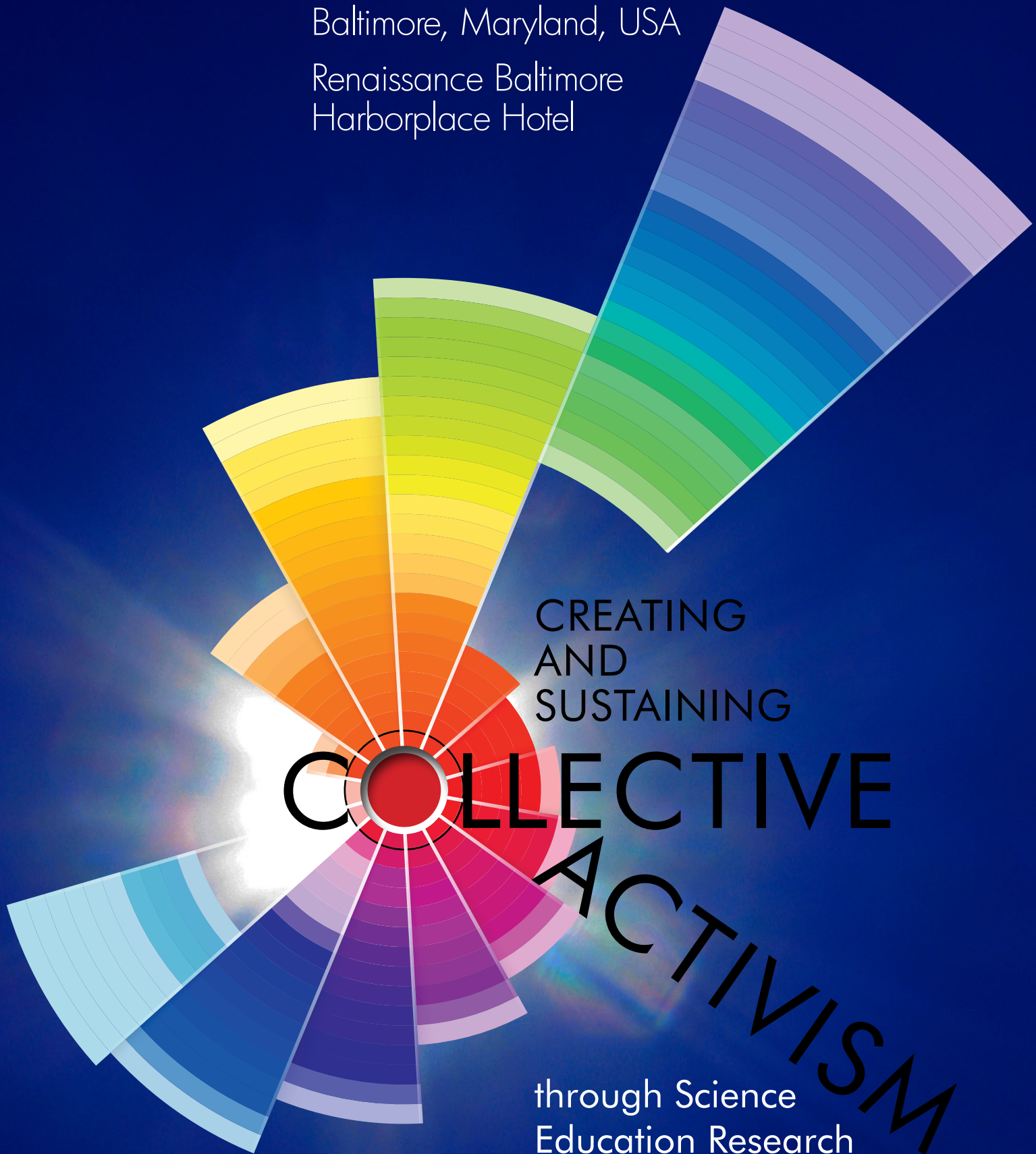


NARST

92nd Annual International Conference
March 31-April 3, 2019

Baltimore, Maryland, USA

Renaissance Baltimore
Harborplace Hotel



CREATING
AND
SUSTAINING

COLLECTIVE

ACTIVISM

through Science
Education Research



We want to hear from you!

Talk to one of us about your book ideas

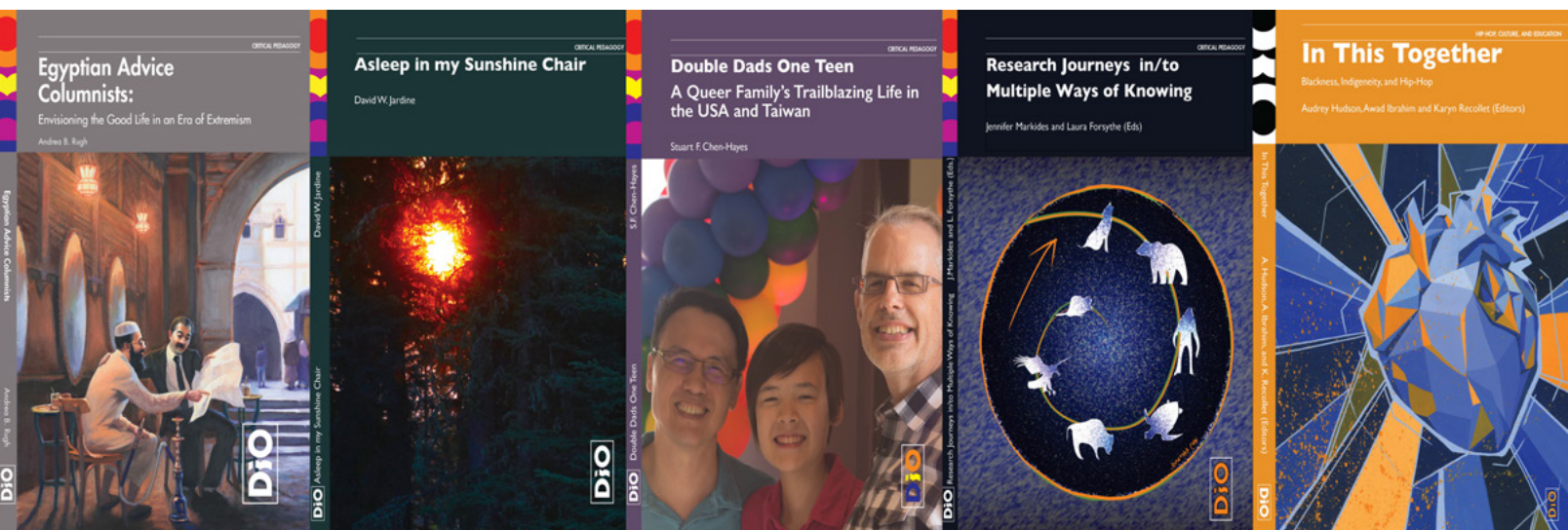
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Do It Ourselves Press

We are continually working on expanding our series lists:

- Canadian Education
- Curriculum: For Curriculum, By Curriculum
- Critical Media Literacy
- Creativity, Culture, and STEM
- Critical Pedagogy
- Ecological Studies in Education
- HipHop, Culture and Education
- Identity, Culture, and Equity
- Literacies as Resistance
- Liberating Education, Liberating Educators
- Mindfulness-Based Teaching and Learning
- Praxis & Paradigms of Wellness: Creativity and Counseling in Schools
- The Black Experience
- Transformative Imaginings: Critical Visions for the Past-Present-Future of Education

- An equitable and socially-conscious press working with and for scholars and teachers to publish accessible and reasonably priced texts and monographs
- DIO Press is incorporated in New York, NY. Key contacts are Michel Lokhorst, CEO mlokhorst@diopress.com and Shirley R Steinberg, Executive Acquisitions and Development Editor ssteinberg@diopress.com; combined, they have an experience of over 50 years in academic publishing, they bring an extensive network in the academic community.

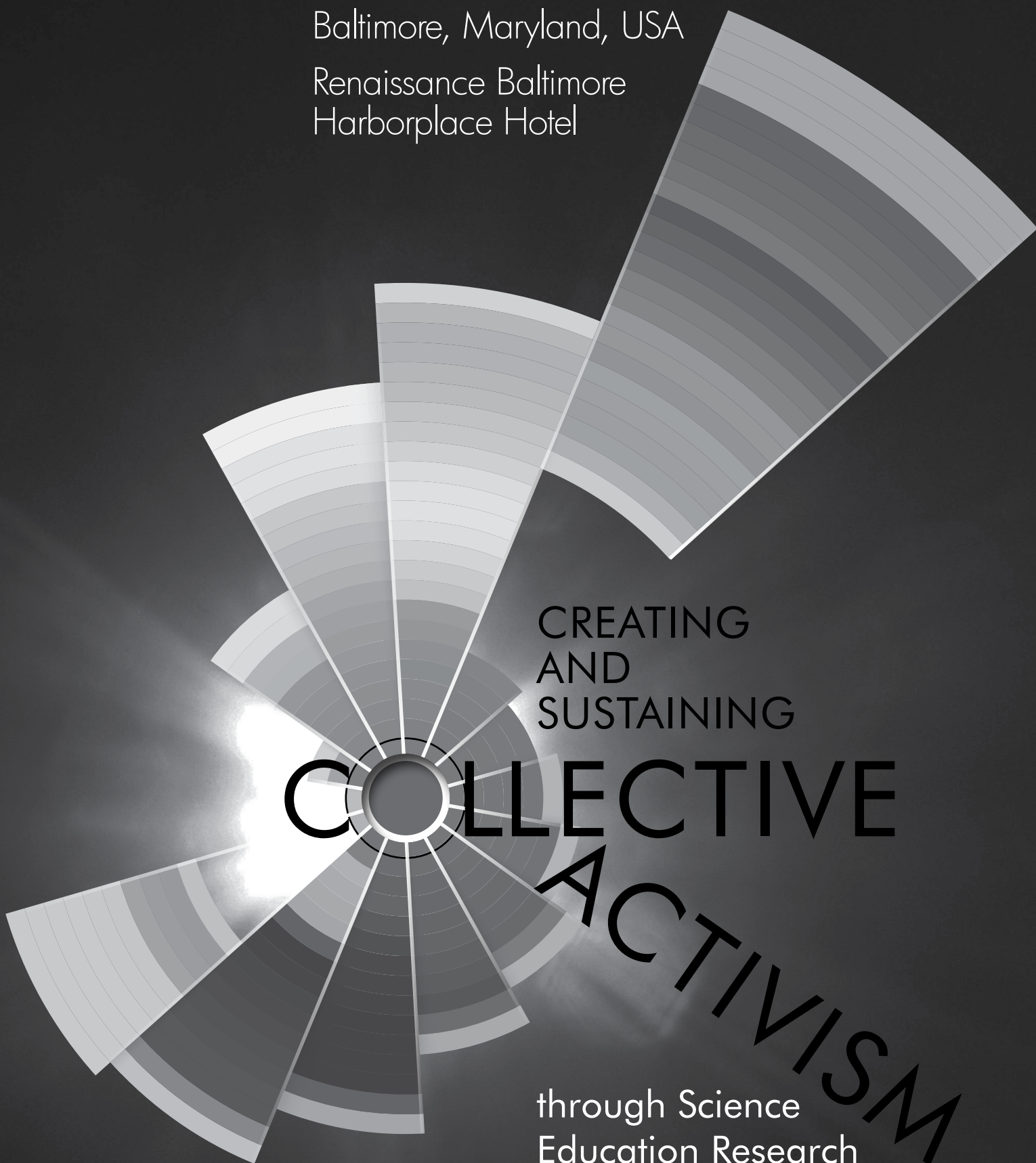


NARST

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COME JOIN US!

Give Back to Baltimore Science Education!

Sunday, March 31st, Noon-4 p.m.

Meet at Renaissance Hotel Lobby at 11:30 a.m.

EEC Community Engagement Event: Baltimore Public Schools Outreach

Join us to support science education at Digital Harbor High School. Our team of volunteers will work with the school's teachers to prepare their garden for planting, build and paint benches for their new pollinators' garden, and take inventory and organize the science labs. We will meet in the hotel lobby and walk to the school together, or you can meet us at the school lobby at noon.

Learn more by reading our **official announcement**.

To sign up, please fill out this **Google form**.

Please also download and sign the **waiver form** and bring it with you to the event.

We hope you'll join us!

Organizers:

Henriette Burns at hburns@siue.edu
Lillian Degand, Hannah Jardine at hjardine@umd.edu,
Felicia Leammukda, Tara Nkrumah at tnkrumah@mail.usf.edu,
Alexis Rutt, and Ms. Nicole Veltre of Digital Harbor High School, Baltimore, MD

Contact any of the emails on day of event.

**The event is not sponsored by NARST.*

NARST 2019

92nd Annual International Conference

Renaissance Baltimore Harborplace Hotel | Baltimore, MD, USA

March 31 - April 3, 2019

Creating and Sustaining

Collective Activism

through Science Education Research

ACKNOWLEDGMENTS

The following members of the Program Committee helped in preparing and editing the 2019 NARST Annual International Conference Program Book.

Gail Richmond, President and
Program Committee Co-Chair

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

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Executive Director

William C. Kyle Jr.,
Executive Director Emeritus

Toni A. Sondergeld,
NARST Scheduling Coordinator

Kimber Nation
NARST Staff

Tara Reddy
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Notes

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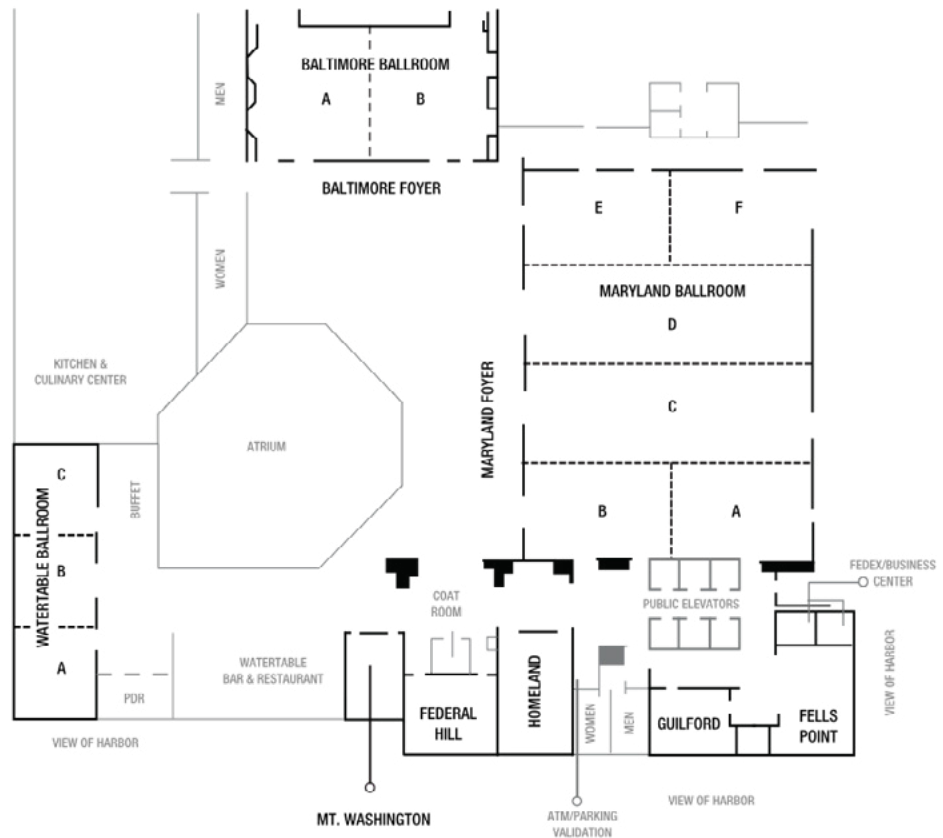
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Session titles, presenters, rooms, and times are subject to change. Names, organizational affiliations, and contact information are printed as submitted.

FLOOR PLANS

Fifth Floor



Sixth Floor



General Information

Information about NARST

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

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

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

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

NARST Mission Statement

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

The ultimate goal of NARST is to help all learners achieve science literacy. NARST promotes this goal by: 1) encouraging and supporting the application of diverse research methods and theoretical perspectives from multiple disciplines to the investigation of teaching and learning in science; 2) communicating science education research findings to researchers, practitioners, and policy makers; and 3) cooperating with other educational and scientific societies to influence educational policies. To learn more about NARST you may visit the Association's website at <http://narst.org/>.

Member 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.
- The NARST Annual International Conference Program and Abstracts are available on the conference page of the NARST website.
- Website and Listserv, allowing access to further information about the Association. You may access this site at: <http://www.narst.org>. There is further information about subscribing to the listserv on this site.

Explanation of Program Session Formats

Paper Sessions Organized by the Program Committee

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

Symposium

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

Related Paper Set

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

Interactive Poster Sessions

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

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

Guidelines for Meeting Presenters

- Go to the designated room at least 10 minutes early.
- Greet the presider/discussant.
- NARST provides the LCD and screen in each presentation room. NARST does not provide computers, speakers, microphones, pointers, or other audio/visual equipment. You must have your own computer or you may put your file on a USB flash drive in advance, in case you will be using another presenter's computer for your presentation.
- Check your understanding of the LCD projector and any other audio/visual equipment prior to the session.
- Keep presentation within the designated time limit.
- Invite audience comments and questions.
- If there is no presider assigned for your session, then presenters should keep time for each other.

Guidelines for Presiders and Discussants

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

The role of the Presider includes:

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

The role of the Discussant includes:

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

Strand Key

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

A Special Thanks to our Sponsors and Exhibitors

Springer Nature
Routledge (Taylor & Francis)
Digital Harbor Foundation
DIO Press
Brill USA

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

2020 NARST Annual International Conference

The Program Chair invites NARST members and others to participate in the 2020 NARST Annual International Conference and contribute to the 2020 conference by submitting program proposals.

VENUE:

2020 NARST Annual International Conference

Portland Marriott Downtown Waterfront

Portland, OR, USA

March 15 – 18, 2020

THEME:

School, community, citizenship:

Science education across places and contexts

People learn science in many environments. Initially, the home is where children have their first experiences with scientific phenomena when they notice hot water cooling, the vapor on the bathroom mirror, the sugar that disappears when added to hot water and toy cars that stop moving after they bang into each other. Outside, children see water flowing in a river or down the street, birds on the ground or in a tree, spiders on leaves and bees on flowers. The exchanges between adults and children about these phenomena constitute the premises of science education, and continue throughout people's lives with parents, siblings, friends, children and grandchildren. Schooling makes it possible to examine and grasp these real-life science experiences in formal laws, processes and theories.

School science education, in its various forms, has always attempted to connect students with science to spark students' interest and enthusiasm and to enable them to acquire a deep understanding of what science is and how science is done. Throughout the years, science education research has shown that teaching isolated science concepts and focusing on structures of disciplines distance students from science, whereas learning science in real life contexts about phenomena first rather than laws and theories enhances students' attitudes and dispositions toward science. In order for science to be more relevant to student life it has to be taught in real life contexts and involve the student community in large.

The idea of 'community' can be interpreted in different ways, all of which are relevant to science education. The community can be defined as the people around us who are breathing the same air, drinking the same water and who are exposed to the same environmental hazards that need to be studied before concerted action can be taken. Community institutions such as science centers, museums, public parks and zoos provide places and

different contexts for learning science. Unlike schools, these institutions enable multi-generational interaction on and about science. Communities when defined as social contexts in which people act to reduce inequalities, support each other and be united, constitute a context for dealing with public health issues, and the affordances and dangers of technologies such as wind turbines, radiation, smart and clean transportation, etc.

Learning science, in different places and contexts aims at bridging between schools and out-of-school settings, and eliminating the boundaries between age groups since we learn with others at home, in and across communities. A child in rural Canada, Russia or China can watch the same TED lecture as a child in New York City, Beijing or London. Different communities across the world are struggling with the impact of pesticides on public health worldwide. Although in most countries concentrations do not exceed legislative thresholds "safe limits" may underestimate the real health risk as in the case of the simultaneous exposure to two or more chemical substances which occurs in real-life conditions. Do different communities have the same access to organic food? This is simply a small but telling instance of how science, agriculture and public health are related to social justice within and across communities.

To encourage the public to take an active part in setting the agenda for safe food, water, air and transportation; in order to be able to protect our children from dangerous diseases and safeguard the ecosystems that support human life on Earth, we need to involve people of all ages, backgrounds and geographical locations in science and the scientific endeavor. Citizens can take steps by becoming community activists, as members of NGOs, participants in science communication events, and as citizen scientists who are genuinely involved in doing science. All these forms of citizenship can promote science education for life, health and prosperity.

SUBMISSION DEADLINE:

The Program Chair or designate must receive your program proposals for the 2020 Annual International Conference by August 15, 2019. This deadline allows sufficient time for processing, reviewing, and evaluating the many submitted proposals in a fair manner. By early July 2019, the call for program proposals will appear on the NARST website.

CONFERENCE CHAIR:

Tali Tal, President-Elect

Future Meeting Dates for NARST, NSTA, and AERA

2019

AERA April 5 – 9 | Toronto, ON
NSTA April 11 – 14 | St. Louis, MO

2020

NARST March 15 – 18 | Portland, OR
NSTA April 2 – 5 | Boston, MA
AERA April 17 – 21 | San Francisco, CA

2021

NSTA April 8 – 11 | Chicago, IL
AERA April 22 – 25 | Orlando, FL



NARST 2020 MARCH 15-18

ANNUAL
INTERNATIONAL
CONFERENCE

PORTLAND, OR, USA

Portland Marriott
Downtown Waterfront

SCHOOL · COMMUNITY · CITIZENSHIP

SCIENCE EDUCATION ACROSS PLACES AND CONTEXTS

NARST Sponsored Sessions at NSTA Conferences 2019

Saint Louis, MO (April 11 – 14, 2019)

- **Reducing Misconceptions in Genetics Using Learning Technologies**

Presenter(s): Judith Lederman (Illinois Institute of Technology: Chicago, IL), Norman Lederman (Illinois Institute of Technology: Chicago, IL), Dionysius Gnanakkan (Baltimore County Public Schools: Baltimore, MD)

- **Getting Through the Modeling Cycle – Supporting Students in Sensemaking in Phenomena**

Presenter(s): Consuelo Morales (Michigan State University: East Lansing, MI), Renee Bayer (Michigan State University: East Lansing, MI), Idit Adler (Michigan State University: East Lansing, MI), Jane Lee (Michigan State University: East Lansing, MI)

- **Equity in Science Teacher Education – Toward an Expanded Definition**

Presenter(s): Enrique Suarez (University of Washington: Seattle, WA), Deb Morrison (University of Washington: Seattle, WA), Philip Bell (University of Washington: Seattle, WA)

- **Teaching about Human Genetic Variation is Not a Socially Neutral Endeavor**

Presenter(s): Brian Donovan (Stanford Graduate School of Education: Stanford, CA)

- **Designing Science Education from a Feminist Perspective**

Presenter(s): Heather Page (High School of Economics and Finance: New York, NY)

- **Using Modeling to Make Sense of Climate Change and Carbon Cycling in a 10th-Grade Classroom**

Presenter(s): Patricia Friedrichsen (University of Missouri: Columbia, MO), Laura Zangori (University of Missouri: Columbia, MO), Troy Sadler (The University of North Carolina at Greensboro: Greensboro, NC), Amanda Peel (University of Missouri: Columbia, MO)

- **Science and Literacy – How is Preservice Teacher Learning Impacted by a Mobile Device Curriculum?**

Presenter(s): Deepika Menon (Towson University: Towson, MD), Meera Chandrasekhar (University of Missouri: Columbia, MO), Dorina Kosztin (University of Missouri: Columbia, MO), Doug Steinhoff (University of Missouri: Columbia, MO)

- **How to Promote Student Inquiry and Reflection on What Science, Scientists Are Like**

Presenter(s): Randy Bell (Oregon State University: Corvallis, OR), Bridget Mulvey (Kent State University: Kent, OH)

- **Exploring the Human Body Systems and Engaging in 3-D Learning Through Immersive Gameplay and Guided Inquiry Activities**

Presenter(s): Kayla Flanagan (University of Georgia: Athens, GA), Georgia Hodges (University of Georgia: Athens, GA), Sandhya Krishnan (University of Georgia: Athens, GA)

- **Understanding Student Thinking: Using Crosscutting Concepts to Represent Key Aspects of the Disciplinary Core Ideas**

Presenter(s): Jonathan

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(20) Calvin Kalman, (19) Cesar Delgado

Strand 2: Science Learning: Contexts, Characteristics and Interactions

(20) David Owens, (19) Erin Peters-Burton

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

(20) Carrie-Anne Sherwood, (19) Anna Maria Arias

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

(20) Justina Ogodo, (19) Amy Trauth

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

(20) Jana Bouwma-Gearhart, (19) Jaime Sabel

Strand 6: Science Learning in Informal Contexts

(20) Nancy Staus, (19) Scott Pattison

Strand 7: Pre-service Science Teacher Education

(20) Shannon Sung, (19) Tamara Holmlund

Strand 8: In-service Science Teacher Education

(20) Tracy Huziak-Clark, (19) Julianne Wenner

Strand 9: Reflective Practice

(20) Pei-Ling Hsu, (19) Nazan Bautista

Strand 10: Curriculum, Evaluation, and Assessment

(20) Hun Jin, (19) Becky Matz

Strand 11: Cultural, Social, and Gender Issues

(20) Natalie King, (19) Julie Bianchini

Strand 12: Educational Technology

(20) Jonah Firestone, (19) Meg Blanchard

Strand 13: History, Philosophy and Sociology of Science

(20) Dina Tsybulsky, (19) Valarie Akerson

Strand 14: Environmental Education

(20) Isis Alkaher, (19) Kim Haverkos

Strand 15: Policy

(20) Carrie Allen, (19) Eugene Judson

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Edmondson, Elizabeth	Herman, Ben	Klock, James	Marbach-Ad, Gili
Edwards, Kirsten	Hermann, Ron	Knox, Kerry	Marco-Bujosa, Lisa
Eidin, Emil	Herrmann Abell, Cari	Koulagna, Yotah	Mark, Sheron
Ellis, Joshua	Hill, Kathleen	Koval, Jayma	Marshall, Stefanie
Emmanuel, Okwuduba	Hodges, Georgia	Krajeski, Stephen	Marth, Michaela
Enderle, Patrick	Holmlund, Tamara	Kranzfelder, Petra	Matathia Tor, Hrisilda
Epler-Ruths, Colleen	Hong, Zuway-R	Krishnan, Sandhya	Matsuura, Takuya
Ewing, Mary	Honwad, Sameer	Kubsch, Marcus	Matz, Rebecca
Ewing, Benjamin	Hooper, LeeAnna	Kudumu, Mwenda	Mawyer, Kirsten
Farhangi, Sanaz	Hsu, Pei-Ling	Lachapelle, Cathy	McBeath, Jasmine Kyle
Fick, Sarah	Huang, Ying Syuan	Lally, Diane	Mccomas, William
Firestone, Jonah	Huffman, Karen	Lamichhane, Roshan	Mcdonald, Christine
Fleming, Michelle	Hufnagel, Elizabeth	Lamkin, Darron	McDonald, Scott
Foley, Brian	Hutchison, Paul	Langbeheim, Elon	McFadden, Justin
Ford, Danielle	Huziak-Clark, Tracy	Langenhoven, Keith	McGinnis, Randy
Forsythe, Michelle	Ibe, Ebere	Lardy, Corinne	McGivney, Eileen

McGowan, Veronica	Piedrahita Uruena, Yuri	Schuchardt, Anita	Vesterinen, Veli-Matti
McKinney, David	Planey, James	Schumacher, Fabian	Villa, Anthony
Meng, Qi	Pleasants, Jacob	Scott, Emily	Vishnumolakala, Venkat Rao
Merritt, Joi	Plummer, Julia	Seiler, Gale	Vo, Tina
Merritt, Eileen	Podrasky, Agatha	Sengul, Ozden	Wade-Jaimes, Katherine
Michel, Hanno	Polman, Joseph	Severance, Samuel	Waight, Noemi
Miller, Katherine	Pols, Freek	Sharon, Aviv	Wang, Hui-Hui
Miller-Rushing, Anica	Premo, Joshua	Shi, Fan	Wang, Hsin Hui
Minshew, Lana	Purohit, Kiran	Short, Mary	Wang, Nixi
Moreno, Daniel	Purzer, Senay	Siatras, Anastasios	Wang, Jianlan
Morosky, Katherine	Quan, Gina	Sibuma, Bernadette	Wang, Lu
Morrison, Deb	Quintana Cifuentes, Jenny	Siebert-Evenstone, Amanda	Warfa, Abdirazak
Morton, Terrell	Rachmatullah, Arif	Silva Mangiante, Elaine	Waters, Charlotte
Moura, Francisco	Radloff, Jeffrey	Simon, Marsha	Watkins, Shari
Mulvey, Bridget	Rafanelli, Stephanie	Siry, Christina	Weible, Jennifer
Murray, Jaclyn	Ram, Jeffrey	Sisk-Hilton, Stephanie	Weiser, Gary
Mutegi, Jomo	Ramirez, Lorraine	Sivaraj, Ramya	Wendell, Kristen
Naidoo, Kara	Raviv, Guy	Smith, John	Wengrowicz, Niva
Namdar, Bahadir	Rebello, Carina	Sohr, Erin	Wenner, Julianne
Narayan, Ratna	Rehmat, Abeera	Sondergeld, Toni	Wertheim, Jill
Nargund, Vanashri	Reid, Joshua	Sorge, Stefan	Wertz, Ruth
Nasim Thompson, Amreen	Reigh, Emily	Staus, Nancy	Wessnigk, Susanne
Nehring, Andreas	Reyes, Jaime	Steinberger, Pnina	Wheeler, Lindsay
Newell, Alana	Reynolds, William	Stender, Anita	Whitford, Melinda
Nguyen, Dawn	Richardson, Tasha	Suárez, Enrique	Whittington, Kirby
Nguyen, Hai	Ricketts, Amy	Subramaniam, Karthigeyan	Wickler, Nicole
Nixon, Ryan	Rillero, Peter	Summers, Ryan	Wieselmann, Jeanna
Nordine, Jeffrey	Ritchie, Allison	Sun, Tianying	Williams, Tory
Norville, Kayla	Rivero, Ana	Sung, Shannon	Williamson, Francesca
Nyachwaya, James	Robinson-Hill, Rona	Swanson, Rebecca	Wink, Donald
Nyaema, Mary	Roehrig, Gillian	Tal, Tali	Witzig, Stephen
Nyirenda, Euginia	Rojas-Perilla, Diego	Tan, Michael	Wray, Kraig
Oertli, Robert	Rollnick, Marissa	Tank, Kristina	Yang, Yang
Ogan-Bekiroglu, Feral	Rosenberg, Joshua	Taylor, Jonte	Yao, Jian-Xin
Ogodo, Justina	Ross, Danielle	Techawitthayachinda, Ratrapee	Yenikalayci, Nisa
Ogunniyi, Meshach	Rost, Marvin	Telli, Sibel	Yesilyurt, Ezgi
Ogunsola-Bande, Mercy	Roy, Ranu	Tenbrink, Jared	Yeter, Ibrahim
Okebukola, Peter	Ruppert, John	Thompson, Stephen	Yeter-Aydeniz, Kubra
Olitsky, Stacy	Russell, John	Tinnell, Terri	Yilmaz, Elanur
Ong, Yann Shiou	Sabel, Jaime	Titu, Preethi	Yoon, Sae Yeol
Oramous, Jennifer	Sahin, Ercin	Todd, Amber	You, Hye Sun
Orofino, Renata	Sahingöz, Selçuk	Toma, Radu Bogdan	Yuksel, Tugba
Otulaja, Femi	Saleh, Asmalina	Trauth, Amy	Zeller, Laura
Ozer, Ferah	Salisbury, Sara	Tsybulsky, Dina	Zhang, Helen
Park, Wonyong	Salloum, Sara	Tutwiler, Shane	Zhao, Fangfang
Pattison, Scott	Samarapungavan, Ala	Ünal, Ahmet	Zhao, Pingping
Paul, Kelli	Sampath Kumar, Bharath	Upadhyay, Bhaskar	Zillmer, Nicole
Pavez, Jose	Samuel, Naomi	Ursavas, Nazihan	Zimmerman, Heather
Payne, Corey	Santiago, Marisol Mercado	Usselman, Marion	Zisk, Robert
Pengelly, Ivanna	Sbeglia, Gena	Van De Kerkhof, Mary	Zwiep, Susan
Pérez, Greses	Schaffer, Dannah	Vanderhoof, Carmen	
Perin, Suzanne	Schenkel, Kathleen	Vasudevan, Veena	
Perkins Coppola, Matthew	Schnittka, Christine	Vedder-Weiss, Dana	
Perry, Tony	Schoerning, Emily	Verbeke, Monae	
Peters-Burton, Erin	Schröder, Jan	Vergara, Claudia	

NARST Presidents

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

NARST Executive Director

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

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

JRST Editors

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

NARST Emeritus Members

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

NARST AWARD RECIPIENTS

Distinguished Contributions to Science Education through Research Award

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

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

Outstanding Doctoral Research Award

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

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

Early Career Research Award

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

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

The Journal of Research in Science Teaching (JRST) Award

The JRST Award was awarded annually to the author or authors of the *Journal of Research in Science Teaching* article judged to be the most significant publication for the Volume year. It was awarded annually between 1974 and 2015.

Year	Awardee	Year	Awardee	Year	Awardee
1974	Donald E. Riechard and Robert C. Olson	1980	John R. Staver and Dorothy L. Gabel (tie) Linda R. DeTure	1986	Anton E. Lawson
1975	Mary Budd Rowe	1981	William C. Kyle, Jr.	1987	Russell H. Yeany, Kueh Chin Yap, and Michael J. Padilla
1976	Marcia C. Linn and Herbert C. Thier	1982	Robert G. Good and Harold J. Fletcher (tie) F. David Boulanger	1988	Kenneth G. Tobin and James J. Gallagher
1977	Anton E. Lawson and Warren T. Wollman			1988	(tie) Robert D. Sherwood, Charles K. Kinzer, John D. Bransford, Jeffrey J. Franks and Anton E. Lawson
1978	Dorothy L. Gabel and J. Dudley Herron	1983	Jack A. Easley, Jr.		
1979	Janice K. Johnson and Ann C. Howe	1984	Marcia C. Linn, Cathy Clement and Stephen Pulos	1989	Glen S. Aikenhead
		1985	Julie P. Sanford		

Year	Awardee	Year	Awardee	Year	Awardee
1990	Richard A. Duschl and Emmett L. Wright	2000	Allan G. Harrison, J. Grayson, and David F. Treagust	2008	Christine Chin
1991	E. P. Hart and I. M. Robottom	2001	Fouad Abd-El-Khalick and Norman G. Lederman	2009	Kihyun Ryoo and Bryan Brown
1992	John R. Baird, Peter J. Fensham, Richard E. Gunstone, and Richard T. White	2002	Andrew Gibert and Randy Yerrick	2010	Helen Patrick, Panayota Mantzicopoulos, and Ala Samarapungavan
1993	Nancy R. Romance and Michael R. Vitale	2003	Sofia Kesidou and Jo Ellen Roseman	2011	Daphne Minner, Jeanne Century, and Abigail Jurist Levy
1994	E. David Wong	2004	Jonathan Osborne, Sue Collins, Mary Ratcliffe, Robin Millar and Richard Duschl	2012	Julie A. Luft, Jonah B. Firestone, Sissy S. Wong, Irasema Ortega, Krista Adams, and EunJin Bang
1995	Stephen P. Norris and Linda M. Phillips	2005	Jonathan Osborne, Sibel Erduran and Shirley Simon	2013	Edys S. Quellmalz, Michael J. Timms, Matt D. Silbergliitt, and Barbara C. Buckley
1996	David F. Jackson, Elizabeth C. Doster, Lee Meadows, and Teresa Wood	2006	Troy D. Sadler and Dana L. Zeidler	2014	Joseph Taylor, Susan Kowalski, Christopher Wilson, Stephen Getty, and Janet Carlson
1997	C.W.J.M. Klassen and P.L. Linjse	2007	Jerome Pine, Pamela Aschbacher, Ellen Roth, Melanie Jones, Cameron McPhee, Catherine Martin, Scott Phelps, Tara Kyle and Brian Foley	2015	Matthew Kloser
1998	Julie Bianchini				
1999	Phillip M. Sadler				

The NARST Outstanding Paper Award

The NARST Outstanding Paper Award was awarded annually for the paper or research report presented at the NARST Annual International Conference that was judged to have the greatest significance and potential in the field of science education. It was awarded annually between 1975 and 2015.

