95th NARST International Conference | Program

March 27–30, 2022

UNITY & INCLUSION for Global Scientific Literacy

INVITE as a community. UNITE as a community.

Vancouver, British Columbia, JW Marriott Parq

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Acknowledgments

The following helped to prepare and to edit the 2022 NARST Annual International Conference Program Book:

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Paul Kemp
Conference Program and Data Coordinator

Julie Utano
Virtual, Inc.
Association Manager

Vancouver, British Columbia, JW Marriott Parq

95th NARST International Conference

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Please note that this program is subject to change.

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

General Information

Information about NARST

NARST is a worldwide organization for improving science teaching and learning through research. Since its inception in 1928, NARST has promoted research in science education and the communication of knowledge generated by the research. The ultimate goal of NARST is to help all learners achieve science literacy.

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

NARST— A global organization for improving science education through research.

Research areas of interest to NARST members include 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.

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.

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.

Code of Ethical Conduct

The purpose of the National Association of Research in Science Teaching (NARST) Code of Ethical Conduct is to articulate a set of aspirational principles to guide and support members as they engage in professional activities—research, teaching, and service. NARST members are science education professionals who include researchers, practitioners, and graduate students from various cultures worldwide. These aspirational principles align with and support the mission of the organization to help all members achieve, develop, and contribute meaningfully to the improvement of science teaching and learning through research. NARST expects its members to adhere to the highest ethical standards. The Code of Ethical Conduct serves as a guide to the everyday professional conduct of science educators.

Unfamiliarity with NARST's Code of Ethical Conduct is not a valid defense for engaging in or failing to challenge observed unethical behavior. We accomplish this through our Code of Ethical Conduct where there is:

A. Professional Competence

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

B. Integrity

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

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

Science education professionals have a responsibility to use research practice and policy to advance NARST members' understanding of the teaching and learning of science in all learning contexts—formal, informal, local, and global—through research, practice, and policy. They adhere to the highest scholarly and professional standards within their field of expertise and accept responsibility for adherence to those standards. Science education professionals should regard the tutelage of graduate students and early career faculty as a trust conferred by the organization for which they work, as well as NARST, for the promotion of these individuals' learning and professional development.

Code of Ethical Conduct

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

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

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

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

E. Social Responsibility

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

References

AERA Council. (2011). Code of ethics: American Educational Research Association. Educational Researcher, 40(3), 145-146.

American Sociological Association. (1999). Code of ethics and policies and procedures of the ASA committee on professional ethics. Retrieved from: http://www.asanet.org/membership/code-ethics

American Psychological Association. (2017). Ethical principles of psychologists and code of conduct. Retrieved from: http://www.apa.org/ethics/code/

Explanation of Program Session Formats

Session	Description
Pre-Conference Workshops	Interactive working group sessions before the official Conference.
Graduate Student Forum	Synchronous opportunity for graduate students to interact and learn.
Mentor-Mentee Session	Synchronous opportunity for first attendees to conference and early-career individuals to interact with more seasoned NARST members.
NARST Welcome Session for First-Time Attendees	Sponsored by the Membership Committee, this session provides first-time attendees with an overview of conference logistics as well as opportunities to ask questions relevant to navigating the NARST experience. An in-person session and an online session are scheduled.
Poster Sessions	The 2022 poster sessions are in person and virtual displays of scholarship for discussion.
General Sessions	Sessions offered for all attendees (in person and livestreamed for virtual attendees). These include the Opening Welcome Session with Keynote, Membership Meeting, Recognitions and Reflections Session, and Closing Session.
Concurrent Sessions	Concurrent sessions include multiple paper presentations related to a strand or topic, symposium, or administrative session. Concurrent session presentations may include a mix of in-person and virtual participants. A selection of sessions are livestreamed to the virtual audience (three sessions per concurrent time slot). In person sessions are viewed only by the in person audience.
Committee and RIG Meetings	Standing committees and Research Interest Groups meet to discuss ongoing business and activities. These meetings are open to all conference attendees.

Explanation of Program Session Formats

Paper Sessions Organized by the Program Committee

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

Symposium

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

Related Paper Set

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

Explanation of Program Session Formats

Poster Session

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

Virtual posters are displayed on the conference website and include a chat feature for asynchronous discussion. Presenters also have the option of including a brief (2-3 minute) video overview of their poster.

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 manuscripts may be available either **via** hard copy distribution at the session **or** via electronic access provided by the author.

Roundtable Session

Roundtable sessions allow maximum interaction among presenters and attendees. Papers accepted for a roundtable session will be grouped into tables with three papers per table, clustered around shared interests. For 2022, roundtable sessions are **45 minutes**. The groupings may include in person as well as virtual presenters. We ask that the presenters at each table share the time equally. Presenters wishing to display information may do so from their own laptop computer screens. If you plan to use a laptop, please be sure the battery is charged, as a power source will not be provided. Alternatively, presenters can share printed materials.

Research Interest Groups (RIGs) Information

Continental and Diasporic Africa in Science Education RIG (CADASE)

The purpose of CADASE RIG is to **(a)** encourage science educators to engage in research aimed at meeting the needs of people of African descent; and **(b)** provide intellectual, professional, and personal space for science educators engaged in such research. This RIG will provide opportunities for science education researchers to integrate the study of culture, ethnicity, gender, race, and social class as lenses for performing critical analyses and evaluations of prevailing theory and practice of science education on the lives of people of African descent. A variety of theoretical and methodological frameworks will be used to address issues in science curriculum, learning, teaching, assessment and evaluation, and policy issues in both K-14 formal and informal venues in different contexts.

Chair: **Mary M. Atwater**
atwater@uga.edu

Steering Committee Chair: **Rona Robinson-Hill**
rmrobinsonhi@bsu.edu

Secretary: **Shari Earnest Watkins**
shariear@yahoo.com

Treasurer: **Brittany Gavin-Hudson**
bagarvin@gmail.com

LATINO/A RIG (LARIG)

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

Chair: **Regina L Suriel**, Valdosta State University
rlsuriel@valdosta.edu

Contemporary Methods for Science Education Research

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

Chair: **Robert Talbot**, University of Colorado Denver
robert.talbot@ucdenver.edu

Co-Chair: **Bina Vanmali**, Arizona State University
Bina@asu.edu

Engineering Education RIG (ENE-RIG)

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

Chair: **Anne Emerson Leak**, High Point University
aleak@highpoint.edu

Indigenous Science Knowledge Research Interest Group (ISK-RIG)

The ISK-RIG was set up to showcase and provide support to current and future research works of a growing number of Indigenous Knowledge Systems (IKS) researchers working within indigenous communities throughout the world who are members of NARST. This group includes active members from Africa and the African Diaspora, Alaska, Australia, Canada, Indigenous populations of the Americas, Asia and the Pacific, the Middle East, Thailand, Nordic Regions, New Zealand, Scandinavia, the West and East Indies, etc. The goal is to increase awareness of what indigenous knowledge systems can contribute to research.

Chair: **Bhaskar Upadhyay**, University of Minnesota
bhaskar@umn.edu

Secretary: **Cikigaq-Irasema Ortega**, University of Alaska, Anchorage
iortega2@uaa.alaska.edu

Treasurer: **Sharon Nelson-Barber**, WestEd
snelson@wested.org

Research in Artificial Intelligence-Involved Science Education (RAISE)

This RAISE RIG aims at employing AI to extend the landscape of science education, increase the capacity of all participants in the venture to face worldwide challenges, and significantly address the equity and ethical problems in the world broadly. This RIG will **(a)** support cutting-edge innovations using AI to address learning, teaching, assessment, equity and policy issues in science education; **(b)** communicate the cutting-edge research involving AI to all researchers, practitioners, and policymakers; and **(c)** encourage junior scholars in the field to pursue AI innovations within science education research as it is broadly practiced.

Chair: **Xiaoming Zhai**, University of Georgia
Xiaoming.zhai@uga.edu

Co-Chair: **Kent J. Crippen**, University of Florida
kcrippen@coe.ufl.edu

Asian and Pacific Islander Science Education Research (APISER)

The APRSER RIG will promote diversity, equity, and inclusion in science education research using the lenses relevant to Asian and pacific islander cultures, ethnicities, gender, and class, as well as the intersections of these markers. It will also serve as an intellectual network to support and mentor current and future Asian and Pacific Islander scholars within and outside of the United States, including NARST members interested in API related research endeavors.

Dr. Ling Liang
liang@lasalle.edu

Dr. Xiufeng Liu
xliu5@buffalo.edu

Strand Key

Strand 1:	**Science Learning: Development of Student Understanding**
Strand 2:	**Science Learning: Contexts, Characteristics, and Interactions**
Strand 3:	**Science Teaching—Primary School: Characteristics and Strategies** (Grades PreK-6)
Strand 4:	**Science Teaching—Middle and High School: Characteristics and Strategies** (Grades 5-12)
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:	**Discontinued**
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 and Sustainability**
Strand 15:	**Policy, Reform and Program Evaluation**

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The University of North Carolina at Chapel Hill

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Bahadir Namdar (2022)
Recep Tayyip Erdogan University

Kader Bilican (2023)
Kirikkale University

Strand 2: Science Learning: Contexts, Characteristics and Interactions

Edna Tan (2022)
University of North Carolina-Greensboro

Angela Chapman (2023)
University Of Texas Rio Grande Valley

Strand 3: Science Teaching—Primary School

(Grades preK-6)

Ornit Spektor-Levy (2022)
Bar Ilan University

Selina Bartels (2023)
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Strand 4: Science Teaching—Middle and High School

(Grades 5-12)

Shannon Navy (2022)
Kent State University

Jose Pavez (2023)
University of Georgia

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(Grades 13-20)

Anne Emerson Leak (2022)
High Point University

Grant Gardner (2023)
Middle Tennessee State University

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Washington State University Tri-Cities

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University of North Carolina - Chapel Hill

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University of Missouri

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Giresun University

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University of Montana

Heather Page (2023)
New York City Department of Education

Strand 15: Policy

Mercy Ogunsola-Baudele (2022)
National Open University of Nigeria

Sanlyn Buxner (2023)
University of Arizona

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Gareth Price
Catherine Quinlan
Arif Rachmatullah
Jeffrey Radloff
Jennifer Radoff
Shelley Rap
Ashelee Rasmussen
Sara Raven
Carina Rebello
Emma Refvem
Emily Reigh
Bianca Reinisch
Jaime Reyes
Wm. Matthew Reynolds
Kathryn Ribay
Samantha Richar
Gail Richmond
Ron Rinehart
Marc Rodemer
Brandon Rodriguez
Laura Rodriguez
Miguel Rodriguez
Lukas Rokos
Marissa Rollnick
Suzanna Roman
Veronika Rozhenkova
John Ruppert
Tatiane Russo-Tait
Richard Deanne Sagun
Sara Salisbury
Susannah Sandrin
Asli Saylan Kirmizigül
Gena Sbeglia
Dannah Schaffer
Jennifer Schellinger
Déana Scipio
Mina Sedaghatjou
Emily Seeber
Helen Semilarski
Hanife Sen
John Settlage
Samuel Severance
Neta Shaby
Matthew Shackley
Sheikh Ahmad Shah
Anat Shauly
Soo-Yean Shim
Yael Shwartz
Tiffanyrose Sikorski
Jonathan Singer
Mamta Singh
Awneet Sivia
Theila Smith
Melanie Snow
Alex Sobotka
Regina Soobard

Program Proposal Reviewers

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Ornit Spektor-Levy
Alex St. Louis
Molly Staggs
Hanna Stammes
Nancy Staus
Magdeline Stephen
Anne Stephens
Jessica Stephenson Reaves
Lisa Stinken-Rösner
Annabel Stoler
Cheryl Sundberg
Hassan Tairab
Mariam Takkouch
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Preethi Titu
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Ann Varnedoe
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Gary Weiser
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Fang-Ying Yang
Jie Yang
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Ayse Yildiz Tezer
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Xinying Yin
HyeSun You
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Laura Zeller
Mao-Ren Zeng
Letong Zhang
FangFang Zhao
Lexie Zhao
Michal Zion
Anastasios Zoupidis
Cathy Zozakiewicz
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NARST Presidents

1928 **W. L. Eikenberry**
1929 **W. L. Eikenberry**
1930 **W. L. Eikenberry**
1931 **Elliot R. Downing**
1932 **Elliot R. Downing**
1933 **Francis D. Curtis**
1934 **Ralph K. Watkins**
1935 **Archer W. Hurd**
1936 **Gerald S. Craig**
1937 **Walter G. Whitman**
1938 **Hanor A. Webb**
1939 **John M. Mason**
1940 **Otis W. Caldwell**
1941 **Harry A. Carpenter**
1942 **G. P. Cahoon**
1943 **Florence G. Billig**
1944 **Florence G. Billig**
1945 **Florence G. Billig**
1946 **C. L. Thield**
1947 **Earl R. Glenn**
1948 **Ira C. Davis**
1949 **Joe Young West**
1950 **N. Eldred Bingham**
1951 **Betty Lockwood**
1952 **Betty Lockwood**
1953 **J. Darrell Barnard**
1954 **George G. Mallinson**
1955 **Kenneth E. Anderson**
1956 **W. C. Van Deventer**
1957 **Waldo W. Blanchet**
1958 **Nathan S. Washton**
1959 **Thomas P. Fraser**
1960 **Vaden W. Miles**
1961 **Clarence H. Boeck**
1962 **Herbert A. Smith**
1963 **Ellsworth S. Obourn**
1964 **Cyrus W. Barnes**
1965 **Frederic B. Dutton**
1966 **Milton P. Pella**
1967 **H. Craig Sipe**
1968 **John M. Mason**
1969 **Joseph D. Novak**
1970 **Willard D. Jacobson**
1971 **Paul D. Hurd**
1972 **Frank X. Sutman**
1973 **J. David Lockard**
1974 **Wayne W. Welch**
1975 **Robert E. Yager**
1976 **Ronald D. Anderson**
1977 **O. Roger Anderson**
1978 **Roger G. Olstad**
1979 **James R. Okey**
1980 **John W. Renner**
1981 **Stanley L. Helgeson**
1982 **Stanley L. Helgeson**
1983 **Carl F. Berger**
1984 **Ann C. Howe**
1985 **Ertle Thompson**
1986 **David P. Butts**
1987 **James P. Barufaldi**
1988 **Linda DeTure**
1989 **Patricia Blosser**
1990 **William G. Holliday**
1991 **Jane Butler Kahle**
1992 **Russell H. Yeany**
1993 **Emmett L. Wright**
1994 **Kenneth G. Tobin**
1995 **Dorothy L. Gabel**
1996 **Barry J. Fraser**
1997 **Thomas R. Koballa, Jr.**
1998 **Audrey B. Champagne**
1999 **Joseph S. Krajcik**
2000 **David F. Treagust**
2001 **Sandra K. Abell**
2002 **Norman G. Lederman**
2003 **Cheryl L. Mason**
2004 **Charles W. (Andy) Anderson**
2005 **John R. Staver**
2006 **James A. Shymanksy**
2007 **Jonathan F. Osborne**
2008 **Penny J. Gilmer**
2009 **Charlene M. Czerniak**
2010 **Richard A. Duschl**
2011 **Dana L. Zeidler**
2012 **J. Randy McGinnis**
2013 **Sharon J. Lynch**
2014 **Lynn A. Bryan**
2015 **Valarie L. Akerson**
2016 **Mary M. Atwater**
2017 **Mei-Hung Chiu**
2018 **Barbara Crawford**
2019 **Gail Richmond**
2020 **Tali Tal**
2021 **Eileen R. C. Parsons**
2022 **Renée Schwartz**
2023 **Gillian Roehrig**

NARST Executive Directors

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

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

JRST Editors

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

Emeritus Members

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

NARST Award Recipients

Distinguished Contributions to Science Education through Research Award

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

Year	Awardee(s)
1986	Anton E. Lawson
1987	Paul DeHart Hurd
1988	John W. Renner
1989	Willard Jacobson
1990	Joseph D. Novak
1991	Robert L. Shrigley
1992	Pinchas Tamir
1993	Jack Easley, Jr.
1994	Marcia C. Linn
1995	Wayne W. Welch
1996	Carl F. Berger
1997	Rosalind Driver
1998	James J. Gallagher
1999	Peter J. Fensham
2000	Jane Butler Kahle
2001	John K. Gilbert
2002	Audrey B. Champagne
2003	Barry J. Fraser
2004	Robert E. Yager Paul Black
2005	John C. Clement
2006	David Treagust
2007	Kenneth Tobin
2008	Dorothy Gabel
2009	Peter W. Hewson Leonie Jean Rennie Wolff-Michael Roth
2010	Reinders Duit Joseph Krajcik
2011	Norman Lederman
2012	Charles W. (Andy) Anderson Larry Yore
2013	Dale R. Baker
2014	Glen Alkenhead Richard Gunstone Frances Lawrenz
2015	Richard A. Duschl Meshach Mobolaji Ogunniyi
2016	Lynn D. Dierking John N. Falk Dana L. Zeidler
2017	Avi Hofstein
2018	Marissa Rollnick Jonathan Osborne
2019	Mary M. Atwater Maria Pilar Jiménez-Aleixandre
2020	Judy Dori Saouma Bou Jaoude
2021	Valarie Akerson Greg Kelly
2022	Fouad Abd-El-Khalick Gail Jones

NARST Award Recipients

Outstanding Doctoral Research Award

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

Year	Awardee(s)	Advisor(s)
1992	Rene Stofflett	Dale R. Baker
1993	Julie Gess-Newsome	Norman G. Lederman
1994	Carolyn W. Keys	Burton E. Voss
1995	Jerome M. Shaw	Edward Haertel
1996	Christine M. Cunningham	William L. Carlsen
1997	Jane O. Larson	Ronald D. Anderson
1998	Kathleen Hogan	Bonnie K. Nastasi
1999	Fouad Abd-El-Khalick	Norman G. Lederman
2000	Danielle Joan Ford	Annemarie S. Palinscar
2001	Iris Tabak	Brian Reiser
2002	Mark Girod	David Wong
2003	Hsin-Kai Wu	Joseph Krajcik
2004	David L. Fortus	Ronald Marx Joseph Krajcik
2005	Thomas Tretter	Gail M. Jones
2006	Stacy Olitsky	Kenneth Tobin
2007	Julia Plummer	Joseph S. Krajcik
2008	Victor Sampson	Douglas Clark
2009	Lei Liu	Cindy E. Hmelo-Silver
2010	Heather Toomey	Phillip Bell Zimmerman
2011	Jeffrey J. Rozelle	Suzanne M. Wilson
2011	Catherine Eberbach	Kevin Crowley
2012	Melissa Braaten	Mark Windschitl
2013	Lori Fulton	Jian Wang
2014	Daniel Birmingham	Angela Calabrese Barton Anne-Lise Halvorsen
2015	Allison Godwin	Geoffrey Potvin
2016	Anna MacPherson	Jonathan Osborne
2017	Anita Schuchardt	Christian Schunn
2018	Katherine Wade-Jaimes	Renée Schwartz
2019	Anita S. Tseng	Jonathan F. Osborne
2020	Netta Shaby	Orit Ben Zvi-Assaraf
2021	Eben Witherspoon	Christian D. Schunn
2022	Won Jung Kim	Angela Calabrese Barton Alicia Alonzo

NARST Award Recipients

Early Career Research Award

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

Year	Awardee(s)
1993	Wolff-Michael Roth
1994	Deborah J. Tippins
1995	Nancy B. Songer
1996	Mary B. Nakhleh
1997	Peter C. Taylor
1998	J. Randy McGinnis
1999	Craig W. Bowen Gregory J. Kelly
2000	Angela Calabrese Barton
2001	Julie A. Bianchini
2002	Alan G. Harrison
2003	Fouad Abd-El-Khalick
2004	Grady J. Venville
2005	Randy L. Bell
2006	Heidi Carlone
2007	Bryan A. Brown
2008	Hsin-Kai Wu
2009	Troy D. Sadler
2010	Thomas Tretter
2011	Katherine L. McNeill
2012	Victor Sampson
2013	Alandeom W. Oliveira
2014	Cory Forbes
2015	Benjamin C. Herman
2016	Richard L. Lamb
2017	Ying-Chih Chen David Stroupe
2018	Doug Lombardi
2019	Hosun Kang Eve Manz
2020	Brian Donovan Dana Vedder Weiss
2021	Lama Jaber
2022	Maria González-Howard Laura Zangori

NARST Fellows Award:

The NARST Fellow Program is an award program that honors and recognize excellence in science education research and service. This program promotes and advances the NARST mission in science education, and the role of science education in the local and global community, by designating NARST members as Fellows.

Year	Awardee(s)
2021	Bryan A. Brown
2021	Richard A Duschl
2021	Gillian Roehrig
2022	Peter A. Okebukola

Future Meeting Dates for NARST, NSTA, and AERA

2022

NSTA March 31-April 2 | Houston, TX
AERA April 21-26 | San Diego, CA

2023

NARST April 17-April 20 | Chicago, IL
AERA April 13-16 | Chicago, IL

NARST Award Recipients

The *Journal of Research in Science Teaching (JRST)* Award

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

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

*Tie

NARST Award Recipients

The NARST Outstanding Paper Award

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

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

*Tie

NARST Award Recipients

Outstanding Masters Thesis Award

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

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

Classroom Applications Award

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

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

NARST Leadership Committees

Elections Committee

Final Year	Committee Leadership
2022	**Bridget Mulvey** (Chair) Kent State University
2023	**Melody Russell** (Co-Chair) Auburn University
	Members
2022	**Mary Atwater** University of Georgia
2022	**Nazan U. Bautista** Miami University
2022	**Jeanna Wieselmann** Southern Methodist University
2022	**Seema Rivera** Clarkson University
2023	**Sheron Mark** University of Louisville
2024	**Miri Barak** Technion, Israel
2024	**Hernán Cofré Mardones** Pontificia Universidad Católica de Valparaíso, Chile
	Board Member Liaison
2024	**Scott McDonald** Penn State University
	Representative from the Equity and Ethics Committee
2022	**Seema Rivera** Clarkson University
	Representative from the International Committee
2023	**Sheron Mark** University of Louisville
	Ex Officio
2022	**Eileen Parsons** (Immediate Past President) University of North Carolina

Equity and Ethics Committee

Final Year	Committee Leadership
2022	**Justina Ogodo** (Chair) Baylor University
2023	**María González-Howard** (Co-Chair) The University of Texas at Austin
	Members
2022	**Tara Nkrumah** Arizona State University
2022	**April Holton** Arizona State University
2022	**James Nyachwaya** North Dakota State University
2023	**Henriette Burns** Southern Illinois University, Edwardsville
2024	**Erique Suarez** University of Massachusetts
2024	**Stephanie Eldridge** University of Georgia
2024	**Saiqa Azam** Memorial University of Newfoundland
2024	**Marsha Simon** University of West Georgia
2024	**Justice Walker** University of Texas, El Paso
2024	**Regina McCurdy** Georgia Southern University
	Board Liaison
2022	**Bhaskar Upadhyay** University of Minnesota

NARST Leadership Committees

External Policy and Relations Committee

Final Year	Committee Leadership
	Members
2022	**Eugene Judson** Arizona State University
2023	**Durdane Bayram-Jacobs** Eidhoven University of Technology
2023	**Henriette Burns** Southern Illinois University, Edwardsville
2023	**Peter Okebukola** Lagos State University, Nigeria
2024	**Xavier Fazio** Brock University
2024	**Francesca Williamson** Bulter University
2024	**Andy Cavagnetto** Washington State University
	Board Liaison
2024	**Leon Walls** University of Vermont
	Ex Officio Members
2022	**Renée Schwartz** (President) Georgia State University
	Lisa Martin-Hansen (Executive Director)

Graduate Student Committee

The Graduate Student Committee is composed of graduate student members appointed by the President-elect. The committee is chaired by the Graduate Student Representative, a non-voting (ex-officio) liaison to the NARST Board. A Board Director is appointed to serve as an ex officio advisor to the committee.

Final Year	Committee Leadership
2023	**Theila Smith** (Chair) University of Groningen
2022	**Jordan Henley** (Co-Chair) University of Georgia
	Members
2022	**Tim Klavon** Temple University
2022	**Emily Little** Georgia State University
2022	**Mohammed Estaiteyeh** University of Western Ontario
2022	**Ines Mosquera-Bargiela** Universidade de Santiago de Compostela
2023	**Andrea Reeder** Middle Tennessee State University
2023	**Scott Cohen** Georgia State University
2023	**Uchechi Agnes Ahanonye** University of the Witwatersrand Johannesburg
2023	**Jennifer Slavick** West Chester University
2023	**Helena Aptyka** Institute for Biology Education
2023	**Samantha Ringl** University of Kentucky
	Ex Officio Member
2023	**Gillian Roehrig** (President-Elect) University of Minnesota

NARST Leadership Committees

Awards Committee

Final Year	Board Liaison
2022	**Noemi Waight** University of Buffalo

Outstanding Doctoral Research Award

Final Year	Committee Leadership
2022	**Dana Vedder Weiss** (Chair) Ben Gurion University, Israel
2023	**Heidi Cian** (Co-Chair) Florida International University
	Members
2022	**Idit Adler** Tel Aviv University
2022	**Dina Tsybulsky** Technion
2023	**Terrance Burgess** Michigan State University
2023	**Juan Diaz** MAC US
2023	**Eve Manz** Boston University
2023	**Jianlan Wang** Technion, Israel
2023	**Jayma Koval** Georgia State University
2024	**Judith Lederman** Illinois Institute of Technology
2024	**Julia Plummer** Penn State University
2024	**Michael Zion** Bar Ilan University
2024	**Hosun Kang** University of California Irvine

Early Career Research Award

Final Year	Committee Leadership
2022	**Kate McNeill** (Co-Chair) Boston College
2023	**Hsin-Kai Wu** National Taiwan Normal University
	Members
2022	**Amelia Gotwals** Michigan State University
2022	**Anna Danielsson** Uppsala University
2022	**Judy Dori** Technion, Israel
2022	**James Minogue** North Carolina State University
2023	**Matthew Weinstein** University of Washington-Tacoma
2023	**Anton Puviraja** University of Western Ontario
2023	**Doris Ash** University of California-Santa Cruz
2024	**Douglas Larkin** University of California-Santa Cruz
2024	**Eleanor Abrahms** University of Massachusetts, Lowell

Distinguished Contributions to Science Education Through Research

Final Year	Committee Leadership
2022	**Marissa Rollnick** (Co-Chair) University of the Witwatersrand, South Africa
2022	**Dana Zeidler** (Co-Chair) University of South Florida
	Members
2022	**Okhee Lee** New York University
2022	**John Falk** Oregon State University
2023	**Lynn Bryan** Purdue University
2023	**Dale Baker** Arizona State University
2024	**Valarie Akerson** Indiana University
2024	**Xiufeng Liu** University of Buffalo
2024	**Avi Hofstein** The Weitzman Institute of Science

NARST Leadership Committees

NARST Fellows Award

Final Year	Committee Leadership
2023	**Jomo Mutegi** (Chair) Old Dominion University
2024	**Hosun Kang** (Co-Chair) Seoul National University
	Members
2023	**Lucy Avraamidou** University of Groningen
2023	**Julie Brown** University of Florida
2024	**Lama Jaber** Florida State University

International Committee

Final Year	Committee Leadership
2022	**Sonya Martin** (Chair) Seoul National University
2022	**Sara Wilmes** (Co-Chair) University of Luxemburg
2022	**Gavin Fulmer** (Co-Chair) University of Iowa
	Members
2022	**Mathias Ropohl** University of Duisburg-Essen
2022	**Allison Gonsalves** McGill University
2023	**Sheron Mark** University of Louisville
2023	**Tasneem Anwar** Aga Khan University
2024	**Claudia Vergara** Alberto Hurtado University
2024	**Irene Drymiotou** University of Cyprus and University of Groningen
2024	**Stefan Sorge** IPN Leibniz Institute for Science and Mathematics Education
2024	**Lucia Vazquez Ben** Universidad da Coruña

International Committee (con't)

Final Year	Members
2024	**Hayat Hokayem** Texas Christian University
2024	**Lee Kenneth Jones** Texas Tech University

Membership Committee

Final Year	Committee Leadership
2022	**ReAnna S. Roby** (Chair) Vanderbilt University
2023	**Elizabeth de los Santos** (Co-Chair) University of Nevada, Reno
	Members
2022	**Shirly Avargil** Technion
2022	**Mark Newton** East Carolina University
2022	**Sule Aksoy** (Graduate Student) Syracuse University
2023	**K.C. Busch** North Carolina State University
2024	**Tugba Yuksel** Recep Tayyip Erdogan University
2024	**Shiang-Yao Liu** National Taiwan Normal University
2024	**Robert Bennett** Georgia State University
	Representative from the Equity and Ethics Committee
2022	**April Holton** Arizona State University
	Representative from the International Committee
2022	**Mathias Ropohl** University of Duisburg-Essen
	Board Liaison
2023	**Brooke Whitworth** Clemson University

NARST Leadership Committees

Program Committee

	Renée Schwartz (Chair) Georgia State University
	Gillian Roehrig (Co-Chair) University of Minnesota
	Ex Officio Member
	Lisa Martin-Hansen (Executive Director)
	Members
2022	**Bahadir Namdar** Recep Tayyip Erdogan University
2022	**Ke Li** University of North Carolina–Chapel Hill
2022	**Terrell Morton** University of Missouri
2022	**Leigh Ann Haefner** Penn State Altoona
2022	**Alison Cullinane** University of Oxford
2022	**Beth Covitt** University of Montana
2022	**Mercy Ogunsola-Baudele** National Open University of Nigeria
2022	**Edna Tan** University of North Carolina–Greensboro
2022	**Ornit Spektor-Levy** Bar Ilan University
2022	**Shannon Navy** Kent State University
2022	**Anne Emerson Leak** High Point University
2022	**June Teisan** Belle Isle Aquarium
2022	**Takumi Sato** Virginia Tech
2022	**Jonah Firestone** Washington State University
2023	**Kader Bilican** Middle East Technical University
2023	**Jing Lin** Beijing Normal University
2023	**Katharine Wade-Jaimes** University of Nevada, Las Vegas
2023	**Preethi Titu** Kennesaw State University
2023	**Gunkut Mesci** Giresun University
2023	**Heather Page** New York City Department of Education
2023	**Sanlyn Buxner** University of Arizona
2023	**Angela Chapman** University of Texas Rio Grande Valley
2023	**Selina Bartels** Valparaiso University
2023	**Jose Pavez** University of Georgia
2023	**Grant Gardner** Middle Tennessee State University
2023	**Eli Tucker-Raymond** Boston University
2023	**Amanda Berry** Monash University
2023	**Patrick Enderle** Georgia State University

NARST Leadership Committees

Publications Advisory Committee	
Final Year	**Committee Leadership**
2023	**Shakhnoza Kayumova** (Chair) University of Massachusetts Dartmouth
2023	**Dante Cisterna** Education Testing Service
	Members
2022	**Allison Antink-Meyer** Illinois State University
2022	**Kyungjin Cho** Pennsylvania State University
2022	**Shulamit Kapon** Technion, Israel Institute of Technology
2022	**Ibrahim Yeter** National Institute of Education, Nanyang Technological University
2023	**Fouad Abd-El-Khalick** University of North Carolina, Chapel Hill
2024	**Lindsay Lightner** Washington State University, Tri-Cities
2024	**Emily Dare** Florida International University
2024	**Saouma Boujaoude** American University of Beirut, Lebanon
2024	**Carla Johnson** North Carolina State University
2024	**Kent Crippen** University of Florida
	Board Liaison
2023	**Knut Neumann** Leibniz Institute for Science and Mathematics Education
	Ex Officio Members
2023	**Renée Schwartz** (President) Georgia State University
2025	**Troy Sadler** (JRST Editor) University of North Carolina at Chapel Hill
2025	**Felicia Moore Mensah** (*JRST* Editor) Teachers College, Columbia University
2024	**Cynthia Crockett** NSTA Research Division Director Harvard University
	Lisa Martin-Hansen (Executive Director)

Research Committee

Final Year	Committee Leadership
2022	**Asli Sezen-Barrie** (Chair) University of Maine
2023	**Rouhollah Aghasaleh** (Co-Chair) Georgia State University
	Members
2022	**S. Selcen Guzey** Purdue University
2022	**Li Ke** University Of North Carolina, Greensboro
2022	**Ling L. Liang** La Salle University
2022	**Yann Shiou Ong** National Institute of Education, Nanyang Technological University
2022	**Marcus Kubsch** Kiel University
2023	**Lori Andersen** University of Kansas
2023	**Narendra Deshmukh** Tata Institution of Fundamental Research
2023	**Sissy Wong** University of Houston
2024	**Natalie King** Georgia State University
2024	**Sarah Fick** Washington State University
2024	**Jessica Karch** University of Massachusetts Boston
2024	**Peter Wulff** University of Pottsdam
2024	**Mwenda Kudumu** North Carolina State University
	Board Liaison
2024	**Malcolm Butler** University of North Carolina, Charlotte
	NARST Liaison to NSTA
2024	**G. Michael Bowen** Mount Saint Vincent University

Social Media, Website and Communications Committee

Final Year	Committee Leadership
2022	**Lisa Lundgren** (Chair) Utah State University
2023	**Len Annetta** (Co-Chair) East Carolina University
	Members
2022	**Minjung Ryu** Purdue University
2022	**Sandhya Krishnan** University of Georgia
2023	**Sharona T. Levy** University of Haifa
2023	**Jaclyn Murray** Augusta University
2024	**Amy Voss Farris** Penn State University
	Board Liaison
2023	**Christina Schwarz** Michigan State University

Sponsorship Program for Graduate Student Memberships

NARST members gave generously to sponsor graduate student memberships this year through the new initiative: Graduate Student Sponsorship Program. This program was started in response to needs of our graduate student community. Because graduate students may sometimes obtain assistance from their universities to attend the NARST conference, their NARST membership is usually not covered. While $60 may not sound like a lot of money, to a graduate student on an extremely limited budget, $60 is a lot. Aligned with NARST's commitment to support the graduate student community, through donations to the GSSP, NARST was able to offer partial or full financial assistance toward joining the organization.

This year (2022), with the $1,200 donated since the start of the program, we were able to provide financial assistance (partial or full) to 26 graduate students to become NARST members.

NARST Recognizes and Thanks This Year's Graduate Student Sponsors:

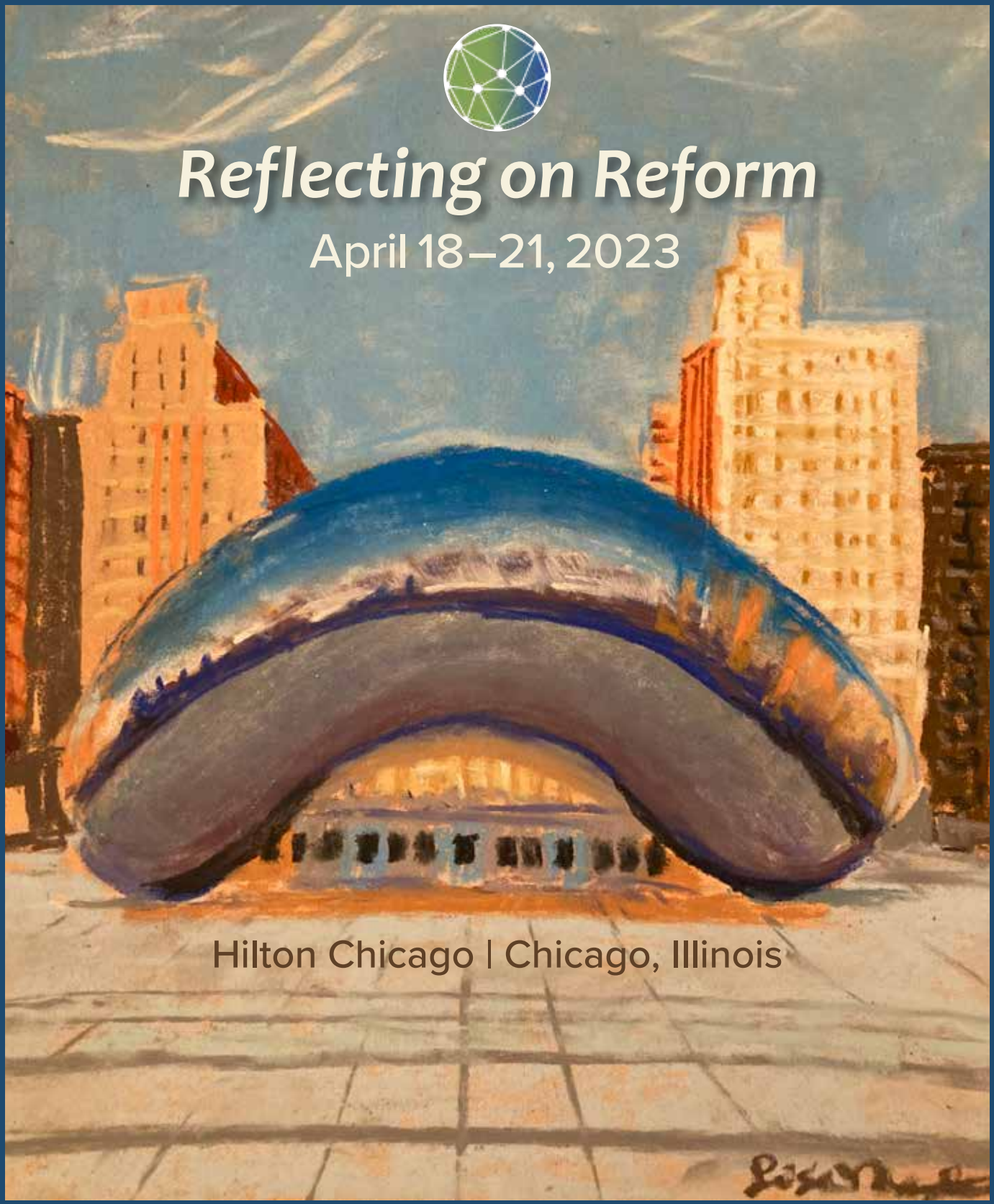
Valarie Akerson
Lynn Bryan
Sylvia Butterfield
Beth Covitt
Lisa Martin-Hansen
William McComas
Scott McDonald
Gillian Roehrig
Renée Schwartz
Christina Schwarz
Brooke Whitworth

If you didn't hear about the opportunity, or if you find that you can donate now, for just $60, you can pay the NARST membership of a graduate student.

To become a sponsor, please go to https://bit.ly/3vvCSzM or scan the QR code below

Become a Graduate Student Sponsor!

96th NARST International Conference



Reflecting on Reform

April 18–21, 2023

Hilton Chicago | Chicago, Illinois

95th NARST International Conference
March 27–30, 2022

UNITY & INCLUSION
for Global Scientific Literacy

INVITE as a community. UNITE as a community.

Vancouver, British Columbia | JW Marriott Parq

This document reflects the conference schedule and session details as of March 4, 2022. Changes requested after that date are not necessarily reflected in this document. Please refer to the addendum posted to the 2022 conference website: https://narst.org/conferences/2022-annual-conference

DUE TO CONTINUING PROGRAM CHANGES, THERE WILL NOT BE A PRINT VERSION AVAILABLE AT THE CONFERENCE. If you would like a printed program, you will need to download and print the document. Only a printed version of the Schedule at a Glance will be available at the conference.

Please also note that PRESIDERS are listed in a linked document: https://tinyurl.com/NARSTpresider

Presiders for the in-person/hybrid sessions must be present in-person. Please check the Presider document for assignments.

