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
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- Creativity, Culture, and STEM
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- Literacies as Resistance
- Liberating Education, Liberating Educators
- Mindfulness-Based Teaching and Learning
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- 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 mllokhorst@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.
CREATING AND SUSTAINING COLLECTIVE ACTIVISM through Science Education Research
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 tkrumah@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.*
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

Helen Schneider Lemay, Executive Director

William C. Kyle Jr., Executive Director Emeritus

Toni A. Sondergeld, NARST Scheduling Coordinator

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NARST Staff
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Disclaimer:
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 toys 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

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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

NARST Leadership Team 2018-2019

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Strand 1: Science Learning, Understanding, and Conceptual Change
(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) Jonath 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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Hong, Zuway-R
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Hsu, Pei-Ling
Huang, Ying Syuan
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Hutchison, Paul
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Irish, Tobias
Iveland, Ashley
Iwuanyanwu, Paul
Jackson, Ashley
Jackson, David
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Jensen, Betty
Jeong, Sophia (Sun Kyung)
Jin, Qingna
Jin, Hui
Jones, Tamecia
Judson, Eugene
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Lee, Irene
Lee, Eun Young
Lee, May
Lemmi, Catherine
LePretre, Dawna
Levy, Sharona
Lewis, Elizabeth
Li, Siqi
Liang, Ling
Lin, Jing
Lin, Peiling
Lindner, Martin
Liu, ChangChia
Livstrom, Illana
Lo, Abraham
Lombardi, Doug
Long, Haiying
Long, Christopher
Lowell, Benjamin
Luccioni, Noelie
Luckay, Melanie
Luft, Julie
Lundgren, Lisa
Macalalag, Augusto
Madden, Lauren
Maeng, Seungho
Maguire, Jennifer
Makki, Nidaa
Malcolm, Stephen
Mann, Michele
Manuel, Mariam
Manz, Eve
Maramante, Lori
Marbach-Ad, Gili
Marco-Bujosa, Lisa
Mark, Sheron
Marshall, Stephanie
Marth, Michaela
Matathia Tor, Hrisilda
Matsuura, Takuya
Matz, Rebecca
Mawyer, Kirsten
McBeath, Jasmine Kyle
Mccomas, William
McDonald, Christine
McDonald, Scott
McFadden, Justin
McGinnis, Randy
McGivney, Eileen
NARST Presidents

1928   W. L. Eikenberry     1929   W. L. Eikenberry     1930   W. L. Eikenberry
1931   Elliot R. Downing    1932   Elliot R. Downing    1933   Francis D. Curtis
1934   Ralph K. Watkins     1935   Archer W. Hurd       1936   Gerald S. Craig
1937   Walter G. Whitman    1938   Hanor A. Webb       1939   John M. Mason
1940   Otis W. Caldwell     1941   Harry A. Carpenter   1942   G. P. Cahoon
1943   Florence G. Billig   1944   Florence G. Billig  1945   C. L. Thield
1946   Willard D. Jacobson  1947   Earl R. Glenn       1948   Ira C. Davis
1949   Joe Young West      1950   N. Eldred Bingham    1951   Betty Lockwood
1952   Betty Lockwood      1953   J. Darrell Barnard  1954   George G. Mallinson
1955   Kenneth E. Anderson  1956   W. C. Van Deventer   1957   Waldo W. Blanchet
1958   Nathan S. Washton   1959   Thomas P. Fraser     1960   Vaden W. Miles
1961   Clarence H. Boeck    1962   Herbert A. Smith     1963   Ellsworth S. Obourn
2015   Valerie L. Akerson  2016   Mary M. Atwater    2017   Mei-Hung Chiu
2018   Barbara Crawford   2019   Gail Richmond

NARST Executive Director

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


JRSA Editors

1985 – 1989   Russell H. Yeany, Jr.  and Dana L. Zeidler
1990 – 1993   Ronald G. Good
NARST Emeritus Members

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

NARST AWARD RECIPIENTS

Distinguished Contributions to Science Education through Research Award

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>Paul DeHart Hurd</td>
<td>2003</td>
<td>Barry J. Fraser</td>
<td>2014</td>
<td>Glen Alkenhead</td>
</tr>
<tr>
<td>1989</td>
<td>Willard Jacobson</td>
<td>2005</td>
<td>Paul Black</td>
<td>2016</td>
<td>Frances Lawrenz</td>
</tr>
<tr>
<td>1994</td>
<td>Marcia C. Linn</td>
<td>2010</td>
<td>Peter W. Hewson</td>
<td>2017</td>
<td>Chile M. Zeldiier</td>
</tr>
<tr>
<td>1996</td>
<td>Carl F. Berger</td>
<td>2010</td>
<td>Reinders Duit</td>
<td>2018</td>
<td>Marissa Rollnick</td>
</tr>
<tr>
<td>1998</td>
<td>James J. Gallagher</td>
<td>2012</td>
<td>Norman Lederman</td>
<td>2019</td>
<td>Mary M. Atwater</td>
</tr>
<tr>
<td>2000</td>
<td>Jane Butler Kahle</td>
<td></td>
<td>Larry Yore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>John K. Gilbert</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Outstanding Doctoral Research Award