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

Outstanding Masters Thesis Award

This award was established in 1995 to be given annually for the Master's Thesis judged to have the greatest significance in the field of science education. It was last awarded in 2002.

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

Classroom Applications Award

The Classroom Applications Award was established in 1979. The award was given annually to authors whose papers were presented at the previous NARST Annual International Conference and judged to be outstanding in terms of emphasizing classroom application of research in science education. The award was last presented in 1991.

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

NARST Leadership Team & Committees

2018-2019

Officers

President	Gail Richmond	Michigan State University
President-elect	Tali Tal	Technion, Israel Institute of Technology
Immediate Past President	Barbara A. Crawford	The University of Georgia
Secretary/Treasurer	Gregory Kelly	Pennsylvania State University
Executive Director	Helen Schneider Lemay	The Schneider Group, Inc.
Executive Board Members	Jennifer D. Adams Alejandro J. Gallard M. Senay Purzer Judith S. Lederman Femi S. Otulaja Christian Siry Lynn D. Dierking Jomo Mutegi Katherine L. McNeill	University of Calgary Georgia Southern University Purdue University Illinois Institute of Technology University of the Witwatersrand, Johannesburg The University of Luxembourg Oregon State University Indiana University, IUPUI Boston College
International Coordinator	Lucy Avraamidou	University of Groningen, Netherlands
Graduate Student Representative	Francesca A. Williamson	Indiana University, Bloomington
NARST Liaison to NSTA	Michael G. Bowen	Mount Saint Vincent University
NSTA Representative	Emily Schoerning	Anshe Emet
JRST Editors (term ends 2020)	Fouad Abd-El-Khalick Dana L. Zeidler	The University of North Carolina at Chapel Hill University of South Florida - Tampa Bay

AWARDS COMMITTEE

Chair

(19) Lynn Dierking	Oregon State University	dierklin@science.oregonstate.edu
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Awards: Outstanding Doctoral Research Award Selection Subcommittee

Co-Chairs

(19) Barbara Hug	University of Illinois at Urbana-Champaign	bhug@illinois.edu
(20) David Fortus	Weizmann Institute of Science	david.fortus@weizmann.ac.il

Members

(20) Amy Lark	Michigan Technological University	amlark@mtu.edu
(20) Jay Fogleman	University of Rhode Island	fogleman@uri.edu
(20) Carrie Tzou	University of Washington	tzouct@uw.edu
(20) Sue Dale Tunnicliffe	University College London	lady.tunnicliffe@mac.com

(20) Phyllis Katz	Emeritus Founder & Director, Hands on Science	phsu3@utep.edu
(20) Pei-Ling Hsu	University of Texas at El Paso	dstroupe@msu.edu
(20) David Stroupe	Michigan State University	jwlin@spoonbill.info
(19) Jing-Wen Lin	National Dong Hwa University	skapon@technion.ac.il
(19) Shulamit Kapon	Technion-Israel Institute of Technology	billsp1@nku.edu
(21) Patricia Bills	Northern Kentucky University	wbug1234@yahoo.com
(21) Wendy Frazier	Houston Baptist University	ejbahng@iastate.edu
(21) Eunjin Bahng	Iowa State University	granger@bio.fsu.edu
(21) Ellen Granger	Florida State University	jdellis@ku.edu
(21) James Ellis	University of Kansas	stevensdanielle1@gmail.com
(21) Danielle Ferguson	American Institute for Research	d.chakraverty@wsu.edu
(21) Devasmita Chakraverty	Washington State University	

Awards: Early Career Research Subcommittee

Co-Chairs

(19) Troy Sadler (Chair)	University of North Carolina, Greensboro	sadlert@missouri.edu
(20) Christine McDonald (Co-chair)	Griffith University	c.mcdonald@griffith.edu.au

Members

(20) Noemi Waight	University at Buffalo	nwright@buffalo.edu
(20) Michal Zion	Bar-Ilan University	michal.zion@biu.ac.il
(20) Patricia Friedrichsen	The University of Missouri	friedrichsenp@missouri.edu
(20) Elizabeth Davis	The University of Michigan	betsyd@umich.edu
(19) Alandeom Oliveira	University at Albany, SUNY	aoliveira@albany.edu
(19) Victor Sampson	The University of Texas at Austin	victor.sampson@utexas.edu
(19) Hanna Sevia	University of Massachusetts, Boston	Hannah.Sevia@umb.edu
(19) Ravit Duncan	Rutgers University	ravit.duncam@gse.rutgers.edu
(21) Erin Furtak	University of Colorado-Boulder	erin.furtak@colorado.edu
(21) Mauricio Pietrocola	University of San Paulo	mpietro@usp.br

Awards: Distinguished Contributions in Research Subcommittee

Chair

(20) Annemarie Palincsar	The University of Michigan	annemari@umich.edu
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Members

(20) Jan Van Driel	Melbourne Graduate School of Education	j.vandriel@unimelb.edu.au
(20) Sherry Southerland	Florida State University	ssoutherland@fsu.edu
(19) Joe Krajcik	Michigan State University	krajcik@msu.edu
(19) Richard Duschl	Pennsylvania State University	rad19@psu.edu
(19) Masakata Ogawa	Tokyo University of Science	ogawam@rs.kagu.tus.ac.jp
(21) Nasser Mansour	University of Exeter, UK	n.mansour@ex.ac.uk
(21) Rachel Mamlok-Naaman	Weizmann Institute	rachel.mamlok@weizmann.ac.il
(21) Sibel Erduran	Oxford University	sibel.erduran@education.ox.ac.uk
(21) Julie Luft	University of Georgia	jaluft@uga.edu
(21) Maria Varelas	University of Illinois, Chicago	mvarelas@uic.edu

ELECTIONS COMMITTEE

Ex officio Member Immediate Past President

(19) Barbara Crawford	University of Georgia	barbarac@uga.edu
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Board Member Liaison

(21) Alejandro Gallard	Georgia Southern University	agallard@georgiasouthern.edu
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Representative from Ethics and Equity Committee

(19) Senetta F. Bancroft	Southern Illinois University	senetta.bancroft@siu.edu
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Representative from the International Committee

(19) Ravinder Koul	Penn State University	rxk141@psu.edu
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Co-Chairs

(19) Malcolm Butler (Lead Co-Chair)	University of Central Florida	malcolm.butler@ucf.edu
(20) Leon Walls (Co-Chair)	University of Vermont	lwalls@uvm.edu

Members

(20) Norman Lederman	Illinois Institute of Technology	ledermann@iit.edu
(19) Emily Driessen	University of Kentucky	Emily.Driessen@uky.edu
(19) Saouma BouJaoude	University of Beirut	boujaoud@aub.edu.lb
(21) Ibrahim Delen	Usak University	delenibrahim@gmail.com
(21) Regina L. Surriel	Valdosta State University	rsurriel@valdosta.edu

EQUITY AND ETHICS COMMITTEE

Board Liaison

(20) Femi Otulaja	University of the Witwatersrand	Femi.Otulaja@wits.ac.za
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Chair

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Members

(20) Lillian H. Degand	Illinois Institute of Technology	degalil@hawk.iit.edu
(20) Catherine Quinlan	Howard University	clk8@tc.columbia.edu
(21) Sara Raven	Texas A&M University	sraven@tamu.edu
(20) Irasema Ortega	University of Alaska-Anchorage	iortega2@alaska.edu
(19) Rekha Koul	Curtin University	R.koul@curtin.edu.au
(19) Senetta F. Bancroft	Southern Illinois University	senetta.bancrofts@siu.edu
(19) Melody Russell	Auburn University	russeml@auburn.edu
(21) Tara Monique Nkrumah	University of South Florida	tnkrumah@mail.usf.edu
(21) Danielle Dani	Ohio University	dani@ohio.edu
(21) James Nyachwaya	North Dakota State University	james.nyachwaya@ndsu.edu

EXTERNAL POLICY AND RELATIONS COMMITTEE

Board Liaisons

(19) Katherine McNeill	Boston College	kmcneill@bc.edu
(21) Senay Purzer	Purdue University	purzer@purdue.edu

Chair/Co-Chair

(19) Christina V. Schwarz (Chair)	Michigan State University	cschwarz@msu.edu
(21) Stefanie Marshall (Co-Chair)	Michigan State University	marsh413@msu.edu

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(20) Sharon Lynch	George Washington University	slynch@gwu.edu
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(20) Stacy Olitsky	Saint Joseph's University	solitsky@sju.edu
(20) Margaret M Lucero	Santa Clara University	mlucero@scu.edu
(19) Andy Anderson	Michigan State University	andya@msu.edu
(19) Patricia Simmons	North Carolina State University	patricia_simmons@ncsu.edu
(21) Kadir Demir	Georgia State University	abdulkadir_d@yahoo.com
(21) Sarah Carrier	North Carolina State University	sjcarrie@ncsu.edu

GRADUATE STUDENT COMMITTEE

Board Liaison

(20) Judith Lederman	Illinois Institute of Technology	ledermanj@iit.edu
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Chair

(19) Francesca White	Indiana University	frawhite@indiana.edu
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(19) Marcus Kubsch	IPN, Kiel University	kubsch@ipn.uni-kiel.de
(19) Heidi Cian	Clemson University	hdcian@g.clemson.edu
(19) Thomas Kameronoski	Penn State University	tak37@psu.edu
(19) Amber Bismack	University of Michigan	abismack@umich.edu
(19) Christa Haverly	Michigan State University	haverlyc@msu.edu
(19) Zhigang "Jacob" Jia	Middle Tennessee State University	zj2e@mtmail.mts
(19) Alpha Thomas Bangura	University of Missouri, St. Louis	tbangura2@gmail.com
(20) Emmanuel Jaff	Morgan State University	ejaff@ymail.com
(20) Ayca Karasahinoglu	University of Georgia	ayca.karasahinoglu@gmail.com
(20) Margaretann Connell	Illinois Institute of Technology	connmar1@hawk.iit.edu

INTERNATIONAL COMMITTEE

Chair - International Coordinator:

(19) Lucy Avraamidou	University of Groningen, Netherlands	l.avraamidou@rug.nl
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Members

(20) Andri Christodoulou	University of Southampton, UK	A.Christodoulou@soton.ac.uk
(20) Hye-Eun Chu	Macquarie University	hyeeun.chu@gmail.com
(20) Ravinder Koul	The Pennsylvania State University	rxk141@psu.edu
(19) Shirly Avargil	Bar-Ilan University	shirly.avargil@biu.ac.il
(19) Dante Cisterna	University of Missouri	dicister@gmail.com
(19) Hyewon Jang	Harvard University	hwjang@seas.harvard.edu
(19) Henriette Tolstrup Holmegaard	University of Copenhagen, Denmark	htholmegaard@ind.ku.dk
(21) Peter Wulff	Leibniz Institute, Kiel University	wulff@ipn.uni-kiel.de
(21) Jing Lin	Beijing Normal University	linjing@bnu.edu.cn

MEMBERSHIP COMMITTEE

Board Member Liaison

(20) Judith Lederman	Illinois Institute of Technology	ledermanj@iit.edu
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Chair

(20) Brooke Whitworth	Northern Arizona University	Brooke.Whitworth@nau.edu
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Members

(20) Gary Holliday	University of Akron	gh30@uakron.edu
(20) Amanda Peel	University of Missouri	anpn98@mail.missouri.edu
(20) Lynn Bryan	Purdue University	lbryan@purdue.edu
(19) Karen Oates	Worcester Polytechnic Institute	koates@wpi.edu
(19) Michelle A. Fleming	Wright State University	michelle.fleming@wright.edu
(21) Alison Riley Miller	Bowdoin College	amiller2@bowdoin.edu
(21) Felicia Moore Mensah	Teachers College, Columbia University	fm2140@tc.columbia.edu

RESEARCH COMMITTEE

Board Member Liaison

19) Jomo Mutege	Indiana University - Purdue University, Indianapolis	jmutegi@iupui.edu
(21) Jennifer D. Adams	University of Calgary	jennifer.adams1@ucalgary.ca (New Board member)

Chair

(19) Phillip Boda	Teachers College, Columbia University	Boda@exchange.tc.columbia.edu
(20) Ryan Summers (Co-Chair)	University of North Dakota	yan.summers@und.edu

Members

(20) Vanashri Nargund	New Jersey City University	vnargund@njcu.edu
(20) Tina Vo	University of Nebraska-Lincoln	tina.vo@huskers.unl.edu
(20) Joe Taylor	BSCS Science Learning	jtaylor@bscs.org
(19) Ying-Chih Chen	Arizona State University	yichen495@asu.edu
(19) Umesh Ramnarain	University of Johannesburg	uramnarain@uj.ac.za
(19) Carolyn Parker	The Johns Hopkins University	carolyn.parker@jhu.edu
(21) Abdi Warfa	University of Minnesota	awarfa@umn.edu
(21) Carina Rebello	Purdue University	rebelloc@purdue.edu
(21) Banu Avsar	Ermit Recep Tayyip Erdogan University (Turkey)	avsarbanu@gmail.com
(21) Patricia Patrick	Columbus State University	trish.patrick.ise@gmail.com
(20) George Turner	Auburn University	get0002@auburn.edu
(19) Ornit Spektor-Levy	Bar-Ilan University	ornitsl@gmail.com
(19) Rouhollah Aghasaleh	Georgia State University	raghasaleh@gsu.edu
(20) Jennifer Parrish	University of Northern Colorado	jennifer.parrish@unco.edu
(21) Kelsey Lipsitz	University of Missouri, Exploratorium	kcgv4@mail.missouri.edu

PUBLICATIONS ADVISORY COMMITTEE

Board Liaison

(21) Christina Siry	University of Luxembourg	Christina.Siry@uni.lu
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Chair

Research for Practitioners and Policymakers Sub Committee

(19) Andrea Bierema (Lead Co-chair)	Michigan State University	abierema@msu.edu
(20) Hayat Al Hokayem (Co-chair)	Texas Christian University	h.hokayem@tcu.edu

Scholarship Sub Committee

(19) Ron Gray (Lead Co-chair)	Ohio State University	ding.65@osu.edu
(20) Justin McFadden (Co-chair)	University of Louisville	jrmcfa05@louisville.edu

Pre-Conference Workshop and Sponsored Symposium Sub Committee

(19) Eli Tucker-Raymond (Lead Co-Chair)		
(21) Heidi Carlone (Co-chair)	University of North Carolina, Greensboro	heidi_carlone@uncg.edu

Members:

(21) Amanda (Mandi) Berry	Monash University	amanda.berry@monash.edu
(21) Jeanne Brunner	University of Massachusetts, Amherst	jbrunner@umass.edu
(21) Deena Gould	Arizona State University	deena.gould@asu.edu

WEBSITE COMMITTEE

Board Liaison

Greg Kelly

Chair

(20) Scott McDonald (Chair)	Penn State University	smcdonald@psu.edu
()		

Members

(20) Jennifer Weible	Central Michigan University	weebel@gmail.com
(19) Sandhya Krishnan	The University of Georgia	sandhya.krishnan25@uga.edu
(19) Deborah Hanuscin	University of Western Washington	Debi.Hanuscin@wwu.edu
(20) Jennifer Oramous	University of Arkansas	joramous@uark.edu
(21) Katherine Wade-Jaimes	University of Memphis	kswade@memphis.edu

PROGRAM COMMITTEE

Co-Chairs:

Gail Richmond (Chair)	Michigan State University	gailr@msu.edu
Tali Tal (Co-chair)	Technion-Israel Institute of Technology	rtal@ed.technion.ac.il

Members (Strand Co-Coordinator):

Strand 1: Science Learning, Understanding, and Conceptual Change

(19) Cesar Delgado	North Carolina State University	cesar_delgado@ncsu.edu
(20) Calvin Kalman	Concordia University	calvin.kalman@concordia.ca

Strand 2: Science Learning: Contexts, Characteristics and Interactions

(19) Erin Peters-Burton	George Mason University	epeters1@gmu.edu
(20) David Owens	Georgia Southern University	dcowens@georgiasouthern.edu

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

(19) Anna Maria Arias	Illinois State University	aarias4@ilstu.edu
(20) Carrie-Anne	Sherwood Southern Connecticut State University	sherwoodc4@southernct.edu

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

(19) Amy Trauth	University of Delaware	anare@udel.edu
(20) Justina Ogodo	Ohio State University	ogodo.1@osu.edu

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

(19) Jaime Sabel	University of Memphis	jlsabel@memphis.edu
(20) Jana Bouwma-Gearhart	Oregon State University	jana.bouwma-gearhart@oregonstate.edu

Strand 6: Science Learning in Informal Contexts

(19) Scott Pattison	Institute for Learning Innovation	scott.pattinson@freechoicelearning.org
(20) Nancy Staus	Oregon State University	stausn@oregonstate.edu

Strand 7: Pre-service Science Teacher Education

(19) Tamara Holmlund	Washington State University Vancouver	tnelson1@wsu.edu
(20) Shannon Sung	Spelman College	shansungstemed@gmail.com

Strand 8: In-service Science Teacher Education

(19) Julianne Wenner	Boise State University	juliannewenner@boisestate.edu
(20) Tracy Huziak-Clark	Bowling Green State University	thuziak@bgsu.edu

Strand 9: Reflective Practice

(19) Nazan Bautista	Miami University	nubautista@miamioh.edu
(20) Pei-Ling Hsu	University of Texas-El Paso	phsu3@utep.edu

Strand 10: Curriculum, Evaluation, and Assessment

(19) Becky Matz	Michigan State University	matz@msu.edu
(20) Hui Jin	Educational Testing Service	hjin@ets.org

Strand 11: Cultural, Social, and Gender Issues

(19) Julie Bianchini	University of California - Santa Barbara	julie.bianchini@ucsb.edu
(20) Natalie King	Georgia State University	natalieking@gsu.edu

Strand 12: Educational Technology

(19) Meg Blanchard	North Carolina State University	meg_blanchard@ncsu.edu
(20) Jonah Firestone	Washington State University-Tricity	jonah.firestone@tricity.wsu.edu

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

(19) Valarie Akerson	Indiana University	vakerson@indiana.edu
(20) Dina Tsybulsky	Technion - Israel Institute of Technology	dinatasy@technion.ac.il

Strand 14: Environmental Education

(19) Kim Haverkos	Thomas More College	kimberly.haverkos@thomasmore.edu
(20) Iris Alkaher Kibbutzim	College of Education	iris_alk@smkb.ac.il

Strand 15: Policy

(19) Eugene Judson	Arizona State University	Eugene.Judson@asu.edu
(20) Carrie Allen	SRI International	Carrie.Allen@sri.com

SCHEDULE AT A GLANCE

NARST Annual International Conference

March 31 – April 3, 2019

Renaissance Baltimore Harborplace Hotel
Baltimore, MD USA

SCHEDULE AT A GLANCE

Date/Time	Event	Room
Saturday, March 30		
7:30 AM – 5:00 PM	NARST Executive Board Meeting #1	Homeland
2:00 PM – 5:00 PM	Conference Registration	Maryland Foyer
Sunday, March 31		
7:30 AM – 10:30 AM	NARST Executive Board Meeting #1 (continued)	Homeland
7:00 AM – 4:30 PM	Conference Registration	Maryland Foyer
8:00 AM – 11:45 AM	PRE-CONFERENCE WORKSHOPS	
<i>Please note: You must register for the Pre-conference Workshops with your Advance Conference Registration. You may only register for one workshop.</i>		
8:00 AM – 11:45 AM	Pre-Conference Workshop #1: Equity and Ethics Committee Cost: Free Maximum registration: 90 Title: Science Educators Creating and Sustaining Collective Activism through Science Education Research Organizers: Senetta F. Bancroft (sfp4@zips.uakron.edu); Sara P. Raven (sraven@tamu.edu); Saiqa Azam (sazam@mun.ca); Danielle E. Dani (dani@ohio.edu); Jordan L. Henley (jlhenley78@gmail.com); Sheron L. Mark (sheron.mark@louisville.edu) Presenters: Angela Calabrese Barton (acb@msu.edu); Meredith Kier (mwkier@wm.edu); Felicia Mensah (fm2140@tc.columbia.edu); Mercy Ogunsola-Bandele (ogunband@hotmail.com) Minjung Ryu (mryu@purdue.edu); Maria Varelas (mvarelas@uic.edu)	Baltimore A
8:00 AM – 11:45 AM	Pre-Conference Workshop #2: Research Committee Cost: Free Maximum registration: 50 Title: Indigenous Science Research - Navigating the Process of Knowing Presenters: Stacey Britton (sbritton@westga.edu); Pauline Chinn (chinn@hawaii.edu); Sophia (Sun Kyung) Jeong; Meshach Ogunniyi (mogunniyi@uwc.ac.za); Irasema Ortega (iortega2@alaska.edu); Femi Otulaja (Femi.Otulaja@wits.ac.za); Deborah J. Tippins	Maryland F
8:00 AM – 11:45 AM	Pre-Conference Workshop #3: Research Committee Cost: Free Maximum registration: 40 Title: Democratizing Classrooms: Exploring the Relationship of Connected Learning, Design Thinking, and STEAM Instruction to Engage Students in Activism Presenters: Cassie Quigley (cquigley@pitt.edu); Dani Herro (dherro@clermson.edu); Amy Trauth (anare@udel.edu) Jenni Buckley (jbuckley@udel.edu); Maria Varelas (mvarelas@uic.edu)	Maryland B

Date/Time	Event	Room
8:00 AM – 11:45 AM	Pre-Conference Workshop #4: Research Committee Cost: Free Maximum registration: 50 Title: Understandings of Scientific Inquiry; Learning to Score and Administer Valid and Reliable Instruments (Views about Scientific Inquiry and Young Children Views about Science) Presenters: Judith S. Lederman (ledermanj@iit.edu); Norman G. Lederman(ledermanj@iit.edu); Selina L. Bartels (Selina.bartels@valpo.edu); Juan Jimenez-Pavez (jjimen10@iit.edu)	Maryland A
8:00 AM – 11:45 AM	Pre-Conference Workshop #5: Research Committee Cost: Free Maximum registration: 50 Title: Using RStudio to Create Visualizations for Communicating about Data Presenters: Robert (Bud) Talbot (robert.talbot@ucdenver.edu); Jayson Nissen (jayson.nissen@maine.edu); Joe Taylor (jtaylo18@uccs.edu); Geoff Potvin (gpotvin@fiu.edu); Andrew McDevitt (andrew.mcdevitt@ucdenver.edu)	Kent
8:00 AM – 11:45 AM	Pre-Conference Workshop #6: Membership Committee Free Maximum registration - 60 Title: Early Career Faculty Forum Facilitators: Brooke Whitworth (baw3tj@virginia.edu); Alison Riley Miller (amiller2@bowdoin.edu); Felicia Moore Mensah (fm2140@tc.columbia.edu)	Baltimore B
8:00 AM – 11:45 AM	Pre-Conference Workshop #7: International Committee Cost: \$25 Maximum registration: 50 Title: African Theory of eZiko siPheka siSophula: A case for incorporating methodological, epistemological and theoretical indigenous perspectives in science teaching learning and research Organizers: Femi S. Otulaja (Femi.Otulaja@wits.ac.za); Nomalungelo Goduka (ngoduka@wsu.ac.za) Presenters: Nomalungelo Goduka (ngoduka@wsu.ac.za); Femi S. Otulaja (Femi.Otulaja@wits.ac.za); Yolisa Madolo (yolimado@webmail.co.za); Carina Rozani (carinarozani@gmail.com); Vuyiswa Taleni (vtaleni@gmail.com); Meshach Ogunniyi (mogunniyi@uwc.ac.za); Pauline Chinn (chinn@hawaii.edu); Stacey Britton (biolady24@yahoo.com); Irasema Ortega (iortega2@alaska.edu)	Maryland E
11:45 AM – 12:45 PM	Lunch	On your own
12:45 – 2:30 PM	Conference Welcome, Recognitions, & Plenary Session Speaker: Talia Milgrom-Elcott (Co-Founder and Executive Director of 100Kin10) Title: Turning a Moment to a Movement: Mining lessons from 100Kin10 on collective activism and STEM education	Maryland C - D
2:40 PM – 4:10 PM	Concurrent Session # 1	Concurrent Session Rooms
4:20 PM – 5:50 PM	Concurrent Session # 2	Concurrent Session Rooms
6:00 PM – 7:00 PM	Research Interest Groups (RIGs) Meetings Continental and Diasporic Africa in Science Education (CADASE) Latino/a RIG (LARIG) Engineering Education Contemporary Methods for Science Education Research Indigenous Science Knowledge Mentor/Mentee Nexus	Baltimore A Baltimore B Kent Federal Hill Maryland E Fells Point
7:00 PM – 9:30 PM	Presidential / Welcome Reception Light appetizers will be served. Cash bar.	Maryland C - D

Date/Time	Event	Room
Monday, April 1		
6:00 AM – 7:15 AM	Mind and Sole (Off-site) <i>*This event is not sponsored nor endorsed by NARST</i>	Lobby
8:00 AM – 4:30 PM	Conference Registration	Maryland Foyer
8:30 AM – 10:00 AM	Concurrent Session # 3	Concurrent Session Rooms
10:15 AM – 11:45 AM	Concurrent Session # 4	Concurrent Session Rooms
12:00 PM – 1:00 PM	NARST Annual Membership Meeting	Baltimore A
12:00 PM – 1:00 PM	Lunch	On your own
1:15 PM – 2:45 PM	Concurrent Session # 5	Concurrent Session Rooms
2:45 PM – 3:15 PM	Networking Break	Ballroom Foyer
3:15 PM – 4:15 PM	Concurrent Session # 6A: Poster Session	Maryland C – D Maryland and Baltimore Foyer
4:15 PM – 5:15 PM	Concurrent Session # 6B: Poster Session	Maryland C – D Maryland and Baltimore Foyer
5:30 PM – 7:00 PM	Graduate Student Forum	Baltimore A
6:00 PM – 8:30 PM	JRST Editorial Team Meeting / Dinner Sponsored by Wiley-Blackwell (By invitation only)	Watertable A - B
6:00 PM – 7:30 PM	International Journal of Science and Mathematics Education Reception Sponsored by Springer (By invitation only)	Homeland
	Routledge Reception Sponsored by the International Journal of Science Education (By invitation only)	Guilford
Tuesday, April 2		
7:30 AM – 4:30 PM	Registration	Maryland Foyer
8:00 AM – 9:30 AM	Concurrent Session # 7	Concurrent Session Rooms
9:30 AM – 10:00 AM	Networking Break	Ballroom Foyer
10:00 AM – 11:30 AM	Concurrent Session # 8	Concurrent Session Rooms
11:30 AM – 1:15 PM	Lunch	On your own
11:45 AM – 1:10 PM	Committee Meetings	Concurrent Session Rooms
1:20 PM – 2:15 PM	Looking Toward the Future: DCRA Recipients and NARST Leadership Presentations	Maryland C - D
2:30 PM – 4:00 PM	Concurrent Session # 9	Concurrent Session Rooms
4:15 PM – 5:45 PM	Concurrent Session # 10	Concurrent Session Rooms
6:30 PM – 9:00 PM	Equity & Ethics Dinner (Maximum attendance: 100) Dinner, including tax and gratuity, is \$45.	Off-site: Spirit of Baltimore Dinner Cruise Address: Baltimore Inner Harbor
Boarding is at 6:30 PM	<i>Please note:</i> You must register for this event with your Advance Conference Registration. Tickets purchased for this event are not refundable. NOTE: The Spirit of Baltimore will depart from the west wall of Baltimore’s Inner Harbor. The distance from the Renaissance Hotel is about 3 blocks, mostly along the harbor. Transportation services will not be provided.	
Wednesday, April 3		
7:00 AM – 8:15 PM	Strand Meetings	Concurrent Session Rooms
8:00 AM – 11:00 AM	Conference Registration	Maryland Foyer
8:30 AM – 10:00 AM	Concurrent Session # 11	Concurrent Session Rooms
10:00 AM – 10:30 AM	Networking Break	Ballroom Foyer
10:30 AM – 12:00 PM	Concurrent Session # 12	Concurrent Session Rooms
12:00 PM – 1:30 PM	Lunch	On your own
1:30 PM – 3:00 PM	Concurrent Session # 13	Concurrent Session Rooms
4:00 PM – 9:00 PM	NARST Executive Board Meeting #2	Watertable A – B

PROGRAM

Saturday, March 30, 2019

NARST Executive Board Meeting #1
7:30am – 5:00pm, Homeland

Conference Registration
2:00pm – 5:00pm, Maryland Foyer

Sunday, March 31, 2019

Conference Registration

7:30am – 4:30pm, Maryland Foyer

NARST Executive Board Meeting #1 (continued)

7:30am – 10:30pm, Homeland

Pre-Conference Workshops 8:00am – 11:45am

NOTE: You must register for the Pre-Conference Workshops with your advance conference registration. You may only register for one Workshop.

Pre-Conference Workshop #1: Equity and Ethics

8:00 – 11:45 AM, Committee Baltimore A

Cost: Free

Maximum registration: 90

Science Educators Creating and Sustaining Collective Activism through Science Education Research

Organizers:

Senetta F. Bancroft (sfp4@zips.uakron.edu)

Sara P. Raven (sraven@tamu.edu)

Saiqa Azam (sazam@mun.ca)

Danielle E. Dani (dani@ohio.edu)

Jordan L. Henley (jlhenley78@gmail.com)

Sheron L. Mark (sheron.mark@louisville.edu)

Presenters:

Angela Calabrese Barton (acb@msu.edu)

Meredith Kier (mwkier@wm.edu)

Felicia Mensah (fm2140@tc.columbia.edu)

Mercy Ogunisola-Bandele (ogunband@hotmail.com)

Minjung Ryu (mryu@purdue.edu)

Maria Varelas (mvarelas@uic.edu)

Pre-Conference Workshop #2: Research Committee

8:00 – 11:45 AM, Maryland F

Cost: Free

Maximum registration: 50

Indigenous Science Research - Navigating the Process of Knowing

Presenters:

Stacey Britton (sbritton@westga.edu)

Pauline Chinn (chinn@hawaii.edu)

Sophia (Sun Kyung) Jeong

Meshach Ogunniyi (mogunniyi@uwc.ac.za)

Irasema Ortega (iortega2@alaska.edu)

Femi Otulaja (Femi.Otulaja@wits.ac.za)

Deborah J. Tippins

Pre-Conference Workshop #3: Research Committee

8:00 – 11:45 AM, Maryland B

Cost: Free

Maximum registration: 40

Democratizing Classrooms: Exploring the Relationship of Connected Learning, Design Thinking, and STEAM Instruction to Engage Students in Activism

Presenters:

Cassie Quigley (cquigley@pitt.edu)

Dani Herro (dherro@clemson.edu)

Amy Trauth (anare@udel.edu)

Jenni Buckley (jbuckley@udel.edu)

Maria Varelas (mvarelas@uic.edu)

Pre-Conference Workshop #4: Research Committee

8:00 – 11:45 AM, Maryland A

Cost: Free

Maximum registration: 50

Understandings of Scientific Inquiry; Learning to Score and Administer Valid and Reliable Instruments (Views about Scientific Inquiry and Young Children Views about Science)

Presenters:

Judith S. Lederman (ledermanj@iit.edu)

Norman G. Lederman (ledermanj@iit.edu)

Selina L. Bartels (Selina.bartels@valpo.edu)

Juan Jimenez-Pavez (jjimen10@iit.edu)

Pre-Conference Workshop #5: Research Committee

8:00 – 11:45 AM, Kent

Cost: Free

Maximum registration: 50

Using RStudio to Create Visualizations for Communicating about Data

Presenters:

Robert (Bud) Talbot (robert.talbot@ucdenver.edu)

Jayson Nissen (jayson.nissen@maine.edu)

Joe Taylor (jtaylo18@uccs.edu)

Geoff Potvin (gpotvin@fiu.edu)

Andrew McDevitt (andrew.mcdevitt@ucdenver.edu)

Pre-Conference Workshop #6: Membership Committee

8:00 – 11:45 AM, Baltimore B

Cost: Free

Maximum registration: 60

Early Career Faculty Forum

Facilitators:

Brooke Whitworth (baw3tj@virginia.edu)

Alison Riley Miller (amiller2@bowdoin.edu)

Felicia Moore Mensah (fm2140@tc.columbia.edu)

Pre-Conference Workshop #7: International Committee

8:00 – 11:45 AM, Maryland E

Registration fee: \$25

Maximum registration: 50

African Theory of eZiko siPheka siSophula: A case for incorporating methodological, epistemological and theoretical indigenous perspectives in science teaching learning and research

Organizers:

Femi S. Otulaja (Femi.Otulaja@wits.ac.za)

Nomalungelo Goduka (ngoduka@wsu.ac.za)

Presenters:

Nomalungelo Goduka (ngoduka@wsu.ac.za)

Femi S. Otulaja (Femi.Otulaja@wits.ac.za)

Yolisa Madolo (yolimado@webmail.co.za)

Carina Rozani (carinarozani@gmail.com);

Vuyiswa Taleni (vtaleni@gmail.com)

Meshach Ogunniyi (mogunniyi@uwc.ac.za)

Pauline Chinn (chinn@hawaii.edu)

Stacey Britton (biolady24@yahoo.com)

Irasema Ortega (iortega2@alaska.edu)

Lunch—On Your Own

11:45am – 12:45pm

Conference Welcome, Recognitions, & Plenary Session

12:45pm – 2:30pm, Maryland C - D

Turning a Moment to a Movement: Mining lessons from 100Kin10 on collective activism and STEM education

Speaker:



Talia Milgrom-Elcott

Co-Founder and Executive Director of 100Kin10

Talia Milgrom-Elcott is recognized for her innovative approach to tackling large, systemic challenges. At 100Kin10, she's creating a new model for networked, nimble, and iterative collaboration that's relentlessly focused on identifying—and solving—some of our most intractable social challenges.

Under her leadership, what began as a call in President Obama's 2011 State of the Union address for 100,000 excellent STEM teachers in 10 years is becoming a reality, with more than 250 leading organizations from across sectors coming together in an unprecedented movement to train and retain 100,000 excellent STEM teachers by 2021.

Talia is a frequent public speaker and moderator, focusing on social innovation, science and technology, education, philanthropy, and the tenuous balancing act that is running a start-up, being a mother, and trying to have a life. Over the past several years, she's led sessions or been a featured speaker at the White House, SXSW, Business Innovation Factory, the Philanthropy Roundtable, Scientific American, US News STEM Solutions, the National Institutes of Health, the Yale School of Management, and the Social Impact Exchange's Conference on Scaling Impact, among others.

