96th NARST International Conference | Program
April 18 - 21, 2023

REFLECTING on REFORM

Coming together to reflect on global science education reforms

Chicago, Illinois – Hilton Downtown Chicago
THANK YOU TO OUR SPONSORS

We acknowledge Wiley and their work as publisher of the *Journal of Research in Science Teaching – JRST.*
Table of Contents

2 Sponsors
3 Table of Contents
4 NARST General Information
5 Code of Ethical Conduct
7 Research Interest Groups (RIGs) Information
8 Strand Key
9 NARST Leadership Team
10 Strand Coordinators
11 Program Proposal Reviewers
15 NARST Presidents & Executive Directors
16 JRST Editors & NARST Emeritus Members
17 NARST Awards
18 Outstanding Doctoral Research Award
19 Early Career Research Award & NARST Fellows
20 JRST Award
21 Outstanding Paper Award
22 Outstanding Master’s Thesis Award & Classroom Applications Award
23 NARST Leadership Committees
30 Sponsorship Program for Graduate Student Memberships
34 2024 NARST International Conference
36 Hilton Chicago Floor Map

19 NARST Future Meeting Dates

Please note that this program is subject to change.

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

NARST is a global 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 global 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, Member Portal and Listserv, allowing access to further information about the Association. You may access this site at: [http://www.narst.org](http://www.narst.org). There is further information about subscribing to the listserv on this site.
- Opportunities to participate in monthly webinars.
**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.
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


**Research Interest Groups (RIGs)**

**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: **Francesca Williamson**, Indiana University  
frawhite@iu.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: **Monica Cardella**, Florida International University  
mcardell@fiu.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: **Francesca Williamson**, Indiana University  
frawhite@iu.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 alacoba (space) for Latin@s/Latino science educators and others interested in Latin@ science education.

Chair: **Angela Chapman**, University of Texas Rio Grande Valley  
angela.chapman@utrgv.edu
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.

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.

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      | Technology for Teaching, Learning, and Research |
| Strand 13      | History, Philosophy, Sociology, and Nature of Science |
| Strand 14      | Environmental Education and Sustainability |
| Strand 15      | Policy, Reform and Program Evaluation |
2022–2023 NARST Leadership Team

Officers and Board of Directors:

President
Gillian Roehrig (2024)
University of Minnesota

President-Elect
Jomo Mutegi (2025)
Old Dominion University

Immediate Past President
Renée Schwartz (2023)
Georgia State University

Secretary-Treasurer
Jerome Shaw (2023)
University of California Santa Cruz

Executive Director
Lisa Martin-Hansen
California State University – Long Beach

Executive Board Members:

Christina Schwarz (2023)
Michigan State University, East Lansing

Knut Neumann (2023)
IPN–Leibniz Institute for Science and Mathematics Education

Brooke Whitworth (2023)
Clemson University

Malcolm Butler (2024)
University of North Carolina, Charlotte

Scott McDonald (2024)
Pennsylvania State University

Leon Walls (2024)
University of Vermont

Amelia Wenk Gotwals (2025)
Michigan State University

Sharon Nelson-Barber (2025)
WestEd

International Coordinator
Mercy Ogunsonla-Bande (2025)
National Open University of Nigeria

Graduate Student Coordinator
Theila Smith (2023)
University of Groningen

NARST Liaison to NSTA
Michael G. Bowen (2024)
Mount Saint Vincent University

NSTA Representative
Cynthia Crockett (2024)
Harvard-Smithsonian Center for Astrophysics

JRST Editors

Felicia Moore Mensah (2025)
Teachers College, Columbia University

Troy Sadler (2025)
The University of North Carolina at Chapel Hill
### 2023-2024 Strand Coordinators

#### Strand 1: Science Learning—Development of Student Understanding
- **Shannon Navy** (2023)
  Kent State University
- **Xiaoming Zhai** (2024)
  University of Georgia

#### Strand 2: Science Learning—Contexts, Characteristics and Interactions
- **Angela Chapman** (2023)
  University Of Texas Rio Grande Valley
- **Patricia Patrick** (2024)
  Columbus State University

#### Strand 3: Science Teaching—Primary School
(Grades preK-6)
- **Selina Bartels** (2023)
  Valparaiso University
- **Karl Jung** (2024)
  Bradley University

#### Strand 4: Science Teaching—Middle and High School
(Grades 5-12)
- **Jose Pavez** (2023)
  University of Georgia
- **Elizabeth Lewis** (2024)
  University of Nebraska, Lincoln

#### Strand 5: College Science Teaching and Learning
(Grades 13-20)
- **Grant Gardner** (2023)
  Middle Tennessee State University
- **Anita Schuchardt** (2024)
  University of Minnesota

#### Strand 6: Science Learning in Informal Contexts
- **Eli Tucker-Raymond** (2023)
  Boston University
- **Neta Shaby** (2024)
  University of Southampton

#### Strand 7: Pre-service Science Teacher Education
- **Amanda Berry** (2023)
  Monash University
- **Amal Ibourk** (2024)
  Florida State University

#### Strand 8: In-service Science Teacher Education
- **Patrick Enderle** (2023)
  Georgia State University
- **Julie Bianchini** (2024)
  University of California, Santa Barbara

#### Strand 10: Curriculum and Assessment
- **Jing Lin** (2023)
  Beijing Normal University
- **Tejaswini Dalvi** (2024)
  University of Massachusetts, Boston

#### Strand 11: Cultural, Social, and Gender Issues
- **Katharine Wade-Jaimes** (2023)
  University of Nevada
- **Kathryn Kirchgasler** (2024)
  University of Wisconsin, Madison

#### Strand 12: Technology for Teaching, Learning, and Research
- **Preethi Titu** (2023)
  Kennesaw State University
- **Richard Lamb** (2024)
  East Carolina University

#### Strand 13: History, Philosophy, Sociology, and Nature of Science
- **Gunkut Mesci** (2023)
  Giresun University
- **Jacob Pleasants** (2024)
  University of Oklahoma

#### Strand 14: Environmental Education and Sustainability
- **Heather Page** (2023)
  New York City Department of Education
- **Wardell A. Powell** (2024)
  Framingham State University

#### Strand 15: Policy, Reform, and Program Evaluation
- **Sanlyn Buxner** (2023)
  University of Arizona
- **Felicia Leammukda** (2024)
  St. Cloud State University
Program Proposal Reviewers

Abdi Warfa
Abir Saleh
Adekunle Oladejo
Adepeju Prince
Aditi Wagh
Adrian Schmidt
Albeliza Perez
Albert Zeyer
Alex Sobotka
Alex Waugh
Alexander Büssing
Alexander Weber
Alexandra Race
Alexandra Schindel
Alexis Riley
Ali Asif
Ali Muller
Alia Hamdan
Alison Cullinane
Alison Mercier
Allison Antink-Meyer
Allyson Randall
Allyson Rogan-Klyve
Alp Köksal
Amal Ibourk
Amanda Benedict-Chambers
Amanda Berry
Amanda Garner
Amanda Gonczi
Amber Simpson
Amy Farris
Amy Ricketts
Ana Valdmann
Anastasia S Sanchez
Anat Shauly
Andrea Möller
Andrea Phillips
Andreas Borowski
Andreas Nehring
Andrew Gilbert
Angela Chapman
Angela Irene
Anjar Putro Utomo
Anna Arias
Anna Grinath
Anna Kim
Anna MacPherson
Anna Skorupa
Annabel Stoler
Anne Mcalister
Anne Solli
Annelies Pieterman-Bos
Aparajita Rajwade
Argyris Nipyarakis
Arif Rachmatullah
Asli Kaya
Asnat Zohar
Austin Heil
Ayca K Fackler
Ayelet Baram
Bailey Nafziger
Becky Mathers-Lowery
Ben Herman
Benjamin Lowell
Benny Mart Hiwatig
Beth Covitt
Beyza Okan
Bharath Kumar
Sampath Kumar
Bhaskar Upadhyay
Bradley Davey
Brandin Conrath
Brenda Guerrero
Brian Hancock
Bridget Mulvey
Brit Toven-Lindsey
Caglin Akilioglu
Caitlin Fine
Calli Shekell
Candice Kim
Cansu Başak Uygun
Cari Herrmann Abell
Carina Rebello
Carla Johnson
Carla Zembal-Saul
Carol Waters
Carola Garrecht
Carolina Alvarado
Carrie D. Allen
Casey Shapiro
Catherine Milne
Cesar Delgado
Chandra Turpen
Cheng-Wen He
Cherilyn Porter
Chris Jadallah
Christa Haverly
Christi Whitworth
Christine Lotter
Christine McGrail
Christine Schnittka
Christopher Wojciechowski
Claire Ceslarev
Claudia Vergara
Claussell Mathis
Conghui Liu
Consuelo Morales
Cristiano Moura
Cristina García-Ruiz
Cristina Guarrella
Crystal Wang
Cynthia Lima
Dana Vedder-Weiss
Daniel Pimentel
Daniela Fiedler
Daniela Lopes Scarpa
Danielle Rhemer
Danielle Scharen
David Fortus
David Jackson
David Johannes Hauck
David Menendez
Deborah Kelemen
Deborah Oluwatosin Agbanimu
Delan Hao
Denise Bressler
Devan Jones
Devasmita Chakraverty
Devon Christman
Dewi Ungu
Diana Sachmpazidi
Diane Codding
Diego Alonso
Maltrana Romer
Dilara Gören
Dimitris Stavrou
Dimitris Timpilis
Dina Tsybulsky
Program Proposal Reviewers

Doug Ball
E.J. Bahng
Edith Koh
Eleanor Abrams
Eleanor Kenimer
Elif Özülkü
Elizabeth Davis
Elizabeth de los Santos
Elizabeth Hasseler
Elizabeth Lewis
Elsun Seung
Elysa Corin
Emanuel Eidin
Emily Adah Miller
Emily Dare
Emily Harris
Emily Little
Emily Seeber
Emma Refvem
Emma Stevenson
Engin Kardas
Ercin Sahin
Eric Kirk
Eric Nolan
Erin Peters-Burton
Esther Peter
Eugene Cox
Eugene Judson
Eva Nyutu
Eva Rexigel
Eve Manz
Fatlume Berisha
Felicity McLure
Feral Bekiroğlu
Florenca Gomez
Zaccarelli
Fouad Abd-El-Khalick
Franklin U.
Onowugbeda
Frikkie George
Gail Richmond
Gary Holliday
Gary Wright
Gavin Fulmer
Gaye Ceyhan
Gayle Buck
Gena Merliss
Gena Sbeglia
Gerald Tembrevilla
Gili Ad-Marbach
Gina Childers
Giulia Tasquier
Gorkem Altunbas
Gozde Tosun
Grace Tukurah
Gregory Kelly
Gregory Thomas
Gultekin Cakmakci
Hai Nguyen
Hamideh Talafian
Hamza Malik
Hannah Cook
Harleen Singh
Hasan Deniz
Hatice Ozen Tasdemir
Heba Abdelnaby
Heba EL-Deghaidy
Heesoo Ha
Heidi Cian
Heidi Masters
Helen SemilarSKI
Helena Aptyka
Helin SemilarSKI
Hendrik Härtig
Hernan Cofre
Hildah Makori
Holly Amerman
Hong Tran
Hye-eun Chu
HyunJu Park
I-Chien Chen
Ibukunolu Ademola
Ihsan Ghazal
Iliana De La Cruz
Imogen Herrick
Irene Neumann
Irit Vivante
Isabell Adler
Iyad Dkeidek
Jaclyn Murray
Jacob Kelter
Jacob Pleasants
Jacquelyn Duran
Jale Ercan Dursun
James Nyachwaya
Jan Van Driel
Jan Winkelmann
Janice Mak
Jared Tenbrink
Jayme Del Mario
Jean-Philippe Ayotte-Beaudet
Jeanna Wieselmann
Jee Suh
Jeff Spencer
Jeffrey Radloff
Jennifer Heisler
Jennifer Jackson
Jennifer Richards
Jennifer Smith
Jennifer Tripp
Jennifer Wilhelm
Jenny Ingber
Jessica Reaves
Jeungtae Eom
Jing Lin
Johan Tabora
Johanna Kranz
John Bencze
Jonathan Bowers
Jonathan Hall
Jonathan McCausland
Jongchan Park
Jordan Henley
Jose Pavez
Joseph Isaac
Joseph Watts
Juan Jimenez
Julia Plummer
K.C. Busch
Karlis Greitans
Katarzyna Pomian Bogdanov
Kate Elizabeth Miller
Kate Henson
Katherine McCance
Kathleen Schenkel
Kathryn Bateman
Kathryn Hayes
Kathryn Kirchgasler
Kathryn Ribay
Katie Nolan
Katja Plicht
Katy Nilsen
Program Proposal Reviewers