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Major Professor</th>
<th>Year</th>
<th>Awardee</th>
<th>Major Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>Carolyn W. Keys</td>
<td>Burton E. Voss</td>
<td>2010</td>
<td>Heather Toomey Zimmerman</td>
<td>Phillip Bell</td>
</tr>
<tr>
<td>1996</td>
<td>Christine M. Cunningham</td>
<td>William L. Carlsen</td>
<td>2011</td>
<td>Catherine Eberleib</td>
<td>Kevin Crowley</td>
</tr>
<tr>
<td>1997</td>
<td>Jane O. Larson</td>
<td>Ronald D. Anderson</td>
<td>2012</td>
<td>Melissa Braaten</td>
<td>Mark Windschitl</td>
</tr>
<tr>
<td>1998</td>
<td>Kathleen Hogan</td>
<td>Bonnie K. Nastasi</td>
<td>2013</td>
<td>Lori Fulton</td>
<td>Jian Wang</td>
</tr>
<tr>
<td>1999</td>
<td>Fouad Abd-El-Khalick</td>
<td>Norman G. Lederman</td>
<td>2014</td>
<td>Daniel Birmingham</td>
<td>Angela Calabrese Barton</td>
</tr>
<tr>
<td>2000</td>
<td>Danielle Joan Ford</td>
<td>Annemarie S. Palinscar</td>
<td></td>
<td></td>
<td>and Anne-Lise Halvorsen</td>
</tr>
<tr>
<td>2001</td>
<td>Iris Tabak</td>
<td>Brian Reiser</td>
<td>2015</td>
<td>Allison Godwin</td>
<td>Geoffrey Potvin</td>
</tr>
<tr>
<td>2002</td>
<td>Mark Girod</td>
<td>David Wong</td>
<td>2016</td>
<td>Anna MacPherson</td>
<td>Jonathan Osborne</td>
</tr>
<tr>
<td>2004</td>
<td>David L. Fortus</td>
<td>Ronald Marx and Joseph Krajcik</td>
<td></td>
<td>Katherine Wade-Jaines</td>
<td>Renée Schwartz</td>
</tr>
<tr>
<td>2005</td>
<td>Thomas Tretter</td>
<td>Gail M. Jones</td>
<td>2019</td>
<td>Anita S. Tseng</td>
<td>Jonathan F. Osborne</td>
</tr>
<tr>
<td>2006</td>
<td>Stacy Olitsky</td>
<td>Kenneth Tobin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Julia Plummer</td>
<td>Joseph S. Krajcik</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Early Career Research Award

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Major Professor</th>
<th>Year</th>
<th>Awardee</th>
<th>Major Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Wolff-Michael Roth</td>
<td></td>
<td>2002</td>
<td>Alan G. Harrison</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Deborah J. Tippins</td>
<td></td>
<td>2003</td>
<td>Fouad Abd-El-Khalick</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>Nancy B. Songer</td>
<td></td>
<td>2004</td>
<td>Grady J. Venville</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>Mary B. Nakhlé</td>
<td></td>
<td>2005</td>
<td>Randy L. Bell</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>Peter C. Taylor</td>
<td></td>
<td>2006</td>
<td>Heidi Carlone</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Craig W. Bowen</td>
<td></td>
<td>2008</td>
<td>Hsin-Kai Wu</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Angela Calabrese Barton</td>
<td></td>
<td>2009</td>
<td>Troy D. Sadler</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Julie A. Blanchini</td>
<td></td>
<td>2010</td>
<td>Thomas Tretter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2011</td>
<td>Katherine L. McNeill</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>and Robert C. Olson</td>
<td></td>
<td>(tie) Linda R. DeTure</td>
<td></td>
<td>Russell H. Yeany</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>Mary Budd Rowe</td>
<td>1981</td>
<td>William C. Kyle, Jr.</td>
<td></td>
<td>Kueh Chin Yap,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kueh Chin Yap,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>Marcia C. Linn and Herbert C. Thier</td>
<td>1982</td>
<td>Robert G. Good</td>
<td></td>
<td>Kenneth G. Tobin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and Harold J. Fletcher</td>
<td></td>
<td>and James J. Gallagher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>Anton E. Lawson</td>
<td>1983</td>
<td>(tie) F. David Boulanger</td>
<td>1988</td>
<td>(tie) Robert D. Sherwood,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Warren T. Wollman</td>
<td></td>
<td>Jack A. Easley, Jr.</td>
<td></td>
<td>Charles K. Kinzer,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>John D. Bransford,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>Dorothy L. Gabel</td>
<td>1984</td>
<td>Marcia C. Linn, Cathy Clement</td>
<td>1988</td>
<td>Jeffrey J. Franks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and J. Dudley Herron</td>
<td></td>
<td>and Stephen Pulos</td>
<td></td>
<td>and Anton E. Lawson</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The **NARST Outstanding Paper Award**

