shukla, Kathan</td>
<td>112</td>
</tr>
<tr>
<td>Shwarts Asher, Daphna</td>
<td>57</td>
</tr>
<tr>
<td>Shwartz, Gabriela</td>
<td>87</td>
</tr>
<tr>
<td>Shwartz, Yael</td>
<td>17, 61</td>
</tr>
<tr>
<td>Siani, Merav</td>
<td>113</td>
</tr>
<tr>
<td>Siddique, Mohammad</td>
<td>16, 51</td>
</tr>
<tr>
<td>Siegel, Marcelle</td>
<td>97</td>
</tr>
<tr>
<td>Siehl, Sharon</td>
<td>65</td>
</tr>
</tbody>
</table>
### Author Index

<table>
<thead>
<tr>
<th>Author Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signorini, Adriana</td>
<td>61</td>
</tr>
<tr>
<td>Silander, Megan</td>
<td>51</td>
</tr>
<tr>
<td>Silfver, Eva</td>
<td>47</td>
</tr>
<tr>
<td>Silvia Mangiante, Elaine</td>
<td>14, 50</td>
</tr>
<tr>
<td>Simon, Marsha</td>
<td>60, 119</td>
</tr>
<tr>
<td>Simpson, Lauren</td>
<td>77</td>
</tr>
<tr>
<td>Sindiani, Ayshi</td>
<td>88</td>
</tr>
<tr>
<td>Singh, Harleen</td>
<td>15, 118</td>
</tr>
<tr>
<td>Sinthuwa, Waralee</td>
<td>55</td>
</tr>
<tr>
<td>Siry, Christina</td>
<td>92, 94</td>
</tr>
<tr>
<td>Sivaraj, Ramya</td>
<td>39, 109</td>
</tr>
<tr>
<td>Siyahhan, Sinem</td>
<td>111</td>
</tr>
<tr>
<td>Skinner, Ron</td>
<td>42, 114</td>
</tr>
<tr>
<td>Skrob, Samantha</td>
<td>16, 86, 114</td>
</tr>
<tr>
<td>Slotta, James</td>
<td>103</td>
</tr>
<tr>
<td>Smith, Amanda</td>
<td>119</td>
</tr>
<tr>
<td>Smith, Brittany</td>
<td>14, 69</td>
</tr>
<tr>
<td>Smith, Cody</td>
<td>14, 49</td>
</tr>
<tr>
<td>Smith, Jim</td>
<td>97</td>
</tr>
<tr>
<td>Smith, Patrick</td>
<td>16, 109</td>
</tr>
<tr>
<td>Smith, Rebecca</td>
<td>78, 91</td>
</tr>
<tr>
<td>Smith, Theila</td>
<td>16, 24, 38, 64</td>
</tr>
<tr>
<td>Sneed, Stacey</td>
<td>75</td>
</tr>
<tr>
<td>Snowden, Jeffery</td>
<td>65, 101</td>
</tr>
<tr>
<td>Sodini, Claudia</td>
<td>50</td>
</tr>
<tr>
<td>Solis, Jorge</td>
<td>110</td>
</tr>
<tr>
<td>Songer, Nancy</td>
<td>86</td>
</tr>
<tr>
<td>Soni, Parth</td>
<td>16, 112</td>
</tr>
<tr>
<td>Sönmez, Elf</td>
<td>85</td>
</tr>
<tr>
<td>Sonnert, Gerhard</td>
<td>45, 92, 96</td>
</tr>
<tr>
<td>Soobard, Regina</td>
<td>16</td>
</tr>
<tr>
<td>Sorensen, Amanda</td>
<td>40</td>
</tr>
<tr>
<td>Sorge, Stefan</td>
<td>16, 56, 115</td>
</tr>
<tr>
<td>Southerland, Sherry</td>
<td>42, 72, 74, 78, 94, 109, 114, 116</td>
</tr>
<tr>
<td>Spektor-Levy, Ornit</td>
<td>13, 16, 26, 54, 84</td>
</tr>
<tr>
<td>Spurgin, Caroline</td>
<td>14, 42</td>
</tr>
<tr>
<td>Stadler, Matthias</td>
<td>56</td>
</tr>
<tr>
<td>Stahi-Hitin, Reut</td>
<td>95, 113</td>
</tr>
<tr>
<td>Staples, Kimberly</td>
<td>15, 118</td>
</tr>
<tr>
<td>Stark, Louisa</td>
<td>41, 76</td>
</tr>
<tr>
<td>Staudt, Carolyn</td>
<td>57</td>
</tr>
<tr>
<td>Staust, Nancy</td>
<td>16, 50, 59, 78</td>
</tr>
<tr>
<td>Stehle, Stephanie</td>
<td>49</td>
</tr>
<tr>
<td>Steimle, Alice</td>
<td>77</td>
</tr>
<tr>
<td>Stennett, Betty</td>
<td>71, 85</td>
</tr>
<tr>
<td>Stephen, Magdeline</td>
<td>15, 41, 77</td>
</tr>
<tr>
<td>Stepp, Zachary</td>
<td>72</td>
</tr>
<tr>
<td>Stern, Florian</td>
<td>83</td>
</tr>
<tr>
<td>Stevenson, Kathryn</td>
<td>81</td>
</tr>
<tr>
<td>Stimac, Catherine</td>
<td>71</td>
</tr>
<tr>
<td>Stinken-Rösner, Lisa</td>
<td>15, 58</td>
</tr>
<tr>
<td>Stivers, Alexander</td>
<td>61</td>
</tr>
<tr>
<td>Stowe, Ryan</td>
<td>110</td>
</tr>
<tr>
<td>Stroupe, David</td>
<td>37, 90, 97</td>
</tr>
<tr>
<td>Stuhlsatz, Molly</td>
<td>16, 63, 85, 90, 97, 101</td>
</tr>
<tr>
<td>Suarez, Enrique</td>
<td>48</td>
</tr>
<tr>
<td>Suh, Jee Kyung</td>
<td>67, 101</td>
</tr>
<tr>
<td>Suh, Jennifer</td>
<td>79</td>
</tr>
<tr>
<td>Sukinahimi, Peresang</td>
<td>40, 108</td>
</tr>
<tr>
<td>Sukirsi, Weerephat</td>
<td>62, 97</td>
</tr>
<tr>
<td>Sun, Ying</td>
<td>82</td>
</tr>
<tr>
<td>Sunal, Dennis</td>
<td>115</td>
</tr>
<tr>
<td>Sweetman, Sara</td>
<td>48, 100</td>
</tr>
<tr>
<td>Szopiak, Michael</td>
<td>76</td>
</tr>
</tbody>
</table>