She lives in Brooklyn with her husband and three little kids. She used to read lots of books and magazines, run, practice yoga, and sit in cafes reading the Sunday Times. Now she plays with Legos, magnetiles, and "stuffies" and reads books with pictures, a great tradeoff, all things considered.

Concurrent Session #1

2:40pm – 4:10pm

Publications Advisory Committee

Admin Symposium-How to Get Your Research Published in Science Education Journals

2:40 PM-4:10 PM, Baltimore A

How to Get Your Research Published in Science Education Journals

Ron Gray, Northern Arizona University
 Fouad Abd El-Khalick, University of North Carolina at Chapel Hill
 Dana Zeidler, University of South Florida
 Sherry Southerland, Florida State University
 John Settlage, University of Connecticut
 Gail Jones, NC State University
 Julia Gouvea, Tufts University
 Catherine Milne, New York University
 Christina Siry, University of Luxembourg
 Susan Yoon, University of Pennsylvania
 Kent Crippen, University of Florida
 Todd Campbell, University of Connecticut
 Geeta Verma, Colorado State University Denver
 Greg Kelly, Penn State University
 Donna King, Queensland University of Technology
 Carla Johnson, Purdue University
 Lucy Avraamidou, University of Groningen
 William McComas, University of Arkansas
 Ross Nehm, Stonybrook University
 Gail Richmond, Michigan State University

Strand 01: Science Learning, Understanding and Conceptual Change

Diverse Instructional Approaches

2:40 PM-4:10 PM, Fells Point

Presider: Calvin S. Kalman, Concordia University

Collaborative, Tactile and Interactive Mixed-Reality Enhances Problem Solving and Reduces the Barriers to Experimentation

Anusha Naganathan, University of Rochester
 Yang Zhang, University of Rochester
 April Lynn Luehmann, University Of Rochester
 Rainier Barrett, University of Rochester
 Heta Gandhi, University of Rochester
 Andrew Wihte, University of Rochester

Examination of the Role(s) of Crosscutting Concepts in Research Articles 2012- June 2018

Sarah J. Fick, University of Virginia
 Anna Maria Arias, Kennesaw State University

Identifying Epistemic Growth in Dialogic Instruction: An Apt Epistemic Performance Approach

Na'ama Y. Av-Shalom, Rutgers, the State University of New Jersey
 Sarit Barzilai, Faculty of Education, University of Haifa, Haifa, Israel
 Ravit Golan Duncan, Rutgers University
 Clark A. Chinn, Rutgers University

Improving high school students' understanding of the concept of force and Newton's laws through the combination of Laboratories and Reflective Writing

Calvin S. Kalman, Concordia University
 Joseph El-Helou, Concordia University
 Mark Lattery, University Of Wisconsin-Oshkosh

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Discourse in a Science Classroom

2:40 PM-4:10 PM, Watertable Salon A

Presider: Olugbenga G. Akindoju, Lagos State University

How Frames for Emotional Discourse Are Constituted in an Ecology Course

Elizabeth Hufnagel, University of Maine

Student Positioning within Scientific Discussions in a University Kinesiology Classroom

Allison Ritchie, ONTARIO INSTITUTE OF STUDIES IN EDUCATION

Supporting Student Critique: a multi-leveled analysis of a case of productive science talk

Emily Reigh, Stanford

Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies

Examining teacher learning of pedagogical reasoning and practices to support elementary engineering design

2:40 PM-4:10 PM, Maryland B

Decomposing a teacher's approximations of engineering design-based science teaching

Jeffrey D. Radloff, Purdue University
 Brenda M. Capobianco, Purdue University

Teacher questioning during whole-class engineering design discussions

Kristen B. Wendell, Tufts University

Failing productively in learning and teaching engineering design

Michelle Jordan, Arizona State University
Wendy Wakefield

Elementary teachers collective inquiry into students' engineering design work

Elaine M. Silva Mangiante, Salve Regina University

Teacher noticing in online video discussions of students' engineering

Jessica Watkins, Vanderbilt University
Merredith D. Portsmouth, Tufts University
Yangsook Kim, Tufts University

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies STEM Instruction in Secondary Settings

2:40 PM-4:10 PM, Maryland F

Presider: Shirly Avargil, Technion - Israel Institute of Technology

Engaging Minority Students through Integrated STEM: A Mixed Methods Analysis of a Freshmen iSTEM Academy

Denise M. Bressler, Rutgers University
Suparna Sinha, Rutgers University
David J. Shernoff, Rutgers University

Exploring students' acceptance of coding activities during integrative STEM lessons

Radu Bogdan Toma, University of Burgos
Norman G. Lederman, Illinois Institute Of Technology
Juan Jimenez, Illinois Institute of Technology
Jesús Ángel Meneses Villagrà, Universidad de Burgos

Investigating the Use of Educational Technology for Differentiated Instruction in Secondary STEM Education

Olivia N. Ritter, University of Tennessee
Mehmet Aydeniz, University Of Tennessee

Teacher-skills for Guiding and Supporting Design Activities in the Chemistry Classroom

Sathyam D. Sheoratan, Delft University of Technology
Ineke Henze-Rietveld, Delft University Of Technology
Erik Barendsen, Radboud University & Open University
Marc de Vries, TU Delft

Strand 05: College Science Teaching and Learning (Grades 13-20)

Students' persistence and motivation

2:40 PM-4:10 PM, Watertable Salon B

Presider: Mary K. Nyaema, Florida International University

Community College Chemistry Coursetaking and STEM Academic Persistence

Richard Cohen, Nassau Community College
Angela M. Kelly, Stony Brook University

Experience with Peers as a Unique Source of Science Motivation for First Generation Students

Joshua Premo, Washington State University
William B. Davis, Washington State University

Increasing Student Persistence and Success Via a Living and Learning Community

Katerina Thompson, University of Maryland

Strand 05: College Science Teaching and Learning (Grades 13-20)

Insights into faculty teaching

2:40 PM-4:10 PM, Watertable Salon C

Presider: Sae Yeol Yoon, Delaware State University

Gaining Insight into the UC System's Tenure-Track Lecturer Position

Ashley N. Harlow, University of California, Irvine
Brian Sato, University Of California, Irvine
Stanley M. Lo, University Of California, San Diego

Investigating faculty teaching through the theory of planned behavior: A case study

Lillian G. Senn, California State University, Fresno
Emily M. Walter, California State University, Fresno
Evelin E. Munoz, California State University, Fresno
Mireya Lemus, California State University, Fresno
Ivan Ceballos Madrigal, California State University, Fresno
Alejandro Mendez, California State University, Fresno
Glen E. Martin, California State University, Fresno

STEM Faculty Motivations for Using Learning Data: Implications for Accountability for Student Learning

Cindy A. Lenhart, Oregon State University
Jana L. Bouwma-Gearhart, Oregon State University

University Makerspaces and Faculty Practices: Potential Affordances for Diverse Students' STEM Role Identity Development

Jana Bouwma-Gearhart, Oregon State University
Cindy A. Lenhart, Oregon State University
Idalis Villanueva, Utah State University
Louis S. Nadelson
Kate Youmans, Utah State University
Sarah Lanci, Colorado Mesa University

Strand 07: Pre-service Science Teacher Education Preservice Teacher PCK & Modeling

2:40 PM-4:10 PM, Pride of Baltimore

President: Michelle A. Fleming, Wright State University

A Comprehensive Look at Pre-Service Teachers' Orientations towards Teaching and its Impact on PCK Development

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

College Faculty and Teacher Candidates' Perspectives on the Choice to Teach Physics

Lauren Madden, The College of New Jersey
Susan C. Eriksson, Virginia Tech
Nathan Magee, The College of New Jersey, Physics Dept.
Marissa Bellino, The Graduate Center, CUNY
AJ Richards, The College of New Jersey
Melissa Chessler, The College of New Jersey

Modeling and Development of Professional Content Knowledge of Pre- Service Physics Teachers

Patrick Enkrott, University of Potsdam
David Buschhüter, University of Potsdam
Andreas Borowski, University of Potsdam

The role of anomalous data in pre-service biology teachers' modelling processes

Moritz Krell, Freie Universität Berlin
Sabine Meister, Humboldt-Universität zu Berlin
Annette Upmeyer Zu Belzen, Humboldt-Universität Zu Berlin

Strand 07: Pre-service Science Teacher Education Effects of Instructional Strategies

2:40 PM-4:10 PM, James

President: Melissa Braaten, University Of Colorado - Boulder

A Broader Sense of Everything: Exploring the Impacts of Wonder in a Science Methods Course

Christie C. Byers, George Mason University
Andrew Gilbert, George Mason University

Effects of Socio-Scientific Issue (SSI)-Based Instruction on Pre-Service Teachers' Socio-Scientific Reasoning and Attitudes towards SSI

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

The Effect of Interactive Science Journals on Pre-Service Teachers' Planning and Teaching

Mark A. Brenneman, Auburn University
Christine Schnittka, Auburn University

Strand 09: Reflective Practice

Reflective Practices for Instructors Inside and Outside of Classrooms

2:40 PM-4:10 PM, Gibson

President: Ivanna Pengelley, Florida State University

Examining Reflective Practice as a Premise to Develop Elementary Teachers' Science PCK During Student Teaching

Ranu Roy, Indiana University, Bloomington
Meredith A. Park Rogers, Indiana University

Identifying a gap: a study of a Reflective Professional Development program for zoo instructors.

Netanel Dwolatzky, Ben Gurion University of the Negev, Israel
Orit Ben Zvi Assaraf, Ben-Gurion University Of the Negev, Israel
Chagit E. Tishler, David Yellin Academic College of Education

Learning How to Design NGSS Learning Experiences for K-8 Teachers: A Self-Study

Candice R. Gaytán, University of Nevada, Reno
Elizabeth X. De Los Santos, University of Nevada, Reno
David T. Crowther, University Of Nevada, Reno

Strand 10: Curriculum, Evaluation, and Assessment Modeling and systems thinking

2:40 PM-4:10 PM, Kent

President: Brendan E. Callahan, Kennesaw State University

Assessing Students ability to Create and Use Models to Explain Phenomena involving Energy

Joseph M. Hardcastle, American Association for the Advancement of Science

Cari F. Herrmann Abell, American Association for the Advancement Of Science - Project 2061
George DeBoer, American Association for the Advancement Of Science

Empirical Evidence for Describing Mental Models in Chemistry Education

Marvin Rost, Humboldt-Universität zu Berlin
Rüdiger Tiemann, Humboldt - Universität Zu Berlin

Evaluating Students' Chemistry Performance Using Electrostatic versus Molecular Frameworks

Mary Lamar, Eastern Kentucky University
Jennifer A. Wilhelm, University of Kentucky

Supporting the development of system thinking for explaining global change phenomena

Abraham Lo, BSCS Science Learning
Jessica R Bean, University of California Museum of Paleontology, UC Berkeley
Aleeza Oshry, Howard Hughes Medical Institute
Molly Stuhlsatz, BSCS Science Learning
Charles R Marshall, University of California Museum of Paleontology, UC Berkeley

**Strand 10: Curriculum, Evaluation, and Assessment
*Symposium-Defining and Measuring Science Curiosity across Perspectives, Contexts, and Methodologies***

2:40 PM-4:10 PM, Baltimore B

Discussant: Christian Schunn, University of Pittsburgh

Defining and Measuring Science Curiosity across Perspectives, Contexts, and Methodologies

Ornit Spektor-Levy, Bar-Ilan University
Jamie Jirout, University of Virginia
Asheley Landrum, Texas Tech University
Christian D. Schunn, University of Pittsburgh
Yael Kesner-Baruch, Bar Ilan University
Zemira Mevarech, Bar Ilan University
Dan M. Kahan, Yale Law School, Yale University
Jennifer L. Weible, Central Michigan University
Virginia Vitiello
David Klahr, Carnegie Mellon University

**Strand 11: Cultural, Social, and Gender Issues
*Examining sociocultural perspectives on agency and identity as framings for learning and teaching science***

2:40 PM-4:10 PM, Maryland E

Development of agency and identity in figured worlds of early-career science teachers

Gail Richmond, Michigan State University
Kraig A. Wray, Michigan State University

Science identity trajectories throughout school visits to a science museum

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

Investigating novice teacher professional identity during the mentoring process

Effrat Akiri, Technion
Gabby Shwartz, Technion
Judy Yehudit Dori, Technion

Undesirable talent in science: A critical analysis of teachers' and students' production of talent, gender and strategies within higher education

Henriette T. Holmegaard, University Of Copenhagen
Bjørn F. Johannsen, University of Gothenburg

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

NOS, SSI and Evolution

2:40 PM-4:10 PM, Federal Hill

Presider: Dina Tsybulsky, Technion - Israel Institute Of Technology

Students' Place-based SSI Instruction Influenced Trophic Cascade Explanations and Their Association with NOS Views

Ben Herman, University of Missouri
Robert T. Oertli, University of Missouri
David C. Owens, Georgia Southern University
Laura Zangori, University Of Missouri

A Spectrum of Students' Epistemic Agency: Connecting Inquiry and Activism through Socioscientific Issues

Sarah C. Boylen, Sonoma State University
Edward G. Lyon, Sonoma State University

Secondary Science Teachers' Understanding of the Nature of Science and Its Relationship to Evolution Theory

Stephanie P. Toro, Universidad de los Andes

Public School Teachers' Approaches to Teaching Evolution and Understanding of Evolution Laws

Ronald S. Hermann, Townson University
Lee Meadows, University Of Alabama
Ian C. Binns, University Of North Carolina At Charlotte
Joseph W. Shane, Shippensburg University

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

Symposium-Enhancing Nature of Science (NOS) Instruction Through Research-Guided Practices

2:40 PM-4:10 PM, Maryland A

Presider: William F. McComas, University Of Arkansas

Enhancing Nature of Science (NOS) Instruction Through Research-Guided Practices

William F. McComas, University Of Arkansas

William W. Coburn, Western Michigan University

Erin E. Peters-Burton, George Mason University

Stephen Burton, Loudoun Valley Public Schools

Michael P. Clough, Texas A&M University

Irene Neumann, IPN - Leibniz Institute for Science and Mathematics Education (Kiel, Germany)

Hanno Michel, IPN Kiel

Julie Angle, Oklahoma State University

Dina Tsybulsky, Technion--Israel Institute of Technology

Elizabeth W. Edmondson, Virginia Commonwealth University

Stephen R. Burgin, University Of Arkansas

Concurrent Session #2

4:20pm – 5:50pm

Equity And Ethics Committee

Admin Symposium-Science Educators Creating and Sustaining Collective Activism: Implications for Research and Practice

4:20 PM-5:50 PM, Baltimore A

Science Educators Creating and Sustaining Collective Activism: Implications for Research and Practice

Organizers:

Catherine Quinlan, Howard University, School of Education

Melody Russell, Auburn University

Gillian U. Bayne, Lehman College Of CUNY

Pauline W. U. Chinn, University Of Hawaii At Manoa

James M. Nyachwaya, North Dakota State University

Bhaskar Upadhyay, University of Minnesota

Panelists:

Sheila Borges Rajguru, New York University, NY

German Cadenas, Lehigh University, PA

Alexis Riley, Teachers College, Columbia University, NY

Wendy F. Smythe, National Science Foundation

Francesca White, Indiana University, IN

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Representations, Scientific Knowledge, and Identity Construction: Minoritized Students and Science

4:20 PM-5:50 PM, Maryland A

Dramatizing Science Ideas:

Multimodal Science Learning and Generative Engagement in Urban Elementary Classrooms

Rebecca Kotler, University of Illinois at Chicago

Maria Varelas, University Of Illinois At Chicago

Nathan Phillips, University of Illinois at Chicago

Rachelle Tsachor, University of Illinois at Chicago

Rebecca Woodard, University of Illinois at Chicago

Science Theater by Minoritized Students:

Multimodality, Meaning Making, and Science Expertise

Hannah Natividad, University of Illinois at Chicago

Maria Varelas, University Of Illinois At Chicago

Nathan Phillips, University Of Illinois At Chicago

Rachelle Tsachor, University Of Illinois At Chicago

Rebecca Woodard, University Of Illinois At Chicago

Identity Avatars and Concept Maps: Bridging Science Content Learning and Identity Construction

Brezhnev Batres, University of Illinois at Chicago

Maria Varelas, University Of Illinois At Chicago

Ethnodance and Science Identity:

Black Students Making Sense of their Sense Making

Mindy J. Chappell, University of Illinois at Chicago

Maria Varelas, University Of Illinois At Chicago

Strand 04: Science Teaching-Middle and High School (Grades 5-12): Characteristics and Strategies

Assessment in Middle and High School

4:20 PM-5:50 PM, Maryland F

Presider: Melissa Braaten, University Of Colorado - Boulder

An Equity Lens on NGSS-Aligned Classroom-Embedded Assessments

Sharon L. Mark, University Of Louisville

Thomas R. Tretter, University of Louisville

Secondary Science Teachers Experiences with Three-dimensional Teaching and Learning, and Formative Assessment

Yotah Koulagna, Georgia State University

Renee S. Schwartz, Georgia State University

Exploring Physics Teachers Formative Assessment Knowledge of Force and Motion via a Many-Facet Rasch Model

Marilyn M. Stephens, University of Alabama
Dennis Sunal, University Of Alabama
Stefanie A. Wind, University of Alabama
Cynthia Szymanski Sunal, University Of Alabama

Strand 05: College Science Teaching and Learning (Grades 13-20)

Fostering students' argumentation and discourse

4:20 PM-5:50 PM, Watertable Salon B

President: Brandy L. Bowling, North Carolina State University

Cultural and Professional World Boundaries: Reports from a Study of First-Generation STEM Undergraduate Literacies

Margaret M. Lucero, Santa Clara University
Tricia Serviss, University of California, Davis

Facilitating undergraduates' problem solving performance and confidence using blended argumentation and problem solving prompts

Yuri B. Piedrahita, Purdue University
Carina M. Rebello, Purdue University
N. Sanjay Rebello, Purdue University

The Classroom Discourse Observation Protocol (CDOP) for Undergraduate STEM Classrooms: A New Instrument to Characterize Teacher Discourse Moves

Petra Kranzfelder, University of Minnesota
Jennifer L Bankers-Fulbright, Augsburg University
Marcos E Garcia-Ojeda, University of California-Merced
Sagal Mohammed, University of Minnesota
Vinit Vaghani, University of Minnesota
Lindsey Walker, University of Minnesota
Abdirizak M. Warfa, University of Minnesota

Argumentative Writing Assignments: Using Writing to Improve College non Science Major Achievement and Argumentation.

Claudia Aguirre-Mendez, Emporia State University
Ying-Chih Chen, Arizona State University
Ratrapee Techawitthayachinda, Arizona State University
Takeshi Terada, Arizona State University

**Strand 07: Pre-service Science Teacher Education
*Elementary Preservice Teachers' Science & Engineering Self-Efficacy***

4:20 PM-5:50 PM, James

President: Claudia P. Aguirre-Mendez, Emporia State University

Effects of Field Experience on Preservice Teachers' Science Self Efficacy

Sheryl L. McGlamery, University Of Nebraska Omaha
Bridget A. Franks, University of Nebraska at Omaha
Saundra L. Shillingstad, University Of Nebraska Omaha

Sources of Engineering Teaching Self-Efficacy for Pre-service Elementary Teachers

Ezgi Yesilyurt, University Of Nevada, Las Vegas
Hasan Deniz, University Of Nevada
Erdogan Kaya, University Of Nevada, Las Vegas

Teaching Engineering Self-Efficacy: A Mini-Unit Approach in Elementary Science Methods

Matthew P. Perkins Coppola, Purdue University Fort Wayne

**Strand 07: Pre-service Science Teacher Education
*Making and Preservice Teachers: Exploring Designs for Supporting the Integration of Making in STEM Classrooms***

4:20 PM-5:50 PM, Maryland B

Discussant: Scott McDonald, Pennsylvania State University

Makers-in-residence: An apprenticeship model for supporting pre-service elementary teachers to adopt making pedagogies

Sara Heredia, The University of North Carolina Greensboro
Matthew Fisher, The University of North Carolina Greensboro

Pedagogies of Making: One Science Teacher's Transition from Pre-service to Inservice

Colby Tofel-Grehl, Utah State University
Kristin A. Searle, Utah State University

Investigating Development of Pedagogical Dispositions and Skills of STEM Teacher Candidates' Work in a Makerspace

Kevin D. Cunningham, Central Michigan University

From Informal STEM After-School Making to the Classroom: Pre-service Teachers' Reflections on the Experience

Jennifer L. Weible, Central Michigan University

Discussant

Scott McDonald, Pennsylvania State University

**Strand 08: In-service Science Teacher Education
*Supporting Authentic Science and Engineering Practices***

4:20 PM-5:50 PM, Pride of Baltimore

Presider: Eliza Bobek, University of Massachusetts Lowell

Impact of a Science Endorsement Program on Teachers' Implementation of the Science and Engineering Practices

Brendan E. Callahan, Kennesaw State University

Charlease Kelly-Jackson, Kennesaw State University

Making an impact with professional development: Understanding changes in science teachers' engineering self-efficacy and practice

Emily A. Dare, Florida International University

Joshua A. Ellis, Florida International University

John L. Irwin, Michigan Technological University

Partnership Work between Researchers and Elementary Teachers: Moving Towards Responsive Science Teaching Practices

Christa Haverly, Michigan State University

**Strand 08: In-service Science Teacher Education
*Teacher Leadership and Science Professional Development***

4:20 PM-5:50 PM, Watertable Salon C

Presider: Julie C. Brown, University Of Florida

Elementary Science Teacher Leaders: Scaling Effective Analysis-of-Practice PD Program in an Urban District

Nicole I.Z. Wickler, Cal Poly Pomona

Kathleen J. Roth, Cal Poly Pomona Foundation

Rebecca Eddy, Cobblestone Applied Research & Evaluation, Inc.

Paul M. Beardsley, California State Polytechnic University, Pomona

Joseph A. Taylor, BSCS

Jody Bintz, BSCS

Exploring the Potential of Teacher Leadership to Drive STEM Programming in Public Schools

Elizabeth A. Crotty, University of Minnesota

Gillian Roehrig, University of Minnesota

Elizabeth A. Ring-Whalen, St. Catherine University

Illana C. Livstrom, University of Minnesota

Sustainable, Videobased, Analysis-of-Practice Science PD in a High-Needs District: Longitudinal Teacher Leader, Student Learning Results

Paul M. Beardsley, California State Polytechnic University, Pomona

Kathleen J. Roth, Cal Poly Pomona Foundation

Joseph A. Taylor, BSCS

Nicole Wickler, Cal Poly Pomona

**Strand 10: Curriculum, Evaluation, and Assessment
*Symposium-Reconceptualizing Alignment for NGSS Assessments***

4:20 PM-5:50 PM, Baltimore B

Discussant: James Pellegrino, University of Illinois at Chicago

Reconceptualizing Alignment for NGSS Assessments

Aneesha Badrinarayan, Achieve, Inc.

Jill A. Wertheim, Stanford University

Joseph S. Krajcik, Michigan State University

James Pellegrino, University of Illinois at Chicago

William R. Penuel, University of Colorado

Tamara J. Smolek, Michigan Department of Education

Sara Cooper, Nebraska Department of Education

**Strand 10: Curriculum, Evaluation, and Assessment
*Engineering design and assessment***

4:20 PM-5:50 PM, Kent

Presider: Tamecia R. Jones, North Carolina State University

Classroom Observation Protocol for Engineering Design (COPED): Instrument Development, Validation, and Implications for Use

Lindsay B. Wheeler, University Of Virginia

Shannon Navy, Kent State University

Jennifer Maeng, University Of Virginia

Brooke A. Whitworth, University of Mississippi

Hydroponics/Engineering Design Unit Assessment: Interpreting Results from Seventh-Grade Students in Urban, Suburban and Suburban/Rural Schools

Amy R. Semerjian, Boston College

Elaine M. Silva Mangiante, Salve Regina University

Jameson Chace, Salve Regina University

Implementation of Engineering Design Process in the K-12 Classrooms: A Meta-Synthesis Study

Merve ARIK, Faculty of Education

Mustafa S. Topcu, Yildiz Technical University

Synthesis of Local, Policy, and Higher Education Objectives into a K-12 Engineering Epistemic Frame

Tamecia R. Jones, North Carolina State University
Monica E. Cardella, Purdue University
Senay Purzer, Purdue University
Morgan M. Hynes, Purdue University

Using Multimodal Assessments to Highlight Third Graders' Abilities to Problem Scope During Engineering Tasks

Jessica Cellitti, Drexel University
Christopher G. Wright, Drexel University

Strand 11: Cultural, Social, and Gender Issues
Critical Examination of Science Experiences at the Intersections of Race and Gender

4:20 PM-5:50 PM, Fells Point

Presider: Terrell R. Morton, University of Missouri - Columbia

9th and 12th graders' science-related occupational expectations between genders and among races

Yang Yang, Qingdao University
Xiufeng Liu, State University Of New York At Buffalo (SUNY)
Joseph A. Gardella, State University Of New York At Buffalo (SUNY)

Black and a Woman:

A Case Study of a Successful Scientist

Jonathan L. Hall, University of Connecticut
Malcolm B. Butler, University of Central Florida

Black undergraduate STEM majors' positioning of race/gender identity markers and manifestations of positioning

Eileen Carlton Parsons, University Of North Carolina At Chapel Hill

The Double Penalty: Minority Women's Experiences of the Impostor Phenomenon

Devasmita Chakraverty, Washington State University

Strand 11: Cultural, Social, and Gender Issues
Working to Improve All Students' Engagement and Learning in Science

4:20 PM-5:50 PM, Gibson

Presider: Cassie Quigley, University of Pittsburgh

Movement expressiveness as an enactment of engagement and learning: A case study within a chemistry lab

Molly H. Weinburgh, Texas Christian University

Moving Beyond High Standards: Understanding Conceptions of Academic Achievement Through the Lens of Cognitive Demand

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

Educators' and Empathy in the Design Process

Henriette D. Burns, Washington State University

Youth Teachers Restructuring Classroom Power Hierarchies and Supporting Productive Identity Work

Kathleen A Schenkel, Michigan State University

Strand 11: Cultural, Social, and Gender Issues
From Sleeping Police to Socio-Material Entanglement: Rethinking the Racialization and Gendering of STEM Education Practices

4:20 PM-5:50 PM, Maryland E

Health Interventions as Sleeping Police: How Science | Health Education Produces and Regulates Racialized Others

Kathryn L. Kirchgasler, The University of Kansas
Maria C C. Olivares, TERC

Sleeping with the Sleeping Policemen: Working Within and Against College and Career Readiness Discourse in STEM Education

Rouhollah Aghasaleh, Georgia State University
Patrick J. Enderle, Georgia State University

Making Science Learning Visible Among Culturally and Linguistically Diverse Learners: Affordances of Expressive and Heterogeneous Epistemic Tools

Shakhnoza Kayumova, University of Massachusetts-Dartmouth

Ignoring "Sleeping Police": Chemistry Education's Failure to Engage with New Materialism

Kathryn Scantlebury, University of Delaware
Catherine E. Milne, New York University
Anita Hussenius, Uppsala University, Centre for Gender Research

Strand 13: History, Philosophy, Sociology, and Nature of Science
NOS and Scientific Literacy

4:20 PM-5:50 PM, Watertable Salon A
Presider: Jacob Pleasants, Iowa State University

Can Science Literacy Help Individuals Identify Misinformation in Everyday Life?

Aviv J. Sharon, Technion - Israel Institute of Technology
Ayelet Baram-Tsabari, Technion - Israel Institute of Technology

Styles of Scientific Reasoning: A better Framework for the Nature of the Sciences in NGSS

Jonathan Francis Osborne, Stanford Graduate School Of Education
Stephanie Rafanelli, Stanford University Graduate School of Education

Investigating the potential for unanticipated consequences of teaching the tentative nature of science

William W. Cobern, Western Michigan University
Betty Adams, Western Michigan University
Brandy A. Pleasants, Western Michigan University
Andrew P. Bentley, University of Northern Colorado
Robert E. Kagumba, Delta State University

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

International Perspectives on NOS

4:20 PM-5:50 PM, Federal Hill

Presenter: Zoubeida R. Dagher, University of Delaware

The Potential and Challenges of Cooperation With Informal Learning Settings In Developing NOS Views

Kader Bilican, Kirikkale University
Yasemin Ozdem-Yilmaz, Gaziosmanpasa University
Bahadır Han

International Collaborative Investigation of Seventh Grade and High School Students' Understandings of Scientific Inquiry: Is There Evidence of Progress?

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

Analysis of Teachers' Ontological, Epistemological and Phenomenological Beliefs in Digital Age

Hillel Rozenzweig, Tel Aviv University
Dina Tsybulsky, Technion--Israel Institute of Technology
Ilya Levin, Tel Aviv University

Nature of Science Representations in the Philippine Curricula

Tanzimul Ferdous, Kent State University
Mila Rosa L. Librea-Carden, Kent State University
Bridget K. Mulvey, Kent State University

Mentor/Mentee Nexus

6:00pm – 7:00pm, Fells Point

Research Interest Groups (RIGs) Meetings

6:00pm – 7:00pm

Continental and Diasporic Africa in Science Education (CADASE)

6:00 – 7:00 PM, Baltimore A

Latino/a RIG (LARIG)

6:00 – 7:00 PM, Baltimore B

Engineering Education

6:00 – 7:00 PM, Kent

Contemporary Methods for Science Education Research

6:00 – 7:00 PM, Federal Hill

Indigenous Science Knowledge

6:00 – 7:00 PM, Maryland E

Presidential/Welcome Reception
7:00pm – 9:30pm, Maryland C – D

Join your colleagues for light refreshments and the opportunity to learn more about NARST committees. Visit with committee representatives and Board liaisons at this informal reception to learn about volunteer opportunities and current and future committee projects.

Light hors d'oeuvres will be served. Cash bar.

Monday, April 1, 2019

Mind and Sole (Off-site)**6:00am – 7:15am, Lobby**

This event is not sponsored or endorsed by NARST

Conference Registration**8:00am – 4:30pm, Maryland Foyer****Concurrent Session #3****8:30am – 10:00am****External Policy And Relations Committee*****Admin Symposium-Achieving More Powerful Research Impacts Through Dissemination and Engagement with Varied Audiences***

8:30 AM-10:00 AM, Baltimore A

Achieving More Powerful Research Impacts Through Dissemination and Engagement with Varied Audiences

Sharon J. Lynch, The George Washington University

Philip L. Bell, University Of Washington

Stefanie Marshall, University of Minnesota

Katherine L. McNeill, Boston College

William R. Penuel, University of Colorado

Membership And Election Committee***Admin Symposium-Professional Citizenship: Lifetime commitments and rewards***

8:30 AM-10:00 AM, Homeland

Professional Citizenship: Lifetime commitments and rewards

Selina L. Bartels, Valparaiso University

Brooke A. Whitworth, University of Mississippi

Gary M. Holliday, University Of Akron

Felicia Moore Mensah, Teachers College, Columbia University

Judith S. Lederman, Illinois Institute Of Technology

Barbara A. Crawford, University Of Georgia

Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel

Strand 02: Science Learning: Contexts, Characteristics and Interactions***Motivation***

8:30 AM-10:00 AM, Watertable Salon A

President: Miri Barak, Technion - Israel Institute Of Technology***Facilitation of Motivation and Learning by Enhancing Instruction with Motivational Strategies***

Sadik Bulut, Marmara University

Feral Ogan-Bekiroglu, Marmara University

Latent Expectancy-value-cost Motivation Classes in Black/African-American Fifth Grade Students

David E. McKinney, Johns Hopkins University School of Education

Predictors of students' self-determined motivation qualities in biology lessons

Lisa-Maria Kaiser, University of Bielefeld

Nadine Großmann, University of Bielefeld

Melanie Basten, University of Bielefeld

Matthias Wilde, University of Bielefeld

**Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies
*Elementary Student Learning***

8:30 AM-10:00 AM, Gibson

President: Mary Ewing, University of North Carolina, Chapel Hill***Exploring the Effects of Critique-driven Inquiry on Children's Critical Thinking and Engagement in Learning Science***

Hsiang-Ting Chen, National Sun Yat-sen University

Zuway-R Hong, National Sun Yat-sen University

Ying-Yan Lu, National Sun Yat-sen University

Yu-Ning Huang, National Sun Yat-sen University

Pei-Zhen Xia, National Sun Yat-sen University

Investigating the Impact of NGSS-Aligned Resources to Address Elementary Energy Standards

Sara J. Lacy, TERC

Roger G. Tobin, Tufts University

Sally Crissman, TERC

Lezlie DeWater, Seattle Pacific University

Nick Haddad, TERC

Bill Nave

Michael H Russell, Boston College

Lane Seeley, Seattle Pacific University

Where Does Energy Go when it's "Gone"? Developing Ideas about Dissipation in Grades 4/5

Roger G. Tobin, Tufts University

Sara J. Lacy, TERC

Sally Crissman, TERC

Nick Haddad, TERC

Lane Seeley, Seattle Pacific University

Kara E. Gray, Seattle Pacific University

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies
The Role of Teacher Affect and Beliefs in Secondary Science

8:30 AM-10:00 AM, Maryland F

Presider: Veronica McGowan, University Of Washington

The complex interplay between emotion management and social bonding in science teaching

Alberto Bellocchi, Queensland University of Technology

Relationships of Teaching Approaches, Enjoyment of Science, and Student Science Performance: An Analysis of PISA 2015 Data of the US

Haiying Long, Florida International University

Su Gao, University of Central Florida

Secondary Science Teachers' Conceptions of Authenticity: Implications for Research and Practice

Stephen R. Burgin, University Of Arkansas

Jennifer F. Oramous, University Of Arkansas

William F. McComas, University Of Arkansas

Strand 05: College Science Teaching and Learning (Grades 13-20)

Students' conceptual understanding and beliefs

8:30 AM-10:00 AM, Watertable Salon B

Presider: Jaime L. Sabel, University Of Memphis

A Mixed-Methods Evaluation of Plant Blindness and Botanical Literacy in an Undergraduate Botany Course

Kathryn Parsley, University of Memphis

Jaime L. Sabel, University Of Memphis

Laura Zangori, University Of Missouri

Jason Koontz, Augustana College

Is Knowledge of Evolution Useful? A Mixed Methods Examination of College Biology Students' Views

Lisa A. Borgerding, Kent State University

Fatma Kaya, Kent State University

University Students' Understanding of Nature of Science

Selin Akgün, Bogazici University

Ebru Kaya, Bogazici University

Strand 06: Science Learning in Informal Contexts
Public Science Learning and Literacy

8:30 AM-10:00 AM, Pride of Baltimore

Presider: Monae Verbeke, Institute for Learning Innovation

Measuring Scientific Reasoning with Day-To-Day Scenarios

Yael Barel-Ben David, Technion

Keren E. Dalyot, Technion Israel Institute of Technology

Yaela N Golumbic, Technion

Ayelet Baram-Tsabari, Technion - Israel Institute of Technology

Science Festivals:

Promoting Science Learning, Science Literacy, and Fun

Gina Childers, University of North Georgia

Macey Jarrard, University of North Georgia

Tony Sacchitello, University of North Georgia

Donna Governor, University of North Georgia

Lesley Simanton-Coogan, University of North Georgia

Conceptions of Energy in the Printed Media for the General Public

Shahar Abramovitch, Weizmann Institute Of Science

David L. Fortus, Weizmann Institute Of Science

Evaluating Baseline Self-Efficacy for Science and Environmental Action in Citizen Scientists

Leona F Davis, University of Arizona

Monica D Ramirez-Andreotta, University of Arizona

Sanlyn Buxner, University Of Arizona

Strand 07: Pre-service Science Teacher Education
Model-Based Instruction & Lesson Planning

8:30 AM-10:00 AM, James

Presider: Narendra D. Deshmukh, Homi Bhabha Centre for Science Education

A Mixed Methods Investigation of Elementary Preservice Teachers' Science/Technology Lesson Planning

Tina Vo, University of Nevada- Las Vegas

Modeling in Teacher Education: A Review of Relevant Research from 1999-2016

Bahadır Namdar, Recep Tayyip Erdogan University

Sara P. Raven, Texas A&M University

Natalie Mansen, Texas A&M University

Caroline Burks, Texas A&M University

The Development of a Pre-Service Science Teacher's Model-based Teaching Pedagogy

Samia Khan, University of Dundee

Strand 08: In-service Science Teacher Education

Attending to Student Talk

8:30 AM-10:00 AM, Watertable Salon C

Presider: Melissa Braaten, University Of Colorado - Boulder

Changes in Science Teachers' Instructional Practice in Response to Professional Development

Jarod Kawasaki, University of California - Los Angeles

Alexander Kwako, University of California, Los Angeles

William A. Sandoval, University of California, Los Angeles

Heather F. Clark, UCLA

Anahid S. Modrek, UC San Diego

Opportunities and obstacles to teacher change from discourse-focused professional development

William A. Sandoval, University of California, Los Angeles

Heather F. Clark, UCLA

Jarod Kawasaki, University of California - Los Angeles

Alexander Kwako, University of California, Los Angeles

Anahid S. Modrek, UC San Diego

Supporting Teachers' Science and Disciplinary Literacy Formative Assessment Practices Through the Analysis of Think-Alouds

Kirsten D. Edwards, Michigan State University

Charles W. Anderson, Michigan State University

Strand 08: In-service Science Teacher Education

Social Network-based Investigations of Teacher Communities of Practice and Professional Persistence.