Kelsey Beeghly
Kelsie Fowler
Kent Crippen
Kevin Cherbow
Kevin Fleming
Khadija Fouad
Khanh Tran
Klaudja Caushi
Kraig Wray
Kristen Brown
Kristen Napolitano
Kristin Guinckel
Kristin Mansell
Kristina Tank
Kristine Squillace Stenlund
KT Doerr
Kuay-keng Yang
Kyungjin Cho
Lacey Huffling
Laura Blue
Laura Pirkle Howd
Laura Sührig
Laura Zangori
Lauren Madden
Lauren Vogelstein
Lauren Wagner
Lauri Davis
Leonard Annetta
Lezly Taylor
Linda Hämmerle
Linda Morell
Linda Preminger
Lindsay Lightner
Lion Cornelius Glatz
Lisa Borgerding
Lisa Lundgren
Lisa Marco-Bujosa
Lucy McClain
Lutz Kasper
Lydia Burke
Lyndsay Munro
Lyrica Lucas
M. Gail Jones
Maia Elkana
Maizie Miller
Man Su
Manal Almalki
Mandi Collins
Mandy Peel
Maram Al Aqra
Marcus Kubsch
Mareike Freese
Margaret Blanchard
Maria González-Howard
Mariam Yamout
Marianne Ødegaard
Maricar Prudente
Marida Ergazaki
Marie-Noel Salem
Marina Birkenstock
Mark Akubo
Martí Canipe
Mary Atwater
Mary Johnston
Mary Short
Matthew Kloser
Matthew Perkins Coppola
Matthew Weinstein
Matthew Wilsey
Matthias Fischer
May Lee
Meena Balgopal
Megan Ennes
Meghan Marrero
Melanie Kinskey
Melissa McCartney
Mengyu Wang
Meredith Park Rogers
Meredith Schwendemann
Merryn Cole
Metin Sardag
Michael Adewusi
Michael Giamellaro
Michaela Maurer
Michal Dvir
Michal Haskel-Ittah
Michelle Parslow
Mihye Won
Mikayla Strasser
Mila Rosa Carden
Min Jung Lee
Minyoung Gil
Miri Barak
Mohammed Estatieyeh
Mojtaha Khajeloo
Molly Staggs
Molly Zhang
Mon-Lin Monica Ko
Monica Cardella
Moriah Ariely
Moritz Krell
Muhammad Abd Hadi Bunyamin
Muhammad Purwanto
Muriel Grenon
Mutliara Syifa
Nancy Staus
Narendra Deshmukh
Natalie Ahne
Natalie De Lucca
Nicolette Maggiore
Niki Koukoulidis
Nilay Ozturk
Nina Christenson
Nitsaha Mathayas
Niyazi Erdoğan
Noemi Waight
Noushin Nouri
Nurcan Keles
O. Theresa Ayangbola
Öğr. Üyesi Banu Avşar Erümit
Olayinka Mohorn
Omiya Sultana
Orit Ben Zvi Assaraf
Orit Herscovitz
Orkun Koçak
Ornit Spektor-Levy
Osman Aksit
Ozgur Dogan
Özlem Akçil
Pamela Lottero-Perdue
Patricia Patrick
Patrick Enderle
Paulina Gajewska-Schaefer
Peng He
Peter Garik
Peter Okebukola
Program Proposal Reviewers

Peter Rillero
Peter Wulff
Philip Bell
Preetha Krishnan
Menon
Preethi Titu
Preeti Gupta
Priyanka Parekh
Qingna Jin
Qiuyan Wu
Quentin Sedlacek
Rachel Garcia
Rachel Ruggirello
Rachel Sheffield
Rachel Stronach
Ragnhild Barbu
Ravishankar Chatta
Subramaniam
Razan Hamed
Rebecca Rawson
Rebekah Hammad
Regina Soobard
Rekha Koul
Renee Schwartz
Richard Bex
Richard Lamb
Risa Haridza
Rita Hagevik
Rita Krebs
Robert Lightfoot
Robert Paul Dalka
Robertta Hunter
Roger Erb
Rola Khishfe
Romola Bernard
Ron Gray
Roshni Bano
Roslinawati Roslan
Ross Nehm
Ruiping Huang
Ryan Cain
Ryan Coker
Ryan Nixon
Ryan Summers
S Burrell
Sabine Fechner
Sabrina Stanley
Salwa Ali
Sam Severance
Sam Skrob-Martín
Samia Khan
Samuel Lee
Sandra Richy John
Sandra Yarema
Sanlyn Buxner
Sara Heredia
Sara Tolbert
Sara Wilmes
Sarah Braden
Sarah Carrier
Sarah Fick
Sarah Fogelman
Sarah Halwany
Sarah Lilly
Sarah Poor
Savannah Graham
Sayuri Tanabashi
Scott Cohen
Scott McDonald
Scott Pattison
Selcen Guzey
Selin Akgun
Senay Purzer
Senetta Bancroft
Shahaf Rocker Yoel
Shane Tutwiler
Shannon Davidson
Sharfun Islam Nancy
Sharona T Levy
Sherry Southerland
Shiang-Yao Liu
Shirly Avargil
Shukufe Rahman
Sierra Morandi
Silvia Jessica
Mostacedo
Marasovic
Soon Lee
Soonhye Park
Sophia Jeong
Stefan Sorge
Stefanie Marshall
Stephen Burgin
Stephen Thompson
Stephen Witzig
SuChi Fang
Sugat Dabholkar
Suzanne Poole
Swarna Mahapatra
T Sikorski
T.S. Yang
Taiwo Ogundapo
Takeshia Pierre
Takunda Maisva
Takuya Matsuura
Tamar Fuhrmann
Tamar Ginzburg
Tania Jarosewich
Ted Clark
Teresa Leavens
Teresa Massey
Terrance Burgess
Tess Bernhard
Tessa Andrews
Theila Smith
Thomas McKenna
Ti’Era Worsley
Tim Goebel
Tim Hartelt
Tingting Li
Todd Harwell
Toma Radu Bogdan
Tulana Ariyaratne
Tyler Harper-Gampp
Valarie Akerson
Vanessa Fischer
Vanessa Louis
Verena Ruf
Veronica McGowan
Veronika Rozhenkova
William Romine
Wisal Ganaiem
Wisam Sedawi
Won Jung Kim
Wonyong Park
Xinyu He
Yael Rozenblum
Yang Zhanng
Yehudit Judy Dori
Yejun Bae
Ying Chen
Ying-Yan Lu
Yu Zhang
Yu-Chen Chiu
Yu-Jan Tseng
Zac Patterson
Zoubeida Dagher
### NARST Presidents

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1928</td>
<td>W. L. Eikenberry</td>
</tr>
<tr>
<td>1929</td>
<td>W. L. Eikenberry</td>
</tr>
<tr>
<td>1930</td>
<td>W. L. Eikenberry</td>
</tr>
<tr>
<td>1931</td>
<td>Elliot R. Downing</td>
</tr>
<tr>
<td>1932</td>
<td>Elliot R. Downing</td>
</tr>
<tr>
<td>1933</td>
<td>Francis D. Curtis</td>
</tr>
<tr>
<td>1934</td>
<td>Ralph K. Watkins</td>
</tr>
<tr>
<td>1935</td>
<td>Archer W. Hurd</td>
</tr>
<tr>
<td>1936</td>
<td>Gerald S. Craig</td>
</tr>
<tr>
<td>1937</td>
<td>Walter G. Whitman</td>
</tr>
<tr>
<td>1938</td>
<td>Hanor A. Webb</td>
</tr>
<tr>
<td>1939</td>
<td>John M. Mason</td>
</tr>
<tr>
<td>1940</td>
<td>Otis W. Caldwell</td>
</tr>
<tr>
<td>1941</td>
<td>Harry A. Carpenter</td>
</tr>
<tr>
<td>1942</td>
<td>G. P. Cahoon</td>
</tr>
<tr>
<td>1943</td>
<td>Florence G. Billig</td>
</tr>
<tr>
<td>1944</td>
<td>Florence G. Billig</td>
</tr>
<tr>
<td>1945</td>
<td>Florence G. Billig</td>
</tr>
<tr>
<td>1946</td>
<td>C. L. Thield</td>
</tr>
<tr>
<td>1947</td>
<td>Earl R. Glenn</td>
</tr>
<tr>
<td>1948</td>
<td>Ira C. Davis</td>
</tr>
<tr>
<td>1949</td>
<td>Joe Young West</td>
</tr>
<tr>
<td>1950</td>
<td>N. Eldred Bingham</td>
</tr>
<tr>
<td>1951</td>
<td>Betty Lockwood</td>
</tr>
<tr>
<td>1952</td>
<td>Betty Lockwood</td>
</tr>
<tr>
<td>1953</td>
<td>J. Darrell Barnard</td>
</tr>
<tr>
<td>1954</td>
<td>George G. Mallinson</td>
</tr>
<tr>
<td>1955</td>
<td>Kenneth E. Anderson</td>
</tr>
<tr>
<td>1956</td>
<td>W. C. Van Deventer</td>
</tr>
<tr>
<td>1957</td>
<td>Waldo W. Blanchet</td>
</tr>
<tr>
<td>1958</td>
<td>Nathan S. Washton</td>
</tr>
<tr>
<td>1959</td>
<td>Thomas P. Fraser</td>
</tr>
<tr>
<td>1960</td>
<td>Vaden W. Miles</td>
</tr>
<tr>
<td>1961</td>
<td>Clarence H. Boeck</td>
</tr>
<tr>
<td>1962</td>
<td>Herbert A. Smith</td>
</tr>
<tr>
<td>1963</td>
<td>Ellsworth S. Obourn</td>
</tr>
<tr>
<td>1964</td>
<td>Cyrus W. Barnes</td>
</tr>
<tr>
<td>1965</td>
<td>Frederic B. Dutton</td>
</tr>
<tr>
<td>1966</td>
<td>Milton P. Pella</td>
</tr>
<tr>
<td>1967</td>
<td>H. Craig Sipe</td>
</tr>
<tr>
<td>1968</td>
<td>John M. Mason</td>
</tr>
<tr>
<td>1969</td>
<td>Joseph D. Novak</td>
</tr>
<tr>
<td>1970</td>
<td>Willard D. Jacobson</td>
</tr>
<tr>
<td>1971</td>
<td>Paul D. Hurd</td>
</tr>
<tr>
<td>1972</td>
<td>Frank X. Sutman</td>
</tr>
<tr>
<td>1973</td>
<td>J. David Lockard</td>
</tr>
<tr>
<td>1974</td>
<td>Wayne W. Welch</td>
</tr>
<tr>
<td>1975</td>
<td>Robert E. Yager</td>
</tr>
<tr>
<td>1976</td>
<td>Ronald D. Anderson</td>
</tr>
<tr>
<td>1977</td>
<td>O. Roger Anderson</td>
</tr>
<tr>
<td>1978</td>
<td>Roger G. Olstad</td>
</tr>
<tr>
<td>1979</td>
<td>James R. Okey</td>
</tr>
<tr>
<td>1980</td>
<td>John W. Renner</td>
</tr>
<tr>
<td>1981</td>
<td>Stanley L. Helgeson</td>
</tr>
<tr>
<td>1982</td>
<td>Stanley L. Helgeson</td>
</tr>
<tr>
<td>1983</td>
<td>Carl F. Berger</td>
</tr>
<tr>
<td>1984</td>
<td>Ann C. Howe</td>
</tr>
<tr>
<td>1985</td>
<td>Ertle Thompson</td>
</tr>
<tr>
<td>1986</td>
<td>David P. Butts</td>
</tr>
<tr>
<td>1987</td>
<td>James P. Barufaldi</td>
</tr>
<tr>
<td>1988</td>
<td>Linda DeTure</td>
</tr>
<tr>
<td>1989</td>
<td>Patricia Blosser</td>
</tr>
<tr>
<td>1990</td>
<td>William G. Holliday</td>
</tr>
<tr>
<td>1991</td>
<td>Jane Butler Kahle</td>
</tr>
<tr>
<td>1992</td>
<td>Russell H. Yeany</td>
</tr>
<tr>
<td>1993</td>
<td>Emmett L. Wright</td>
</tr>
<tr>
<td>1994</td>
<td>Kenneth G. Tobin</td>
</tr>
<tr>
<td>1995</td>
<td>Dorothy L. Gabel</td>
</tr>
<tr>
<td>1996</td>
<td>Barry J. Fraser</td>
</tr>
<tr>
<td>1997</td>
<td>Thomas R. Koballa, Jr.</td>
</tr>
<tr>
<td>1998</td>
<td>Audrey B. Champagne</td>
</tr>
<tr>
<td>1999</td>
<td>Joseph S. Krajcik</td>
</tr>
<tr>
<td>2000</td>
<td>David F. Treagust</td>
</tr>
<tr>
<td>2001</td>
<td>Sandra K. Abell</td>
</tr>
<tr>
<td>2002</td>
<td>Norman G. Lederman</td>
</tr>
<tr>
<td>2003</td>
<td>Cheryl L. Mason</td>
</tr>
<tr>
<td>2004</td>
<td>Charles W. (Andy) Anderson</td>
</tr>
<tr>
<td>2005</td>
<td>John R. Staver</td>
</tr>
<tr>
<td>2006</td>
<td>James A. Shymanksy</td>
</tr>
<tr>
<td>2007</td>
<td>Jonathan F. Osborne</td>
</tr>
<tr>
<td>2008</td>
<td>Penny J. Gilmer</td>
</tr>
<tr>
<td>2009</td>
<td>Charlene M. Czerniak</td>
</tr>
<tr>
<td>2010</td>
<td>Richard A. Duschl</td>
</tr>
<tr>
<td>2011</td>
<td>Dana L. Zeidler</td>
</tr>
<tr>
<td>2012</td>
<td>J. Randy McGinnis</td>
</tr>
<tr>
<td>2013</td>
<td>Sharon J. Lynch</td>
</tr>
<tr>
<td>2014</td>
<td>Lynn A. Bryan</td>
</tr>
<tr>
<td>2015</td>
<td>Valarie L. Akerson</td>
</tr>
<tr>
<td>2016</td>
<td>Mary M. Atwater</td>
</tr>
<tr>
<td>2017</td>
<td>Mei-Hung Chiu</td>
</tr>
<tr>
<td>2018</td>
<td>Barbara Crawford</td>
</tr>
<tr>
<td>2019</td>
<td>Gail Richmond</td>
</tr>
<tr>
<td>2020</td>
<td>Tali Tal</td>
</tr>
<tr>
<td>2021</td>
<td>Eileen R. C. Parsons</td>
</tr>
<tr>
<td>2022</td>
<td>Renée Schwartz</td>
</tr>
<tr>
<td>2023</td>
<td>Gillian Roehrig</td>
</tr>
<tr>
<td>2024</td>
<td>Jomo Mutegi</td>
</tr>
</tbody>
</table>