**T**

<table>
<thead>
<tr>
<th>Author Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tal, Marina</td>
<td>61</td>
</tr>
<tr>
<td>Tal, Tali</td>
<td>12, 24, 48, 55, 112</td>
</tr>
<tr>
<td>Talbot, Robert</td>
<td>38, 114</td>
</tr>
<tr>
<td>Tanas, Jamie</td>
<td>107</td>
</tr>
<tr>
<td>Tankersley, Amy</td>
<td>89</td>
</tr>
<tr>
<td>Tashiro, Lynn</td>
<td>77</td>
</tr>
<tr>
<td>Tasquier, Giulia</td>
<td>14, 98</td>
</tr>
<tr>
<td>Tawbush, Rachael</td>
<td>16, 115</td>
</tr>
<tr>
<td>Taylor, Joseph</td>
<td>99</td>
</tr>
<tr>
<td>Taylor, Lezly</td>
<td>109</td>
</tr>
<tr>
<td>Taylor, Monica</td>
<td>101</td>
</tr>
<tr>
<td>Teeter, Stephanie</td>
<td>16, 42</td>
</tr>
<tr>
<td>Tekkumru Kisa, Miray</td>
<td>42, 54, 101, 109, 110</td>
</tr>
</tbody>
</table>

**T**

<table>
<thead>
<tr>
<th>Author Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tembrevilia, Gerald</td>
<td>14, 120</td>
</tr>
<tr>
<td>Terada, Takeshi</td>
<td>49</td>
</tr>
<tr>
<td>Thomas, Misty</td>
<td>54</td>
</tr>
<tr>
<td>Thomas, Nicole</td>
<td>95</td>
</tr>
<tr>
<td>Thompson, Katerina</td>
<td>110</td>
</tr>
<tr>
<td>Thompson, Stephen</td>
<td>16, 70</td>
</tr>
<tr>
<td>Tierney-Fife, Peter</td>
<td>65</td>
</tr>
<tr>
<td>Tillotson, John</td>
<td>18, 49</td>
</tr>
<tr>
<td>Tippins, Deborah</td>
<td>57, 77</td>
</tr>
<tr>
<td>Titu, Preethi</td>
<td>16, 24, 57, 87, 105</td>
</tr>
<tr>
<td>Tobin, Roger</td>
<td>88</td>
</tr>
<tr>
<td>Tolbert, Sara</td>
<td>42, 64, 99</td>
</tr>
<tr>
<td>Toma, Radu Bogdan</td>
<td>16, 91, 105</td>
</tr>
<tr>
<td>Tompkins, Amanda</td>
<td>14, 71</td>
</tr>
<tr>
<td>Topcu, Mustafa</td>
<td>108</td>
</tr>
<tr>
<td>Toro, Stephanie</td>
<td>85</td>
</tr>
<tr>
<td>Tosun, Gozde</td>
<td>14, 71</td>
</tr>
<tr>
<td>Touitou, Israel</td>
<td>96, 107</td>
</tr>
<tr>
<td>Tran, Hong</td>
<td>77, 118</td>
</tr>
<tr>
<td>Tran, Kelly</td>
<td>111</td>
</tr>
<tr>
<td>Tran, Khanh</td>
<td>91</td>
</tr>
<tr>
<td>Tran, Susan</td>
<td>64</td>
</tr>
<tr>
<td>Treagust, David</td>
<td>117</td>
</tr>
<tr>
<td>Tripp, Jennifer</td>
<td>15, 27, 40, 108</td>
</tr>
<tr>
<td>Tröbst, Steffen</td>
<td>55</td>
</tr>
<tr>
<td>Truscott, Diane</td>
<td>102</td>
</tr>
<tr>
<td>Author</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>--------</td>
<td>--------------</td>
</tr>
<tr>
<td>Trygstad, Peggy</td>