8:30 AM-10:00 AM, Maryland B

Program Features Contributing to the Success of NSF Noyce Teacher Preparation Projects and Teacher Communities

Michael E. Beeth, UW Oshkosh/COEHS

Gillian Roehrig, University of Minnesota

Rebecca Konz, University Of Minnesota Twin Cities

Longitudinal and Institutional Changes to STEM Teacher Education Programs Influenced by Noyce Programs

Keith Sheppard, Stony Brook University

Margaret J. Mohr-Schroeder, University of Kentucky

Gender, Age, and Self-efficacy: The Contingent Value of Bonding and Bridging Social Capital

Samuel J. Polizzi, Kennesaw State University

Brandon R. Ofem, University of Missouri-St. Louis

The Role of Network Bridging in Teacher Persistence

Greg Rushton, Middle Tennessee State University

Samuel J. Polizzi, Kennesaw State University

Yicong Zhu, Stony Brook University

Strand 10: Curriculum, Evaluation, and Assessment
Scientific literacy and reasoning

8:30 AM-10:00 AM, Kent

Presider: Leonora Kaldaras, Michigan State University

An Investigation on Scientific Practices of Seventh Grade Students in China

Tianying Sun, Beijing Normal University

Jing Lin, Beijing Normal University

Xiaoyu Shi, Beijing Normal University

Automated Scoring of a Constructed Response Vision II Scientific Literacy Assessment

A.J. Womack, University Of Missouri

Robert T. Oertli, University of Missouri

Troy Sadler, University Of North Carolina Greensboro

David C. Owens, Georgia Southern University

Andrew T. Kinslow, Rock Bridge High School

Development and Pilot of a Model for Science Disciplinary Literacy in Early Elementary Classrooms

Nancy Moreno, Baylor College of Medicine

Alana Newell, Baylor College Of Medicine

Development of scientific reasoning skills: results of cross-sectional research from Grade 5 to Grade 9

Takuya Matsuura, Hiroshima University

Strand 11: Cultural, Social, and Gender Issues

Symposium-Disability Studies in (Science) Education as a Framework for Equity and Action

8:30 AM-11:00 AM, Maryland A

Disability Studies in (Science) Education as a Framework for Equity and Action

Sami Kahn, Ohio University

Michele Koomen, Gustavus Adolphus College

Elaine M. Silva Mangiante, Salve Regina University

Teresa Shume, North Dakota State University

Lauren Madden, The College of New Jersey
 Phillip A. Boda, Stanford University
 Jonte C. Taylor, Pennsylvania State University
 Kevin Fleming, George Washington University

Strand 11: Cultural, Social, and Gender Issues

Exploring the Implications of Gender in the Enactment of Science Curriculum

8:30 AM-10:00 AM, Fells Point

Presider: Rouhollah Aghasaleh, Georgia State University

Exploring the effects of early STEM experiences on STEM identity: A gender study

Susie Cohen, Florida International University
 Zahra Hazari, Florida International University
 Gerhard Sonnert, Harvard University
 Philip Sadler, Harvard University

The Effect of Gender Composition on Motivation in Small High School Biology Groups

Julie R. Robinson, University of North Dakota
 Martina Nieswandt, University Of Massachusetts Amherst
 Elizabeth McEneaney, UMass-Amherst

Things Matter in the Actualization of Gender: Exploring Socio-Material Relations in Advanced Placement Biology Classrooms

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

Where are the Women Engineers? Questioning the Rationale for Expanding the Diversity Through Role Models

Jeanne W. Christman, Rochester Institute Of Technology
 Randy K. Yerrick, University At Buffalo
 Maureen Valentne, Rochester Institute of Technology

'Your husband makes the big bucks': Gender and teaching physical science at a research university

Katherine Doerr Morosky, The University of Texas at Austin

Strand 12: Educational Technology

Using Technology to Promote Students' Modeling Practice and Complex Systems Thinking

8:30 AM-10:00 AM, Maryland E

Discussant: Dirk Krueger, Freie Universitaet Berlin

Presider: Annette Upmeier Zu Belzen, Humboldt-Universität Zu Berlin

Introduction- Using Technology to Promote Students' Modeling Practice and Complex Systems Thinking

Daniel N. Damelin, The Concord Consortium
 Joseph S. Krajcik, Michigan State University
 Annette Upmeier Zu Belzen, Humboldt-Universität Zu Berlin
 Dirk Krueger, Freie Universitaet Berlin

Logical discrepancies in semi-quantitative system models: Visual cues to causal modeling issues vs. accurate modeling of alternative concepts.

A. Lynn Stephens, University of Massachusetts
 Consuelo J. Morales, University of Michigan
 Steven Roderick, The Concord Consortium

Epistemic considerations of modeling: Understanding the usefulness and limitations of models with Emergent Systems Microworlds

Sugat Dabholkar, Northwestern University
 Hillary L. Swanson, Northwestern University
 Uri Wilensky, Northwestern University

Working Together: Integrating Different Modeling Approaches to Promote Students' Content Understanding and Metamodeling Knowledge

Tom Bielik, Michigan State University
 Ravit Golan Duncan, Rutgers University
 Sharona T. Levy, University of Haifa

Agent-Based and Systems Dynamics Modeling of Complex System Behaviors

Carolyn Staudt, Concord Consortium
 Hee-Sun Lee, The Concord Consortium

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

Nature of Engineering

8:30 AM-10:00 AM, Federal Hill

Presider: Khadija E. Fouad, Appalachian State University

What is the Nature of Engineering? Toward a Construct for K-12 Science Education

Jacob Pleasants, Iowa State University
 Joanne K. Olson, Texas A&M University

Engineering Education Professional Development for K-8 Science Teachers' Nature of Engineering Understandings

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

What “ideas-about-engineering” should be taught in K-12 schools? A Delphi investigation

Brian Hartman, Walla Walla University

Randy L. Bell, Oregon State University

Admin Symposium-Science Teacher Professional Development: Addressing Challenges of Complexity, Responsivity and Scale

8:30 AM-10:00 AM, Baltimore B

Discussant: James Hamos, National Science Foundation**Science Teacher Professional Development: Addressing Challenges of Complexity, Responsivity and Scale**

Gail Richmond, Michigan State University

Hannah Sevan, University Of Massachusetts Boston

Judy Yehudit Dori, Technion

Christel Balck, Odisee University College

James E. Hamos, National Science Foundation

**Concurrent Session #4
10:15am – 11:45am****Research Committee****Admin Symposium-Creating and sustaining collective activism: The case of sharing indigenous science knowledge, education and research**

10:15 AM-11:45 AM, Homeland

Creating and sustaining collective activism: The case of sharing indigenous science knowledge, education and research

Femi S. Otulaja, University Of the Witwatersrand

Pauline W. U. Chinn, University Of Hawaii At Manoa

Irasema Ortega, University of Alaska-Anchorage

Sharon Nelson-Barber, WestEd

Stacey Britton, University of West Georgia

Research Committee**Admin Symposium-Network Science Approaches to Science Education Research Problems**

10:15 AM-11:45 AM, Baltimore A

Network Science Approaches to Science Education Research Problems

Robert M. Talbot, University of Colorado Denver

Stanley M. Lo, University Of California, San Diego

Albert Chai, University Of California, San Diego

Joshua Le, University Of California, San Diego

Andrew Lee, University Of California, Los Angeles

Daniel Grunspan, Arizona State University

Brian Sato, University Of California, Irvine

Jesper Bruun, Copenhagen University

Andrew McDevitt, University of Colorado, Denver

Paul Le, University of Colorado Denver

Laurel Hartley, University of Colorado Denver

Strand 02: Science Learning: Contexts, Characteristics and Interactions**Outcomes of Engagement in Immersive Argument-based Professional Development**

10:15 AM-11:45 AM, Maryland A

Presider: Mark A. McDermott, University Of Iowa**Exploring the Epistemic Orientations of ASSIST PD Participants Using a Mixed-Methods Approach**

Nathan Quarderer, University of Iowa

Mark A. McDermott, University Of Iowa

Establishing Immersive Learning Environments through 21st Century Teacher Expertise: Exploratory Research about Teacher Paradigmatic Shifts and Teaching Practices

Yejun Bae, The University of Iowa

Brian M. Hand, University Of Iowa

Gavin Fulmer, University of Iowa

Immersive Professional Development and its Impact on Teacher Implementation: An Update on the ASSIST Approach

Kathleen A. Weiss, University of Iowa

Nathan Quarderer, Northeast Iowa Community College

Mark A. McDermott, University of Iowa

The Impact of Teachers' Epistemic Orientations on Growth of Representation Competence

Ali Cikmaz, University of Iowa

Brian M. Hand, University Of Iowa

Gavin W. Fulmer, University Of Iowa

fatma Yaman, Yozgat Bozok University

Developing Assessment of Multimodal Communication Products from Students in Immersive Argument-based Learning Environments

Andrea Malek, University of Iowa

Mark A. McDermott, University Of Iowa

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Contextualized Science Learning

10:15 AM-11:45 AM, Watertable Salon B

Presider: Justina A. Ogodo, The Ohio State University

Can real-life contexts make students generate suitable questions for chemistry education?

Lisa Schmitz, University of Paderborn

Sabine Fechner, University Of Paderborn

Design-based Pedagogy: Integrating Robotics for Supporting Students With Disabilities in Middle School Science and Math

Adam Devitt, New York University

Catherine E. Milne, New York University

Jasmine Ma, New York University

Magued Iskander, New York University

Vikram Kapila, New York University

Innovation in nanotechnology projects through teamwork in diverse learning environments

Maya Usher, Technion

Miri Barak, Technion, Israel Institute Of Technology

Students' Involvement in Contextualized Science Assessment

Xiaoming Zhai, Stanford University

Maria Araceli Ruiz-Primo, University of Colorado Denver

Min Li, University Of Washington

Klint Kanopka, Stanford University

Philip Hernandez, Stanford University

Dongsheng Dong, University Of Washington

Jim A. Minstrell, FACET Innovations

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies Teacher Knowledge and Professional Learning in Secondary Settings

10:15 AM-11:45 AM, Maryland F

Presider: Claudia P. Aguirre-Mendez, Emporia State University

A Little Knowledge can be a Dangerous Thing: How Out-of-field Teachers Develop over Time

Harleen Singh, University of Georgia

Jessica B Napier, University of Georgia

Julie A. Luft, University of Georgia

Exploring Personal Pedagogical Content Knowledge of Science Teachers: Experiences of Teaching Electricity

Saiqa Azam, Memorial University of Newfoundland

How does a research-based instructional framework support teachers' customization of web-based curriculum?

Libby Gerard, UC Berkeley Graduate School of Education

Allison Bradford, University of California, Berkeley

Jonathan Lim-Breitbart

Korah Wiley

Marcia C. Linn, University of California-Berkeley

What Do We Know About Prospective Middle School Science Teachers' Content Knowledge?

Kim T Watson, Stony Brook University

Greg Rushton, Stony Brook University

Lisa Shah, Stony Brook University

Jie Hao, Kennesaw State University

Herman E Ray, Kennesaw State University

Case Study of Three Teachers Project-based Learning Enactments: Implications for Professional Development

Christine R. Lotter, University of South Carolina

Lark Widener, University of South Carolina

Strand 06: Science Learning in Informal Contexts Measuring and Explaining Impact

10:15 AM-11:45 AM, Pride of Baltimore

Presider: Scott Byrd, Maine Mathematics and Science Alliance

Affective and Cognitive Effects of Hands-on Particle Physics Workshops – An International Study

Julia Woithe, CERN & University of Kaiserslautern

Jochen Kuhn, University of Kaiserslautern

Andreas Mueller, University Of Geneva

Sascha M. Schmeling, CERN

Influence of Cooking Classes in a Children's Museum on Promoting Positive Perspectives of Healthy Eating

Dawn Nguyen, Columbus State University

Patricia Patrick, Columbus State University

The Influences of Personally-Relevant Learning on Adolescents in Summer Camp: Genetics Concepts, Curiosity, and Self-Efficacy

Heather Toomey Zimmerman, Penn State University

Jennifer L. Weible, Central Michigan University

Elizabeth Wright, Penn State University

Nina G. Jablonski, Penn State University

Impacts of museum tour interpretation on visitors' interrelatedness toward marine environment and post-visit conservation behaviors

Yi Ting Pan, Institute of education, National Sun Yat-sen University
 Kuay-Keng Yang, Department of Science Communication
 Zuway-R Hong, National Sun Yat-Sen University
 Huann-Shyang Lin, National Sun Yat-Sen University

**Strand 07: Pre-service Science Teacher Education
*Scaffolding for Learners with Exceptionalities***

10:15 AM-11:45 AM, James

President: Kayla Norville, North Carolina State University

A Tale of Two Courses: Teacher Candidates' Translation of Inclusive Methods Instruction Into Science Teaching

Sami Kahn, Ohio University
 Ryan Pigman, Ohio University
 Jennifer Ottley, Ohio University

Compare Scaffolding Pedagogical Instruction with Direct Instruction in Pre-service Science Teacher Education

Jianlan Wang, Texas Tech University

Increased expectations for all: Science teacher interns leading discussions in middle school inclusion classrooms

Susan De La Paz, University of Maryland
 Daniel M. Levin, University of Maryland, College Park
 Alexander K Chumbley, University of Maryland, College Park
 Crystina D McShay, University of Maryland
 Erika Thomas, University of Maryland

**Strand 08: In-service Science Teacher Education
*Professional Learning Communities***

10:15 AM-11:45 AM, Watertable Salon C

President: Stephen B. Witzig, University Of Massachusetts Dartmouth

Interrogating Practice or Show and Tell?: PLC Engagement Using a Digital Portfolio and NGSS-based Framework

Matthew Kloser, University Of Notre Dame
 Jose Felipe Martinez, University of California, Los Angeles
 Brian Stecher, RAND Corp.
 Amanda Edelman, RAND Corp.
 Erin Lavin, University of Notre Dame
 Catherine Floyd, University of Notre Dame
 Jayashri Srinivasan, University of California, Los Angeles

Teacher Exploratory and Expository Talk: Contrasting Cases of Unpacking the NGSS Science and Engineering Practices

Laura A. Zeller, University of Illinois at Chicago
 Donald Wink, University of Illinois at Chicago
 Brian D. Gane, University of Illinois at Chicago

The Characteristics of Teachers Attending Professional Learning Communities, Focusing on Collegial Interactions and Data Transfer

Guy Raviv, Technion - Israel Institute of Technology
 Shirly Avargil, Technion - Israel Institute of Technology

**Strand 09: Reflective Practice
*Exploring the Use of Practical Measures to Support Improvement in Science Education***

10:15 AM-11:45 AM, Maryland B

Discussant: Sara Heredia, The University of North Carolina Greensboro

President: Elizabeth B. Dyer, WestEd

Centering the Student Perspective around Epistemic Agency Through the Use of Practical Measures

Elizabeth B. Dyer, WestEd
 Maya Salcido White, WestEd
 Ashley Iveland, WestEd

Using Practical Measures to support Secondary Science Teachers to Implement NGSS

Heena R. Lakhani, University of Washington
 Enrique Suárez, University of Washington
 Deb Morrison, University Of Washington

Practical Measures to Sense and Support States' Implementation Efforts of Science Education Reform

Deb Morrison, University Of Washington
 Robbin Riedy, University of Colorado- Boulder
 William R. Penuel, University of Colorado

Exploring Students' Perceptions of the Relevance of Science Learning with Practical Measures

Maya Salcido White, WestEd
 Heena R. Lakhani, University of Washington
 Elizabeth B. Dyer, WestEd
 Enrique Suárez, University of Washington

Discussant Remarks

Sara Heredia, The University of North Carolina Greensboro
 Michael J. Novak, Northwestern University

Strand 10: Curriculum, Evaluation, and Assessment
Supporting teachers in development, assessment, and instruction - part I

10:15 AM-11:45 AM, Kent

President: Shahar Abramovitch, Weizmann Institute Of Science

Designing Theory | Practice-Based Tools for Analyzing Learning in Educational Environments

Susan Kirch, New York University

Pooneh Sabouri, New York University

Moyu Zhang, New York University

Wanjing Ma, University of Pennsylvania

Development and Evaluation of a University Seminar to Foster PCK on Scientific Inquiry Processes

Oliver Tepner, Chemistry Education, University of Regensburg, Germany

Stefan Anthofer, Goethe Gymnasium, Regensburg, Germany

Measuring Learning Environments:

Making Sense of Student-Reported Inquiry-Driven Science Teaching Practices

Sara J. Dozier, Stanford University

Prospective science teachers' competencies in dealing with students' conceptions:

Validation of a video vignette test

Kristin Helbig, Freie Universität Berlin

Dirk Krueger, Freie Universitaet Berlin

Strand 10: Curriculum, Evaluation, and Assessment
Symposium-Developing High School Biology Curriculum Materials that Support NGSS Teaching and Learning: Opportunities and Challenges

10:15 AM-11:45 AM, Baltimore B

Discussant: Ross Nehm, Stony Brook University - SUNY

Developing High School Biology Curriculum Materials that Support NGSS Teaching and Learning: Opportunities and Challenges

Jo Ellen Roseman, American Association for the Advancement Of Science

Louisa A. Stark, University Of Utah

Cari F. Herrmann Abell, American Association for the Advancement Of Science - Project 2061

Kristin M Bass, Rockman et al

George E. De Boer, American Association for the Advancement Of Science - Project 2061

Dina Drits, University Of Utah

Joseph M. Hardcastle, American Association for the Advancement of Science

Sheila A. Homburger, University of Utah

Molly Malone

Ross H. Nehm, Stony Brook University - SUNY

Strand 11: Cultural, Social, and Gender Issues
Explorations in Teaching Science to Multilingual and Other Marginalized Learners

10:15 AM-11:45 AM, Gibson

President: Bhaskar Upadhyay, University of Minnesota

Views of the individual | collective dialectic: An examination of plurilingual students' science notebook use

Sara Wilmes, University of Luxembourg

Christina Siry, University Of Luxembourg

Preparing Reform-Minded Secondary Science and Mathematics Teachers to Teach English Learners: An Investigation Across Programs

Walter Aminger, University of California, Santa Barbara

Mandy McLean, University of California, Santa Barbara

Valerie Meier, University of California, Santa Barbara

Alexis Spina, University of California, Santa Barbara

Leslie Bushong, University of California, Riverside

Susann Pinter, University of California, Davis

Stacey L. Carpenter, University of California - Santa Barbara

Julie A. Bianchini, University Of California, Santa Barbara

Science Text Book Analysis: Intertextuality for Learning in Multilingual Settings

Sara Salloum, University of Balamand

The Analysis of Science Terms in American Sign Language

Scott Cohen, Georgia State University

Patrick J. Enderle, Georgia State University

Renee S. Schwartz, Georgia State University

Investigating Relative Linguistic Bias in Machine Scoring of an Argumentation Task

Zoe E. Buck Bracey, BSCS Science Learning

Molly Stuhlsatz, BSCS Science Learning

Marisol M Santiago, Michigan State University

Tina Cheuk, Stanford University

Christopher Wilson, BSCS Science Learning

Mark Urban-Lurain, Michigan State University

Jonathan Francis Osborne, Stanford Graduate School Of Education

Strand 11: Cultural, Social, and Gender Issues
Culturally relevant virtual reality learning: Bridging cultures, content, and contexts

10:15 AM-11:45 AM, Maryland E

Culturally relevant science in virtual reality (CRP-VR) learning environments: An introduction

Bryan A. Brown, Stanford University
 Phillip A. Boda, Stanford University
 Catherine Lemmi, Stanford University
 Kathryn Ribay, Stanford University
 Greses A. Jöhnk, Stanford University

Finding meaning in science through CRP-VR: Critical understandings of science among diverse elementary students

Greses A. Jöhnk, Stanford University
 Bryan A. Brown, Stanford University
 Phillip A. Boda, Stanford University
 Kathryn Ribay, Stanford University
 Matthew Wilsey, Stanford University

Designing and testing CRP-VR: A mixed-methods, quasi-experimental multiple trial study

Matthew Wilsey, Stanford University
 Phillip A. Boda, Stanford University
 Bryan A. Brown, Stanford University
 Greses A. Jöhnk, Stanford University
 Kathryn Ribay, Stanford University

Challenges and affordances of designing VR with embedded cultural relevancy: Describing the multimedia nuances within a two-year DBR analysis

Phillip A. Boda, Stanford University
 Kathryn Ribay, Stanford University
 Catherine Lemmi, Stanford University
 Greses A. Jöhnk, Stanford University
 Bryan A. Brown, Stanford University

Strand 11: Cultural, Social, and Gender Issues
Reconceptualizing Representation in Science Education: Experiences of Teachers and Students of Color

10:15 AM-11:45 AM, Fells Point

Presider: Katherine Wade-Jaimes, University of Memphis

"We Practice Sounding Robotic": Audit Culture, Emotional Labor and Identity for Science Teachers of Color
 Stacy Olitsky, Saint Joseph's University

A phenomenography of secondary science teachers' views of their science success compared with underrepresented students

Julie C. Brown, University Of Florida
 Justine S. Oesterle, University of Florida
 Hillary A. Barron, University of Minnesota - Twin Cities

Exploring the Science Identity Development of Elementary Students of Color Through Multiple Domains

Terrance Burgess, Syracuse University

STEM Integration that Cultivates STEM Interest in Middle School Female Students of Color

Felicia DT Leammukda, University of Minnesota
 Bonnie B Boyd, Minneapolis Public Schools
 Gillian Roehrig, University of Minnesota

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

History of Science, Students, and Teachers

10:15 AM-11:45 AM, Watertable Salon A
Presider: Aviv J. Sharon, Technion - Israel Institute of Technology

Views of Scientific Inquiry: A Comparative Study between Pre High School Students and Prospective Teachers of Science

Soraya Hamed, University of Seville
 Juan Jimenez, Illinois Institute of Technology
 Judith S. Lederman, Illinois Institute Of Technology
 Norman G. Lederman, Illinois Institute Of Technology

The Impact of Innovative Instructional Effort to Enhance the Understanding About SI of 7th Graders

Ferah Ozer, Bogazici University
 Nihal Dogan, Abant Izzet Baysal University
 Fouad Abd-El-Khalick, University Of North Carolina At Chapel Hill

Impact of Instructor Teaching Orientations on their Pedagogy for Teaching History of Science

Noushin Nouri, University of Texas Rio Grande Valley
 William F. Mccomas, University Of Arkansas
 Gerardo Aponte-Martinez, University of Texas Rio Grande Valley

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

NOS in Books, Media and Context

10:15 AM-11:45 AM, Federal Hill
Presider: Christine V. McDonald, Griffith University

The New Science: Images of Science in a Commercially Available Science-Themed Board Game

Leah A. Bricker, University Of Michigan
Darrell Allen, University of Michigan
Chris Quintana, University of Michigan
Rebecca Quintana, University of Michigan
Ashley N. Jackson, University Of Michigan

Teaching Nature of Science with Trade Books: Influencing Inquiry Instruction

Jeanne Brunner, University of Massachusetts Amherst
Christine McGrail, University of Massachusetts Amherst

The Transfer of Nature of Science Understandings

Rola Khishfe, American University of Beirut

The Effect of Science Fiction Stories on the NOS Views of Sixth-Grade Students

Kayahan Ince, Hacettepe University

Lunch—On Your Own

11:45am – 1:15pm

NARST Annual Membership Meeting

12:00pm – 1:00pm, Baltimore A

NARST members should plan to attend this informative session to get a brief overview of the budget and open discussion with members of the Board of Directors about changes, challenges, and initiatives. Come share your feedback and suggestions!

Concurrent Session #5

1:15pm – 2:45pm

Admin Symposium—Learn about Elections & Get Involved

1:15 PM-2:45 PM, Homeland

Learn about Elections & Get Involved

Malcolm B. Butler, University of Central Florida
Leon Walls, University Of Vermont
Saouma B. Boujaoude, American University Of Beirut
Ibrahim Delen, Usak University
Norman G. Lederman, Illinois Institute Of Technology
Regina Suriel, Valdosta State University
Ravinder Koul, Pennsylvania State University
Melody Russell, Auburn University

Admin Symposium-NSTA's Annual Research Worth Reading Recognition

1:15 PM-2:45 PM, Baltimore B

NSTA's Annual Research Worth Reading Recognition

Emily G. Schoerning, Anshe Emet
Hyat Hokayem, Texas Christian University
G. Michael Bowen, Mount Saint Vincent University
Christina Siry, University of Leemboug
G. Michael Bowen, Mount Saint Vincent University
Heba El-deghaidy, American University in Cairo

Join us in congratulating this year's recipients of the NSTA Annual Research Worth Reading award. This award is given to three research groups whose 2018 *JRST* articles inspire excellent teaching innovations.

This year's recipients are:

Morales-Doyle, Daniel. (2018) Students as curriculum critics: Standpoints with respect to relevance, goals, and science. *Journal of Research in Science Teaching*, 55(5), 749-773.

Åcensal, Zeynep, Jakobson, B., Wickman, P-O., & Molander, B-O. (2018). Gesticulating science: Emergent bilingual students' use of gestures. *Journal of Research in Science Teaching*, 55(1), 121-144.

Tobin, Roger G., Lacy, S., Crissman, S. and Haddad, N. (2018). Model-based reasoning about energy: A fourth-grade case study. *Journal of Research in Science Teaching*, 55(8), 1134-1161.

International Committee

ESERA Symposium—Perspectives Perspectives on Science Education from a Range of National Contexts

1:15 – 2:45, Maryland B

Chair: Regina Kelly, University of Limerick, Ireland

The Language in Science Debate: Localising the International and Globalising the Local

Audrey Msimanga, University of the Witwatersrand, South Africa
Makomosela Qhobela, National University of Lesotho, Lesotho
Climant Khoza, University of the Witwatersrand, South Africa
Maletsau Mphahlele, University of the Witwatersrand, South Africa
Margaret Probyn, University of the Western Cape, South Africa

STEM Undergraduates Perceived Association with STEM Culture in Ireland.

Regina Kelly, University of Limerick, Ireland
Oliver McGaer, University of Limerick, Ireland
Louise Lehanne, National University of Ireland, Galway, Ireland
Siber Erduran, University of Oxford, United Kingdom

The Big Bell Test : A First Contact with Quantum Unpredictability in Primary School

Estelle Blanquet, Université de Bordeaux
 Florian Kaiser, Université Côte d'Azur
 Tommaso Lunghi, Université Côte d'Azur
 Eric Picholle Université Côte d'Azur
 Sebastien Tanzilli, Université Côte d'Azur

Teaching Reconceptualised Family Resemblance Approach to Nature of Science in Lower Secondary Lessons

Aysegul Cilekrenkli, Bogazici University, Turkey
 Ebru Kaya, Boğaziçi University, Turkey

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Argumentation in the Science Classroom

1:15 PM-2:45 PM, Federal Hill

Presider: Venkat Rao Vishnumolakala, Curtin University

Argumentation skills in science education research: a systematic review from 2000 to 2017

Renata P Orofino, Professor at Federal University of ABC - Brazil
 Lucas Vechiato
 Lucas Nascimento
 André Martelini
 Daniela L Scarpa, Professor at University of Sao Paulo - Brazil

Student argumentation in the context of classroom science learning

Qingna Jin, University of Alberta

Uncertainty Management Productivities in Argumentation

Ratrapee Techawitthayachinda, Arizona State University
 Ying-Chih Chen, Arizona State University

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Socio-Scientific Issues

1:15 PM-2:45 PM, Watertable Salon A

Presider: Mary Ewing, University of North Carolina, Chapel Hill

Connecting Science Knowledge to Everyday Life Through SSI Materials

Dürdane Bayram-Jacobs, Radboud University Faculty of Science
 Ineke Henze, TU Delft
 Erik Barendsen, Radboud University Nijmegen

Electronic Waste as a topic for context-based chemistry teaching

David S. Di Fuccia, University of Kassel
 Mareike Frevert, University of Kassel
 Ignacio Sanchez Diaz, University of Kassel

Health communication in the classroom through role play about a socio-scientific issue

Matthias Wilde, University of Bielefeld
 Melanie Basten, University of Bielefeld

Strand 05: College Science Teaching and Learning (Grades 13-20)

Students' experiences with research activities

1:15 PM-2:45 PM, Watertable Salon B

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

A Tool to Assess the Impact of STEM Research Experiences on Identity, Community and Belonging

Senetta Bancroft, Southern Illinois University Carbondale
 Samantha R. Fowler, Florida Institute Of Technology
 Katherine V. Thompson, University of Maryland-College Park
 Patrick Killion, University of Maryland-College Park
 Neal Simon, Lehigh University
 Vassie Ware, Lehigh University
 Richard Pollenz, University of South Florida
 Danielle Findley-Van Nostrand, Roanoke University
 Joel Rothman, University of California-Santa Barbara
 Julie Reynolds, Duke University

Authentic Virtual Experiences as Pre-Laboratory

Shalaunda Reeves, University of Florida
 Lorelie Imperial, University of Florida
 Kent J. Crippen, University of Florida

Student Outcomes in a Course-based Undergraduate Research Experience in Cell Biology

Amy E Trauth, University of Delaware
 Michelle D Snyder, Towson University
 Elana Ehrlich, Towson University

Students' perceptions about being well prepared for an organic chemistry laboratory

Roshan Lamichhane, Indiana University

Strand 06: Science Learning in Informal Contexts
Symposium-Citizen Science in STEM Education: Linking society, Scientists and Education Systems

1:15 PM-2:45 PM, Maryland E

Discussant: Arjen Wals, Wageningen University, The Netherlands & University of Gothenburg, Sweden

President: Keren E. Dalyot, Technion - Israel Institute of Technology

Citizen Science in STEM Education: Linking society, Scientists and Education Systems

Keren E. Dalyot, Technion - Israel Institute of Technology

Yaela N Golumbic, Technion - Israel Institute of Technology

Bruce V. Lewenstein, Cornell University

Tali Tal, Technion

Heidi Ballard, University of California - Davis

Arjen Wals, Wageningen University, The Netherlands & University of Gothenburg, Sweden

Anne Bowser, Woodrow Wilson International Center for Scholars

Ayelet Baram-Tsabari, Technion - Israel Institute of Technology

Caren Cooper, North Carolina State University

Strand 07: Pre-service Science Teacher Education
Integration of Language & Science for Diverse Learners

1:15 PM-2:45 PM, James

President: Digna Couso, Crecim-Universitat Autònoma De Barcelona

Changes in Preservice Secondary Science Teachers' Understanding of Principles of Equitable Reform-Based Science Instruction

Stacey L. Carpenter, University of California - Santa Barbara

Alexandria K. Hansen, University Of California, Santa Barbara

Meghan Macias, University of California, Santa Barbara

Erik Arevalo, University of California, Santa Barbara

Elisa M. Stone, University of California, Berkeley

Julie A. Bianchini, University Of California, Santa Barbara

Elementary Preservice Teachers Learning to Teach ELLs through an Integrated Disciplinary Literacy Science Methods Course

Su Gao, University of Central Florida

Vassiliki Zygouris-Coe, University of Central Florida

Rebeca A Grysko, University of Central Florida

Jonathan L. Hall, University of Central Florida

Modeling science content and language development through a problem-based learning experience

Peter Rillero, Arizona State University

Margarita Jimenez-Silva, University of California, Davis

Strand 07: Pre-service Science Teacher Education
Ambitious Science Teaching

1:15 PM-2:45 PM, Maryland F

President: Sheryl L. McGlamery, University Of Nebraska Omaha

Elementary PSTs' Use of Analytic Reflection as a Scaffold for Making Sense of the ASTPs

LeeAnna C. Hooper, Pennsylvania State University

Courtney M. Lynch, Pennsylvania State University

Planning Ambitious Science Lessons: Preservice Elementary Teachers' Curricular Adaptations

Carrie-Anne Sherwood, Southern Connecticut State University

The Development and Implementation of a Core Practices Instructional Framework for Science Teacher Preparation

Ron Gray, Northern Arizona University

Strand 08: In-service Science Teacher Education
Considerations for Curricular and Materials Decisions

1:15 PM-2:45 PM, Watertable Salon C

President: Amy R. Ricketts, Purdue University

(re)Designing Professional Learning Based on Knowledge-in-Use to Launch a Project-Based Learning Curriculum

Emily C. Miller, University of Wisconsin Madison

Samuel Severance, Michigan State University

Joseph S. Krajcik, Michigan State University

Teachers' Methods of Alignment to NGSS and Affecting Factors Across Contextual Levels

Jamie L. Tanas, University of Iowa

Gavin W. Fulmer, University Of Iowa

Strand 10: Curriculum, Evaluation, and Assessment
Students' STEM interests and pathways

1:15 PM-2:45 PM, Kent

President: Elizabeth Chatham, New Visions for Public Schools

Development of a Survey to Measure Engineering Identity and Career Aspirations in Elementary Students

Kelli M Paul, Indiana University

Adam V. Maltese, Indiana University

Merredith D. Portsmore, Tufts University

Karen Miel, Tufts University

Elementary Students' Engineering Interests and Attitudes: Demographic and Treatment Differences

Cathy P. Lachapelle, Museum of Science

Christine M. Cunningham, Museum of Science, Boston

STEM Pathways: Factors at Selective STEM High Schools that Motivate Continued Student Pursuits in STEM

Xavier J. Monroe, Stanford University

Anthony M. Villa, Stanford University

Elizabeth B. Dyer, Stanford University

Jessica Triant, WestEd

Dennis Ciancio, WestEd

Mingyu Feng, WestEd

Joshua Valcarcel, WestEd

Kim Luttgen, WestEd

Edward D. Britton, WestEd

Steve Schneider, WestEd

**Strand 11: Cultural, Social, and Gender Issues
*Social Justice Curriculum and Agency in Science Education***

1:15 PM-2:45 PM, Gibson

President: Greses Pérez, Stanford University

A Dynamic Framework to Describe Teachers' Conceptions of Integrating Social Justice into Chemistry Classrooms