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NARST 2022 Conference
Schedule at a Glance

Date/Time (all in Pacific time, unless otherwise noted)	Event	Session format/room
March 21, 2022 8:00 am CENTRAL time	Membership Committee sponsored workshop: NARST Writing Retreat	Virtual
March 24, 2022 8:00 am– 9:00 am PST (11:00 EST)	Membership Committee Welcome Session for New Attendees (virtual)	Virtual
March 25, 2022 9:00 am – 12:00 pm PST	Pre-conference Workshop: An Introduction to Data Science in Science Education Using R	Virtual
May 13, 2022 12:00 pm – 2:00 pm EST Note: This is a post-conference workshop.	YESTEM: Justice-Oriented Pedagogies and Practices for Informal Science Learning and Research	Virtual
Saturday, March 26		
8:00 am – 5:00 pm	**NARST Executive Board Meeting #1**	Burrard
12:00 pm – 6:00 pm	Conference Registration	Prefunction
Sunday, March 27		
7:30 am – 6:00 pm	Conference Registration	Prefunction
8:00 am– 12:00 pm	**NARST Executive Board meeting #1 con't**	Burrard
8:00 am – 11:45 am	**Pre-Conference Workshops**	
8:00 am – 11:45 am	Equity and Ethics Preconference Workshop: Unity and Inclusion for Global Scientific Literacy. Invite as a Community: Unite as a Community.	Hybrid Kitsilano Ballroom A
8:00 am – 11:45 am	Conducting Policy Reviews to Uncover Systemic Barriers into Science Education	In person Kitsilano Ballroom C
8:00 am – 11:45 am	Teaching and Learning Science in a 'Post-Truth' Society: New Roles for Socio-Scientific Issues	Hybrid Kitsilano Ballroom D
8:00 am – 11:45 am	LaRIG Pre-Conference Workshop: Community Building for Success: Latinx Graduate Students, Early Career Educators and Scholars in Science Education (Multilingual Workshop)	Hybrid Parq Salon A

8:00 am – 11:45 am	Early Career Faculty Forum	In person Kitsilano Ballroom B
8:00 am – 11:45 am	Indigenous Science Knowledge RIG Pre-Conference Workshop: Indigenous Knowledge for Sustainable Science Education Research	Hybrid Parq Salon B
10:00 am-11:00 am	NARST Welcome Session for New Attendees	Parq Salon C Separate session for virtual
11:00 am –11:45 am	Mentor-Mentee Nexus Virtual participants may schedule sessions with their mentor according to availability using your own communication platform.	Parq Salon C Separate session for virtual
11:45 am– 1:00 pm	Lunch (on your own or with an Ambassador group!)	Explore the city!
11:45 am– 1:00 pm	Graduate Student Networking social	Kitsilano Ballroom D
1:00 pm – 2:45 pm	**OPENING SESSION** **Welcome: Renée Schwartz, NARST President** **First Nations Land Acknowledgement: Marny Point** **Opening Keynote** **Speaker: Dr. Megan Bang, Northwestern University** ***What now?*** ***Science education that contributes to just, sustainable, and culturally thriving futures***	Hybrid [**livestream**] Parq Salon DEF
3:00 pm – 4:30 pm	Concurrent Session #1	In person/ virtual
4:45 pm – 6:15 pm	Concurrent Session #2	In person/ virtual
7:00 pm – 9:00 pm	**President's Reception and Welcome Celebration**	In person Prefunction, Parq Salon DEF
7:00 pm – late night	Online social sessions	Virtual

Monday, March 28		
6:00 am – 7:15 am	Mind and Sole (off-site) This event is not sponsored nor endorsed by NARST)	In person/ virtual
6:30 am – 8:00 am	Breakfast (provided) and online breakfast or cocktail social time	Prefunction, Parq DEF
7:00 am – 8:00 am	**RIG business meetings [except for CADASE RIG]**	In person/ virtual
	Latino/a RIG [LARIG]	Parq Salon A
	Contemporary Methods for Science Education Research	Parq Salon B
	Engineering Education [ENE-RIG]	Parq Salon C
	Indigenous Science Knowledge [ISK-RIG]	Kitsilano Ballroom A
	Research in Artificial Intelligence-involved Science Education [RAISE]	Kitsilano Ballroom B
	Asian and Pacific Islander Science Education Research [APISER]	Kitsilano Ballroom C
7:30 am – 4:30 pm	Conference Registration	Prefunction
8:00 am – 9:30 am	Concurrent Session #3	In person/ virtual
9:30 am – 10:45 am	**Coffee and Committee meetings**	In person/ virtual
	Committee	**Room**
	Awards	Kitsilano D
	Elections	Parq Salon B
	Equity and Ethics	Parq Salon C
	External Policy and Relations	Kitsilano Ballroom A
	Graduate Students	Kitsilano Ballroom B
	International	Kitsilano Ballroom C
	Membership (**livestream**)	Parq Salon D
	Program [strand coordinators]	Parq Salon A
	Research	Stanley
	Social media, Website, Communications	Cambie
11:00 am – 12:30 pm	Concurrent Session #4	In person/ virtual
12:30 pm - 2:30 pm	Lunch and activity break [on your own]	Explore the city!
1:00 pm – 2:30 pm	CADASE RIG business meeting	Virtual Parq Salon F
2:45 pm – 4:15 pm	Concurrent Session #5	In person/

		virtual
4:30 pm - 5:30 pm	**NARST Annual Membership meeting and Community Conversations** (soda/snacks)	Hybrid [**livestream**] Parq Salon E
5:00 pm – 9:00 pm	Workshop Queering science teacher education and research: Toward gender, sex, and sexuality inclusive science teaching practice.	Virtual Parq Salon F
6:00 pm - ??	Online social activities Local activities on your own or with Ambassadors	Have some fun, meet people, explore!
6:30 pm – 8:30 pm	JRST Editorial Team Meeting/Dinner Sponsored by Wiley (by invitation only) CANCELLED	**CANCELLED**
5:45 pm – 6:45 pm	Graduate Student Forum	Virtual
7:00 pm – 8:00 pm	Sandra K Abell Institute students' reception (by invitation only)	In person

Tuesday, March 29		
7:30 am – 4:30 pm	Conference Registration	Prefunction
7:30 am – 8:45 am	**Invited ESERA Symposium sponsored by the International Committee:** **Socioscientific Argumentation in Science Education** Panelists (Virtual) Ute Harms, Leibniz Institute for Science and Mathematics Education (IPN) Carola Garrecht, IPN - Leibniz Institute for Science and Mathematics Education Maria Evagorou, University of Nicosia, Nicosia, Cyprus Nina Christenson, Karlstad University Susanne Walan, Department of Environmental and Life Sciences, Karlstad University, Karlstad, Sweden Pablo Brocos, University of Santiago de Compostela Maria Pilar Jiménez-Aleixandre, Department of Applied Didactics, Universidade de Santiago de Compostela, Santiago de Compostela, Spain Hanno Michel, IPN Kiel Dirk S. Gellermann, Leibniz Institute for Science and Mathematics Education (IPN) Ute Harms, Leibniz Institute for Science and Mathematics Education (IPN)	Hybrid Parq Salon F **(livestream)**
7:45 am – 8:45 am	CADASE RIG social	Virtual Parq Salon E
8:00 am – 8:50 am	Roundtables (coffee/tea available)	In person/Virtual
8:00 am – 9:00 am	Exhibitor Workshop: **Creating interactive presentations and digital posters using Snorkle.io** Host: Jonathan Fisher (Snorkle, Inc.) Email: jonathan@snorkle.io Zoom link: https://zoom.us/j/2687045958	Virtual
9:00 am – 10:30 am	Concurrent Session #6	In person/virtual
10:45 am – 11:45 am	Poster Q & A (Concurrent session #7)	In person/virtual
11:45 pm – 12:45 pm	**Celebration Lunch Buffet**	Prefunction & Parq Salon DEF
12:30 pm – 1:20 pm	**NARST Recognitions & Reflections (livestream)**	Parq Salon DEF
2:00 pm – 3:30 pm	Concurrent Session #8	In person/virtual
3:40 pm – 5:10 pm	Concurrent Session #9 (coffee/tea/soda)	In person/virtual
5:20 pm – 6:50 pm	Concurrent Session #10	In person/virtual
7:00 pm – ??	Explore the city	
7:15 pm – 10:00 pm	Equity and Ethics Dinner (registration and prepay required)	**CANCELLED**

Wednesday, March 30		
7:30 am – 11:00 am	Conference Registration	Prefunction
7:30 am – 8:30 am	Committee meetings (coffee/tea available)	Hybrid
	Committee	**Room**
	Awards	Kitsilano D
	Elections	Parq Salon B
	Equity and Ethics	Parq Salon C
	External Policy and Relations	Kitsilano Ballroom A
	Graduate Students	Kitsilano Ballroom B
	International	Kitsilano Ballroom C
	Membership	Parq Salon D
	Program [strand coordinators]	Parq Salon A
	Research	Stanley
	Social media, Website, Communications	Cambie
8:45 am – 10:15 am	Concurrent Session #11	In person/virtual
10:30 am – 12:00 pm	Concurrent Session #12	In person/virtual
12:00 pm – 1:30 pm	Lunch break (on your own or with an Ambassador group!)	
12:00 pm – 1:15 pm	CADASE Graduate Student social	Virtual Parq Salon F
1:30 pm – 3:00 pm	Concurrent Session #13	In person/virtual
3:10 pm – 4:00 pm	**CLOSING SESSION** **President's Remarks** **Looking ahead to the 2023 Conference** Renée Schwartz, outgoing NARST President Gillian Roehrig, incoming NARST President	Hybrid Parq Salon DEF **(livestream)**
4:30 pm – 10:00 pm	**NARST Executive Board meeting #2**	Burrard

Preconference/Postconference workshops occurring at off usual schedule days/time:

Note: You must register for the pre-conference workshops with your advanced conference registration.

Date/Time	Session format/abstract
March 21, 2022, 8AM CENTRAL time **NARST Writing Retreat** **Lead Person(s):** Shirly Avargil savargil@technion.ac.il ReAnna Roby reanna.orby@vanderbilt.edu Felicia Mensah fm2140@tc.columbia.edu	**VIRTUAL** The Writing Retreat organized by the NARST Membership Committee will be a half-day virtual event where members come together to write and get feedback on writing projects as a virtual kick-off for the official conference. The Writing Retreat is a collective space where members write and support each other. Writers with varied experiences 2022will be present to answer questions and address challenges you are facing in finalizing (or even getting started) on your writing projects, papers, or manuscripts. Additionally, given the hybrid nature of the conference, we will be joined by a number of International scholars with substantial experience publishing in English language journals who will be available for consultation as well.
March 24, 2022 **8:00 am – 9:00 am PACIFIC (11:00 EST)**	**VIRTUAL** **Membership Committee Welcome Session for New Attendees** https://clemson.zoom.us/j/95687748475 The Welcome Meeting organized by the NARST Membership Committee will be a 1 hour event where new members, first-time attendees, practitioners are provided with conference logistics as well as opportunities to ask questions relevant to navigating the NARST experience. The Welcome Session is a communal space to learn about the functioning of NARST in a space with little to no judgment, while also fostering relationships with their peers. Developed by the Membership Committee, attendees will hear from NARST Leadership and other key constituents who will share about their own relationship to NARST and what keeps them coming back. Additionally, attendees will also be provided with information regarding spotlight sessions and opportunities to get involved with the organization early.
March 25, 2022 **11am - 3pm CST (9am to noon PST)** **An Introduction to Data Science in Science Education Using R** **Lead persons:** Cynthia D'Angelo, cdangelo@illinois.edu	**VIRTUAL** Data science-involving the use of mathematics and statistics, tools and ideas from computer science, and knowledge of a particular domain-can enable analysts to work with their data more effectively. This workshop is sponsored by the NARST Contemporary Methods Research Interest Group (RIG) and is designed to equip science education researchers with the tools and knowledge to begin to use data science methods. Participants will learn about prior research and techniques for using data science methods in science education research and will understand what a typical data science process entails. Participants will also gain experience reasoning about, running, and understanding the results of code using the statistical programming language R. The use of RStudio Cloud will enable participants to quickly begin to use R without installing R or any R packages (add-ons) prior to the workshop. Furthermore, participants will have the opportunity to begin to carry out their own analyses and can ask targeted questions to guide future work. Finally, this workshop will provide opportunities for attendees to network with others interested in data science methods. Broadly, this workshop will support the

	efforts of NARST members interested in understanding and applying cutting-edge research methods in their work.
May 13, 2022 **12:00 – 2:00 PM EST** **Note that this is a POST-conference workshop.** **YESTEM: Justice-Oriented Pedagogies and Practices for Informal Science Learning and Research** **Lead Person(s):** Day Greenberg daygr@umich.edu	**ONLINE: POST-CONFERENCE** This workshop engages participants in new/emerging conceptual frameworks and approaches in support of the design and enactment of justice-oriented pedagogies to enhance Informal Science Learning (ISL) and Research+Practice efforts. Insights for this workshop emerge from long-term research-practice partnerships (RPPs) across informal STEM learning spaces in the US and UK. Frameworks and approaches support researchers, educators, designers, and directors working in informal (out-of-school) STEM learning, towards unity and inclusion for global scientific literacy through the centering of youth, families, and communities. The workshop could be especially helpful for researchers seeking to establish new RPPs with a central focus on justice. Justice-Oriented ISL is an integrated approach to support STEM-agentic lives, so that youth can enact and transform STEM to address issues that matter to them. This work centers on pedagogies that embrace youth as co-learners and necessary partners in the present and future of STEM. Justice-Oriented ISL positions youth as co-owners of STEM spaces (instead of just visitors or guests), to address historical and continued impacts of racism, sexism, and classism on learning and practice. This means design and pedagogical practice towards more equitable power sharing, rethinking what and who counts in STEM. Participants will leave with innovative approaches and concepts to enhance relationship-building, resource-sharing, learning facilitation and pedagogies, institution planning, space design, and program design. Participants will also receive access to a suite of materials and resources, including concept guides, youth-adult interaction strategies, tools to support youth knowledge and practice, and youth feedback measures. This workshop draws from 5 years of longitudinal RPP work involving international surveys (youth and adult) and workshops (adult ISL leaders and staff), critical ethnographic participatory research, and design-based implementation research (DBIR).

SATURDAY, MARCH 26, 2022

Conference Registration
Prefunction area
12:00 pm – 6:00 pm

NARST Executive Board Meeting
Room: Burrard
8:00 am – 5:00 pm

SUNDAY, MARCH 27, 2022

Conference Registration
Prefunction area
7:30 am – 6:00 pm

NARST Executive Board Meeting
Room: Burrard
8:00 am – 12:00 pm

Preconference Workshops
Room: Burrard
8:00 am – 12:00 pm

Note: You must register for the pre-conference workshops with your advanced conference registration.

Preconference Workshops	
Date/Time	**Session format/abstract**
8:00 – 11:45 am	In person/virtual/hybrid
Equity and Ethics Preconference Workshop: Unity and Inclusion for Global Scientific Literacy. Invite as a Community: Unite as a Community. Room: Kitsilano Ballroom A **Lead Organizer** Justina Ogodo Justina_ogodo@baylor.edu **Presenters:** Dr. Saouma BouJaoude, American University of Beirut, boujaoud@aub.edu.lb	**HYBRID** (in-person and online) Science education researchers have always been concerned with how communities participate in science. Science connects people with the natural world, supports the development of scientific literacy, and provides frameworks for engaging with the opportunities and challenges the world faces today. These goals are increasingly important given the enduring gap in access and opportunities for science learning for an increasingly diverse student population across the globe. In response, the NARST community is now charged with considering how inclusive science education can transform science teaching and learning across multiple and varied, real and virtual contexts to promote a socially just world. Through an equity and ethics lens, pre-conference workshop participants will engage in constructive and meaningful dialogue with leading science education scholars about strategies to develop critical and scientifically literate educators both within and beyond their classroom practice, research, and service. Additionally, we will discuss leveraging our research to involve the community in co-constructing scientific literacy and participation in relevant and important science. The dialogue will center on equity, citizenship, privilege, access in science education, and research between

Dr. Gregory Clark, The University of Texas at Austin, gbclark@utexas.edu Dr. Meredith Kier, The College of William and Mary, mwkier@wm.edu Dr. Natalie King, Georgia State University, natalieking@gsu.edu Dr. Christina Siry, The Université du Luxembourg, christina.siry@uni.lu	and among workshop participants and the leading science education scholars. The session will be facilitated as a whole and small group discussion. Also, technology integration such as Twitter will provide a platform to foster continuous dialogue during the workshop and throughout the conference using: #NARST/EEC.
Conducting Policy Reviews to Uncover Systemic Barriers into Science Education **Lead Organizer:** Takumi Sato, takumi@vt.edu Room: Kitsilano Ballroom C	**IN PERSON** The workshop will engage participants in hands-on experience of reviewing institutional documents that contain policy as related to membership in the science education community. The intent is to diversify the science education community by identifying and advocating for changes to policies that serve to exclude marginalized populations. This includes requirements for entry into science teacher education programs, teacher licensure requirements, graduate program policies and procedures and more. The workshop directly responds to research that indicates persistent problems of underrepresentation of Teachers of Color in US K12 science classrooms (and teaching more broadly) and limited access and opportunities in science learning within underserved communities. The aim is to remove systemic barriers in the science education community as a means to foster inclusive spaces. The workshop facilitators will provide an overview of systemic barriers and strategies for examining policy documents. Participants will be provided time to work collaboratively with each other with support and guidance from the facilitators. The workshop will conclude with the opportunities to draft a plan of action to address potential barriers found within the policy documents.
Teaching and Learning Science in a 'Post-Truth' Society: New Roles for Socio-Scientific Issues **Lead Organizer:** Elena Boldyreva, elena.boldyreva@mail.utoronto.ca **Presenters:** Dr. Jonathan Osborne, Dr. Troy D. Sadler, Dr. Jim Slotta, Daniel Pimentel, Elena Boldyreva Room: Kitsilano Ballroom D	**HYBRID** There is an urgent need to address socio-scientific issues (SSI) in the science classroom, such as genome editing, emerging diseases (e.g., COVID-19), climate change, antibiotic resistance, and others. SSI have been shown by a wealth of prior research to offer an excellent context for the development of critical thinking skills about information and resources, exploration of the Nature of Science, scientific argumentation, analysis and collaboration (McNeil & Krajcik, 2008). Moreover, in the last two decades, the volume of information readily available to students has grown exponentially, while the quality of that information has become more difficult for students and teachers to assess due to a lack of gatekeeping and an absence of adequate peer review (i.e., of the scientific information published online). In the current 'Post-Truth' era, where scientific reasoning and even the competence of scientists is questioned by the general public (McIntyre, 2018), students must learn how to evaluate information critically, detect bias, and make decisions about whether sources of information are credible. Moreover, SSI offer a rich context for engaging, culturally relevant and inclusive STEM curriculum that supports the NGSS and development of 21st century competencies (Reiser, 2013). This workshop will provide hands-on opportunities for educators to explore relevant theoretical frameworks and pedagogical approaches for integrating SSI within science education. We will focus on creating scientific classroom communities and addressing 21st Century and scientific competencies, such as collaboration, communication, global citizenship, scientific argumentation and the ability to evaluate the credibility of primary and secondary resources.

Sunday 3-27-2022

LaRIG Pre-Conference Workshop: Community Building for Success: Latinx Graduate Students, Early Career Educators and Scholars in Science Education (Multilingual Workshop) **Lead Organizer:** Regina Suriel rlsuriel@valdosta.edu Room: Parq Salon A	**HYBRID** This workshop aims to be a space for Latinx and other culturally and linguistically diverse scholars, educators and graduate students to identify the properties of effective a) mentorships b) research publications and c) tenure and promotion processes from other successfully established scholars in the science education research community. Workshop panelists will present their research and experiences as Latinx in the field of science education to illustrate relevant examples of projects with Latinx peers and students. The session is also designed for Latinx scholars and other culturally and linguistically diverse NARST members to establish supportive relationships with knowledgeable mentors and with each other, thus increasing their repertoire of strategies for successfully navigating academia. The workshop will combine panel sessions where participants can ask questions to senior and emerging scholars, with small group discussion where participants will share their experiences in greater depth and receive more specific advice. The discussions will focus on three areas: 1) advice to get the mentoring you want and becoming an effective mentor, 2) advice on a) career activities to support on-time tenure and promotion or b) successful practices for completing doctoral programs, 3) strategizing writing and publishing about our research with Latinx and/or other populations, and 4) learning how to actively engage in the NARST community. Small group discussions may be conducted in the preferred language of the participants (Spanish, English, or any combination of them). Overall, the workshop aims to provide all participants a safe space for positive and constructive mentoring/community building experiences for doctoral students and career scholars to feel empowered to succeed in their roles as researchers and science teacher educators.
Early Career Faculty Forum **Lead :** K.C. Busch, Shirly Avargil Kbusch@ncsu.edu Reanna.roby@vanderbilt.edu Room: Kitsilano Ballroom B	**IN PERSON** The Membership Committee hosts an annual Early Career Faculty Forum. This year the forum will use a panel approach to introduce junior faculty members and post-doctoral fellows to peers, recently promoted colleagues, and prominent scholars. The forum will focus on the nuances of succeeding during the early career years as a faculty member. Our discussions will include issues of developing and maintaining a research agenda (e.g., publications & grant writing), adhering to teaching responsibilities, and effective ways for engaging in meaningful service experiences. In addition, the forum will explore many of the challenges of transitioning into new professional roles and maintaining balance in your life in the process. The Early Career Faculty forum will provide participants with a detailed examination of the many small nuances that impact the successful navigation of early faculty careers in science education. Following the panel, attendees will have the opportunity to participate in round table discussions for more in depth sharing and questioning.
Indigenous Science Knowledge RIG Pre-Conference Workshop: Indigenous Knowledge for Sustainable Science Education Research	**HYBRID** This workshop will use the lens of Bio-cultural diversity to allow participants to intermingle with Indigenous and First Nations knowledge, people, places, artifacts, language, and culture. Indigenous communities and people face immense challenges in sustaining and preserving their culture and knowledge. These challenges bring issues of loss of traditional lands, practices, resources, and language to threats brought by climate change, COVID-19, public health, and our everyday lives. Since our

Lead Organizer: Bhaskar Upadhyay bhaskar@umn.edu Room: Parq Salon B	current environmental problems (fires and drought in particular) are directly the result of our human activities, education and educational research have a key role to play in seeking solutions. Indigenous communities also have endured the greatest challenges in their traditional practices and livelihoods as a result of our changing climate. Therefore a core feature of this workshop will involve a guided and engaging dialectic with local Indigenous knowledges and pedagogies with the overarching goal for participants to decolonize their thinking and learn more about the nature of Indigenous practices, values, beliefs, and the deep meanings these have for Indigenous people. This will be followed by roundtables supporting interactive conversations to learn the need for collaborative community-driven work, conceptualize and implement meaningful research in Indigenous settings to enact place-based knowledge and methodologies that supports Indigenous ways of knowing and learning. Further, roundtable discussants will focus on the place for science teaching, teacher preparation and educational research in Indigenous communities including but not limited to ethics, equity, historical and environmental contexts and the roles of place, language, stories, values and practices. Participants will be invited to discuss how Indigenous knowledge and collaboration with Indigenous communities should involve reciprocity so we ensure that the research benefits the people more than the researcher.
NARST Welcome Session for New Attendees **10:00am-11:00am Pacific** **Lead Organizer:** Tugba Yuksel tugbayuksel@gmail.com **Room: Parq Salon C**	**IN-PERSON and a separate ONLINE session (March 24)** The Welcome Meeting organized by the NARST Membership Committee will be a 1 hour event where new members, first-time attendees, practitioners are provided with conference logistics as well as opportunities to ask questions relevant to navigating the NARST experience. The Welcome Session is a communal space to learn about the functioning of NARST in a space with little to no judgment, while also fostering relationships with their peers. Developed by the Membership Committee, attendees will hear from NARST Leadership and other key constituents who will share about their own relationship to NARST and what keeps them coming back. Additionally, attendees will also be provided with information regarding spotlight sessions and opportunities to get involved with the organization early.
Mentor-Mentee Nexus **11:00-11:45 in person** **Virtual participants may schedule sessions with their mentor** according to availability using your own communication platform. **Lead Organizer:** Elizabeth De Los Santos elizabeth.xeng.delossantos@gmail.com Room: Parq Salon C	**IN-PERSON and a separate ONLINE session** The membership committee hosts an annual Mentor-Mentee Nexus. This 45-minute session serves as a context for those first-time attendees, or those relatively new, to NARST (i.e. Mentee) to interact with more experienced NARST members (i.e. Mentor). Session leaders facilitate the introduction of mentors and mentees by identifying and matching interested parties, creating an environment that supports communication among mentors and mentees, and monitors and evaluates mentor and mentee needs with respect to the NARST session. During the session, Mentors provide insight regarding topics of interest to the Mentee by either providing answers to Mentee questions or helping the Mentee identify an appropriate source of information. During the session, Mentees locate their Mentor and in a small group share questions, concerns, and insights with their Mentors and other Mentees.

Sunday 3-27-2022

Lunch (on your own or with an Ambassador group!)
11:45 am-1:00 pm

Graduate Student Networking Social [lunch served]
Kitsilano Ballroom D
11:45 am-1:00 pm

Sunday: March 27, 2022
Opening Session & Keynote Address [livestream]
Parq Salon DEF
1:00 pm-2:45 pm

WELCOME: Renée Schwartz, NARST President

Professor of Science Education
Department of Middle and Secondary Education
Georgia State University
Atlanta, Georgia USA

FIRST NATIONS LAND ACKNOWLEDGEMENT

Marny Point, Musqueam elder
The University of British Columbia,
First Nations and Endangered Languages program
Urban Coordinator, NITEP

ʔa: səy̓em̓ nə si:ye y̓ə, ʔəy̓ tə nə šxʷqʷeləwən tə n̓a weyəl!
My respected friends and relatives, I feel glad today!

Marny is from the Musqueam band, of the Coast Salish people. Marny would also like to acknowledge UBC resides on the traditional and unceded territory of the Musqueam people. Marny has completed both her degrees: a Bachelor of Education & Masters of Educational Technology and is currently working on her Ph.D. in LLED at UBC. Marny has been the Program Coordinator and is an Instructor in the NITEP On-Campus center, teaching the introductory Indigenous education courses. She is an active member of the UBC/MIB Language Committee and was the First Nations and Endangered Languages Program (FNEL) Instructor, teaching the intermediate level of the Coast Salish traditional Musqueam language course, hən̓ q̓ əmin̓ əm̓ from 2002 until 2019. She understands how the connection to Indigenous languages; gives value, honour and a sense of identity, which cements Native Indigenous, people in place and culture.

Marny comes from a long line of fisher-people, and she too is an avid fisherwoman – owning and operating her own gillnetter. As her dad and grandfather always did, she harvests sockeye salmon from the Fraser River every summer, in this cultural activity, she is able to share those same teachings on to her own children, connecting them to their traditional language & ways of her people. Marny is actively involved in the education of the Aboriginal youth – she has taught in the elementary grades, been a liaison for her community and neighbouring schools and sits on many committees to ensure the betterment of Indigenous education.

Sunday 3-27-2022

OPENING KEYNOTE ADDRESS

Speaker: Dr. Megan Bang, Northwestern University

What now? Science education that contributes to just, sustainable, and culturally thriving futures

Megan Bang (Ojibwe and Italian descent) is a Professor of the Learning Sciences and Psychology at Northwestern University and is the Senior Vice President at the Spencer Foundation. Dr. Bang studies dynamics of culture, learning, and development across the life course. She is particularly interested in knowledge organization, reasoning, and decision-making about complex socio-ecological systems and their intersections with identity, cultural variation, history and power. She conducts research in schools, informal learning environments, and everyday community contexts. Dr. Bang creates intergenerational place based (field-based) science learning environments and studies teacher practice and student learning in such environments. Further, Dr. Bang has engaged in a range of related scholarship with respect to family and community engagement and leadership. Dr. Bang is a member of the National Academies of Education and she serves on the Board of Science Education at the National Academy of Sciences.

Sunday, March 27, 2022
Concurrent Session # 1
3:00 pm-4:30 pm

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Middle School & NGSS Science Teaching & Learning
3:00 PM-4:30 PM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

A Longitudinal Study of Middle School Students' Science Task Values (Virtual)
Sufen Chen, Graduate Institute of Digital Learning and Education & Teacher Education Center, National Taiwan University of Science and Technology, Taiwan
Ssu-Ching Huang, Graduate Institute of Digital Learning and Education, National Taiwan University of Science and Technology, Taiwan
Pey-Yan Liou, Department of Education, Korea University, Korea

An Exploratory Study to Develop a Framework of Middle School Science Giftedness in NGSS Era
Shari E. Hiltbrand, Texas Tech University
Mihwa Park, Texas Tech University

Examining Middle School Teacher Implementation and Enactment of the NGSS: A Mixed Methods Study
Erik Arevalo, University of California, Santa Barbara
Meghan Macias, University of California, Santa Barbara
Katy Nilsen, WestEd
Ashley Iveland, WestEd

Examining NGSS Scientific Practices in K-12 Science Classrooms (Virtual)
Peter Hu, University of Pittsburgh
Ling L. Liang, La Salle University
Ying-Chih Chen, Arizona State University
Takeshi Terada,

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Admin Symposium-A community of practice contextualized within sociocultural phenomena: Mitigating teaching and learning of STEM through counter-praxis
3:00 PM-4:30 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Panelists
Angela M Chapman, University Of Texas Rio Grande Valley
Ariana Garza Garcia
Felicia Rodriguez,
Anthony Bailey,
Juan B. Lazo,
Alejandro J. Gallard, Georgia Southern University

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
SC-organized paper set-Diverse Opportunities for Early Science and Engineering Experiences
3:00 PM-4:30 PM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

A Mixed Methods Study of Serious Game Design Heuristics that Support Elementary Science Learners
Georgia W Hodges, University of Georgia
Kayla P Flanagan, University of Georgia
Stephanie Eldridge, University of Georgia
Joanna Schneider , University of Georgia
Allan Cohen, University of Georgia
Juyeon Leet ,

Temperature Measurement with Early Elementary Students
Ryan Cain, Weber State University
Victor R Lee, Stanford University

Inspiring Learning Environments—What Preschoolers' Prefer? Do Enriched Environments Enhance Engineering Capabilities? Does Gender Matter? (Virtual)
Ornit Spektor-Levy, Bar-Ilan University
Netta Perry, Bar Ilan University
Taly Shechter, Bar Ilan University

Strand 5: College Science Teaching and Learning (Grades 13-20)
Related Paper Set-The Missing Materials in College Science Learning: Intersections of Materiality, Agency, and Disciplinary Inquiry (Virtual)
3:00 PM-4:30 PM, Kitsilano Ballroom A

Discussant: Timothy Atherton, Tufts University

Presider: https://tinyurl.com/NARSTpresider

Using Conjecture Mapping to Uncover Sociomaterial Entanglements in Introductory Physics Labs (virtual)
Ian Descamps, Tufts University

Leveraging Material Uncertainty to Support Students' Trajectories of Practice (virtual)
Robert D. Hayes, Tufts University
Julia Gouvea, Tufts University
Aditi Wagh, Massachusetts Institute of Technology

Curating Materials for Epistemic Agency (virtual)
Leslie Atkins Elliott, Boise State University
Shakayla Moran, Boise State University

Developing Disciplinary Relationships in Computational Physics (virtual)
Ezra Gouvea, Tufts University
Brian E Gravel, Tufts University
Timothy Atherton, Tufts University

Strand 6: Science Learning in Informal Contexts
SC-organized paper set-Emerging research in Informal Science
3:00 PM-4:30 PM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

Examining the Nature of Canada's Scientific Literacy Through COVID-19 Tweets
Samantha Jewett, University of Western Ontario
Anton Puvirajah, University of Western Ontario
Mohammad Azzam, Western University
Jingrui Jiang, University of Western Ontario

Native Animals, Native Knowledge? An analysis of zoo portrayal of Indigenous Cultures
Jonathan R Bowers, Michigan State University
Gail Richmond, Michigan State University

The Portuguese Maritime Voyages: the exploration of the history of a city with an App (Virtual)
Cláudia Faria, Instituto De Educação Da Universidade De Lisboa
Elsa Guilherme, Instituto de Educação da Universidade de Lisboa
Joaquim Pintassilgo, Instituto de Educação da Universidade de Lisboa
Maria João Mogarro, Instituto de Educação da Universidade de Lisboa
Ana Sofia Pinho, Instituto de Educação da Universidade de Lisboa
Mónica Baptista, Instituto de Educação da Universidade de Lisboa
Isabel Chagas, Instituto de Educação da Universidade de Lisboa
Cecília Galvão, Instituto de Educação da Universidade de Lisboa

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Strand 7: Pre-service Science Teacher Education
Symposium-Building an Elementary Science Teacher Education Community to Advance Equity and Justice
3:00 PM-4:30 PM, Cambie

Discussant: Felicia Mensah, Teachers College, Columbia University

Presider: https://tinyurl.com/NARSTpresider

Panelists
Christa Haverly, Northwestern University
Terrance Burgess, Michigan State University
Marti Canipe, Northern Arizona University
Tina Cheuk, California Polytechnic State University
Judith A. Cooper-Wagoner, University of Arizona
Amal Ibourk, Florida State University
Thomas J McKenna, Boston University
Meenakshi Sharma, Mercer University
Christina V. Schwarz, Michigan State University
Felicia Moore Mensah, Teachers College, Columbia University
Elizabeth A. Davis, University of Michigan
Kristin Gunckel, University of Arizona

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Exploring challenges of PCK development in pre-service teacher education
3:00 PM-4:30 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Catalyst or Catastrophe: Examining the Influence of the edTPA on Preservice Science Teachers' PCK Development (Virtual)
Matt Reynolds, North Carolina State University
Soonhye Park, North Carolina State University

Examining elementary pre-service teachers' competence of questioning in leveraging students' conceptual understanding (Virtual)
Jianlan Wang, Texas Tech University
Yuanhua Wang, West Virginia University
Yanhong Guo, Texas Tech University
Shawn Kashef, University of Georgia

Examining Pre-Service Physics Teachers' Pedagogical Content Knowledge – A Sequence of Proficiency Levels
Dustin Schiering, IPN – Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Stefan Sorge, IPN – Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Melanie Keller, IPN – Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Knut Neumann, IPN – Leibniz Institute for Science and Mathematics Education, Kiel, Germany

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Strand 10: Curriculum and Assessment
Related Paper Set-Bringing researcher perspectives and research-based approaches to the design of instructional materials for broad use
3:00 PM-4:30 PM, Burrard

Discussant: Brian Reiser, Northwestern University

Presider: https://tinyurl.com/NARSTpresider

Bringing a Science Education Research Perspective to the Development of Instructional Materials for Broad Use
Daniel C. Edelson, BSCS Science Learning
Brian J. Reiser, Northwestern University
Katherine L. McNeill, Boston College
William R. Penuel, University of Colorado
Shelly LaDoux, The Dana Center

Addressing Tensions Inherent in Using Student Surveys to Make Equitable Decisions about Phenomenon Selection
Zoe E. Buck Bracey, BSCS
Lindsey Mohan, BSCS Science Learning
Jamie D Noll, Northwestern University

Designing middle school science curricula 'by states, for states'
Audrey Mohan, BSCS Science Learning
Michael J. Novak, Northwestern University
Shafiq Chaudhary, New Mexico Public Education Department
Hillary Paul Metcalf, Massachusetts Department of Elementary and Secondary Education

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Strand 11: Cultural, Social, and Gender Issues
Symposium-Analytic Approaches to Studying Identity Work Longitudinally
3:00 PM-4:30 PM, Parq Salon D (**livestream** 1)

Discussant: Allison Gonsalves, McGill University
Presider: https://tinyurl.com/NARSTpresider

Panelists
Alison Mercier, University of Wyoming
David Segura, Beloit College
Zahra Hazari, Florida International University
Heidi B. Carlone, Vanderbilt University
Edna Tan, University Of North Carolina At Greensboro
Lucy Avraamidou, University Of Groningen
Robert H. Tai, University Of Virginia
Louise Archer, UCL Institute of Education
Henriette T. Holmegaard, University Of Copenhagen
Bryan A. Brown, Stanford University
Maria Varelas, University of Illinois Chicago
Daniel Morales-Doyle, University of Illinois Chicago
Geoff Potvin, Florida International University
Pooneh Sabouri, Florida International University
Thomas Head, Florida International University
Joinee Taylor, Florida International University
Benjamin Archibeque, Florida International University
Aerin Benavides, University of North Carolina at Greensboro
Julie Moote, UCL Institute of Education
Katia Bill Nielson, University of Copenhagen
Ene Hoppe, University of Copenhagen

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Belonging and Retention in Postsecondary STEM
3:00 PM-4:30 PM, Stanley

Presider: https://tinyurl.com/NARSTpresider

Retaining Underrepresented Minorities in STEM Majors: The Role of Mentoring in the First Year
Stacy Olitsky, Saint Joseph's University

What is the Science when Talking Science Identity? Reflections from a Higher Education Biology Perspective.
Katerina P. Günter, Centre for Gender Research, Uppsala University, Uppsala, Sweden
Carolina De Barros Vidor, Department of Education, Uppsala University, Uppsala, Sweden
Annica Gullberg, Teaching in STEM, KTH, Royal Institute of Technology, Stockholm, Sweden

Building Bridges: An Intervention to Improve Academic Outcomes for Underrepresented "Minority" Students in General Chemistry
Natasha H. Johnson, University of Toledo

Hands-On Learning About Inclusion in an Undergraduate Physics Lab (Virtual)
Kim-Alessandro Weber, Leibniz Universitaet Hannover, Institute for Mathematics and Physics Education
Rüdiger Scholz, Leibniz Universitaet Hannover, Institut fuer Quantenoptik
Gunnar Friege, Leibniz Universitaet Hannover, Institute for Mathematics and Physics Education

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Strand 12: Technology for Teaching, Learning, and Research
SC-organized paper set-Using Representations, Data, and Graphing to Support Concept Development
3:00 PM-4:30 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

Supporting middle school students to integrate graph data with physical science content
Phillip A. Boda, University of California, Berkeley
Emily Harrison, University of California, Berkeley
Marcia C. Linn, University of California-Berkeley

Applying visual highlighting techniques to support students' understanding in organic chemistry
Nicole Graulich, Justus-Liebig Universität Giessen
Marc Rodemer, IPN Kiel
Julia Eckhard, Justus-Liebig-University Giessen
Sascha Bernholt, IPN Kiel

The Role of Individual Differences in Working Memory Capacity When Comprehending Visualizations With Relative Data and Seductive Details (Virtual)
Kristine A. Antonyan, University of Florida
Poorya M. Shidfar, University of Florida
Do Hyong Koh, University of Florida
Pavlo D. Antonenko, University Of Florida

Will CTCA Help Students' Understanding of Difficult Concepts In Computer Studies?
Mariyam Pentho Abdulhadi, ACEITSE-Lagos State University
Peter A. Okebukola, ACEITSE-Lagos State University
Fred Awaah, University of Professional Studies Accra
Adekunle Ibrahim Oladejo, ACEITSE – Lagos State University
Deborah Oluwatosin Agbanimu, ACEITSE-Lagos State University

Strand 14: Environmental Education and Sustainability
SC-organized paper set-Exploring literacies in environmental education and education for sustainable development
3:00 PM-4:30 PM, Granville II

Presider: https://tinyurl.com/NARSTpresider

A systematic literature review: assessing sustainability literacy
Rolf Saarna, University of Tartu
Anne Laius, University of Tartu

Creative and Digital Pedagogies for Teaching Ocean Literacy: The Ocean Connections Project (Virtual)
Lindsay Hetherington, University of Exeter
Justin S Dillon, University of Exeter
Birgitte Lund Nielsen, VIA University College
Harald Brandt, VIA University College
Maria MJ Malmierca, CESGA

Equipping the Young to Tackle Current Societal Challenges
Giulia Tasquier, University of Bologna
Erik Knain, University of Oslo
Alfredo Jornet, University of Oslo

Fostering Environmental Literacy through Engagement in Self-Regulation Learning Processes
Michal Zion, Bar Ilan University, School of education
Guly Ortal-Ivry, Bar Ilan University, School of education
idit Adler, Tel Aviv University, School of Education

Admin Symposium-Graduate Student Research Symposium
3:00 PM-4:30 PM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Organizers
Scott Cohen, Georgia State University
Theila Smith, University of Gorningen
Jordan L. Henley, University of Georgia
Helena Aptyka, University of Cologne
Mohammed Estaiteyeh, Western University
Timothy G. Klavon, Black Hills State University
Andrea Reeder, Middle Tennessee State University
Chelsea Sexton, University of Georgia

The graduate students research symposium is for the up-and-coming scholars sharing their work-in-progress studies as they develop their research capacity while working with a mentor. Attendees are encouraged to attend and share inputs with our presenters.