### NARST Executive Directors

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Year</th>
<th>Name</th>
<th>Year</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2002–2007</td>
<td>John Tillotson</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
JRST Editors

1966–1968 H. Craig Sipe
1969 James T. Robinson
1970–1974 O. Roger Anderson
1975–1979 David P. Butts
1980–1984 James A. Shymansky
1990–1993 Ronald G. Good
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  Elsa Feher  John Christopher  Paul Joslin
Albert Nous  George Bodner  Joseph Novak  Peter Hewson
Avi Hofstein  Gerald Krockover  Judith Lederman  Peter Okebukola
Aviva Klieger  Gian Pedemonte  Julia Clark  Richard Haney
Barbara Crawford  Glenn Berkheimer  Kathryn Scantlebury  Richard Walding
Bill Jaffarian  Glenn Markle  Larry Enochs  Robert Dehaan
Carl Angell  Gottfried Merzyn  Larry Yore  Robert Poel
Charles Anderson  Guilford Bartlett  Leonie Rennie  Robert Sherwood
Charles McFadden  Hanna Arzi  Linda Phillips  Robert Williams
Dale Baker  Hans Andersen  Lowell Bethel  Rodney Doran
David Haury  Helmut Dahncke  Mansoor Niazi  Roger Olstad
David Kennedy  Herbert Thier  Manuel Sequeira  Ronald Anderson
Donald Riechard  Ivo Lindauer  Marianne Barnes  Stanley Helgeson
Donald Schmidt  J. Prather  Marlene Thier  Sue Tunncliffe
Doris Ash  J. Swift  Michael Agin  Sung Jae Pak
Doris Simonis  Jacqueline Mallinson  Michael Padilla  Uri Ganiel
Ed Van Den Berg  James Poth  Michael Piburn  Vincent Lunetta
Edward Smith  James Shymansky  Nitza Barnea  Wayne Welch
Eileen Parsons  Jane Kahle  Obed Norman  William Holliday
Elke Sumfleth  Jay Lemke  Onno De Jong
Ellen Simmons  Jim Minstrell  Patricia Friedrichsen
### NARST Award Recipients

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

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>Anton E. Lawson</td>
</tr>
<tr>
<td>1987</td>
<td>Paul DeHart Hurd</td>
</tr>
<tr>
<td>1988</td>
<td>John W. Renner</td>
</tr>
<tr>
<td>1989</td>
<td>Willard Jacobson</td>
</tr>
<tr>
<td>1990</td>
<td>Joseph D. Novak</td>
</tr>
<tr>
<td>1991</td>
<td>Robert L. Shrigley</td>
</tr>
<tr>
<td>1992</td>
<td>Pinchas Tamir</td>
</tr>
<tr>
<td>1993</td>
<td>Jack Easley, Jr.</td>
</tr>
<tr>
<td>1994</td>
<td>Marcia C. Linn</td>
</tr>
<tr>
<td>1995</td>
<td>Wayne W. Welch</td>
</tr>
<tr>
<td>1996</td>
<td>Carl F. Berger</td>
</tr>
<tr>
<td>1997</td>
<td>Rosalind Driver</td>
</tr>
<tr>
<td>1998</td>
<td>James J. Gallagher</td>
</tr>
<tr>
<td>1999</td>
<td>Peter J. Fensham</td>
</tr>
<tr>
<td>2000</td>
<td>Jane Butler Kahle</td>
</tr>
<tr>
<td>2001</td>
<td>John K. Gilbert</td>
</tr>
<tr>
<td>2002</td>
<td>Audrey B. Champagne</td>
</tr>
<tr>
<td>2003</td>
<td>Barry J. Fraser</td>
</tr>
<tr>
<td>2004</td>
<td>Robert E. Yager</td>
</tr>
<tr>
<td></td>
<td>Paul Black</td>
</tr>
<tr>
<td>2005</td>
<td>John C. Clement</td>
</tr>
<tr>
<td>2006</td>
<td>David Treagust</td>
</tr>
<tr>
<td>2007</td>
<td>Kenneth Tobin</td>
</tr>
<tr>
<td>2008</td>
<td>Dorothy Gabel</td>
</tr>
<tr>
<td>2009</td>
<td>Peter W. Hewson</td>
</tr>
<tr>
<td></td>
<td>Leonie Jean Rennie</td>
</tr>
<tr>
<td></td>
<td>Wolff-Michael Roth</td>
</tr>
<tr>
<td>2010</td>
<td>Reinders Duit</td>
</tr>
<tr>
<td></td>
<td>Joseph Krajcik</td>
</tr>
<tr>
<td>2011</td>
<td>Norman Lederman</td>
</tr>
<tr>
<td>2012</td>
<td>Charles W. (Andy) Anderson</td>
</tr>
<tr>
<td></td>
<td>Larry Yore</td>
</tr>
<tr>
<td>2013</td>
<td>Dale R. Baker</td>
</tr>
<tr>
<td>2014</td>
<td>Glen Alkenhead</td>
</tr>
<tr>
<td></td>
<td>Richard Gunstone</td>
</tr>
<tr>
<td></td>
<td>Frances Lawrenz</td>
</tr>
<tr>
<td>2015</td>
<td>Richard A. Duschl</td>
</tr>
<tr>
<td></td>
<td>Meshach Mobolaji Ogunniyi</td>
</tr>
<tr>
<td>2016</td>
<td>Lynn D. Dierking</td>
</tr>
<tr>
<td></td>
<td>John N. Falk</td>
</tr>
<tr>
<td></td>
<td>Dana L. Zeidler</td>
</tr>
<tr>
<td>2017</td>
<td>Avi Hofstein</td>
</tr>
<tr>
<td>2018</td>
<td>Marissa Rollnick</td>
</tr>
<tr>
<td></td>
<td>Jonathan Osborne</td>
</tr>
<tr>
<td>2019</td>
<td>Mary M. Atwater</td>
</tr>
<tr>
<td></td>
<td>Maria Pilar Jiménez-Aleixandre</td>
</tr>
<tr>
<td>2020</td>
<td>Judy Dori</td>
</tr>
<tr>
<td></td>
<td>Saouma Bou Jaoude</td>
</tr>
<tr>
<td>2021</td>
<td>Valerie Akerson</td>
</tr>
<tr>
<td></td>
<td>Greg Kelly</td>
</tr>
<tr>
<td>2022</td>
<td>Fouad Abd-El-Khalick</td>
</tr>
<tr>
<td></td>
<td>Gail Jones</td>
</tr>
<tr>
<td>2023</td>
<td>Franz X. Bogner</td>
</tr>
<tr>
<td></td>
<td>Okhee Lee</td>
</tr>
</tbody>
</table>
### Outstanding Doctoral Research Award