Kathryn Ribay, Stanford University

Critical consciousness, empowerment, and sociopolitical action: A high school science teacher and students' actions

Bhaskar Upadhyay, University of Minnesota

Pushing the Boundaries of Culturally Responsive Pedagogy: The Case of Cultural Artifacts as Culturally Related Instructional Model (CRIM)

Sina J. Fakoyede, University of the Witwatersrand

Femi S. Otulaja, University of the Witwatersrand

Role of Commercial Pre-service Teacher Assessment in the Development of Social Justice Science Teachers

Gale A. Seiler, Iowa State University

Hildah K. Makori, Iowa State University

**Strand 12: Educational Technology
*Technology Efficacy, Beliefs, and Expectations***

1:15 PM-2:45 PM, Fells Point

President: Noemi Waight, University at Buffalo

to Support Multidisciplinary Engagement in Middle School

Debra Bernstein, TERC

Gillian Puttick, TERC

Michael Cassidy, TERC

Kristen B. Wendell, Tufts University

Fayette Shaw, Tufts University

Ethan Danahy, Tufts University

Susan Bitetti, Tufts University

Collaborative Tool for Model-Based Systems Engineering: Pilot for Evaluating Students' Expectations

Hanan Kohen, Technion - Israel Institute of Technology

Niva Wengrowicz, Technion

Rea Lavi, Technion- Israeli Institute Of Technology

Dov Dori, Technion

Impact of a Computational Thinking Intervention on Teachers' Robotics Teaching Efficacy Beliefs, Interest and Knowledge

Erdogan Kaya, University Of Nevada, Las Vegas

Ezgi Yesilyurt, University Of Nevada, Las Vegas

Hasan Deniz, University Of Nevada

Investigating Preservice Elementary Teachers' Technology Self-efficacy: Affordances of a Mobile Technology-based Curriculum

Meera Chandrasekhar, University Of Missouri

Deepika Menon, Towson University

Dorina Kosztin, University of Missouri

**Strand 14: Environmental Education
*Admin Symposium-Socioscientific Contexts and Environmental Education Curriculum Materials for K-18 Educators***

1:15 PM-2:45 PM, Baltimore A

Socioscientific Contexts and Environmental Education Curriculum Materials for K-18 Educators

Augusto Z. Macalalag, Arcadia University

John R. Ruppert, Saint Peter's University

Joseph A. Johnson, Mercyhurst University

Networking Break

2:45pm – 3:15pm, Ballroom Foyer

Coffee and tea

POSTER SESSION A

3:15pm – 4:15pm

Strand 01: Science Learning, Understanding and Conceptual Change

Strand 1 Poster Session

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer

A1. Analysis of Students' System Models in an NGSS-aligned Curriculum Unit about Urban Water Runoff

Sarah J. Fick, University of Virginia
Karsten J Kim, University of Virginia
Jennifer Chiu, University Of Virginia
Kevin W. McElhaney, SRI International

A3. A Review of Science Instruction for Students with Intellectual & Developmental Disabilities and Autism

Jonte C. Taylor, Pennsylvania State University
Jiwon Hwang, California State University - Bakersfield
Karen Rizzo, Pennsylvania State University - Behrend
Doris Hill, Auburn University

A5. Analysis of Students' Explanatory Models on Ocean Acidification and Its Impacts on Oysters

Asli Sezen-Barrie, University of Maine
Mary Stapleton, Towson University
Anica Miller-Rushing, University of Maine

A7. Characterizing chemistry students' causal reasoning when building written explanations of a natural phenomenon

Patricia Moreira, Pontificia Universidad Católica de Chile
Ainoa Marzabal, Pontificia Universidad Católica de Chile
Vicente A. Talanquer, University of Arizona

A9. Entanglement of computational and fairness reasoning in a resource-allocation scenario

Erin R. Sohr, University of Maryland
Jennifer A. Radoff, University of Maryland, College Park
Ayush Gupta, University of Maryland
Andrew Elby, University of Maryland

A11. High School Students' Developing Ideas About Computational Modeling of Earth and Environmental Systems

Agatha S. Podrasky, University of Montana- spectrUM Discovery Area

Beth A. Covitt, University Of Montana - spectrUM Discovery Area
Michael Jahnke, University of Montana- spectrUM Discovery Area

A13. How visualizing human reproduction as augmented reality affects students' learning outcomes in Biology

Ebere Ibe, University of Nigeria, Nsukka
Apollonia A. Nwosu, University Of Nigeria, Nsukka
Uchenna M. Nzewi, University Of Nigeria, Nsukka
Joy Abamuiche, University Of Nigeria, Nsukka

A15. Mathematical Modelling in Chemistry Lessons – Students' Difficulties and Possible Ways of Teaching

Ines Goldhausen, University of Kassel, Chemistry Education
David S. Di Fuccia, University of Kassel

A17. Tendencies in elementary students' scientific problem solving

Mijung Kim, University of Alberta
Suzanna S. H. Wong, University of Alberta
Qingna Jin, University of Alberta

A19. Understanding Students' Dialogic Learning Experience in an Emergent Transformative Science Classroom

Wanjing Ma, University of Pennsylvania
Susan Kirch, New York University
Pooneh Sabouri, New York University
Moyu Zhang, New York University

A21. Exploring Developmental Level of Science High School Students' Metamodeling Knowledge in Science

jung-eun Kim, Korea National University of Education
Sujeong Jang, Korea National University of Education
Seoung-Hey Paik, Korea National University Of Education

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Strand 2 Poster Session

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer

A23. Lessons about Science Learning and Advice from Two Groups of College Students

Lauren Madden, The College of New Jersey
Stuart Z Carroll, The College of New Jersey
Amy K Schuler, The College of New Jersey

A25. Access to objects around the science classroom: A tale of the influence of Ringo

Michele J. Mann, University Of Texas At Austin

A27. Constructing Theoretical Foundations of Immersive Learning Environments

Yejun Bae, The University of Iowa
 Ali Cikmaz, University of Iowa
 Brian M. Hand, University Of Iowa

A29. Examining Growth and Interdependence of Epistemic Tools in Different Learning Environments

Ali Cikmaz, University of Iowa
 Gavin W. Fulmer, University Of Iowa
 fatma Yaman, Yozgat Bozok University
 Brian M. Hand, University Of Iowa

A31. Promoting Sensemaking and Argumentation Through an Inclusive Approach to Language in the Science Classroom

Catherine Lemmi, Stanford Universtiy

A33. Proposing a conceptual profile on energy related to Physics and Chemistry classrooms

José Euzébio Simões Neto, Federal Rural University of Pernambuco, Brazil
 Edenia Maria R. do Amaral, Federal Rural University of Pernambuco, Brazil

A35. Redefining success in a Learning Assistant supported general biology classroom

Paul Le, University of Colorado Denver
 Sarah Hug, CU Boulder
 Laurel Hartley, University Of Colorado, Denver
 Leanne Doughty, University of Colorado Denver
 Amreen Nasim Thompson, University Of Colorado Denver
 Chelsey Grassie, University of Colorado Denver

A37. Peer tutoring, classroom interaction pattern and students' achievement in physics

Olugbenga G. Akindoju, Lagos State University
 Olatunde Lawal Owolabi, Lagos State University
 Hakeem O. Akintoye, Lagos State University
 Peter A. Okebukola, Lagos State University

A39. The Effects of K-12 Students' Attitudes on Their STEM Achievements: An International Exploratory Study

Ibrahim H. Yeter, Purdue University
 Cristina Diordieva, Texas Tech University

A41. Using Cogenerative Dialogues as Boundary Pedagogy in a High School Students' Science Internship

Pei-Ling Hsu, University Of Texas At El Paso

Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies
Strand 3 Poster Session

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer

A43. Gender Differences of Latinx 5th grade students and their in Recognition of STEM accomplishments

David D. Liu, UC Irvine

A45. Elementary Teachers Attempts at Integrating Science and Engineering Over the Course of a Semester

Kristina M. Tank, Iowa State University
 Jacob Pleasants, Iowa State University
 Joanne K. Olson, Texas A&M University

A47. Examining Novice Teachers' Developing Teacher Practices: Planning for Instruction and Discourse

Sarah J. Carrier, North Carolina State University
 James Minogue, North Carolina State University

A49. Examining variability in elementary teachers' content knowledge for teaching about phase change

Suzanne Ritter, Princeton Charter School
 Jamie N. Mikeska, Educational Testing Service
 Debra Brockway, ETS
 Joseph Ciofalo, Educational Testing Service
 Hui Jin, Educational Testing Service

A51. Indications of Early Engineering Habits of Mind among Young Children During a Problem-Solving Play-Like Task

Ornit Spektor-Levy, Bar-Ilan University
 Taly Shechter, Bar Ilan University

A53. Students' Investment in the Engineering Problem Space through Engineering Storybooks

Carmen M. Vanderhoof, Pennsylvania State University
 Gregory J. Kelly, Pennsylvania State University
 Christine M. Cunningham, Museum of Science, Boston

Strand 04: Science Teaching-Middle and High School (Grades 5-12): Characteristics and Strategies
Strand 4 Poster Session

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer

A55. Conditions teachers scaffold students' uncertainty management in argumentation

Ratrapee Techawitthayachinda, Arizona State University
 Ying-Chih Chen, Arizona State University

A57. Features of Explicit Instruction in Inquiry-Based Teaching - A Video-Based Analysis of Classroom Practice

Andreas Vorholzer, Justus Liebig University Giessen
Verena Petermann, Justus Liebig University Giessen

A59. Impact of A Contextualized Inquiry and Simulation-Based Curriculum on Student Scientific Decision Making

Shane Tutwiler, University of Rhode Island
Alana Newell, Baylor College Of Medicine
Nancy Moreno, Baylor College of Medicine

A61. Teachers' Beliefs about Computational Thinking: Survey Results

Teon Edwards, TERC
Michael Cassidy, TERC

A63. What Should We Be Preparing Students to Read?: An Analysis of Texts on Socio-Scientific Issues

Kirsten D. Edwards, Michigan State University

Strand 05: College Science Teaching and Learning (Grades 13-20)

Strand 5 Poster Session

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer

A65. Applying a K-12 Consensus Model to Science Teaching Assistant Professional Development

Cody Smith, North Carolina State University
Cesar Delgado, North Carolina State University

A67. Chemistry students' understanding of enthalpy, entropy and Gibb's free energy: the context of cellular respiration.

James M. Nyachwaya, North Dakota State University
Nicholas Garza, Oakland University

A69. Examining Undergraduates' Metamodeling Skills after Computational Modeling Activities in Introductory Biology

Gretchen P. King, University of Nebraska-Lincoln
Joseph Dauer, University Of Nebraska-Lincoln

A71. Heterogeneity of Undergraduate Student Demographics and Educational Backgrounds in Introductory Biology: Implications for Teaching Reform

Michelle Bertke, University of Maryland
Katerina Thompson, University of Maryland
Gili Marbach-Ad, University Of Maryland

A73. Indonesian Pre-service Biology Teachers' Conceptual Understanding of Genetics Compared to Americans

Ai N Rusmana, Kangwon National University, Republic of Korea
Arif Rachmatullah, North Carolina State University
Minsu Ha, Kangwon National University
Eni Nuraeni, Indonesia University of Education

A75. Instruction and Educational Background Influences Tree Thinking Skills and Misconceptions Across the Undergraduate Biology Curriculum

Hans Lemke, University of Maryland
Michelle Bertke, University of Maryland
Eric Haag, University of Maryland
Gili Marbach-Ad, University Of Maryland
Francisca Saavedra, University Of Maryland
Katerina Thompson, University of Maryland

A77. Instructional Strategies Preferred and Experienced by Undergraduate and Graduate Students across Science Disciplines

Ngawang Y. Gonsar, Gustavus Adolphus College
Lorelei E Patrick, University of Minnesota
Sehoya Cotner, University of Minnesota

A79. Investigating Motivations of STEM Graduate Students to Engage in Outreach

Stephanie Teeter, NC State University

A81. Male and Female Perceptions of the Culture of Biological Research following a Course-based Research Experience

Jessica Dewey, University of Minnesota
Anita Schuchardt, University of Minnesota

A83. Ontological Framework For Exploring Postsecondary STEM Education Comprehensive Change Initiatives

Ellen Aster, Oregon State University
Jana L. Bouwma-Gearhart, Oregon State University
Cindy A. Lenhart, Oregon State University
Stephanie Ramos, Oregon State University

A85. Small Teaching Practices for Problematizing the Quantitative Nature of Biology in Non-science Majors Biology Laboratories

Joshua Reid, Middle Tennessee State University
Candice M. Quinn, Middle Tennessee State University
Anna S. Grinath, Middle Tennessee State University
Ryan S. Jones, Middle Tennessee State University
Zhigang Jia, Middle Tennessee State University

**A87. Student and Teacher Identity:
The Influence of Being an Undergraduate Teaching
Assistant in a Biology Laboratory Course**

Emily M. Dykstra, University Of Arizona
Kristin L. Gunckel, University Of Arizona

**A89. Teaching Identity? Exploring the STEM Graduate
Student Identity While Teaching in a Summer
Outreach Program**

Kerri Donohue, Indiana University
Gayle A. Buck, Indiana University

**A91. The noticing behaviors and professional visions of
LAs during classroom interactions**

Amreen Nasim Thompson, University Of Colorado Denver
Robert M. Talbot, University of Colorado Denver

**A93. Using a Biology Faculty Learning Community to
Increase College Teaching Self-Efficacy and Promote
Student Metacognition**

Gili Marbach-Ad, University Of Maryland
Anna Davis, University of Maryland
Michelle Bertke, University of Maryland
Katerina Thompson, University of Maryland

**A95. Validation of Computer Scored Constructed Response
Items in Undergraduate Introductory Biology Courses**

Hye Sun You, University of Texas at Austin
John Merrill, Michigan State University
Kevin C. Haudek, Michigan State University
Mark Urban-Lurain, Michigan State University

**Strand 06: Science Learning in Informal Contexts
Strand 6 Poster Session**

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer

**A97. Understanding Community-Level Science Literacy:
The Case of Experts' Outreach on Facebook Groups**

Aviv J. Sharon, Technion - Israel Institute of Technology
Ayelet Baram-Tsabari, Technion - Israel Institute of Technology

**A99. Preservice Teacher Engagement during a
Nature-Based Fieldtrip**

Sara L. Salisbury, Middle Tennessee State University
Kristy L. Daniel, Texas State University

**A101. Designing for Middle School Youths' STEM Identity
Work in Out-of-School Programs: The STEM Affinity Toolkit**

Heidi B. Carlone, The University Of North Carolina At Greensboro
Michelle Lovett, The University of North Carolina at Greensboro
Alison Mercier, The University of North Carolina at Greensboro
David Schouweiler, The University of North Carolina at Greensboro

**A103. Conservation, NGSS and school-zoo interactions:
Examining teacher expectations for an urban zoo**

James F. Kiesel, California State University, Long Beach

**A105. STEM Experiences in High School Associated with
Postsecondary STEM Major Aspirations**

Melinda Whitford, University at Buffalo
Hsun_Yu Chan, Texas A&M University-Commerce
Hyejin Choi, University of Georgia
Meseret Hailu, The Ohio State University
Sheila DeRouen, Louisiana State University in Baton Rouge
Ya-Chi Hung, Pennsylvania State University

**A107. Exploring the Intersection of Math and Making:
Insights from Theory and Practice**

Scott A. Pattison, TERC
Andee Rubin, TERC

**A109. STEM Learning as Contribution on an Urban High
School Robotics Team**

Colin Hennessy Elliott, New York University

**A111. School Gardens as a Context to Facilitate
Science Practices**

Carmen A. Carrion, Georgia State University
Renee S. Schwartz, Georgia State University

**A113. Out-of-School-Time Educators Linking Youth
Funds of Knowledge in a Middle-School Engineering and
Planetary Science Curriculum**

Elisabeth Roberts, Northern Arizona University
Nena Bloom, Northern Arizona University
Joelle G. Clark, Northern Arizona University
Lori Rubino-Hare, Northern Arizona University
Haylee Archer, Northern Arizona University
Chris N. San Antonio, Museum of Science, Boston
Cathy P. Lachapelle, Museum of Science

Strand 09: Reflective Practice

Strand 9 Poster Session

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer
President: Preethi Titu, University Of Minnesota

**A115. Secondary General and Master Teachers' Structural
Perceptions about STEAM Education Based on Rogers'
Innovative Characteristics**

Sujeong Jang, Korea National University of Education
Seoung-Hey Paik, Korea National University Of Education
Sungki Kim, Jeonnam Science High school

Strand 14: Environmental Education**Strand 14 Poster Session**

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer

A117. Applying the AIM SSR framework - a pedagogical model for SSI based on authentic civic engagement

John R. Ruppert, Saint Peter's University

Masiel C. Infante, Saint Peter's University

Paul Bartlett, Saint Peter's University

A119. Climate Literacy Research: A Systematic Review

Devarati Bhattacharya, University of Nebraska, Lincoln, NE

A. McKinzie Sutter, University of Nebraska, Lincoln, NE

Kimberly N Carroll-Steward, University of Nebraska, Lincoln, NE

Cory T. Forbes, University Of Nebraska-Lincoln

Mark A Chandler, Columbia University - NASA/GISS, New York, NY

A121. Investigating Educators' Understanding of Climate Change from a Computational Thinking Systems Perspective

Wayne Breslyn, University of Maryland, College Park

Randy McGinnis, University Of Maryland

Strand 15: Policy**Strand 15 Poster Session**

3:15 PM-4:15 PM, Maryland C-D; Maryland and Baltimore Foyer

A123. Location, Location, Location... A Study of Chemistry Teachers in New York State

Linda Padwa, Stony Brook University

Keith Sheppard, Stony Brook University

Angela M. Kelly, Stony Brook University

Greg Rushton, Middle Tennessee State University

A125. Models of Exemplary STEM-Focused Elementary Schools: What are the Critical Components?

Erin E. Peters-Burton, George Mason University

Ann House, SRI International

Vanessa L. Peters-Hinton, Digital Promise

Julie Remold, SRI International

A127. STEM Education as Systemic Change: A Rural District Case Study

Tamara D Holmlund, Washington State University Vancouver

Kristin S Huggins, Washington State University Vancouver

Michele Haberlach, Washington State University Vancouver

Samya Matouk, Washington State University Vancouver

POSTER SESSION B**4:15pm – 5:15pm****Strand 07: Pre-service Science Teacher Education****Strand 7 Poster Session**

4:15 PM-5:15 PM, Maryland C-D; Maryland and Baltimore Foyer

B2. Back Pocket Questions: A Pedagogical Tool for Preservice Science Teachers to Notice Student Thinking

Kirsten K. Mawyer, University of Hawaii

Heather J. Johnson, Vanderbilt University

B4. Capturing Conceptions and Practices of Social Justice in an Urban Teacher Residency

Imelda L. Nava, UCLA

Melissa S Arias, UCLA

B6. Compare Physics Identity of Undergraduate Physics Majors Taking Tracks of Physics Teacher and General Physics

Jianlan Wang, Texas Tech University

Qiqi Li, Beijing Normal

B8. Critical Themes of the AAAS/NSF Dialogue: Stimulating Research on Preservice STEM Teachers in High-Need Schools

Ann M.L. Cavallo, The University of Texas at Arlington

Gregory Hale, University Of Texas At Arlington

B10. Develop Teacher Education Course to Support Chinese Preservice Biology Teachers in Scientific Modeling

Pingping Zhao, Hebei Normal University

Gaixiao Zhou, College of Life and Environmental Science,

Wenzhou University

Li Ke, Michigan State University

Enshan Liu, Beijing Normal University

B12. Developing Pre-service teachers' knowledge to teach academic language to English Learners: An Analysis of Methods course.

Vanashri Nargund-Joshi, New Jersey City University

B14. Developing prospective elementary teachers' self-efficacy for culturally responsive teaching of engineering

Donna L. Webb, George Fox University

Keelan P. LoFaro, Portland State University

B16. How Pre-Service Teachers' Philosophies Affect Their Perceptions of an Innovative STEM Program

Montserrat Dorantes, Hope College
 Abby Couwenhoven, Hope College
 Melissa Porchik, Hope College
 Stephen C. Scogin, Hope College

B18. Is the Engage Really Engaging?: How Pre-Service Teachers Engage their students in a 5E Lesson

Ramya K. Enugu, Great Hearts Irving
 Hayat Hokayem, Texas Christian University

B20. Lost in Translation: Challenges and Opportunities in Texas for a 2+2 Teacher Transfer Pipeline.

Steven Fletcher, St. Edward's University
 Shelly Rodriguez, University of Texas
 Wan Sin Lim, University of Massachusetts

B22. Pedagogical Content Knowledge Development in Preservice Science Teachers During Student Teaching

Soonhye Park, North Carolina State University

B24. Preservice Elementary Teachers' Exposure to the Science Practices in a Physics Course

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

B26. Pre-Service Teachers' Integration of Pedagogical Content Knowledge of Students' Understanding in Science and Instructional Strategies

Johannes Sæleset, UiT - The Arctic University of Norway
 Patricia J. Friedrichsen, University Of Missouri-Columbia

B28. Pre-service Teachers' Understanding of Modeling-based Assessment as a Formative Assessment in Science Classrooms

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

B30. Reporting on an Evolution in elementary Pre-service teachers' science Self-efficacy: unpacking the underlying teaching-learning experiences.

Tejaswini S. Dalvi, University of Massachusetts

B32. Simultaneous Preservice and Inservice Professional Development for Elementary Science

Joanne K. Olson, Texas A&M University
 Jacob Pleasants, Iowa State University
 Kristina M. Tank, Iowa State University
 Christopher Spinler, Iowa State University

B34. Teacher Candidate Perspectives on Problem-Based Learning Module in Science Methods Courses

Peter Rillero, Arizona State University
 Ying-Chih Chen, Arizona State University

B36. Using Socioscientific Issues to Improve Elementary Preservice Teacher Self-Efficacy

Melanie Kinskey, University of South Florida

B38. Where the Pipeline Ends:**Analyzing the Post-Graduation Outcomes of Two Urban STEM Teacher Preparation Programs**

David M. Sparks, University Of Texas At Arlington
 Debbie Jackson, Cleveland State University

**Strand 08: In-service Science Teacher Education
Strand 8 Poster Session**

4:15 PM-5:15 PM, Maryland C-D; Maryland and Baltimore Foyer

B40. Lesson study:**A novel approach for improving in-service teacher pedagogical design capacity for argumentation**

Jonathan Bowers, Wright State University
 Lisa Kenyon, Wright State University

B42. New Generation of STEM for New Southbound Countries: In-service Teacher-Training Workshop between Taiwan and Vietnam

Pei-Ling Lin, Science Education Centre, National Taiwan Normal University
 Khuyen Thi To Nguyen, Graduate Institute of Science Education, National Taiwan Normal University
 Shih-Wei Ko, Graduate Institute of Science Education, National Taiwan Normal University
 Van Hien NGUYEN, Hanoi National University of Education
 Van Bien Nguyen, Hanoi National University of Education
 Chun-Yen Chang, Science Education Center, National Taiwan Normal University

B44. A Professional Development Design Cycle to Support Embedding Modeling Practices into Socio-scientific Issue Teaching

Amanda N. Peel, University Of Missouri
 Hai T. Nguyen, University Of Missouri-Columbia
 Troy Sadler, University Of North Carolina Greensboro
 Patricia J. Friedrichsen, University Of Missouri-Columbia
 Laura Zangori, University Of Missouri
 Andrew T. Kinslow, Rock Bridge High School

B46. Cross-Contextual Analysis of Professional Learning and Classroom Environments:

Factors Impacting Integration of Climate Change

Mary K Stapleton, Towson University
Asli Sezen-Barrie, University of Maine
Gili Marbach-Ad, University Of Maryland

B48. Development and Validation of the Engineering Teaching Efficacy Belief Instrument

Ezgi Yesilyurt, University Of Nevada, Las Vegas
Hasan Deniz, University Of Nevada
Erdogan Kaya, University Of Nevada, Las Vegas

B50. Exploring Changes in Instructional Practices through Teacher Reflection

Nidaa Makki, The University of Akron
Kristin L. Koskey, The University of Akron

B52. From Inquiry to the Science and Engineering Practices: Implications for Professional Development

Benjamin R. Lowell, Boston College
Emily Reigh, Stanford University
Kathryn Ribay, Stanford University

B54. From Mundane to "Off-the-wall": Elementary Teachers' Perspectives and Reflections as they Make Shifts in Practice toward Reform-based Science Teaching

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

B56. Measuring Pedagogical Reform and the Integration of Engineering Design in STEM Classrooms

Tory H. Williams, University of Maryland Baltimore County
Jonathan Singer, University of Maryland, Baltimore County
Christopher Rakes, University of Maryland, Baltimore County
Jacqueline Krikorian, University of Maryland Baltimore County
Julia Ross, Virginia Tech College of Engineering

B58. Teacher Professional Learning through Co-design in a Design-based Research-Practice Partnership: Teacher Expertise in Computational Inquiry

Kristen Clapper Bergsman, University of Washington
Elaine Klein, University Of Washington
Veronica McGowan, University Of Washington
Deb Morrison, University Of Washington
Philip L. Bell, University Of Washington

**Strand 10: Curriculum, Evaluation, and Assessment
Strand 10 Poster Session**

4:15 PM-5:15 PM, Maryland C-D; Maryland and Baltimore Foyer

B60. A Rating Rubric for Integration for NGSS Alignment Analysis

Gavin W. Fulmer, University Of Iowa
Jamie L. Tanas, University of Iowa
Kathleen A. Weiss, University of Iowa

B62. Development of a Tool to Compare Student Socioscientific Reasoning of Environmental and Genetic Issues

Heidi Cian, Clemson University

B64. Embedding computational thinking into a middle school science meteorology curriculum

Nanette Dietrich, Millersville University Of Pennsylvania
Meridith Bruozas, Argonne National Laboratory
Carolyn Staudt, Concord Consortium

B66. How Can Science Teachers Enhance Their Knowledge of Assessment of NOS Based on the Development of NOS Tools by Researchers?

Jose M. Pavez, University of Georgia
Cary W. Sell, University Of Georgia/ Parkview High School

B68. Impact of Responsible Research and Innovation in scientific competence: a systematic literature review

Silvia Alcaraz-Dominguez, Universitat de Barcelona
Mario Barajas, Universitat de Barcelona

B70. Informing the Development of a Climate Change Survey for Eighth Graders Using a Rasch Modeling Approach

Nathan Quarderer, Northeast Iowa Community College
Gavin W. Fulmer, University Of Iowa

B72. Science and Engineering Practices Coverage in Zambia's Integrated Science Curriculum

Vivien M. Chabalengula, University Of Virginia
Frackson Mumba, University Of Virginia

B74. Student Results from Five Years of Testing a New NGSS Evolution Unit That Integrates Heredity

Louisa A. Stark, University of Utah
Dina Drits-Esser, University off Utah
Joseph M. Hardcastle, American Association for the Advancement of Science
Kristin M. Bass, Rockman Et Al

Molly Malone, University of Utah
 Sheila A. Homburger, University of Utah
 Jo Ellen Roseman, American Association for the
 Advancement Of Science
 George DeBoer, American Association for the Advancement
 Of Science
 Kevin Pompei, University of Utah

B76. Testing Generalizability Aspect of the Measure of Acceptance of the Theory of Evolution (MATE) Across Religions and Majors in Korean Sample

Yustika Sya'bandari, Kangwon National University
 Arif Rachmatullah, North Carolina State University
 Minsu Ha, Kangwon National University

B78. The Indonesia Vocational Secondary Science Teachers' Priority Regarding 21st Century Skills in Their Science Classrooms

Esty Haryani, Western Michigan University
 William W. Cobern, Western Michigan University

Strand 11: Cultural, Social, and Gender Issues
Strand 11 Poster Session

4:15 PM-5:15 PM, Maryland C-D; Maryland and Baltimore Foyer

B80. An Ethnographic Approach on Engineering Students in Japan: Three Storylines of Images of the Scientists

E.J. Bahng, Iowa State University
 Takako Yasuta, University of Aizu
 Jungpil Shin, University of Aizu
 Sissy S. Wong, University of Houston

B82. An examination of youth approaches to community engineering problem definition

Jacqueline Handley, University of Michigan
 Elizabeth B. Moje, University of Michigan

B84. Culture or Language?: Examining Perceptions, Challenges and Live Experiences of International Associate Instructors in a US University

Valarie L. Akerson, Indiana University
 Banu Avsar Erumit, Recep Tayyip Erdogan University
 Gayle A. Buck, Indiana University

B86. It got me back to science: arts-integrated science engagement for middle school girls

Terri Tinnell, University of Louisville
 Sheron L. Mark, University Of Louisville
 Olivia Alexander, University of Louisville
 Geena Constantin, Jefferson County Public Schools

B88. Parenting and Physics: Supporting undergraduate physics students who are Raising Children

Rose Young, St. Mary's College of Maryland

B90. Investigation of Girls and Vulnerable Populations' Access to STEM Higher Education and Workforce in Malawi

George E. Glasson, Virginia Polytechnic Institute and State University
 Joseph S. Mukuni, Virginia Polytechnic Institute and State University
 Brenda R. Brand, Virginia Tech University

B92. Searching for humanizing practices and experiences in science classrooms

Daniel Birmingham, Colorado State University
 Takumi Sato, Virginia Polytechnic Institute & State University

B94. Teachers' Descriptions of Social Justice Relative to their Beliefs about Science Teaching

Fredrica Nash, The George Washington University

B96. Why Some Persist: Factors Associated with Adolescent Girls' Science Interest Development

Stephanie Rafanelli, Stanford University Graduate School of Education

B98. Identifying and studying universities where women of color thrive in physics, math and computer science

Angela Johnson, St. Mary's College of Maryland
 Rose Young, St. Mary's College of Maryland
 Elizabeth Mulvey, St. Mary's College of Maryland

B100. Distributed expertise and relational agency: Examining the work of a science teacher professional development team

Christina Siry, University Of Luxembourg
 Sara E. Wilmes, University of Luxembourg
 Kerstin Te Heesen, University of Luxembourg

B102. Factors Influencing Students' STEM-related occupational expectations: Evidence from PISA 2015

Yang Yang, Qingdao University
 Jingying Wang, Capital Normal University

B104. Using Intersectionality to Highlight the Desires of Black Girls: Implications for Science Education

Ashley N Jackson, University of Michigan

Strand 12: Educational Technology**Strand 12 Poster Session**

4:15 PM-5:15 PM, Maryland C-D; Maryland and Baltimore Foyer

B106. Effective Online Curriculum for Improving Science Learning for All

Fatima Terrazas Arellanes, University Of Oregon
 Lisa Strycker, Research Assistant

B108. Introducing Computational Thinking and Object-Oriented Orientation in Primary Education Within the Context of Physical Science Courses

Kalliopi Kanaki, Department of Preschool Education, University of Crete, Rethymno, Greece
 Michail Kalogiannakis, Department of Preschool Education, University of Crete, Rethymno, Greece

B110. Learning Technologies and Misconception Alleviation in Genetics: Gleanings from Four Case Studies

Dionysius T. Gnanakkan, Illinois Institute Of Technology
 Norman G. Lederman, Illinois Institute Of Technology
 Judith S. Lederman, Illinois Institute Of Technology

B112. Learning to Teach Coding Using Collective Argumentation in Elementary Classrooms

Barbara A. Crawford, University Of Georgia
 AnnaMarie Conner, The University of Georgia
 ChanMin Kim, Penn State University

B114. The Code-Free Computational Thinking Framework: Teaching Science and CT Without Writing Code

Vance J. Kite, North Carolina State University
 Soonhye Park, North Carolina State University
 Eric N. Wiebe, North Carolina State University

B116. The Functionality of Flow: Using Game-Based Learning to Trigger Science Interest

Denise M. Bressler, Rutgers, The State University of New Jersey
 Shane Tutwiler, University of Rhode Island

B118. Comparing Authentic Inquiry Experiences: How do student practices differ between simulated and real-world inquiry?