Searching for understanding: How do NOS and science identity intersect for HS students?
Robert Bennett, Georgia State University,

Environmental Service-Learning as University-Community Partnership: Using actor-network theory to examine a new model of engagement
Hannah Cooke, University of Connecticut

Minoritized, Secondary Students and Risk-Taking in STEM Classrooms
Danielle Daniels, University of Rochester

Modeling water quality scientists' participation in science communication
Brenda Guerrero, Florida International University

Exploration of Secondary Science Teacher Candidates' Ideological Shifts in an Initial Teacher Preparation Program
Claudia Hagan, Georgia State University

The Lived Experiences of Graduate and Early Career Black Women in STEM Academia
Lisa Hanson, Middle Tennessee State University

Science Instructors' New Approaches to Teaching During the COVID-19 Pandemic (Virtual)
Olena James, Middle Tennessee State University

Investigating the Experiences of Preservice Teachers of Color in a STEM Focused Teacher Education Program at a Historically White Institution

Victor Kásper, Florida State University

Lessons Learnt from Designing an SDG STEM Club to Increase Awareness about SDGs Among Canadian Youth
Midhat Noor Kiyani, McGill University

Developing and Using Models as Assessments to Inform the Teaching Progression in the Science Classroom
Kristin Mansell, Texas Tech University

Designing for Axiological Engagement: Manifesting Implicit Power Relationships in STEM Research through Embodied Play
Sophia Marlow, University of Calgary

How Science Identities are Formed by Recognition?: Exploring Bangladeshi Women Science Teachers' Challenges and Aspirations
Shamnaz Arifin Mim, McGill University

Collaborating S-T-E-M In-Service Teachers Developing Integrated STEM Teaching
Argyris Nipyrakis, University of Groningen & University of Crete

Black Students' Access to STEM Undergraduate Studies via Transitional Education
ProgramsNadia Qureshi, OISE, University of Toronto

Exploring the Coordination of Secondary Science Teachers' Resources Across Their Resource Systems
David Schouweiler, The University of North Carolina at Greensboro

Student Centered Science Classrooms: Dilemmas Faced While Teaching Science Through a Global Pandemic
Jennifer Slavick, West Chester University

Failure and Creativity: The Case to Embrace Both in STEM Education
Elizabeth Stretch, University of Minnesota

Researching race and experience in postsecondary STEM education at a Western Canadian University (Virtual)
Kristal Turner, University of Calgary

Exploring pre-service science teachers' attitudes and beliefs towards gender and sexual diversity-inclusive science teaching
Gary Wright, North Carolina State University

The Figured World of the Introduction of a Justice-Centered Secondary Science Education Program
Yang Zhang, University of Rochester

Administrative Session: Research Committee
Admin Symposium-Global Perspectives from the Handbook of Research on Science Education, Volume III
3:00 PM-4:30 PM, Parq Salon E (**livestream** 2)

Presiders:
Dana L Zeidler, University of South Florida
Judith S Lederman, Illinois Institute of Technology

Introduction and Overview
Dana L Zeidler, University of South Florida
Judith S Lederman, Illinois Institute of Technology

Section I. Theory and Methods of Science Education Research
Section II. Science Learning
Section III. Diversity and Equity in Science Learning
Section IV. Science Teaching
Section V. Curriculum and Assessment in Science
Section VI. Science Teacher Education

Multi-Strand-*Virtual Session A*
3:00 PM-4:30 PM, Parq Salon F (**livestream** 3)

Teaching and Learning Floating and Sinking: a Metaanalysis (Virtual)
Martin Schwichow, PH Freiburg
Anastasios Zoupidis, Democritus University of Thrace

How Do Students Make Sense of Simultaneous Synthesis Physics Tasks? (Virtual)
Bashirah Ibrahim, Bahrain Teachers College, University of Bahrain
Lin Ding, Ohio State University

Pedagogy in practice: exploring the use of pedagogy course knowledge by learning assistants (Virtual)
Vera Degtiareva, Boston University
Emily C. Allen, Boston University
Andrew Duffy, Boston University
Manher Jariwala, Boston University

Physics Education Curriculum from the decoloniality lens: a Brazilian case study (Virtual)
Carlos Mometti, University of São Paulo
Tanja Tajmel, Concordia University
Mauricio Pietrocola, University of São Paulo

Sunday: March 27, 2022
Concurrent Session # 2
4:45 pm-6:15 pm

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Middle School Science Teaching & Learning
4:45 PM-6:15 PM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

An Investigation of Teaching and Learning Approaches Influencing Students' Intrinsic Motivation towards Science Learning: A Longitudinal Analysis from Grade 6 to 9
Moonika Teppo, University Of Tartu
Regina Soobard, University Of Tartu
Miia Rannikmae, University Of Tartu

Exploring Student- and Teacher-Level Characteristics on Middle School Students' Engagement in Life Science Classes
Zeynep Gonca Akdemir, Purdue University
Muhsin Menekse, Purdue University
Selcen Guzey, Purdue University

Teaching and Learning Kinematics: A Comparison of two Approaches
Gunnar Friege, University of Hannover Physics Education Group
Ingmar Schneider, University of Hannover Physics Education Group

The Effect of Multi-Faceted Holistic Approach in Science Instruction on Students' Achievements, Preferences, and Needs
Oshra Aloni, Bar-ilan University
Michal Zion, Bar-Ilan University
Ornit Spektor-Levy, Bar-Ilan University

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Related Paper Set-Students and teachers' challenges explaining the mechanism of complex systems and suggestions to address them
4:45 PM-6:15 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Using concept maps to evaluate preservice biology teachers' conceptualization of Covid-19 as a complex phenomenon
Tom Bielik, Freie Universität Berlin

Moritz Krell, Freie Universität Berlin
Johannes Jageman,
Dirk Krueger, Freie Universitaet Berlin
Orit Ben Zvi Assaraf, Ben-Gurion University Of the Negev, Israel

Developing a Coherent Understanding of Biology Through a Complex Systems Lens (Virtual)
Susan Yoon, University of Pennsylvania
Katherine Miller, University of Pennsylvania

Leveraging causal heuristics to scaffold student understanding in dynamic system models (Virtual)
Lynn Stephens, The Concord Consortium
Steve Roderick , The Concord Consortium

Comparing how students' conceptual understanding and computational model explain system mechanisms in time-based phenomena (Virtual)
Emil Eidin, Michigan State University
Jonathan Bowers, Michigan State University

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
SC-organized paper set-Professional Development of Science Teachers
4:45 PM-6:15 PM, Parq Salon D (**livestream** 1)

Presider: Selina L. Bartels, Valparaiso University

Empirically Grounding a Learning Performances Framework for K-5 Students' Modeling Competency Using Evidence-Centered Design
Florian Böschl, University of Leipzig
Tina Vo, University of Nevada- Las Vegas
Cory T. Forbes, University of Texas Arlington
Kim Lange-Schubert, University of Leipzig

Learning to Care for Students as Science Sensemakers: Preservice Elementary Teachers' Noticing and Epistemic Empathy
Ruveyde A. Kaya, Florida State University
Jennifer Schellinger, FSU
Sherry A. Southerland, Florida State University
Kirby Whittington, The University of Utah
Samantha Skrob-Martin, Florida State University

The Role of Responsibilist Intellectual Virtues in Science Learning
*(*presenting author)*
Ronald W Rinehart, University of Northern Iowa
*Mason Kuhn, University of Northern Iowa
Todd Milford, University of Victoria

Utilizing lesson study to lay the foundation for preservice teachers to begin shaping elementary students' scientific literacy
Selina L. Bartels, Valparaiso University

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Science teaching practices in secondary content areas
4:45 PM-6:15 PM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

Assessment of chemistry teacher student's diagnostic competencies in the Simulated Chemistry Classroom (SiCC). (Virtual)
Sascha Wittchen, Freie Universität Berlin
Claus Bolte, Freie Universität Berlin
Nils Machts, Christian-Albrechts-Universität zu Kiel

Capturing a Teacher's Multidimensional and Dynamic Attention to Student Learning in Design-Based Chemistry Education
Hanna Stammes, Delft University of Technology & Radboud University
Ineke Henze, Radboud University
Marc de Vries, Delft University of Technology
Erik Barendsen, Radboud University & Open University

Examining the Relative Effectiveness of CTCA in Improving Secondary School Students' Achievement in Genetics
Israel O. Adebayo, ACEITSE-Lagos State University
Peter A. Okebukola, ACEITSE-Lagos State University
Adekunle I. Oladejo, ACEITSE-Lagos State University

I am CTCA, and this is my first Attempt in the Physics Class - How Will I perform? (Virtual)
Adekunle Ibrahim Oladejo, ACEITSE-Lagos State University
Peter A. Okebukola, ACEITSE-Lagos State University
Israel Oludotun Adebayo, ACEITSE-Lagos State University
Gabriel Korede Adeosun, ACEITSE-Lagos State University
Deborah Oluwatosin Agbanimu, ACEITSE-Lagos State University
Franklin U. Onowugbeda, ACEITSE-Lagos State University
Ibukunolu Adebiyi Ademola, ACEITSE-Lagos State University
Esther Oluwafunmilayo Peter, ACEITSE-Lagos State University
Olasunkanmi Adio Gbeleyi, ACEITSE-Lagos State University
Fred Awaah, University of Professional Studies Accra

Strand 6: Science Learning in Informal Contexts
SC-organized paper set-Engaging youth in STEM through informal learning experiences
4:45 PM-6:15 PM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

A meta-synthesis on the impact of informal STEM programs on STEM major and STEM career awareness, interest, and engagement
Bobby Habig, American Museum of Natural History
Preeti Gupta, American Museum of Natural History
Jennifer Adams, University Of Calgary
Mandë Holford, Hunter College

Enhancing Gifted Students' Attitudes toward STEM: An Insight from a Research Apprenticeship Program (Virtual)
Shuchen Guo, Nanjing Normal University
Enshan Liu, Beijing Normal University
Cheng Liu, Beijing Normal University
Hailan Wang, Xiangyang No. 5 Middle School

Youth Science Identity and Perspectives of Scientists after Participation in a STEM-based Afterschool Program (Virtual)
Devon M Christman, University of California, Santa Barbara
Kassandra Ortega, University of California, Santa Barbara
Nathalie Paesler, University of California, Santa Barbara
Alexandria Muller, University of California- Santa Barbara
Diana J Arya, University of California, Santa Barbara

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Centering social justice in science teacher education
4:45 PM-6:15 PM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

"Kinda awful.I spent a lot of time crying":Attending to the Emotions of PSTs of Color
Victor Kásper, Florida State University
Shannon G. Davidson, Florida State University
Lama Jaber, Florida State University

Learning Antiracist and Socially Just STEM Teaching Within an Embedded, Place-Based Model of Teacher Education (Virtual)
Rachael M. Gordon, University of Michigan

STEM Education through Abolitionist Teaching: A Research-Practice Partnership to Support Virtual Microteaching Experiences

Vanessa Louis, Georgia State University
Natalie S. King, Georgia State University

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Cultivating positive dispositions toward science teaching
4:45 PM-6:15 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Attitudes of Preservice Elementary Science Teachers toward iSTEM Teaching: The Role of Adaptive Expertise (Virtual)
Mounir R. Saleh, Bahrain Teachers College, University of Bahrain
Bashirah Ibrahim, Bahrain Teachers College, University of Bahrain

Preservice Science Teachers' Implementation and Self-Efficacy About The Science And Engineering Practices (Virtual)
Fatma Kaya, Middle Tennessee State University
Lisa A. Borgerding, Kent State University
Shannon Navy, Kent State University

Systematic Assessment of Future Primary School Teachers' Interests in Science
Steffen Wagner, Humboldt-Universität zu Berlin
Burkhard Priemer, Humboldt-Universität zu Berlin
Doris Lewalter, Technical University Munich

Strand 8: In-service Science Teacher Education
SC-organized paper set-Impact of Unique Professional Development Foci
4:45 PM-6:15 PM, Granville II

Presider: https://tinyurl.com/NARSTpresider

Changes in Teacher Thinking about Enactment Influenced by a PD about an NGSS-Aligned Storyline Unit
Nessrine Machaka, University of Illinois At Urbana - Champaign
Stina Krist, University of Illinois at Urbana-Champaign

Creating Unity and Inclusion Through Developing the Research Team Teacher Role
Aline Gjelaj, Dual Language Middle School, New York, NY
Jessica White, Benjamin Syms Middle School, Hampton, VA.
Elaine V Howes, American Museum of Natural History
Jamie Wallace, American Museum of Natural History
Elizabeth Edmondson, Virginia Commonwealth University

*The enactment of professional development principles in a collaborative project between science and RE teachers * presenting author*
Ann Childs, University of Oxford
*Liam Guilfoyle, University of Oxford

Rural Science Teachers' Sensemaking about Teaching' Data Practices to Investigate Authentic Weather Phenomena (Virtual)
Asli Sezen-Barrie, University of Maine
Josephine Louie, Education Development Center
Brianna Roche, Education Development Center
Emily Fagan, Education Development Center
Brian Fitzgerald, Mount Washington Observatory
Kevin Waterman, Education Development Center
Deb Morrison, University of Washington

Strand 10: Curriculum and Assessment
Related Paper Set-Engaging with Curricular Infrastructure to Support Elementary Science Teacher Learning and Identity Development
4:45 PM-6:15 PM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Curriculum Materials Adoption Processes: Teacher Learning in an Organizational Routine (Virtual, mixed)
Christa Haverly, Northwestern University
Emily Rose Seeber, University of Michigan
Elizabeth A. Davis, University of Michigan
James P Spillane, Northwestern University
Angela Lyle, University of Michigan

Supporting Early Elementary Science and Literacy Teaching: The Synergy of Pedagogical Tools
Amelia Wenk Gotwals, Michigan State University
Amber S. Bismack, Oakland University
Samantha Danzinger,
Arianna Pikus, Michigan State Univsersity
Tanya S Wright, Michigan State University
Miranda S. Fitzgerald, University of North Carolina At Charlotte

Collaborative Development of Tools to Address Content-Practice Tensions in Classroom Science Investigations
Eve Manz, Boston University School of Education
Chris Georgen, Boston University
Betsy Beckert,

Supporting Elementary Teachers in Enacting Curricular Reform and Reform-based Science Instruction (Virtual)
Christina Siry, University Of Luxembourg
Sara E. Wilmes, University of Luxembourg
Kerstin Te Heesen, University of Luxembourg

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Black STEM Professionals and STEM Teaching, Learning, and Engagement
4:45 PM-6:15 PM, Stanley

Presider: https://tinyurl.com/NARSTpresider

Centering Black Scientists' Lived Experiences : A Context for Culturally and Linguistically Embedded Science (Virtual)
Gillian U Bayne, Lehman College of the City University of New Yorkl

Mentorship to Combat Loneliness, Bridge Opportunity Gaps, and Fight Underrepresentation in STEM Disciplines (Virtual)
Veeshan Narinesingh, Department of Physics The Graduate Center of The City University of New York
Farrah Simpson, Department of Physics Brown University
Tracy Edwards, Department of Physics Michigan State University
Milena Chakraverti-Wuerthwein, The Harlem Gallery of Science

Exploring Racism in the Undergraduate and Graduate School Choices of Scientists and Engineers: Counterspaces for Black men in S&E (Virtual)
Shari Watkins, American University
Brian McGowan, American University

Strand 12: Technology for Teaching, Learning, and Research
Symposium-Applying epistemic heuristics to characterize student reasoning about mechanisms with computational tools
4:45 PM-6:15 PM, Burrard

Discussant: Christina Krist, University of Illinios, Urbana Champagne

Presider: https://tinyurl.com/NARSTpresider

Reasoning about interactions when constructing mechanistic explanations (Virtual)
Michal Haskel-Ittah, Weizmann Institute of Science, Israel
Rami Marelly, Weizmann Institute of Science, Israel
Smadar Szekely, Weizmann Institute of Science, Israel

Reasoning about clogging in crowd evacuation through bottlenecks
Elon Langbeheim, Ben-Gurion University of the Negev, Israel
Shani Ben-Hamo, Ben-Gurion University of the Negev, Israel
Stav Shapira, Ben-Gurion University of the Negev, Israel

*Student Use of Epistemic Heuristics at the Intersection of Science and Social Justice (*presenting author)*
Allison Bradford, University of California, Berkeley
Libby Gerard, University of California, Berkeley
*Marcia Linn, University of California, Berkeley

Reasoning about heat transfer while examining the relationships between physical experiment and computer model (Virtual)
Tamar Fuhrmann, Stanford University
Carmel Bar, Weizmann Institute of Science, Israel
Paulo Blikstein, Teachers College, Columbia University

Strand 14: Environmental Education and Sustainability
SC-organized paper set-Innovative approaches in environmental science education
4:45 PM-6:15 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

[Program Name]: Powering the Science Learning Process with Co-Created Citizen Science
Ruth Kermish-Allen, Maine Mathematics and Science Alliance
Alexandria Brasili, Maine Mathematics and Science Alliance

Assessing Elementary Students Ability to Make Informal Observations About Living Organisms Outdoors
Jean-Philippe Ayotte-Beaudet, Université De Sherbrooke
Abdelkrim Hasni, Université de Sherbrooke
Valérie Vinuesa, Université de Sherbrooke
Élise Rodrigue-Poulin, Université de Sherbrooke
Gabriela Quintela Do Carmo, Columbia University in the City of New York
Étienne Gendron, Université de Sherbrooke

Bringing the Outside In and Inside Out: Connecting Socioemotional Learning with Science (Virtual)
Ava Marie Gibler, California Polytechnic State University, San Luis Obispo
Alexis Van Howe, California Polytechnic State University, San Luis Obispo
Jasmine McBeath Nation, California Polytechnic State University, San Luis Obispo
Kurt Holland, California Polytechnic State University, San Luis Obispo

Marine Science, Climate Change, and the NGSS: Lessons Learned from an Initial Round of PD
Lauren Madden, The College of New Jersey

Louise Ammentorp, The College of New Jersey
Nathan Magee, The College Of New Jersey, Physics Department
Graceanne Taylor, Save Barnegat Bay

Administrative Session: Equity And Ethics Committee
Admin Symposium-Jhumki Basu Poster Symposium
4:45 PM-6:15 PM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Organizers
María González-Howard, University of Texas at Austin
Justina Ogodo, Baylor University
Sara Sallom, University of Balamand, Lebanon
Enrique Suarez, University of Massachuttes, Amherst
Jenny Norman, University of Minnesota

Critical Approaches Leveraging Technology In Science Education
Phillip A. Boda, University of Illinois at Chicago

Towards Liberating Methods: Ethnodance as an Embodied Narrative of Black Students' Science Identity
Mindy J. Chappell, University of Illinois at Chicago

Meaningful Assessment of Engineering Experts' and Teachers' Conceptions of Nature of Engineering
Erdogan Kaya, George Mason University
Ezgi Yesilyurt, Weber State University
Hasan Deniz, University of Nevada Las Vegas

Learning How to Mean Through Multimodality Embedded in Modeling – "Scientifically" Speaking (Virtual)
Ayca K. Fackler, University of Georgia

Exploring Students Mechanistic Reasoning Within the Context of Resource Oriented Instructional Materials
Clausell Mathis, University of Washington
Lisa Goodhew, Seattle Pacific University
Paula Heron, University of Washington

Experiences of prospective and novice science teacher educators during the design of k-12 science methods courses
José Pavez, University of Georgia

Experiences of School Science Coordinators During the COVID-19 Pandemic: An International Perspective
Harleen Singh, Medaille College
Hong H. Tran, University of Georgia
Hatice Ozen-Tasdemir, University of Georgia
Yuxi Huang, University of Georgia
Julie A. Luft, University of Georgia
Brooke A. Whitworth, Clemson University

Machine Learning Scoring Bias on Students that are Underrepresented in STEM (Virtual)
Xiaoming Zhai, University of Georgia

Administrative Session: Research Committee
Admin Symposium-Latinx Science Learners and Scientific Literacy: Successes and Challenges
4:45 PM-6:15 PM, Parq Salon E (**livestream** 2)

Panelists
Regina Suriel, Valdosta State University
Alejandro J. Gallard, Georgia Southern University
Angela Chapman, University Of Texas Rio Grande Valley
Lizette de Robles,
Diego F. Rojas-Perilla, Teachers College, Columbia University
Enrique H Suarez,
Tatiane Russo-Tait, University of Texas At Austin
Diana Camacho, Oregon State University

Multi-Strand-*Virtual Session B*
4:45 PM-6:15 PM, Parq Salon F (**livestream** 3)

High School Students' Emergent Positions from Science Internships (Virtual)
Pei-Ling Hsu, University Of Texas At El Paso
Dina Thomason, University Of Texas At El Paso

Citizen Science in School: the Case of the Invasion of Wild Boars (Virtual)
Keren Sarah Levy, Technion - Israel Institute Of Technology
Keren Mintz, Technion - Israel Institute Of Technology
Tali Tal, Technion - Israel Institute Of Technology

Writing Science in English at College: Non-Anglophone Students' Participation in Epistemic Practices (Virtual)
Luciana Martiliano Milena, Universidade Federal Do ABC
Danusa Munford, Universidade Federal de Minas Gerais
Priscila C. Fernandes, Universidade Federal de Sao Joao del Rei

Sunday 3-27-2022

Motivations of Scientists and Teachers to Collaborate in School-Based Citizen Science Projects (Virtual)
Osnat Atias, University of Haifa
Ayelet Baram-Tsabari, Technion - Israel Institute of Technology
Ayelet Shavit, Technion - Israel Institute of Technology
Yael Kali, University of Haifa

Sunday: March 27, 2022

PRESIDENT'S RECEPTION AND WELCOME BACK CELEBRATION

Prefunction area & Parq Salon DEF
7:15 pm-9:30 pm

Come join the homecoming celebration! We are excited to be together after three long years (yes, the last time NARST had an in-person conference was 2019)! Reconnect with old friends. Make connections with new friends. The NARST community is coming together for an evening of good food and fun. There will be some surprises too!

Substantial appetizers and desserts will be served. Cash bar.

MONDAY, MARCH 28, 2022

Mind and Sole (off-site) (This event is not sponsored nor endorsed by NARST)
6:00 am-7:15 am

Breakfast (provided for in-person attendees) and online breakfast or cocktail social time (as you please)
Prefunction
6:30 am-8:00 am

RIG Business Meetings [Except for CADASE RIG]
7:00 am-8:00 am

NARST Research Interest Groups will meet to review activities of the past year and plans for the upcoming year. Anyone interested in learning more about a RIG is welcome to attend the meetings.

Research Interest Group	Room
Latino/a RIG [LARIG]	Parq Salon A
Contemporary Methods for Science Education Research	Parq Salon B
Engineering Education [ENE-RIG]	Parq Salon C
Indigenous Science Knowledge [ISK-RIG]	Kitsilano Ballroom A
Research in Artificial Intelligence-involved Science Education [RAISE]	Kitsilano Ballroom B
Asian and Pacific Islander Science Education Research [APISER]	Kitsilano Ballroom C

Monday, March 28, 2022
Concurrent Session # 3
8:00 am-9:30 am

Strand 1: Science Learning: Development of student understanding
SC-organized paper set-Pedagogical Approaches to Enhance Science Understading
8:00 AM-9:30 AM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

Applying art-based methods to talk with children about nature, technology, and health
Ene Ernst Hoppe, University of Copenhagen
Katia Bill Nielsen, Universtity of Copenhagen
Henriette T. Holmegaard, University Of Copenhagen

Please Mind the Gap: Black Boxes as a Pedagogical Construct in the Biology Classroom
Gur Arie Livni Alcasid, Department of Science Teaching, Weizmann Institute of Science
Michal Haskel Ittah, The Weizmann Institute Of Science

Student Depictions of the Engineering Design Process (Virtual)
Alexandria Muller, University of California- Santa Barbara
Marco Barron, University of California- Santa Barbara
Devon M Christman, UCSB
Ron Skinner, MOXI, The Wolf Museum of Exploration + Innovation
Danielle Boyd Harlow, University Of California At Santa Barbara

The interplay between students' motivational profiles and science learning
Marcus Kubsch, IPN - Leibniz Institute for Science and Mathematics Education
David L. Fortus, Weizmann Institute Of Science
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel
Jeffrey Nordine, Leibniz Institute for Science and Mathematics Education (IPN)
Joseph S. Krajcik, Michigan State University

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Science Teaching & Learning during the Pandemic
8:00 AM-9:30 AM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Investigating the Triple Threat of COVID-Necessitated Online Engineering Courses to Diverse Students' Sense of Belonging
Thomas R. Tretter, University of Louisville

Brian S Robinson, University of Louisville
Jessica B Buckley, University of Louisville
Alex Hammond, University of Louisville

Reimagining Virtual Participatory Design Research: Supporting Youth's Rightful Presence in a Community Science Project (Virtual)
Rishi Krishnamoorthy, Rutgers University
Edna Tan, University Of North Carolina At Greensboro
Ravit Golan Duncan, Rutgers University
Frieda Reichsman, The Concord Consortium
Sarah Haavind, The Concord Consortium
Tiahna Selby, Rutgers University
Burrell Smithen, Rutgers University
Tasha Austin, Rutgers University

Student emotional engagement through the emergency transition to online learning due to COVID-19 (Virtual)
Emma Wester, Donald Danforth Plant Science Center
Lisa L. Walsh, Donald Danforth Plant Science Center
Kristine Callis-Duehl, Donald Danforth Plant Science Center

Student Interest, Concerns and Information-Seeking Behaviors Related to Covid-19 (Virtual)
Jamie Elsner, University of North Carolina at Chapel Hill
Troy D Sadler, University of North Carolina at Chapel Hill
Laura Zangori, University Of Missouri
Patricia J. Friedrichsen, University Of Missouri–Columbia
Li Ke, University of North Carolina at Chapel Hill

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Designing and enacting pedagogy for secondary classrooms
8:00 AM-9:30 AM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

Effects of pedagogical interruptions on secondary student interest, engagement, and comprehension of narrative science videos.
Matthew Kloser, University Of Notre Dame
Michael Szopiak, University of Notre Dame
Catherine Wagner, University of Notre Dame

Exploration of Teacher Discursive Claims Enacting Social Justice Pedagogy in 7th grade Science (Virtual)
Fredrica Nash, The George Washington University

The agile educator: investigating science teachers' pedagogical capacity to design subject-specific up-to-date citizenship lessons
Ineke Henze-Rietveld, Delft University of Technology & Radboud University
Erik Barendsen, Radboud University & Open University
Dury Bayram Jacobs, Eindhoven University of Technology

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Collaboration to Promote Learning
8:00 AM-9:30 AM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Analyzing an Interdisciplinary Education and Science/Engineering Team's Interactions Using Activity Theory (Virtual)
Katherine McCance, North Carolina State University
Stephanie Teeter, NC State University
Margaret R. Blanchard, NC State University
Richard Venditti, NC State University

Engineering Design in Introductory Physics: Undergraduate Students' and Graduate Teaching Assistants' Perceptions (virtual)
Amir Bralin, Purdue University
Thomas Chapman, Purdue University
Jason Morphew, Purdue University
Carina M. Rebello, Purdue University
N Sanjay Rebello, Purdue University

Molecular orbital theory in entry-level university chemistry – A computer-supported collaborative intervention
David J Hauck, TU Dortmund University
Insa Melle, TU Dortmund University

Understanding Scientists,' Engineers,' and Educators' Perceptions of Collaboration and Interdisciplinarity: National Survey Validation and Results (Virtual)
Katherine R McCance, North Carolina State University
Margaret R. Blanchard, NC State University

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Problem Solving and Critical Thinking
8:00 AM-9:30 AM, Parq Salon D (**livestream** 1)

Presider: https://tinyurl.com/NARSTpresider

Heartbreak for Underachievement: Perspectives of CTCA on Students' Achievement and Critical Thinking in Computer Studies (Virtual)
Olasunkanmi Adio Gbeleyi, ACEITSE- Lagos State University
Peter A. Okebukola, ACEITSE- Lagos State University
Ibukunolu Adebiyi Ademola, ACEITSE-Lagos State University
Franklin U. Onowugbeda, ACEITSE- Lagos State University
Fred Awaah, University of Professional Studies Accra
Esther Oluwafunmilayo Peter, ACEITSE- Lagos State University
Deborah Oluwatosin Agbanimu, ACEITSE-Lagos State University
Adekunle Ibrahim Oladejo, ACEITSE-Lagos State University
Ashimi B. Ganiyyu, Lagos State University
Hussein T. Abdulazeez, Lagos State University

Investigating the effect of context-based teaching on students' science engagement and perceptions of utility value (Virtual)
Ya-Chun Chen, Institute of Education, National Yang Ming Chiao Tung University

Perspectives on generalizability in problem-solving from undergraduate physics students: Influences of a mastery homework approach
Kevin Hall, University of Illinois at Urbana-Champaign
Stina Krist, University of Illinois at Urbana-Champaign
Eric Kuo, University of Illinois at Urbana-Champaign
Joshua Rosenberg, University of Tennessee

Strategies undergraduate students use to solve a volumetric analysis problem before and after instruction. (Virtual)
Ted M. Clark, The Ohio State University
Nicole Dickson-Karn, The Ohio State University

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Innovation and enhancement of science practices
8:00 AM-9:30 AM, Granville I

Presider https://tinyurl.com/NARSTpresider

Investigating Preservice Secondary STEM teachers' Reflective Practice in a Microteaching Context (Virtual)
Deepika Menon, University of Nebraska-Lincoln
Rosetta Ngugi, Kennesaw State University

Preservice Science Teachers' Descriptions of Simulation-enhanced Inquiry-based Lesson for Asynchronous Learning Environments (virtual)
Ilgim Ozergun, Bogazici University
Sevil Akaygun, Bogazici University

Science and Engineering Practices and Cognitive Demand Present in Preservice Teachers' Planning and Instruction
Donna Governor, University of North Georgia
April Nelms, University of North Georgia

Virtual Rehearsal Simulations as Authentic Practice Spaces for Developing Scientific Discourse Skills
Tammy D. Lee, East Carolina University
Carrie Lee, East Carolina University
Mark H. Newton, East Carolina University
Jennifer Gallagher, East Carolina University
Paul Vos , East Carolina University
Daniel L. Dickerson, East Carolina University
Bonnie B. Glass, East Carolina University

Strand 8: In-service Science Teacher Education
Symposium-The Role of Emotions in Science Teacher Education and Professional Development
8:00 AM-9:30 AM, Parq Salon F (**livestream** 3)

Discussant: Maria Varelas, University Of Illinois At Chicago

Presider: https://tinyurl.com/NARSTpresider
Panelists
Arnau Amat, University Of Vic
Alberto Bellocchi, Queensland University of Technology
Shannon G. Davidson, Florida State University
Vesal Dini, Tufts University
Lama Jaber, Florida State University
Laura Martin Ferrer, University Of Vic
Rotem Trachtenberg-Maslaton, Ben Gurion University of the Negev
Karin Tsarfati-Shaulov, Ben Gurion University of the Negev
Dana Vedder-Weiss, Ben-Gurion University Of the Negev, Israel
Maria Varelas, University Of Illinois At Chicago

Strand 8: In-service Science Teacher Education
Symposium-The Handbook of Research in Science Teacher Education: Current and Future Directions for Research
8:00 AM-9:30 AM, Granville II

Presider: https://tinyurl.com/NARSTpresider

Panelists
Julie A. Luft, University of Georgia
Gail Jones, North Carolina State University
Sarah J. Carrier, North Carolina State University
David F. Jackson, University Of Georgia
Lauren Madden, The College of New Jersey
Soonhye Park, North Carolina State University
Rachel Mamlok-Naaman, The Weizmann Institute of Science
Jose M. Pavez, University of Georgia

Strand 10: Curriculum and Assessment
Related Paper Set-Research and Practice Perspectives on Developing and Implementing a Three-Dimensional District Biology Assessment
8:00 AM-9:30 AM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

A District Perspective on Developing a Three-Dimensional Science Assessment
Sylvia Scoggin, Washoe County School District
Rebecca Curtright, Washoe County School District
Elizabeth X. De Los Santos, University of Nevada, Reno
Candice R. Guy-Gaytán, BSCS Science Learning

A District Perspective on the Use of Science Assessment Data
Rebecca Curtright, Washoe County School District
Sylvia Scoggin, Washoe County School District
Elizabeth X. De Los Santos, University of Nevada, Reno
Candice R. Guy-Gaytán, BSCS Science Learning

Investigating Teachers' Professional Learning Experiences on an Assessment Development Team
Elizabeth X. De Los Santos, University of Nevada, Reno

Candice R. Guy-Gaytán, BSCS Science Learning
Suzanne Lewis, University of Nevada, Reno

Investigating Students' Reasoning on a Practices-based Exam (Virtual)
Candice R. Guy-Gaytán, BSCS Science Learning
Suzanne Lewis, University of Nevada, Reno

Elizabeth X. De Los Santos, University of Nevada, Reno

Strand 11: Cultural, Social, and Gender Issues
Symposium-Indigenizing the Processes of Science and Engineering: Increasing Inclusivity with Implementation of the SEP's
8:00 AM-9:30 AM, Parq Salon E (**livestream** 2)

Discussant: Pauline Chinn, University of Hawaii at Manoa

Presider: https://tinyurl.com/NARSTpresider

Panelists
Julie Robinson, University of North Dakota
Frank Bowman, University of North Dakota
Bethany Klemetsrud, University of North Dakota
Bhaskar Upadhyay, University of Minnesota
Rebekah Hammack, Montana State University
Paichi Shein, National Sun Yat-sen University
Peresang Sukinarhimi, National Sun Yat-sen University
Tzu-yu Kuo**,** Institute of Education, National Sun Yat-sen University
Nick Lux, Montana State University
Paul Gannon, Montana State University

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Considering Gender in Higher Education
8:00 AM-9:30 AM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

Durability of Systemic Gendering of STEM in College STEM Students' Definitions of a STEM Person (Virtual)
Heidi Cian, Florida International University
Remy Dou, Florida International University

Influence of Active Goals on Attitudes, Intentions, and Academic Behaviors of STEM Women in an Undergraduate Peer Mentoring Program
Jennifer A. Gatz, Stony Brook University
Angela M. Kelly, Stony Brook University
Monica Bugallo, Stony Brook University

Gender Dynamics During Discourses in SCALE-UP Format of Physics Course: An Exploratory Single Case Study
Mark O Akubo, Florida State University and Cornell University
Sherry A. Southerland, Florida State University

Strand 13: History, Philosophy, Sociology, and Nature of Science
Admin Symposium-The Unnatural Nature of Science without Norm Lederman: Honoring the Legacy of Dr. Norman Lederman
8:00 AM-9:30 AM, Burrard

Presider: https://tinyurl.com/NARSTpresider

Panelists
Valarie L. Akerson, Indiana University
Judith S Lederman, Illinois Institute of Technology
Dana L Zeidler, University of South Florida
Renée Schwartz, Georgia State University
Fouad Abd-El-Khalick, University Of North Carolina At Chapel Hill

Strand 14: Environmental Education and Sustainability
SC-organized paper set-Lenses on environmental science educators
8:00 AM-9:30 AM, Stanley

Presider: https://tinyurl.com/NARSTpresider

Assessing Elementary Preservice Teachers' Knowledge, Awareness, Attitude, and Beliefs Toward Environmental Education
Mamta Singh,

*Investigating the Knowledge Bases Science Teachers Use When Considering a Socioscientific Issue (*presenting author)*
Lucas Menke, Drake University
*Jerrid Kruse, Drake University
Kinsey Zacharski, Drake University
Sarah Voss, Drake University

Ohio Secondary Science Teachers' Climate Change Instruction (virtual)
Lisa A. Borgerding, Kent State University
Jennifer Heisler, Kent State University
Breanna Beaver, Kent State University

Understanding How an Environmental Educator Identifies & Thinks about Environmental Issues (Virtual)
Hamza Malik,
Stephen B. Witzig, University Of Massachusetts Dartmouth

Elections Committee
Admin Symposium- Leaders Wanted: Envisioning Pathways to NARST Leadership
8:00 AM-9:30 AM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

Facilitators
Bridget K. Mulvey, Kent State University
Melody Russell, Auburn University
Mary M. Atwater, University of Georgia
Nazan U. Bautista, Miami University
Jeanne R. Wieselmann, Southern Methodist University

Panelists
Mei-Hung Chiu, National Taiwan Normal University
Malcolm Butler, University of North Carolina at Charlotte
Scott McDonald, Pennsylvania State University
Eileen Parsons, University of North Carolina at Chapel Hill

Administrative Session: Research Committee
Admin Symposium-Sandra K. Abell Institute for Doctoral Students 2021 Poster Symposium
8:00 AM – 9:30 AM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Organizer*s*
Asli Sezen-Barrie, University of Maine
Rouhollah Aghasaleh, Humboldt State University
Sara Tolbert, Te Whare Wananga O Waitaha University of Canterbury
Kathryn Scantlebury, University of Delaware

Phronetic Science: Reflections on the First Virtual SKAIDS in a Social-natural Crisis
Rouhollah Aghasaleh, Humboldt State University
Sara Tolbert, University of Canterbury, New Zealand
Kathryn Scantlebury, University of Delaware, USA

Addressing the diversity issues in Science & Engineering in Ph.D. Programs
Lisa Hanson, Middle Tennessee State University

Be like water: The role of science in social movements towards justice and multi species solidarity
Jenny Tilsen, University of Minnesota

Redefining productive struggle through an asset-based perspective
Clarissa Keen, University of Massachusetts Boston

Design principles for implementing Lesson Study: A professional development model for graduate teaching assistants

Nicole Suarez, University of California San Diego and San Diego State University

Questioning the Core Ideas: Approaching NGSS using a Lens of Ecofeminism
Suzanne Poole Patzelt, Montclair State University

Care and Harm in California Science Teacher Preparation Curriculum
Caroline Spurgin, University of California Santa Cruz

Elements of Humanizing Pedagogy in K-8 Science Teacher Preparation (Virtual)
Dan Moreno, University of Arizona

Learning How to Build Knowledge in Science Through Multimodality Embedded in Modeling
Ayca Fackler, University of Georgia

Historicizing Contemporary Access & Equity Discourses in P-12 Engineering Education Curricular Materials (Virtual)
Natalie De Lucca, Vanderbilt University

"Kinda awful.I spent a lot of time crying": Attending to the Emotions of PSTs of Color
Victor Kásper, Florida State University

Pathways of Indigenous Science in Environmental Conservation of Thai Urban society
Waralee Sinthuwa, Faculty of Education, Kasetsart University

Asset-Based Supplemental Chemistry
Klaudja Caushi, University of Massachusetts Boston

The Tensions of Bridging the Culture of Home and School Science through Ethnic Education in an Indigenous Community in Taiwan
Mu-Yin Lin, The University of Georgia

(Re)defining Teacher Perceptions of Student Science Success to Promote Unity and Inclusion in Science Education
Takeshia Pierre, University of Florida

A portrait of Postsecondary STEM Teaching: mixed-method study examining the influence of identity and context
Sule Aksoy, Syracuse University

Multimodal revoicing: Embodied student resources to support students' explanations of science phenomena
Samuel Lee, Boston College

Equity Audit: Why Aren't the Black Students Showing Up?
Dionne Wilson, Florida State University

Monday, March 28, 2022
Coffee and Committee Meetings
9:30 am-10:45 am

Get a nice beverage and attend a committee meeting. One of the best ways to get involved with NARST and ensure your voice is heard is to volunteer for committee service. These committee meetings will review the activities of the prior year and look forward to what's to come. A call for committee volunteers will go out to the membership shortly after the conference. Which one interests you most?