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
<th>Year</th>
<th>Awardee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>John J. Koran</td>
<td>1997</td>
<td>no award</td>
<td>2000</td>
<td>Allan G. Harrison, J. Grayson, and David F. Treagust</td>
</tr>
<tr>
<td>1976</td>
<td>Anton E. Lawson</td>
<td>1998</td>
<td>Wolff-Michael Roth, Reinders Duit, Michael Komorek, and Jens Wilbers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>M. James Kozlow and Arthur L. White</td>
<td>1984</td>
<td>Darrell L. Fisher and Barry J. Fraser</td>
<td>2005</td>
<td>Chi-Yan Tsui and David Treagust</td>
</tr>
<tr>
<td>1989</td>
<td>Wolff-Michael Roth</td>
<td>1993</td>
<td>Wolff-Michael Roth</td>
<td>2014</td>
<td>Ying-Chih Chen, Soonye Park and Brian Hand</td>
</tr>
<tr>
<td>1990</td>
<td>Wolff-Michael Roth</td>
<td>1994</td>
<td>Wolff-Michael Roth</td>
<td>2015</td>
<td>Lori M. Ihrig, Michael P. Clough, and Joanne K. Olson</td>
</tr>
<tr>
<td>1991</td>
<td>Wolff-Michael Roth</td>
<td>1995</td>
<td>Wolff-Michael Roth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.

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

Classroom Applications Award

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>(Five Equal Awards)</td>
</tr>
<tr>
<td></td>
<td>Livingston S. Schneider and John W. Renner</td>
</tr>
<tr>
<td></td>
<td>Heidi Kass and Allan Griffiths</td>
</tr>
<tr>
<td></td>
<td>Ramona Saunders and Russell H. Yeany</td>
</tr>
<tr>
<td></td>
<td>Joe Long, James R. Okey, and Russell H. Yeany</td>
</tr>
<tr>
<td></td>
<td>M. James Kozlow and Arthur L. White</td>
</tr>
<tr>
<td>1981</td>
<td>(Four Equal Awards)</td>
</tr>
<tr>
<td></td>
<td>Dorothy L. Gabel, Robert D. Sherwood, and Larry G. Enochs</td>
</tr>
<tr>
<td></td>
<td>Wayne Welch, Ronald D. Anderson, and Harold Pratt</td>
</tr>
<tr>
<td></td>
<td>Mary Ellen Quinn and Carolyn Kessler</td>
</tr>
<tr>
<td></td>
<td>P. Ann Miller and Russell H. Yeany</td>
</tr>
<tr>
<td>1982</td>
<td>(Four Equal Awards)</td>
</tr>
<tr>
<td></td>
<td>Louise L. Gann and Seymour Fowler</td>
</tr>
<tr>
<td></td>
<td>Dorothy L. Gabel and Robert D. Sherwood</td>
</tr>
<tr>
<td></td>
<td>Thomas L. Russell</td>
</tr>
<tr>
<td></td>
<td>Joseph C. Cotham</td>
</tr>
<tr>
<td>1983</td>
<td>Robert D. Sherwood, Larry G. Enochs, and Dorothy L. Gabel</td>
</tr>
<tr>
<td>1984</td>
<td>(Four Equal Awards)</td>
</tr>
<tr>
<td></td>
<td>Mary Westerback, Clemencia Gonzales, and Louis H. Primavera</td>
</tr>
<tr>
<td></td>
<td>Kenneth G. Tobin Hanna J. Arzi, Ruth Ben-Zvi, and Uri Ganiel</td>
</tr>
<tr>
<td></td>
<td>Charles Porter and Russell H. Yeany</td>
</tr>
</tbody>
</table>

1985 (Three Equal Awards)

Dan L. McKenzie and Michael J. Padilla
Margaret Walkosz and Russell H. Yeany
Kevin C. Wise and James R. Okey

1986 (Four Equal Awards)

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

1987 (Four Equal Awards)

Dorothy L. Gabel, V. K. Samuel, Stanley L. Helgeson, Saundra McGuire, Joseph D. Novak, and John Butzow

1988 (Four Equal Awards)

Linda Cronin, Meghan Tweist, and Michael J. Padilla

1989 (Four Equal Awards)

James D. Ellis and Paul J. Kuerbis

1990 (Four Equal Awards)

Dale R. Baker, Michael D. Piburn, and Dale S. Niederhauser

1991 (Four Equal Awards)

David F. Jackson, Billie Jean Edwards, and Carl F. Berger
NARST Leadership Team & Committees
2018-2019

Officers

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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

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Helen Schneider Lemay
The Schneider Group, Inc.