Emily Royse, University of Northern Colorado
 Melanie Pepper, University of Northern Colorado
 Jessie Sutton, University of Northern Colorado

B120. Supporting Role of "Gas Properties" Computer Simulation on Students' Arguments about Behavior of Gases

Tugba Keser Solak, Trakya University

B122. Describing the practices of members within one niche of social paleontology's digital ecology

Lisa Lundgren, University of Florida
 Kent J. Crippen, University of Florida
 Richard T. Bex, University of Florida

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

4:15 PM-5:15 PM, Maryland C-D; Maryland and Baltimore Foyer

B124. Exploring and Characterizing Preservice Elementary Teachers' Understandings of Science as Socially and Culturally Embedded

Jeffrey D Radloff, Purdue University
 David C. Eichinger, Purdue University

B126. Extending the Utility of Views of Nature of Science Assessment through Epistemic Network Analysis

Erin E. Peters-Burton, George Mason University
 Jennifer C. Parrish, University of Northern Colorado
 Bridget K. Mulvey, Kent State University

B128. History of science in science education: Rationales, evidence, and implications for future research

Sijin Yan, Texas A&M University
 Xihong Xu, Texas A&M University
 Michael P. Clough, Texas A&M University

B130. Scientists and Science Teachers' Views on Handling Data in Scientific Investigations

Hui Jin, Educational Testing Service
 Hayat Al Hokayem, Texas Christian University

B132. Students' Functional Understanding of Nature of Science: Contributions from a Film-based Teaching Activity

Rosária Justi, Universidade Federal de Minas Gerais
 Monique Santos, Universidade Federal de Minas Gerais

B134. Disentangling the Meaning of STEM: Implications for Science Education

Valarie L. Akerson, Indiana University
Angela H. Burgess, Indiana University Bloomington
Alex Gerber, Indiana University
Meize Guo, Indiana University
Taukir Ahmed Khan, Indiana University Bloomington
Steven Newman, Indiana University

B136. Digital Triad in Science and Technology Education

Dina Tsybulsky, Technion-Israel Institute of Technology
Aharon Gero, Technion - Israel Institute of Technology
Ilya Levin, Tel Aviv University

B138. University geoscientists' conceptualization and use of geological (scientific) observation in research and teaching

Julianne Snider, Pennsylvania State University

Graduate Student Forum

5:30pm – 7:00pm, Baltimore A

JRST Editorial Team Meeting/Dinner

6:00pm – 8:30pm, Watertable A – B

Sponsored by Wiley-Blackwell (By invitation only)

International Journal of Science and Mathematics Education Reception

6:00pm – 7:30pm, Homeland

Sponsored by Springer (By invitation only)

Routledge Reception

6:00pm – 7:30pm, Guilford

Sponsored by *Journal of Science Education* (By invitation only)

Tuesday, April 2, 2019

Conference Registration

7:30am – 4:30pm, Maryland Foyer

Concurrent Session #7

8:00am – 9:30am

Research Committee

Admin Symposium-Graduate Student Research Symposium

8:00 AM-9:30 AM, Homeland

Graduate Student Research Symposium

Amber S. Bismack, University of Michigan
Margaretann G. Connell, Illinois Institute of Technology
Thomas A. Kameronoski, The Pennsylvania State University
Ayca K. Fackler, University of Georgia
Francesca A. Williamson, Indiana University

Research Committee

Admin Symposium-Integrating Science and Engineering with a Focus on Evidence of Student Learning

10:00 AM-11:30 AM, Baltimore A

Integrating Science and Engineering with a Focus on Evidence of Student Learning

Selcen Guzey, Purdue University
Senay Purzer, Purdue University
Kerrie Douglas, Purdue University
James Pellegrino, University of Illinois at Chicago
Corey Schimpf, Purdue University
Kristen B. Wendell, Tufts University
Jessica Watkins, Vanderbilt University

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Thinking Processes

8:00 AM-9:30 AM, Watertable Salon A

President: Chanmi Jung, Ewha Womans University, Research Institute of Ecoscience

Different ways of thinking and speaking on acids/bases: a case study on hair treatment

Edenia M R Amaral, Federal Rural University of Pernambuco, Brazil
Flávia C V Silva, Federal Rural University of Pernambuco, Brazil

Productive Thinking and Science Learning in Design Teams

Selcen Guzey, Assistant Professor, Purdue University
Ji Yoon Jung, Graduate student, Purdue University

The 8-9th graders' abductive reasoning in authentic geologic fieldwork: Focusing on catching geologic clues

Chanmi Jung, Ewha Womans University, Research Institute of Ecoscience
Donghee Shin, Ewha Womans University

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Student Argumentation

8:00 AM-9:30 AM, Federal Hill

President: Alberto Bellocchi, Queensland University of Technology

Examining Secondary Students' Use of Claims, Evidence, and Reasoning to Evaluate Data in Life Sciences

May Lee, Michigan State University
Melissa Kjellvik, Michigan State University
Elizabeth Schultheis, Elizabeth Schultheis
Louise Mead, Michigan State University
Molly Stuhlsatz, BSCS

In Their Own Words: Exploring Students' Communicative and Argumentative Competency in Fourth Grade Classrooms

Ashley Hunt, University of Virginia
Sara E Rimm-Kaufman, University of Virginia
Eileen G. Merritt, Arizona State University
Nicole Bowers, Arizona State University

Levels of students' arguments regarding theoretical scientific models

Sulaiman M. Al-Balushi, Sultan Qaboos University

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Eliciting and Supporting Students' Doing Science in School

8:00 AM-9:30 AM, Maryland A

Discussant: Rosemary Russ, University Of Wisconsin-Madison

Designing for diverse trajectories of student-driven scientific practice

Rob Hayes
Julia Gouvea, Tufts University

***Responsive Teaching Training for Teaching Assistants:
Examining Shifts in Noticing and Responding***

Matt Simon

Julia Gouvea, Tufts University

***Inviting Natural Ways of Building Knowledge and
Community into the Science Classroom***

Lara Appleby, Tufts University

Vesal Dini, Tufts University

David Hammer, Tufts University

***Structuring Class Conversation about Condensation to
Position Students as Active Sense Makers***

Yara Shaban

Brian Gravel, Tufts University

Discussant

Rosemary Russ, University Of Wisconsin-Madison

**Strand 05: College Science Teaching and Learning
(Grades 13-20)**

Investigating students' systems thinking

8:00 AM-9:30 AM, Watertable Salon B

President: Ashley N. Harlow, University of California, Irvine

***Opportunities for Active Learning: Undergraduate
Students' Reasoning about Water Systems using a
Computer-Based Model***

Diane Lally, University of Nebraska, Lincoln

Cory T. Forbes, University Of Nebraska-Lincoln

***Investigating college students' translation and
representation of gas laws through the lens of
systems thinking***

Ya-Chun Chen, Institute of Education, National Sun

Yat-sen University

Huann-Shyang Lin, National Sun Yat-Sen University

***Patterns of System Thinking While Using OPM
Conceptual Models***

Niva Wengrowicz, Technion

Ahmad Jbara, Assistance Professot Computer Science and
Engineering University of Connecticut

**Strand 07: Pre-service Science Teacher Education
*STEM Design & Competencies***

8:00 AM-9:30 AM, James

President: Olugbenga G. Akindoju, Lagos State University

***Developing Pre-Service Science Teachers'
Understanding of the Engineering Design Process
and the Scientific Method***

Alexis A. Rutt, University of Virginia

Laura K. Pottmeyer, University Of Virginia

Frackson Mumba, University Of Virginia

***Effects of STEM Education on Pre-Service Science
Teachers' Perception of 21st Century Skills
and Competences***

Ayşe Ciftci, Mus Alparslan University

Mustafa S. Topcu, Yildiz Technical University

Aslı Koçulu, Yildiz Technical University

Searching for STEM Integration: Designers or Teachers?

Ibrahim Delen, Usak University

Gül Unal Coban, Dokuz Eylül University Buca Faculty of Education

Tom Bielik, Michigan State University

**Strand 07: Pre-service Science Teacher Education
*Professional Identity & Self-Efficacy***

8:00 AM-9:30 AM, Maryland F

President: Paul N. Iwuanyanwu, University Of the Western Cape

***Investigating Preservice Elementary Teachers' Science
Teacher Identity and Self-efficacy***

Deepika Menon, Towson University, Maryland

Saiqa Azam, Memorial University Of Newfoundland

***Negotiating Dissonant Identities as a Teacher of Science
During Student Teaching***

Martha M Canipe, Northern Arizona University

The Power of Perception & Emotion: Examining Preservice

Elementary Teachers' Professional Identity

Stephanie Hathcock, Oklahoma State University

**Strand 08: In-service Science Teacher Education
*Characteristics of Successful Teacher Learning***

8:00 AM-9:30 AM, Watertable Salon C

President: Christine R. Lotter, University of South Carolina

***K-8 Teacher Blended Learning Professional Development,
NGSS, and Communities of Practice:
A Mixed Methods Study***

Leah Bug, Pennsylvania State University

***An Exploration of #NGSSchat Through Social
Network Analysis***

Joshua Reid, Middle Tennessee State University

Joshua M. Rosenberg, The University of Tennessee, Knoxville

Matthew J. Koehler, Michigan State University
 Christian Fischer, University of California, Irvine
 Thomas J. McKenna, University of Connecticut

Value-Added Effects of Science Teachers' Short-term Follow-up PD on Their Students' Performance on Science Tests

Soon Chun Lee, Wichita State University

**Strand 08: In-service Science Teacher Education
 Secondary Teacher Learning**

8:00 AM-9:30 AM, Pride of Baltimore

President: Mary Ewing, University of North Carolina, Chapel Hill

Professional Age of Isolated Teachers as a Mediator of Chemistry Performance in High Needs Schools

Greg Rushton, Middle Tennessee State University
 Angela M. Kelly, Stony Brook University
 Linda Padwa, Stony Brook University
 Keith Sheppard, Stony Brook University

Teachers' Beliefs and Practices of STEM Integration in a Complex System through Interdisciplinary Collaboration

Hui-Hui Wang, Purdue University
 Neil A. Knobloch, Purdue University
 Mingla Charoenmuang, Purdue University
 Roger Tormoehlen, Purdue University

Using Teacher Professional Development to Create High School Science Reform

Dennis W. Sunal, University Of Alabama
 Marsha Simon, The University of Alabama
 Cynthia S. Sunal, University Of Alabama
 James W. Harrell, University of Alabama
 Justina A. Ogodo, The Ohio State University
 Michelle Wooten, University of Alabama
 Haley Harville-York, University of Alabama
 Marilyn M. Stephens, University of Alabama
 Rachael Tawbush, University of Alabama
 Mohan Aggarwal, Alabama A&M University

**Strand 10: Curriculum, Evaluation, and Assessment
 Three-dimensional assessments and curriculum design**

8:00 AM-9:30 AM, Kent

President: Gavin W. Fulmer, University Of Iowa

Assessing Curriculum for NGSS Alignment: Oversimplification of Cognitive Load and Separation of the Three Dimensions

Benjamin R. Lowell, Boston College
 Kevin Cherbow, Boston College
 Katherine L. McNeill, Boston College

Building Toward Sensemaking – Adapting and Piloting an Evidence-Based High School Chemistry Curriculum

Ryan L. Stowe, Michigan State University
 Deborah G. Herrington, Grand Valley State University
 Robert L. McKay, Michigan State University
 Melanie M. Cooper, Michigan State University

Design Principles for Amending the Next Generation Science Standards for Research and Practice

Gary Weiser, Teachers College, Columbia University
 Lei Liu, Educational Testing Service
 Cindy E. Hmelo-Silver, Ctr. for Research on Learning & Technology
 Asmalina Saleh, Indiana University
 Karyn Housh, Indiana University

Three-Dimensional Assessment of NGSS Upper Elementary Engineering Design Performance Expectations

Kevin W. McElhaney, SRI International
 Satabdi Basu, SRI International
 Tallie Wetzel, SRI International
 Jared Boyce, SRI International

Tracking the Quality of Classroom-Embedded, Formative Assessments in the Era of NGSS

Justin R. McFadden, University of Louisville
 Matthew Trzaskus, University of Louisville
 Terri Tinnell, University of Louisville
 Brian Robinson, University of Louisville
 Thomas R. Tretter, University of Louisville

**Strand 10: Curriculum, Evaluation, and Assessment
 Promoting Sustainability Through Research-Practice Partnerships**

8:00 AM-9:30 AM, Maryland B

Discussant: Kathleen Bergin, National Science Foundation

President: Jayma Koval, Georgia Institute Of Technology, Jessica Gale, Georgia Institute Of Technology - CEISM

Building Partnerships to Promote Sustainability

Marion Usselman, Georgia Institute Of Technology
 Meltem Alemdar, Georgia Institute Of Technology
 Mary Moriarty, Moriarty Research and Evaluation Associates, LLC
 Kathleen Bergin, National Science Foundation

Sustaining Change at the Classroom Level: Advancing Science Teaching Practices through a Math-Science Partnership

Jessica Gale, Georgia Institute Of Technology - CEISM
 Meltem Alemdar, Georgia Institute Of Technology
 Sabrina Grossman, Georgia Institute Of Technology - CEISM
 Jayma Koval, Georgia Institute Of Technology

Developing Curricular Sustainability within a Math and Science Partnership

Jayma Koval, Georgia Institute Of Technology
 Meltem Alemdar, Georgia Institute Of Technology
 Jessica Gale, Georgia Institute Of Technology - CEISMC
 Sunni Newton, Georgia Institute of Technology
 Marion Usselman, Georgia Institute Of Technology

Designing for Sustaining Change with School Systems

Sabrina Grossman, Georgia Institute Of Technology - CEISMC
 Meltem Alemdar, Georgia Institute Of Technology
 Mary Moriarty, Moriarty Research and Evaluation Associates
 Sunni Newton, Georgia Institute of Technology
 Marion Usselman, Georgia Institute Of Technology

***Strand 11: Cultural, Social, and Gender Issues
 Symposium-Using Race-Visible Pedagogy to Disrupt
 Persistent Inequities in the STEM Education of African
 American Learners***

8:00 AM-9:30 AM, Baltimore B

Using Race-Visible Pedagogy to Disrupt Persistent Inequities in the STEM Education of African American Learners

Jomo W. Mutege, Indiana University, IUPUI
 Glenda L. Prime, Morgan State University
 Felicia Moore Mensah, Teachers College, Columbia University
 Gale A. Seiler, Iowa State University
 Vanessa Dodo Seriki, University of Houston Clear Lake
 Julius L Davis, Bowie State University
 Ramon B Goings, Loyola University Maryland
 Keisha M Allen, University of Maryland Baltimore County
 Roni M Ellington
 Jacqueline Leonard, University of Wyoming

***Strand 11: Cultural, Social, and Gender Issues
 At the Intersection of Culture and Community:
 Student and Family Science Learning***

8:00 AM-9:30 AM, Gibson

President: Ramya Sivaraj, University of Minnesota

***Location-based contextual learning:
 the case of Druze middle school students***

Miri Barak, Technion, Israel Institute Of Technology
 Shadi Asakle, Technion - Israel Institute of Technology

Culture, Context and Scientific Explanations by Biology Students: An African Case Study

Tunde Owolabi, Lagos State University, Lagos, Nigeria
 Sunday Banjoko, Lagos State University, Lagos, Nigeria
 Immaculata C. Egerue, Lagos State University, Lagos, Nigeria

Attitude toward Science among Indonesian elementary and middle school students: Finding on gender and academic level

Rahmi Q. Aini, Kangwon National University
 Arif Rachmatullah, North Carolina State University
 Minsu Ha, Kangwon National University

Holistic Learning in a Global Age: A Case Study of Family Engagement in Science Education

Ramya Sivaraj, University of Minnesota
 Bhaskar Upadhyay, University of Minnesota

Strand 12: Educational Technology***Technology in Next Generation Learning Laboratories***

8:00 AM-9:30 AM, Fells Point

President: Len Annetta, East Carolina University

E-Learning In Chemistry Education: Self-Regulated Learning and Activity Patterns In a Virtual Classroom

Yael Shwartz, The Weizmann Institute Of Science
 Rachel Rosanne Eidelman, Weizmann Institute

Evaluating the Design and Learning Outcomes of a Knowledge Integration Based Online General Chemistry Unit

William J. Farina, Lehigh University
 Alec M. Bodzin, Lehigh University

Interpretational Functions of Imagery in Instructional Media for Science Education

Matthew Peterson, North Carolina State University
 Cesar Delgado, North Carolina State University
 Kayla Norville, North Carolina State University
 Clement Bordas, North Carolina State

The Haptic Bond: Learning about Energy and Forces in Chemical Bonding with ELI-Chem Environment

Asnat R. Zohar, University of Haifa
 Sharona T. Levy, University of Haifa

Strand 12: Educational Technology***Student Use of Evidence in Multi-User Virtual and Augmented Reality-Based Science Curricula: Examples from EcoLearn***

8:00 AM-9:30 AM, Maryland E

President: Tina Grotzer, Harvard University

Developing Scientific Explanations in the Face of Highly-Variable Real World Data Collection Supported by Augmented Reality and Environmental Probeware

Amy M. Kamarainen, Harvard Graduate School of Education

Joseph M. Reilly, Harvard University
 Denise M. Bressler, Rutgers University
 M. Shane Tutwiler, University of Rhode Island
 Meredith Thompson, MIT
 Shari J. Metcalf, Harvard University
 Tina Grotzer, Harvard University
 Chris Dede, Harvard University

Uncovering the Roots of Self-Efficacy through Field Trip Conversations

Meredith Thompson, MIT
 Denise M. Bressler, Rutgers University
 Chris Dede, Harvard University
 Tina Grotzer, Harvard University

The Importance of Time and Sequence on Learning in Mobile Augmented Reality

Joseph M. Reilly, Harvard University
 Shari J. Metcalf, Harvard University
 Chris Dede, Harvard University
 Tina Grotzer, Harvard University

Linking Evidence and Concept Maps in Virtual Environments for Ecosystems Science Learning

Shari J. Metcalf, Harvard University
 Joseph M. Reilly, Harvard University
 Jamie Studwell, Education Researcher and Quantitative Analyst
 Amy M. Kamarainen, Harvard Graduate School of Education
 Tina Grotzer, Harvard University
 Chris Dede, Harvard University

Networking Break

9:30am – 10:00am, Ballroom Foyer

Coffee and tea

Concurrent Session #8

10:00am – 11:30am

Research Committee

Admin Symposium-African Diasporic Science Education: Teaching and Learning Through Activism

8:00 AM-9:30 AM, Baltimore A

African Diasporic Science Education: Teaching and Learning Through Activism

Mary M. Atwater, University Of Georgia
 Rona M. Robinson-Hill, Ball State University
 Justin Shaifer, Fascinate Inc.; Columbia University

Strand 01: Science Learning, Understanding and Conceptual Change

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

10:00 AM-11:30 AM, Homeland

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

Sarah J. Fick, University of Virginia
 Jeffrey Nordine, Leibniz Institute for Science and Mathematics Education (IPN)
 Kevin W. McElhaney, SRI International
 Cindy E. Hmelo-Silver, Ctr. for Research on Learning & Technology
 Joseph S. Krajcik, Michigan State University
 Anne Westbrook, BSCS Science Learning

Strand 01: Science Learning, Understanding and Conceptual Change

Analyzing Scientific Phenomena

10:00 AM-11:30 AM, Gibson

Presider: Emine Sahin, Indiana University

Five years of evolution acceptance– Are general students different than biology students?

Ryan Dunk, Syracuse University
 Jason R. Wiles, Syracuse University

Ordering of Arts and Science Integration to Reverse Misconceptions

Joseph T. Wong, University of California, Irvine
 Sage Andersen, University of California, Irvine
 Michael Corrigan, Multi-Dimensional Education Inc.
 Vince Sipkovich, Science Specialists
 Brad Hughes, University Of California, Irvine

Students' Learning of Practices of Scientific Investigations – A Video-Based Analysis

Andreas Vorholzer, Justus Liebig University Giessen
 Jörn J. Hägele, Justus Liebig University Giessen
 Claudia Von Aufschnaiter, Justus Liebig University Giessen

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Issues in Physics Learning

10:00 AM-11:30 AM, Watertable Salon A

Presider: Moraima Castro-Faix, Rutgers University

Longitudinal Analysis of Identity Trajectories of Undergraduate Physics Students

Gina M Quan, University of Colorado Boulder

Chandra Turpen, University Of Maryland, College Park

Andrew Elby, University of Maryland

Students in Upper Secondary Education Solving Algebraic Physics Problems

Süleyman Tursucu, Science Education and Communication

The productive failure approach in physics classes

Knut Wille, Physics Education Group - Leibniz Universität Hannover

Gunnar Friege, Leibniz Universitaet Hannover, Institute for

Mathematics and Physics Education

The Influence of Institutional Elements in Reforming

William E. Lindsay, University of Colorado Boulder

Valerie K Otero, University of Colorado, Boulder

Strand 02: Science Learning: Contexts, Characteristics and Interactions***Engineering in the High School Classroom***

10:00 AM-11:30 AM, Federal Hill

President: Ala Samarapungavan, Purdue University***"It's not a project. It's a real thing that could save lives":******A Case Study of Applied Engineering at the High School Level***

Jessica Gale, Georgia Institute Of Technology - CEISMC

Affects – Essential for Meaningful Engagement in High School Biology Inquiry/Engineering Design Group Activities

Martina Nieswandt, University Of Massachusetts Amherst

Elizabeth McEneaney, UMass-Amherst

Exploring High-Achieving High School Students' Understanding of the Nature of Engineering

Mehmet Aydeniz, University Of Tennessee

Chien-fei Chen, The University of Tennessee

Anne Skutnik, The University of Tennessee

Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies***Characterizing Elementary Science Teachers'******Development with an Eye toward Sensemaking:******A Related Paper Set***

10:00 AM-11:30 AM, Maryland A

Discussant: Matthew Kloser, University Of Notre Dame***Sensemaking and teaching in the science education literature: A conceptual review***

Annemarie Palincsar, University of Michigan

Elizabeth A. Davis, University of Michigan

Matthew Kloser, University Of Notre Dame

The Development of High-leverage Science Teaching Practices among Novice Elementary Teachers

Elizabeth A. Davis, University of Michigan

Annemarie Palincsar, University of Michigan

Novice Elementary Teachers' Development of their Content Knowledge for Teaching Science Over Time

Amber S. Bismack, University of Michigan

Elizabeth A. Davis, University of Michigan

Annemarie Palincsar, University of Michigan

Preservice Elementary Teacher Knowledge and Use of Science Practices

Adam Bennion, University of Michigan

Elizabeth A. Davis, University of Michigan

Annemarie Palincsar, University of Michigan

Novice Teachers' Use of Tools and Frameworks from their Science Methods Course

John-Carlos Marino, University of Michigan

Elizabeth A. Davis, University of Michigan

Annemarie Palincsar, University of Michigan

Strand 05: College Science Teaching and Learning (Grades 13-20)**Development of TAs and preservice educators**

10:00 AM-11:30 AM, Watertable Salon B

President: Claudia P. Aguirre-Mendez, Emporia State University***Examining Biology Teaching Assistants' Perceptions of Their Teaching and Their Concerns for Improvement***

Hillary A Barron, University of Minnesota - Twin Cities

Lorelei E Patrick, University of Minnesota

Julie C Brown, University of Florida

Sehoya Cotner, University of Minnesota

Instructional Supports for Teaching Assistants to Foster Explanatory Rigor in Undergraduate Biology Labs

Anna S. Grinath, Middle Tennessee State University

Tina B. Carter, Middle Tennessee State University

Angela Google, Middle Tennessee State University

Zhigang Jia, Middle Tennessee State University

PCK for Teaching Chemical Bonding of TAs Compared to Teachers

Marissa S. Rollnick, Wits University

Frackson Mumba, University Of Virginia
 Bette Davidowitz, University of Cape Town
 Rene Toerien, University of Cape Town

***Statistics Anxiety of Pre-Service Teachers;
 Exploration of a Multi-Dimensional Concept***

Phina Steinberger, Orot Israel College of Education

***Undergraduate Learning Researchers as Vehicles to Foster
 Formative Assessment in Large STEM College Classrooms***

Young Ae Kim, University of Arizona
 Jonathan Cox, University of Arizona
 Kathlyn Southard, University of Arizona
 Lisa Elfring, University of Arizona
 Paul Blowers, University of Arizona
 Vicente A. Talanquer, University of Arizona

**Strand 06: Science Learning in Informal Contexts
 Informal STEM Education Professionals**

10:00 AM-11:30 AM, Pride of Baltimore

President: Rebecca D. Swanson, Tufts University

***Using an Evidence-based Professional Learning
 Framework to Strengthen and Broaden the Informal
 STEM Learning (ISL) Field***

Martin Storksdieck, Oregon State University
 Nancy L. Staus, Oregon State University
 Nancee Hunter, Oregon State University

***An Analysis of Early Childhood Creative Engagement and
 Facilitator Interaction at the Color Wall***

Meghan Macias, University of California, Santa Barbara
 Jasmine Marckwordt, University of California, Santa Barbara

***An Exemplary Scientist's Storytelling in A High School
 Students' Science Internship***

Pei-Ling Hsu, University Of Texas At El Paso

***The Emotional Labor of Librarians Facilitating an Out-of-
 School Family-Based STEAM Making Program***

Nancy Price, University of Washington

**Strand 07: Pre-service Science Teacher Education
 Culturally & Socially Responsive Pedagogy**

10:00 AM-11:30 AM, James

President: Erdogan Kaya, University Of Nevada, Las Vegas

***An Examination of Well-prepared Urban Science Teachers:
 Teacher Preparation as Identity Work***

Lisa Marco-Bujosa, Villanova University

***Equipping Pre-service STEM Teachers with Culturally
 Responsive Pedagogical Knowledge for Urban
 High-Need Schools.***

Justina A. Ogodo, The Ohio State University
 Karen Irving, The Ohio State University
 Patti Brosnan, The Ohio State University
 Lin Ding, Ohio State University

***Preservice Teachers' Attention To and Awareness Of
 Students' Resources in the Science Classroom***

Heather J. Johnson, Vanderbilt University
 Panchompoo Wisittanawat, Vanderbilt

**Strand 08: In-service Science Teacher Education
 Supporting the Exploration of Computational Thinking
 and Data**

10:00 AM-11:30 AM, Watertable Salon C

President: Douglas B. Larkin, Montclair State University

***Exploring Elementary Teachers and Students Perceptions
 of Computational Thinking***

Abeera P. Rehmat, Purdue University
 Hoda Ehsan
 Ibrahim H. Yeter, Purdue University
 Tamara J. Moore, Purdue University
 Monica E. Cardella, Purdue University

***Supporting Science Teachers' Focus on Data in
 Secondary Classrooms***

Tobias Irish, University of Hawaii at Hilo
 Alan R. Berkowitz, Cary Institute of Ecosystem Studies
 Cornelia Harris, SUNY Albany
 Carol Brewer, Prairie Ecotone Research Group, LLC

***Teachers' emerging disciplinary questions in the context
 of computational play***

Brian Gravel, Tufts University
 Maria C C. Olivares, TERC
 Eli Tucker-Raymond, TERC
 Aditi Wagh, Tufts University
 Ezra Gouvea, Tufts University
 Amon Millner, Olin College of Engineering
 Ada Ren, TERC

**Strand 10: Curriculum, Evaluation, and Assessment
 Supporting teachers in development, assessment, and
 instruction - part II**

10:00 AM-11:30 AM, Kent

President: Keith R. Langenhoven, University Of the Western Cape

Assessing Pre-service Science Teachers' Views of Scientists, their Activities and Locations:

The VoSAL Questionnaire

Bianca Reinisch, Freie Universität Berlin
Moritz Krell, Freie Universität Berlin

Attitudes toward STEM Teaching and Assessment Methods: Policy Makers and Teachers

Hrisilda Matathia Tor, Faculty of Education in Science and Technology Technion, Haifa, Israel
Effrat Akiri, Faculty of Education in Science and Technology Technion, Haifa, Israel
Judy Yehudit Dori, Faculty of Education in Science and Technology Technion, Haifa, Israel Samuel Neaman Institute, Haifa, Israel

Improving Understanding of Teaching Practice for Student Learning: A Holistic Measure of Fidelity of Implementation

Eileen McGivney, Harvard Graduate School of Education
Emily Gonzalez, Harvard Graduate School of Education
Sabrina G. De Los Santos, TERC
Amy M. Kamarainen, Harvard Graduate School of Education
Tina Grotzer, Harvard University

Teacher Perspectives on Enhancing Phenomena-Based Instruction Through Immersive Multimedia Narrative Exploring Climate and Disease Dynamics

James P. Planey, University of Illinois at Urbana Champaign
Barbara Hug, University Of Illinois At Urbana-Champaign

Towards Developing Classroom Supports for Assessing Students' Knowledge-In-Use

Samuel Severance, Michigan State University
Consuelo J. Morales, University of Michigan
Chanyah Dahsah, Michigan State University
Phyllis H. Pennock, CREATE for STEM/Michigan State University

Strand 10: Curriculum, Evaluation, and Assessment Evolution and cultural understanding

10:00 AM-11:30 AM, Maryland F

President: Roya Heydari, BioBus

Analysis of Science Textbooks as Cultural Supportive Tools: the Case of Arab Countries

Saouma B. Boujaoude, American University Of Beirut
Razan H. Nouredin, American University of Beirut

Measuring Evolution Acceptance using the GAENE: Influences of Gender, Race, Degree-plan, and Instruction

Gena C. Sbeglia, Stony Brook University
Ross H. Nehm, Stony Brook University - SUNY

Measuring Science Teachers' Emotions around Evolution with Real World Scenarios

William L. Romine, Wright State University
Rutuja Mahajan, Wright State University
Amber Todd, Wright State University

Strand 10: Curriculum, Evaluation, and Assessment Achieving Three-dimensional Learning in Diverse Classrooms

10:00 AM-11:30 AM, Maryland B

Discussant: David Stroupe, Michigan State University

President: Charles W. Anderson, Michigan State University

Developing Automated Scoring for Large-scale Assessments of Three-dimensional Learning

Jay Thomas, Act Inc.
Ellen Holste, Michigan State University
Karen Draney, UC Berkeley
Shruti Bathia, University of California, Berkeley
Charles W. Anderson, Michigan State University
David Stroupe, Michigan State University

What factors affect students' learning?

Qinyun Lin, Michigan State University
Ken Frank, Michigan State University
Charles W. Anderson, Michigan State University

Patterns in Project Classrooms:

Learning Gains and Local Contexts

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

Relationships Among Patterns in Classroom Discourse and Student Learning Performances

Beth A. Covitt, University Of Montana - SpectrUM Discovery Area
Christie Morrison Thomas, Michigan State University
Qinyun Lin, Michigan State University
Elizabeth X. De Los Santos, University of Nevada, Reno
Charles W. Anderson, Michigan State University

Strand 11: Cultural, Social, and Gender Issues Symposium-Unequal Distribution of Educational Resources for K-12 Science Instruction

10:00 AM-11:30 AM, Baltimore B

President: Patrick S. Smith, Horizon Research, Inc.

Unequal Distribution of Educational Resources for K-12 Science Instruction

Peggy J. Trygstad, Horizon Research, Inc.
Eric R. Banilower, Horizon Research, Inc.
Patrick S. Smith, Horizon Research, Inc.

Strand 12: Educational Technology

Virtual and location-based education through technology

10:00 AM-11:30 AM, Fells Point

Presider: Jeffrey L. Ram, Wayne State University

GIS Integration in Secondary School Science Classrooms: Effects on Student and Teacher Spatial Thinking Ability

Siqi Li, SUNY University at Buffalo

Xiufeng Liu, State University Of New York At Buffalo (SUNY)

Middle school students generate location-based multimedia questions as a means of promoting scientific thinking

Shadi Asakle, Technion - Israel Institute of Technology

Miri Barak, Technion, Israel Institute Of Technology

Mission HydroSci:

A NGSS aligned Virtual Learning Environment

Eric P. Wulff, University of Missouri

Will Romine, Wright State University

Troy D. Sadler, University of North Carolina Greensboro

A.J. Womack, University of Missouri

James M. Laffey, University of Missouri

Sean P. Goggins, University of Missouri

Joseph Griffin, University of Missouri

Justin Sigoloff, University of Missouri

The Implementation of Socio-Environmental Science Investigations Using Mobile Learning and Web GIS: Pilot Test Findings

Alec M. Bodzin, Lehigh University

Thomas Hammond, Lehigh University

Qiong Fu, Lehigh University

William J. Farina, Lehigh University

Kate Popejoy, Popejoy STEM, LLC

Strand 14: Environmental Education

Adolescent anthropo- and ecocentrism: Qualitative conceptual views and quantitative relationships

10:00 AM-11:30 AM, Maryland E

Presider: Franz X Bogner, University of Bayreuth Full Professor, Director of the Centre of Math & Science Education (Z-MNU)

Categorizing adolescent conceptions about biodiversity Jennifer Schneiderhan, University of Bayreuth Federal teacher qualification program (BMBF)

Franz X Bogner, University of Bayreuth Full Professor, Director of the Centre of Math & Science Education (Z-MNU)

Relationship between Preservation, Utilization and Appreciation of Nature among different university student groups

Alexandra Stoeckert, University of Bayreuth OSOS program (HORIZON2020)

Franz X. Bogner, University of Bayreuth Full Professor, Director of the Centre of Math & Science Education (Z-MNU)

Contrasting values of the 2-MEV model, Appreciation of Nature and Morningness/Eveningness

Patricia Raab, University of Bayreuth Federal teacher qualification program (BMBF)

Franz X. Bogner, University of Bayreuth Full Professor, Director of the Centre of Math & Science Education (Z-MNU)

Environmental Literacy Model: Integration of environmental knowledge, attitudes and behavior

Michaela Maurer, University of Bayreuth OSOS program (HORIZON2020)

Franz X. Bogner, University of Bayreuth Full Professor, Director of the Centre of Math & Science Education (Z-MNU)

Lunch—On Your Own

11:30am – 1:15pm

Committee Meetings

11:45am – 1:10pm, Concurrent Session Rooms

Outstanding Doctoral Research Award Committee Meeting

11:45 AM-1:10 PM, James

Early Career Research Award Committee Meeting

11:45 AM-1:10 PM, Federal Hill

Distinguished Contributions through Research Award Committee Meeting

11:45 AM-1:10 PM, Fells Point

Equity and Ethics Committee Meeting

11:45 AM-1:10 PM, Gibson

External Policy and Relations Committee Meeting

11:45 AM-1:10 PM, Homeland

Research Committee Meeting

11:45 AM-1:10 PM, Baltimore A

Membership Committee Meeting

11:45 AM-1:10 PM, Maryland F

Election Committee Meeting

11:45 AM-1:10 PM, Maryland B

International Committee Meeting

11:45 AM-1:10 PM, Maryland A

Program Committee Meeting

11:45 AM-1:10 PM, Kent

Publications Advisory Committee Meeting

11:45 AM-1:10 PM, Baltimore B

Graduate Student Committee Meeting

11:45 AM-1:10 PM, Maryland E

Website Committee Meeting

11:45 AM-1:10 PM, Water Table A

Looking Toward the Future:

DCRA Recipients and NARST Leadership Presentations

1:20pm – 2:15pm, Maryland C – D

Concurrent Session #9

2:30pm – 4:00pm

Admin Symposium-Viewing Collective Activism Through the Lenses of Critical Science Education Research

2:30 PM-4:00 PM, Baltimore A

Viewing Collective Activism Through the Lenses of Critical Science Education Research

Gail Richmond, Michigan State University

William R. Penuel, University of Colorado

Louise Archer, UCL Institute of Education

Raj Pandya, American Geophysical Union

Strand 01: Science Learning, Understanding and Conceptual Change

Discourse and Decision-Making in Scientific Inquiry

2:30 PM-4:00 PM, Gibson

President: Ercin Sahin, University of Iowa

Characterizing Trade-off Decisions Abilities in Middle School Students

Senay Purzer, Purdue University

Molly Goldstein, University of Illinois at Urbana-Champaign

Disciplinary Practice in Students' Talk about Why We See Stars Only at Night

Ashley N. Murphy, West Virginia University

Melissa J. Luna, West Virginia University

Evidence-based Argumentation: Reasons Students Provide to Link Evidence to Claims

Hebbah El-Moslimany, Rutgers University

Clark A. Chinn, Rutgers University

Ravit Golan Duncan, Rutgers University

Elizabeth O'Brien, Rutgers University

Exploring the relationship between students' entity/process thinking and their non-canonical ideas of scientific phenomena

Fangfang Zhao, the University of Minnesota, twin cities

Anita Schuchardt, University of Minnesota

Strand 01: Science Learning, Understanding and Conceptual Change

Symposium-Uncertainty Manifested within Science and Computational Thinking Practices

2:30 PM-4:00 PM, Homeland

Discussant: Gregory Kelly, Pennsylvania State University

Uncertainty Manifested within Science and Computational Thinking Practices

Hee-Sun Lee, The Concord Consortium

Gey-Hong Gweon, Physics Front LLC

A. Lynn Stephens, University of Massachusetts

Lisa Hardy, The Concord Consortium

Gregory J. Kelly, Pennsylvania State University

Daniel N. Damelin, The Concord Consortium

Sherry Hsi, The Concord Consortium
 Colin Dixon, The Concord Consortium
 Amy Pallant, The Concord Consortium
 Scott McDonald, Pennsylvania State University

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Small Groups and Peer Feedback

2:30 PM-4:00 PM, Watertable Salon A

Presider: David S. Di Fuccia, University of Kassel

Characterizing Peer Feedback on Product and Process in Elementary Engineering

Nicole A. Batrouny, Tufts University
 Tejaswini S. Dalvi, University of Massachusetts
 Kristen B. Wendell, Tufts University
 Chelsea Andrews, Tufts University
 Fatima Rahman, Tufts University

Developing a Critical Stance through Student-centered Critique Instruction in Scientific Inquiry

Yann Shiou Ong, National Institute of Education, Nanyang Technological University

Learning Outcomes Of Laboratory Work In Biology In Connection With Peer- And Device Explanations

Katja Löppenberg, Didaktik der Biologie, Universität Duisburg-Essen
 Angela Sandmann, Didaktik der Biologie, Universität Duisburg-Essen
 Christine Florian, Didaktik der Biologie, Universität Duisburg-Essen

Reuse and Transformation: Development of Classroom Modeling Practices from a Co-Operative Action Perspective

Ashlyn Pierson, Vanderbilt University
 Douglas B. Clark, Vanderbilt University

Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies Teaching in Elementary Classrooms

2:30 PM-4:00 PM, James

Presider: Sara E. Wilmes, University of Luxembourg

"I've always been curious about science": Elementary teachers' experiences outside of teaching

Ryan Nixon, Brigham Young University
 Leigh K. Smith, Brigham Young University
 Richard R. Sudweeks, Brigham Young University