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee(s)</th>
<th>Advisor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>Rene Stofflett</td>
<td>Dale R. Baker</td>
</tr>
<tr>
<td>1993</td>
<td>Julie Gess-Newsome</td>
<td>Norman G. Lederman</td>
</tr>
<tr>
<td>1994</td>
<td>Carolyn W. Keys</td>
<td>Burton E. Voss</td>
</tr>
<tr>
<td>1995</td>
<td>Jerome M. Shaw</td>
<td>Edward Haertel</td>
</tr>
<tr>
<td>1996</td>
<td>Christine M. Cunningham</td>
<td>William L. Carlsen</td>
</tr>
<tr>
<td>1997</td>
<td>Jane O. Larson</td>
<td>Ronald D. Anderson</td>
</tr>
<tr>
<td>1998</td>
<td>Kathleen Hogan</td>
<td>Bonnie K. Nastasi</td>
</tr>
<tr>
<td>1999</td>
<td>Fouad Abd-El-Khalick</td>
<td>Norman G. Lederman</td>
</tr>
<tr>
<td>2000</td>
<td>Danielle Jo Ford</td>
<td>Annemarie S. Palinscar</td>
</tr>
<tr>
<td>2001</td>
<td>Iris Tabak</td>
<td>Brian Reiser</td>
</tr>
<tr>
<td>2002</td>
<td>Mark Girod</td>
<td>David Wong</td>
</tr>
<tr>
<td>2003</td>
<td>Hsin-Kai Wu</td>
<td>Joseph Krajcik</td>
</tr>
<tr>
<td>2004</td>
<td>David L. Fortus</td>
<td>Ronald Marx</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Joseph Krajcik</td>
</tr>
<tr>
<td>2005</td>
<td>Thomas Tretter</td>
<td>Gail M. Jones</td>
</tr>
<tr>
<td>2006</td>
<td>Stacy Olitsky</td>
<td>Kenneth Tobin</td>
</tr>
<tr>
<td>2007</td>
<td>Julia Plummer</td>
<td>Joseph S. Krajcik</td>
</tr>
<tr>
<td>2008</td>
<td>Victor Sampson</td>
<td>Douglas Clark</td>
</tr>
<tr>
<td>2009</td>
<td>Lei Liu</td>
<td>Cindy E. Hmelo-Silver</td>
</tr>
<tr>
<td>2010</td>
<td>Heather Toomey</td>
<td>Phillip Bell Zimmerman</td>
</tr>
<tr>
<td>2011</td>
<td>Jeffrey J. Rozelle</td>
<td>Suzanne M. Wilson</td>
</tr>
<tr>
<td>2011</td>
<td>Catherine Eberbach</td>
<td>Kevin Crowley</td>
</tr>
<tr>
<td>2012</td>
<td>Melissa Braaten</td>
<td>Mark Windschitl</td>
</tr>
<tr>
<td>2013</td>
<td>Lori Fulton</td>
<td>Jian Wang</td>
</tr>
<tr>
<td>2014</td>
<td>Daniel Birmingham</td>
<td>Angela Calabrese Barton</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anne-Lise Halvorsen</td>
</tr>
<tr>
<td>2015</td>
<td>Allison Godwin</td>
<td>Geoffrey Potvin</td>
</tr>
<tr>
<td>2016</td>
<td>Anna MacPherson</td>
<td>Jonathan Osborne</td>
</tr>
<tr>
<td>2017</td>
<td>Anita Schuchardt</td>
<td>Christian Schunn</td>
</tr>
<tr>
<td>2018</td>
<td>Katherine Wade-Jaines</td>
<td>Renée Schwartz</td>
</tr>
<tr>
<td>2019</td>
<td>Anita S. Tseng</td>
<td>Jonathan F. Osborne</td>
</tr>
<tr>
<td>2020</td>
<td>Netta Shaby</td>
<td>Orit Ben Zvi-Assaraf</td>
</tr>
<tr>
<td>2021</td>
<td>Eben Witherspoon</td>
<td>Christian D. Schunn</td>
</tr>
<tr>
<td>2022</td>
<td>Won Jung Kim</td>
<td>Angela Calabrese Barton</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alicia Alonzo</td>
</tr>
<tr>
<td>2023</td>
<td>Gary William Wright III</td>
<td>Cesar Delgado</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Wolff-Michael Roth</td>
</tr>
<tr>
<td>1994</td>
<td>Deborah J. Tippins</td>
</tr>
<tr>
<td>1995</td>
<td>Nancy B. Songer</td>
</tr>
<tr>
<td>1996</td>
<td>Mary B. Nakhleh</td>
</tr>
<tr>
<td>1997</td>
<td>Peter C. Taylor</td>
</tr>
<tr>
<td>1998</td>
<td>J. Randy McGinnis</td>
</tr>
<tr>
<td>1999</td>
<td>Craig W. Bowen, Gregory J. Kelly</td>
</tr>
<tr>
<td>2000</td>
<td>Angela Calabrese Barton</td>
</tr>
<tr>
<td>2001</td>
<td>Julie A. Bianchini</td>
</tr>
<tr>
<td>2002</td>
<td>Alan G. Harrison</td>
</tr>
<tr>
<td>2003</td>
<td>Fouad Abd-El-Khalick</td>
</tr>
<tr>
<td>2004</td>
<td>Grady J. Venville</td>
</tr>
<tr>
<td>2005</td>
<td>Randy L. Bell</td>
</tr>
<tr>
<td>2006</td>
<td>Heidi Carlone</td>
</tr>
<tr>
<td>2007</td>
<td>Bryan A. Brown</td>
</tr>
<tr>
<td>2008</td>
<td>Hsin-Kai Wu</td>
</tr>
<tr>
<td>2009</td>
<td>Troy D. Sadler</td>
</tr>
<tr>
<td>2010</td>
<td>Thomas Tretter</td>
</tr>
<tr>
<td>2011</td>
<td>Katherine L. McNeill</td>
</tr>
<tr>
<td>2012</td>
<td>Victor Sampson</td>
</tr>
<tr>
<td>2013</td>
<td>Alandeom W. Oliveira</td>
</tr>
<tr>
<td>2014</td>
<td>Cory Forbes</td>
</tr>
<tr>
<td>2015</td>
<td>Benjamin C. Herman</td>
</tr>
<tr>
<td>2016</td>
<td>Richard L. Lamb</td>
</tr>
<tr>
<td>2017</td>
<td>Ying-Chih Chen, David Stroupe</td>
</tr>
<tr>
<td>2018</td>
<td>Doug Lombardi</td>
</tr>
<tr>
<td>2019</td>
<td>Hosun Kang, Eve Manz</td>
</tr>
<tr>
<td>2020</td>
<td>Brian Donovan, Dana Vedder Weiss</td>
</tr>
<tr>
<td>2021</td>
<td>Lama Jaber</td>
</tr>
<tr>
<td>2022</td>
<td>Maria González-Howard, Laura Zangori</td>
</tr>
<tr>
<td>2023</td>
<td>Natalie S. King, Christina Krist</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>Bryan A. Brown</td>
</tr>
<tr>
<td>2021</td>
<td>Richard A Duschl</td>
</tr>
<tr>
<td>2021</td>
<td>Gillian Roehrig</td>
</tr>
<tr>
<td>2022</td>
<td>Peter A. Okebukola</td>
</tr>
<tr>
<td>2023</td>
<td>Julie Bianchini</td>
</tr>
<tr>
<td>2023</td>
<td>Ron Blonder</td>
</tr>
<tr>
<td>2023</td>
<td>Patricia Friedrichsen</td>
</tr>
<tr>
<td>2024</td>
<td>Troy D. Sadler</td>
</tr>
<tr>
<td>2025</td>
<td>Thomas Tretter</td>
</tr>
<tr>
<td>2026</td>
<td>Katherine L. McNeill</td>
</tr>
<tr>
<td>2027</td>
<td>Victor Sampson</td>
</tr>
<tr>
<td>2028</td>
<td>Alandeom W. Oliveira</td>
</tr>
<tr>
<td>2029</td>
<td>Cory Forbes</td>
</tr>
<tr>
<td>2030</td>
<td>Benjamin C. Herman</td>
</tr>
<tr>
<td>2031</td>
<td>Richard L. Lamb</td>
</tr>
<tr>
<td>2032</td>
<td>Ying-Chih Chen, David Stroupe</td>
</tr>
<tr>
<td>2033</td>
<td>Doug Lombardi</td>
</tr>
<tr>
<td>2034</td>
<td>Hosun Kang, Eve Manz</td>
</tr>
<tr>
<td>2035</td>
<td>Brian Donovan, Dana Vedder Weiss</td>
</tr>
<tr>
<td>2036</td>
<td>Lama Jaber</td>
</tr>
<tr>
<td>2037</td>
<td>Maria González-Howard, Laura Zangori</td>
</tr>
<tr>
<td>2038</td>
<td>Natalie S. King, Christina Krist</td>
</tr>
</tbody>
</table>

Future NARST Meeting Dates

2024
March 16–19 | Denver, CO

2025
March 22-25 | Washington, D.C.

2026
April 18-21 | Seattle, WA
The Journal of Research in Science Teaching (JRST) Award

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee(s)</th>
<th>Year</th>
<th>Awardee(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>Mary Budd Rowe</td>
<td>1991</td>
<td>E. P. Hart, I. M. Robottom</td>
</tr>
<tr>
<td>1978</td>
<td>Dorothy L. Gabel, J. Dudley Herron</td>
<td>1994</td>
<td>E. David Wong</td>
</tr>
<tr>
<td>1982</td>
<td>Robert G. Good, Harold J. Fletcher, F. David Boulanger</td>
<td>1998</td>
<td>Julie Blanchini</td>
</tr>
<tr>
<td>1983</td>
<td>Jack A. Easley, Jr.</td>
<td>1999</td>
<td>Phillip M. Sadler</td>
</tr>
<tr>
<td>1984</td>
<td>Marcia C. Linn, Cathy Clement, Stephen Pulos</td>
<td>2000</td>
<td>Allan G. Harrison, J. Grayson, David F. Treagust</td>
</tr>
<tr>
<td>1985</td>
<td>Julie P. Sanford</td>
<td>2001</td>
<td>Fouad Abd-El-Khallick, Norman G. Lederman</td>
</tr>
<tr>
<td>1986</td>
<td>Anton E. Lawson</td>
<td>2002</td>
<td>Andrew Gibert, Randy Yerrick</td>
</tr>
<tr>
<td>1989</td>
<td>Glen S. Aikenhead</td>
<td>2006</td>
<td>Troy D. Sadler, Dana L. Zeldner</td>
</tr>
<tr>
<td>2007</td>
<td>Jerome Pine, Pamela Aschbacher, Ellen Roth, Melanie Jones, Cameron McPhee, Catherine Martin, Scott Phelps, Tara Kyle, Brian Foley</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Christine Chin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Kihyun Ryoo, Bryan Brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Helen Patrick, Panayota Mantzicopoulous, Ala Samarapungavan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>Daphne Minner, Jeanne Century, Abigail Jurist Levy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>Julie A. Luft, Jonah B. Firestone, Sissy S. Wong, Irasema Ortega, Krista Adams, Eun Jin Bang</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>Edys S. Quellmalz, Michael J. Timms, Matt D. Silberglitt, Barbara C. Buckley</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>Joseph Taylor, Susan Kowalski, Christopher Wilson, Stephen Getty, Janet Carlson</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>Matthew Kloser</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Awardee(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>John J. Koran</td>
</tr>
<tr>
<td>1976</td>
<td>Anton E. Lawson</td>
</tr>
<tr>
<td>1977</td>
<td>NO AWARD</td>
</tr>
<tr>
<td>1978</td>
<td>Rita Peterson</td>
</tr>
<tr>
<td>1979</td>
<td>Linda R. DeTure</td>
</tr>
<tr>
<td>1980</td>
<td>M. James Kozlow, Arthur L. White</td>
</tr>
<tr>
<td>1981</td>
<td>William Capie, Kenneth G. Tobin, Margaret Boswell</td>
</tr>
<tr>
<td>1982</td>
<td>F. Gerald Dillashaw, James R. Okey</td>
</tr>
<tr>
<td>1983</td>
<td>William C. Kyle, Jr., James A. Shymansky, Jennifer Alport</td>
</tr>
<tr>
<td>1984</td>
<td>Darrell L. Fisher, Barry J. Fraser</td>
</tr>
<tr>
<td>1985</td>
<td>Hanna J. Arzi*, Ruth Ben-Zvi*, Uri Ganiel*</td>
</tr>
<tr>
<td></td>
<td>Russell H. Yeany, Kueh Chin Yap, Michael J. Padilla</td>
</tr>
<tr>
<td>1986</td>
<td>Barry J. Fraser*, Herbert J. Walberg*, Wayne W. Welch*</td>
</tr>
<tr>
<td>1987</td>
<td>Robert D. Sherwood</td>
</tr>
<tr>
<td>1988</td>
<td>Barry J. Fraser, Kenneth G. Tobin</td>
</tr>
<tr>
<td>1989</td>
<td>James J. Gallagher, Armando Contreras</td>
</tr>
<tr>
<td>1990</td>
<td>Patricia L. Hauslein, Ronald G. Good, Catherine Cummins</td>
</tr>
<tr>
<td>1991</td>
<td>Nancy R. Romance, Michael Vitale</td>
</tr>
<tr>
<td>1992</td>
<td>Patricia Heller, Ronald Keith, Scott Anderson</td>
</tr>
<tr>
<td>1993</td>
<td>Wolff-Michael Roth</td>
</tr>
<tr>
<td>1994</td>
<td>Wolff-Michael Roth, Michael Bowen</td>
</tr>
<tr>
<td>1995</td>
<td>Wolff-Michael Roth</td>
</tr>
<tr>
<td>1996</td>
<td>Nancy J. Allen</td>
</tr>
<tr>
<td>1997</td>
<td>NO AWARD</td>
</tr>
<tr>
<td>1998</td>
<td>Wolff-Michael Roth, Reinders Duit, Michael Komorek, Jens Wilbers</td>
</tr>
<tr>
<td>1999</td>
<td>Lynn A. Bryan</td>
</tr>
<tr>
<td>2000</td>
<td>Joseph L. Hoffman, Joseph S. Krajcik</td>
</tr>
<tr>
<td>2001</td>
<td>Allan G. Harrison</td>
</tr>
<tr>
<td>2002</td>
<td>Carolyn Wallace Keys, Eun-Mi Yang, Brian Hand, Liesl Hohenshell</td>
</tr>
<tr>
<td>2003</td>
<td>Wolff-Michael Roth</td>
</tr>
<tr>
<td>2004</td>
<td>Joanne K. Olson*, Sharon J. Lynch*</td>
</tr>
<tr>
<td></td>
<td>Joel Kuipers, Curtis Pyke, Michael Szczes</td>
</tr>
</tbody>
</table>
General Information

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.