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Purdue University

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University of the Witwatersrand, Johannesburg

Christian Siry
The University of Luxembourg

Lynn D. Dierking
Oregon State University

Jomo Mutege
Indiana University, IUPUI

Katherine L. McNeill
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 Schoenning
Anshe Emet

JRST Editors (term ends 2020)
Fouad Abd-El-Khalick
The University of North Carolina at Chapel Hill

Dana L. Zeidler
University of South Florida - Tampa Bay

AWARDS COMMITTEE

Chair
(19) Lynn Dierking
Oregon State University
dierklinl@science.oregonstate.edu

Awards: Outstanding Doctoral Research Award Selection Subcommittee

Co-Chairs
(19) Barbara Hug
University of Illinois at Urbana-Champaign
bhu@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 Tunnicleffe
University College London
lady.tunnicleffe@mac.com
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 nwaight@buffalo.edu
(20) Michal Zion Bar-Ilan University michal.zion@biu.ac.il
(20) Patricia Friedrichsen The University of Missouri friedrichsemp@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 Sevian University of Massachusetts, Boston Hannah.Sevian@umb.edu
(19) Ravit Duncan Rutgers University ravit.duncan@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

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 Krajcir Michigan State University krajcir@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

Board Member Liaison
(21) Alejandro Gallard Georgia Southern University agallard@georgiasouthern.edu

Representative from Ethics and Equity Committee
(19) Senetta F. Bancroft Southern Illinois University senetta.bancafort@siu.edu

Representative from the International Committee
(19) Ravinder Koul Penn State University rsk141@psu.edu

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 ledemann@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 Suriel Valdosta State University rlsuriel@valdosta.edu

EQUITY AND ETHICS COMMITTEE

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

Chair
--- --- ---

Members
(20) Lillian H. Degand Illinois Institute of Technology degalil@hawk.iit.edu
(20) Catherine Quintan Howard University ckl8@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
Members
(20) Sharon Lynch  George Washington University  slynch@gwu.edu
(20) Remy Dou  Florida International University  douremy@gmail.com
(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  sjcarrier@ncsu.edu

GRADUATE STUDENT COMMITTEE

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

Chair
(19) Francesca White  Indiana University  frawhite@indiana.edu

Members
(19) Marcus Kubsch  IPN, Kiel University  kubsch@ipn.uni-kiel.de
(19) Heidi Cian  Clemson University  hdcian@g.clemson.edu
(19) Thomas Kameroski  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

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  rsk141@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  hwjiang@seas.harvard.edu
(19) Henriette Tolstrup Holmegaard  University of Copenhagen, Denmark  htholmegaard@ind.ku.dk
(21) Peter Wuff  Leibniz Institute, Kiel University  wuff@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

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

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  labryan@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 Mutegi  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  ychen495@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  rebello@purdue.edu
(21) Banu Aysar  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  raghanasaheh@gsu.edu
(20) Jennifer Parrish  University of Northern Colorado  jennifer.parrish@unco.edu
(21) Kelsey Lipsitz  University of Missouri, Exploratorium  kcgxv4@mail.missouri.edu

PUBLICATIONS ADVISORY COMMITTEE

Board Liaison
(21) Christina Siry  University of Luxembourg  Christina.Siry@uni.lu
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 Cartone (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-Coordinators):

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 Huizik-Clark  Bowling Green State University  thuizik@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) Valerie Akerson  Indiana University  vakerson@indiana.edu
(20) Dina Tsybulsky  Technion - Israel Institute of Technology  dinats@technion.ac.il

Strand 14: Environmental Education
(19) Kim Haverkos  Thomas More College  kimberly.haverkos@thomasmore.edu
(20) Iris Alkafer 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  

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## SCHEDULE AT A GLANCE

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Saturday, March 30</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:30 AM – 5:00 PM</td>
<td>NARST Executive Board Meeting #1</td>
<td>Homeland</td>
</tr>
<tr>
<td>2:00 PM – 5:00 PM</td>
<td>Conference Registration</td>
<td>Maryland Foyer</td>
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<tr>
<td><strong>Sunday, March 31</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:30 AM – 10:30 AM</td>
<td>NARST Executive Board Meeting #1 (continued)</td>
<td>Homeland</td>
</tr>
<tr>
<td>7:00 AM – 4:30 PM</td>
<td>Conference Registration</td>
<td>Maryland Foyer</td>
</tr>
<tr>
<td>8:00 AM – 11:45 AM</td>
<td>PRE-CONFERENCE WORKSHOPS</td>
<td></td>
</tr>
</tbody>
</table>

*Please note:* You must register for the Pre-conference Workshops with your Advance Conference Registration. You may only register for one workshop.