Effects of Supportive Argument-Driven Inquiry Teaching on Children's Self-efficacy of and Engagement in Learning Science

Ying-Yan Lu, National Sun Yat-sen University
 Zuway-R Hong, National Sun Yat-Sen University; Australian Catholic University
 Huann-Shyang Lin, Australian Catholic University; National Sun Yat-Sen University
 Hsiang-Ting Chen, National Sun Yat-sen University; Northern Illinois University
 Hsin-Hui Wang, National SunYat-sen University; Australian Catholic University

'It's not structured enough but it's correct science learning': Teacher Discussions about Out-of-Classroom Teaching

Dana Vedder-Weiss, Ben-Gurion University Of the Negev, Israel
 Aliza Segal, Ben-Gurion University Of the Negev, Israel
 Rotem Trachtenberg, Ben-Gurion University Of the Negev, Israel

Shaping a Community of Practice in the First Grade

Laura A. Zangori, University of Missouri

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies Learning from Activists and Organizers to Make Science Education a Catalyst for Social Change

2:30 PM-4:00 PM, Maryland A

Preservice Science Teachers Learning from Community Organization

David Segura, Beloit College
 Maria Varelas, University Of Illinois At Chicago
 Daniel Morales-Doyle, University of Illinois at Chicago

A Decolonial Heuristic for Science Teaching & Learning

LaToya Strong, Urban Education - The Graduate Center, CUNY

Toward Youth Participatory Science: In Search of Science (Education) for the People

Alejandra Frausto, Chicago Public Schools
 Daniel Morales-Doyle, University of Illinois at Chicago
 Shelby Hatch, Northwestern University
 Alanah Fitch, Loyola University Chicago
 Kathryn L. Nagy, University of Illinois at Chicago

Beyond PCK: Science Teachers Building Critical Historical Knowledge for Environmental Justice

Daniel Morales-Doyle, University of Illinois at Chicago
 Adilene Aguilera, Chicago Public Schools
 Karen J. Canales, Little Village Environmental Justice Organization
 Mindy J. Chappell, University of Illinois at Chicago

Tiffany L Childress Price, University of Illinois at Chicago
 Darrin A Collins, University of Illinois at Chicago
 Alejandra Frausto, Chicago Public Schools
 Elizabeth Herrera, University of Illinois at Chicago
 Amy L Levingston, Chicago Public Schools

Strand 05: College Science Teaching and Learning (Grades 13-20)

Students' problem solving and design

2:30 PM-4:00 PM, Watertable Salon B

Presider: Petra Kranzfelder, University of Minnesota

Diversity of Identified Problems and Use of Science Ideas in an Engineering Design Task

Jaclyn Murray, Georgia Institute of Technology

Effects of simulation-based formative assessments on student problem-solving strategies

Mihwa Park, Texas Tech University

Epistemic Positioning in a STEM Design Studio: Bridging Life Science and the Social Sciences

Carol B. Brandt, Temple University

Organic Chemistry Professors' Teaching Orientations and Their Students' Abstraction during Problem Solving

Ira Caspari, University of Massachusetts Boston

Hannah Sevan, University Of Massachusetts Boston

Melissa Weinrich, University of Northern Colorado

Strand 06: Science Learning in Informal Contexts *Diversity and Equity in Informal STEM Education*

2:30 PM-4:00 PM, Pride of Baltimore

Presider: Enrique Suárez, University of Washington

The Impacts of School Visits to a Medical Simulation- Based Informal Learning Environment

Sameer M. Dallasheh, Technion - Israel Institute of Technology
 Tali Tal, Technion

"Those Poor Kids": Applying Cultural Wealth Theory to Informal Learning Youth Programs

Bobby Habig, American Museum of Natural History

Preeti Gupta, American Museum of Natural History

Jennifer Adams, University of Calgary

Leveraging Research Practice Partnerships to examine problems of practice in informal science learning contexts

Geeta Verma, University of Colorado Denver

Todd Campbell, University of Connecticut

Anton Puvirajah, University of Western Ontario

Engaging Diverse Citizen Scientists for Environmental Justice through Contextual Project Design

Leona F Davis, University of Arizona

Monica D Ramirez-Andreotta, University of Arizona

Sanlyn Buxner, University Of Arizona

Alma L Anides Morales, University of Arizona

Shana A Sandhaus, University of Arizona

Strand 06: Science Learning in Informal Contexts *Symposium-Illuminating Strategies that Support Science and Engineering Practices in Informal Settings*

2:30 PM-4:00 PM, Maryland E

Discussant: Philip Bell, University Of Washington

Presider: Julia Plummer, Pennsylvania State University

Illuminating Strategies that Support Science and Engineering Practices in Informal Settings

Julia Plummer, Pennsylvania State University

Philip L. Bell, University Of Washington

Lisa Anthony, University of Florida

Kyungjin Cho, Pennsylvania State University

Michele Crowl, Discovery Space of Central Pennsylvania

Zachary A. McKinley, Pennsylvania State University

Scott A. Pattison, TERC

Kathryn Stofer, University of Florida

Gina N. Svarovsky, University Of Notre Dame

Jamie Wallace, American Museum of Natural History

Strand 07: Pre-service Science Teacher Education *Nature of Science & edTPA*

2:30 PM-4:00 PM, Kent

Presider: Jan Schröder, RWTH Aachen

Aligning teacher education and curriculum policy on nature of science: The case of Ireland

Alison Cullinane, Department of Education

Sibel Erduran, University of Oxford

Paul Conway, University of Limerick

Does the edTPA Accurately Predict the Quality of Inservice Science Teachers' Instruction?

Dawnne M. LePrete, Illinois Institute of Technology

Selina L. Bartels, Valparaiso University

Judith S. Lederman, Illinois Institute Of Technology

Perceptions of nature of science: A comparative study on pre-service teachers from England and Turkey

Aysegul Cilekrenkli, Bogazici University

Ebru Kaya, Bogazici University

Sibel Erduran, University of Oxford

Selin Akgün, Bogazici University

Busra Aksoz, Bogazici University

**Strand 08: In-service Science Teacher Education
Teachers' Uptake of Inquiry-Based Practices**

2:30 PM-4:00 PM, Watertable Salon C

President: Anica Miller-Rushing, University of Maine

***Confidence, Understandings, and Practices of New
Secondary Science Teachers: A Randomized Controlled
Trial Investigation***

Shannon L. Navy, Kent State University

Jennifer L. Maeng, University Of Virginia

Randy L. Bell, Oregon State University

***Finding a path to indagación: Evaluation professional
growth for Chilean biology teachers***

Marjee Chmiel, Howard Hughes Medical Institute

Rodrigo Tapia, Biomedical Neurological Institute of Chile

Javier Robalino, Howard Hughes Medical Institute

***Qatari teachers and students' perceptions and experiences
of inquiry-based learning in science***

Nasser Mansour, University Of Exeter

Carol Murphy, University of Tasmania

Abdullah Abu-Tineh, Qatar University

Nigel Calder, University of Waikato

**Strand 10: Curriculum, Evaluation, and Assessment
Accessibility and equity**

2:30 PM-4:00 PM, Maryland F

President: Lori Andersen, University Of Kansas

***An Analysis of a State Science Instruction Companion to
the Danielson Framework***

Catherine R. Gaynor, Montclair State University

Douglas B. Larkin, Montclair State University

***Breaking the Language Barrier:
Equitable Assessment in General Chemistry***

Eshani N Lee, Penn State University Hazleton

Marykay Orgill, University Of Nevada, Las Vegas

***Equitable Design of NGSS-aligned Science
Curricular Activities***

Reina M. Fujii, SRI International

Nonye M. Alozie, SRI International

Kevin W. McElhaney, SRI International

Alyssa Lim

Ron Fried, SRI International

***Investigating Two Linguistic Factors Associated with
Differential Performance of English Language Learners***

Cari F. Herrmann Abell, American Association for the Advancement
Of Science - Project 2061

George E. De Boer, American Association for the Advancement Of
Science - Project 2061

Ursula M. Sexton

Elise Trumbull

Sarah Glassman, Smithsonian Science Education Center

Chun-Wei Huang, WestEd

Sharon Nelson-Barber, WestEd

***Using Learning Map Models to Design Universally
Accessible Science Assessments***

Lori Andersen, University of Kansas

Russell Swinburne Romine, University of Kansas

Sue Bechard, University of Kansas

Lindsay Ruhter, University of Kansas

Michelle Shipman, University of Kansas

**Strand 10: Curriculum, Evaluation, and Assessment
Measuring Complex Constructs in Science Education:
Applications of Automated Analysis**

2:30 PM-4:00 PM, Maryland B

Discussant: Ross Nehm, Stony Brook University - SUNY

President: Christopher D Wilson, BSCS Science Learning

Introduction

Christopher D Wilson, BSCS Science Learning

Ross H. Nehm, Stony Brook University - SUNY

***Design Principles of Developing Argumentation in Science
Items and Automated Scoring Rubrics***

Tina Cheuk, Stanford University

Marisol Mercado Santiago, Michigan State University

Jonathan Francis Osborne, Stanford Graduate School Of Education

Christopher D Wilson, BSCS Science Learning

Mark Urban-Lurain, Michigan State University

Molly Stuhlsatz, BSCS Science Learning

Kevin C. Haudek, Michigan State University

John Merrill, Michigan State University

Brian M. Donovan, BSCS Science Learning

Zoe E. Buck Bracey, BSCS Science Learning

***Challenges in Developing Computerized Scoring Models
for Principle-Based Reasoning in a Physiology Context***

Dirk Kruger, Freie Universität Berlin

Molly Stuhlsatz, BSCS Science Learning

Moritz Krell, Freie Universität Berlin

Assessment of Meta-Modelling Knowledge: Computer-Automated Scoring of Constructed Response Items

Lauren Jescovitch, Michigan State University
 Jennifer H Doherty, University of Washington
 Emily Scott, University of Washington
 Jack A Cerchiara, University of Washington
 Mary Pat Wenderoth, University of Washington
 Mark Urban-Lurain, Michigan State University
 John Merrill, Michigan State University
 Kevin C. Haudek, Michigan State University

Applying Automated Analysis to Measuring Science Teacher Pedagogical Content Knowledge

Molly Stuhlsatz, BSCS Science Learning
 Zoe E. Buck Bracey, BSCS Science Learning
 Brian M. Donovan, BSCS Science Learning
 Christopher Wilson, BSCS Science Learning
 April L. Gardner, BSCS Science Learning
 Mark Urban-Lurain, Michigan State University
 John Merrill, Michigan State University
 Kevin C. Haudek, Michigan State University

Strand 12: Educational Technology

Symposium-Disentangling Coding in Secondary School Science: Contexts, Interfaces and Assessments

2:30 PM-4:00 PM, Baltimore B

Discussant: David Weintrop, Northwestern University

Disentangling Coding in Secondary School Science: Contexts, Interfaces and Assessments

Elon Langbeheim, Weizmann Institute of science
 Sharona T. Levy, University of Haifa
 David Weintrop, Northwestern University
 Janan Saba, University of Haifa
 Chris Orban, Ohio State University
 Rebecca Vieyra, American Association of Physics Teachers
 Richelle Teeling-Smith, University of Mount Union
 Edit Yerushalmi, Weizmann Institute of Science, Israel

Strand 15: Policy

Designing and Implementing Science Standards

2:30 PM-4:00 PM, Fells Point

Presider: Carrie D. Allen, SRI International

Analyzing coordination between scientific practices and crosscutting concepts in the NGSS

Mary E. Short, The George Washington University
 Tiffanyrose Sikorski, George Washington University

Fostering Teacher Autonomy and Risk-Taking in NGSS Implementation: Exploring the Role of Administrators

Ashley Iveland, WestEd
 Elizabeth B. Dyer, WestEd
 Burr Tyler, WestEd
 Edward D. Britton, WestEd
 Kimberly Nguyen, WestEd

Hidden in Plain Sight: What National and State Data Reveal about Out-of-Field Teaching in Science

Julie A. Luft, University of Georgia
 Elana B Worth, University of Georgia
 Harleen Singh, University of Georgia
 Lu Wang, University of Georgia
 Deborah L. Hanuscin, Western Washington University

Science Standards Developers: What Were They Thinking About?

Eugene Judson, Arizona State University
 Kristi Glassmeyer, Arizona State University
 Kathryn N. Hayes, California State University, East Bay

Supporting k-8 principals' vision of science instruction: Shifting towards science as practice through professional development

Katherine L. McNeill, Boston College
 Rebecca Lowenhaupt, Boston College
 Kevin Cherbow, Boston College
 Benjamin R. Lowell, Boston College

Concurrent Session #10

4:15pm – 5:45pm

Research Committee

Admin Symposium-Embodying Collective Activism in Science Education Research:

Philosophies, Praxis, and Pragmatics

4:15 PM-5:45 PM, Baltimore A

Embodying Collective Activism in Science Education Research: Philosophies, Praxis, and Pragmatics

Phillip A. Boda, Stanford University
 Ryan Summers, University of North Dakota
 Shirley R. Steinberg, University of Calgary
 Carolyn A. Parker, American University
 Pauline W. U. Chinn, University Of Hawaii At Manoa
 Ying-Chih Chen, Arizona State University
 Deborah J. Tippins, University Of Georgia
 Tina Vo, University of Nevada- Las Vegas

Alberto J. Rodriguez, Purdue University
 Jennifer Adams, University Of Calgary
 Tali Tal, Technion, Israel Institute of Technology
 Sami Kahn, Ohio University

Strand 01: Science Learning, Understanding and Conceptual Change

Concepts of chemical phenomena

4:15 PM-5:45 PM, Gibson

President: Anita Schuchardt, University of Minnesota

Conceptual Profile of Substance: Representing Heterogeneity of Thinking and Speaking about Substance in Chemistry Classrooms

Raul Orduna Picon, University of Massachusetts Boston
 Hannah Sevan, University Of Massachusetts Boston
 Eduardo F. Mortimer, Universidade Federal de Minas Gerais
 Renata Reis Pereira, Universidade Federal de Minas Gerais

Effects of Dynamic Visualizations on Linguistically Diverse Students' Accurate and Alternative Concepts of Chemical Phenomena

Matthew P. Hutchinson, University of North Carolina, Chapel Hill
 Leah E. Metcalf, University of North Carolina, Chapel Hill
 Kihyun (Kelly) Ryoo, University Of North Carolina At Chapel Hill

Kindergarteners' Use of Particle Models of Matter to Explain Material Phenomena

Ala Samarapungavan, Purdue University
 Lynn A. Bryan, Purdue University
 Carolyn Staudt, Concord Consortium

The Perception and Use of Multiple External Representations in Chemistry Education

Perihan Akman, University of Paderborn
 Sabine Fechner, University Of Paderborn

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Strategies for Overcoming Barriers to Science Learning

4:15 PM-5:45 PM, Watertable Salon A

President: Catherine Lemmi, Stanford University

A socio-cultural perspective of the role of learning assistants in active learning environments

Mary K. Nyaema, Florida International University

Exploring the Relationship Between Ability Grouping and Science Vocabulary Learning

Patrick Brown, Fort Zumwalt School District
 James Concannon, Director of Education at William Woods University

Using Sense-Making Maps to Study Students' Sense-Making During the Practice of Modeling

Meredith B. Marcum, The Key School

What makes this experiment difficult? A teacher survey

Lina Boyer, Universität Duisburg-Essen
 Anita Stender, Universität Duisburg-Essen
 Hendrik Härtig, Universität Duisburg-Essen

Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies Engineering in the Elementary Classroom

4:15 PM-5:45 PM, James

President: Georgia Hodges, University Of Georgia

A Principled Approach to NGSS-Aligned Curriculum Development Integrating Science, Engineering, and Computation: A Pilot Study

Jennifer Chiu, University Of Virginia
 Kevin W. McElhane, SRI International
 Ningyu Zhang, Vanderbilt University
 Gautam Biswas, Vanderbilt University
 Ron Fried, SRI International
 Satabdi Basu, SRI International
 Nonye M. Alozie, SRI International

Elementary Student Perceptions and Dispositions Towards the field of Engineering and Engineering Practices

Issam H. Abi-El-Mona, Rowan University

Engineering Design in the Elementary Setting: Examining Student Justifications, Authority and Legitimation

Karl G. Jung, University Of South Florida
 Justin McFadden, University of Louisville

First-Grade Students as Epistemic Agents in Engineering

Heidi B. Carlone, The University Of North Carolina At Greensboro
 Alison Mercier, The University of North Carolina at Greensboro
 Salem Metzger, The University of North Carolina at Greensboro

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies
Symposium-Ways of Thinking Influencing the Teaching and Learning of Evolution

4:15 PM-5:45 PM, Homeland

Discussant: Amanda Glaze, Georgia Southern University

Ways of Thinking Influencing the Teaching and Learning of Evolution

Katie Green, North Carolina State University

Brandon Foster, Wake Technical Community College

Margaret M. Lucero, Santa Clara University

Jose M. Pavez, University of Georgia

Sandhya Krishnan, University of Georgia

David F. Jackson, University Of Georgia

Amanda Glaze, Georgia Southern University

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies
Measuring and Modelling How and When Effective Science Teaching Occurs

4:15 PM-5:45 PM, Maryland A

Secondary Science Teachers' Use of Scientific Practices in the Classroom

Amy Tankersley, University of Nebraska-Lincoln

Equity in Classroom Assessment Practices

Elizabeth Hasseler, University of Nebraska-Lincoln

Validation of the Discourse in Inquiry Science Classrooms (DiISC) Instrument

Lyrica Lucas, University of Nebraska-Lincoln

Brandon Holding, Boulder Learning, Inc.

Elizabeth B. Lewis, University of Nebraska-Lincoln

Modelling Beginning Science Teachers' Inquiry-based Science Teaching

Elizabeth B. Lewis, University of Nebraska-Lincoln

Brandon Holding, Boulder Learning, Inc.

Lyrica Lucas, University of Nebraska-Lincoln

Amy Tankersley, University of Nebraska-Lincoln

Elizabeth Hasseler, University of Nebraska-Lincoln

Strand 05: College Science Teaching and Learning (Grades 13-20)

Student achievement, attitudes, engagement

4:15 PM-5:45 PM, Watertable Salon B

President: Roshan Lamichhane, Indiana University

A Framework For Characterizing and Measuring Student Engagement in College Science

Kubra Yeter-Aydeniz, Tennessee Technological University

Mehmet Aydeniz, University Of Tennessee

Building Biology Experts: A Longitudinal Analysis of Students' Attitudes and Knowledge in Majors' Biology Courses

Emily M. Walter, California State University, Fresno

Glen E. Martin, California State University, Fresno

Allyssa Gomez, California State University, Fresno

Ivan Ceballos Madrigal, California State University, Fresno

Investigating the Impact of Different Latent Classes of Evidence-Based Teaching on College Students' Academic Achievement

Sungmin Moon, University of Washington Seattle

Mary Pat Wenderoth, University of Washington

Jennifer H. Doherty, University Of Washington

Deborah H Wiegand, University of Washington

Strand 07: Pre-service Science Teacher Education
Practice-Based Curriculum Design

4:15 PM-5:45 PM, Kent

President: Jan Schröder, RWTH Aachen

Preservice Elementary Teachers' Analyses and Noticing of Rehearsals and Classroom Enactments: Looking Across Three Universities

Anna Maria Arias, Kennesaw State University

Sarah J. Fick, University of Virginia

Amanda Benedict-Chambers, Missouri State University

Developing Middle Level Preservice Science Teachers' Abilities to Design NGSS Lessons

Danielle E. Dani, Ohio University

Negotiating the transition: From "practicing responsive teaching" into "responsive teaching practice"

Alexander K Chumbley, University of Maryland

Daniel M. Levin, University of Maryland

Jennifer E. Mesiner, University of Maryland

Strand 08: In-service Science Teacher Education
Issues of Equity and Diversity Related to Teacher Learning
 4:15 PM-5:45 PM, Watertable Salon C
Presider: Sage Andersen, University Of California - Irvine

Democratic Science Teaching: Case studies from a professional development program
 Casandra Gonzalez, Boston College
 Megan T. McKinley, Boston College
 Jim D. Slotta, University of Toronto
 Michael Barnett, Boston College

Exploring value-creation of Black engineers involved in STEM Teacher Professional Development
 Meredith W. Kier, College of William and Mary
 Adrian W Bruce, Post-Doctoral Assistant at Howard University
 Deena Khalil, Associate Professor of Mathematics Education

Teaching Science and the Pedagogical Implications of Student Diversity: A Longitudinal Investigation of Changing Conceptions
 Douglas B. Larkin, Montclair State University
 Liz Carletta, Montclair State University
 Sam Evans, University of Wisconsin-Madison

Strand 10: Curriculum, Evaluation, and Assessment
Supporting Purposeful Sensemaking in Science Classrooms
 4:15 PM-5:45 PM, Maryland B

Supporting purposeful sensemaking with storylines that are coherent from the students' perspective
 Brian J. Reiser, Northwestern University
 Michael J. Novak, Northwestern University
 Tara McGill, Northwestern University
 Kelsey D. Edwards, Northwestern University

Purposeful sensemaking and modeling in high school biology
 Chris D. Griesemer, University of California Davis
 Cynthia Passmore, University of California-Davis

What goes into facilitating purposeful sensemaking in the classroom? Theorizing about teacher learning
 Jessica Alzen, University of Colorado, Boulder
 William R. Penuel, University of Colorado
 Brian J. Reiser, Northwestern University
 Cynthia Passmore, University of California-Davis

Teachers reports on successes and challenges in co-constructing direction of learning using storylines curriculum materials
 John F. Smith, Northwestern University
 Brian J. Reiser, Northwestern University

Strand 10: Curriculum, Evaluation, and Assessment
Assorted topics in physics
 4:15 PM-5:45 PM, Maryland F
Presider: Jeffrey Nordine, Leibniz Institute for Science and Mathematics Education (IPN)

Analyzing the Use of Educative Curriculum Materials in Physics Teaching
 Judith Breuer, University of Paderborn
 Christoph Vogelsang, University of Paderborn
 Peter Reinhold, University Of Paderborn

Detecting Non-Parallelism in Hierarchically Contextualized Physics Assessments
 Klint Kanopka, Stanford University

Roller Coaster or Skateboard? The Role of Real-World Contexts for Engaging Students in Physics
 Daniel Laumann, Leibniz-Institute for Science and Mathematics Education (IPN)
 Julian Fischer, Leibniz Institute for Science and Mathematics Education (IPN)
 Susanne Wessnigk, Leibniz University of Hannover
 Knut Neumann, Leibniz Institute for Science and Mathematics Education (IPN)

Simulation Development and Evaluation in Physics: An Exploration of Utilizing Learning Assistants in Curriculum Design
 Emily C. Allen, Boston University
 Andrew Duffy, Boston University
 Manher Jariwala, Boston University

Strand 13: History, Philosophy, Sociology, and Nature of Science
Symposium-Teaching Science with historical, philosophical and sociological context in Ibero-America
 4:15 PM-5:45 PM, Baltimore B
Discussant: Judith Lederman, Illinois Institute Of Technology, Norman Lederman, Illinois Institute Of Technology, , , , , ,
Presider: Maria Elice de Brzezinski Prestes, Departamento de Genética e Biologia Evolutiva, Instituto de Biociências, Universidade de São Paulo, Brasil

Teaching Science with historical, philosophical and sociological context in Ibero-America

Maria Elice de Brzezinski Prestes, Departamento de Genética e Biologia Evolutiva, Instituto de Biociências, Universidade de São Paulo, Brasil

Agustin Aduriz-Bravo, Universidad De Buenos Aires

Nathália Azevedo, University of São Paulo, Brasil

Ileana M. Greca, Universidad de Burgos, Burgos, Spain

Marco Braga, Federal Center for Technological Education (CEFET) Rio de Janeiro, RJ, Brasil.

Norman G. Lederman, Illinois Institute Of Technology

Judith S. Lederman, Illinois Institute Of Technology

Strand 14: Environmental Education***Empowered Environmental Education in the Classroom***

4:15 PM-5:45 PM, Fells Point

President: Sarah J. Carrier, North Carolina State University

Integration of Science Disciplinary Core Ideas and Environmental Education Practices

Dorothy Holley, Clayton High School

Soonhye Park, North Carolina State University

Kathryn Stevenson, North Carolina State University

I Didn't Know What Real Science Was: Citizen Science and STEM Education and Careers Interest

Mary N. Hedenstrom, University of Minnesota

Michele Koomen, Gustavus Adolphus College

Solving Problems that Matter:***Elementary Students Applying NGSS Concepts through Environmental Service-Learning***

Eileen G. Merritt, Arizona State University

Nicole Bowers, Arizona State University

Tracy Harkins, Harkins Consulting, LLC

Candace Lapan, Wyngate University

Sara E Rimm-Kaufman, University of Virginia

Student Empowerment in an Environmental Science Literacy Unit about Groundwater Contamination

Daniel L. Moreno, University of Arizona

Kristin L. Gunckel, University Of Arizona

Strand 15: Policy***The Status of K-12 Science Education: Obstacles and Progress Toward the Vision of the NGSS***

4:15 PM-5:45 PM, Maryland E

Characteristics of the Science Teaching Force

Patrick S. Smith, Horizon Research, Inc.

Science Instruction

Eric R. Banilower, Horizon Research, Inc.

Professional Development of Science Teachers

Meredith L. Hayes, Horizon Research, Inc.

Policies and Other Factors Affecting Science Instruction

Peggy J. Trygstad, Horizon Research, Inc.

Equity & Ethics Dinner**Dinner Cruise - Baltimore Inner Harbor**

6:30pm – 9:00pm, Off-site:

Spirit of Baltimore

Boarding is at 6:30 PM (Maximum attendance: 100)

Dinner, including tax and gratuity, is \$45.

Please note:

You must register for this event with your Advance Conference Registration. Tickets purchased for this event are not refundable.

The Spirit of Baltimore will depart from the west wall of Baltimore's Inner Harbor. The distance from the Renaissance Hotel is about 3 blocks, mostly along the harbor.

Transportation services will not be provided.

Wednesday, April 3, 2019

Strand Meetings**7:00am – 8:15am****Strand 1: Science Learning, Understanding and Conceptual Change**

7:00 AM-8:15 AM, James

Strand 2: Science Learning: Contexts, Characteristics and Interactions

7:00 AM-8:15 AM, Federal Hill

Strand 3: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies

7:00 AM-8:15 AM, Fells Point

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

7:00 AM-8:15 AM, Gibson

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

7:00 AM-8:15 AM, Baltimore A

Strand 6: Science Learning in Informal Contexts

7:00 AM-8:15 AM, Maryland F

Strand 7: Pre-service Science Teacher Education

7:00 AM-8:15 AM, Maryland B

Strand 8: In-service Science Teacher Education

7:00 AM-8:15 AM, Maryland A

Strand 9: Reflective Practice

7:00 AM-8:15 AM, Kent

Strand 10: Curriculum, Evaluation, and Assessment

7:00 AM-8:15 AM, Baltimore B

Strand 11: Cultural, Social, and Gender Issues

7:00 AM-8:15 AM, Maryland E

Strand 12: Educational Technology

7:00 AM-8:15 AM, Water Table A

Strand 13: History, Philosophy, and Sociology of Science

7:00 AM-8:15 AM, Water Table B

Strand 14: Environmental Education

7:00 AM-8:15 AM, Water Table C

Strand 15: Policy

7:00 AM-8:15 AM, Pride

Conference Registration**8:00am – 11:00am, Maryland Foyer****Concurrent Session #11****8:30am – 10:00am****International Committee*****Admin Symposium-The Role of Science Education in a Changing World: Identity, Language, and Equity***

8:30 AM-10:00 AM, Baltimore A

The Role of Science Education in a Changing World: Identity, Language, and Equity

Jennifer Adams, University Of Calgary

Saouma B. Boujaoude, American University Of Beirut

Digna Couso, Crecim-Universitat Autònoma De Barcelona

Christa Haverly, Michigan State University

Shakhnoza Kayumova, University of Massachusetts-Dartmouth

Paul Le, University of Colorado Denver

Christina Siry, University Of Luxembourg

Seema Rivera, Clarkson University

Carla Zembal-Saul, Pennsylvania State University

Sara E. Wilmes, University of Luxembourg

Lucy Avraamidou, University of Groningen, Netherlands

Theila Smith, University of Groningen, Netherlands

Sara Salloum, University of Balamand, Lebanon

Strand 01: Science Learning, Understanding and Conceptual Change***Learning progressions***

8:30 AM-10:00 AM, Gibson

President: Justina A. Ogodu, The Ohio State University***Based on Students' Performance to Develop a Learning Progression for Scientific Inquiry***

Shu-Fen Lin, National Changhua University of Education

Bases for Developing a Hypothetical LP for Quantification in Science

Hui Jin, Educational Testing Service
Cesar Delgado, North Carolina State University
Malcolm I Bauer, Educational Testing Service
Caroline E Wylie, Educational Testing Service
Kenneth F. Llort, ETS
Dante Cisterna, Educational Testing Service

Developing a Hypothetical Learning Progression for NGSS Crosscutting Concepts: Structure-Function and Systems & Systems Models

Asmalina Saleh, Indiana University
Gary Weiser, Teachers College, Columbia University
Karyn Housh, Indiana University
Cindy E. Hmelo-Silver, Ctr. for Research on Learning & Technology
Lei Liu, Educational Testing Service
Kenneth F. Llort, ETS

Strand 02: Science Learning: Contexts, Characteristics and Interactions

STEM in the Secondary Setting

8:30 AM-10:00 AM, Federal Hill
President: Matthew J. Benus, Indiana University Northwest

Comparing Science Instruction and STEM Integration in STEM and non-STEM High Schools

Rebecca Stanley, RTI International
M. Gail Jones, North Carolina State University

Examining High School Students' Interest in STEM Careers Through Participation in a Two- Year Bioscience Program

Danielle K. Ross, Northern Arizona University
Ron Gray, Northern Arizona University

The Relationship between Middle School Students' 21st Century Skills and their Interest in STEM Careers

Nejla Atabey, Mus Alparslan University
Mustafa Sami Topçu, Yıldız Technical University

**Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies
Elementary Learning Environments**

8:30 AM-10:00 AM, James
President: Sarah J. Carrier, North Carolina State University

A Mixed Methods Study that Compares Learning Gains Associated with Serious Gameplay and Hands-on Science

Georgia Hodges, University Of Georgia
Kayla Flanagan, University of Georgia

Sandhya Krishnan, University of Georgia
Juyeon Lee, University of Georgia
Allen Cohen, University of Georgia
Stephanie Eldridge, University of Georgia

Engaging Elementary Students with Big Data through Hands-On Science

Kayla Flanagan, University of Georgia
Georgia Hodges, University Of Georgia

Experiential Learning in Upper Elementary Science Classrooms: Influence on Students' Problem-solving and Attitudes in Science

Sara Salloum, University of Balamand
Neyoulla Al Jurdi, University of Balamand

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies

Epistemic Foundations of Reform-based Teaching
8:30 AM-10:00 AM, Maryland E
President: Veronica McGowan, University Of Washington

An epistemological disagreement between a student teacher and her mentor in the classroom: Arguing about argument

Andrew Elby, University of Maryland, College Park
Daniel M. Levin, University of Maryland, College Park
Alexander K Chumbley, University of Maryland, College Park
Susan De La Paz, University of Maryland, College Park

Instructional Quality in Science Classrooms in the NGSS Era

Miray Tekkumru-Kisa, Florida State University
Courtney Preston, Florida State University
Zahid Kisa, Florida State University
Elif Oz, Florida State University
Jennifer Morgan, Florida State University

Title: Beliefs of Science Teachers on Inquiry Based Teaching in Classroom Practice

Tahmina Hoq, Institute of education and Research , University of Dhaka

Toward developing an authentic measure of epistemology for secondary-level science instructors

Nicole Zillmer, Authentic Connections
J. Bryan Henderson, Arizona State University
Megan Goss, University of California-Berkeley
Eric Greenwald, University of California-Berkeley
April B. Holton, Arizona State University
M. Lisette Lopez, University of California-Berkeley

Understanding Science Teachers' Perceptions and Misconceptions of the Epistemic Foundation of NGSS Science Practices

Katherine R McCance, North Carolina State University
Vance J. Kite, North Carolina State University
Soonhye Park, North Carolina State University
Eulsun Seung, Indiana State University

Strand 05: College Science Teaching and Learning (Grades 13-20)

Curricular innovations for student learning

8:30 AM-10:00 AM, Watertable Salon B

President: Rebecca L. Matz, Michigan State University

A Learning Progression Characterizing How Biology Students Understand Ion Movement

Jennifer H. Doherty, University Of Washington
Emily E Scott, University of Washington
Jack A Cerchiara, University of Washington
Jenny L McFarland, Edmonds Community College
Mary Pat Wenderoth, University of Washington

An Emerging Learning Progression Characterizing How Students Use Mass Balance Reasoning to Understand Physiology

Emily E Scott, University of Washington
Jack A Cerchiara, University of Washington
Lauren Jescovitch, Michigan State University
Mary Pat Wenderoth, University of Washington
Jennifer H. Doherty, University Of Washington

Exploring Student-Centered Active Learning Environment in Undergraduate Physics (SCALE-UP): Epistemic Agency in Small Group Interactions

Mark Akubo, Florida State University
Clausell Mathis, Florida State University
Sherry A. Southerland, Florida State University

Strategic Undergraduate STEM Talent Acceleration Initiative (SUSTAIN): Impacts on Underrepresented College Students' STEM Learning Experiences

John W. Tillotson, Syracuse University
Sule Aksoy, Syracuse University
Gaye D. Ceyhan, Syracuse University
Jeremy D. Sloane, Syracuse University
Jason R. Wiles, Syracuse University

Strand 05: College Science Teaching and Learning (Grades 13-20)

Students' metacognition and agency

8:30 AM-10:00 AM, Watertable Salon A

President: Anita Schuchardt, University of Minnesota

1st year Psychology Students Writing Exams: Examining confidence calibration, question complexity, and the Dunning-Kruger effect

G. Michael Bowen, Mount Saint Vincent University
Kimberley P Good, Dalhousie University

Examining Studying Behaviors as Related to Engagement in Metacognition in Undergraduate Biology Majors

Jaime L. Sabel, University Of Memphis
Rand Alqirem, University of Memphis
Kathryn Parsley, University of Memphis

Investigating the Impact of an Intervention on Students' Self-Efficacy and Metacognition in Undergraduate Biology Courses

Catherine Martin-Dunlop, Morgan State University
Robert Javonillo, Morgan State University
Ernest C. Steele, Morgan State University
Erika Whitney, Morgan State University
YueJin Li, Morgan State University
Samala Lewis, Morgan State University
Viji Sither, Morgan State University

Measuring Self-Efficacy and Persistence of Undergraduates in a Reformed Laboratory Curriculum Field Study

Corey A. Payne, University of Florida
Kent J. Crippen, University of Florida
Lorelie Imperial, University of Florida
Maria Korolev, University of Florida
Phil Brucat, University of Florida
Chang-Yu Wu, University of Florida

Strand 06: Science Learning in Informal Contexts

New frameworks for studying equity in informal STEM settings: Cross-cultural perspectives

8:30 AM-10:00 AM, Maryland A

President: Angela Calabrese-Barton, Michigan State University

Fun moments or consequential outcomes? Exploring what underserved youth in two UK cities derive from participation in informal STEM learning settings

Louise Archer, UCL Institute of Education
Spela Godec, UCL Institute of Education
Emily Dawson, University College London