Committee	**Room**
Awards	Kitsilano D
Elections	Parq Salon B
Equity and Ethics	Parq Salon C
External Policy and Relations	Kitsilano Ballroom A
Graduate Students	Kitsilano Ballroom B
International	Kitsilano Ballroom C
Membership	Parq Salon D
Program [strand coordinators]	Parq Salon A
Research	Stanley
Social media, Website, Communications	Cambie

Monday, March 28, 2022
Concurrent Session # 4
11:00 am-12:30 pm

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Science Teaching & Learning at the College Level
11:00 AM-12:30 PM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

Undergraduate STEM Majors' Association of K-12 Experiences with their STEM Identities (Virtual)
Remy Dou, Florida International University
Heidi Cian, Florida International University

Group Dynamics: Examining Group Member Roles in Small Group Data-Based Argumentation Tasks in the context of a Large-Lecture Course
Andy Cavagnetto, Washington State University
Nyck Ledezma, Cal Poly Pomona
Archer Harrold, University of Nebraska
Anna Ferroggiaro, Washington State University
Brandon Call, Washington State University
Dana Roach, Washington State University
Lauren Duffy, Washington State University
Jessie Arneson, Washington State University
Erika Offerdahl, Washington State University
Jacob Woodbury, Washington State University

Teaching science while socially distanced: College science laboratory instructors' experiences with synchronous hybrid courses
Laura B. Schneider, St. Mary's College of Maryland; Great Mills High School

Perceiving data as inconsistent with expectations - an important factor for sense-making of experimental results (Virtual)
Burkhard Priemer, Humboldt Universität zu Berlin
Sophia Chroszczinsky, Humboldt Universität zu Berlin
Amy M Masnick, Hofstra University

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Related Paper Set-Supporting Anti-Deficit Noticing and Equitable Science Teaching and Learning
11:00 AM-12:30 PM, Parq Salon D (**livestream** 1)

Presider: https://tinyurl.com/NARSTpresider

Rearticulating Deficit Language Ideologies with Researchers and Teachers in Elementary Science Professional Development (Virtual)
Ashlyn Pierson, The Ohio State University
Bethany Daniel, Vanderbilt University
Sarah Jaewon Lee, Vanderbilt University
Andrea Wentworth Henrie, Vanderbilt University
Heather J. Johnson, Vanderbilt University
Danielle T. Keifert, University of North Texas
Noel Enyedy, Vanderbilt University

Secondary Pre-service Teachers Becomings: Fostering Anti-deficit Noticing Through Attending To Students' Sense-making Repertoires
David P. Steele, Alder Graduate School of Education
Sophia Jeong, The Ohio State University
Natasha Hillsman Johnson, University of Toledo

Use of Science and Engineering Practices to Create Equitable STEM Learning: Implication For Teachers' Anti-deficit Noticing
Meenakshi Sharma, sharma_m@mercer.edu

Community-based Research as Pedagogy for Strength-based Teacher Education
Adam Bell, University of Washington
Jeff Chandler, University of Washington
Gracie Merrett, University of Washington

Conditions Expanding Opportunities for Pre-service Teachers to Learn in Field Placements
Karin Lohwasser, University of California, Santa Barbara
Caroline Hadley Long, University of Washington
Soo-Yean Shim, University of Illinois
Mark Windschitl, University Of Washington
Tammy Q. Tasker, Western Washington University

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Symposium-International Collaborative Investigation of Third Grade Students' Understandings of Scientific Inquiry
11:00 AM-12:30 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Panelists
Judith S. Lederman, Illinois Institute Of Technology
Selina L. Bartels, Valparaiso University
Juan P. Jimenez, Illinois Institute of Technology

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Student motivation and creativity in secondary science
11:00 AM-12:30 PM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

A new way to promote creative thinking skills of students: Innovative science learning environments
Ferah Ozer, Bogazici University
Nihal Dogan, Bolu Abant Izzet Baysal University

Adolescents' Motivation and Self-Efficacy in Science Face-to-Face Learning Environments vs. in Distance Learning
Shira Passentin, Weizmann Institute of Science
David L. Fortus, Weizmann Institute Of Science

Variations in the Co-occurrence of Epistemic Agency and Collective Enterprise
Jessica L. Alzen, University of Colorado Boulder
Kelsey D. Edwards, Northwestern University
William R. Penuel, University of Colorado
Brian J. Reiser, Northwestern University
Cynthia Passmore, University of California-Davis
Chris D. Griesemer, University of California Davis
Aliza Zivic, Northwestern University
Christina M Murzynski, Northwestern University
Jason Buell, Northwestern University

Strand 6: Science Learning in Informal Contexts
SC-organized paper set-Evaluating informal learning interventions
11:00 AM-12:30 PM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

Building Capacity for Collective Evaluation across ISE Centers: A Tested Model for a Collaborative Approach
K. C. Busch, North Carolina State University
Lynn Chesnut, North Carolina State University
Regina Ayala Chavez, North Carolina State University
Kathryn T. Stevenson, North Carolina State University
Lincoln Larson, North Carolina State University
Charles Yelton, North Carolina Museum of Natural Science

Examining Practices and Attitudes about the NSF's Broader Impacts Criterion: A Systematic Literature Review
Stephanie Teeter, NC State University

Spatial Drawing Ability: Informal Learning Experiences
Kimberly Ann Currens, Texas A&M University
Sandra B. Nite, Texas A&M University
Ali Bicer, University of Wyoming
Jihu Lee, Allen Academy
Lila Moseley, Texas State University
Rachael Jones, Texas A&M University

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Connecting science and society in teacher education
11:00 AM-12:30 PM, Cambie

Presider: https://tinyurl.com/NARSTpresider

ENACT Project: Promoting Pre-service Science Teachers' Perceptions on Social Responsibility of Scientists and Engineers (Virtual)
Yeonjoo Ko, Ewha Womans University
Hyunju Lee, Ewha Womans University
Jiyeon Hong, Ewha Womans University

Establishing a Community of Practice to Support Elementary Preservice Teachers' Socioscientific Issues-Focused Instruction
Melanie Kinskey, Sam Houston State University
Dana L. Zeidler, University Of South Florida

Exploring connections between anxiety and science understanding around Covid-19
Tina Vo, University of Nevada- Las Vegas
Margarita Huerta, University of Nevada- Las Vegas
Heather Dahl, University of Nevada- Las Vegas
Kenneth Varner, University of Nevada- Las Vegas

Preservice science teachers' competences in evidence-based practice – A longitudinal case study
Pascal Pollmeier, Paderborn University
Sabine Fechner, Paderborn University

Strand 8: In-service Science Teacher Education
SC-organized paper set-Tools and Techniques to Understand and Support Teacher Learning
11:00 AM-12:30 PM, Stanley

Presider: https://tinyurl.com/NARSTpresider

It's the work that it does, not the object itself: Scientific posters as boundary objects
Shannon G. Davidson, Florida State University
Sherry A. Southerland, Florida State University
Lama Jaber, Florida State University

The types of feedback used by teacher educators in engineering design workshops and their effectiveness
Minyoung Gil, Pennsylvania State University
Matthew Johnson, Pennsylvania State University

Tools for Observing Productive Talk: A Comparison of Two Protocols (RTOP/IQA-SOR)
Patrick J. Enderle, Georgia State University
Claudia Hagan, Georgia State University
Sierra Lynn Morandi, Florida State University
Ryan Coker, Florida State University
Victor Kasper, Florida State University
Danielle M. Vande Zande, Florida State University
Jennifer Schellinger, FSU
Sherry A. Southerland, Florida State University

Using Argumentative Tasks to Promote Out of Field Physics Teachers' Professional Development
David Perl Nussbaum, Weizmann Institute of Science
Edit M. Yerushalmi, Weizmann Institute of Science

Strand 8: In-service Science Teacher Education
SC-organized paper set-The Role of Collaboration in Teacher Learning
11:00 AM-12:30 PM, Granville II

Presider: https://tinyurl.com/NARSTpresider

A Design-Based Research Methodology Utilizing Conjecture Mapping to Frame Embedded Co-design Cycles
Amanda N. Peel, Northwestern University
Jacob Kelter, Northwestern University
Lexie Zhao, Northwestern University
Michael Horn, Northwestern University
Uri Wilensky, Northwestern University

Experienced Teachers' Thinking about NGSS Classroom Assessment: Resources, Coherences with Instruction, and Shifts through Co-Design
Jennifer Richards, Northwestern University
Olivia D. Masse, Northwestern University
Kevin Cherbow, Florida State University
Miray Tekkumru Kisa, Florida State University

Investigating the Effectiveness of an Innovative Professional Development Program for Inquiry-based Secondary Science Education
Arne Bewersdorff, Technical University of Munich
Armin Baur, Heidelberg University of Education
Markus Emden, Zurich University of Teacher Education

Multimodal Analysis of Science Teachers' Facework During Collaborative Video-Based Learning (Virtual)
Adi Mendler, Ben-Gurion University of the Negev, Israel
Dana Vedder-Weiss, Ben-Gurion University Of the Negev, Israel

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Strand 8: In-service Science Teacher Education
Related Paper Set-Centering Place-Based Education for Teaching Science Outdoors in Urban Contexts
11:00 AM-12:30 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

Understanding Informal Science Educator Identity as Critical Leverage for Science Teaching & Learning Partnerships (Virtual)
Gail Richmond, Michigan State University
Roberta Hunter, Michigan State University
Eleanor Kenimer, Michigan State University

Cultural Historical Activity Theory (CHAT) as a lens for understanding challenges of developing successful formal/informal science education partnerships (Virtual)
Eleanor Kenimer, Michigan State University
Gail Richmond, Michigan State University

The power of virtual platforms to support teacher learning and community development for urban outdoor science teaching (Virtual)
Roberta Hunter, Michigan State University
Irene S. Bayer, Michigan State University
Gail Richmond, Michigan State University

The role of professional learning in the development of questioning (Virtual)
Kara Haas, Michigan State University
Tali Tal, Technion
Gail Richmond, Michigan State University

The role of context in supporting responsive place-based urban science teaching
Tali Tal, Technion
Gail Richmond, Michigan State University
Roberta Hunter, Rutgers University

Strand 10: Curriculum and Assessment
Related Paper Set-Teaching and Learning about COVID-19 in the Midst of the Pandemic
11:00 AM-12:30 PM, Parq Salon E (**livestream** 2)

Justice-Centered STEM Education to Address Pressing Societal Challenges Using the Case of the COVID-19 Pandemic (Virtual)
Okhee Lee, New York University
Todd Campbell, University of Connecticut

Teacher Learning Through Collaborative Curriculum Design During the COVID-19 Pandemic
Troy D Sadler, University of North Carolina at Chapel Hill
Li Ke, University of North Carolina at Chapel Hill
Patricia J. Friedrichsen, University Of Missouri–Columbia
Rebecca Rawson,
Laura Zangori, University Of Missouri

COVID Connects Us: Tensions and Celebrations
Yang Zhang, University of Rochester
April Lynn Luehmann, University Of Rochester

Teaching Science During the COVID-19 Pandemic: A National Study of Teacher of Decision Making
Peggy J. Trygstad, Horizon Research, Inc.
Sean Smith, Horizon Research, Inc.

Understanding Minoritized Youth Learning through Social Networks during the COVID-19 Multi-pandemic (Virtual)
Angela Calabrese-Barton, University of Michigan
Francisco Parra, University of Michigan
Frankie Calabrese Barton, Youth Action Council
Grace Rose, Youth Action Council
Devon Riter, University of Michigan
Day W. Greenberg, University of Michigan

Strand 11: Cultural, Social, and Gender Issues
Symposium-Multiplying Perspectives on Racial Equity in STEM Education: Insights from Canada, Netherlands, and the USA.
11:00 AM-12:30 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Panelists
Sarah Halwany, University of Calgary
Jennifer Adams, University Of Calgary
Terrell R. Morton, University of Missouri - Columbia
Tia C. Madkins, The University of Texas At Austin
Claire Paton, University of Calgary
Nadia Qureshi, University of Toronto
Theila Smith, University of Groningen
Shari Watkins, American University
Kevin Hewitt, Dalhousie University
Maydianne Andrade, University of Toronto
Juliet Daniel, McMaster University
Carl James, York University
ReAnna Roby, Vanderbilt University
Whitney McCoy, Duke University
Kristal Turner, University of Calgary

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Critical Race Theory and Other Race Critical Approaches to STEM Education
11:00 AM-12:30 PM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

A Critical View of STEM Curriculum from the LatCrit Perspective
Gianna Lopez-Colson, University of Texas Rio Grande Valley
Joe De Leon, University of Texas Rio Grande Valley
Roxana Jimenez, University of Texas Rio Grande Valley

Case Studies of Science Teachers' Experiences With a State Law Banning Critical Race Theory
Katherine Wade-Jaimes, University of Nevada
Rachel D. Askew, Vanderbilt University

Re-Constructing the "Black" Box and Making it Transparent for the Future of Science and Technology in Science Education: Towards Equitable, Social Justice Criticality
Noemi Waight, University at Buffalo
Shakhnoza Kayumova, University of Massachusetts-Dartmouth
Jennifer Tripp, University at Buffalo
Feyza Achilova,

*Science Preservice Teachers' Views on Diversity and Race in the Science Classroom (*presenting author)*
Preethi Titu, Kennesaw State University
*Seema Rivera, Clarkson University

Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-organized paper set-NOS and Science Pedagogy and instruction
11:00 AM-12:30 PM, Burrard

Presider: https://tinyurl.com/NARSTpresider

Evaluation of Nature of Science Representations in Biology School Textbooks Using the Family Resemblance Approach (Virtual)
Kristina Fricke, Freie Universität Berlin
Bianca Reinisch, Freie Universität Berlin

Exploring the Articulation of Nature of Science Ideas in Turkish Middle School Science Textbooks
Beyza Okan, Bogazici University
Ebru Kaya, Bogazici University

Impacts of Professional Science Experience on Induction Science Teachers' NOS understandings, Pedagogy, and Science Identities
Emily Little, Georgia State University
Robert D. Bennett, Georgia State University
Renée Schwartz, Georgia State University

Proposed Teacher Competencies to Support Effective Nature of Science Instruction: A Meta-Synthesis of the Literature (Virtual)Erin
Noushin Nouri, University of Texas Rio Grande Valley
William F McComas, University Of Arkansas

Strand 14: Environmental Education and Sustainability
SC-organized paper set-Making sense of socioscientific issues
11:00 AM-12:30 PM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

Adjusting the Lens: Elementary Students Sharing and Learning about Climate Change through Photovoice
Imogen R Herrick, University of Southern California
Michael Lawson, Kansas State University
Ananya Matewos, St. Norbert College

Investigating Relationship(s) Between Epistemological Beliefs, Argument Quality and Informal Reasoning in the Context of SSI (Virtual)
Cansu Basak Uygun, Middle East Technical University
Ozgul Yilmaz-Tuzun, Middle East Technical University

Moral and ethical development through Socioscientific Holistic Perspectives (SSHP)
Eric Nolan, Northern Arizona University, Flagstaff

Pre-Service Secondary Science Teachers' Views on Teaching Socioscientific Issues
Jen-Yi Wu, National Taiwan Normal University
Ying-Shao Hsu, National Taiwan Normal University
Wen-Xin Zhang, National Taiwan Normal University

Multi-Strand-*Virtual Session D*
11:00 AM-12:30 PM, Parq Salon F (**livestream** 3)

3D Printing with Preservice Teachers: Implementation, Effects, and Future Directions (Virtual)
Shannon L. Navy, Kent State University
Elena Novak, Kent State University

Visualizing STEM in Pakistan: Insights from a Professional Development for Conceptualizing STEM (Virtual)
Tasneem Anwar, The Aga Khan University

An Investigation of Differences in Students' Interest in STEM Among NGSS and Non-NGSS Implementation (Virtual)
Brienne May, Liberty University
Jillian L. Wendt, University of the District Of Columbia
Michelle Barthlow, Liberty University

Development of Students' Systems Thinking and Problem-solving through Authentic Aerosol Science Research (Virtual)
Jeremy W Melton, National Sun Yat-sen University, Taiwan
Paichi-Pat Shein, National Sun Yat-sen University, Taiwan
Jepri A. Saiful, National Sun Yat-sen University, Taiwan

Lunch and Activity Break [on your own or with Ambassador group]
12:30 pm-2:30 pm

CADASE RIG Business Meeting
Parq Salon F
1:00 pm-2:30 pm

Monday, March 28, 2022
Concurrent Session # 5
2:45 pm-4:15 pm

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Student Experiences in Science Teaching & Learning
2:45 PM-4:15 PM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

"Do worms have urine?": Resources students draw upon in response to uncertainty in biology laboratories
Sam Skrob-Martin, Florida State University
Alicia Batailles,
Sherry A. Southerland, Florida State University

"Why aren't you listening to me?!: Community and Individual roles in students' epistemic agency in science
Jennifer Schellinger, FSU
Katarina Gomez, Florida State University
Lama Z Jaber, Florida State University
Sherry A Southerland, Florida State University

Using Making to Transform the Learning of Physics into a Personally Meaningful Experience
Tal Peer, Technion - Israel Institute of Technology
Shulamit Kapon, Technion - Israel Institute of Technology

Implementing Contextualized Science Curriculum and Instruction in Tanzania: The Practice and Possibilities
Winston E Massam, Assistant Professor - Aga Khan University (Institute for Educational Development, East Africa)

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Related Paper Set-Equity and Justice in Engineering and Science: Centering Black and Latinx culture, language and Identity
2:45 PM-4:15 PM, Parq Salon D (**livestream** 1)

Presider: Okhee Lee, New York University

Latent Class Analysis of Black Families' Access to a Community-Based STEM Program
Natalie S. King, Georgia State University
Zachary Collier, University of Delaware

Bridgette G. Johnson, University of Delaware
Melanie Acosta, Florida Atlantic University
Charisse N Southwell, Broward County Public Schools, Fort Lauderdale, Florida

Latinx Students' Sense of Familismo in Undergraduate Science and Engineering
Enrique Lopez, University of Colorado, Boulder
Vincent Basile, Colorado State University
Magnolia Landa-Posas, University of Colorado, Boulder
Kaylee Ortega , University of Colorado, Boulder
America Ramirez, University of Colorado, Boulder

Amplifying the Voices of Multicompetent students in STEM by Centering Justice and Audience Design in Engineering and Science
Greses Pérez, Tufts University
Okhee Lee, New York University

Becoming a Teacher of Engineering as a Racialized Local Contentious Practice (Virtual)
Christopher G. Wright, Drexel University
Rasheda Likely, Kennesaw State University
Mikhail Miller,
Neisha Young, Drexel University
Sinead Meehan, Drexel University

Fifth-Grade Engineering and Language, Culture, and Identity: Lessons Learned by Teacher and Researcher
Claudia Walker, Murphey Traditional Academy, Greensboro, NC
Heidi B. Carlone, Vanderbilt University

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
SC-organized paper set-Strategies for Science and Engineering Education
2:45 PM-4:15 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Elementary Teachers' Verbal Supports during an NGSS-Aligned Unit for Inclusive and General Class Contexts
Sarah C Lilly, University of Virginia
Anne M McAlister, University of Virginia
Jennifer L Chiu, University of Virginia

Elementary Science and Engineering Teaching Self-Efficacy: Trends in the Literature and a Research Framework (Virtual)
Jeanna R. Wieselmann, Southern Methodist University
Deepika Menon, University of Nebraska-Lincoln
Sarah A. Haines, Towson University
Sumreen Asim, Indiana University Southeast

Factors Associated with K-5 Science Teaching Time (Virtual)
Alison Brockhouse, Institute for School Partnership
Maia Elkana, Institute for School Partnership, Washington University in St. Louis
Rachel Ruggirello, Washington University in St. Louis

Teacher Educators and Elementary Teachers Share Goals for Authentic Science and Literacy Integration in the 20th Century Realities of 21st Century Classrooms (Virtual)
Sarah J. Carrier, North Carolina State University
Danielle R Scharen, North Carolina State University

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Academic Pathways, Persistence, and Science Identity
2:45 PM-4:15 PM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

Becoming a Scientist: Exploring How Critique Supports the Development of Undergraduate Students' Science Identity
Gabrielle Jablonski, Idaho State University
Anna S. Grinath, Idaho State University

Bridge/or Barrier? Institutional Agents Shape Sense of Belonging for First-Generation STEM Students Holding Intersecting Identities
Angela N. Google, University of South Alabama
Jeremiah Henning, University of South Alabama
Grace Sekaya, University of South Alabama
Zachery McMullen, University of South Alabama

Framework for chemistry course redesign to support first generation college student success (Virtual)
Roshni Bano, University of Illinois At Chicago
Minjung Ryu, University of Illinois At Chicago

Predictors of Community College Astronomy Performance
Zachary Richards, Suffolk County Community College and Stony Brook University
Angela M. Kelly, Stony Brook University

Strand 6: Science Learning in Informal Contexts
SC-organized paper set-Informal learning as a family activity
2:45 PM-4:15 PM, Stanley

Presider: https://tinyurl.com/NARSTpresider

Activity Design Principles that Support Family-Based Engineering Learning in Early Childhood
Scott A. Pattison, TERC
Gina N. Svarovsky, University Of Notre Dame
Smirla Ramos-Montañez, TERC
Catherine Wagner, University of Notre Dame
Amy Corbett, Metropolitan Family Service
Maria Perdomo, Metropolitan Family Service
Viviana López Burgos, Independent Consultant
Sabrina De Los Santos, TERC

Engaging children and caregivers in engineering design projects: Development of maker workshops and digital tools (Virtual)
Susan Letourneau, New York Hall of Science
David Wells, New York Hall of Science
Sonja Latimore, GBH
Mary Haggerty, GBH
Peter Ciavarella, New York Hall of Science
Lauren Vargas, New York Hall of Science
Daniel Kirk, New York Hall of Science
Lisa Ellsworth, GBH
Melissa Carlson, GBH
Louise Flannery, GBH

Intergenerational Family Learning in Conservation Science
Jonathan Simmons, University of Connecticut
Todd Campbell, University of Connecticut
David M. Moss, University of Connecticut
John Volin, University of Maine
Chester Arnold, University of Connecticut
Laura M Cisneros, University of Connecticut
Cary Chadwick, University of Connecticut
David Dickson, University of Connecticut
Nicole Freidenfelds, University of Connecticut

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-The role of noticing in learning to teach science
2:45 PM-4:15 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Elementary Preservice Teachers' Noticing of Scientific Argumentation within Two Online Practice Spaces (Virtual)
Pamela S. Lottero-Perdue, Towson University
Heidi L. Masters, University Of Wisconsin–La Crosse
Jamie N. Mikeska, Educational Testing Service (ETS)
Meredith M. Thompson, MIT
Meredith Park Rogers, Indiana University
Dionne Cross Francis, University of North Carolina at Chapel Hill

Pre-service Teachers Notice Student Thinking. Then What?
Tara Barnhart, Chapman University
Miray Tekkumuru-Kisa, Florida State University
Heather J. Johnson, Vanderbilt University

Supporting Pre-Service Teachers' Attention to All Students' Ideas Using a Learning Progression Approach (Virtual)
Alicia C. Alonzo, Michigan State University

The impacts of content area on novice teacher noticing-a preliminary analysis (Virtual)
Lu Wang, Indiana University Kokomo

Strand 8: In-service Science Teacher Education
SC-organized paper set-Variations in STEM Teachers Changes through Professional Development
2:45 PM-4:15 PM, Granville II

Presider: https://tinyurl.com/NARSTpresider

Exploring The Sources of Science Teachers' Self-Efficacy
Jessica Gale, Georgia Institute Of Technology - CEISMC
Meltem Alemdar, Georgia Institute Of Technology
Christopher Cappelli, Georgia Institute OfTechnology

Trajectories of Adoption and Abandonment After Professional Development in Project-Based Learning (Virtual)
Cesar Delgado, North Carolina State University

Kathryn Green, University of Georgia
Minnie Webster, North Carolina State University

Variable Take-up of Professional Development: How Activity Systems Influence Science Teachers' Enactment of Project-Based Learning
Tess Bernhard, University of Pennsylvania
Amy Guillotte, University of Pennsylvania
Sarah Kavanagh, University of Pennsylvania

Co-Designing to Understand Equity-Focus in Computational Thinking (CT) Integrated Science Curricula (Virtual)
Marissa A. Levy, Northwestern University
Amanda Peel, Northwestern University
Sugat Dabholkar,
Lexie Zhao, Northwestern University
Susan Juhl,
Lauren Levites,
Jacob Mills,
Sally Wu,
Michael Horn, Northwestern University
Uri Wilensky, Northwestern University

Strand 8: In-service Science Teacher Education
SC-organized paper set-Developing Teacher Leaders
2:45 PM-4:15 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

Developing and Retaining Mid-Career Science Teachers through a Teacher Leadership Program
Andrea Reeder, Middle Tennessee State University
Fatma Kaya, Middle Tennessee State University
Weiqi Zhao, University of Cincinnati
Melody J Elrod, Middle Tennessee State University
Joshua Reid, Middle Tennessee State University
Greg T Rushton, Middle Tennessee State University
Brett Criswell, West Chester University

Exploring Boundary Spanning as a Theoretical Framework to Design for Science Teacher Leader Professional Learning (Virtual)
Sara C Heredia, The University of North Carolina Greensboro
Michelle Lea Phillips, Exploratorium
Ti'Era D. Worsley, University of North Carolina at Greensboro

Hadrian Pollard, University of North Carolina at Greensboro
Sarah Stallings , University of North Carolina at Greensboro
Julie Yu, Exploratorium

Impact of Teacher Leadership Skills and Adaptability during Educational Upheaval
Christine R. Lotter, University of South Carolina
Amanda Gonczi, Michigan Technological University

Knowledge, Practices, and Attributes of International Science Coordinators and the Resources They Draw Upon: Supporting Teachers During the COVID-19 Pandemic
Harleen Singh, Medaille College
Hatice Ozen_Tasmedir, University of Georgia
Yuxi Huang, University of Georgia
Hong H Tran, University of Georgia
Julie A Luft, University of Georgia
Brooke A Whitworth, Clemson University

Strand 10: Curriculum and Assessment
SC-organized paper set-Assessment for modeling and reasoning
2:45 PM-4:15 PM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

Assessing Socio-scientific Systems Thinking for the COVID-19 Pandemic (Virtual)
Eric A Kirk, University of North Carolina at Chapel Hill
Troy Sadler, University of North Carolina at Chapel Hill
Li Ke, University of North Carolina at Chapel Hill
Laura Zangori, University Of Missouri

Exploring Student Reasoning Patterns in the Context of a NGSS-Aligned Assessment Task: The Harvestmen Item (Virtual)
Dante Cisterna, Educational Testing Service
Lei Liu, Educational Testing Service
Aoife Cahill, Educational Testing Service
Devon Kinsey, Educational Testing Service
Xianyang Chen, Educational Testing Service
Yi Qi, Educational Testing Service

Investigation on effect of spatial visualization on scientific modeling in primary and secondary school students (Virtual)
Jing Lin, Beijing Normal University

Letong Zhang, Beijing Normal University
Ping-Han Cheng, National Taiwan Normal University
Chun-Yen Chang, National Taiwan Normal University

Scaffolding Support for Student Modeling in Three Dimensional Assessment Tasks
Kate Henson, University of Colorado
Jason Buell, CU Boulder

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Cultural Approaches to the Teaching and Learning of Science
2:45 PM-4:15 PM, Burrard

Presider: https://tinyurl.com/NARSTpresider

Improving the Achievement and Problem-solving Skills of Students: How Effective is CTCA in Nuclear Chemistry? (Virtual)
Ibukunolu A. Ademola, ACEITSE-Lagos State University
Peter A. Okebukola, ACEITSE-Lagos State University
Olasunkanmi A. Gbeleyi, ACEITSE-Lagos State University
Adekunle I. Oladejo, ACEITSE-Lagos State University
Franklin U. Onowugbeda, ACEITSE-Lagos State University
Deborah O. Agbanimu, ACEITSE-Lagos State University
Fred Awaah, University of Professional Studies Accra
Esther O. Peter, ACEITSE-Lagos State University
Stella I. Uhuegbu, ACEITSE-Lagos State University
Yetunde A. Mabadeje, ACEITSE-Lagos State University

Teacher Understanding of Funds of Knowledge in the High School Biology Classroom
Molly M. Staggs, University Of South Florida
Karl G. Jung, University Of South Florida
Julie C. Brown, University Of Florida

Underachievement in Difficult Concepts in Biology: Can CTCA be the Way Out?
Francisca A. Allename, ACEITSE- Lagos State University
Peter A. Okebukola, ACEITSE- Lagos State University
Deborah Oluwatosin Agbanimu, ACEITSE- Lagos State University
Franklin U. Onowugbeda, ACEITSE- Lagos State University
Esther Oluwafunmilayo Peter, ACEITSE- Lagos State University

Strand 12: Technology for Teaching, Learning, and Research
Related Paper Set-Learning Chemistry in Immersive Virtual Reality: A Spatial Analysis of Students' Collaborative Interactions
2:45 PM-4:15 PM, Parq Salon E (**livestream** 2)

Discussant: Joseph Krajcik, Michigan State University
Presider: Chin-Chung Tsai, National Taiwan Normal University

An Analytical Framework for Spatial Analysis of Students' Interactions in Immersive Virtual Reality (Virtual)
Mihye Won, Curtin University
Dewi Ungu, Curtin University
Henry Matovu, Curtin University
David F. Treagust, Curtin University
Chin-Chung Tsai, National Taiwan Normal University
Mauro Mocerino, Curtin University
Roy Tasker, Western Sydney University
Joseph S. Krajcik, Michigan State University

Students' Construction of Learning Activities to Understand the Formation of Snowflakes with Three Different Modes (Virtual)
Dewi Ungu, Curtin University
Mihye Won, Curtin University
Henry Matovu, Curtin University
David F. Treagust, Curtin University
Chin-Chung Tsai, National Taiwan Normal University
Mauro Mocerino, Curtin University
Roy Tasker, Western Sydney University

Comparative Analysis on the Impact of Scaffolding on Students' Interactions within Immersive Virtual Reality (Virtual)
David F. Treagust, Curtin University
Dewi Ungu, Curtin University
Mihye Won, Curtin University
Henry Matovu, Curtin University
Chin-Chung Tsai, National Taiwan Normal University
Mauro Mocerino,
Roy Tasker, Western Sydney University

Progression of Students' Interactions over Three Immersive Virtual Reality Learning Activities (Virtual)
Henry Matovu, Curtin University
Mihye Won, Curtin University
Dewi Ungu, Curtin University
David F. Treagust, Curtin University
Chin-Chung Tsai, National Taiwan Normal University
Mauro Mocerino, Curtin University
Roy Tasker, Western Sydney University

Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-organized paper set-NOS and Undergraduate Education
2:45 PM-4:15 PM, Parq Salon F (**livestream** 3)

Presider: Jacob Pleasants, University of Oklahoma

Comparing Undergraduates NOS Views in Traditional vs. Inquiry-Taught Science Course
Alex T. St. Louis,
Hayat Hokayam, Texas Christian University

Development and Validation of a Rubric to Qualify and Quantify Responses to the VNOS Questionnaire
Fouad Abd-El-Khalick, University of North Carolina at Chapel Hill
Ryan Summers, University of North Dakota
Jeanne Brunner, University of Massachusetts Amherst
Jeremy Belramino, University of Illinois - Urbana-Champaign
John Y. Myers, University of Illinois at Urbana-Champaign

Learning to Teach NOS: How do NOS instructional views develop during semester-long NOS course?
Jerrid W. Kruse, Drake University
Isaiah Kent-Schneider, Drake University
Sarah Voss, Drake University

University Biology Students' Sociocultural and NOS Associated Positions About Policymakers' and Scientists' COVID-19 Responses (Virtual)
Alex J Sobotka, Texas A&M University
Ben A Janney, Texas A&M University
Benjamin C Herman, Texas A&M University
Sarah V Poor, Texas A&M University
Aaron Kidd, Texas A&M University
Michael P. Clough, Texas A&M University
Asha Rao, Texas A&M University

Strand 14: Environmental Education and Sustainability
SC-organized paper set-Place, culture, and connection in environmental science education
2:45 PM-4:15 PM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Are School Gardens Culturally Relevant? Forging Connections Between High School Students and the Community
Mariam Takkouch, Western University
Isha DeCoito, Western University

Exploring Sense of Place across Generations: A Case study of a Negev Bedouin Community
Wisam Sedawi, Ben Gurion University
Orit Ben Zvi Assaraf, Ben-Gurion University Of the Negev, Israel
Amane Alatamin, Ben-Gurion University Of the Negev, Israel

Understanding Middle School Students' Connectedness with Nature
Andrea Moeller, Unversity of Vienna
Petra Bezeljak, University of Vienna
Gregor Torkar, University of Ljubljana, Slovenia

Using environmental chemistry to engage students in scientific thinking while affirming their cultural context
Jeffrey Spencer, University of Michigan at Ann Arbor
Danielle N Maxwell, University of Michigan at Ann Arbor
Kaare Sikuaq Erickson, Ikaaġun Engagement; Ukpeaġvik Inupiat Corporation
Daniel Wall, Iḷisaġvik College
Linda Nicholas-Figueroa, Ḷisaġvik College; University of Alaska - Fairbanks
Kerri Pratt, University of Michigan at Ann Arbor
Ginger Shultz, University of Michigan at Ann Arbor

Administrative Session: CADASE RIG
Admin Symposium- Unifying Our Community through Science Education
2:45 PM-4:15 PM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Organizers
Mary M. Atwater, University Of Georgia
Rona Robinson-Hill, Ball State University
Jonathan Hall, University of West Florida

The CADASE RIG Administrative Session is a 90 minute session that is divided into two parts. The first part includes a Plenary Presentation of 45 minutes in which Professor Bryan Brown from Stanford University will speak on the topic, "Needing Twice As Good: Culture Matter in Providing Access to Quality Science Education". The second 45 minutes is the CADASE Poster Presentation hosted by Professor Melody Russell with poster presentations.

Monday, March 28, 2022

NARST Annual Membership meeting and Community Conversations [livestream]

Parq Salon E
4:30 pm-5:30

We have been through a challenging time. Come hear an update on the current state of NARST. You will hear from the NARST leadership, including a brief overview of the budget and new initiatives. There will be open discussion with members of the Board of Directors and Executive Committee. We want to hear your voice!

Drinks and snacks provided!

Monday, March 28, 2022
Workshop

Parq Salon D [virtual]
5:00 pm-9:00 pm

5:00pm-9:00 pm Pacific **Queering science teacher education and research: Toward gender, sex, and sexuality inclusive science teaching practice.** Lead Organizer: Stephanie Eldridge Presenters: Sonya Martin Sophia Jeong David Steele Jose Manuel Pavez	**ONLINE** As science teacher educators and researchers, we have a responsibility to consistently engage in conversations with pre- and in-service teachers about equity, be prepared to learn and share new language, and reflect on our own implicit biases as we prompt teachers to do the same. With the recent societal increase in conversations around the needs of gender and sexually diverse students comes a greater opportunity to support LGBTQ+ students in all contexts including the science classroom. This workshop focuses on gender-inclusive practices and seeks to be informational, instructional, and transformative. Topics range from supporting LGBTQ+ college students who wish to become teachers to preparing K-12 science teachers to create gender, sex, and sexuality affirming classrooms. Participants can expect to develop an inclusive vocabulary and an understanding of gender-affirming terms, share practical pedagogical tips, and gain some resources to support teacher education on LGBTQ+ inclusivity. The ultimate goal is for science educators to build more complete views of both science and society by developing the tools that address the diversity and fluidity of sex, gender, and sexuality in both human and non-human species. These approaches help support a more full sense of belonging for gender-diverse students in science education and are an important learning focus for all members of society.

Graduate Student Forum
Virtual
5:45 pm-6:45 pm

Admin Symposium-Graduate Student Forum
5:45 PM-6:45 PM, Virtual

Link:

Panelists
Theila Smith, University of Groningen
Inés Mosquera Bargiela, Universidade de Santiago de Compostela
Emily Little, Georgia State University
Samantha Ringl, Alice Lloyd College
Ti'Era D. Worsley, University of North Carolina at Greensboro
Johan Tabora, University of Illinois at Chicago

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

JRST Editorial Team Meeting/Dinner (Sponsored by Wiley)
6:30 pm-8:30 pm Cancelled

Sandra K Abell Institute Students' Reception (By Invitation Only)
7:00 pm-8:00 pm

TUESDAY, MARCH 29, 2022

Virtual Poster Session
7:00 am – 7:30 am
Use this time to have live discussions with presenters of the virtual posters on PlayBackNow.

COFFEE/TEA AVAILBLE [Prefunction]
7:30 – 9:00 AM

International Committee invited ESERA Symposium
Socioscientific Argumentation in Science Education
7:30 AM-8:45 AM, Parq Salon F (livestream 3)

Panelists (Virtual)
Ute Harms, Leibniz Institute for Science and Mathematics Education (IPN)
Carola Garrecht, IPN - Leibniz Institute for Science and Mathematics Education
Maria Evagorou, University of Nicosia, Nicosia, Cyprus
Nina Christenson, Karlstad University
Susanne Walan, Department of Environmental and Life Sciences, Karlstad University, Karlstad, Sweden
Pablo Brocos, University of Santiago de Compostela
Maria Pilar Jiménez-Aleixandre, Department of Applied Didactics, Universidade de Santiago de Compostela, Santiago de Compostela, Spain
Hanno Michel, IPN Kiel
Dirk S. Gellermann, Leibniz Institute for Science and Mathematics Education (IPN)
Ute Harms, Leibniz Institute for Science and Mathematics Education (IPN)

CADASE RIG Social
Parq Salon E (virtual)
7:45 am-8:45 am

Peter A. Okebuka will lead the CADASE Social Event. It will center on (a) African dress and on the science in the way the dress is worn or in the way the fabric is made, (b) some African stories and how Africans got their science, and finally (c) African dance as physical movement and social enjoyment. All attendees are encouraged to wear African garments if they own some.

Roundtable Sessions [hybrid]
8:00 am-8:50 am

There are 11 Roundtable sessions, each with 3-4 papers grouped for in-depth discussion. Each Table group is scheduled in a separate room. Not all the rooms will have a physical table. The presenters may arrange the room as they wish for the session, but please put the room back as it was originally arranged. Each room has a dedicated zoom link for virtual presenters to participate. These sessions are not recorded. These sessions are not livestreamed to the full virtual audience.