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

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

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

### Elections Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
<th>Members</th>
<th>Board Member Liaison</th>
<th>Ex Officio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>Nazan U. Bautista</strong> (Chair) Miami University</td>
<td><strong>Hernán Cofré Mardones</strong> Pontificia Universidad Católica de Valparaíso, Chile</td>
<td></td>
<td><strong>Renee Schwartz</strong> (Immediate Past President) Georgia State University</td>
</tr>
<tr>
<td>2025</td>
<td><strong>David Crowther</strong> (Co-Chair) University of Nevada, Reno</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### External Policy and Relations Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
<th>Members</th>
<th>Board Liaison</th>
<th>Ex Officio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2024</td>
<td><strong>Durdane Bayram-Jacobs</strong> (Chair) Eindhoven University of Technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td><strong>Henriette Burns</strong> Southern Illinois University, Edwardsville</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td><strong>Peter Okebukola</strong> Lagos State University, Nigeria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td><strong>Xavier Fazio</strong> Brock University, Canada</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td><strong>Francesca Williamson</strong> Butler University</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td><strong>Andy Cavagnetto</strong> Washington State University</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td><strong>Sara Raven</strong> Texas A&amp;M University</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td><strong>Ellen Granger</strong> Florida State University</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Equity and Ethics Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
<th>Members</th>
<th>Ex Officio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>María González-Howard</strong> (Chair) University of Texas, Austin</td>
<td><strong>Sara Salloum</strong> University of Balamand</td>
<td><strong>Gillian Roehrig</strong> (President) University of Minnesota</td>
</tr>
<tr>
<td>2023</td>
<td><strong>Ebru Eren</strong> Trinity College of Dublin, Ireland</td>
<td><strong>Erbogan Kaya</strong> George Mason University</td>
<td><strong>Lisa Martin-Hansen</strong> (Executive Director)</td>
</tr>
<tr>
<td>2024</td>
<td></td>
<td><strong>Phillip Boda</strong> University of California, Berkeley</td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td></td>
<td><strong>David Steele</strong> Alder Graduate School of Education</td>
<td></td>
</tr>
</tbody>
</table>
NARST Leadership Committees

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.

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>Theila Smith (Chair) University of Groningen</td>
</tr>
<tr>
<td></td>
<td>Scott Cohen (Co-Chair) Georgia State University</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
</tbody>
</table>

Ex Officio Member

| 2025 | Jomo Mutegi (President-Elect) Old Dominion University |

<table>
<thead>
<tr>
<th>Awards Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Year</td>
</tr>
<tr>
<td>2025</td>
</tr>
</tbody>
</table>

Outstanding Doctoral Research Award

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>Heidi Cian (Chair) Florida International University</td>
</tr>
<tr>
<td>2024</td>
<td>Julia Plummer (Co-Chair) Penn State University</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
</tbody>
</table>
## Awards Committee (con’t)

### Early Career Research Award

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>Hsin-Kai Wu</strong> (Chair) National Taiwan Normal University</td>
</tr>
<tr>
<td>2024</td>
<td><strong>Doug Larkin</strong> (Co-Chair) Montclair State University</td>
</tr>
</tbody>
</table>

**Members**

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>Matthew Weinstein</strong></td>
<td>University of Washington, Tacoma</td>
</tr>
<tr>
<td>2023</td>
<td><strong>Doris Ash</strong></td>
<td>University of California, Santa Cruz</td>
</tr>
<tr>
<td>2023</td>
<td><strong>Anton Puvirajah</strong></td>
<td>University of Western Ontario</td>
</tr>
<tr>
<td>2024</td>
<td><strong>Eleanor Abrahms</strong></td>
<td>University of Massachusetts, Lowell</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Ben Herman</strong></td>
<td>Texas A&amp;M University</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Christine Lotter</strong></td>
<td>University of South Carolina</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Meg Blanchard</strong></td>
<td>North Carolina State University</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Erin Peters-Burton</strong></td>
<td>George Mason University</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Bridget Miller</strong></td>
<td>University of South Carolina</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Larry Yore</strong></td>
<td>University of Victoria</td>
</tr>
</tbody>
</table>

### Distinguished Contributions to Science Education Through Research

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>2024</td>
<td><strong>Dana Neidler</strong> (Chair) University of South Florida</td>
</tr>
<tr>
<td>2024</td>
<td><strong>Xiufeng Liu</strong> (Co-Chair) University of Buffalo</td>
</tr>
</tbody>
</table>

**Members**

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>Agustín Adúriz-Bravo</strong></td>
<td>Universidad de Buenos Aires</td>
</tr>
<tr>
<td>2023</td>
<td><strong>Dale Baker</strong></td>
<td>Arizona State University</td>
</tr>
<tr>
<td>2023</td>
<td><strong>Fouad Abd-El-Khali</strong></td>
<td>University of North Carolina, Chapel Hill</td>
</tr>
<tr>
<td>2024</td>
<td><strong>Valarie Akerson</strong></td>
<td>Indiana University</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Justin Dillon</strong></td>
<td>Exeter University, UK</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Kathy Trundle</strong></td>
<td>Utah State University</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Mei-Hung Chiu</strong></td>
<td>National Taiwan Normal University</td>
</tr>
</tbody>
</table>

### NARST Fellows Award

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>2024</td>
<td><strong>Hosun Kang</strong> (Chair) University of California, Irvine</td>
</tr>
<tr>
<td>2024</td>
<td><strong>Lama Jaber</strong> (Co-Chair) Florida State University</td>
</tr>
</tbody>
</table>

**Members**

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>Lucy Avraamidou</strong></td>
<td>University of Groningen</td>
</tr>
<tr>
<td>2024</td>
<td><strong>Julie Luft</strong></td>
<td>University of Georgia</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Senay Purzer</strong></td>
<td>Purdue University</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Enrique Suarez</strong></td>
<td>University of Massachusetts, Amherst</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Lezly Taylor</strong></td>
<td>Virginia Polytechnic Institute and State University</td>
</tr>
</tbody>
</table>
## NARST Leadership Committees

### International Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>International Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>2025</td>
<td><strong>Mercy Ogunsola-Bandele</strong> (Chair)</td>
</tr>
<tr>
<td></td>
<td>National Open University of Nigeria</td>
</tr>
</tbody>
</table>

### Committee Leadership

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>Gavin Fulmer</strong> (Chair)</td>
</tr>
<tr>
<td></td>
<td>University of Iowa</td>
</tr>
<tr>
<td>2024</td>
<td><strong>Hayat Hokayem</strong> (Co-Chair)</td>
</tr>
<tr>
<td></td>
<td>Texas Christian University</td>
</tr>
</tbody>
</table>

### Members

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>Sheron Mark</td>
<td>University of Louisville</td>
</tr>
<tr>
<td>2023</td>
<td>Tasneem Anwar</td>
<td>Aga Khan University</td>
</tr>
<tr>
<td>2024</td>
<td>Claudia Vergara</td>
<td>Alberto Hurtado University, Chile</td>
</tr>
<tr>
<td>2024</td>
<td>Irene Drymiotou</td>
<td>University of Cyprus and University of Groningen</td>
</tr>
<tr>
<td>2024</td>
<td>Stefan Sorge</td>
<td>IPN Leibniz Institute for Science and Mathematics Education, Germany</td>
</tr>
<tr>
<td>2024</td>
<td>Lucía Vázquez Ben</td>
<td>Universidad da Coruña, Spain</td>
</tr>
<tr>
<td>2024</td>
<td>Lee Kenneth Jones</td>
<td>Texas Tech University</td>
</tr>
<tr>
<td>2025</td>
<td>Imran Tufail</td>
<td>University of Waikato</td>
</tr>
<tr>
<td>2025</td>
<td>Ranu Roy</td>
<td>Amity University Kolkata</td>
</tr>
<tr>
<td>2025</td>
<td>Aerin W. Benavides</td>
<td>University of North Carolina, Greensboro</td>
</tr>
<tr>
<td>2025</td>
<td>Nuri Balta</td>
<td>Suleyman Demirel University</td>
</tr>
</tbody>
</table>

### Membership Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>Elizabeth de los Santos</strong> (Chair)</td>
</tr>
<tr>
<td></td>
<td>University of Nevada, Reno</td>
</tr>
<tr>
<td>2025</td>
<td><strong>Mihwa Park</strong> (Co-Chair)</td>
</tr>
<tr>
<td></td>
<td>Texas Tech University</td>
</tr>
</tbody>
</table>

### Members

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>K.C. Busch</td>
<td>North Carolina State University</td>
</tr>
<tr>
<td>2024</td>
<td>Tugba Yuksel</td>
<td>Recep Tayyip Erdogan University</td>
</tr>
<tr>
<td>2024</td>
<td>Shiang-Yao Liu</td>
<td>National Taiwan Normal University</td>
</tr>
<tr>
<td>2024</td>
<td>Robert Bennett</td>
<td>Georgia State University</td>
</tr>
<tr>
<td>2025</td>
<td>Melanie Kinskey</td>
<td>Sam Houston State University</td>
</tr>
<tr>
<td>2025</td>
<td>Harini Krishnan</td>
<td>Florida State University</td>
</tr>
<tr>
<td>2025</td>
<td>Harleen Singh</td>
<td>University of Georgia</td>
</tr>
</tbody>
</table>

### Board Liaison

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Liaison</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td><strong>Brooke Whitworth</strong></td>
</tr>
<tr>
<td></td>
<td>Clemson University</td>
</tr>
</tbody>
</table>
## NARST Leadership Committees

### Program Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Leaders</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>Gillian Roehrig, President (Chair) University of Minnesota</td>
<td>2023 Shannon Navy Kent State University</td>
</tr>
<tr>
<td>2024</td>
<td>Jomo Mutegi (President-Elect) Old Dominion University</td>
<td>2023 Angela Chapman University Of Texas, Rio Grande Valley</td>
</tr>
<tr>
<td></td>
<td><strong>Ex Officio Member</strong> Is Digital Chair</td>
<td><strong>Members</strong></td>
</tr>
<tr>
<td></td>
<td>Lisa Martin-Hansen (Executive Director)</td>
<td>2023 Selina Bartels Valparaiso University</td>
</tr>
<tr>
<td>2024</td>
<td>Karl Jung University of South Florida</td>
<td>2023 Jose Pavez University of Georgia</td>
</tr>
<tr>
<td>2024</td>
<td>Xiaoming Zhai University of Georgia</td>
<td>2023 Grant Gardner Middle Tennessee State University</td>
</tr>
<tr>
<td>2024</td>
<td>Patricia Patrick Columbus State University</td>
<td>2023 Eli Tucker-Raymond Boston University</td>
</tr>
<tr>
<td>2024</td>
<td>Sanlyn Buxner University of Arizona</td>
<td>2023 Amanda Berry Monash University, Australia</td>
</tr>
<tr>
<td>2024</td>
<td>Elizabeth Lewis University of Nebraska, Lincoln</td>
<td>2023 Patrick Enderle Georgia State University</td>
</tr>
<tr>
<td>2024</td>
<td>Ana Schuchardt University of Minnesota</td>
<td>2024 Jing Lin Beijing Normal University</td>
</tr>
<tr>
<td>2024</td>
<td>Neta Shaby Ben Gurion University of the Negev</td>
<td>2024 Katharine Wade-Jaimes University of Nevada</td>
</tr>
<tr>
<td>2024</td>
<td>Amal Ibouk Florida State University</td>
<td>2024 Preethi Titu Kennesaw State University</td>
</tr>
<tr>
<td>2024</td>
<td>Julie Bianchini University of California, Santa Barbara</td>
<td>2024 Gunkut Mesci Giresun University, Turkey</td>
</tr>
<tr>
<td>2024</td>
<td>Tejaswini Dalvi University of Massachusetts, Boston</td>
<td>2024 Kathryn Kirchgasler University of Wisconsin, Madison</td>
</tr>
<tr>
<td>2024</td>
<td>Richard Lamb East Carolina University</td>
<td>2024 Jacob Pleasants Oklahoma University</td>
</tr>
<tr>
<td>2024</td>
<td>Wardell A. Powell Framingham State University</td>
<td>2024 Felicia Leammukda St. Cloud State University</td>
</tr>
</tbody>
</table>