<td>109</td>
</tr>
<tr>
<td>Tsybulsky, Dina</td>
<td>14, 120</td>
</tr>
<tr>
<td>Tufail, Imran</td>
<td>15, 68, 116</td>
</tr>
<tr>
<td>Turner, Emily</td>
<td>52</td>
</tr>
<tr>
<td>Turner, Kristal</td>
<td>75</td>
</tr>
<tr>
<td>Tuwiler, Shane</td>
<td>16, 100, 113</td>
</tr>
<tr>
<td>Tuvi-Arad, Inbal</td>
<td>58</td>
</tr>
<tr>
<td>Tuvilla, Mavreen Rose</td>
<td>92</td>
</tr>
<tr>
<td>Tzou, Carrie</td>
<td>65</td>
</tr>
<tr>
<td>Uchinokura, Shingo</td>
<td>49</td>
</tr>
<tr>
<td>Ugwu, Patrick</td>
<td>58</td>
</tr>
<tr>
<td>Uhl, Juli</td>
<td>15, 111</td>
</tr>
<tr>
<td>Unal Coban, Gul</td>
<td>115</td>
</tr>
<tr>
<td>Upadhyay, Bhaskar</td>
<td>12, 14, 24, 40, 57, 80, 102, 108</td>
</tr>
<tr>
<td>Upmeier Zu Belzen, Annette</td>
<td>82, 96</td>
</tr>
<tr>
<td>Usher, Maya</td>
<td>87</td>
</tr>
<tr>
<td>Uygun, Cansu Basak</td>
<td>52</td>
</tr>
<tr>
<td>Valdmann, Ana</td>
<td>14</td>
</tr>
<tr>
<td>Van Loon, Kyle</td>
<td>114</td>
</tr>
<tr>
<td>Van Staaden, Moira</td>
<td>77</td>
</tr>
<tr>
<td>Vande Zande, Danielle</td>
<td>14, 54, 101</td>
</tr>
<tr>
<td>Varelas, Maria</td>
<td>25, 63, 92</td>
</tr>
<tr>
<td>Varnedoe, Ann</td>
<td>102</td>
</tr>
<tr>
<td>Vazquez-Ben, Lucia</td>
<td>15, 48</td>
</tr>
<tr>
<td>Vedder-Weiss, Dana</td>
<td>59, 100, 118</td>
</tr>
<tr>
<td>Venditti, Richard</td>
<td>69, 113</td>
</tr>
<tr>
<td>Verma, Geeta</td>
<td>59, 92, 94</td>
</tr>
<tr>
<td>Versano, Merav</td>
<td>103</td>
</tr>
<tr>
<td>Visintainer, Tammie</td>
<td>88</td>
</tr>
<tr>
<td>Vivante, Irit</td>
<td>118</td>
</tr>
<tr>
<td>Vladimirska, Irena</td>
<td>117</td>
</tr>
<tr>
<td>Vo, Tina</td>
<td>16, 26, 27, 56, 60, 95</td>
</tr>
<tr>
<td>Vogelsang, Christoph</td>
<td>117</td>
</tr>
<tr>
<td>Vogt, Patrik</td>
<td>51</td>
</tr>
<tr>
<td>Vokos, Stamatis</td>
<td>116</td>
</tr>
<tr>
<td>Von Aufschnaiter, Claudia</td>
<td>107</td>
</tr>
<tr>
<td>Vo, Paul</td>
<td>87</td>
</tr>
<tr>
<td>Voss, Daniel</td>
<td>69</td>
</tr>
<tr>
<td>Vossoughi, Shirin</td>
<td>48</td>
</tr>
<tr>
<td>Wan, Tong</td>
<td>92, 93</td>
</tr>
<tr>
<td>Wang, Changzhao</td>
<td>72</td>
</tr>
<tr>
<td>Wang, Cong</td>
<td>14, 82</td>
</tr>
<tr>
<td>Wang, Hui-Hui</td>
<td>117</td>
</tr>
<tr>
<td>Wang, Jian</td>
<td>82</td>
</tr>
<tr>
<td>Wang, Jianlan</td>
<td>15, 50, 75, 119</td>
</tr>
<tr>