TABLE 1: Kitsilano Ballroom A

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Roundtables-Strand 2 Round Table: Argumentation in Science Teaching & Learning I

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

Categorizing Classroom-based Argumentation in Elementary STEM Lessons: Applying Walton's Dialogue Theory
Anna Gillespie-Schneider, UGA
Lorraine Franco, University of Georgia
Barbara A. Crawford, University Of Georgia
Yuling Zhuang, University of Georgia
Jonathan Foster, University of Georgia
AnnaMarie Conner, University of Georgia

Challenge in Reasoning about Evolution Acceptance for Muslim Students: The Mechanism of Motivated Reasoning
Rahmi Q. Aini, Kangwon National University
Minsu Ha, Kangwon National University

Examining Science Engagement: Epistemic Operations and Agentic Practices During Argumentation (Virtual)
Vivian A Zohery, University of Maryland - College Park
Ananya Matewos, Saint Norbert College
Lauren Cabrera, Virginia Commonwealth University
Doug Lombardi, University of Maryland, College Park

TABLE 2: Kitsilano Ballroom B

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Roundtables-Strand 2 Roundtable: Argumentation in Science Teaching & Learning II

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

Describing changes in Student thinking about evolution in response to inquiry and argumentation-based instruction
Hernan Cofre, Pontificia Universidad Católica de Valparaíso
Francisca Carmona, Pontificia Universidad Católica de Valparaíso
Diego Canales, Pontificia Universidad Católica de Valparaíso
Paola Nuñez, Pontificia Universidad Católica de Valparaíso
Antonia Larrain, Alberto Hurtado University
Claudia Vergara, Alberto Hurtado University

Examining Relevant Evidence Construction as Actor-Network in the Collective Argumentation (Virtual)
Weiwei He, East China Normal University
Sihan Xiao, East China Normal University

Massive Dependence of Science students' answers about Relativity upon the Formulation of the question
Estelle Blanquet, University of Bordeaux
Eric Picholle, CNRS & Université Côte d'Azur

TABLE 3: Kitsilano Ballroom C

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Roundtables-Strand 2 Round Table: Mediating Learning Processes in Science Teaching & Learning

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

The Authoritative-to-Dialogic Spectrum of Facilitation Practices
Carina M Carlos, Tufts University
Vesal Dini, Tufts University
Ira Caspari, Tufts University

The impact of typography in learning materials of science textbook (Virtual)
Rosalie Heinen, University of Münster
Susanne M. Heinicke, University of Münster

Using Student-created Core Idea Maps to Promote Meaningful Learning in Science
Helen Semilarski, Doctoral student
Regina Soobard, Research Fellow of Science Education
Miia Rannikmae, Professor

TABLE 4: Parq Salon A

MIXED STRANDS 1, 3 *Elementary Science*

8:00 AM-8:50 AM
Presider: https://tinyurl.com/NARSTpresider

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

Revisiting elementary school students' images of scientists
Jing Lin, Beijing Normal University
Wenting Wei, Beijing Normal University
Ting Yuan, Beijing Normal University

The Impact of Arts-based Science Instruction on Emerging Multilingual Students' Achievement in Elementary Science
Sage Andersen, University of Texas At Austin
Brad Hughes, University Of California, Irvine

Strand 1: Science Learning: Development of student understanding

Planning in Science-Integrated Engineering: Kindergartners' Incorporation of Ideas about Inertia in their Design Plans
Pamela S. Lottero-Perdue, Towson University
John Settlage, UConn

TABLE 5: Parq Salon B

Strand 7: Pre-service Science Teacher Education
Roundtables-Strand 7 Roundtable

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

Computational Thinking Integration in STEM Pedagogy by Teacher Candidates (Virtual)
Heather F. Clark, UCLA
Imelda L. Nava, UCLA
Leticia Perez, UCLA
Jaleel Howard, UCLA

Investigating Pre-Service Teachers' Noticing of the Cultural Foundations of Children's Scientific Explanations
Alison Mercier, University of Wyoming
Tierney Hinman, Auburn University

Preparing and Retaining Race-Conscious Science Teachers Through Race, Culture, & Coffee
Stefanie L. Marshall, University of Minnesota- Twin Cities
Jenny Sarah Tilsen, University of Minnesota- Twin Cities
Jessica Forrester, University of Minnesota- Twin Cities

What Does an Undergraduate Research Experience Look Like in STEM Education?
Jennifer A. Wilhelm, University of Kentucky
Molly Fisher, University of Kentucky

TABLE 6: Parq Salon C

Strand 14: Environmental Education and Sustainability
Rounds-Strand 14 Roundtable

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

Empirical research on school garden-based learning: A systematic review of the literature
Kathy Cabe Trundle, Utah State University
Rita Hagevik, The University of North Carolina At Pembroke

Incorporation of a Utility-Value Intervention into a Place-Based, Culturally Sustaining General Education Science Course (Virtual)
Michele L. Guannel, University of the Virgin Islands
Olivia Diana, University of the Virgin Islands
Angelisa Freeman, University of the Virgin Islands

Longitudinal effects of nature experiences on middle school students' environmental attitudes, interest and knowledge
Petra Bezeljak, Austrian Educational Competence Center for Biology, University of Vienna
Anna-Lena Neurohr, Austrian Educational Competence Center for Biology, University of Vienna
Andrea Möller, Austrian Educational Competence Center for Biology, University of Vienna

Places of Learning: Case studies on selected learning environments during COVID
David B. Zandvliet, Simon Fraser University

TABLE 7: Burrard

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
Roundtables-Collaboration and science learning in middle grades

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

"What if we explore..." Using Mountain Rescue to Promote Engaged Learning and Collaboration
Denise M. Bressler, East Carolina University
Shane Tutwiler, University of Rhode Island
Amanda Siebert-Evenstone, University of Wisconsin - Madison
Len Annetta, East Carolina University
Jason A. Chen, The College of William & Mary

Developing Scientifically Literate Citizenship: Self-Efficacy Beliefs of an Interdisciplinary Community of Practice (Virtual)
Mandi Collins, University of Nevada, Reno
Elizabeth X. De Los Santos, University of Nevada, Reno
Robert J Quinn, University of Nevada, Reno

Science Teachers' Views on the Integration of Science and Language for Emergent Bilinguals in Sixth-grade Classrooms
Sissy S. Wong, University of Houston
Jie Zhang, University of Houston
Araceli Enriquez-Andrade, University of Houston
Ma Glenda Wui, Ateneo de Manila University

The Effect of Teacher Participation in Multimedia Professional Development on Science Achievement Among Middle-School Students (Virtual)
Victoria J. VanUitert, University of Virginia
Michael J. Kennedy, University of Virginia
Lindsay M. Carlisle, University of Virginia

TABLE 8: Cambie

Strand 5: College Science Teaching and Learning (Grades 13-20)
Roundtables-Becoming Scientists: Students' Scientific Practices and Sense of Belonging

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

An Interdisciplinary Approach to Develop Interest for Bioproduct Careers with Historically Underrepresented STEM Undergraduates (Virtual)
Shana L. Mcalexander, Duke University
Katherine McCance, North Carolina State University
Margaret R. Blanchard, NC State University
Richard Venditti, NC State University

Building Inclusive Excellence in Undergraduate Science Education through Faculty Learning Communities: A Study of Five Cohorts
Marcelle Siegel, University Of Missouri–Columbia
Yejun Bae,
Terrell Morton,
Courtney Ngai,
Mojtaba Khajeloo,
Swarna Mahapatra,
Ritesh Sharma,
Charles Nilon,
Johannes Schul,

College Students' Sense of Belonging in the STEM Learning Ecosystem: Classroom, Department, and University Culture (Virtual)
Yejun Bae, Carolina University
Marcelle Siegel, University Of Missouri–Columbia
Mojtaba Khajeloo, University Of Missouri
Terrell R. Morton, University of Missouri - Columbia
Charles Nilon, University of Missouri-Columbia
Johannes Schul, University of Missouri-Columbia
Hyejin Shim, University of Missouri-Columbia

Effect of Demographic Factors on the Understanding of Concepts of Evidence: A Mixed Methods Study (Virtual)
Elizabeth Vergis, St. Mary's University, Calgary
Fostering Undergraduate STEM Students' and Teachers' Systems Thinking and Modeling Skills via a Food-Related Mini-Course
Roee Peretz, Technion—Israel Institute of Technology, Haifa 3200003, Israel
Marina Tal, Technion—Israel Institute of Technology, Haifa 3200003, Israel
Effrat Akiri, Technion—Israel Institute of Technology, Haifa 3200003, Israel
Yehudit Judy Dori, Technion—Israel Institute of Technology, Haifa 3200003, Israel
Dov Dori, Technion—Israel Institute of Technology, Haifa 3200003, Israel

TABLE 9: Stanley

MIXED STRANDS 1, 6, 12: *Learning in Contexts*

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

Strand 1: Science Learning: Development of student understanding

Experiencing the Emergence of Antibiotics Resistant Bacteria: Students' Understanding of the Nature of Evolution
Bat-Shahar Dorfman, Weizmann Institute of Science
Amir Mitchell, Program in Systems Biology, University of Massachusetts Medical School, Worcester, Massachusetts, United States of America, Program in Molecular Medicine, University of Massachusetts Medical School, Worcester, Massachusetts, United States of America
Orna Dahan, Department of Molecular Genetics, Weizmann Institute of Science, Rehovot, Israel
Anat Yarden, Weizmann Institute Of Science

Strand 6: Science Learning in Informal Contexts

Decisions for Our Future: Learning through Collaborative Civic Decision-Making in a Digital Climate Simulation
Lynne Zummo, University of Utah

Strand 12: Technology for Teaching, Learning, and Research

Using a Simulated Classroom to Prepare Elementary Preservice Teachers During and After the Pandemic
Jamie N. Mikeska, Educational Testing Service (ETS)
Heather Howell, ETS
Devon Kinsey, ETS

TABLE 10: Granville I

Strand 11: Cultural, Social, and Gender Issues
Roundtables-Strand 11: Fostering Inclusion through STEM Leadership, Teaching, and Learning

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

"It's really important to me for kids to get interested in and become aware of the options that are available to them in the STEM": Culturally Responsive School Leadership
Noemi Waight, University at Buffalo
Jennifer Tripp, University at Buffalo
Lorenda Chisolm, Schenectady City School District

Community driven and relational STEM Teacher Leadership: Perceptions of Indigenous Female Teachers
Bhaskar Upadhyay, University of Minnesota
Kamal P Koirala, Tribhuban University, Gorkha Campus, Gorkha, Nepal

Generating an operational framework of gender and sexual diversity (GSD)-inclusive STEM teaching: A systematic literature review
Gary W. Wright, North Carolina State University

Impact of STEM Professionals Engaging with Students in Title One Schools
Sarah K. Guffey, University of South Alabama
Andrea C. Burrows, University Of Wyoming
Andria Schwortz, Quinsigamond Community College

TABLE 11: Granville II

Strand 11: Cultural, Social, and Gender Issues
Roundtables-Strand 11: Structural, Cultural, and Social Factors that Influence Student's STEM Identity and Engagement

8:00 AM-8:50 AM

Presider: https://tinyurl.com/NARSTpresider

Employing the Stereotype Content Model's Dimensions of Warmth and Competence to Identify and Categorize the Portrayal of Scientists in Meme-Based GIFs
Richard Velasco, University of Iowa
Yujiro Fujiwara, Texas Tech University
Lee Kenneth Jones, Asia-Pacific International School
Rebecca Hite, Texas Tech University

Examining the STEM career interest of juvenile justice youth using the Social Cognitive Career Theory (Virtual)
Ally Hunter, University of Massachusetts, Amherst
Heather Griller Clark, Arizona State University
Michael Krezmien, University of Massachusetts, Amherst
Sarup Mathur, Arizona State University
Craig Wells, University of Massachusetts, Amherst

*How to Broaden Participation in STEM by Indigenous Islanders (*presenting author)*
Jon Boxerman, WestEd
*Sharon Nelson-Barber, WestEd
Kimberly Nguyen, WestEd

Micro-aggression and impostor phenomenon among racial/ethnic minorities in STEM (Virtual)
Devasmita Chakraverty, Indian Institute of Management Ahmedabad

Tuesday, March 29, 2022

Exhibitor Workshop: Creating interactive presentations and digital posters using Snorkle.io

Virtual
8:00 am-9:00 am

Title: Creating interactive presentations and digital posters using Snorkle.io

Host: Jonathan Fisher (Snorkle, Inc.)
Email: jonathan@snorkle.io
Description:
In this online workshop, we will show you how to use the snorkle.io web app to embed interactive biomedical visualizations, freely available models, and more into MS PowerPoint presentations. We will also show you how to create smoothly zoomable, QR-linked electronic posters that do the same. Feel free to come armed with your own poster files!

Zoom link: https://zoom.us/j/2687045958

Tuesday, March 29, 2022
Concurrent Session # 6
9:00 am-10:30 am

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Related Paper Set-Supporting Teachers to Develop Expansive Learning Environments in Science and Engineering
9:00 AM-10:30 AM, Kitsilano Ballroom C

Discussant: https://tinyurl.com/NARSTpresider

Toward More Expansive Science Learning for Pre-Service Teachers
Jessica Watkins, Vanderbilt University
Natalie A De Lucca, Vanderbilt University

Centering Racialized Disciplinary Becoming in the Design of Teacher Professional Learning Communities (Virtual)
Christopher G. Wright, Drexel University
Rasheda Likely, Kennesaw State University
Sinead Meehan, Drexel University
Neissha Young, Drexel University
Mikhail Miller, Drexel University

Expanding Science Teacher Learning through Critical Relationality
Eli Tucker-Raymond, Boston University
Maria C. Olivares, Boston University
Brian Gravel, Tufts University
Amon Millner, Olin College of Engineering
Donna Peruzzi, Cambridge Public Schools

Exploring the "Wobbliness" of Teacher Candidates' Deficit and Anti-Deficit Framing
Kirsten K. Mawyer, University of Hawaii
Heather J. Johnson, Vanderbilt University

Elementary Science Teachers' Use of Representations to
Sarah Jaewon Lee, Vanderbilt University
Ashlyn Pierson, The Ohio State University
Danielle T. Keifert,
Andrea Wentworth Henrie, Vanderbilt University
Heather J. Johnson, Vanderbilt University
Déana A. Scipio, IslandWood

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Technology & Computer Science
9:00 AM-10:30 AM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

Exploring the Potency of Culturo-Techno-Contextual Approach on Achievement of Secondary School Students in Computer Networking (Virtual)
Esther O. Peter, ACEITSE-Lagos State University
Peter A. Okebukola, ACEITSE-Lagos State University
David G. Peter, Lagos State University
Deborah O. Agbanimu, ACEITSE-Lagos State University
Fred A. Awaah, University of Professional Studies, Accra
Franklin U. Onowugbeda, ACEITSE-Lagos State University
Olasunkanmi A. Gbeleyi, ACEITSE- Lagos State University
Adekunle I Oladejo, ACEITSE-Lagos State University
Ibukunolu A. Ademola, ACEITSE-Lagos State University
Imole Samson, Lagos State University

Flowchart and Algorithm as Difficult Concepts in Computer Studies: Can CTCA Come to the Rescue? (Virtual)
Deborah Oluwatosin Agbanimu, ACEITSE-Lagos State University
Peter A. Okebukola, ACEITSE-Lagos State University
Franklin U. Onowugbeda, ACEITSE-Lagos State University
Esther Oluwafunmilayo Peter, ACEITSE-Lagos State University
Adekunle Ibrahim Oladejo, ACEITSE-Lagos State University
Fred Awaah, University of Professional Studies Accra
Ibukunolu Adebiyi Ademola, ACEITSE-Lagos State University
Olasunkanmi Adio Gbeleyi, ACEITSE-Lagos State University
Francisca Ayobami Allename, Lagos State University, Nigeria

Student perceptions of computational thinking practices in a CT-integrated environmental science unit (Virtual)
Lexie Zhao, Northwestern University
Amanda N. Peel, Northwestern University
Michael Horn, Northwestern University
Uri Wilensky, Northwestern University

Will the Culturo-Techno-Contextual Approach Help Students' Understanding of Difficult Concepts in Computer Studies?
Daniel Ayomide Solarin, ACEITSE-Lagos State University
Peter A. Okebukola, ACEITSE-Lagos State University
Fred Awaah, ACEITSE-Lagos State University

Gamification: Toward the enhancement of self-efficacy in an introductory undergraduate biology laboratory course
David C. Owens, Georgia Southern University
Antonio P. Gutierrez de Blume, Georgia Southern University
Charles B. Hodges, Georgia Southern University
Kim Miles, Georgia Southern University
Cindi Smith-Walters, Middle Tennessee State University
Angela T. Barlow, University of Central Arkansas

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Coherent learning in NGSS curriculum and classrooms
9:00 AM-10:30 AM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Assessing Coherence Understanding of Energy as a Crosscutting Concept
Avraham Merzel, The Hebrew University of Jerusalem
Yaron Lehavi, The David Yellin College of Education

Examining Teachers' Attempts to Support Student Motivation in Middle Grades NGSS Classrooms (Virtual)
Katy Nilsen, WestEd
Christopher J. Harris, WestEd
David McKinney, University of Nevada, Las Vegas
Gwen Marchand, University of Nevada, Las Vegas

Influences on NGSS Instruction: Curriculum, Professional Learning, and District Support (Virtual)
Melissa Rego, WestEd
Ashley Iveland, WestEd
Charlie Mahoney, WestEd
Robert F. Murphy,
Christopher J. Harris, WestEd

Responsive instructional design for students' coherence-seeking: Documenting episodes of principled improvisation in storyline enactment
Kevin Cherbow, Florida State University

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Inclusive Pedagogy and Student Success
9:00 AM-10:30 AM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Case Study Pedagogy as Inclusive Pedagogy: Entry Points for STEM Faculty to Build Inclusive Classrooms (Virtual)
Ally Hunter, University of Massachusetts, Amherst
Melissa Zwick, Stockton University

Did COVID-19 & Distance Learning Heighten Performance Disparities in General Chemistry? (Virtual)
Ted M. Clark, The Ohio State University
Glenn A Clark, Whirlpool Corporation

Examining Science Teacher Educators' Perspectives of Inclusion (Virtual)
Karen C. Goodnough, Memorial University
Saiqa Azam, Memorial University
Todd Milford, University of Victoria
Christine D. Tippett, University Of Ottawa

When Disaster Strikes: How New Majority Students Navigate STEM During a Global Disruption
Terrell R. Morton, University of Missouri - Columbia
Yejun Bae, University of Missouri
Courtney Ngai, University of Missouri-Columbia
Marcelle Siegel, University Of Missouri–Columbia
Charles Nilon, University of Missouri-Columbia
Ritesh Sharma, University of Missouri-Columbia

Strand 6: Science Learning in Informal Contexts
SC-organized paper set-Informal learning centers - Transition during crisis
9:00 AM-10:30 AM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

An adaptive design of a remote SEM authentic outreach activity
Ella Yonai, Weizmann institute of science
Ron Blonder, The Weizmann Institute Of Science

Online Learning in Museums One Year after COVID-19 Closures (Virtual)
Megan Ennes, University of Florida
Amanda Wagner-Pelkey, University of Florida

Perpetuation of privilege: Impacts of low pay on workforce equity and diversity in informal education (Virtual)
Kathryn Rende, North Carolina State University
M. Gail Jones, North Carolina State University
Megan Ennes, University of Florida

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Developing science teacher practices
9:00 AM-10:30 AM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Deep structures of student lesson plans at the end of the university teacher education
Tanja Mutschler, University of Potsdam
David Buschhüter, University of Potsdam
Andreas Borowski, University of Potsdam

How Preservice Secondary Science Teachers Support Sensemaking and Discourse Across Disciplines (Virtual)
Valerie Meier, University Of California - Santa Barbara
John Galisky, University Of California - Santa Barbara
Matthew D. Bennett, University Of California - Santa Barbara
Julie A. Bianchini, University Of California - Santa Barbara

Identifying the seeds of productive science discourse in undergraduate courses for pre-service science teachers
Hadeel Omar Edrees Dabbah, Ben-Gurion University of the Negev
Orit Ben Zvi Assaraf, Ben-Gurion University of the Negev
Ahmad Basheer, Academic Arab College for Education in Israel – Haifa
Naji Kortam, Academic Arab College for Education in Israel – Haifa

Planning vs. Instruction: Analysis of Preservice Secondary Science Teachers' Use of Practices and Crosscutting Concepts (Virtual)
John Galisky, University of California, Santa Barbara
Matthew D. Bennett, UCSB
Julie A. Bianchini, University Of California - Santa Barbara
Sarah Hough, University of California, Santa Barbara
Meghan Macias, University of California, Santa Barbara

Strand 8: In-service Science Teacher Education
SC-organized paper set-Teacher Learning across Science Disciplines
9:00 AM-10:30 AM, Parq Salon D (**livestream** 1)

Presider: https://tinyurl.com/NARSTpresider

A Physics Case Study for Why Teachers Feel In- or Out-of-Field: Looking Beyond Educational Background (Virtual)
Kyla Smith, University of Oxford
Judith Hillier, University of Oxford
Sibel Erduran, University of Oxford

Biology Teachers' Knowledge Considerations and Pedagogical Goals When Designing Dataset Driven Instruction Units
Carmel Bar, Weizmann Institute of Science
Bat-Shahar Dorfman, Weizmann Institute of Science
Anat Yarden, Weizmann Institute Of Science

Capturing Collective Pedagogical Content Knowledge (cPCK) of Evolution for understand how biology teachers develop their personal PCKevo
Claudia Vergara, Alberto Hurtado University
Arlette Bassaber, Pontificia Universidad Catolica de Valparaiso
Paola Nuñez, Pontificia Universidad Catolica de Valparaiso
Beatriz Becerra, Pontificia Universidad Católica de Valparaiso
Harold Hurtado, pontificia Universidad Católica de Valparaíso
David Santibanez, Universidad Finis Terrae
Hernan Cofre, Pontificia Universidad Católica de Valparaíso

Chemistry Teacher Retention, Migration, and Attrition (Virtual)
Martin F Palermo, Stony Brook University
Angela M. Kelly, Stony Brook University
Robert Krakehl, Stony Brook University

Strand 8: In-service Science Teacher Education
SC-organized paper set-Exploring Elements of Elementary Science Teaching
9:00 AM-10:30 AM, Granville II

Presider: https://tinyurl.com/NARSTpresider

Academic Impact for Preschoolers and Kindergarteners of Classroom and Family Science: A Randomized, Control-Group Study (Virtual)
Susanna E. Hapgood, University of Toledo
Joan Kaderavek, University Of Toledo

Peter Paprzycki, University Of Southern Mississippi
Charlene M. Czerniak, University Of Toledo
Scott Molitor, University Of Toledo
Grant Wilson, The University of Toledo
Jeanna Heuring, Keene State College

Elementary teachers' understandings of student cognitive engagement in science through witnessing models of classroom instruction
Patricia S. Bills, Oakland University
Imogen R Herrick, University of Southern California

Reconsidering Touch in an Elementary Science Sensemaking Space
Michelle N Brown, Pennsylvania State University

Strand 10: Curriculum and Assessment
SC-organized paper set-Curriculum and assessment for science learning
9:00 AM-10:30 AM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

Cells in Context: Comparing Online vs. In-person Delivery (virtual)
Louisa A Stark, Genetic Science Learning Center - University of Utah
Dina Drits-Esser, Genetic Science Learning Center - University of Utah
Ann E Lambert, Genetic Science Learning Center - University of Utah
Jen C Taylor, Genetic Science Learning Center - University of Utah
Molly Malone, Genetic Science Learning Center - University of Utah
Sheila A Homburger, Genetic Science Learning Center - University of Utah
Kristin E Fenker, Genetic Science Learning Center - University of Utah

Designing Biomimetic Robots: Examining Middle School Students' Knowledge in an Interdisciplinary Environment
Michael Cassidy, TERC
Debra Bernstein, TERC
Gillian Puttick, TERC
Fayette Shaw, Tufts University
Kristen Wendell, Tufts University
Ethan Danahy, Tufts University

Students' Science Learning Interests and Formal Biology Curriculum Emphases: Special Reference to Viruses in the COVID Pandemic Era
Vivien M. Chabalengula, University Of Virginia
Ian Nicolaides, Southern Illinois University

Three-Dimensional Learning Progression for Supporting Students' Knowledge-in-use Proficiency in High School Project-based Learning Chemistry Curriculum (Virtual)
Peng He, Michigan State University
I-Chien Chen, Michigan State University
Joseph S. Krajcik, Michigan State University

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Cultural Relevance in Science & STEM
9:00 AM-10:30 AM, Stanley

Presider: https://tinyurl.com/NARSTpresider

A Select Physics Teachers Use of Empathy While Engaging in Culturally Relevant Practices
Clausell Mathis, University of Washington
Sherry A. Southerland, Florida State University

An exploration of Chinese Secondary Chemistry Teachers' Conceptions of Culturally Relevant Science Teaching (Virtual)
Xinying Yin, California State University-San Bernardino

Black women science teachers and anti-racist teaching: An argument for Historically Relevant Science Pedagogy (Virtual)
Alexis Riley, Teacher's College -Columbia University
Felicia Moore Mensah, Teachers College, Columbia University

Cultivating culturally sustaining STEM classrooms: A narrative inquiry case study of a science teacher
Khanh Q. Tran, Purdue University, West Lafayette
Selcen Guzey, Purdue University

Strand 12: Technology for Teaching, Learning, and Research
SC-organized paper set-Digital Multimedia and Computational Thinking to Support Science Learning and Teaching
9:00 AM-10:30 AM, Burrard

Presider: https://tinyurl.com/NARSTpresider

Integrating Computational Thinking and Engineering Practices to Teach STEM: Examining Students' Attitudes About Physical Computing
Tyler S. Love, The Pennsylvania State University, Harrisburg
Julpa Rajyaguru, The Pennsylvania State University, Harrisburg

Integrating Computational Thinking as Part of Simulation-based Scientific Investigations with Volcanic Hazards and Risk
Christopher Lore, Concord Consortium
Hee-Sun Lee, The Concord Consortium
Amy Pallant, The Concord Consortium

Sensemaking Through Computational Thinking: Images of Computing as a Scientific Epistemic Practice in Teacher Learning (Virtual)
Gozde Tosun, Penn State University
Amy V. Farris, Penn State

Teaching digital multimedia design with eye-tracking – exploring a new teaching approach for student teachers
Axel Langner, Institute of Chemistry Education, Justus-Liebig-University Giessen, Germany
Nicole Graulich, Justus-Liebig Universität Giessen

Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-organized paper set-Nature of Science and Higher Education
9:00 AM-10:30 AM, Parq Salon E (**livestream** 2)

Presider: https://tinyurl.com/NARSTpresider

How Teachers Used the Covid-19 Pandemic to Teach How Science Works
Jeanne L Brunner, University of Massachusetts Amherst
Ryan Summers, University of North Dakota

Learning in trajectories of participation: Nature of Science and Temporality in the Nature of Scientists (Virtual)
Ashwin Krishnan Mohan, Pennsylvania State University
Gregory J. Kelly, Pennsylvania State University

Re-thinking Science Education Using Non-linear Theories: Implications of Posthumanism on Ethics, Policy, and Practice (Virtual)
Sophia Jeong, The Ohio State University
Kathryn M. Bateman, Temple University
David P. Steele, Alder Graduate School of Education
Brandon Sherman, IUPUI

Strand 15: Policy, Reform, and Program Evaluation
Related Paper Set-Explorations of K-12 Integrated STEM Teaching
9:00 AM-10:30 AM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Discussant: Erin Peters-Burton, George Mason University

The Current State of Integrated STEM Education: Comparing Science Content Areas and Grade-Levels (Virtual)
Emily A. Dare, Florida International University
Joshua A. Ellis, Florida International University
Gillian Roehrig, University of Minnesota
Elizabeth A. Ring-Whalen, St. Catherine University
Erin E. Peters-Burton, George Mason University

Understanding the Relationship between Context and Content Integration (Virtual)
Benny Mart Hiwatig, University of Minnesota Twin Cities
Joshua A. Ellis, Florida International University
Farah Faruqi, University of Minnesota Twin Cities
Khomson Keratithamkul, University of Minnesota Twin Cities
Elizabeth Forde, Florida International University
Gillian Roehrig, University of Minnesota
Erin E. Peters-Burton, George Mason University

Manifestations of Integration in Practice: A Case Study of Three Elementary Teachers' Integration of Engineering and Science (Virtual)
Farah Faruqi, University of Minnesota Twin Cities
Khomson Keratithamkul, University of Minnesota Twin Cities
Gillian Roehrig, University of Minnesota
Erin E. Peters-Burton, George Mason University

Yes, Math is There, but ...: Examining Mathematical Content in Integrated STEM (Virtual)
Elizabeth Forde, Florida International University
Latanya Robinson, Florida International University
Joshua A. Ellis, Florida International University
Emily A. Dare, Florida International University
Erin E. Peters-Burton, George Mason University

Administrative Session: Publications Advisory Committee
Admin Symposium-NARST/NSTA Annual Research Worth Reading Recognition
9:00 AM-10:30 AM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

Organizers
Shakhnoza Kayumova, University of Massachusetts-Dartmouth
Dante Cisterna, Educational Testing Service
Allison Antink-Meyer, Illinois State University
G. Michael Bowen, Mount Saint Vincent University, Halifax, Nova Scotia, Canada

Cynthia Crockett, Harvard-Smithsonian Center for Astrophysics
Knut Neumann, IPN–Leibniz Institute for Science and Mathematics Education, Kiel, Germany

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 2021 JRST articles inspire excellent teaching innovations. This year's recipients are:

- Harris, E. M., & Ballard, H. L. (2021). Examining student environmental science agency across school science contexts. *Journal of Research in Science Teaching, 58*(6), 906–934.

- Puntambekar, S., Gnesdilow, D., Dornfeld Tissenbaum, C., Narayanan, N. H., & Rebello, N. S. (2021). Supporting middle school students' science talk: A comparison of physical and virtual labs. *Journal of Research in Science Teaching, 58*(3), 392–419.

- Donovan, B. M., Weindling, M., Salazar, B., Duncan, A., Stuhlsatz, M., & Keck, P. (2021). Genomics literacy matters: Supporting the development of genomics literacy through genetics education could reduce the prevalence of genetic essentialism. *Journal of Research in Science Teaching, 58*(4), 520–550.

Multi-Strand-*Virtual Session E*
9:00 AM-10:30 AM, Parq Salon F (**livestream** 3)

"I'm too slow to get through Statistics": The Relationship between Statistics Anxiety and Academic Dishonesty (Virtual)
Pnina Steinberger, Orot Israel College of Education
Yovav Eshet, Zefat Academic College
Keren Grinautsky, Western Galilee College

The Importance of Family-level Variables to Evolution-related Perspectives and Careers in Black Undergraduates (Virtual)
Ross H. Nehm, Stony Brook University
Gena C. Sbeglia, Stony Brook University

What science teachers' autobiographies tell us about their own science education and career choices (Virtual)
Mariana Luzuriaga, University of San Andrés
Maria Eugenia Podesta, University of San Andrés
Melina Furman, University of San Andrés

Science Classrooms as Hostile Environments for Black Female Science Teachers (Virtual)
Olayinka Mohorn, Dominican University

Tuesday, March 29, 2022
Poster Q & A (Concurrent session #7)
Prefunction area
10:45 AM - 11:45 AM

In person posters will be displayed on boards in the prefunction area. Presenters will be with their posters for discussion. Virtual posters will be available throughout the conference, with space to post questions and responses.

Strand 1: Science Learning: Development of student understanding
Poster-Strand 1 Poster Session
10:45 AM - 11:45 AM, Poster Space

101
Examining the crosscutting concept of patterns: An initial construct map in the context of ecosystems
Kristin L. Gunckel, University Of Arizona
Daniel L. Moreno, University of Arizona
Sean Tan, University of California Berkeley
Anna McPherson, American Museum of Natural History
Sara J. Dozier, CSU Long Beach
Linda Morell, University Of California, Berkeley

102
Exploring the concept of scientific civic engagement and its role in developing science literacy skills
Jenny M Dauer, University of Nebraska-Lincoln
Irfanul Alam, University of Colorado Boulder
Lisa A Corwin, University of Colorado Boulder

103
Investigating The Effects Of Instructional Support On Students' Inquiry-based Writing In Chemistry
Jan-Martin Österlein, University of Duisburg-Essen
Mathias Ropohl, University of Duisburg-Essen
Sebastian Habig, Paderborn University
Miriam Morek, University of Duisburg-Essen

104
Studies on Visualization in Science Classrooms: A Systematic Literature Review (Virtual)
Mijung Kim, University of Alberta
Qingna Jin, University of Alberta

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Poster-Strand 2 Poster Session
10:45 AM - 11:45 AM, Poster Space

201
Factors Influencing Evolution Acceptance: A Systematic Literature Review and Meta-Analysis
Daniela Fiedler, Department of Biology Education, IPN - Leibniz Institute for Science and Mathematics Education, Kiel, Germany

202
Influence of Digital Learning Design Features and Self-Regulation on Students' Behavioral and Emotional Engagement (Virtual)
Daniel Laumann, University of Münster
Julia Welberg, University of Münster
Julian Alexander Fischer, Leibniz Institute for Science Education (IPN) Kiel
Tatjana Steinmann, Leibniz University of Hannover
Susanne M. Heinicke, University of Münster
Susanne Weßnigk, Leibniz University of Hannover
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel

203
Interacting with Luna: Scientific characters and 3rd graders' construction of relationships with Science (Virtual)
Deborah Cotta, Universidade Federal de Minas Gerais
Danusa Munford, Faculdade de Educacao - Universidade Federal de Minas Gerais
Elaine S. França, Centro Pedagógico (1-9 grades school) - Universidade Federal de Minas Gerais

204
Investigating the Ways Students Leverage Lived Experience to Explain Phenomena (Virtual)
Kraig A. Wray, Pennsylvania State University
Amy R. Pallant, The Concord Consortium
Hee-Sun Lee, The Concord Consortium
Scott McDonald, Pennsylvania State University

205
Learning in Multidisciplinary Teams in a Challenge-Based Learning Course (Virtual)
Canan Mesutoglu,
Dürdane Dury Bayram-Jacobs, Eindhoven University of Technology

206
Make or Break Collaborative Disciplinary Engagement in Science: Managing Conceptual Uncertainty in Group Work (Virtual)
Harini Krishnan, Florida State University
Lama Jaber, Florida State University
Sherry A. Southerland, Florida State University

207
Scientists' and Teachers' Perceptions of Costs and Benefits in School-Based Citizen Science (Virtual)
Osnat Atias, University of Haifa
Ayelet Baram-Tsabari, Technion - Israel Institute of Technology
Ayelet Shavit, Technion - Israel Institute of Technology
Yael Kali, University of Haifa

208
Seasons in the Sun: Unpacking Seasons Lesson Approaches as Teachers Model Earth-based and Space-based Perspectives
Jennifer A. Wilhelm, University of Kentucky
Merryn Cole, University Of Nevada Las Vegas
Paula Ames, University of Kentucky
Jaden Hayes, University of Kentucky
Samantha Ringl, University of Kentucky

209
Social and material resources mediating young children's engagement in spatial sensemaking during summer engineering camp (Virtual)
Julia Plummer, Pennsylvania State University
Katie Nolan, Pennsylvania State University

210
Student Assertions in Science Discourse Spaces (Virtual)
Lauren Cabrera, Virginia Commonwealth University
Ananya Matewos, Saint Norbert College
Vivian Ali Zohery, University of Maryland - College Park
Doug Lombardi, University of Maryland, College Park

211
Supporting Discussion-based Science Practices for Special Education Students (Virtual)
Grace K. Baker, Penn State University
Emma J. Jacobson, Penn State University
Amy R. Pallant, The Concord Consortium
Hee-Sun Lee, The Concord Consortium
Scott McDonald, Pennsylvania State University

212
Supporting macro-ethical reasoning in college students' collaborative design work (Virtual)
Jennifer Radoff, University of Maryland-College Park
Chandra Turpen, University of Maryland-College Park
Fatima Abdurrahman, University of Maryland-College Park

213
The Impact of COVID-19 Lockdown on Parents and Adolescent Children in Relation to Science Learning
Ella Ofek-Geva, Weizmann Institute of Science
Michal Vinker, Department of Pediatrics and Department of Pediatric Endocrinology and Diabetes, Assuta Ashdod University Medical Center, Ashdod, Israel
Yonatan Yeshayahu, Department of Pediatrics and Department of Pediatric Endocrinology and Diabetes, Assuta Ashdod University Medical Center, Ashdod, Israel
David L. Fortus, Weizmann Institute Of Science

214
Critical pedagogy of place to enhance ecological engagement activities: Expanding "place" beyond the biophysical
Andrea E Weinberg, Arizona State University
Amanda Cicchino, Colorado State University
Meena M. Balgopal, Colorado State University
Laura B. Sample McMeeking, Colorado State University STEM Center

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Poster-Strand 3 Poster Session
10:45 AM - 11:45 AM, Poster Space
301
A Case of Revealing Preservice Elementary Science Teachers' Understanding of Models and Modeling Through Reflections (Virtual)
Ayca K Fackler, University of Georgia

302
Assessing Elementary Students' Science Interests and Career Aspirations
M. Gail Jones, North Carolina State University
Katherine Chesnutt, Appalachian State University
Megan Ennes, University of Florida
Daniel Macher, Karl-Franzens-University of Graz
Manuela Paechter, Karl-Franzens-University of Graz

303
Developing Routines for Planning Elementary Science Investigations
Annabel J Stoler, Boston University
Eve Manz, Boston University
Chris Georgen, Boston University

304
Examining the Relationship between Preschool Teachers' Attitudes and Beliefs towards Science and Classroom Practice
Elica B. Sharifnia, University of Miami
Daryl Greenfield, University of Miami

305
Exploring the Nature of Challenges Preservice Elementary Teachers Experience about Matter Content and Content Teaching
Jamie N. Mikeska, Educational Testing Service (ETS)
Heena R. Lakhani, University of Washington
Dante Cisterna, Educational Testing Service

306
Science, Language, and Equity Practices: How Teachers Respond to Professional Learning Focused on Epistemic Agency (Virtual)
Emily C. Miller, University of Wisconsin Madison
Emily Reigh, Stanford
Maria C. Simani, University Of California, Riverside

307
Teachers' planned use of place-based stories rooted in students' everyday experiences of natural phenomenon Melissa J. Luna, West Virginia University

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
Poster-Strand 4 Poster Session
10:45 AM - 11:45 AM, Poster Space

401
Critical Discussions in Small Groups to Support the Design of Experiments
Takuya Matsuura, Hiroshima University
Urumi Hayashiuchi, Takehara City Educational Board

402
Innovative STEM curriculum to enhance students' engineering design skills and attitudes toward STEM (Virtual)
Meng-Fei Cheng, National Changhua University of Education
Yu-Heng Lo, National Changhua University of Education

403
Middle School Teachers' Self-efficacy for Teaching Science in a Computationally Rich Environment: A Mixed-Methods Study (Virtual)
Arif Rachmatullah, SRI International
Eric N. Wiebe, North Carolina State University

404
Science Instructional Practices: Comparison of Two Strategies for Students with Learning Disabilities (Virtual)
Gamze Karaer, University of Iowa
Macid Ayhan Melekoglu, Eskisehir Osmangazi University

405
Teachers' Conceptions of Phenomena in the Secondary Science Classroom
Daniel Pimentel, Stanford University

406
The Challenges of Teaching in Charter Schools and How They were Overcome During the COVID-19 Pandemic (Virtual)
Pamela Huff, Doctoral Candidate
Gail Jones, North Carolina State University

Strand 5: College Science Teaching and Learning (Grades 13-20)
Poster-Strand 5 Poster Session
10:45 AM - 11:45 AM, Poster Space

501
Cultivating and supporting STEM faculty allyship (Virtual)
Thanh K. Le, Western Washington University
Regina Barber DeGraaff, Western Washington University
Leticia Romo, Chaffey College

502
Design and Outcomes for Computational Interest, Competency Belief, and Anxiety in "Science for Future Presidents"
Sheikh Ahmad Shah, Boston College
David W. Jackson, Boston College and Waltham (MA) Public Schools

503
Exploring of environmental engineering college students' social responsibility and problem solving through the SSI project (Virtual)
Yohan Hwang, Seoul National University
Kongju Mun, Dongduk Women's University
Kyung-Suk Cho, Ewha Womans University
Hyunju Lee, Ewha Womans University