### 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 (jhenley78@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 Ogunslola-Bandele (ogunband@hotmail.com);  
Minjung Ryu (mryu@purdue.edu); Maria Varelas (mvarelas@uic.edu)

### 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 (ortega2@alaska.edu);  
Femi Otulaja (Femi.Otulaja@wits.ac.za); Deborah J. Tippins

### 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@clemson.edu); Amy Trauth (anare@udel.edu);  
Jenni Buckley (jbuckley@udel.edu); Maria Varelas (mvarelas@uic.edu)
Date/Time  | Event                                                                 | Room          
---          |----------------------------------------------------------------------|---------------
8:00 AM – 11:45 AM | **Pre-Conference Workshop #4: Research Committee**<br>Cost: Free<br>Maximum registration: 50<br>**Title**: Understandings of Scientific Inquiry; Learning to Score and Administer Valid and Reliable Instruments (Views about Scientific Inquiry and Young Children Views about Science)<br>**Presenters**: Judith S. Lederman (ledermanj@iit.edu); Norman G. Lederman (ledermanj@iit.edu); Selina L. Bartels (Selina.bartels@valpo.edu); Juan Jimenez-Pavez (jjimenez10@iit.edu)<br>**Title**: Using RStudio to Create Visualizations for Communicating about Data<br>**Presenters**: Robert (Bud) Talbot (robert.talbot@ucdenver.edu); Jayson Nissen (jayson.nissen@maine.edu); Joe Taylor (jlayo18@uccs.edu); Geoff Potvin (gpotvin@flu.edu); Andrew McDevitt (andrew.mcdevitt@ucdenver.edu)<br>**Title**: Early Career Faculty Forum<br>**Facilitators**: Brooke Whitworth (baw3tj@virginia.edu); Alison Riley Miller (amiller2@bowdoin.edu); Felicia Moore Mensah (fm2140@c.columbia.edu)<br>**Title**: African Theory of eZiko siPheka siSophula: A case for incorporating methodological, epistemological and theoretical indigenous perspectives in science teaching learning and research<br>**Organizers**: Femi S. Otulaja (Femi.Otulaja@wits.ac.za); Nomalungelo Goduka (ngoduka@wsu.ac.za)<br>**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 Oguminyi (moguminyi@uwc.ac.za); Pauline Chinn (chinn@hawaii.edu); Stacey Britton (biolady24@yahoo.com); Irasema Ortega (iortega2@alaska.edu)
---          | **Lunch**                                                           | On your own   
11:45 AM – 12:45 PM | **Conference Welcome, Recognitions, & Plenary Session**<br>**Speaker**: Talia Milgrom-Elcott (Co-Founder and Executive Director of 100Kin10)<br>**Title**: Turning a Moment to a Movement: Mining lessons from 100Kin10 on collective activism and STEM education
12:45 – 2:30 PM | **Concurrent Session # 1**                                        | Concurrent Session Rooms
2:40 PM – 4:10 PM | **Concurrent Session # 2**                                        | Concurrent Session Rooms
6:00 PM – 7:00 PM | **Research Interest Groups (RIGs) Meetings**<br>Continental and Diasporic Africa in Science Education (CADASE)<br>Latino/a RIG (LARIG)<br>Engineering Education<br>Contemporary Methods for Science Education Research<br>Indigenous Science Knowledge<br>Mentor/Mentee Nexus<br>**Title**: Continental and Diasporic Africa in Science Education (CADASE)<br>**Title**: Latino/a RIG (LARIG)<br>**Title**: Engineering Education<br>**Title**: Contemporary Methods for Science Education Research<br>**Title**: Indigenous Science Knowledge<br>**Title**: Mentor/Mentee Nexus
7:00 PM – 9:30 PM | **Presidential / Welcome Reception**<br>Light appetizers will be served. Cash bar. | Maryland C - D
<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, April 1</td>
<td><strong>Mind and Sole (Off-site)</strong> <em>This event is not sponsored nor endorsed by NARST</em></td>
<td>Lobby</td>
</tr>
<tr>
<td>6:00 AM – 7:15 AM</td>
<td><strong>Conference Registration</strong></td>