**General Information**
### NARST Leadership Committees

#### Publications Advisory Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>Dante Cisterna (Chair) Education Testing Service</td>
</tr>
<tr>
<td>2024</td>
<td>Lindsay Lightner (Co-Chair) Washington State University Tri-Cities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Board Liaison</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023 Knut Neumann Leibniz Institute for Science and Mathematics Education</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ex Officio Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>2025 Troy Sadler (JRST Editor) University of North Carolina, Chapel Hill</td>
</tr>
<tr>
<td>2025 Felicia Moore Mensah (JRST Editor) Teachers College, Columbia University</td>
</tr>
<tr>
<td>2024 Gillian Roehrig (President) University of Minnesota</td>
</tr>
<tr>
<td>2024 Cynthia Crockett NSTA Research Division Director Harvard University</td>
</tr>
<tr>
<td>2024 Lisa Martin-Hansen (Executive Director)</td>
</tr>
</tbody>
</table>

#### Research Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>Rouhollah Aghasaleh (Chair) Humboldt State University</td>
</tr>
<tr>
<td>2024</td>
<td>Sarah Fick (Co-Chair) Washington State University</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2025</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Board Liaison</th>
</tr>
</thead>
<tbody>
<tr>
<td>2024 Malcolm Butler University of North Carolina, Charlotte</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NARST Liaison to NSTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2024 Michael Bowen Mount Saint Vincent University</td>
</tr>
</tbody>
</table>
## NARST Leadership Committees

### Social Media, Website and Communications Committee

<table>
<thead>
<tr>
<th>Final Year</th>
<th>Committee Leadership</th>
</tr>
</thead>
</table>
| 2023       | **Len Annetta** (Chair)  
             | East Carolina University |
| 2025       | **Ryan Cain** (Co-Chair)  
             | Weber State University |

<table>
<thead>
<tr>
<th>Members</th>
</tr>
</thead>
</table>
| 2023    | **Jaclyn Murray**  
          | Augusta University |
| 2023    | **Amber Adgerson**  
          | University of South Carolina |
| 2024    | **Stephanie Teeter**  
          | North Carolina State University |
| 2024    | **Stanton Belford**  
          | University of Tennessee Southern |
| 2024    | **Mark Newton**  
          | East Carolina University |
| 2024    | **Amy Voss Farris**  
          | Penn State University |
| 2025    | **Anna Maria Arias**  
          | Kennesaw State University |
| 2025    | **Sarah Frodsham**  
          | Oxford Brookes University |
| 2025    | **Won Jung Kim**  
          | Santa Clara University |

<table>
<thead>
<tr>
<th>Board Liaison</th>
</tr>
</thead>
</table>
| 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 Graduate Student Sponsorship Program initiative. 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.

Last 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:

- Meg Blanchard
- Kathryn Hayes
- Lisa Martin-Hansen
- Felicia Mensah
- Jonathan Osborne
- Brian Reiser
- Gillian Roehrig
- Christina Schwarz
- Jennifer Slavick
- Brooke Whitworth

Become a Graduate Student Sponsor!

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://members.narst.org/donations/
TURN YOUR CLASSROOM INTO A SPACESHIP

Infini-D Learning is an online collaborative platform that gives access to a library of interactive missions. Each mission is a choose-your-own adventure created around K-9 math and science standards. It's the first technology capable of providing data based on proficiency benchmarks for both critical skills and subject mastery.

LAUNCH COLLABORATIVE MISSIONS AT THE PUSH OF A BUTTON

1. Select a Standard
   Choose which standards-based mission will best capstone your instruction

2. Run a Mission
   Students work together in a gamified setting to resolve a standard-driven crisis

3. Review the Data
   See clear results on how each student performs in a variety of areas

SEE WHOLE-Student ANALYTICS

- Knowledge
- Application
- Initiative
- Collaboration
- Critical Thinking
- Resilience

“It’s like combining Nearpod, Kahoot, and the Magic School Bus into one ridiculously engaging platform. It is by far my students’ favorite thing to do in class.”

Jessica Romero
Elementary STEM Teacher

Create a free account at infinidlearning.com
Springer Nature publishes open access (OA) books and chapters under its SpringerOpen and Palgrave Macmillan imprints. We helped to pioneer OA book publishing, first piloting OA publication for books in 2011. We publish OA books across a wide range of areas in:

- 550+ books
- 280+ chapters

Benefits of publishing an OA book with Springer Nature:

- Increased visibility
- Maximised discoverability
- Global readership
- CC BY 4.0 licence for maximum reuse
- Author retains copyright
- Rigorous peer review
- Access to Bookmetrix
- Free for readers (PDF, ePub, HTML, MOBI)
- Various formats accepted: monographs, edited volumes/collections, proceedings, protocols, short-form books (SpringerBriefs, Palgrave Pivots), chapters.

Download stats:
- 30+ million chapter downloads since 2013
- Average chapter downloads per open access book: 58.7K
- Readers are in 150+ countries

200+ funding partners:
- Including:
  - European Commission
  - European Research Council
  - FWF, IEA
  - IMISCOE, Simula
  - The Wellcome Trust

Contact Claudia Acuna
Editor, Social Sciences
claudia.acuna@springer.com
SeeMeTeach
Teacher Observation Reimagined!

Research Support and Grant Evaluation

Incorporate SMT high-resolution data from teacher and classroom observations into your research and grant evaluation.

Examine the real impact of professional or curriculum development on key and critical indicators of teaching and lesson success!

- Teacher Actions - Questioning, responding, and wait time.
- Student Engagement - Individuals and groups of students and/or by student demographics.
- Student Misbehaviors - Individual and group misbehaviors, and teacher reactions.
- Lesson Type - Data separated by type of lesson.
- Instant Analysis - Displayed via the seating chart heat maps, graphs, timelines, and data tables.

Benefit from the robust data collected and analyzed by using this observation app!

Used For:
- Faculty and graduate student research
- Faculty and TA teaching development
- Grant evaluation
- Teacher observation in preservice programs
- Teacher observation in schools

- Extensive data linked to video
- Qualitative & quantitative modes
- Numerous key indicators of teacher actions, student engagement, and lesson success

Get Started TODAY!
USA 1 (866) 412.3456
doc@seemeteach.com

www.seemeteach.com

The SMT team can train observers to use the app, help plan for data collection, provide assistance in the analysis of data, and be contracted to complete the evaluation.
William Lutz, in his book *Doublespeak*, describes the various ways that governments and corporations present alternative truths and misrepresent reality. In one of his lectures on the book, Lutz used sugar labeling as an example of doublespeak. After the lecture an audience member explained that he had been diagnosed with diabetes some years prior. The audience member further explained that he and his wife were religious about reading food labels and avoiding food products with added sugar. He then grew solemn as he thanked Lutz and admitted that, “I just learned today that for years I’ve been eating ‘sugar-free’ products that actually contain sugar.”

This audience member is not alone. A 2017 study in the journal *Preventing Chronic Disease* found that many consumers (anywhere from 25-50%) have difficulty understanding and making decisions based on nutrition labels. Neither is this audience member alone in his struggle against diabetes. In 2012, the CDC estimated that one in every 7 to 8 adults had Type II Diabetes. And this number is growing rapidly. Between 1990 and 2010, the number of people with diabetes tripled.

Diabetes is not the only threat. Lead tainted water, adulterated food, perfluoroalkyl substances, addictive devices, corporate and governmental disinformation, and adverse cultural agendas are among hundreds of threats that accompany STEM advances. Although children spend most of their waking hours in school, studies on public understanding of science consistently show that they are not becoming adults who are able to recognize, understand and successfully navigate these threats. While the threats that result from STEM advances are not caused by STEM educators (and those with a vested interest in STEM education), we may unknowingly be complicit in maintaining them.

One of our biggest challenges may be our longstanding effort to use K-12 science education as a space for producing more scientists. The goal of producing more scientists has been explicitly articulated in every major reform movement from *Sputnik to Science for All Americans*, to the *National Science Education Standards*, to the *Next Generation Science Standards*.

The effort to produce more scientists would not be a problem except that the percentage of scientists is very small. In its Science Report, Towards 2030, the United Nations Educational, Scientific, Cultural Organization (UNESCO) reports that there are 7.8 million full-time science researchers worldwide. While this number may seem large it represents only 0.1% of the world’s population. So we are essentially teaching a version of science to all children that amounts to career preparation for 0.1% of the world. At the same time, the rest of us (99.9%) are not gaining an understanding of science that would enable us to enrich our lives.

The conference theme, *Science Education for the Rest of Us*, is intended to foreground the purpose of science education, and to draw our collective attention to the many socio-scientific issues that are increasingly important in modern society but have yet to find a place in the standard K-12 curriculum. There is no better place to engage in this exciting work than with colleagues at the 2024 NARST Annual Conference.

We welcome your contributions and look forward to seeing you in Denver!
SCIENCE EDUCATION FOR THE REST OF US

NARST 2024

97th Annual International Conference
March 17-20
Denver, CO
# NARST 2023 International Conference

## Schedule at a Glance

*All times are USA Central Time*

## Regular Sessions

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, April 17</td>
<td><strong>Registration</strong></td>
<td>8th St. Foyer on Lobby Level [near Business Center]</td>
</tr>
<tr>
<td>3:00 pm – 5:00 pm</td>
<td><strong>NARST Board Meeting</strong></td>
<td>Waldorf</td>
</tr>
<tr>
<td>8:00 am – 5:00 pm</td>
<td><strong>NARST Board Meeting</strong></td>
<td>Waldorf</td>
</tr>
</tbody>
</table>

## Workshops

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Integrating Science with Computer Science for Linguistically Diverse Classrooms at Upper Elementary Grades via Educational Robotics</td>
<td>Salon A1</td>
</tr>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Use of cutting-edge technologies in STEM education. Programs and lessons learned with AR, VR, and 3D modeling</td>
<td>Salon A2</td>
</tr>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Critically theorizing the margins for reform-based equity in science: A disobedient reckoning</td>
<td>Salon A3</td>
</tr>
</tbody>
</table>

## Business Meetings

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, April 17</td>
<td><strong>NARST Board Meeting</strong></td>
<td>Waldorf</td>
</tr>
<tr>
<td>8:00 am – 12:00 pm</td>
<td><strong>NARST Board Meeting</strong></td>
<td>Waldorf</td>
</tr>
</tbody>
</table>

## Social Events

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, April 17</td>
<td>Mentor-Mentee Nexus (ticketed event) Sponsor: Membership Committee</td>
<td>Salon A5</td>
</tr>
<tr>
<td>9:10 am – 10:10 am</td>
<td>Early Career Faculty Forum (ticketed event) Sponsor: Membership Committee</td>
<td>Salon A5</td>
</tr>
<tr>
<td>10:20 am – 11:20 am</td>
<td>Welcome Session (ticketed event) Sponsor: Membership Committee</td>
<td>Salon A5</td>
</tr>
</tbody>
</table>

## Tuesday, April 18

### Pre-Conference Events

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 am – 7:00 pm</td>
<td>Registration</td>
<td>2nd floor landing</td>
</tr>
<tr>
<td>8:00 am – 12:00 pm</td>
<td><strong>NARST Board Meeting</strong></td>
<td>Waldorf</td>
</tr>
<tr>
<td>8:00 am – 9:00 am</td>
<td>Mentor-Mentee Nexus (ticketed event) Sponsor: Membership Committee</td>
<td>Salon A5</td>
</tr>
<tr>
<td>9:10 am – 10:10 am</td>
<td>Early Career Faculty Forum (ticketed event) Sponsor: Membership Committee</td>
<td>Salon A5</td>
</tr>
<tr>
<td>10:20 am – 11:20 am</td>
<td>Welcome Session (ticketed event) Sponsor: Membership Committee</td>
<td>Salon A5</td>
</tr>
</tbody>
</table>