504
Exploring the Perception of College Students in STEM Fields on Social Responsibility of Scientists and Engineers (Virtual)
Hyunju Lee, Ewha Womans University
Yuhyun Choi, Chungnam National University
Seung-Yong Ok, Hankyong National University
Chang-Hoon Nam, Daegu Gyeongbuk Institute of Science & Technology
Sungok Seren Shim, Ball State University
Yohan Hwang, Seoul National University
Yeonjoo Ko, Ewha Womans University
Kyungmi Lee, Ewha Womans University

505
Investigating learning assistants' use of questioning in the online setting of an inquiry-oriented physics course (Virtual)
Jianlan Wang, Texas Tech University
Yuanhua Wang, West Virginia University
Beth Thacker, Texas Tech University
Stephanie Hart, Texas Tech University

506
Preparing Graduate Students for Success: Validating Interdisciplinary Skill Development Needs (Virtual)
Nicole Campbell, Western University
Mohammed Estaiteyeh, Western University
Isha DeCoito, Western University

507
Student Participation and Self-Efficacy in Communities of Practice in Remote Undergraduate Physics Laboratories
Drew Jason Rosen, University of Maine Stony Brook University
Angela M. Kelly, Stony Brook University

508
Supporting New Research on Teaching Professional Development for Graduate Student: Progression and Personal/Professional Benefits (Virtual)
Gili Marbach-Ad, University Of Maryland
Patrick Sheehan, University Of Maryland
Bridgette Heine, University Of Maryland
Grant E. Gardner, Middle Tennessee State University
Judith S. Ridgway, The Ohio State University
Kristen Miller, University of Georgia
Elisabeth Schussler, University Of Tennesse

509
The Interconnectedness of Chemical contents – a Challenge for Teacher Training
Marina Regina Birkenstock, University of Kassel
David S. Di Fuccia, University of Kassel

Strand 6: Science Learning in Informal Contexts
Poster-Strand 6 Poster Session
10:45 AM - 11:45 AM, Poster Space

601
"We're Not that Different": Typologies of Guests' Relationships to Museum Objects via Mechanic Assemblage within a Dinosaur Gallery (Virtual)
Joshua Cruz, Texas Tech University
Rebecca Hite, Texas Tech University
Richard C. Velasco, University of Iowa

602
Peer-to-Peer Seminars: Proposal to Use Peers and Structure to Promote Student Learning at Research Seminars (Virtual)
Elizabeth W Kelley, University of Chicago

603
Social Network Analysis as a Tool to Operationalize Communities of Practice and Document Social Learning
K. C. Busch, North Carolina State University
Lynn Chesnut, North Carolina State University

604
Using Augmented Reality (AR) to Bring the Past to Life in Informal Science Learning
Imogen R Herrick, University of Southern California
Gale Sinatra, University of Southern California
Alana Kennedy , University of Southern California
Benjamin Nye, University of Southern California
Bill Swartout, University of Southern California
Emily Lindsey, The La Brea Tar Pits Museum

Strand 7: Pre-service Science Teacher Education
Poster-Strand 7 Poster Session
10:45 AM - 11:45 AM, Poster Space

701
Impact of Inquiry Lesson Experiences on Development of Preservice Elementary Teachers' Effective Science Teaching Beliefs
Kelsey Beeghly, University of Central Florida

702
Participating in online Teacher Learning Communities as a Tool for Pre-Service Teacher Education (Virtual)
Loucas T. Louca, European University-Cyprus
Theopisti Skoulia, European University-Cyprus

703
Teaching as enactment of habitus: Preparing preservice science teachers for new ways of teaching science (Virtual)
Hildah K. Makori, Iowa State University

704
Understanding Elementary Preservice Teachers' Beliefs about the Importance and Value of the NGSS Science Practices
Elsun Seung, Indiana State University
Vance J. Kite, North Carolina State University
Soonhye Park, North Carolina State University
Aeran Choi, Ewha Womans University

705
Using a PCK lens to capture pre-service science teachers' internalized knowledge of Nature of Science
Louise Lehane, llehane@stangelas.nuigalway.ie

706
Preservice Science Teachers' Informal Reasoning Modes in Two Different Issue Contexts (Virtual)
Nilay Ozturk, Kirsehir Ahi Evran University
Kubra Yolacti-Kizilkaya, Kirsehir Ahi Evran University

Strand 8: In-service Science Teacher Education
Poster-Strand 8 Poster Session
10:45 AM - 11:45 AM, Poster Space

801
Investigating Impacts of Professional Development on High School Physics Teachers' Collaboration and Lesson Planning (Virtual)
James B. Hancock, Alma College
Jack T Poling, Alma College

802
A Cross-Case Analysis of In-Service Science Teacher's Assessment Literacy in Model-Based Teaching
Alexis Gonzalez-Donoso, University of British Columbia
Samia Khan, University of British Columbia

803
An Online Professional Development Community (APTeach): Teacher Perception and Practice (Virtual)
Fatma Kaya, Middle Tennessee State University
Preethi Titu, Kennesaw State University
Siying Jiang, Stony Brook University
Jiecheng Song, Stony Brook University
Steven Berryhill, Middle Tennessee State University
Amanda S. Perez, Carnegie Mellon University
Chinmay Kulkarni, Carnegie Mellon University
Wei Zhu, Stony Brook University
David Yaron, Carnegie Mellon University
Greg Rushton, Middle Tennessee State University

804
Analyzing Teaching Perceptions of Utilizing a District Level Professional Learning Community to Identify Guaranteed Curriculum (Virtual)
Kristin E Mansell,

805
Examine Chinese In-service Science Teachers' Views of Nature of Science
Yang Yang, Beijing Normal University
Qin Yan, Beijing Normal University
Jing Lin, Beijing Normal University

806
Exploration of Epistemic Orientation towards Teaching Science in a Longitudinal Professional Development Study
Sierra L. Morandi, Florida State University
Claudia Hagan, Georgia State University
Ellen M. Granger, Florida State University
Jennifer Schellinger, Florida State University
Sherry A. Southerland, Florida State University

807
Exploring Early Enactment Attempts for Integrating Engineering Design Practices in High School Biology
Jonathan Singer, University of Maryland, Baltimore County
Jacqueline Krikorian, Baltimore City Public Schools
Tory H. Williams, University of Maryland Baltimore County
Christopher Rakes, University of Maryland, Baltimore County
Julie Ross, Virginia Tech

808
Listening to Find Integrated STEM Discourse: Power and Positioning During a Teacher Professional Development STEM Activity (Virtual)
Andria C. Schwortz, University of Wyoming
Andrea C. Burrows, University Of Wyoming

809
Lived Experiences of K-12 Teachers Who Attended Professional Development Hosted By Informal Education Institutions
Vashunda Williams Warren, Dallas Baptist University

810
Professional Development Principles to Advance Socio-scientific Issue-oriented Science Education: The Case of British Columbia.
Travis T. Fuchs, The University of British Columbia
Anthony Clarke, The University of British Columbia

811
Questionnaire Measuring Teachers' Perception of Practical Work in Inclusive Physics Lessons
Laura Sührig, Department of Physics Education, Goethe University Frankfurt
Katja Hartig, Institute of Psychology, Goethe University Frankfurt
Roger Erb, Department of Physics Education, Goethe University Frankfurt
Albert Teichrew, Department of Physics Education, Goethe University Frankfurt
Jan Winkelmann, University of Education Schwäbisch Gmünd
Holger Horz, Institute of Psychology, Goethe University Frankfurt
Mark Ullrich, Institute of Psychology, Goethe University Frankfurt

812
Science Teachers' Interactions With and Conceptions of Curriculum Use (Virtual)
Byung-Yeol Park, University of Connecticut
Todd Campbell, University of Connecticut
Miriah Kelly, Southern Connecticut State University
Chester Arnold, University of Connecticut

813
Science teaching performance: investigating gender, qualification, and teaching experiences (Virtual)
Hiya M. Almazroa, Princess Nourah Bint Abdulrahman University
Eman M Alrwaythi, AlImam Muhammad Ibn Saud University
Fahad S. Alshaya, King Saud University

814
Teacher's Readiness to Promote Science-related Career Awareness Among Middle School Students
Regina Soobard, University Of Tartu
Ana Valdmann, University Of Tartu
Miia Rannikmae, University Of Tartu

815
Pathways to Critical Practice in Elementary Science Education (Virtual)
Emily Rose Seeber, University of Michigan
Christa Haverly, Northwestern University

Strand 10: Curriculum and Assessment
Poster-Strand 10 Poster Session
10:45 AM - 11:45 AM, Poster Space

1001
Assessing the Inquiry Practices of Teachers in the Philippines (Virtual)
Dennis L. Danipog, National Institute for Science and Mathematics Education Development, University of the Philippines Diliman
Suzanne Rice, Assessment Research Centre, University of Melbourne
Zhonghua Zhang, Assessment Research Centre, University of Melbourne

1002
Implementation of the ALL for Science Framework Across Three Grade Levels
Nancy Moreno, Baylor College of Medicine
Alana Newell, Baylor College Of Medicine
Lollie Garay, Baylor College of Medicine
Misty Sailors, University of North Texas

1003
Relationships Among Teacher Beliefs About STEAM Education, Perceptions of School Climate, and Enacted Practices.
Jaymie Paige Stein, Fordham University
John Craven, Fordham University

1004
Video-based Instruments as Assessment Tool in Science Teacher Education: A Systematic Literature Review (Virtual)
Yuxi Huang, University of Georgia
Hatice Ozen Tasdemir, The University of Georgia

Strand 11: Cultural, Social, and Gender Issues
Poster-Strand 11 Poster Session
10:45 AM - 11:45 AM, Poster Space

1101
Uncovering Sex and Gender Language in High School Biology Textbooks
Awais Syed, BSCS Science Learning
Dennis Lee, BSCS Science Learning
Monica Weindling, BSCS Science Learning
Sophie Arnold, New York University
Andrei Cimpian, New York University
Catherine Riegle-Crumb, University of Texas
Molly Stuhlsatz, BSCS Science Learning
Brian M. Donovan, BSCS Science Learning

1102
Intervention Highlights the Importance of Career Awareness Promotion on Students' Equal STEM Career Awareness Development
Tormi Kotkas, University Of Tartu
Jack B. Holbrook, University Of Tartu
Miia Rannikmae, University Of Tartu

1103
The new four-letter word, 'race': Exploring Teacher Positions within biology education and critical race theory. (Virtual)
Uchenna Emenaha, The University of Texas at San Antonio

1104
John Henryism: Exploration of Physiological Examination of College STEM, Cumulative Trauma, Allostatic Load.
Douglas Lee Hoston,
Richard Lamb, University at Buffalo

1105
Effectiveness and Inclusivity: determining best physics and astronomy departments for women of colour (Virtual)
Jaimie Lauren Miller-Friedmann, University of Birmingham
Nicola Wilkin, University of Birmingham

1106
Exploring the prevalence of whiteness within science education using duoethnographic methods
Jennifer Jackson, Pennsylvania State University
Jonathan D. McCausland, Pennsylvania State University

1107
Faculty Awareness and Responsiveness to Inclusivity in STEM Classrooms (Virtual)
Grant E. Gardner, Middle Tennessee State University
Olena T James, Middle Tennessee State University
Sarah Bleiler-Baxter, Middle Tennessee State University
Gregory Rushton, Middle Tennessee State University
Fonya Crockett Scott, Middle Tennessee State University
Amanda Heath, Middle Tennessee State University
Theresa Ayangbola, Middle Tennessee State University

1108
Identifying the Methods District Science Coordinators Utilize to Monitor and Promote Equity
Shaugnessy McCann,
Yamil Ruiz,
Brooke A. Whitworth, Clemson University
Julie A. Luft, University of Georgia

1109
Instructor Impact on the Equity of Collaborative Small Groups in a Science Class
Mary Binzley, Grinnell College
Paul Hutchison, Grinnell College

1110
Examining Moments of Liberatory Design Possibility in Youth-centered Engineering Design Practice (Virtual)
Jacqueline Handley, University of Michigan

Strand 12: Technology for Teaching, Learning, and Research
Poster-Strand 12 Poster Session
10:45 AM - 11:45 AM, Poster Space

1201
Applying the eye tracking method to analyze university leaners' learning and reasoning behaviors in the Augmented Reality Environment (Virtual)
Fang-Ying Yang, National Taiwan Normal University
Yi-Wen Hung, The Affiliated Senior High School of National Taiwan Normal University
Yuan-Li Liu, National Taiwan Normal University

1202
Automated Assessment of Students' Response to Free-response Items on Particulate Nature of Matter Utilizing AI
Gyeong-Geon Lee, Seoul National University
Jaeyong Lee, Seoul National University
Hun-Gi Hong, Seoul National University

1203
CryptoComics: Design of an Integrative STEM+C Transmedia Curriculum
Pavlo D. Antonenko, University Of Florida
Kara Dawson, University of Florida
Zhen Xu, University of Florida
Do Hyong Koh, University of Florida
Christine Wusylko, University of Florida
Amber Benedict, Arizona State University
Swarup Bhunia, University of Florida

1204
Exploring Science Student Learning Outcomes using Machine Learning Classifications During Online Sessions (Virtual)
Richard Lamb, East Carolina University
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel

1205
Investigating Differential Effects of a Digital 'Ladder of Learning' With Adaptive Support in Chemistry
Michelle Möhlenkamp, University of Duisburg-Essen
Helena Van Vorst, University of Duisburg-Essen
Sebastian Habig, University of Duisburg-Essen
Mathias Ropohl, University of Duisburg-Essen

1206
Scaffolding Scientific Argumentation in a Science Inquiry Unit (Virtual)
Kathryn Rupp, Northern Illinois University
Karyn Higgs, Northern Illinois University
M. Anne Britt, Northern Illinois University
Kathleen Easley, The Learning Partnership
Randi McGee-Tekula, The Learning Partnership
Steven McGee, The Learning Partnership

1207
School Leaders Learning How to Observe Science Teachers Using Equitable Discourse Through Virtual Reality
Len Annetta, East Carolina University
Matthew Militello, East Carolina University
Lynda Tredway, Institute for Educational Leadership
Lawrence Hodgkins, East Carolina University
Ken Simon, Institute for Educational Leadership
Jim Argent, East Carolina University

1208
The Science of Data Visualization Comprehension: Analysis of Seminal Theoretical Frameworks (Virtual)
Kristine A. Antonyan, University of Florida
Pavlo D. Antonenko, University Of Florida

1209
Tracing the Development of a Haptically-enabled Science Simulation (HESSs) for Force and Motion (Virtual)
James Minogue, North Carolina State University
Emily Brunsen, North Carolina State University
Tabitha Peck, Davidson College
David Borland, RENCI

1210
Was that Productive? Exploring Student-Student Verbal Interactions while Engaged with Virtual Learning Environments about Magnetism (Virtual)
Joey D Marion, North Carolina State University
James Minogue, North Carolina State University
Michaela O'Leary, North Carolina State University
Katee Finegan, North Carolina State University

Strand 13: History, Philosophy, Sociology, and Nature of Science
Poster-Strand 13 Poster Session
10:45 AM - 11:45 AM, Poster Space

1301
Considering the conceptual role of compassion in socioscientific issues research
David C. Owens, Georgia Southern University
Dana L. Zeidler, University Of South Florida

1302
Developing Pre-Service Teachers' Understanding of the Distinctions Between Science and Engineering
Jacob Pleasants, University of Oklahoma
Jennifer C. Parrish, University of Northern Colorado
Anne Leak, Assistant Professor, High Point University

1303
Exploring the complexity of student-created mind maps, based on science-related core ideas
Helen Semilarski, Doctoral student
Regina Soobard, Research Fellow of Science Education
Jack Holbrook, Professor
Miia Rannikmae, Professor

1304
Moroccan Science Professors' Nature of Science's Understandings and Perceptions on its Instruction for Preservice Teachers
Farnaz Avarzamani, Mary Lou Fulton Teachers College, Arizona State University, Tempe, AZ
Mila Rosa Librea Carden, Mary Lou Fulton Teachers College, Arizona State University, Tempe, AZ
Peter Rillero, Mary Lou Fulton Teachers College, Arizona State University, Tempe, AZ
Florence Hamel, Gary Herberger Young Scholars Academy, Mary Lou Fulton Teachers College, Arizona State University, Tempe, AZ

Strand 14: Environmental Education and Sustainability
Poster-Strand 14 Poster Session
10:45 AM - 11:45 AM, Poster Space

1401
Ambitious Science Teaching as a way of integrating place-based and systems-literacy learning (Virtual)
Madison Botch, Pennsylvania State University
Amy R. Pallant, The Concord Consortium
Hee-Sun Lee, The Concord Consortium
Scott McDonald, Pennsylvania State University

1402
Exploring 6th-Grade Students Model-Based Reasoning about Energy Flow Between Societal and Earth Systems
Laura Zangori, University Of Missouri
Laura B Cole, University of Missouri
Mohammad Dastmalchi, University of Missouri

1403
Exploring the Potential for Place-Based Ecology Lessons in Middle School Science Classes
Sara L. Salisbury, Middle Tennessee State University
Fonya Crockett Scott, MTSU

1404
Fourth Graders' Knowledge of Energy and Environmental Literacy and Application through Flashlight Design (Virtual)
Heidi Masters, University Of Wisconsin–La Crosse
Vanashri J. Nargund, New Jersey City University

1405
Unite for the environment: Examining the impact a sustainable livelihoods program on pro-environmental behaviors in Ugandan student households near a biodiversity hotspot (Virtual)
Sarah J. Carrier, North Carolina State University
Aimee B Fraulo, North Carolina State University
Corinne Kendall, North Carolina Zoo
Austin Leeds,
Tinka John, UNITE
Elizabeth Folta, North Carolina Zoo
Kristen E Lukas, Cleveland Metro Parks Zoo

1406
Adolescent Framings of Climate Change, Psychological Distancing & Implications for Climate Change Concern and Behavior (Virtual)
Regina Ayala Chavez, North Carolina State University
K. C. Busch, North Carolina State University

Strand 15: Policy, Reform, and Program Evaluation
Poster-Strand 15 Poster Session
10:45 AM - 11:45 AM, Poster Space

1501
Expression of Next Generation Science Standards in Picture Books (Virtual)
Kelly Marie Shepard, Illinois Institute of Technology

1502
Faculty Voices on the Implementation of Science Education Policy in Higher Education-A Case Study
Mercy Ogunsola-Bandele, National Open University Of Nigeria
Bamikole O. Ogunleye, National Open University Of Nigeria

Tuesday, March 29, 2022

Lunch Buffet

Parq DEF & Prefunction area
11:45 am-12:45 pm

Enjoy a lunch of soup, salad, sandwiches, and desserts before we celebrate the 2022 NARST award winners.

NARST Recognitions & Reflections [livestream]

Parq DEF
12:30 pm-1:20 pm

The NARST 2022 Award Winners will be announced. Come share in recognizing these distinguished scholars in areas of Doctoral research, Early Career, NARST Fellows, and the highest honor of NARST Distinguished Contribution to Science Education through Research Award. The Awardees will be presenting on their scholarship in two additional sessions following this ceremony. These sessions will also be livestreamed.

During this session, the NARST President will also provide brief comments on advances within NARST through reflection on "Unity and Inclusion for Global Scientific Literacy: Invite as a Community. Unite as a Community."

Tuesday, March 29, 2022
Concurrent Session # 8
2:00 pm-3:30 pm

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Theoretical & Literature Review Papers
2:00 PM-3:30 PM, Kitsilano Ballroom A

Presider:

Emotions in Science Learning and Teaching: A Systematic Review (Virtual)
Xiao Chen, East China Normal University
Sihan Xiao, East China Normal University

Fresh Air: Glowing Conspirations Towards Scientific Fluency
Hartley Banack, University of Northern British Columbia (UNBC)
Gerald Tembrevilla, Mount Saint Vincent University
Claire Robson, Adjunct Faculty at Simon Fraser University
Anne Robillard, Graduate Student, Department of Curriculum and Pedagogy, Faculty of Education, UBC

The motivational consequence of pattern-seeking fatigue
Elon Langbeheim, Ben-Gurion University of the Negev
Edit M. Yerushalmi, Weizmann Institute of Science

Transformative Science Education: A Review of Transformative Experience Theory
Kevin J Pugh, University of Northern Colorado

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Distance/online Science Teaching & Learning
2:00 PM-3:30 PM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Science Teaching Practices and Student Engagement in HyFlex Learning Environments
Hong H. Tran, University of Georgia
Yuxi Huang, University of Georgia
Cheng-Wen (Nuby) He, University of Georgia
Brooke A. Whitworth, Clemson University

Yamil Ruiz, Clemson University
Shaugnessy McCann, University of Georgia
Julie A. Luft, University of Georgia

Shifting to Distance Learning of Science in China and Israel: A Comparative Study of Students and Teachers
David L. Fortus, Weizmann Institute of Science
Jing Lin, Beijing Normal University
Shira Passentin, Weizmann Institute of Science

The effect of in-person vs. distance learning on the quality of students' learning
Julian A. Fischer, Leibniz Institute for Science Education (IPN) Kiel
Tatjana Steinmann, Leibniz University of Hannover
Daniel Laumann, University of Münster
Susanne Weßnigk, Leibniz University of Hannover
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel

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Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Discourse and argumentation in secondary science teaching
2:00 PM-3:30 PM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

Argumentation with Summary Tables in geoscience learning
Brandin M Conrath, Pennsylvania State University
Kathryn M. Bateman, Temple University
Amy R. Pallant, The Concord Consortium
Hee-Sun Lee, The Concord Consortium
Scott McDonald, Pennsylvania State University

Discourse in Inquiry Science Classrooms (DiISC) Version 2.0: Developing a Validity Argument for a Secondary Science Classroom Observation Instrument (Virtual)
Elizabeth B Lewis, University of Nebraska–Lincoln
Lyrica L Lucas, University of Nebraska–Lincoln
Brandon A Helding, University of Nebraska-Lincoln
Amy Tankersley, University of Nebraska-Lincoln
Ana M Rivero, Seattle University
Elizabeth Hasseler, University of Nebraska-Lincoln
Dale R Baker, Arizona State University

Teachers' Instructional Vision and Practices around Promoting Productive Talk in Science Classrooms
Ozlem Akcil Okan, Florida State University
Miray Tekkumru Kisa, Florida State University

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Collaborative Learning in Remote Contexts
2:00 PM-3:30 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

"It truly benefited me!": Surprising Learning Benefits for Collaborating Education and Engineering Undergraduates During COVID
Kristie S. Gutierrez, Old Dominion University
Jennifer Kidd, Old Dominion University
Min Jung Lee, Old Dominion University
Pilar Pazos, Old Dominion University
Krishna Kaipa, Old Dominion University
Stacie I. Ringleb, Old Dominion University
Orlando Ayala, Old Dominion University

Cyber Peer Led Team Learning (cPLTL) Supports Women in Science, Engineering, Technology, and Mathematics (STEM)
Mariah Claire Maxwell, Syracuse University
Jason R. Wiles, Syracuse University

Exploring the Impact of Peer-to-Peer Interactions on Learning and Course Performance in an Online Environment (Virtual)
Anshuman Swain, University of Maryland, College Park
Marcia Shofner, University of Maryland, College Park
William F Fagan, University of Maryland, College Park
Gili Marbach-Ad, University Of Maryland, College Park

Student In-The-Moment Learning in LA-Facilitated Interactions in Undergraduate Chemistry and Physics Courses
Jessica Karch, Tufts University
Ira Caspari, Tufts University

Strand 6: Science Learning in Informal Contexts
SC-organized paper set-Informal learning in the community
2:00 PM-3:30 PM, Parq Salon D (**livestream** 1)

Presider: https://tinyurl.com/NARSTpresider

Measuring Electro Dermal Activity (EDA) to detect and identify emotional engagement during family science activities
Neta Shaby, Ben Gurion University of the Negev
Dana Vedder-Weiss, Ben-Gurion University Of the Negev, Israel

Youth Environmental Science Learning and Agency: a Unifying Lens Across Community and Citizen Science Settings
Ana I. Benavides Lahnstein, Natural History Museum, London, UK
Heidi L. Ballard, University of California, Davis, CA, USA
Maryam Ghadiri Khanaposhtani, University of California, Davis, CA, USA
Julia Lorke, IPN - Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Christothea Herodotou, Open University, Milton Keynes, UK
Annie E. Miller, California Academy of Sciences, San Francisco, CA, USA
Sasha Pratt-Taweh, Natural History Museum, London, UK
Jessie Jennewein, Natural History Museum of Los Angeles County, CA, USA
Maria Aristeidou, Open University, Milton Keynes, UK
Nashwa Ismail, Open University, Milton Keynes, UK

Youth Participatory Action Research: Positioning Science Learning as and for Community Participation (Virtual)
Steven Worker, University Of California
Martin H. Smith, University Of California
Sally Neas, Graduate Student, University of California, Davis
Car Mun Kok, 4-H Youth Development Advisor, University of California, Agriculture and Natural Resources
Dorina Espinoza, Youth, Families and Communities Advisor, University of California, Agriculture and Natural Resources

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Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Integrating Engineering into science education
2:00 PM-3:30 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Placing Empathy at the Center of Engineering: Design Thinking Embraced by Preservice Teachers for Engineering Design (Virtual)
Myunghwan Shin, California State University, Fresno
Jane J. Lee, Michigan State University

The Importance of Enactive Mastery Experiences: Teaching Engineering Self-Efficacy in a Pandemic
Matthew P. Perkins Coppola, Purdue University Fort Wayne

Using Card Sort Epistemic Network Analysis to Explore Preservice Teachers' Ideas about the Nature of Engineering
Jennifer C. Parrish, University of Northern Colorado
Jacob Pleasants, University of Oklahoma
Joshua Reid, Middle Tennessee State University
Bridget K. Mulvey, Kent State University
Erin E. Peters-Burton, George Mason University

Strand 8: In-service Science Teacher Education
SC-organized paper set-Professional Learning for STEM
2:00 PM-3:30 PM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

How some early-career STEM teachers achieved agency during the COVID-19 pandemic
Meena M. Balgopal, Colorado State University
Elizabeth Diaz-Clark, Colorado State University
Andrea Weinberg, Arizona State University
Laura B. Sample McMeeking, Colorado State University
Diane Susan Wright, Colorado State University
Danielle E. Lin Hunter, Colorado State University

STEM Labs: The Future of Professional Development for Early STEM
Hope K. Gerde, Texas A&M University
Gary E. Bingham, Georgia State University
Melody Kung, Georgia State University
Arianna Pikus, Michigan State Univsersity
Hannah Etchison, Georgia State University

What Works in K-12 STEM Professional Development Programs?: A Meta-Analysis of its Impacts on Teachers and Students
Hye Sun You, Arkansas Tech University
Sunyoung Park, California Lutheran University
Minju Hong, University of Georgia

*Teaching Science for Social Justice Using an Identity Framework (*presenting author)*
Katherine Wade-Jaimes, University of Nevada
*Rachel D. Askew, Vanderbilt University

Strand 10: Curriculum and Assessment
SC-organized paper set-Educative features and implementations of NGSS-aligned curricula
2:00 PM-3:30 PM, Granville II

Presider: https://tinyurl.com/NARSTpresider

Proposing a Framework to Analyze Educative Features in NGSS-aligned Science Curricular Materials (Virtual)
Soo-Yean Shim, University of Illinois at Urbana Champaign
Kevin Hall, University of Illinois at Urbana Champaign
Tania Jarosewich, Conseo Group
Stina Krist, University of Illinois at Urbana-Champaign
Mon-Lin Monica Ko, University of Illinois at Chicago
Barbara Hug, University of Illinois at Urbana–Champaign

Learning to Teach with Storyline Curriculum Materials
Annie Allen, University of Colorado Boulder
Clarissa Deverel-Rico, University of Colorado Boulder
William R. Penuel, University of Colorado Boulder
Carol Pazera, University of Texas Austin

Variation in the Implementation of Educative Curriculum Materials for Teacher Educators in Two Course Contexts (Virtual)
Deborah L. Hanuscin, Western Washington University
Josie C. Melton, Western Washington University
Emily J. Borda, Western Washington University
Jamie N. Mikeska, Educational Testing Service (ETS)

Inequitable opportunities to learn: Frequency of inquiry-based teaching in the United States (Virtual)
Sara J. Dozier, Stanford University

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Diverse Student Conceptions of Science and Engineering
2:00 PM-3:30 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

A Comparative Case Study Investigating Indigenous/Rural Elementary Students' Conceptions of Community Engineering
Rebekah Hammack, Montana State University
Tina Vo, University of Nevada- Las Vegas
Miracle Moonga, Montana State University
Blake Wiehe, Montana State University
Nick Lux, Montana State University
Paul Gannon, Montana State University

"We think this way as a society!": Community-level Science Literacy among ultra-Orthodox Jews (Virtual)
Ayelet Baram-Tsabari, Technion - Israel Institute of Technology
Lea Taragin-Zeller, Technion - Israel Institute of Technology
Yael Rozenblum, Technion - Israel Institute of Technology

Further Probe into Culture, Context and Scientific Explanations by Biology Students: An African Case Study (Virtual)
Peter A. Okebukola, ACEITSE- Lagos State University
Tunde Owolabi, ACEITSE-Lagos StateUniversity
Foluso O Okebukola, LASSED-Lagos State University

Students' Considerations of Epistemic Criteria and Subsequent Tensions in Mixed-gender Engineering Groups (Virtual)
Christina L. Baze, University of Arizona
María González-Howard, University of Texas at Austin

Strand 11: Cultural, Social, and Gender Issues
Symposium-Designing and Implementing Virtual Black STEM Counterspaces to Elevate Black Learners
2:00 PM-3:30 PM, Burrard

Discussant: ReAnna Roby, Vanderbilt University
Presider: https://tinyurl.com/NARSTpresider

Panelists
Terrell R. Morton, University of Missouri - Columbia
Angela White, North Carolina A&T State University

Nehemiah Mabry, STEMedia
Justin Shaifer, FascinateSci
Natalie S. King, Georgia State University
Kilan Ashad-Bishop, University of Miami, IndentifySTEM
Kelly Knight, George Mason University
Rachedia Lewis, University of Georgia
Cailisha L. Petty, North Carolina A&T State University
ReAnna S. Roby, Vanderbilt University

Strand 12: Technology for Teaching, Learning, and Research
SC-organized paper set-Fostering scientific inquiry through applications of technology
2:00 PM-3:30 PM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Cutting-edge Evolution Research Made Available to High-school Students: Assessing Students' Views of Scientific Inquiry (Virtual)
Bat-Shahar Dorfman, Weizmann Institute of Science
Amir Mitchell, Program in Systems Biology, University of Massachusetts Medical School, Worcester, Massachusetts, United States of America, Program in Molecular Medicine, University of Massachusetts Medical School, Worcester, Massachusetts, United States of America
Orna Dahan, Department of Molecular Genetics, Weizmann Institute of Science, Rehovot, Israel
Anat Yarden, Weizmann Institute Of Science

Research of Online Scientific Inquiry with/without Computer Simulation on 8th Graders' Performance of Scientific Inquiry
Ren-Jye Chou, Institute of Education National Yang Ming Chiao Tung University
Hsiao-Ching She, Institute of Education National Yang Ming Chiao Tung University
Meng Jun Chen, Institute of Education National Yang Ming Chiao Tung University

*Technology-enhanced Inquiry-based Learning: Facilitating Motivation to Learn Science Among Elementary School Students *presenting author*
Tamar Ginzburg, Technion - Israel Institute of Technology
*Miri I. Barak, Technion - Israel Institute Of Technology

Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-organized paper set-Sociocultural and socio-scientific issues
2:00 PM-3:30 PM, Stanley

Presider: https://tinyurl.com/NARSTpresider

Developing Argumentation Skills on Socio-Scientific Issues through Evaluating Digital Sources and Engaging in Reflective Discussions
Shaghig Garo Chaparian, New York University
Saouma B. Boujaoude, American University Of Beirut

Effects of Subsuming Standards-based Objectives within the SSI Framework on Content Acquisition and Global Citizenship
Karrie A. Wikman, University of South Florida

Identifying Evidence of Student Global Discourse in Socioscientific Issues Research
Mary E. Short, The George Washington University

University Biology Students' COVID-19 Decisions: The Interconnected Influence of COVID-19 Science Perceptions and Sociocultural Membership (Virtual)
Benjamin C Herman, Texas A&M University
Michael P Clough, Texas A&M University
Asha Rao, Texas A&M University
Ben Janney, Texas A&M University
Alex Sobotka, Texas A&M University
Sarah Poor, Texas A&M University
Aaron Kidd, Texas A&M University

Strand 14: Environmental Education and Sustainability
Symposium-Preparing Pre-College Students to Solve Emerging Interdisciplinary Problems: Integrating Life Science and Engineering in Classrooms
2:00 PM-3:30 PM, Parq Salon E (**livestream** 2)

Discussant: Emily A. Dare, Florida International University

Presider: https://tinyurl.com/NARSTpresider

Panelists
Christine M. Cunningham, Pennsylvania State University
Gregory J. Kelly, Pennsylvania State University
Debra Bernstein, TERC
Michael Cassidy, TERC
Selcen Guzey, Purdue University

Lynn A. Bryan, Purdue University
Nancy B. Songer, University of Utah
Kirby Whittington, The University of Utah
Erin M. Furtak, University Of Colorado
Emily A. Dare, Florida International University

Administrative Session: Publications Advisory Committee
Admin Symposium-Publishing, Reviewing, and Writing for JRST
2:00 PM-3:30 PM, Parq Salon C

Panelists
Felicia Moore Mensah, Teachers College, Columbia University
Troy Sadler, University of North Carolina at Chapel Hill
Li Ke, University of North Carolina at Chapel Hill

The Journal of Research in Science Teaching is the official journal of NARST: A global organization for improving science education through research. As a premier journal in the field with the largest impact factor, we rely on our associate editors, reviewers, and authors to facilitate convincing research consistent with the highest standards of varied theoretical traditions. In this session, we present an overview of important factors in writing and reviewing for JRST. As Editors, Troy Sadler and Felicia Moore Mensah along with Managing Editor Li Ke will explain the processes that JRST uses to facilitate peer review and make publication decisions. This will be an interactive session in which participants are encouraged to ask questions about the journal and its processes and share ideas for improving JRST. Drs. Sadler and Mensah will also provide updates on how they are realizing their vision for JRST through new initiatives, and discuss ways that the NARST community may work together for improving the journal and its outreach and support.