<td>Maryland Foyer</td>
</tr>
<tr>
<td>8:00 AM – 4:30 PM</td>
<td><strong>Concurrent Session # 3</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>8:30 AM – 10:00 AM</td>
<td><strong>Concurrent Session # 4</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>10:15 AM – 11:45 AM</td>
<td><strong>NARST Annual Membership Meeting</strong></td>
<td>Baltimore A</td>
</tr>
<tr>
<td>12:00 PM – 1:00 PM</td>
<td><strong>Lunch</strong></td>
<td>On your own</td>
</tr>
<tr>
<td>1:15 PM – 2:45 PM</td>
<td><strong>Concurrent Session # 5</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>2:45 PM – 3:15 PM</td>
<td><strong>Networking Break</strong></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>3:15 PM – 4:15 PM</td>
<td><strong>Concurrent Session # 6A: Poster Session</strong></td>
<td>Maryland C – D</td>
</tr>
<tr>
<td>4:15 PM – 5:15 PM</td>
<td><strong>Concurrent Session # 6B: Poster Session</strong></td>
<td>Maryland C – D</td>
</tr>
<tr>
<td>5:30 PM – 7:00 PM</td>
<td><strong>Graduate Student Forum</strong></td>
<td>Baltimore A</td>
</tr>
<tr>
<td>6:00 PM – 8:30 PM</td>
<td><strong>JRST Editorial Team Meeting / Dinner</strong></td>
<td>Watertable A - B</td>
</tr>
<tr>
<td>6:00 PM – 7:30 PM</td>
<td><strong>International Journal of Science and Mathematics Education Reception</strong></td>
<td>Homeland</td>
</tr>
<tr>
<td><strong>Tuesday, April 2</strong></td>
<td><strong>Looking Toward the Future:</strong> DCRA Recipients and NARST Leadership Presentations**</td>
<td>Maryland C - D</td>
</tr>
<tr>
<td>7:30 AM – 8:30 AM</td>
<td><strong>Registration</strong></td>
<td>Maryland Foyer</td>
</tr>
<tr>
<td>8:00 AM – 9:30 AM</td>
<td><strong>Concurrent Session # 7</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>9:30 AM – 10:00 AM</td>
<td><strong>Networking Break</strong></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>10:00 AM – 11:30 AM</td>
<td><strong>Concurrent Session # 8</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>11:30 AM – 1:15 PM</td>
<td><strong>Lunch</strong></td>
<td>On your own</td>
</tr>
<tr>
<td>11:45 AM – 1:10 PM</td>
<td><strong>Committee Meetings</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>1:20 PM – 2:15 PM</td>
<td><strong>Equity &amp; Ethics Dinner</strong></td>
<td>Off-site: Spirit of Baltimore Dinner Cruise Address: Baltimore Inner Harbor</td>
</tr>
<tr>
<td>2:30 PM – 4:00 PM</td>
<td><strong>Concurrent Session # 9</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>4:15 PM – 5:45 PM</td>
<td><strong>Concurrent Session # 10</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>6:30 PM – 9:00 PM</td>
<td><strong>Boarding is at 6:30 PM (Maximum attendance: 100)</strong> Dinner, including tax and gratuity, is $45.**</td>
<td>Spirit of Baltimore Dinner Cruise Address: Baltimore Inner Harbor</td>
</tr>
<tr>
<td><strong>Wednesday, April 3</strong></td>
<td><strong>Strand Meetings</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>7:00 AM – 8:15 PM</td>
<td><strong>Conference Registration</strong></td>
<td>Maryland Foyer</td>
</tr>
<tr>
<td>8:00 AM – 11:00 AM</td>
<td><strong>Concurrent Session # 11</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>8:30 AM – 10:00 AM</td>
<td><strong>Networking Break</strong></td>
<td>Ballroom Foyer</td>
</tr>
<tr>
<td>10:00 AM – 10:30 AM</td>
<td><strong>Concurrent Session # 12</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>10:30 AM – 12:00 PM</td>
<td><strong>Lunch</strong></td>
<td>On your own</td>
</tr>
<tr>
<td>12:00 PM – 1:30 PM</td>
<td><strong>Concurrent Session # 13</strong></td>
<td>Concurrent Session Rooms</td>
</tr>
<tr>
<td>4:00 PM – 9:00 PM</td>
<td><strong>NARST Executive Board Meeting #2</strong></td>
<td>Watertable A – B</td>
</tr>
</tbody>
</table>
NARST Executive Board Meeting #1
7:30am – 5:00pm, Homeland