### Pre-Conference Workshops

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Integrating Science with Computer Science for Linguistically Diverse Classrooms at Upper Elementary Grades via Educational Robotics</td>
<td>Salon A1</td>
</tr>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Use of cutting-edge technologies in STEM education. Programs and lessons learned with AR, VR, and 3D modeling</td>
<td>Salon A2</td>
</tr>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Critically theorizing the margins for reform-based equity in science: A disobedient reckoning</td>
<td>Salon A3</td>
</tr>
</tbody>
</table>

---

**NARST 2023 International Conference**

**Chicago, IL**
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Towards Scientific Literacy in Inclusive Science Education – A New Approach to Support Pre- and In-Service Teachers</td>
<td>Salon A4</td>
</tr>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Observing Integrated STEM Education in K-12 Science and Engineering Classrooms with New Tools and Resources</td>
<td>Salon C1-2</td>
</tr>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Assessing Early Childhood and Primary Students’ Views of Science: Learning to Administer and Score two Valid and Reliable Instruments (Views about Scientific Inquiry- Elementary and Young Children’s Views about Science)</td>
<td>Salon C3-4</td>
</tr>
<tr>
<td>8:00 am – 11:45 am</td>
<td>Dismantling Systemic Inequalities in Indigenous STEM Education</td>
<td>Spencer Foundation, 625 N Michigan Ave</td>
</tr>
<tr>
<td>11:45 am – 1:00 pm</td>
<td>Graduate Student Luncheon [ticketed event]</td>
<td>Salon A5</td>
</tr>
<tr>
<td>11:45 am – 1:00 pm</td>
<td>Lunch break</td>
<td></td>
</tr>
</tbody>
</table>

**Conference Begins**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 pm – 1:30 pm</td>
<td>Presidential Welcome: Gillian Roehrig, NARST President</td>
<td>Grand Ballroom</td>
</tr>
</tbody>
</table>
| 1:30 pm – 2:45 pm | Keynote Address: Dr. Christine Cunningham, Pennsylvania State University  
*Engineering Science Reform* | Grand Ballroom         |
<p>| 3:00 pm – 4:30 pm | Concurrent Session #1                                                 | See Program            |
| 4:45 pm – 6:15 pm | Concurrent Session #2                                                 | See Program            |
| 7:00 pm – 8:30 pm | Presidential Reception and Welcome Celebration (appetizers and cash bar) | Grand Ballroom         |</p>
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00 am – 8:00 am</td>
<td>Mind and Sole Fun Run (off-site) <em>Not sponsored by NARST</em></td>
<td>Meet in Conference Hotel Lobby</td>
</tr>
<tr>
<td>7:30 am – 4:30 pm</td>
<td>Registration</td>
<td>2nd floor landing</td>
</tr>
<tr>
<td>7:00 am – 8:00 am</td>
<td>RIG Business Meetings</td>
<td>Salon A Foyer</td>
</tr>
<tr>
<td></td>
<td>Asian and Pacific Islander Science Education Research [APISER]</td>
<td>Salon A1</td>
</tr>
<tr>
<td></td>
<td>Latino/a RIG [LARIG]</td>
<td>Salon A2</td>
</tr>
<tr>
<td></td>
<td>Contemporary Methods for Science Education Research</td>
<td>Salon A3</td>
</tr>
<tr>
<td></td>
<td>Engineering Education [ENE-RIG]</td>
<td>Salon A4</td>
</tr>
<tr>
<td></td>
<td>Indigenous Science Knowledge [ISK-RIG]</td>
<td>Salon A5</td>
</tr>
<tr>
<td></td>
<td>Research in Artificial Intelligence-involved Science Education [RAISE]</td>
<td>Salon C1-2</td>
</tr>
<tr>
<td></td>
<td>Continental and Diasporic Africa in Science Education RIG (CADASE)</td>
<td>Salon C3-4</td>
</tr>
<tr>
<td>8:25 am – 9:55 am</td>
<td>Concurrent Session #3 (includes Roundtables #1)</td>
<td>See Program</td>
</tr>
<tr>
<td>9:55am – 10:20am</td>
<td>Coffee break</td>
<td>Salon A Foyer and Normandie Room (2nd Floor)</td>
</tr>
<tr>
<td>10:20 am – 11:50 am</td>
<td>Concurrent Session #4</td>
<td>See Program</td>
</tr>
<tr>
<td>11:50 pm – 1:00 pm</td>
<td>Lunch break</td>
<td></td>
</tr>
<tr>
<td>1:00 pm – 2:30 pm</td>
<td>Concurrent Session #5</td>
<td>See Program</td>
</tr>
<tr>
<td>2:45 pm – 4:15 pm</td>
<td>Awards Dessert Reception</td>
<td>Grand Ballroom</td>
</tr>
<tr>
<td>4:30 pm – 6:00 pm</td>
<td>Concurrent Session #6</td>
<td>See Program</td>
</tr>
<tr>
<td>6:30 pm – 7:30 pm</td>
<td>Graduate Student Forum</td>
<td>Salon A5</td>
</tr>
<tr>
<td>6:30 pm – 7:30 pm</td>
<td>JRST Dinner (by invitation)</td>
<td>Astoria</td>
</tr>
</tbody>
</table>
## Thursday, April 20

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 am – 4:30 pm</td>
<td>Registration</td>
<td>2nd floor landing</td>
</tr>
<tr>
<td>7:30 am – 8:30 am</td>
<td>Committee Meetings</td>
<td>Salon A Foyer</td>
</tr>
<tr>
<td></td>
<td>Elections</td>
<td>Salon A2</td>
</tr>
<tr>
<td></td>
<td>Awards</td>
<td>Salon A3</td>
</tr>
<tr>
<td></td>
<td>Research</td>
<td>Salon A4</td>
</tr>
<tr>
<td></td>
<td>Equity and Ethics</td>
<td>Salon C1-2</td>
</tr>
<tr>
<td></td>
<td>External Policy and Relations</td>
<td>Salon C3-4</td>
</tr>
<tr>
<td></td>
<td>International</td>
<td>Salon C5-6</td>
</tr>
<tr>
<td></td>
<td>Graduate Students</td>
<td>Salon C7-8</td>
</tr>
<tr>
<td></td>
<td>Membership</td>
<td>Salon A1</td>
</tr>
<tr>
<td></td>
<td>Publications Advisory</td>
<td>Salon A5</td>
</tr>
<tr>
<td></td>
<td>Social Media, Website, Communications</td>
<td>Blvd A</td>
</tr>
<tr>
<td></td>
<td>Program [strand coordinators]</td>
<td>Blvd C</td>
</tr>
<tr>
<td>8:40 am – 10:10 am</td>
<td>Concurrent Session #7</td>
<td>See Program</td>
</tr>
<tr>
<td>10:30 am – 12:00 pm</td>
<td>Concurrent Session #8 (Includes Roundtables #2)</td>
<td>See Program</td>
</tr>
<tr>
<td>12:00 pm – 1:10 pm</td>
<td>Lunch break</td>
<td></td>
</tr>
<tr>
<td>1:10 pm – 2:40 pm</td>
<td>Concurrent Session #9</td>
<td>See Program</td>
</tr>
<tr>
<td>2:50 pm – 3:35 pm</td>
<td>Poster Session A (coffee and snacks provided)</td>
<td>Grand Ballroom</td>
</tr>
<tr>
<td>3:35 pm – 4:20 pm</td>
<td>Poster Session B (coffee and snacks provided)</td>
<td>Grand Ballroom</td>
</tr>
<tr>
<td>4:30 pm – 6:00 pm</td>
<td>Concurrent Session #10</td>
<td>See Program</td>
</tr>
<tr>
<td>6:10 pm – 9:00 pm</td>
<td>Equity and Ethics Dinner (registration and prepay required)</td>
<td>Off-site</td>
</tr>
</tbody>
</table>
### Friday, April 21

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 am - 12:00 pm</td>
<td>Registration</td>
<td>2nd floor landing</td>
</tr>
<tr>
<td>8:00 am – 8:50 am</td>
<td>Membership and Business Meeting, Meet Board of Directors</td>
<td>Salon A1</td>
</tr>
<tr>
<td></td>
<td>[continental breakfast provided beginning at 7:30 am]</td>
<td></td>
</tr>
<tr>
<td>9:00 am – 10:30 am</td>
<td>Concurrent Session #11</td>
<td>See Program</td>
</tr>
<tr>
<td>10:45 am – 12:15 am</td>
<td>Concurrent Session #12 (Includes Roundtables #3)</td>
<td>See Program</td>
</tr>
<tr>
<td>12:15 pm – 1:45 pm</td>
<td>Lunch break</td>
<td></td>
</tr>
<tr>
<td>1:45 pm – 3:15 pm</td>
<td>Concurrent Session #13</td>
<td>See Program</td>
</tr>
<tr>
<td>3:15 pm – 4:15 pm</td>
<td>CLOSING SESSION</td>
<td>Salon A1</td>
</tr>
<tr>
<td></td>
<td>Looking ahead to the 2024 Conference</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Showing appreciation for Board and Committee leadership.</td>
<td></td>
</tr>
<tr>
<td>5:00 pm – 10:00 pm</td>
<td>NARST Board meeting</td>
<td>Off-site</td>
</tr>
</tbody>
</table>

**Note:** The Normandie Room on the 2nd Floor is available to use all week as a break room and workspace.
<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 am – 7:30 am</td>
<td>Welcome from President Gill Roehrig and Conference Overview</td>
<td>Zoom A</td>
</tr>
<tr>
<td>7:45 am – 8:45 am</td>
<td>Concurrent Session #1</td>
<td>Zoom A and B</td>
</tr>
<tr>
<td>8:45 am – 9:15 am</td>
<td>Breakout Discussions</td>
<td>Multiple breakout rooms</td>
</tr>
<tr>
<td>9:30 am – 10:30 am</td>
<td>Concurrent Session #2</td>
<td>Zoom A and B</td>
</tr>
<tr>
<td>10:45 am – 12:00 pm</td>
<td>Concurrent Session #3</td>
<td>Zoom A and B</td>
</tr>
<tr>
<td>12:15 pm – 1:00 pm</td>
<td>Poster Session</td>
<td>Poster Gallery</td>
</tr>
<tr>
<td>1:00 pm – 2:00 pm</td>
<td>Lunch break</td>
<td></td>
</tr>
<tr>
<td>2:00 pm – 3:00 pm</td>
<td>Concurrent Session #4</td>
<td>Zoom A and B</td>
</tr>
<tr>
<td>3:15 pm – 4:15 pm</td>
<td>Concurrent Session #5</td>
<td>Zoom A and B</td>
</tr>
<tr>
<td>4:15 pm – 4:40 pm</td>
<td>Breakout Discussions</td>
<td>Multiple breakout rooms</td>
</tr>
<tr>
<td>4:40 pm – 5:00 pm</td>
<td>Closing Session&lt;br&gt;Remarks from outgoing President Gill Roehrig and incoming President Jomo Mutegi</td>
<td>Zoom A</td>
</tr>
</tbody>
</table>
Pre-Conference Workshops

Research Committee
Pre-Conference Workshop
4/18/23, 8:00-11:45, Salon A1 (LL)

*Integrating Science with Computer Science for Linguistically Diverse Classrooms at Upper Elementary Grades via Educational Robotics*

**ORGANIZERS**
- **Erdogan Kaya**, George Mason University, USA
- **Ezgi Yesilyurt**, Weber State University, USA
- **Refika Turgut**, University of South Carolina Upstate, SC, USA
- **Burak Sahin**, University of Nevada, Las Vegas, NV, USA
- **Hasan Deniz**, University of Nevada, Las Vegas, NV, USA