Multi-Strand-*Virtual Session F*
2:00 PM-3:30 PM, Parq Salon F (**livestream** 3)

Adaptation and Validation of a Questionnaire for Measuring Teachers' Views on Nature of Science (Virtual)
Rachel Takriti, United Arab Emirates University
Hassan H. Tairab, United Arab Emirates University
Sibel Erduran, University of Oxford
Ebru Kaya, Bogazici University
Najwa Alhosani, United Arab Emirates University
Lutfieh M Rabbani, United Arab Emirates University
Iman AlAmirah, United Arab Emirates University

Design of Elementary, Middle School and Secondary Science Methods Courses by Prospective Science Teacher Educators: Contents, Decision Making Process and Challenges (Virtual)
Jose M. Pavez, University of Georgia

Preservice Science Teachers' Implementation and Self-Efficacy About The Science And Engineering Practices (Virtual)
Fatma Kaya, Middle Tennessee State University
Lisa A. Borgerding, Kent State University
Shannon L. Navy, Kent State University

Tuesday, March 29, 2022
Concurrent Session # 9
3:40 pm-5:10 pm

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Modelling-based curriculum in secondary classrooms
3:40 PM-5:10 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Defining a Research Agenda for OpenSciEd Curriculum Materials
Kevin W. McElhaney, Digital Promise
Anthony Baker, Digital Promise
Babe Liberman, The Opportunity Trust
Zareen Kasad, Digital Promise
Carly Chillmon, Digital Promise
Jeremy Roschelle, Digital Promise
Tina Vo, University of Nevada- Las Vegas

Exploring Secondary Students' Explanations And Ideas On Evolution In A Modelling-based Task
Blanca Puig Mauriz, University of Santiago de Compostela
Noa Ageitos Prego,

Teachers' Use and Adaptation of a Model-based Climate Curriculum: A Three-year Longitudinal Study
Kimberly Carroll Steward, University Of Nebraska - Lincoln
Cory T. Forbes, University Of Nebraska–Lincoln
Mark Chandler , NASS GISS LAB/Columbia University

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Socioemotional Factors in Science Teaching & Learning
3:40 PM-5:10 PM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Curriculum-Aligned Instruction and Formative Assessments: Promote Students' Academic and Social-Emotional Learning (Virtual)
I-Chien Chen, Michigan State University
Tingting Li, Michigan State University
Selin Akgun,

Emily C. Adah Miller, University of Wisconsin Madison
Joseph S. Krajcik, Michigan State University
Barbara Schneider, Michigan State University

How do immigrant students' self-theories affect PISA 2018 science achievement in three Anglophone countries?
Sibel KAYA, Kocaeli University
Nurullah Eryilmaz, University of Bath, UK
Dogan Yuksel, Kocaeli University, Turkey

Reducing Anxiety and Promoting Meaningful Learning of Difficult Biology Concepts: Can CTCA be a Fix? (Virtual)
Franklin U. Onowugbeda, ACEITSE – Lagos State University
Peter A. Okebukola, ACEITSE – Lagos State University
Deborah Oluwatosin Agbanimu, ACEITSE – Lagos State University
Fred A. Awaah, University of Professional Studies Accra
Ibukunolu Adebiyi Ademola, ACEITSE – Lagos State University
Olasunkanmi Adio Gbeleyi, ACEITSE- Lagos State University
Adekunle Ibrahim Oladejo, ACEITSE – Lagos State University
Esther Oluwafunmilayo Peter, ACEITSE – Lagos State University
Adeleke Micha Ige, ACEITSE – Lagos State University

Science Learning, Theatre, and Practices of Respect: Generative Engagement through Embodying Science in Urban Elementary Classrooms (Virtual)
Rebecca Kotler, University of Illinois at Chicago
Maria Varelas, University Of Illinois At Chicago
Nathan Phillips, University Of Illinois At Chicago
Rachelle Tsachor, University Of Illinois At Chicago
Rebecca Woodard, University Of Illinois At Chicago
Amanda Diaz, University Of Illinois At Chicago
Meghan Rock, University Of Illinois At Chicago
Zachary Sabitt, University Of Illinois At Chicago

Using ML-PBL Teaching Practices to Support Student Sensemaking and Social-Emotional Learning in Elementary Science Classrooms
Selin Akgun, Michigan State University
I-Chien Chen, Michigan State University
Tingting Li, Michigan State University
Emily C. Miller, University of Wisconsin Madison
Joseph S. Krajcik, Michigan State University
Susan K. Codere, MSU CRETE for STEM

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Related Paper Set-The Influence of Religious Identity in Evolution Education
3:40 PM-5:10 PM, Parq Salon A

Discussant: M. Elizabeth Barnes, Department of Biology, Middle Tennessee State University
Presider: https://tinyurl.com/NARSTpresider

The Influence of Religious Identity in Evolution Education - An Introduction to the Related Paper Set
Daniela Fiedler, Department of Biology Education, IPN - Leibniz Institute for Science and Mathematics Education, Kiel, Germany
M. Elizabeth Barnes, Department of Biology, Middle Tennessee State University, USA

A 5-year Analysis of the Impact of Religion and Political Views on Acceptance of Evolution (Virtual)
Ryan Dunk, School of Biological Sciences, University of Northern Colorado, USA
Jason R. Wiles, Department of Biology, Syracuse University, USA

Religious Cultural Competence in Evolution Education and its Association with Changes in Student Acceptance of Evolution across the United States
M. Elizabeth Barnes, Department of Biology, Middle Tennessee State University, USA
Hayley Dunlop, Ohio State University Medical School, USA
Julie Roberts, Psychology Department, Northwestern University, USA
K. Supriya, Center for Education Innovation and Learning in the Science, University of California Los Angeles, USA
Sam Maas, School of Life Sciences, Arizona State University, USA
Baylee Edwards, School of Life Sciences, Arizona State University, USA
Yi Zheng, School of Life Sciences, Arizona State University, USA
Sara Brownell, School of Life Sciences, Arizona State University, USA

Evolution Education in Light of the Conception of Religious Science Teachers and Scientists towards Evolution and Religion (Virtual)
Reut Stahi-Hitin, Department of Science Teaching, Weizmann Institute of Science, Rehovot, Israel
Anat Yarden, Department of Science Teaching, Weizmann Institute of Science, Rehovot, Israel

Daniela Fiedler, Department of Biology Education, IPN - Leibniz Institute for Science and Mathematics Education, Kiel, Germany

Sources of Validity Evidence for Evolution Acceptance of Creationists: A Matter of Microevolution and Macroevolution (virtual)
Anna Beniermann, Department of Biology Education, Humboldt-Universität zu Berlin, Berlin, Germany
Alexandra Moormann, Museum für Naturkunde – Leibniz Institute for Research in Evolution and Biodiversity, Berlin, Germany
Daniela Fiedler, Department of Biology Education, IPN - Leibniz Institute for Science and Mathematics Education, Kiel, Germany
K. Supriya, Center for Education Innovation and Learning in the Science, University of California Los Angeles, USA
Sam Maas, School of Life Sciences, Arizona State University, USA
Baylee Edwards, School of Life Sciences, Arizona State University, USA
Yi Zheng, School of Life Sciences, Arizona State University, USA
Sara Brownell, School of Life Sciences, Arizona State University, USA

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Modelling-based curriculum in secondary classrooms
3:40 PM-5:10 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Defining a Research Agenda for OpenSciEd Curriculum Materials (Virtual)
Kevin W. McElhaney, Digital Promise
Anthony Baker, Digital Promise
Babe Liberman, The Opportunity Trust
Zareen Kasad, Digital Promise
Carly Chillmon, Digital Promise
Jeremy Roschelle, Digital Promise
Tina Vo, University of Nevada- Las Vegas

Exploring Secondary Students' Explanations And Ideas On Evolution In A Modelling-based Task
Blanca Puig Mauriz, University of Santiago de Compostela
Noa Ageitos Prego,

Teachers' Use and Adaptation of a Model-based Climate Curriculum: A Three-year Longitudinal Study
Kimberly Carroll Steward, University Of Nebraska - Lincoln
Cory T. Forbes, University Of Nebraska–Lincoln
Mark Chandler , NASS GISS LAB/Columbia University

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Faculty Perceptions of Instruction and Teaching Professional Development
3:40 PM-5:10 PM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

Development of Multidimensional Framework for Exploring Undergraduates' Conceptions of Studying Science: Student and Faculty Perspectives
Angela N. Google, University of South Alabama
Jeremiah Henning, University of South Alabama
Anna S. Grinath, Idaho State University
Grant E. Gardner, Middle Tennessee State University

Limited or Complete? Conceptions of Teaching and Learning for STEM Teaching vs. Research Faculty
Veronika Rozhenkova, University of California, Irvine
Lauren Snow, University of California, Irvine
Brian Sato, University Of California, Irvine
Natascha Trellinger Buswell, University Of California, Irvine
Managing disruptions and dilemmas in online geoscience instruction during the COVID-19 pandemic (Virtual)
Kathryn M. Bateman, Temple University
Brandin Conrath, The Pennsylvania State University
Joy Ham, Temple University
Ellen Altermatt, Utah Education Policy Center
Anne Egger, Central Washington University
Ellen Iverson, Science Education Resource Center - Carleton College
Cathryn Manduca, Science Education Resource Center - Carleton College
Eric Riggs, Humboldt State University
Kristen St. John, James Madison University
Thomas F Shipley, Temple University

Pedagogical Complexity for Engineering Professors: Learning from a Pilot of the SPARK-ENG Professional Learning Program
Mijung Kim, University of Alberta
Janelle McFeetors, University of Alberta
Kerry Rose, University of Alberta
Qingna Jin, University of Alberta
Sreyasi Biswas,
Jason Carey, University of Alberta
Janice Miller-Young, University of Alberta
Marnie Jamieson, University of Alberta
Samer Adeeb, University of Alberta

Strand 6: Science Learning in Informal Contexts
SC-organized paper set-Leveraging informal learning for formal learning
3:40 PM-5:10 PM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

Cognitive Load, Transfer, and Instructional Decision Making in Middle School STEM Integration
Angela M. Kelly, Stony Brook University
Monica Bugallo, Stony Brook University

Dioramas as a Place for Play and Early Science Learning: Exploring Teachers' Perspectives and Experiences
Jamie Wallace, American Museum of Natural History
Jenny D. Ingber, American Museum of Natural History
Sue Dale Tunnicliffe, University College London Institute of Education

Navigating Sociocultural Constraints that Influence African American Students' Participation in STEM: Deconstructing STEM Access
Lezly Taylor, Virginia Polytechnic Institute and State University
Brenda R. Brand, Virginia Tech University
George E. Glasson, Virginia Polytechnic Institute and State University
Anza Mitchell, Virginia Tech University
Takumi Sato, Virginia Tech

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Investigating Relationships between PCK Components
3:40 PM-5:10 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Influence of pre-service teachers' interactive use of content-specific knowledge components from students' point of view
Olutosin Solomon Akinyemi, University of the Witwatersrand
Adeniran G Adewusi , university of pretoria

Measuring the effects of scaffolds in a video-based learning environment for pre-service biology teachers
Marie Irmer, Biology Education, LMU Munich
Dagmar Traub, Biology Education, LMU Munich
Maria Kramer, Biology Education, LMU Munich
Christian Förtsch, Biology Education, LMU Munich
Birgit Jana Neuhaus, Biology Education, LMU Munich

Relationships Among Preservice Science Teachers' Discipline-, Domain- and Topic-Specific PCK - An Exploratory Study

Sarah Voss, Drake University
Jerrid W. Kruse, Drake University
Maryann Huey, Drake University

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Investigating Relationships between PCK Components
3:40 PM-5:10 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Influence of pre-service teachers' interactive use of content-specific knowledge components from students' point of view
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Relationships Among Preservice Science Teachers' Discipline-, Domain- and Topic-Specific PCK - An Exploratory Study
Sarah Voss, Drake University
Jerrid W. Kruse, Drake University
Maryann Huey, Drake University

Strand 8: In-service Science Teacher Education
SC-organized paper set-Personal Factors Shaping Teacher Growth
3:40 PM-5:10 PM, Granville II

Presider: https://tinyurl.com/NARSTpresider

Defining Teacher Ownership: A Science Education Case Study to Dertarmine Categories of Teacher Ownership
Ana Valdmann, Scientist
Miia Rannikmae, Professor
Jack Holbrook, Professor

Self-regulated Learning Professional Development for Science Teachers: A Systematic Literature Review (Virtual)
Daniel K. Capps, University of Georgia

Hong Tran, UGA
Timothy J. Cleary,

What keeps rural science teachers in rural schools?: Teacher professional resilience
Diane Susan Wright, Colorado State University
Meena M. Balgopal, Colorado State University

A Review of Literature on Professional Learning for Science Teachers of Students with Learning Disabilities in the K-12 Setting
Sahrish S. Panjwani, University of Georgia

Strand 10: Curriculum and Assessment
SC-organized paper set-Methodological approaches to designing science assessment tasks
3:40 PM-5:10 PM, Parq Salon D (**livestream** 1)

Presider: https://tinyurl.com/NARSTpresider

Designing for Engineering: A Model for Integrating Engineering and Science NGSS Middle School Benchmark Assessments
Maia K. Binding, UC Berkeley - Lawrence Hall of Science
Lauren Brodsky, The Learning Design Group

Exploring the Comparability of Multiple-Choice and Constructed-Response Versions of Scenario-Based Assessment Tasks
Cari F. Herrmann Abell, BSCS Science Learning
Joseph M. Hardcastle, BSCS
George E. De Boer, American Association for the Advancement Of Science - Project 2061

Mining the Potential of "Wrong Answers" in Item Pairs to Describe Students' Alternative Thinking (Virtual)
Jim A Minstrell, Facet Innovations
Philip Hernandez, Stanford University
Min Li, University Of Washington
Ruth A. Anderson, FACET Innovations, LLC
Maria Araceli Ruiz-Primo, Stanford University
Xiaoming Zhai, University of Georgia
Dongsheng Dong, amazon
Klint Kanopka, Stanford University

Bayesian versus Frequentist Estimation for Item Response Theory (IRT) Models of Interdisciplinary Science Assessment
Hye Sun You, Arkansas Tech University
Seounghun Lee, University of Texas at Austin

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Gender and Sexual Identity Inclusivity in STEM
3:40 PM-5:10 PM, Burrard

Presider: https://tinyurl.com/NARSTpresider

Don't forget about the LGBTQIA+: Toward a more robust queer theory in science education
Ashley N. Jackson, University Of Michigan
Darrell Allen, University Of Michigan

Education Research Experiences for Pre-Health Students Enhance Clinical Skills and Develop Awareness of LGBTQ+ Microaggressions (Virtual)
Laura A Weingartner, University of Louisville School of Medicine
Emily J Noonan, University of Louisville School of Medicine
M. Ann Shaw, University of Louisville School of Medicine
Linda C. Fuselier, University of Louisville

Supporting Secondary Science Teachers' Awareness of Gender Variance and Creation of Gender-Inclusive Lesson Plans
Stephanie S Eldridge, University of Georgia
Georgia Hodges, University Of Georgia

Gender Atypical? Examining the Gender Identities of Women in Engineering (Virtual)
Ursula Nguyen, The University of Texas at Austin
Catherine Riegle-Crumb, University of Texas

Strand 11: Cultural, Social, and Gender Issues
Related Paper Set-Raciolinguistic Perspectives in Science Education
3:40 PM-5:10 PM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Who gets to sound "like a scientist"? Scientific language as a process of authentication
Quentin C. Sedlacek, Southern Methodist University

Language ideologies in science course materials
Catherine Lemmi, California State University, Chico

Talking beyond science: Deconstructing whiteness and hegemonic language ideologies in preservice science teacher education
Caroline T. Spurgin, UC Santa Cruz
Sara Tolbert, Te Whare Wananga O Waitaha University of Canterbury

Language-as-race: Segregated science education and why it matters for efforts to include 'English learners' today (Virtual)

Kathryn L. Kirchgasler, University of Wisconsin–Madison
Cynthia T. Baeza, University of Wisconsin–Madison

Strand 12: Technology for Teaching, Learning, and Research
SC-organized paper set-Implementing Personalized Digital Platforms to Enhance Student Learning During the Pandemic
3:40 PM-5:10 PM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

Learning Analytics in a Designed Learning Platform During the Covid-19 Pandemic (Virtual)
Michael Adelani Adewusi, Lagos State University (ACEITSE), Ojo

Mobile Learning in the Physics Classroom – Should Students Bring or Schools Provide Smartphones? (Virtual)
Daniel Laumann, University of Münster
Malte Ubben, University of Münster
Susanne M. Heinicke, University of Münster
Stefan Heusler, University of Münster

The influence of a personalized online environment for chemistry teaching and learning on students' outcomes
Ehud Aviran, The Weizmann Institute Of Science
Ron Blonder, The Weizmann Institute Of Science

Using an Adaptive Learning System Teaching Engineering Students: Challenges and Opportunities
Frikkie George, Cape Peninsula University of Technology
Keith R. Langenhoven, University Of the Western Cape
Ekaterina Rzyankina, Cape Peninsula University of Technology

Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-organized paper set-Nature of Science in K-12 Education
3:40 PM-5:10 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

Middle School Students' Understanding of Nature of Science and Their Metacognitive Awareness
Dilara Goren, Bogazici University
Ebru Kaya, Bogazici University

Structuralist or inferential: Which better helps to understand children comprehension of scientific representations?

Fernando Flores-Camacho, Universidad Nacional Autónoma de México
Leticia Gallegos-Cázares, Universidad Nacional Autónoma de México

Students' Understandings about Nature of Science and Their Argumentation Skills
Rola Khishfe, American University of Beirut

Teaching K12 Engineering — Educator's Views of Practices, Nature, and Knowledge (Virtual)
Brian D Hartman, Walla Walla University
Randy L. Bell, Oregon State University

Strand 15: Policy, Reform, and Program Evaluation
Related Paper Set-Supporting Expansive Conceptions of Science Teaching and Learning for Equity
3:40 PM-5:10 PM, Parq Salon E (**livestream** 2)

Discussant: Tiffany Neill, Oklahoma State Department of Education

Presider: https://tinyurl.com/NARSTpresider

Design Principles, Change Theory, and Infrastructuring Needs for Implementation
Abby Rhinehart, University of Washington
Deb L. Morrison, University Of Washington
Philip L. Bell, University Of Washington
Maya Garcia, Colorado Department of Education
Tiffany Neill, Oklahoma State Department of Education

Science Education Leaders' Sense-making and Noticing for Equity
Riley Ceperich, University of California LA
Trang Tran, University of Colorado Boulder
Yamileth Salinas Del Val, University of Colorado Boulder
Kristen Davidson, University of Colorado Boulder
A Landscape Survey Analysis of the Potential for Equity-focused Science Education across the PK-12 Education System
Philip L. Bell, University Of Washington
Abby Rhinehart, University of Washington Seattle
Melissa Campanella, University of Colorado Boulder

*Supporting Science Teachers in Using Student Experience Data to Support More Equitable Participation in Science Classrooms * presenting authors*
Ali Raza, University of Colorado Boulder
*William R. Penuel, University of Colorado Boulder
*Yamileth Salinas Del Val, University of Colorado Boulder

Administrative Session: Publications Advisory Committee
Admin Symposium-How to Get Your Research Published in Science Education Journals
3:40 PM-5:10 PM, *(100% Virtual)*

https://ets.zoom.us/j/6566675605?pwd=eDBYUTNzelgzN2lYdVNWM1ZoTVpZQT09

Meeting ID: 656 667 5605
Passcode: 5R@0V

Organizers
Saouma B. Boujaoude, American University Of Beirut
Dante Cisterna, Educational Testing Service
Ibrahim H. Yeter, National Institute of Education, Nanyang Technological University

Journal of Research in Science Teaching (JRST)
Felicia Mensah, Columbia University
Troy Sadler, University of North Carolina Chapel Hill

Science Education
Sherry Southerland, Florida State University
John Settlage, University of Connecticut

School Science and Mathematics (SSM)
Bridget Miller, University of South Carolina
Christie Martin, University of South Carolina

Journal of Science Teacher Education (JSTE)
Geeta Verma, University of Colorado, Denver
Todd Campbell, University of Connecticut
Wayne Melville, Lakehead University

Journal of Science Education and Technology (JSET)
Kent Crippen, University of Florida

Studies in Science Education (SSE) (Virtual)
Lucy Avraamidou, University of Groningen
Justin Dillon, University of Exeter
Science and Education (Virtual)
Sibel Erduran, Oxford University

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

International Journal of Science Education (IJSE)
Gail Jones, North Carolina State University
Jan van Driel, The University of Melbourne
Research in Science Education (RSE)
Angela Fitzgerald, University of Southern Queensland
Kim Nichols, University of Queensland

Computers and Education
Rachelle S. Heller, George Washington University

Journal of the Learning Sciences
A. Susan Jurow, University of Colorado, Boulder, USA
Jianwei Zhang, University at Albany, State University of New York, USA

Canadian Journal of Science, Mathematics and Technology Education
Doug McDougall, OISE, University of Toronto, Canada

Asia-Pacific Science Education
Sonya Martin, Seoul National University

CBE-Life Science Education
Kimberly Tanner, San Francisco State University
Jeff Schinske, Foothill College

Tuesday 3-29-2022

Administrative Session: Awards Committee
Distinguished Contributions to Science Education through Research Award Panel, A Celebration of NARST Award Recipients: A Discussion of the Future of Science Education
3:40 PM-5:10 PM, Parq Salon F (**livestream** 3)

Presider: Noemi Waight, University at Buffalo

The 2022 recipients of the NARST Distinguished Contributions to Science Education through Research Award will present on their career scholarship.

DISTINGUISHED CONTRIBUTIONS TO SCIENCE EDUCATION THROUGH RESEARCH AWARD (DCRA)

Dr. Fouad Abd-El-Khalick
Dean and Professor of Science Education, School of Education,
University of North Carolina at Chapel Hill

Dr. M. Gail Jones
Alumni Distinguished Graduate Professor, College of Education,
North Carolina State University

Tuesday, March 29, 2022
Concurrent Session # 10
5:20 pm-6:50 pm

Strand 1: Science Learning: Development of student understanding
SC-organized paper set-Inscriptions in Science Learning
5:20 PM-6:50 PM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

A novel method for measuring problem-definition progression of middle schoolers: Use of student artifacts 1
Ferah Ozer, The University of North Carolina at Chapel Hill
Nihal Dogan, Bolu Abant Izzet Baysal University

Narrowing the Gap Between Experiments, Texts and Pictures – Investigation of an Extended Contiguity Principle (Virtual)
Paul Schlummer, Institute of Physics Education (IDP) at the University of Münster
Stefan Heusler, Institute of Physics Education (IDP) at the University of Münster
Daniel Laumann, Institute of Physics Education (IDP) at the University of Münster

Science Notebooks in Preschool Education
Elena Calderón-Canales, Instituto de Ciencias Aplicadas y Tecnología, Universidad Nacional Autónoma de México.
Leticia Gallegos-Cázares, Instituto de Ciencias Aplicadas y Tecnología, Universidad Nacional Autónoma de México.
Fernando Flores-Camacho, Instituto de Ciencias Aplicadas y Tecnología, Universidad Nacional Autónoma de México.

Students' Sensemaking Related to Mathematical Equations in A Biology Classroom (Virtual)
Desi, University of Minnesota
Cuc Vu,
Gillian Roehrig, University of Minnesota
Anita Schuchardt, University of Minnesota

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Early Childhood & Elementary Science Teaching & Learning
5:20 PM-6:50 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Australian Primary School Students' Understandings about the Nature of Scientific Inquiry
Patricia D Morrell, The University of Queensland
Jana Visnovska, The University of Queensland
Jodie Miller, The University of Queensland

Elementary Teachers' Agency for Teaching Science and Engineering when Working Within and Against School Structures
Alison Mercier, University of Wyoming

Using Photovoice to Understand Children's Experiences and Environmental Science Learning at a Nature Preschool
Laura Dell, University of Cincinnati

Using the Scientific and Engineering Practices Observation Protocol (SciEPOP) to Explore Play-based Early Learning Environments
Alison R. Miller, Bowdoin College
Lauren P. Saenz, Bowdoin College

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Admin Symposium-Enhancing Science and Engineering in Preschool through Fifth Grade: A National Academies Consensus Study
5:20 PM-6:50 PM, Parq Salon D (**livestream** 1)

Panelists
Elizabeth A. Davis, University of Michigan
Amy Stephens, National Academies of Sciences, Engineering, and Medicine
Heidi B. Carlone, Vanderbilt University
Eve Manz, Boston University School of Education
Carrie Tzou, University of Washington Bothell
Carla Zembal-Saul, Penn State University
Lucy Avraamidou, University Of Groningen
Tia C. Madkins, The University of Texas At Austin
Felicia M. Mensah, Teachers College, Columbia University

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Pedagogical content knowledge for secondary science teachers
5:20 PM-6:50 PM, Parq Salon E (**livestream** 2)

Presider: Andrea Moeller, Unversity of Vienna

Investigating a Chemistry Teacher's modeling-PCK in the Periodic Table Modeling-Based Instruction (Virtual)
Ya-Ping Tsao, National Taiwan Normal University Graduate Institute of Science Education
Mei-Hung Chiu, National Taiwan Normal University Graduate Institute of Science Education
Mao-Ren Zeng, National Taiwan Normal University Graduate Institute of Science Education
Yen-Tzu Liao, National Taiwan Normal University Graduate Institute of Science Education
Sin-Yun Syu, National Taiwan Normal University Graduate Institute of Science Education
Li-Ya Wang, National Taiwan Normal University Graduate Institute of Science Education

Pre-Service Biology Teachers' PCK about Scientific Reasoning (Virtual)
Leroy Großmann, Freie Universität Berlin
Merryn Dawborn-Gundlach, University of Melbourne
Jan H. Van Driel, University Of Melbourne
Dirk Krüger, Freie Universität Berlin
Moritz Krell, Leibniz Institute for Science and Mathematics Education (IPN)

The impact of assessment change on teachers' orientations and PCK for high school laboratory practices
Vanessa Kind, Durham University
Helen Cramman, Durham University
Helen F Gray, Durham University

The topic specific PCK of videos on the big idea, "What is chemical equilibrium" (Virtual)
Marissa S. Rollnick, Wits University
Stephen A. Malcolm, University of the Witwatersrand

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Learning About Science, Engineering and Social Issues
5:20 PM-6:50 PM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

College Students' Epistemological Beliefs about Medical Science and Trust in Science and Scientists during COVID-19 (virtual)
Lisa A. Borgerding, Kent State University
Bridget K. Mulvey, Kent State University

Engineering students' self-efficacy and civic responsibility in a social innovation curriculum
Tiffanyrose Sikorski, George Washington University
Erica Wortham, George Washington University

Investigating graduate student and instructors' course experiences "Teaching and Learning Science for Social Justice"
Iesha Jackson, University of Nevada- Las Vegas
Tina Vo, University of Nevada- Las Vegas
Sabrina Barakat, UNLV
Nicole J. Thomas, University of Nevada, Las Vegas
Sarah York, UNLV
Abigale Ly, UNLV

Utilizing argument-driven inquiry with scaffolding to improve socioscientific argumentation in undergraduate students (Virtual)
Sarah Krejci, Bethune-Cookman University
Hector N Torres, Bethune-Cookman University
Raphael D Isokpehi, Bethune-Cookman University
Dana L Zeidler, University of South Florida

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Creating spaces and resources for high quality learning in pre-service teacher education
5:20 PM-6:50 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Examining Virtual Rehearsals and Practice Science Teaching as Support Systems for Rural Elementary Teacher Residents
Stephen L. Thompson, University of South Carolina
Amber Adgerson, University of South Carolina

Finding high-quality mentor feedback for science pre-service teachers
Caroline Hadley Long, University of Washington
Mark Windschitl, University Of Washington
Karin Lohwasser, University of California, Santa Barbara
Soo-Yean Shim, University of Illinois
Tammy Q. Tasker, Western Washington University

Learning to Teach During a Pandemic: Preservice Secondary Science and Mathematics Teachers' Use of Resources
Matthew D. Bennett, University of California, Santa Barbara
Valerie Valdez, University of California, Santa Barbara
Cameron Dexter-Torti, University of California, Santa Barbara

Donald McNish, University of California, Santa Barbara
Liliana Garcia, University of California, Santa Barbara
T. Royce Olarte, University of California, Santa Barbara
Sarah Hough, University of California, Santa Barbara
Sarah A. Roberts, University of California, Santa Barbara
Julie A. Bianchini, University of California, Santa Barbara

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Toward inclusive and just outcomes for diverse learners
5:20 PM-6:50 PM, Stanley

Presider: https://tinyurl.com/NARSTpresider

Challenges with Inclusive Teaching at Vocational Schools in Germany
Simone Rueckert, University of Duisburg-Essen
Helena Van Vorst, University of Duisburg-Essen

Cultivating Discourse of English Learners During the Enactment of Cognitively Demanding Work
Walter Aminger, University Of California, Santa Barbara Nevada State College

Preservice Teacher Noticing, Interpreting, Responding to Students' Sensemaking Resources for Equitable Access to Science Understanding
Judith A. Cooper-Wagoner, University of Arizona
Kristin L. Gunckel, University Of Arizona

The Paradox of Dedication: Agonistic interviews on preservice science teacher students' choice-narratives
Jeppe Langkjær, University College Copenhagen
Bjørn Friis Johannsen, University College Copenhagen
Maria Rejkjær Holmen, University College Copenhagen

Strand 8: In-service Science Teacher Education
SC-organized paper set-Teacher Learning and Practice during the Pandemic
5:20 PM-6:50 PM, Granville II

Presider: https://tinyurl.com/NARSTpresider

Exploring Teachers' Experience and Implementation of the Science and Engineering Practices in Different Instructional Contexts
Cheng-Wen He, University of Georgia
Hong H. Tran, UGA
Yamil Ruiz,
Shaugnessy McCann,
Brooke A. Whitworth, Clemson University

Julie A. Luft, University of Georgia

Identification and characterization of the essential knowledge domains for online chemistry teaching during Covid-19 pandemic
Itsik Aroch, The Weizmann Institute of Science
Dvora Katchevich, The Weizmann Institute Of Science
Lili Orland?Barak, University of Haifa
Ron Blonder, The Weizmann Institute Of Science

The Experiences of Biology Teacher Coordinators Participating in a VPLC During the COVID-19 Crisis (Virtual)
Odelia Schrire, Technion
Dina Tsybulsky, Technion - Israel Institute Of Technology
Christine Ipsen, DTU

The role of professional learning communities (PLCs) in supporting chemistry teachers during the COVID-19 crisis (Virtual)
Anat Shauly,
Gabriella Shwartz, Dr.
Shirly Avargil, Dr.

Strand 10: Curriculum and Assessment
SC-organized paper set-Teacher collaborative design of three-dimensional performance assessments
5:20 PM-6:50 PM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

CoFee – Computer-based feedback design for written reflections in pre-service science teacher education
Peter Wulff, University of Potsdam
Lukas Mientus, University of Potsdam
Anna Nowak, University of Potsdam
Andreas Borowski, University of Potsdam

Examining the impact of using pilot data to support teachers in designing high quality three-dimensional performance assessments
Cathy Zozakiewicz, SNAP/SCALE
Jill A. Wertheim, Stanford University

Supporting Teachers' Capacity to Design for Coherent Assessment of Multidimensional Science Learning
Samuel Severance, University of California, Santa Cruz
Guadalupe Martinez, University of California, Santa Cruz

Teacher Agency in a Responsive Co-Design Process of 3D Performance Assessments
Jill Wertheim, Stanford Center for Assessment, Learning, and Equity (SCALE)
Miray Tekkumru Kisa, Florida State University
Ozlem Akcil Okan, Florida State University

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Innovation in Conceptual and Methodological Research Approaches
5:20 PM-6:50 PM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Art-based Methods and Signs of Science Capital: Approaching Young Children's Experiences and Relation to Science
Katia Bill Nielsen, Universtity of Copenhagen
Ene Ernst Hoppe, University of Copenhagen
Henriette T. Holmegaard, University Of Copenhagen

Ethnodance as a Critical Identity Tool for Black Students' Science Identity Construction
Mindy J. Chappell, University of Illinois at Chicago

Patchworking Critical and Cultural-Historical Activity Theoretical Analytics for Research in Science Education
Caroline T. Spurgin, UC Santa Cruz
Alexandra I. Race, UC Santa Cruz
Doris B. Ash, Univeristy of California Santa CruzC Santa Cruz

Inclusive Science Education: Sheltered Instruction for English Language Learner
Hajira Nusret,
Saiqa Azam, Memorial University Of Newfoundland

Strand 12: Technology for Teaching, Learning, and Research
SC-organized paper set-Multimedia, Artificial Intelligence, and Augmented Reality in Teaching and Learning
5:20 PM-6:50 PM, Burrard

Presider: https://tinyurl.com/NARSTpresider

A Bibliometric Analysis of Trends and Issues in Educational AI
Brian Abramowitz, University of Florida
Minyoung Lee, University of Florida
Pavlo Antonenko, University of Florida

An Eye-Tracking Study On Learning Representations In Organic Chemistry With Dynamic Signals

In Instructional Videos
Marc Rodemer, IPN - Leibniz Institute for Science and Mathematics Education
Marlit A. Lindner, IPN - Leibniz Institute for Science and Mathematics Education
Julia Eckhard, Justus-Liebig-University Giessen
Nicole Graulich, Justus-Liebig Universität Giessen
Sascha Bernholt, IPN - Leibniz Institute for Science and Mathematics Education

Exploring Teachers' Conceptions of Artificial Intelligence in K-12 Science Education
Brian Abramowitz, University of Florida
Pavlo D. Antonenko, University Of Florida
Stephanie Killingsworth, University of Florida
Bruce MacFadden, University of Florida
Sadie Mills, University of Florida

Topic specific differences in supporting organic chemistry learning augmented reality based (Virtual)
Sebastian Keller, University of Duisburg-Essen
Sebastian Habig, FAU Erlangen-Nürnberg
Stefan Rumann, University Of Duisburg-Essen

Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-organized paper set-Nature of Science in Teacher Education
5:20 PM-6:50 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

"It's a lesson with no answer!": Understanding preservice teachers' lesson development using history of science (Virtual)
Wonyong Park, University of Southampton
Sibel Erduran, University of Oxford
Jinwoong Song, Seoul National University
Minchul Kim, Kongju National University

What is Physics? Considering Teachers' Epistemic Beliefs about Physics Knowledge
Ellen Watson, Brandon University

Teaching of NOSI in Outdoor Learning Environments in the Period of Covid-19 Pandemic (Virtual)
Eda Erdas Kartal, Kastamonu University
Gunkut Mesci, Giresun University

Pre-Service Chemistry Teacher's Beliefs regarding the use of Experiments and Nature of Science
Janne-Marie Bothor, University of Kassel
David S. Di Fuccia, University of Kassel

Strand 15: Policy, Reform, and Program Evaluation
SC-organized paper set-Standards
5:20 PM-6:50 PM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

Developing a Framework for Identifying Key Innovations in Novel Science Programs: A Learning-by-Making Case Study
Benjamin S Mahrer, WestEd
Gary Weiser, WestEd
Linlin Li, WestEd
Laura Peticolas, Sonoma State University
Lynn Cominsky, Sonoma State University

Searching for Nature of Engineering in the Framework for K-12 Science Education (Virtual)
Hasan Deniz, University of Nevada Las Vegas
Erdogan Kaya, George Mason University
Ezgi Yesilyurt, Weber State University

Private Industry's Push and Pull: Is Computer Science Really for All?
Stefanie L. Marshall, University of Minnesota- Twin Cities
Ain Grooms, University of Iowa

Social Covenants as Contextual Mitigating Factors (CMFs)
Katie L Brkich, Georgia Southern University
Alejandro J. Gallard, Georgia Southern University
Wesley Pitts, Lehman College, CUNY
S. Lizette Ramos, University of Guadalajara
Maria A Rodriguez, University of Texas Rio Grande Valley

Administrative Session: Research Committee
Admin Symposium-Supporting and Advancing Science Education Research Practice through Community Discussions
5:20 PM-6:50 PM, Kitsilano Ballroom D

Panelists
Stanley M. Lo, University of California San Diego
Francesca A. Williamson, Indiana University School of Medicine
Glenn R. Dolphin, Syracuse University
Joe Taylor, University of Colorado Colorado Springs
Scott Cohen, Georgia State University
Jordan L. Henley, University of Georgia
Mohammed Estaiteyeh, Western University
Theila Smith, University of Groningen
Robert M. Talbot, University of Colorado Denver

Tuesday 3-29-2022

Administrative Session: Awards Committee

Early Career Research Award [ECRA], Outstanding Dissertation Research Award [ODRA], and NARST Fellows Award Panel: ***A Celebration of NARST Award Recipients: A Discussion of the Future of Science Education, Session 2***

5:20 PM-6:50 PM, Parq Salon F (**livestream** 3)

Presider: Noemi Waight, University at Buffalo

Early Career Research Award (ECRA)

Dr. María González-Howard,
Assistant Professor,
The University of Texas at Austin

Dr. Laura Zangori,
Associate Professor,
University of Missouri

Tuesday 3-29-2022

Outstanding Doctoral Research Award (ODRA)

Dr. Won Jung Kim,
Assistant Professor,
Santa Clara University

NARST Fellow Award

Dr. Peter A. Okebukola,
Distinguished Professor of Science and Computer Education,
Lagos State University

Equity and Ethics Dinner (registration and prepay required)
7:15 pm-10:00 pm **Canceled**

Wednesday March 30th

Committee Meetings (if needed)
7:30 am-8:30 am

Committee	Room
Awards	Kitsilano D
Elections	Parq Salon B
Equity and Ethics	Parq Salon C
External Policy and Relations	Kitsilano Ballroom A
Graduate Students	Kitsilano Ballroom B
International	Kitsilano Ballroom C
Membership	Parq Salon D
Program [strand coordinators]	Parq Salon A
Research	Stanley
Social media, Website, Communications	Cambie

This time is reserved for those committees needing second meeting during the conference. Committee meetings are open to the membership.

Wednesday, March 30, 2022
Concurrent Session # 11
8:45 am-10:15 am

Strand 1: Science Learning: Development of student understanding
SC-organized paper set-Students' Conceptual Development
8:45 AM-10:15 AM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

Certain about uncertainty: quality of students' justifications in comparing data sets
Karel Kok, Humboldt-University
Burkhard Priemer, Humboldt-University

Constructing Science Concept Development: How Design Artifact Changes Reveal Mental Model Changes in Young Children
Christine McGrail, University of Massachusetts Amherst
Jeanne Brunner, University of Massachusetts Amherst
Martina Nieswandt, University of Massachusetts Amherst

How different approaches to science teaching influence vertical knowledge-linking within the concept of energy (Virtual)
Dennis Dietz, Freie Universität Berlin
Claus Bolte, Freie Universtaet Berlin

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Equity & Social Justice in Science Teaching & Learning
8:45 AM-10:15 AM, Burrard

Presider: https://tinyurl.com/NARSTpresider

A Case for Humane Genetics Education: How Students Used Genetics Knowledge to Argue About a Racial Disparity
Dennis M. Lee, BSCS Learning Sciences
Brian M. Donovan, BSCS
Monica Weindling, BSCS Science Learning
Awais Syed, BSCS Science Learning

Equity Considerations in Earth Science Out-of-Field Teaching and Student Performance (Virtual)
Christine P. Schlendorf,
Angela M. Kelly,
Robert Krakehl, Stony Brook University

Multimodal revoicing: Embodied student resources to support students' explanations of science phenomena
Samuel Lee, Boston College
Kevin Cherbow, Florida State University
Katherine L. McNeill, Boston College

Toward a community of civic practice: a case study on service-based experiential learning in support of community driven science engagement
John R. Ruppert, Saint Peter's University
Jennifer Ayala, Saint Peter's University
Yosra Badiei, Saint Peter's University
Masiel C. Infante, Saint Peter's University
Jeanette Wilmanski, Saint Peter's University

Towards an Inclusion of All in Lab Courses – The Case of a Blind Student
Stefanie Lenzer, Institute for Science Education, Leibniz University Hannover
Marvin Roski, Institute for Science Education, Leibniz University Hannover
Andreas Nehring, Institute for Science Education, Leibniz University Hannover

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Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Related Paper Set-Elementary Preservice Teachers Learning to Support Equitable Sensemaking
8:45 AM-10:15 AM, Parq Salon C

Discussant:
Presider: https://tinyurl.com/NARSTpresider

Elementary Preservice Teachers Investigating Local Phenomena and Problems: Envisioning Opportunities for Equitable Student Sensemaking (Virtual)
Anna Maria Arias, Kennesaw State University
Jessica Stephenson Reaves, Kennesaw State University

An Exploration of Learning Science Subject Matter Knowledge Through Teaching in a Methods Course
Ryan Nixon, Brigham Young University
Sarah J. Fick, Washington State University

Preservice Elementary Teachers' Recognition of Resources Students Bring to Science Learning
Sarah J. Fick, Washington State University
Stephany RunningHawk Johnson, Washington State Unversity

Preservice Elementary Teachers Noticing Features of Classroom Instruction that Support Equitable Sensemaking
Amanda Benedict-Chambers, Missouri State University
Carrie-Anne Sherwood, Southern Connecticut State University
Okhee Lee, New York University

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Secondary science teachers' learning and noticing of student thinking
8:45 AM-10:15 AM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

An Exploratory Study of the Epistemic Goals of a First-Year Science Teacher
Todd L. Hutner, The University of Alabama

Beyond Excellence In Science Teaching Practice: Virtuosity In Science Teaching And Developing Virtuoso Teachers
Emrah Ozyurek,

Teacher noticing for epistemic agency: What cues teachers to open up space for student sensemaking?
Stina Krist, University of Illinois at Urbana-Champaign
Nitasha Mathayas, Indiana University
Soo-Yean Shim, University of Illinois
Susan B. Kelly, California State University Chico
Dan Voss, Dallas Center-Grimes High School
Nessrine Machaka, University of Illinois At Urbana - Champaign
Elizabeth B. Dyer, University of Tennessee, Knoxville

What Beginning and Experienced Secondary Science Teachers Notice in Videos of Classroom Instruction
Julie A. Luft, University of Georgia
Yuxi Huang, University of Georgia
Shelby Watson, Center for Mathematics and Science Education
Harleen Singh, University of Georgia
Hatice Ozen Tasdemir, The University of Georgia
Brooke A. Whitworth, Clemson University
Yamil Ruiz, Clemson University
Hong Tran, UGA
Shaugnessy McCann, University of Georgia
Cheng-Wen He, University of Georgia

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Student Learning in Remote Contexts: Labs and Research
8:45 AM-10:15 AM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

A Meta-Study of Science Laboratories at a Distance
Mercy Ogunsola-Bandele, National Open University Of Nigeria
Dietmar Kennepohl, Athabasca University, Canada

Student Perspectives of Remote Participation in Authentic Research in an Undergraduate Ecology Laboratory Course
Stephen R. Burgin, University Of Arkansas
Adam M Siepielski, University of Arkansas

The Impact of Online STEM Teaching and Learning During COVID-19 on Underrepresented College Students' Self-Efficacy and Motivation (Virtual)
Sami Kahn, Princeton University
Janet Vertesi, Princeton University

The Varied Student Experience with Transitioning to Mandatory Online Chem Lab
Joseph V Watts, University of Florida
Corey A. Payne, University Of Florida
Kent J. Crippen, University of Florida
Lorelie Imperial, University of Florida
Melanie Veige, University of Florida

Strand 6: Science Learning in Informal Contexts
Symposium-Innovative approaches to theorizing and studying family STEM learning
8:45 AM-10:15 AM, Kitsilano Ballroom C

Discussant: Tali Tal, Technion
Presider: https://tinyurl.com/NARSTpresider

Panelists
Neta Shaby, Ben Gurion University of the Negev
Dana Vedder-Weiss, Ben-Gurion University Of the Negev, Israel
Scott A. Pattison, TERC
Smirla Ramos-Montañez, TERC
Irit Vivante, Ben Gurion University
Lucy R. McClain, Pennsylvania State University
Adam V. Maltese, Indiana University
Amber Simpson, Indiana University
Tali Tal, Technion

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Tools for Assessment in Preservice teacher learning
8:45 AM-10:15 AM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

An Evaluation Proposal for Pre-Service Primary Teachers: Self-Regulation of Learning and Emotions
Francisco José Castillo Hernández, University of Almeria
María Rut Jiménez Liso, University of Almeria
María Martínez Chico, University of Almeria
Rafael López-Gay, University of ALmeri

Are Knowledge and Acceptance of Evolution Aligned among Jewish Religious Preservice Science Teachers? (Virtual)
Merav Siani, Weizmann Institute of Science Herzog College
Anat Yarden, Weizmann Institute Of Science

Investigating Pre-service Science Teachers' Modeling Metaknowledge with Open-Ended Questions and Diagrams
Paul Engelschalt, Humboldt-Universität zu Berlin
Tom Bielik, Freie Universität Berlin
Moritz Krell, IPN - Leibniz Institute for Science and Mathematics Education, Kiel, Germany
Dirk Krüger, Freie Universität Berlin
Annette Upmeier Zu Belzen, Humboldt-Universität zu Berlin