Conference Registration
2:00pm – 5:00pm, Maryland Foyer
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 (jhenley78@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)

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 (ortega2@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

Understanding 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

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

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 White, University of Rochester

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 Reign, 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. Portsmore, 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 Menésces Villagrá, 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 Course-taking 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 Lernus, 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
Presider: 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 Upmeier Zu Belzen, Humboldt-Universität Zu Berlin

Strand 07: Pre-service Science Teacher Education
Effects of Instructional Strategies
2:40 PM-4:10 PM, James
Presider: 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
Presider: 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 Universitiy of the Negev, Israel
Orít 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
Presider: 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
Aleezah 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
Orit 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
Concurrent Session #2
4:20 pm – 5:50 pm

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

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
Sheron 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
Presider: 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 Techawithayachinda, 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
Presider: 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 Preservice 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, Cobbblestone 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. Semejian, 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

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
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

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
Presider: 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
Bahadir 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.
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

Facilitation of Motivation and Learning by Enhancing Instruction with Motivational Strategies
Sadik Bulut, Marmara University
Feral Ogan-Bekirolgu, 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
Presider: 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 Akgun, 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
Bahadir 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/OEHS
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
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

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 Metamodelling 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 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-Universitat 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-Universitat 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.
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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 Sevian, 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. Mline, 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. Minstre, 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
Presider: 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
Presider: 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
Presider: 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 Suarez, 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 Suarez, 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
**Presider:** 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 Universität Berlin

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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

**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

**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

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Strand 11: Cultural, Social, and Gender Issues
Explorations in Teaching Science to Multilingual and Other Marginalized Learners
10:15 AM-11:45 AM, Gibson
**Presider:** 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

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Monday, April 1, 2019

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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
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 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

“A 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 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
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
Sauboura 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. Schoerung, Anseh Ernet
Hyat Hokayem, Texas Christian University
G. Michael Bowen, Mount Saint Vincent University
Christina Sily, University of Leembou
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:

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

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

STEM Undergraduates Perceived Association with STEM Culture in Ireland.
Regina Kelly, University of Limerick, Ireland
Oliver McGaar, University of Limerick, Ireland
Louise Lehanne, National University of Ireland, Galway, Ireland
Siber Erduran, University of Oxford, United Kingdom
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 Techawithayachinda, 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 Larnichane, 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
Presider: 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 Golubmic, 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
Presider: Digna Couso, Crecim-Universitat Autonoma 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 Zygonis-Coe, University of Central Florida
Rebecca A Grislyso, 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 08: In-service Science Teacher Education
Considerations for Curricular and Materials Decisions
1:15 PM-2:45 PM, Watertable Salon C
Presider: 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
Presider: 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
Presider: 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
Presider: Noemi Waight, University at Buffalo

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

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

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. Nzewu, University Of Nigeria, Nsukka
Joy Abamuche, 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
Wanqin 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’ Metamodelling 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 University

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. Akindoye, 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
Pel-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

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

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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

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Monday, April 1, 2019
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
Keri 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

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

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 Rubio-Hare, Northern Arizona University
Haylee Archer, Northern Arizona University
Chris N. San Antonio, Museum of Science, Boston
Cathy P. Lachapelle, Museum of Science

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

Monday, April 1, 2019
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. McKinnie 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 Habertlach, 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

Irmeda 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
Qi Qi 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, Univeristy 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

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, Univeristy 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 Misssouri-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 of 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

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**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

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**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 Programming 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

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 Peffer, 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 Epistemetic 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
Xhihong 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

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Graduate Student Forum
5:30pm – 7:00pm, Baltimore A

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JRST Editorial Team Meeting/Dinner
6:00pm – 8:30pm, Watertable A – B
Sponsored by Wiley-Blackwell (By invitation only)

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International Journal of Science and Mathematics Education Reception
6:00pm – 7:30pm, Homeland
Sponsored by Springer (By invitation only)

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Routledge Reception
6:00pm – 7:30pm, Guilford
Sponsored by Journal of Science Education (By invitation only)
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. Kameroski, The Pennsylvania State University
Ayca 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
8:00 AM-9:30 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
Presider: 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
Presider: Alberto Belloccchi, 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 Kjelvik, 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
Presider: 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
Yi-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 Professor Computer Science and Engineering University of Connecticut

Strand 07: Pre-service Science Teacher Education
STEM Design & Competencies
8:00 AM-9:30 AM, James
Presider: 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
Ayeş 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
Presider: 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
Presider: 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
Presider: 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
Rachel Tawbush, University of Alabama
Mohan Aggarwal, Alabama A&M University

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
Presider: Jayma Koval, Georgia Institute Of Technology, Jessica Gale, Georgia Institute Of Technology - CEISMC

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 - CEISMC
Meltem Alemdar, Georgia Institute Of Technology
Sabrina Grossman, Georgia Institute Of Technology - CEISMC
Jayma Koval, Georgia Institute Of Technology

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
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. Mutegi, 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
Presider: 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 StateUniversity, 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
Presider: 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
Presider: 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
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
10:00 AM-11:30 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
Presider: 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

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
Presider: 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**  
Pnina 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

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**Strand 06: Science Learning in Informal Contexts**  
*Informal STEM Education Professionals*  
10:00 AM-11:30 AM, Pride of Baltimore  
**Presider:** 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 Markwordt, 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

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**Strand 07: Pre-service Science Teacher Education**  
*Culturally & Socially Responsive Pedagogy*  
10:00 AM-11:30 AM, James  
**Presider:** 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

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**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

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**Strand 08: In-service Science Teacher Education**  
*Supporting the Exploration of Computational Thinking and Data*  
10:00 AM-11:30 AM, Watertable Salon C  
**Presider:** 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 Wag, Tufts University  
Ezra Gouvea, Tufts University  
Amon Millner, Olin College of Engineering  
Ada Ren, TERC

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**Strand 10: Curriculum, Evaluation, and Assessment**  
*Supporting teachers in development, assessment, and instruction - part II*  
10:00 AM-11:30 AM, Kent  
**Presider:** 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 Univeristy
Consuelo J. Morales, University of Michigan
Chanyah Dahsah, Michigan State University
Phyllis H. Pennock, CREATE for STEM/Michigan State University