Critical Youth Participatory Explorations of STEM Pathways

Day W. Greenberg, Michigan State University
Angela Calabrese-Barton, Michigan State University
Lynn D. Dierking, Oregon State University
Elysa N. Corin, Institute for Learning Innovation
Yoon Ha Choi, Oregon State University

Cultivating equitable STEAM learning environments for adolescent youth

Nancy Price, University of Washington
Philip L. Bell, University Of Washington
Joseph Roche, Trinity College

Retrieving the imagination: Bakhtin meets Greene in OST STEM programming

Bronwyn Bevan, University of Washington
Lissa Soep, YouthRadio
Clifford Lee, YouthRadio
Sam Mejias, London School of Economics

Characterizing Youth Participation in Natural History Museum-led Citizen Science Projects: Designing for the Development of Agency and More Equitable Participation in Science

Heidi Ballard, University of California - Davis
Julia Lorke, Angela Marmot Center for UK Biodiversity, Natural History Museum

Strand 06: Science Learning in Informal Contexts Symposium-Leveraging resources to support engagement in informal science learning environments

8:30 AM-10:00 AM, Homeland

Discussant: Suzanne Perin, University Of Alaska Fairbanks

President: Orit Ben Zvi Assaraf, Ben-Gurion University Of the Negev, Israel

Leveraging resources to support engagement in informal science learning environments

Orit Ben Zvi Assaraf, Ben-Gurion University Of the Negev, Israel
Neta Shaby, Ben-Gurion University of the Negev, Israel
Tali Tal, Technion
Heather Toomey Zimmerman, Pennsylvania State University
Lucy R. McClain, Pennsylvania State University
Soo Hyeon Kim, The Pennsylvania State University
Devon M. Purington, Penn State University

Yong Ju Jung, The Pennsylvania State University
Dana Vedder-Weiss, Ben-Gurion University Of the Negev, Israel
Suzanne Perin, University Of Alaska Fairbanks

Strand 07: Pre-service Science Teacher Education Performance Assessment

8:30 AM-10:00 AM, Kent

President: Nazihan Ursavas, Recep Tayyip Erdogan University

A performance assessment for measuring student teachers' skills to plan physics lessons

Jan Schröder, RWTH Aachen
Christoph Vogelsang, University of Paderborn
Josef Riese, University Of Paderborn

Development of Pre-Service Physics Teachers Skill of Reflecting Physics Lessons

Maren Kempin, University of Bremen
Christoph Kulgemeyer, University of Bremen

How Elementary Science Teacher Candidates' Design for, Notice and Interpret Student Scientific Sense-making through Assessments

Meenakshi Sharma, Michigan State University
Christina V. Schwarz, Michigan State University

Strand 08: In-service Science Teacher Education Complex Topics and Teacher Learning

8:30 AM-10:00 AM, Watertable Salon C

President: Peter S. Garik, Boston University

Escaping the narrative: Helping teachers understand how models can bring structure to complex science explanations

Daniel K. Capps, University of Georgia
Jonathan T. Shemwell, University of Alabama
Carlson H. Coogler, University of Alabama
Elgin Leary, University of Georgia
Ayca K. Fackler, University of Georgia
Eric A. Kirk, Druid Hills High School
Guluzar Eymur, Giresun University

Plants Do What?! Using a Conceptual Change Framework and Computer Simulation to Understand Respiration

Amanda L. Goncz, Michigan Technological University
Jennifer Maeng, University Of Virginia

The Impact of a Learning Study on the Enactment of Topic-Specific PCK in Stoichiometry

Stephen A. Malcolm, University of the Witwatersrand
Marissa S. Rollnick, Wits University
Elizabeth Mavhunga, University of Witwaterrand

Strand 10: Curriculum, Evaluation, and Assessment

Evolution and genetics

8:30 AM-10:00 AM, Maryland F

Presider: Cari F. Herrmann Abell, BSCS Science Learning

A cross-cultural comparison of the relationship between genetic knowledge and belief in genetic determinism across social, biological, and taxonomic contexts

Robyn E. Tornabene, Stony Brook University

Gena C. Sbeglia, Stony Brook University

Ross H. Nehm, Stony Brook University - SUNY

NGSS-Aligned Instrument to Measure High School Students' Understanding of Evolution and Natural Selection

George E. DeBoer, American Association for the Advancement Of Science

Joseph M. Hardcastle, American Association for the Advancement of Science

Jo Ellen Roseman, American Association for the Advancement Of Science

Using High School Students' Initial Perceptions of Evolution Across Biological Levels to Inform Curriculum Development

Angela D. Kolonich, Michigan State University

Alexa Warwick, Michigan State University

Louise Mead, Michigan State University

Frieda Reichsman, The Concord Consortium

Paul Horwitz, The Concord Consortium

Peter White, Michigan State University

James Smith, Michigan State University

Kiley McElroy-Brown, The Concord Consortium

Strand 11: Cultural, Social, and Gender Issues

Symposium-Leveraging Youth's Diverse Backgrounds to Broaden Participation in STEM through Invention Education

8:30 AM-10:00 AM, Baltimore B

Discussant: Michael Barnett, Boston College

Presider: Stephanie Couch, School of Engineering, MIT

Leveraging Youth's Diverse Backgrounds to Broaden Participation in STEM through Invention Education

Stephanie Couch, School of Engineering, MIT

Michael Barnett, Boston College

Stephanie Couch, School of Engineering, MIT

Leigh B. Estabrooks, School of Engineering, MIT

Deoksoon Kim, Boston College

Eunhye Cho, Boston College

So Lim Kim, Boston College

Helen Zhang, Boston College

David W. Jackson, Boston College, Lynch School Of Education

Pablo B. Gutierrez, Boston College

Strand 12: Educational Technology

Improving Science Teaching and Learning through Rigorous and Relevant Education Technology Interventions

8:30 AM-10:00 AM, Maryland B

Mission HydroSci: Using Gaming Technologies to Support NGSS-aligned Learning

Troy Sadler, University Of North Carolina Greensboro

James M. Laffey, University of Missouri

Sean P. Goggins, University of Missouri

Eric P. Wulff, University Of Missouri

A.J. Womack, University Of Missouri

Joseph Griffin, University of Missouri

Justin Sigoloff, University of Missouri

Sean Lander, University of Missouri

Inq-Blotter: An Alerting Teacher Dashboard for Teachers to Help Their Students Learn Science Inquiry Practices

Michael Sao Pedro, Apprendis, LLC

Janice Gobert, Rutgers University; Apprendis, LLC

Rachel Dickler, Rutgers University

Online Virtual Lab Activities that Help Students Think Like Chemists

David Yaron, Carnegie Mellon University

Jodi Davenport, WestEd

Design & Implementation of The Connected Chemistry Curriculum

Mike Stieff, University of Illinois, Chicago

Stephanie M Werner, University of Illinois at Chicago

Strand 14: Environmental Education

Global Perspectives on Environmental Education and Sustainability

8:30 AM-10:00 AM, Fells Point

Presider: Rouhollah Aghasaleh, Georgia State University

Validating a Modified Model of Ecological Values (2-MEV) in Rural Nepal: A Unique Cultural Perspective

Shakil Regmi, Martin Luther University Halle-Wittenberg

Bruce Johnson, University of Arizona

Bed Mani Dahal, Kathmandu University

Martin Lindner, IPN - Institute for Science Education

Connecting formal science classroom learning to community, culture and context in India.

Sameer Honwad, University of New Hampshire
Erica Jablonski, University of New Hampshire
Middleton Michael, City University of New York
Eleanor D. Abrams, University of New Hampshire

Assessing Climate Literacy - Development and Implementation of a Three-Dimensional Assessment Instrument

Dirk Mittenzwei, Leibniz Institute for Science and Mathematics Education (IPN)
Hanno Michel, Leibniz Institute for Science and Mathematics Education (IPN)
Ute Harms, Leibniz Institute for Science and Mathematics Education (IPN)

Ultraorthodoxing" Education for Sustainability – Insights from a Pioneering Ultraorthodox City in Israel

Iris Alkahr, Kibbutzim College Of Education
Daphne Goldman, Beit Berl Academic College

Networking Break

10:00am – 10:30am, Ballroom Foyer

Coffee and tea

Concurrent Session #12

10:30am – 12:00pm

Publications Advisory Committee

Admin Symposium-Publishing and Reviewing in the Journal of Research in Science Teaching

10:30 AM-12:00 PM, Baltimore A

Publishing and Reviewing in the Journal of Research in Science Teaching

Dana L. Zeidler, University Of South Florida
Fouad Abd-El-Khalick, University Of North Carolina At Chapel Hill
Elizabeth C. Niswander, University Of Illinois At Urbana-Champaign

Strand 01: Science Learning, Understanding and Conceptual Change

Eco systems and Natural Selection

10:30 AM-12:00 PM, Gibson

Presider: Umit Aslan, Northwestern University

Computational Thinking: A Scaffold for Natural Selection Context Transfer

Amanda N. Peel, University Of Missouri
Troy Sadler, University Of North Carolina Greensboro
Patricia J. Friedrichsen, University Of Missouri-Columbia

Strategies of data evaluation: Perceptual and interpretational processes in the context of ecosystem dynamics

Sabine Meister, Humboldt-Universität zu Berlin
Corinne Zimmerman, Illinois State University
Annette Upmeyer Zu Belzen, Humboldt-Universität Zu Berlin

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Epistemic Agency and Tools

10:30 AM-12:00 PM, Federal Hill

Presider: Shulamit Kapon, Technion - Israel Institute of Technology

Chemistry Teachers' Intentions and Students' Epistemic Agency in Communicative Patterns in the Classroom

Hannah Sevan, University Of Massachusetts Boston
Orlando Aguiar Jr., Universidade Federal de Minas Gerais
Scott Balicki, Boston Public Schools

Data as proxy: Sociomaterial supports and constraints on the use of data for epistemic agency

M. Lisette Lopez, University of California, Berkeley
Michelle H. Wilkerson, University of California, Berkeley
Vasiliki Laina, University of California, Berkeley

Elementary Students' Practical Epistemology When They Observe Sedimentary Rocks: Epistemic Practice Approach

Seungho Maeng, Seoul National University of Education

Science Teachers' Navigating Their Roles in Supporting Students Knowledge (Re)construction Through Epistemic Tools

Asli Sezen-Barrie, University of Maine
Mary Stapleton, Towson University
Gili Marbach-Ad, University Of Maryland

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Identities, Self-Efficacy, and Engagement in Science

10:30 AM-12:00 PM, Watertable Salon A

Presider: Greses Pérez, Stanford University

A comparison of in-service science teachers' self-efficacy beliefs from Pakistan and Saudi Arabia

Venkat Rao Vishnumolakala, Curtin University/Abu Dhabi University
Amani Hamdan Alghamdi, Imam Abdulrahman Bin Faisal University
Sadiah Shaukat, University of Education, Lahore

Exploring students' intentions to engage with science: A side-by-side comparison of two theoretical models

Ryan Summers, University of North Dakota
 Shuai Wang, SRI International, Washington, DC, USA
 Ashley N Hutchison, Ball State University

Professional Scientists as Mentors: Supporting the Transition from Learner to Researcher

Suzanne Perin, University Of Alaska Fairbanks
 Laura Carsten Conner, University of Alaska Fairbanks
 Laura E. Oxtoby, University of Alaska Fairbanks

The Role of Engagement, Enjoyment, and Self-efficacy in Building Students' and Adults' Scientific Competencies

Hsin-Hui Wang, National Sun Yat-sen University
 Zuway-R Hong, National Sun Yat-Sen University
 Huann-Shyang Lin, National Sun Yat-Sen University

Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies
Equitable Teaching & Diverse Learners

10:30 AM-12:00 PM, James

President: Susanna E. Hapgood, University of Toledo

Integrating Arts Prior to Inquiry Methods Leads to Higher Learning Gains in Elementary Science

Sage Andersen, University of California, Irvine
 Joseph T. Wong, University of California, Irvine
 Michael Corrigan, Multi-Dimensional Education Inc.
 Brad Hughes, University Of California, Irvine

Responsiveness in Elementary Science: Linking Equitable and Disciplinary Theories of Teaching and Learning to Practice

Christa Haverly, Michigan State University

Teaching to Support Equitable and Transformative Sense-Making

Melissa Braaten, University Of Colorado Boulder
 Christa Haverly, Michigan State University
 Christina V. Schwarz, Michigan State University

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies
Disciplinary Literacy in Middle and High School

10:30 AM-12:00 PM, Maryland E

President: Jennifer F. Oramous, University Of Arkansas

Teaching the Language of Science: Disciplinary Literacy in an Era of Educational Reform

Michelle R. Eades-Baird, SUNY Empire State College
 Emily Hayden, Iowa State University

Science and Literacy Integration by Secondary Science and English Language Arts Teachers

Laura E. Robertson, East Tennessee State University
 Renee M.R. Moran, East Tennessee State University
 ChihChe Tai, East Tennessee State University
 Karin Keith, East Tennessee State University

Disciplinary Literacy Instructional Practices in Science Classrooms

Tina Cheuk, Stanford University

Developing Scientific Literacy: Grades 6-8 Teachers' Knowledge and Beliefs

Melissa P. Mendenhall, Alpine School District
 Leigh K. Smith, Brigham Young University
 Ryan S. Nixon, Brigham Young University

Assessing Student Scientific Literacy Using Opportunity-to-Learn Variables

Melinda Whitford, University at Buffalo

Strand 06: Science Learning in Informal Contexts
Intergenerational Science Learning: Possibilities Abound

10:30 AM-12:00 PM, Maryland A

Communities of Color, Churches, and Continual STEM Learning for Future Generations

Natalie S. King, Georgia State University

Facilitating Contextual Learning in the Druze Community

Miri Barak, Technion, Israel Institute Of Technology
 Shadi Asakle, Technion - Israel Institute of Technology

Defining Intergenerational Interactions at a Stingray Touch Tank

Patricia Patrick, Columbus State University

Early Childhood Science Identity Development: Making and Reading Personal Storybooks

Phyllis Katz, University of Maryland

Strand 07: Pre-service Science Teacher Education

Pedagogical Content Knowledge of Preservice Teachers
 10:30 AM-12:00 PM, Kent

President: Claudia Vergara, Alberto Hurtado University

Can the edTPA Appropriately Measure Preservice Teachers' PCK?

William Matthew Reynolds, North Carolina State University
 Soonhye Park, NC State University
 Sarah Cannon, NC State University

Measuring PCK in Earth Science in Preservice teacher: creation of an instrument for elementary teachers

Claudia Vergara, Alberto Hurtado University
David Santibanez, Universidad Católica Silva Henríquez
Beatriz Becerra, Pontificia Universidad Católica de Valparaíso
Hernan Cofre, Pontificia Universidad Católica de Valparaíso

Nature, Quality and Development of Pre-Service Teachers' Early Pedagogical Constructions

Erik Barendsen, Radboud University and Open University of the Netherlands
Ineke Henze-Rietveld, Delft University of Technology

Strand 07: Pre-service Science Teacher Education Symposium-Toward a Coherent Vision of Ambitious Science Teacher Preparation

10:30 AM-12:00 PM, Homeland

Toward a Coherent Vision of Ambitious Science Teacher Preparation

Ron Gray, Northern Arizona University
Heather J. Johnson, Vanderbilt University
Kirsten K. Mawyer, University of Hawaii
Anna C. MacPherson, American Museum of Natural History
Douglas B. Larkin, Montclair State University
David Stroupe, Michigan State University
Amelia Wenk Gotwals, Michigan State University
Scott McDonald, Pennsylvania State University
April Lynn Luehmann, University Of Rochester
Karen Woodruff, Montclair State University

Strand 08: In-service Science Teacher Education Teacher Affect, Agency, and Identity

10:30 AM-12:00 PM, Watertable Salon C

President: Meredith W. Kier, College of William and Mary

"We gotta keep going!" Epistemic Affect within a Science Research Experience for Teachers

Shannon G. Davidson, Florida State University
Lama Z. Jaber, Florida State University
Sherry A. Southerland, Florida State University

Review of Teacher Agency in Science Education Literature

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

Supporting the Science Teacher Identities of Two Elementary Teachers of Color Through Science Professional Development

Jessica L Chen, Teachers College, Columbia University
Felicia Moore Mensah, Teachers College, Columbia University

Strand 08: In-service Science Teacher Education Authentic and Environmental Contexts for Teaching

10:30 AM-12:00 PM, Watertable Salon B

President: Sara Heredia, The University of North Carolina Greensboro

A Case of In-service Science Teachers' Orientations and Practices Developing Socioscientific-Issues-based Instruction: Opportunities and Challenges

Stephen B. Witzig, University Of Massachusetts Dartmouth

Developing Self-efficacy for Inquiry-Based Teaching in Urban Elementary Teachers Through Partnership with Informal Science Institutions

Katherine Miller, University of Pennsylvania
Susan Yoon, University of Pennsylvania
Erin McCool, Riverbend Environmental Education Center

Understanding Teacher Instructional Change: Integrating NGSS and Stewardship in Professional Development

Kathryn N. Hayes, California State University, East Bay
Mele Wheaton, Stanford University
Deborah Tucker, University of La Verne

Strand 10: Curriculum, Evaluation, and Assessment Something like a Phenomenon: Identifying Phenomena to Support the Development of NGSS-aligned Curricula and Assessment

10:30 AM-12:00 PM, Maryland B

President: Jason Y. Buell, University of Colorado Boulder

Designing Contemporary Scientific Phenomena for High School Biology Classrooms: Climate Change, Evolution, and Computational Inquiry

Kristen Clapper Bergsman, University of Washington
Veronica McGowan, University Of Washington
Elaine Klein, University Of Washington
Deb Morrison, University Of Washington
Philip L. Bell, University Of Washington

Tools for Supporting Teachers to Build Quality 3D Assessment Tasks

Katie Van Hone, University Of Colorado Boulder
Jennifer Jacobs, University of Colorado Boulder
William R. Penuel, University of Colorado Boulder
Christopher Wilson, BSCS
Molly Stuhlsatz, BSCS

Selecting Phenomena for Three-Dimensional Assessments

Jason Y. Buell, University of Colorado Boulder
Kate Henson, University of Colorado Boulder
Rajendra Chattergoon, University of Colorado Boulder

Supporting Expansive Science Learning through Different Classes of Investigative Phenomena

Enrique Suárez, University of Washington
Philip L. Bell, University Of Washington

Strand 10: Curriculum, Evaluation, and Assessment
Integrating STEM disciplines

10:30 AM-12:00 PM, Maryland F

Presider: Emine Sahin, Indiana University

A Macro- and Micro-analysis of Teacher-developed Integrated STEM Curriculum

Gillian Roehrig, University of Minnesota
Emily A. Dare, Michigan Technological University
Elizabeth A. Ring-Whalen, St. Catherine University
Jeanna R. Wieselmann, University of Minnesota

Exploring Perceptions of Teacher Agency through STEM Integration Teams

Illana C. Livstrom, University of Minnesota
Elizabeth Crotty, University of Minnesota
Gillian Roehrig, University of Minnesota

Graphing as a Means to Improve Middle School Science Understanding and Affective Domains

Luisa McHugh, Stony Brook University
Angela M. Kelly, Stony Brook University
Keith Sheppard, Stony Brook University

Six Ways of Integrating Science and Engineering: What do Students Learn from Each?

Jenny P. Quintana Cifuentes, Purdue University
Senay Purzer, Purdue University

The Effects of Integrative STEAM Education on Student Learning: A Meta-Analysis

Nam-Hwa Kang, Korea National University of Education
Na-Ri Lee, Korea National University of Education

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

Symposium-Emergent Research using the Family Resemblance Approach to Nature of Science in Science Education

10:30 AM-12:00 PM, Baltimore B

Presider: Christine V. McDonald, Griffith University

Emergent Research using the Family Resemblance Approach to Nature of Science in Science Education

Christine V. McDonald, Griffith University
Zoubeida R. Dagher, University of Delaware
Sibel Erduran, University of Oxford
Ebru Kaya, Bogazici University
Alison Cullinane, Department of Education
Regina Kelly, University of Limerick
Aysegul Cilekrenkli, Bogazici University
Busra Aksoz, Bogazici University
Selin Akgün, Bogazici University
Christine V. McDonald, Griffith University

Strand 14: Environmental Education

Teachers and Engaging Environmental Education

10:30 AM-12:00 PM, Fells Point

Presider: Michelle Forsythe, Texas State University

Sources and Types of Knowledge Used by Students in Classroom, Lab, and Field Settings

Michael Giamellaro, Oregon State University
Kelly Kneece, Oregon State University- Cascades

Teaching Environmental Sustainability with Model My Watershed

Nanette Dietrich, Millersville University Of Pennsylvania
Carolyn Staudt, Concord Consortium
Steven Kerlin, Stroud Water Research Center

Investigating how students and teachers connect their food to the environment and environmental issues

Erica Blatt, Rowan University
Yael Wyner, City College Of New York

Discussion of a Socioscientific Issue: Elementary Classroom Teachers Evaluate Reports Regarding the Missing Bees Phenomenon

Augusto Z. Macalalag, Arcadia University
Julie Dunphy, Arcadia University
Joseph A. Johnson, Mercyhurst University

Lunch—On Your Own

12:00pm – 1:30pm

Concurrent Session #13

1:30pm – 3:00pm

Strand 01: Science Learning, Understanding and Conceptual Change

Concepts in Physics

1:30 PM-3:00 PM, Gibson

Presider: Merryn Cole, University Of Nevada Las Vegas

Systems and transfers vs. forms and transformation: investigating approaches to teaching energy in middle school

Marcus Kubsch, IPN - Leibniz Institute for Science and Mathematics Education

Jeffrey Nordine, Leibniz Institute for Science and Mathematics Education (IPN)

Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel

David L. Fortus, Weizmann Institute Of Science

Joseph S. Krajcik, Michigan State University

Understanding and generative use of physics equations

Shulamit Kapon, Technion - Israel Institute of Technology

Maayan Schvartzer, Technion

Using Cogency to Foster the Use of Concepts of Evidence in Physics Experiments

Freek Pols, TU Delft

Peter Dekkers, TU Delft

Marc de Vries, TU Delft

Visualization of Energy Dissipation with Thermal Imaging Cameras

Larissa Greinert, PhD at Leibniz University of Hannover

Susanne Wessnigk, Leibniz University of Hannover

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Interactions in the STEM context

1:30 PM-3:00 PM, Federal Hill

Presider: Pnina Steinberger, Orot Israel College of Education

Developing the Preschool Scientific and Engineering Practices (PreSEP) Instrument to Explore STEM in Preschoolers' Play

Alison R. Miller, Bowdoin College

Martha Eshoo, Bowdoin College Children's Center

Lauren Saenz, Bowdoin College

Exploring Girls' Participation in Small Group Work during an Integrated STEM Curriculum Unit

Jeanna R. Wieselmann, University of Minnesota

Emily A. Dare, Florida International University

Elizabeth A. Ring-Whalen, St. Catherine University

Gillian H. Roehrig, University of Minnesota

Intellectual Humility: Desettling Teacher-Student Relationships to Knowledge in STEM

Maria C. Olivares, TERC

Eli Tucker-Raymond, TERC

Brian Gravel, Tufts University

Aditi Wagh, Tufts University

Strand 02: Science Learning: Contexts, Characteristics and Interactions

Science Learning Outside of the Classroom

1:30 PM-3:00 PM, Watertable Salon A

Presider: Ercin Sahin, University of Iowa

A good day in the field: Field science and students' shifting identities

David Stroupe, Michigan State University

Heidi B. Carlone, The University Of North Carolina At Greensboro

Factors Related to Middle-School Students' Perception of Learning During Outdoor Science Lessons

Jean-Philippe Ayotte-Beaudet, Université De Sherbrooke

Patrice Potvin, Université du Québec à Montréal

Ways of Be(com)ing in Science: A folksonomy based on youths' perceptions after a science-theatre performance

Megan T. McKinley, Boston College

Michael Barnett, Boston College

Strand 04: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies

Science and Engineering Practices at the Secondary Level

1:30 PM-3:00 PM, Maryland E

Presider: Douglas B. Larkin, Montclair State University

Cognitive achievement of modelers and model viewers in an out-of-school gene-technology laboratory

Julia Mierdel, Universität Bayreuth

Franz X. Bogner, University Of Bayreuth

Impact of Different Instructional Sequences on Modeling Practices in Genetics

Veronica L. Cavera, Rutgers University

Ravit Golan Duncan, Rutgers University

Clark A. Chinn, Rutgers University

Learning Effects of Experimentation with Pictorial Worked Examples Considering Levels of Expertise in Biology

Annika Chomse, Faculty of Biology, University of Duisburg-Essen

Angela Sandmann, Didaktik der Biologie, Universität Duisburg-Essen

Christine Florian, Didaktik der Biologie, Universität Duisburg-Essen

Revealing Argumentation Skills and Conceptual Understanding of Secondary School Students Through Analogical Reasoning

Merve Cin, Dokuz Eylul University Buca Faculty of Education
Zeynep Merve M. Oskay, Dokuz Eylul University Buca Education Institution
Gul Unal Coban, Dokuz Eylul University Buca Faculty of Education

Teacher Perspectives of the Affordances and Challenges of Teaching Computational Thinking

Judith A. Cooper-Wagoner, University Of Arizona
Kristin L. Gunckel, University Of Arizona

Strand 05: College Science Teaching and Learning (Grades 13-20)

Faculty adoption of teaching innovations

1:30 PM-3:00 PM, Watertable Salon B

Presider: Venkat Rao Vishnumolakala, Curtin University

Adoption of Three-Dimensional Learning by College STEM Faculty: Levers and Barriers

Brandon S Goocher, Michigan State University
Cori L Fata-Hartley, Michigan State University
Melanie M. Cooper, Michigan State University
Rebecca L. Matz, Michigan State University

Exploratory Case Study of Instructional Partnerships Between Biology Faculty and Undergraduate Teaching and Learning Assistants

Hannah Jardine, University of Maryland

Primary Sources for the Development of Pedagogical Content Knowledge (PCK) in Community College Biology Instructors

Brandy L. Bowling, North Carolina State University
Soonhye Park, North Carolina State University

**Strand 06: Science Learning in Informal Contexts
*STEM Identities and Aspirations***

1:30 PM-3:00 PM, Watertable Salon C

Presider: Natalie S. King, Georgia State University

"They did not expect me to be a scientist." Informal Service Learning's STEM Identity Impact

Stephanie B. Wortel-London, Stony Brook University - SUNY
Angela M. Kelly, Stony Brook University

National Assessment of the Science Self-Efficacy, Career Aspirations, Science Capital, and Family Habitus of Youth

Megan Ennes, North Carolina State University
M. Gail Jones, North Carolina State University
Katherine Chesnutt, North Carolina State University

Gina Childers, University of North Georgia
Emily M. Cayton, Campbell University

Science for What?

Exploring Science Learning Through Student Voice

Ivanna Pengelley, Florida State University
Amal Ibouk, Florida State University
Roxanne M. Hughes, Center for Integrating Research and Learning, NHMFL / FL State University

Computer Science Stereotypes and Identity:

Two Career-Choice Models for Informal Programs to Consider

Remy Dou, Florida International University
Karina Bhutta, Florida International University
Monique Ross, Florida International University
Vishodana Thamocharan, Florida International University
Laird Kramer, Florida International University

Strand 07: Pre-service Science Teacher Education

Technology Enhanced Pedagogy

1:30 PM-3:00 PM, Kent

Presider: Alberto Bellocchi, Queensland University of Technology

Leading science discussions in a virtual classroom: Profiles of pre-service middle school science teachers

Daniel M. Levin, University of Maryland, College Park
Dana L. Grosser-Clarkson, University of Maryland
Elizabeth E. Fleming, University of Maryland
Alexander K. Chumbley, University of Maryland, College Park
Natalia Galvez Molina, University of Maryland
Amman A. Haque, University of Maryland
Peter Y. Chin, University of Maryland

Preservice elementary teacher perspectives of a college makerspace

Michelle Forsythe, Texas State University

The technological literacy of pre-service teachers and the influence of technology integration on classroom practice at a higher education institute in the Western Cape Province, South Africa

Melanie B. Luckay, University of the Western Cape

Strand 07: Pre-service Science Teacher Education

Exploring the Integration of Computational Thinking in a

Preservice Elementary Science Methods Course:

Multiple Perspectives

1:30 PM-3:00 PM, Maryland A

Discussant: Troy Sadler, University Of Missouri

Presider: Diane Jass Ketelhut, University Of Maryland

Preservice Teachers' Beliefs About CT Integration in Elementary Science Instruction

Emily Hestness, University of Maryland, College Park
Kelly M. Mills, University of Maryland
Randy McGinnis, University Of Maryland
Diane Jass Ketelhut, University Of Maryland
Hannoori Jeong, University of Maryland, College Park
Lautaro Cabrera, University of Maryland, College Park

Preservice Teachers' Changes in Self-Efficacy Regarding Computational Thinking

Lautaro Cabrera, University of Maryland, College Park
Randy McGinnis, University Of Maryland
Diane Jass Ketelhut, University Of Maryland
Emily Hestness, University of Maryland, College Park
Kelly M. Mills, University of Maryland
Hannoori Jeong, University of Maryland, College Park

An Examination of Preservice Teachers' Integration of Computational Thinking in Their Elementary School Lesson Plans

Randy McGinnis, University Of Maryland
Diane Jass Ketelhut, University Of Maryland
Emily Hestness, University of Maryland, College Park
Kelly M. Mills, University of Maryland
Hannoori Jeong, University of Maryland, College Park
Lautaro Cabrera, University of Maryland, College Park

Paper Set Findings and Implications

Troy Sadler, University Of Missouri

How do self-identified minority undergraduate preservice science teachers demonstrate their views towards and understanding of computational thinking (CT) that vary by their background differences?

Hannoori Jeong, University of Maryland, College Park
Randy McGinnis, University Of Maryland
Diane Jass Ketelhut, University Of Maryland
Emily Hestness, University of Maryland, College Park
Kelly M. Mills, University of Maryland
Lautaro Cabrera, University of Maryland, College Park

Strand 08: In-service Science Teacher Education Symposium-Ambitious Science Teacher Learning Across the Professional Continuum

1:30 PM-3:00 PM, Homeland

Discussant: Scott McDonald, Pennsylvania State University

Ambitious Science Teacher Learning Across the Professional Continuum

Kathryn M. Bateman, Pennsylvania State University
Alice Flarend, Pennsylvania State University
Jonathan D. McCausland, Pennsylvania State University

Scott McDonald, Pennsylvania State University
Amy R. Ricketts, University of Delaware
Arzu Tanis-Ozcelik, Recep Tayyip Erdoğan Üniversitesi

Strand 10: Curriculum, Evaluation, and Assessment Measurement and validity

1:30 PM-3:00 PM, Maryland F

Presider: Georgia Hodges, University Of Georgia

Development and validation of an instrument to measure different types of cognitive load

Tianlong Zu, Purdue University
Jeremy M Munsell, Purdue University
N. Sanjay Rebello, Purdue University

Making Claims of Student Understanding Across a Variety of Classroom Assessments

Mary Ewing, University of North Carolina, Chapel Hill
Kerry A. Bartlett, University Of North Carolina - Chapel Hill
Janice L. Anderson, University Of North Carolina At Chapel Hill
Lana Minshew, University Of North Carolina At Chapel Hill
Kelly J. Barber-Lester, The University of North Carolina at Chapel Hill

Measuring Science Motivation with the SMQ II: Testing Validity Inferences using a Rasch Analysis Framework

Donna M. Shapiro, Mount Sinai School District
Ross H. Nehm, Stony Brook University - SUNY
Gena C. Sbeglia, Stony Brook University

Strand 11: Cultural, Social, and Gender Issues Understanding Science Teacher and Student Identity

1:30 PM-3:00 PM, James

Presider: Melissa Braaten, University Of Colorado - Boulder

Science identity as a landscape of becoming: the stories of Maxine and Amina

Lucy Avraamidou, University Of Groningen, Netherlands

A Critical Discourse Analysis of Urban Science Teachers' Identity Work

Katherine Wade-Jaimes, University of Memphis
Rachel Askew, University of Memphis

A 'figured worlds' approach to understanding developing identity and commitment to reform-oriented science teaching

Gail Richmond, Michigan State University
Kraig A. Wray, Michigan State University

Student Experiences from Selective STEM Schools: Students' Negotiated Conceptualizations and Identification with STEM

Anthony M. Villa, Stanford University
Xavier J. Monroe, Stanford University
Elizabeth B. Dyer, WestEd
Maya S. White
Ted Britton, WestEd
Steve Schneider, WestEd

Strand 11: Cultural, Social, and Gender Issues
Reimagining STEM Learning Through Centering Families' Sense-Making Practices

1:30 PM-3:00 PM, Maryland B

Discussant: Leah Bricker, University Of Michigan

President: Enrique Suárez, University of Washington

The sociomateriality of family creativity in story-centered STEAM learning environments

Philip L. Bell, University Of Washington
Enrique Suárez, University of Washington
Don LaBonte, University of Washington
Carrie T. Tzou, University Of Washington Bothell
Megan Bang, Northwestern University

Understanding the Relationship Between Families' Creative Engineering Practices and Products During Engineering Workshops in Libraries and Museums

Soo Hyeon Kim, The Pennsylvania State University
Heather Toomey Zimmerman, Pennsylvania State University

Navigating Opportunities and Tensions in Multilingual Family Science Nights

Tanner Vea, The Pennsylvania State University
Megan Luce, Stanford University
Luke D. Conlin, Salem State University

Family Culture as Substrate for Science Learning

Danielle T. Keifert, Vanderbilt University

Discussant

Leah A. Bricker, University Of Michigan

Strand 14: Environmental Education
Inspiring Environmental Learning through Informal Science Education

1:30 PM-3:00 PM, Fells Point

President: Stacey Britton, University of West Georgia

Actor-Network Theory: Camera Glasses and Family Interactions with Boundary Objects in an Environmental Learning Center

Patricia Patrick, Columbus State University
Michael Dentzau, Columbus State University

Impacts of Scientific Literacy on Rural Sustainability

Craig A. Kohn, Michigan State University

The Lens On Climate Change: Engaging and Inspiring Secondary Students through Place-based Film-making

Megan Littrell, University of Colorado
Erin Leckey, University of Colorado
Anne Gold, University of Colorado
Kelsey Tayne, University of Colorado Boulder
Christine Okochi, University of Colorado
Susan Lynds, University of Colorado

It's just like the eels in the river, no one cares about them: Youth Sense of Place through Urban Citizen Science

Cornelia B Harris, SUNY Albany
Alandeom W. Oliveira, University At Albany, SUNY

Strand 15: Policy

Symposium-Choosing a Science Career: Self-Efficacy and Identity Perspectives

1:30 PM-3:00 PM, Baltimore B

Discussant: Christian Schunn, University of Pittsburgh

President: Hannah Sevian, University Of Massachusetts Boston

Choosing a Science Career: Self-Efficacy and Identity Perspectives

Shirly Avargil, Technion - Israel Institute of Technology
Zehavit Kohen, Technion - Israel Institute of Technology
Daphna Shwartz Asher, Technion - Israel Institute of Technology
Gabby Shwartz, Technion - Israel Institute of Technology
Or Shav-Artza, Technion - Israel Institute of Technology
Greta Strimbaum, Bar-Ilan University
Paulette Vincent-Ruz, University of Pittsburgh
Hannah Sevian, University Of Massachusetts Boston
Christian D. Schunn, University of Pittsburgh
Judy Yehudit Dori, Technion - Israel Institute of Technology

NARST Executive Board Meeting #2
4:00pm – 9:00pm, Watertable A – B

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