<td>Wang, Kai-Lung</td>
<td>108</td>
</tr>
<tr>
<td>Wang, Lei</td>
<td>82, 107</td>
</tr>
<tr>
<td>Wang, Lu</td>
<td>15, 90</td>
</tr>
<tr>
<td>Wang, Yuanhua</td>
<td>75</td>
</tr>
<tr>
<td>Wang, Yun-Ciao</td>
<td>40</td>
</tr>
<tr>
<td>Warfa, Abdirizak</td>
<td>105</td>
</tr>
<tr>
<td>Watkins, Shari</td>
<td>58, 73, 93</td>
</tr>
<tr>
<td>Watts, Elizabeth</td>
<td>14, 116</td>
</tr>
<tr>
<td>Waxman, Hersch</td>
<td>64</td>
</tr>
<tr>
<td>Weinberg, Andrea</td>
<td>66</td>
</tr>
<tr>
<td>Weinstein, Matthew</td>
<td>15, 25, 64, 105</td>
</tr>
<tr>
<td>Weitzel, Holger</td>
<td>15, 115</td>
</tr>
<tr>
<td>Welter, Virginia</td>
<td>55</td>
</tr>
<tr>
<td>Wendell, Kristen</td>
<td>67</td>
</tr>
<tr>
<td>Wengrowicz, Niva</td>
<td>16, 84, 119</td>
</tr>
<tr>
<td>Wenk Gotwals, Amelia</td>
<td>86</td>
</tr>
<tr>
<td>West, Luke</td>
<td>93</td>
</tr>
<tr>
<td>Wheeler, Lindsay</td>
<td>15, 110</td>
</tr>
<tr>
<td>White, Anthony</td>
<td>111</td>
</tr>
<tr>
<td>White, Holly</td>
<td>39, 76, 111</td>
</tr>
<tr>
<td>White, Pete</td>
<td>97</td>
</tr>
<tr>
<td>Whittington, Kirby</td>
<td>42</td>
</tr>
<tr>
<td>Whitworth, Brooke</td>
<td>12, 25, 77</td>
</tr>
<tr>
<td>Wicler, Nicole</td>
<td>85</td>
</tr>
<tr>
<td>Wiebe, Eric</td>
<td>83</td>
</tr>
<tr>
<td>Wiener, Gerfried</td>
<td>50</td>
</tr>
<tr>
<td>Wierzbicki, Annette</td>
<td>49</td>
</tr>
<tr>
<td>Wieselmann, Jeanna R.</td>
<td>24</td>
</tr>
<tr>
<td>Wildcat, Daniel</td>
<td>99</td>
</tr>
<tr>
<td>Wilensky, Daniel</td>
<td>64, 116</td>
</tr>
<tr>
<td>Wiles, Benjamin</td>
<td>71</td>
</tr>
<tr>
<td>Wiles, Jason</td>
<td>114</td>
</tr>
<tr>
<td>Wilhelm, Jennifer</td>
<td>76</td>
</tr>
<tr>
<td>Williams, Brian</td>
<td>102</td>
</tr>
<tr>
<td>Williams, Christopher</td>
<td>58</td>
</tr>
<tr>
<td>Wilmes, Sara</td>
<td>25, 47, 92</td>
</tr>
<tr>
<td>Wilson, Christopher</td>
<td>63, 85, 101</td>
</tr>
<tr>
<td>Wilson, Grant</td>
<td>76</td>
</tr>
<tr>
<td>Wilson, Mark</td>
<td>62, 78, 91, 97</td>
</tr>
<tr>
<td>Windschitl, Mark</td>
<td>116</td>
</tr>
<tr>
<td>Wipfili, Kyle</td>
<td>75</td>
</tr>
<tr>
<td>Witzig, Stephen</td>
<td>16, 56, 75, 90, 104, 115</td>
</tr>
<tr>
<td>Wolf, Rachel</td>
<td>65</td>
</tr>
<tr>
<td>Wolfgramm, Marlena</td>
<td>114</td>
</tr>
<tr>
<td>Wong, Joseph</td>
<td>15, 119</td>
</tr>
</tbody>
</table>
Author Index