Analysis of Science Textbooks as Cultural Supportive Tools: the Case of Arab Countries
Saouma B. Boujaoude, American University Of Beirut
Razan H. Noureddin, 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
Presider: 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
Shrutti 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 Minnesoeta
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
Presider: 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, Lehig 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

**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  
**Presider:** 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. Darmelin, 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

“It’s 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
Alanan 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
Strand 05: College Science Teaching and Learning (Grades 13-20)

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 Sevian, University Of Massachusetts Boston
Melissa Weinrich, University of Northern Colorado

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Strand 06: Science Learning in Informal Contexts

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

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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

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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

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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?**
Dawne M. LePretre, Illinois Institute of Technology
Selina L. Bartels, Valparasio 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
Presider: 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 indagation: 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
Presider: 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
Presider: 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
Elit 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 Ivland, 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
Rebeeca 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 Nevada- Las Vegas
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
Presider: Anita Schuchardt, University of Minnesota

Raul Orduna Picon, University of Massachusetts Boston
Hannah Sevian, 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
Penihan Akman, University of Paderborn
Sabine Fechner, University Of Paderborn

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 02: Science Learning: Contexts, Characteristics and Interactions
Strategies for Overcoming Barriers to Science Learning
4:15 PM-5:45 PM, Watertable Salon A
Presider: Georgia Hodges, University Of Georgia

A socio-cultural perspective of the role of learning assistants in active learning environments
Mary K. Nyaema, Florida International University

Engineering in the Elementary Classroom
Jennifer Chiu, University Of Virginia
Kevin W. McElhaney, 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 Helding, 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 Helding, 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
Presider: 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
Presider: 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)

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 Elise 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
Agustín 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
Presider: 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.
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-Univeritat Autonoma 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
Presider: Justina A. Ogodo, 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

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
Presider: 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, Yildiz Technical University

Strand 03: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies
Elementary Learning Environments
8:30 AM-10:00 AM, James
Presider: 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 Ranagan, University of Georgia

Engaging Elementary Students with Big Data through Hands-On Science
Kayla Ranagan, 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
Presider: 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

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
Presider: 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
Claussell 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 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
Presider: 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
Presider: 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

Plants Do What?! Using a Conceptual Change Framework and Computer Simulation to Understand Respiration
Amanda L. Gonczi, 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 Witwatersrand

Strand 07: Pre-service Science Teacher Education
Performance Assessment
8:30 AM-10:00 AM, Kent
Presider: 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
Presider: 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

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 Witwatersrand

Yong Ju Jung, The Pennsylvania State University
Dana Vedder-Weiss, Ben-Gurion University Of the Negev, Israel
Suzanne Perin, University Of Alaska Fairbanks
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 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

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 Alkaher, 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

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 Upmeier 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 Sevian, 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
Sadia 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
Presider: 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 Havery, Michigan State University

Teaching to Support Equitable and Transformative Sense-Making
Melissa Braaten, University Of Colorado Boulder
Christa Havery, 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
Presider: 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
Presider: Claudia Vergara, Alberto Hurtado University

Can the edTPA Appropriately Measure Preservice Teachers’ PCK?
William Matthew Reynolds, North Carolina State University
Soontyne 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
Presider: 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
Anika 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
Presider: 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

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
Presider: 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 Horne, 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

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 Kubisch, 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 Schwartzter, 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

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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. Wiesemann, 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. Olivaress, TERC
El Tucker-Raymond, TERC
Brian Gravel, Tufts University
Aditi Wagh, Tufts University

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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

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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. Cavena, 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 Eylül University Buca Education Institution
Gül Unal Coban, Dokuz Eylül 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

Science for What?
Exploring Science Learning Through Student Voice
Ivanna Penglisley, Florida State University
Amal Ibourk, 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 Thamothisaran, 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 Bellocoche, 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
Hannoori Jeong, University of Maryland, College Park
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
Presider: 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
Presider: 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
Presider: Hannah Sevian, University Of Massachusetts Boston

Choosing a Science Career: Self-Efficacy and Identity Perspectives
Shirly Avargil, Technion - Israel Institute of Technology
Zehavit Cohen, Technion - Israel Institute of Technology
Daphna Shwarts 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
Routledge Education

at NARST 2019

Explore a range of science education research including:

- African Journal of Research in Mathematics, Science and Technology Education
- Applied Environmental Education & Communication
- Environmental Education Research
- European Journal of Engineering Education
- International Journal of Mathematical Education in Science and Technology
- International Journal of Science Education
- International Journal of Science Education, Part B: Communication and Public Engagement
- International Research in Geographical and Environmental Education
- Investigations in Mathematics Learning
- Journal of Biological Education
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- Journal of Science Teacher Education
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