Strand 8: In-service Science Teacher Education
SC-organized paper set-Teachers Working towards Inclusive Classrooms
8:45 AM-10:15 AM, Granville II

Presider: https://tinyurl.com/NARSTpresider

"I wanted to break the pencil": The Teacher's Role in Reframing Moments of Epistemic Vexation
Claudia Hagan, Georgia State University
Sierra L. Morandi, Florida State University
Victor Kásper, Florida State University
Sherry A. Southerland, Florida State University

Exploring How Engineering Instruction Supports Culturally Relevant Teaching Practices
Amanda M. Gunning, Mercy College
Meghan E. Marrero, Mercy College
Kristen V. Larson, Mercy College

The Interplay Between Scientific Evidence, Diversity and Dialogic Pedagogy
Nasser Mansour, Qatar University

Using Redirections to Examine Responsiveness to Student Thinking in Secondary Science Classrooms
Lauren N. Emery, San Diego State University

Strand 10: Curriculum and Assessment
Symposium-AI-Based Innovative Assessments in Science
8:45 AM-10:15 AM, Parq Salon E (**livestream** 2)

Discussant: Joseph Krajcik, Michigan State University
Presider: https://tinyurl.com/NARSTpresider

Panelists
Xiaoming Zhai, University of Georgia
Joseph S. Krajcik, Michigan State University
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel
Holly Amerman, University of Georgia
Changzhao Wang,
Marcus Kubsch, IPN - Leibniz Institute for Science and Mathematics Education
Mei-Hung Chiu, National Taiwan Normal University
AUSTIN HEIL, University of Georgia
Gary Weiser, WestEd
Ji Shen, University Of Miami

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Resistance and Resilience of Black Women and Black Students
8:45 AM-10:15 AM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

"Radical Openness and Possibility": Black Women's Resistance Strategies to the Oppressive Culture of STEM
Ekaete Udoh, University of Missouri
Michele Williams, University of Missouri
Terrell R. Morton, University of Missouri - Columbia

Counterstories of Black Women About What it Means to be a STEM Person
Amal Ibourk, Florida State University
Roxanne M. Hughes, Center for Integrating Research and Learning, NHMFL / FL State University
Lauren Wagner, Florida State University

Good Trouble: Interrogating the Definition of Black Resilience in STEM Education
Takeshia Pierre, University of Florida

Creating an Experience of Belonging Within Science: Exploring Science Identity Development in a Counterspace
Ivanna Pengelley, Florida State University
Amal Ibourk, Florida State University
Roxanne M. Hughes, Center for Integrating Research and Learning, NHMFL / FL State University

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Strand 12: Technology for Teaching, Learning, and Research
SC-organized paper set-Reinforcing and understanding effective instructional methods
8:45 AM-10:15 AM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Advancing Teachers' Geospatial TPACK: Three Universities' Professional Development Initiatives
Kate Popejoy, Popejoy STEM, LLC
Thomas Hammond, Lehigh University
Alec M. Bodzin, Lehigh University
Judith A. Morrison, Washington State University
Molly H. Weinburgh, Texas Christian University

Electrifying STEM Experiences Through Hybrid Teacher Professional Development (Virtual)
Erik J. Schettig, North Carolina State University
Tamecia R. Jones, North Carolina State University

Applying novel methods to characterize an online, science-based affinity space
Lisa Lundgren, Utah State University
Richard T. Bex, University of Florida
Emily Slater, Utah State University
Jennifer E. Bauer, University of Michigan Museum of Paleontology
Adriane R. Lam, Binghamton University SUNY
A. McKenzie Sonderegger, Utah State University

A Systematic Literature Review on the Use of Social Network Analysis in Discourse Studies
Brock Couch, Middle Tennessee State University
Grant E. Gardner, Middle Tennessee State University

Strand 14: Environmental Education and Sustainability
Related Paper Set-Modelling, Assessment, and Promotion of Climate Literacy
8:45 AM-10:15 AM, Parq Salon F (**livestream** 3)

Presider: https://tinyurl.com/NARSTpresider

Modelling and Assessing Climate Literacy – Development and Implementation of a Knowledge-in-Use Assessment Instrument (Virtual)
Hanno Michel, IPN - Leibniz Institute for Science and Mathematics Education
Ute Harms, IPN - Leibniz Institute for Science and Mathematics Education

Factors that Influence Learners' Climate Literacy and Conceptions of Climate Change (Virtual)
Nathan A. Quarderer, CIRES; Earth Lab University of Colorado Boulder

The Role of Risk Perception for Students' Climate-Friendly Intentions to Act
Carola Garrecht, IPN - Leibniz Institute for Science and Mathematics Education
Nina Christenson, Karlstad University
Ute Harms, IPN - Leibniz Institute for Science and Mathematics Education

Climate Literacy: What do teachers need to know? – A Delphi Study (Virtual)
Kathryn Leve, IPN - Leibniz Institute for Science and Mathematics Education
Ute Harms, IPN - Leibniz Institute for Science and Mathematics Education

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Administrative Session: Equity And Ethics Committee
Admin Symposium-The intersections of 'displacement' and science education: Perspectives across international contexts
8:45 AM-10:15 AM, Stanley

Discussant: Bhaskar Upadhyay, University of Minnesota

Organizers
Sara Salloum, University of Balamand
Justina A. Ogodo, Baylor University
María González-Howard, University of Texas at Austin
Bhaskar Upadhyay, University of Minnesota

Panelists
Alejandro Gallard, Georgia Southern University, USA
Maha Shuyab, Centre for Lebanese Studies at the Lebanese American University, Lebanon
Geeta Verma, University of Colorado Denver, USA
Minjung Ryu, University of Illinois-Chicago, USA

Strand 15: Policy, Reform, and Program Evaluation
SC-organized paper set-Teachers and Training
8:45 AM-10:15 AM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Campus Association as a Predictor of Science Standard Evaluation using Multinomial Logistic Regression
Allison M. Esparza, Texas A&M University

Science Teachers Who Stay: Factors Contributing to Teacher Retention
Dorothy Holley, West Johnston High School
Soonhye Park, North Carolina State University

STEM Professionals in the Classroom and Elementary Teachers' Content Knowledge
Joanne K. Olson, Texas A&M University
Syahrul Amin, Texas A&M University
Jacob Pleasants, University of Oklahoma

The development and validation of the graduate student success survey: A quantitative study
Karen Marie Collier, North Carolina
Margaret R. Blanchard, NC State University

Administrative Session: International Committee
Admin Symposium-Science Education during the COVID-19 Pandemic
8:45 AM-10:15 AM, Parq Salon D (**livestream** 1)

Panelists
Sonya N. Martin, Seoul National University
Mauricio Pietrocola, University of Sao Paulo, Brazil
Ernani Vassoler Rodrigues, Federal University of Espírito Santo, Brazil
Samuel M. Schnorr, Federal University of Rio de Janeiro, Brazil
Julie Nonnekens, University Medical Center Rotterdam, Netherlands
Saouma B. Boujaoude, American University Of Beirut, Lebanon
Savannah Graham, Texas Christian University, USA
Olivia Levrini, Alma Mater Studiorum, University of Bologna, Italy
Hayat Hokayam, Texas Christian University
Matthew Johnson, Pennsylvania State University, USA

Wednesday, March 30, 2022
Concurrent Session # 12
10:30 am-12:00 pm

Strand 1: Science Learning: Development of student understanding
SC-organized paper set-Students' Reasoning
10:30 AM-12:00 PM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

6th-graders' decision-making and informal reasoning about de-extinction (Virtual)
Nannan Fan, University of North Carolina at Chapel Hill

Collaborative drawing to enable and enact reasoning-in-action.
Vanessa De Andrade, Institute of Education of University of Lisbon
Yael Shwartz, The Weizmann Institute Of Science
Sofia Freire, Institute of Education of University of Lisbon
Mónica Baptista, Instituto De Educação Da Educação Da Universidade De Lisboa

High School Students' Reasoning about the Immune System in Beirut, Lebanon
Ihsan Ghazal, Texas Christian University
Hayat Alhokayem, Texas Christian University

Using Hurricane Resilience to Foster the Development of Student Understanding of Ecosystems in Puerto Rico (Virtual)
Steven Mcgee, The Learning Partnership
Randi McGee-Tekula, The Learning Partnership
Noelia Baez Rodriguez, University of Puerto Rico

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Symposium-Teacher change of practice during Project-based science learning enactment: Case studies across diverse contexts.
10:30 AM-12:00 PM, Stanley

Discussant: Samuel Severance, University of California, Santa Cruz
Presider: Joseph S. Krajcik, Michigan State University

Panelists
Miranda S. Fitzgerald, University of North Carolina At Charlotte
Tingting Li, CREATE for STEM Institute
Cory Susanne Miller, Michigan State University
Emily C. Adah Miller, University of Wisconsin Madison

Selin Akgun,
Katy Easley, University of Michigan
Joseph S. Krajcik, Michigan State University
Samuel Severance, University of California, Santa Cruz
Susan K. Codere, MSU CREATE for STEM

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-Instructional & Curricular Approaches in Science Teaching & Learning
10:30 AM-12:00 PM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Pedagogical Moves That Support Coordinating Communication and Co-Authorship in a Multilingual Science Classroom (Virtual)
Shakhnoza Kayumova, Associate Professor of Science Education at the University of Massachusetts Dartmouth
Akira Harper, PhD Candidate at the University of Massachusetts Dartmouth
Eleanor Richard, PhD Candidate at the University of Massachusetts Dartmouth
Noemi Waight, Associate Professor of Science Education at the University at Buffalo

Impacts of a science teacher's curricular enactment and innovation on students' opportunities for scientific sensemaking
Sage Andersen, University of Texas At Austin
María González-Howard, University of Texas at Austin
Karina D Méndez Pérez, University of Texas At Austin

Instructional Strategies to Manage Scientific Uucertainties for Productive Sensemaking: Exploring Korean and American Classrooms
Heesoo Ha, Center for Educational Research, Seoul National University
Ying-Chih Chen, Arizona State University
Jongchan Park, Arizona State University

Language for scientific sensemaking: Examining a teacher's understandings and instruction for supporting their multilingual students
María González-Howard, University of Texas at Austin
Sage Andersen, University of Texas At Austin
Karina Del Carmen Mendez Perez,

Pre-service Teachers' Motivations to Participate in the Near-Peer Mentoring Program (Virtual)
Ilkem Özdinç, Bogazici University
Dilara Kara, Bogazici University
Busra Karga, Bogazici University
Gaye Ceyhan, Bogazici University

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-Socio-scientific issues: Assessment and conceptions in diverse contexts
10:30 AM-12:00 PM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

Formative Assessment in Socio-scientific Issues-based Science Lessons: How Teachers do this (Virtual)
Dürdane Dury Bayram-Jacobs, Eindhoven University of Technology
Ineke Henze, Radboud University
Judith Gulikers, Wageningen University & Research

Putting on a 'skeptic hat': Teachers' and students' conceptions of critiquing socioscientific data infographics
Emily Reigh, Stanford
Daniel Pimentel, Stanford University
Bryan A. Brown, Stanford University
Victor Lee, Stanford University

The Intersection of Socioscientific Issues and Classroom Diversity: Affordances and Benfits (Virtual)
Sanlyn Buxner, Planetary Science Institute and the University Of Arizona

Lauren Cabrera, Virginia Commonwealth University
Ananya Matewos, Saint Norbert College
Janelle M. Bailey, Temple University

Using Socioscientific Issues to Promote Middle School Students' Evidence-Based Reasoning and Decision-Making on Hydraulic Fracking
Wardell Anthony Powell, Framingham State University

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Student Persistence and Well-Being
10:30 AM-12:00 PM, Parq Salon C

Presider: https://tinyurl.com/NARSTpresider

Analysis of the Interplay between Study Satisfaction, Content Knowledge and Drop-out Intention in Chemistry Studies
Vanessa Fischer, University of Duisburg-Essen
Bianca Schindeldecker, University of Duisburg-Essen
Elke Sumfleth, University Of Duisburg-Essen
Maik Walpuski, University Of Duisburg-Essen

Effect of a Year-long Career-forward Chemistry Laboratory Curriculum on Persistence of Students Majoring in Engineering (virtual)
Corey A. Payne, University Of Florida
Kent J. Crippen, University of Florida

Going beyond the Content: Impact of a Values Affirmation Writing Exercise on Student Outcomes in an Undergraduate Majors' Biology Course
Emily M. Walter, California State University - Fresno
Micah J. Johnson, California State University - Fresno
Orlando N. Lopez, California State University - Fresno
Glen Martin, California State University - Fresno

Undergraduate Biology Student Perceptions of Wellness Interventions
McKenzie N Jevnikar, NC State University
Colette E Pappas, NC State University
Lisa M Paciulli, NC State University

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Students' Learning Science and Engineering Practices
10:30 AM-12:00 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

A Model for Facilitating Multidisciplinary Justifications in Engineering Design Challenges
Carina M. Rebello, Purdue University

An investigation of argumentation task framing on students' use of data in introductory biology
Erika Offerdahl, Washington State University
Jessie Arneson, Washington State University
Brett Baerlocher, Idaho State University
Guraustin Brar, Washington State University
Nyck Ledezma, San Louis Obispo
Esperanza Artiles, Central Washington University
Andy Cavagnetto, Washington State University

Drawing-to-Learn in an Undergraduate Herpetology Course: Drawing as a scientific practice to develop Professional Vision
Ashelee Rasmussen, Idaho State University
Charles R. Peterson, Idaho State University
Anna S. Grinath, Idaho State University

When Multimodality Meets Modeling: A Case Study of Preservice Elementary Teachers Building Knowledge in Science (Virtual)
Ayca K. Fackler, University of Georgia

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-On becoming a science teacher
10:30 AM-12:00 PM, Kitsilano Ballroom B

Presider: https://tinyurl.com/NARSTpresider

"Seriously... I Want to Teach": Exploring Motivations of Science Majors Pursuing Teaching Careers
Austin Heil, University of Georgia
Julie A. Luft, University of Georgia

An Expanded Understanding of the Influence of Antecedent Socialization on the Choice to Become a Science Teacher
Emma J. Refvem, North Carolina State University
M. Gail Jones, North Carolina State University
Sarah J. Carrier, North Carolina State University
Kathryn Rende, North Carolina State University
Julianna Nieuwsma, NC State University
Tammy D. Lee, East Carolina University
Amy R. Taylor, University Of North Carolina At Wilmington

Development of Teacher Identity: From 'I can teach Science' to 'I can teach STEM' (Virtual)
Saiqa Azam, Memorial University Of Newfoundland
Karen Goodnough, Memorial University Of Newfoundland

Strand 8: In-service Science Teacher Education
SC-organized paper set-Large Scale Investigations Measures of Teacher Learning
10:30 AM-12:00 PM, Parq Salon E (**livestream** 2)

Presider: https://tinyurl.com/NARSTpresider

Changes in Teachers' Beliefs and Confidence across Multiple Rounds of Professional Development
Benjamin R. Lowell, Boston College
Katherine L. McNeill, Boston College

Developing Science Teachers Professional Competence in Opened Experimentation – An Intervention Study
Markus Emden, Zurich University of Teacher Education
Arne Bewersdorff, Technical University of Munich
Armin Baur, Heidelberg University of Education

Response Shifts in Measurement of Teacher Growth (Virtual)
Andrea Ash, University of Iowa
Gavin W. Fulmer, University Of Iowa

Strengthening Teachers' Confidence to Mentor Students in STEM Research and Science & Engineering Fair Competitions: PD Models for In-person and Virtual Formats (Virtual)
Julie Angle, Oklahoma State University
Rachel Hartnett, Mount St. Mary's University Emmitsburg, MD

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Structural and Cultural Approaches to Identity and Its Influence
10:30 AM-12:00 PM, Parq Salon D (**livestream** 1)

A Cultural Impostor? Native American Experiences of the Impostor Phenomenon in STEM (Virtual)
Devasmita Chakraverty, Indian Institute of Management Ahmedabad

Cultural and Racial Barriers for International Students of Color in STEM Graduate Programs
Miguel Rodriguez, University of Utah
Ramon Barthelemy, University of Utah

Understanding the Role of Race and Identity Development in Ethnically Diverse Students at an HBCU
Karen Benn Marshall, Oakwood University
Carmen Bucknor, Oakwood University
Sylvia M. James, National Science Foundation
Christyn Byrd, Oakwood University

Would a career in science suit me? Students' self-view in relation to science and STEM career aspirations (Virtual)
Irene Drymiotou, University of Cyprus & University of Groningen
Costas P. Constantinou, University of Cyprus
Lucy Avraamidou, University Of Groningen

Strand 11: Cultural, Social, and Gender Issues
Related Paper Set-Multi-faceted and Emerging Approaches towards Transforming STEM Teaching, Learning and Research
10:30 AM-12:00 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

Pedagogical/research methodological approaches for analyzing power shifts in science classrooms (Virtual)
Kathleen Schenkel, San Diego State University

Productive tensions: Researching and imagining a more just STEM education with youth researchers
Colin Hennessy Elliott, Utah State University

Challenging dominant science and language ideologies and practices as a 7th grade dual language teacher (Virtual)
Melissa A. Navarro, San Diego State University
Terrance Burgess, Michigan State University

"Simon says learn." Investigating the narrated and practiced science identities of elementary students of color

Uniting technical approaches and diverse communities: Bringing social justice at the forefront of engineering's design considerations (Virtual)
Sebastian Schäfer, Technical University of Munich
Greses Pérez, Tufts University
Swetha Nittala, Stanford University
Sherri D Sheppard, Stanford University

Strand 12: Technology for Teaching, Learning, and Research
SC-organized paper set-Using Computational Thinking and Videos to Support Pre-Service and In-Service Teachers
10:30 AM-12:00 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

Computational Thinking (CT) Integrated STEM Approach: Early Childhood Pre-Service Teachers' CT Skills
Ayse Ciftci, Mus Alparslan University
Mustafa S. Topcu, Yildiz Technical University

Learning Effective Explanation Videos in Physics Lessons
Fabian Gabriel Sterzing, Paderborn University
Christoph Kulgemeyer, Paderborn University
Peter Reinhold, Paderborn University

Leveraging Learning Experience Design to Deploy Embedded Video Questions to Support Students' Online Learning Experience
Joseph T. Wong, University of California, Irvine
Natalie Au Yeung, University of California, Irvine
Brad Hughes, University Of California, Irvine

The Power of Context: Factors that Influence Teachers' Implementation of Unplugged CT-Infused Science Lessons (Virtual)
Vance J. Kite, North Carolina State University
Soonhye Park, North Carolina State University

Strand 14: Environmental Education and Sustainability
Related Paper Set-Towards a Sociopolitical Dispositif Prioritizing Ecological Vitality and Social Justice
10:30 AM-12:00 PM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Among the Possible, the Is and the Ought: Constructs of 'Micro-Sociotechnical Imaginaries' (Virtual)
Majd Zouda, OISE, University of Toronto
Dimitris Tsoubaris , National and Kapodistrian University of Athens
Sarah El Halwany, University of Calgary, Calgary, AB, Canada
Mohammad Nurul-Hassan, OISE, University of Toronto
Minja Milanovic, The Bishop Strachan School, Toronto, ON
Sadia Sahibzada , OISE, University of Toronto
John Lawrence Bencze, University of Toronto

Students' Material-Semiotic Alliances After Power-focused Application-based Learning
John Lawrence Bencze, OISE, University of Toronto
Dave Del Gobbo, Peel District School Board
Sarah El Halwany, University of Calgary, Calgary, AB, Canada
Mohammad Nurul-Hassan, OISE, University of Toronto
Minja Milanovic, The Bishop Strachan School, Toronto, ON
Jasmine Yeung, OISE, University of Toronto
Majd Zouda, University of Toronto

Weaving Art & Science Pedagogies for More Ecologically-vital & Socially-just Dispositifs
Dave Del Gobbo, Peel District School Board, Mississauga, ON, Canada
Sheliza Ibrahim Khan, University of Toronto
Sarah El Halwany, University of Calgary, Calgary, AB, Canada
Majd Zouda, University of Toronto

Minja Milanovic, The Bishop Strachan School, Toronto, ON
Mohammad Nurul-Hassan, OISE, University of Toronto
Mirjan Krstovic, Peel District School Board, Mississauga, ON, Canada
John Lawrence Bencze, OISE, University of Toronto

Teaching with Emotions: Supporting Critical Views on Nature of Science
Sarah El Halwany, University of Calgary, Calgary, AB, Canada
Mohammad Nurul-Hassan, OISE, University of Toronto
Dave Del Gobbo, Peel District School Board, Mississauga, ON, Canada
Sheliza Ibrahim Khan, University of Toronto
Jasmine Yeung, OISE, University of Toronto
Majd Zouda, OISE, University of Toronto
John Lawrence Bencze, OISE, University of Toronto

Applying an Action-Oriented Pedagogy and STEM Teacher Identity: An Autoethnography
Mohammad Nurul-Hassan, OISE, University of Toronto
Sarah El Halwany, University of Calgary, Calgary, AB, Canada
Majd Zouda, University of Toronto
Kristen Schaffer, OISE, University of Toronto
John Lawrence Bencze, University of Toronto

Administrative Session: Research Committee
Admin Symposium-Future Directions for Research on Equitable and Socially Just Assessments in Science and Engineering Education *(Virtual)*
10:30 AM-12:00 PM, Burrard

Organizers
Asli Sezen-Barrie, University of Maine
Malcolm B. Butler, University of Central Florida
Rouhollah Aghasaleh, Humboldt State University
Sarah J. Fick, Washington State University
Marcus Kubsch, IPN - Leibniz Institute for Science and Mathematics Education
Li Ke, University of North Carolina at Chapel Hill
Yann Shiou Ong, Nanyang Technological University

Panelists

How Could Lack of Alignment Create Inequitable Assessment Systems? (Virtual)
Gavin Fulmer, National Science Foundation, University of Iowa

I am the White assessor: Grappling with dominant paradigms in Framework-aligned formative assessment (Virtual)
Erin Furtak, University of Colorado at Boulder

Developing Justice-Focused Assessment Tasks: Tensions and Possibilities (Virtual)
William Penuel, University of Colorado at Boulder

Addressing equity from the margins: Outcomes of teacher professional development practice (Virtual)
Sheron Mark, University of Louisville

Engineering Curriculum Design for Equitable Assessments (Virtual)
Christine Cunningham, Pennsylvania State University

Translanguaging as a Linguistically Sustaining Science Formative Assessment Design Framework (Virtual)
Caitlin Fine, Boston College

How do we know? The Implications of Translanguaging for Equitably Assessing Multilingual Students' Science Learning (Virtual)
Enrique Suarez, University of Massachusetts at Amherst

Multi-Strand-*Virtual Session C*
10:30 AM-12:00 PM, Parq Salon F (**livestream** 3)

Epistemic Empathy: A Resource for Responsive Teaching (Virtual)
Lama Z. Jaber, Florida State University
Shannon G. Davidson, Florida State University
Allison Metcalf, Florida State University

From Practical to Metacognitive Strategy: Meta-epistemic Discourse and Crosscutting Concept Supports in Curriculum
Lori Andersen, University of Hawai'i at Mānoa

Evaluating the Impact of Online Activities Designed to Help High School Students Reason like Chemists (Virtual)
Sierra McCormick, WestEd
Jodi Davenport, WestEd
Anna Rafferty, Carleton College
Jacklyn Powers, WestEd
Sandra Raysor, Carnegie Mellon University
David Yaron, Carnegie Mellon University

Modeling-based Learning in Pre-School Science: Affordances of Different Types of Student-Constructed Models (Virtual)
Loucas T. Louca, European University-Cyprus

Lunch Break (on your own or with an Ambassador group!)
12:00 pm-1:30 pm

CADASE Graduate Student Social
Parq Salon F
12:00 pm-1:30 pm

Concurrent Session # 13
1:30 pm-3:00 pm

Strand 1: Science Learning: Development of student understanding
SC-organized paper set-Modelling in Science Learning
1:30 PM-3:00 PM, Parq Salon D (**livestream** 1)

Presider: Marcus Kubsch, IPN - Leibniz Institute for Science and Mathematics Education

Building a Computational Model of Food Webs: Impacts on Computational and Systems Thinking Skills (Virtual)
Arif Rachmatullah, SRI International
Eric N. Wiebe, North Carolina State University

Mathematical Modelling in Physics Education
Lilach Ayali, Technion - Israel Institute of Technology
Shulamit Kapon, Technion - Israel Institute of Technology

Scaffolding Sociopolitical Dimensions of Climate Change in Diagrammatic Models (Virtual)
Heather F. Clark, UCLA
Darlene Tieu, LAUSD
Leticia Perez, UCLA
Jaleel Howard, UCLA

Students' Conceptual Models in the Context of Air-Quality Learning Unit
Shirly Avargil, Technion - Israel Institute of Technology
Arunika Saxena, Technion Israel Institute of Technology
François G. Amar, University of Maine
Mitchell Bruce, University Of Maine

Wednesday 3-30-2022

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-organized paper set-High school Science Teaching & Learning
1:30 PM-3:00 PM, Cambie

Presider: https://tinyurl.com/NARSTpresider

Exploring the Efficacy of CTCA in Breaking Barriers to Students' Learning of Difficult Concepts in Biology
Imole J. Samson, Lagos State University
Peter A. Okebukola, ACEITSE-Lagos State University
Esther O. Peter, ACEITSE-Lagos State University
David G. Peter, Lagos State University
Deborah Oluwatosin Agbanimu, ACEITSE-Lagos State University
Fred Awaah, University of Professional Studies Accra
Franklin U. Onowugbeda,
Adekunle I. Oladejo, ACEITSE-Lagos State University

Investigating students' context choice in chemistry education
Fabien Güth, University of Duisburg-Essen
Helena Van Vorst, University of Duisburg-Essen

Students' Types of Interest in Physics
Sarah Maria Zoechling,
Julia Woithe, CERN
Sascha M. Schmeling, CERN
Martin Hopf, University of Vienna

Studying girls' achievement outperformance in Oman: An exploration of attitudinal perceptions towards Science and learning
Sulaiman M. Al-Balushi, Sultan Qaboos University
Rashid S Almehrizi, Sultan Qaboos University
Ibrahim S. Al-Harthy, Sultan Qaboos University
Ambusaidi K. Abdullah, Sultan Qaboos University
Khadijah Al-Balushi, Ministry of Education
Moza Al-Balushi, Ministry of Edcation
Mohammed Al-Aghbari, Sultan Qaboos University

Using Science Historical Short Stories to Impact Students' Science-specific and General Epistemological Beliefs (Virtual)
Jaclyn M. Easter, Grand View University
Jerrid W. Kruse, Drake University
Jesse L. Wilcox, University of Northern Iowa

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Related Paper Set-Project-based Learning Contexts for Developing Adaptation Design Principles that Promote Engagement and Equity
1:30 PM-3:00 PM, Parq Salon C

Discussant: Samuel Severance, University of California, Santa Cruz

Presider: Joseph S. Krajcik, Michigan State University

Using Adaptation Design Principles to Support Teacher Agency in Professional Learning
Emily C. Adah Miller, University of Wisconsin Madison
Susan K. Codere, MSU

PBL Adaptation Principles to Support Equitable Science Instruction
Selin Akgun, Create4STEM
Maria Simani, University of California at Riverside
Hilda Makori, Create for STEM at Michigan State University

Employing adaptation design principles to enhance elementary student engagement in modeling (Virtual)
Tingting Li, CREATE for STEM Institute

How can culturally responsive teaching be framed as creative endeavor through adaptation design principles? (Virtual)
Maria C. Simani, University Of California, Riverside
Kathryn Bateman, Create for STEM at Michigan State University
Emily C Miller, University of Wisconsin-Madison

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
SC-organized paper set-STEM integration in secondary science classrooms
1:30 PM-3:00 PM, Granville II

Presider: https://tinyurl.com/NARSTpresider

How do excellent STEM teachers design and implement best practice of inquiry-based learning? (Virtual)
Shani Zur, Technion Institue
Tali Tal, Technion

Middle School Teachers and Undergraduate Mentors Collaborating for Culturally Relevant STEM Education
Meredith W. Kier, College of William and Mary

The impact of technical Science in increasing access to Stem education for vocational careers in South Africa
Emmanuel Mushayikwa, University of the Witwatersrand
Magdeline Mmapaseka Stephen, University of Witwatersrand

Using event mapping to investigate secondary master teachers' enactment of Naval STEM tasks
Jeffrey D. Radloff, SUNY Cortland
Dominick Fantacone, SUNY Cortland
Angela Pagano, SUNY Administration

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Student Success and 21st Century Skills
1:30 PM-3:00 PM, Parq Salon B

Presider: https://tinyurl.com/NARSTpresider

Addressing Pre-service Teachers' Misconceptions and Promoting Conceptual Understanding through the Conceptual Change Model.
Johannes Addido, University of Wyoming

*Evaluating Evidence-Based Practices Influencing Graduation and Participation in the STEM Workforce and Graduate Programs *presenting author*
Natalie L Hyslop, University of North Georgia
John Holliday, University of North Georgia
Linda B Purvis, University of North Georgia
*April A Nelms, University of North Georgia
John D Leyba, University of North Georgia
Michael Bodri, University of North Georgia

Improving Self-Reported Measures of 21st Century Skills in an Interdisciplinary Undergraduate STEM Course
Haider Ali Bhatti, Graduate Group in Science and Mathematics Education (SESAME) University of California, Berkeley
Perman Gochyyev, Graduate School of Education University of California, Berkeley
Mark Wilson, Graduate School of Education University of California, Berkeley
Robert J Full, Department of Integrative Biology University of California, Berkeley

Investigating Student Response to Anomalous Data When Analyzing and Interpreting Data
Adrian L Adams, University of Utah, Department of Educational Psychology
Lauren A Barth-Cohen, University Of Utah, Department of Educational Psychology
Jason M May, University of Utah, Department of Physics and Astronomy

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Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-organized paper set-Undergraduate and Graduate Student Perspectives on Teaching and Learning
1:30 PM-3:00 PM, Kitsilano Ballroom A

Presider: https://tinyurl.com/NARSTpresider

Analysis of graduate teaching assistant discourse behaviors and the effects of a professional development intervention (Virtual)
Abdirizak M. Warfa, University of Minnesota
Marin Melloy, University of Minnesota

Biology Teaching Assistants Engagement with Educative Curriculum Materials and Enactment of Rigorous Classroom Discourse
Alyssa Freeman, Idaho State University
Angela Google, Middle Tennessee State University
Zhigang Jia, Middle Tennessee State University
Tina B Carter, Middle Tennessee State University
Anna S. Grinath, Idaho State University

How Physical Science Doctoral Students Involved in Educational Outreach View and Value their Educator Role
Anne M McAlister, University of Virginia
Sarah Lilly, University of Virginia
Jennifer Chiu, University Of Virginia

Relating TAs' Enacted Instruction to their Beliefs about Teaching and Learning in an Introductory Physics Tutorial using CHAT (Virtual)
May Lee, University of Groningen
Michael Bennett, University of Colorado - Boulder

Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Using technology and modeling in science teacher education
1:30 PM-3:00 PM, Parq Salon F (**livestream** 3)

Presider: https://tinyurl.com/NARSTpresider

Fostering TPACK in Science Teacher Education – Re-Design and Evaluation of a University Course (Virtual)
Lisa Stinken-Rösner, Leuphana University Lüneburg

Knowledge, Practice and Product: Developing Preservice Science Teachers' Modelling Competence
Song Xue, School of Education and Social Work, University of Dundee
Keith Topping, School of Education and Social Work, University of Dundee
Elizabeth Lakin, School of Education and Social Work, University of Dundee

Science Teaching Orientations of Pre-Service Teachers in a Transformative Learning Environment
Duygu Yilmaz Ergul , Gazi University
Mehmet F. Tasar, Gazi University

That's Enough For An Explanation: Pre-Service Teachers Linking Epistemic And Pedagogical Decisions When Developing Models (Virtual)
Maria E. Tellez-Acosta, PhD Student Martin-Luther-Universität Halle-Wittenberg
Scott McDonald, Professor of Science Education. Pennsylvania State University
Andres Acher, Primary Science Education. Fakultät für Biologie, Universität Bielefeld

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Strand 7: Pre-service Science Teacher Education
SC-organized paper set-Building preservice teacher self-efficacy and competence in STEM Education
1:30 PM-3:00 PM, Granville I

Presider: https://tinyurl.com/NARSTpresider

An Investigation of Pre-Service Teachers' Self-Efficacy Perceptions for STEM Integration (Virtual)
Hamdican Yildirim, Hacettepe University
Sevinc Gelmez Burakgazi, Hacettepe University

Integrating Computational Thinking (CT) in STEM Education: Early Childhood Pre-Service Teachers' CT Teaching Self-Efficacy Beliefs
Mustafa S. Topcu, Yildiz Technical University
Ayse Ciftci, Mus Alparslan University

Pre-service teachers' learning to infuse ingineering indicators into STEM lesson plans (Virtual)
Sevgi Aydin, Van Yuzuncu Yil University
Betul Ekiz Kiran, Tokat Gaziosmanpasa University
Elif Selcan Oztay, Van Yuzuncu Yil University

Strand 8: In-service Science Teacher Education
Symposium-Supporting Teacher Leadership Development: Roles, Growth and Research
1:30 PM-3:00 PM, Kitsilano Ballroom C

Presider: https://tinyurl.com/NARSTpresider

Panelists
Emily J. Perry, Sheffield Hallam University
Arthur Eisenkraft, University Of Massachusetts Boston
Amanda M. Gunning, Mercy College
Meghan E. Marrero, Mercy College
Tammy Wu Moriarty, Stanford University, Graduate School of Education
Janet Carlson, Stanford University
Stuart C. Bevins, Sheffield Hallam University
Richard Pountney, Sheffield Hallam University
Josephine Booth, Sheffield Hallam University
Joelle Halliday, Sheffield Hallam University

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Student Engagement Across Intersecting Identities
1:30 PM-3:00 PM, Kitsilano Ballroom D

Presider: https://tinyurl.com/NARSTpresider

Ways of Identifying as Other: a longitudinal case study of women of colour in physics (Virtual)
Nicola Wilkin, University of Birmingham
Jaimie Lauren Miller-Friedmann, University of Birmingham
Judith Hillier, University of Oxford

Intersectional Analysis of Advanced Placement Chemistry Enrollment and Performance (Virtual)
Robert Krakehl, Stony Brook University
Martin Francis Palermo, Stony Brook University
Angela M. Kelly, Stony Brook University

Enhancing Performance of Students with Intersectional Identities in Inclusive Science Classrooms via Multimedia Professional Development
Lindsay M. Carlisle, University of Virginia
Victoria VanUitert, University of Virginia
Michael J. Kennedy, University of Virginia

Examining Exclusionary and Inclusionary College Classroom Experiences: Effects on Women in Engineering Majors by Race/Ethnicity

Tatiane Russo-Tait, University of Texas at Austin
Catherine Riegle-Crumb, University of Texas at Austin
Ursula Nguyen, University of Texas at Austin
Katherine Doerr, The University of Texas at Austin

Strand 11: Cultural, Social, and Gender Issues
SC-organized paper set-Approaches to Equitable Science Teaching in K-12 Classrooms
1:30 PM-3:00 PM, Stanley

Presider: https://tinyurl.com/NARSTpresider

Connecting Justice-Centered pedagogy to Students' Critical Science Agency in an Elementary and Middle School Science Classroom
Selene Y. Willis, University Of South Florida
Dana L. Zeidler, University Of South Florida

Enhancing STEM Teacher Candidates' Understanding and Implementation of Equity, Diversity, and Inclusion Through Differentiated Instruction
Mohammed Estaiteyeh, Western University
Isha DeCoito, Western University

The Importance of Epistemic Empathy for Equitable and Rigorous Science Teaching
Allison T Metcalf, Florida State University
Shannon G. Davidson, Florida State University
Lama Jaber, Florida State University

Challenges Encountered by Multilingual Learners while Reading to Learn Science: The Role of Intertextuality
Sauoma B. Boujaoude, American University Of Beirut
Sara Salloum, University of Balamand

Strand 12: Technology for Teaching, Learning, and Research
SC-organized paper set-Using digital technologies, simulated teaching, and assessment to support teaching and learning
1:30 PM-3:00 PM, Burrard

Presider: https://tinyurl.com/NARSTpresider

TPACK in teacher education - Supporting pre-service teachers´ reflections and use of digital technologies in science teaching (Virtual)
Pernilla Nilsson, Halmstad University

Using Simulated Classrooms to Examine How Formative Feedback Impacts Elementary Teachers' Ability to Facilitate Discussions
Jamie N. Mikeska, Educational Testing Service (ETS)
Jonathan Steinberg, ETS
Pamela S. Lottero-Perdue, Towson University
Dante Cisterna, Educational Testing Service

Analysis of Concept Maps for the use in Formative Assessment: Can Machine Learning help?
Tom Bleckmann, Leibniz Universitaet Hannover, Institute for Mathematics and Physics Education
Gunnar Friege, Leibniz Universitaet Hannover, Institute for Mathematics and Physics Education
Wolfgang Gritz, TIB Hannover
Ralph Ewerth, TIB Hannover

Digital Curation as a Pedagogical Approach Promoting Critical Thinking (Virtual)
Rivka Gadot, Technion - Israel Institute Of Technology Jerusalem College of Technology The Open University of Israel
Dina Tsybulsky, Technion - Israel Institute Of Technology

Strand 14: Environmental Education and Sustainability
SC-organized paper set-Building competencies for tackling real world problems
1:30 PM-3:00 PM, Parq Salon A

Presider: https://tinyurl.com/NARSTpresider

Infusing social responsibility in higher education through education for sustainable development (Virtual)
Heba El-Deghaidy, The American University In Cairo

Theorizing Science-Civic Practices: Youth Adaptation and Remixing of Science Practices within Digital Civic Participation
Lynne Zummo, University of Utah
Emma C Gargroetzi, University of Texas at Austin

The Effectiveness of Education for Sustainable Development in Promoting Students' Action Competence for Sustainability
Daniel Olsson, Environmental and Life Sciences, Karlstad university
Niklas M. Gericke, Department of Environmental and Life Sciences

A Curricular Model to Train Doctoral Students in Interdisciplinary Collaborative Research at the Food-Energy-Water Nexus (Virtual)
Rianna T. Murray, University of Maryland, College Park
Kelsey McKee, University of Maryland, College Park
Amy R Sapkota, University of Maryland, College Park
Stephanie Lansing, University of Maryland, College Park
Gili Marbach-Ad, University Of Maryland, College Park

Admin Symposium-Indigenous science knowledge as social and cultural capital supporting more resilient and sustainable communities
1:30 PM-3:00 PM, Parq Salon E (**livestream** 2)

Presider: Bhaskar Upadhyay, University of Minnesota, https://tinyurl.com/NARSTpresider

Panelists
Pauline W. U. Chinn, University of Hawaii at Manoa
Bhaskar Upadhyay, University of Minnesota
David Zandvliet, Simon Fraser
Gayle A. Buck, Indiana UniversityBAsu
Julie R. Robinson, University of North Dakota
Rouhollah Aghasaleh, Humboldt State University
Kamal P. Koirala, Tribhuvan University

Closing Session [livestream]

Parq Salon DEF
3:10 pm-4:00 pm

Closing Remarks & Looking Ahead

Speakers: Renée Schwartz & Gillian Roehrig

It has been a unique and challenging year for NARST and the NARST leadership. We will close out the conference with remarks from outgoing President Renee Schwartz and gather insights from incoming President, Gillian Roehrig as we look ahead to 2023. You are Invited!

NARST Executive Board Meeting #2
Burrard
4:30 pm-10:00 pm

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