Wong, Sissy
16, 75

Woodbury, Jacob
95

Woodruff, Karen
39

Woods, Vanessa
116

Wooten, Michelle
53, 64

Wray, Kraig
15, 56, 66

Wright, Casey Elizabeth
92

Wright, Christopher
63, 67

Wright, Diane
14, 66

Wright, Gary
14, 75

Wright, Tanya
86

Wu, Sally
16, 64, 87

Wui, Ma Glenda
75

Wulff, Peter
16, 25, 79, 82

Y
Yachin, Tal
45

Yahdi, Mohammed
77

Yakobov, Hasida
100

Yang, Jie
15, 82, 108

Yang, Yang
83

Yao, Jian-Xin
108

Yap, Melo-Jean
15, 69, 102

Yarden, Anat
52, 95, 113

Yelton, Charles
81

Yesilyurt, Ezgi
14, 93, 105

Yilmaz, Elanur
14, 85

Yilmaz-Tuzun, Ozgul
16, 52

Yisak, Melissa
116

Yonai, Ella
112

You, Hye Sun
15, 56, 76, 117

Young, Heather
71

Yow, Jan
110

Yuan, Shupei
111

Yuan, Xin
93

Z
Zamarrripa Roman, Brian
98

Zangori, Laura
15, 40, 68, 84, 91

Zeidler, Dana
52, 90, 104, 106

Zembal-Saul, Carla
40

Zemel, Yoram
87

Zeng, Liang
76, 109

Zeng, Mao-Ren
47, 102

Zhai, Xiaoming
63, 82, 91, 98, 117

Zhang, Helen
89

Zhang, Jie
75

Zhang, Moyu
116

Zhang, Yingzhi
17, 68

Zhang, Yuanlin
119

Zhang, Zongfang
83

Zhao, FangFang
14, 111

Zhao, Ya-nan
117

Zhou, Xinhui
83

Zhu, Bo
116

Zhu, Yicong
62

Zimmerman, Ifat
112

Zuluaga-Arias, Catalina
85

Zummo, Lynne
15

Zwick, Melissa
27, 60

Zygouris-Coe, Vassiliki
60

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 in the NARST Policies and Procedures manual.
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 in the NARST Policies and Procedures manual.