---

Research Committee
Pre-Conference Workshop
4/18/23, 8:00-11:45, Salon A2 (LL)

*Use of cutting-edge technologies in STEM education. Programs and lessons learned with AR, VR, and 3D modeling*

**ORGANIZERS**
- **Sandra Arango-Caro**, Donald Danforth Plant Science Center, USA
- **Kristine Callis-Duehl**, Donald Danforth Plant Science Center, USA

---

Equity And Ethics Committee
Pre-Conference Workshop
4/18/23, 8:00-11:45, Salon A3 (LL)

*Critically theorizing the margins for reform-based equity in science: A disobedient reckoning*

**ORGANIZERS**
- **Philip Boda**, University of Illinois, Chicago, IL, USA
- **Justice Walker**, The University of Texas, El Paso, TX, USA
- **Gary Wright**, North Carolina State University, NC, USA

---

Research Committee
Pre-Conference Workshop
4/18/23, 8:00-11:45, Salon A4 (LL)

*Towards Scientific Literacy in Inclusive Science Education - A New Approach to Support Pre- and In-Service Teachers*

**ORGANIZERS**
- Lisa Stinken-Rösner, Leuphana University, Lueneburg, Germany
- **Stefanie Lenzer**, Leibniz University, Hannover, Germany
- **Laura Sührig**, Goethe University, Frankfurt, Germany
- **Andreas Nehring**, Leibniz University, Hannover, Germany
- **Simone Abels**, Leuphana University, Lueneburg, Germany

---

Research Committee
Pre-Conference Workshop
4/18/23, 8:00-11:45, Salon C1-2 (LL)

*Observing Integrated STEM Education in K-12 Science and Engineering Classrooms with New Tools and Resources*
Pre-Conference Workshops, 4/18/23, 8:00-11:45

ORGANIZERS
Emily Dare, Florida International University, FL, USA
Joshua Ellis, Florida International University, FL, USA
Elizabeth Ring-Whelan, St. Catherine University, USA
Gillian Roehrig, University of Minnesota - Twin Cities, MN, USA
Mark Rouleau, Michigan Technological University, MI, USA
Benny Hiwatig, University of Minnesota – Twin Cities, MN, USA
Farah Faruqi, University of Minnesota – Twin Cities, MN, USA
Christopher Irwin, Florida International University, FL, USA

Research Committee
Pre-Conference Workshop
4/18/23, 8:00-11:45, Salon C3-4 (LL)

Assessing Early Childhood and Primary Students’ Views of Science: Learning to Administer and Score two Valid and Reliable Instruments (Views about Scientific Inquiry- Elementary and Young Childrens’ Views about Science)

ORGANIZERS
Judith Lederman, Illinois Institute of Technology, IL, USA
Selina Bartels, Valparaiso University, IN, USA

Indigenous Science Knowledge (ISK-RIG)
Pre-Conference Workshop
4/18/23, 8:00-11:45, Off-Site

Dismantling Systemic Inequalities in Indigenous STEM Education

ORGANIZERS
Sharon Nelson-Barber, WestEd, USA
Rouhollah Aghasaleh, California State Polytechnic University, Humboldt, CA, USA
Megan Bang, Northwestern University, IL, USA
Pauline Chinn, University of Hawai`i at Mānoa, HI, USA
Josiah Hester, Northwestern University, IL, USA
Julie Robinson, University of North Dakota, ND, USA
Linda Tuhiwai Smith, Te Whare Wānanga o Awanuiārangi, New Zealand
Bhaskar Upadhyay, University of Minnesota, MN, USA
David Zandvliet, Simon Fraser University, Canada
Other Pre-Conference Events

Board of Directors
NARST Board Meeting
4/18/23, 8:00-12:45, Waldorf (L3)

Membership Committee
Sponsored Session: Mentor-Mentee Nexus
4/18/23, 8:00-9:00, Salon A5 (LL)

ORGANIZERS
Elizabeth de los Santos, University of Nevada, USA
Shiang-Yao Liu, National Taiwan Normal University, Taiwan
Harini Krishnan, Florida State University, USA

Graduate Student Committee
Social Event: Graduate Student Luncheon
4/18/23, 11:45-13:00, Salon A5 (LL)

CADASE RIG
Sponsored Session: CADASE RIG Meet and Greet
4/18/23, 11:45-13:00, Salon C5-6 (LL)

ORGANIZERS
Tuğba Yüksel, Recep Tayyip Erdogan University, Turkey
Robert Bennett, Georgia State University, USA
Melanie Kinskey, Sam Houston State University, USA

Membership Committee
Sponsored Session: Early Career Faculty Forum
4/18/23, 9:10-10:10, Salon A5 (LL)

ORGANIZERS
K.C. Busch, North Carolina State University, USA
Harleen Singh
Brooke Whitworth, Clemson University, USA

Membership Committee
Sponsored Session: NARST Welcome Session
4/18/23, 10:20-11:20, Salon A5 (LL)
Opening Session: Presidential Welcome
4/18/23, 13:00-13:30, Grand Ballroom (L2)

Welcome Address by NARST President
Gillian Roehrig
Introduction to the NARST Board Members

Keynote Speaker: Keynote Address
4/18/23, 13:30-14:45, Grand Ballroom (L2)

Engineering Science Reform
Christine Cunningham*, Pennsylvania State University, USA
Concurrent Session 1
4/18/23, 15:00-16:30

Indigenous Science Knowledge (ISK-RIG)
Sponsored Session: Exploring the Potential of Locally- and Globally-Valued Knowledges
4/18/23, 15:00-16:30, Salon A5 (LL)

ORGANIZERS
Sharon Nelson-Barber, WestEd, Portland, OR, USA

PANELISTS
David Zandvliet, Simon Fraser, Burnaby, BC, Canada
Julie Robinson, U of North Dakota, Grand Forks, ND, USA
Joshua Hunter, U North Dakota, Grand Forks, ND, USA
Bhaskar Upadhyay, U Minnesota, Minneapolis, MN, USA
Pauline Chinn, U Hawai‘i, Mānoa, Mānoa, HI, USA
Paichi Shein, National Sun Yat-sen University, Kaohsiung, Taiwan
Peresang Sukinarhimi, National Sun Yat-sen University, Kaohsiung, Taiwan
Tzu yu Kuo, National Sun Yat-sen University, Kaohsiung, Taiwan

Strand 1: Science Learning:
Development of student understanding
SC-Organized Paper Set: Students’ Use of Computational Models and Reasoning
4/18/23, 15:00-16:30, Salon C1-2 (LL)

Do different types of computational models prompt different types of reasoning?
Emil Eidin*, Michigan State University, USA

Jonathan Bowers, Michigan State University, USA

Right but Wrong: The Independence of Mechanistic Reasoning and Canonical Understanding in Studying Diffusion
Tamar Fuhrmann*, Teachers College, Columbia University, USA
Leah Rosenbaum, Teachers College, Columbia University, USA
Adelmo Eloy, Teachers College, Columbia University, USA
Aditi Wagh, MIT, USA
Jacob Wolf, Teachers College, Columbia University, USA
Paulo Blikstein, Teachers College, Columbia University, USA
Michelle Wilkerson, University of California, Berkeley, USA

Supporting Learners to Evaluate Computational Models: Mechanistic Reasoning about Machine Learning
Anna Kim*, Pennsylvania State University, USA
Amy Farris, Pennsylvania State University, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-Organized Paper Set: Science Teaching & Instruction
4/18/23, 15:00-16:30, Salon C3-4 (LL)

Physics and Wine: an amazing everyday context for science teaching even without alcohol
Lutz Kasper*, University of Education, Physics Dept., Germany
Patrik Vogt, Institute for Teacher Education (ILF), Germany
**Concurrent Session 1, 4/18/23, 15:00-16:30**

**Qualitative Cases of Science Teaching Practice: Comparing Instruction Based on Value-Added Ratings.**

*Elif Özlükü*, University of Notre Dame, USA

*Mathew Kloser*, University of Notre Dame, USA

*Aria Malkani*, University of Notre Dame, USA

*Spencer Bullinger*, University of Notre Dame, USA

*Lauren Ostdiek*, University of Notre Dame, USA

*Catherine Wagner*, University of Notre Dame, USA

**How Convincing Are Experiments? A Comparison of Eight Interactive Videos**

*Lion Glatz*, Goethe University Frankfurt, Germany

*Roger Erb*, Goethe University Frankfurt, Germany

*Albert Teichrew*, Goethe University Frankfurt, Germany

**Science Teachers’ Noticing of Science and Engineering Practices: Does Being Out-of-Field Matter?**

*Harleen Singh*, California State University Stanislaus, USA

*Hatice Ozen-Tasdemir*, University of Georgia, USA

*Yuzi Huang*, University of Georgia, USA

*Joséph Deluca*, University of Georgia, USA

*Julie Luft*, University of Georgia, USA

*Brooke Whitworth*, Clemson University, USA

**Evolving Language in Middle School Project-Based Astronomy**

*Merryn Cole*, University of Nevada, Las Vegas, USA

*Tom Ryan*, University of Nevada, Las Vegas, USA

*Jennifer Wilhelm*, University of Kentucky, USA

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


*Lauren Ostdiek*, University of Notre Dame, USA

*Catherine Wagner*, University of Notre Dame, USA

**Expanding sensemaking spaces for multilingual students through translanguaging instructional practices**

*María González-Howard*, The University of Texas at Austin, USA

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

*Karina Méndez Pérez*, The University of Texas at Austin, USA

**"The Dead Sea is Dying" - Language-Sensitive Science Teaching for Students with Diverging Language Competences**

*Robert Gieske*, Freie Universität, Germany

*Claus Bolte*, Freie Universität, Germany

**Does learning how to deal with data lead to more scientific argumentation?**

*Engin Kardas*, Karlsruhe University of Education, Germany

*Tobias Ludwig*, Karlsruhe University of Education, Germany
Concurrent Session 1, 4/18/23, 15:00-16:30

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-Organized Paper Set: STEM
Student Sense of Belonging and Identity Development
4/18/23, 15:00-16:30, Salon C5-6 (LL)

Factors Associated with Undergraduate Students' Sense of Belonging in STEM Disciplines
Gili Marbach-Ad*, University Of Maryland, USA
Sara Gliese, University Of Maryland, USA
Katerina Thompson, University Of Maryland, USA

Students' sense of belonging in a community of practice fosters scientific literacy and identity formation.
Josie Smith, Colorado State University, USA
Gary McDowell*, Lightoller LLC, USA
Meena Balgopal, Colorado State University, USA
Rebeccah Lijek, Mount Holyoke College, USA

Exploring a Relationships between Students' Science Identities and Achievement Emotions in Physics
Mihwa Park*, Texas Tech University, USA

Introduction to Primary Literature Course: Impacts on undergraduate students' science identity and interest in research
Takunda Maisva*, Syracuse University, USA
Mariah Maxwell*, Syracuse University, USA
Jason Wiles, Syracuse University, USA

Strand 6: Science Learning in Informal Contexts
SC-Organized Paper Set: Families and Play in Contributing to STEM learning
4/18/23, 15:00-16:30, Blvd C (L2)

How Families' Make Learning Personally Relevant while Using a Pollinator-focused Mobile Augmented Reality (MAR) app
Lucy McClain*, Penn State University, USA
Heather Zimmerman, Penn State University, USA
Susan Land, Penn State University, USA
Stephanie Bowles, Penn State University, USA
Charles Keith, Penn State University, USA
Lillyanna Faimon, Penn State University, USA
Yu-Chen Chiu, Penn State University, USA

Play: The Missing Link for Beginning STEM Learning
Sue Tunnicliffe*, UCL, United Kingdom
Yinka Ogunlade, Ekiti State University, Nigeria
Adekunle Oladejo, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Peter Okebukola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Juma Shabani, University of Burundi, Burundi
Rose Agholor, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Angela Irene, National Universities Commission, Nigeria
Deborah Agbanimu, Africa Centre of Excellence for Innovative and
Concurrent Session 1, 4/18/23, 15:00-16:30

Transformative STEM Education, Lagos State University, Nigeria
**Bugoma Suwadu**, University of Burundi, Burundi

*Parents as STEM Facilitators: Perspectives following a Parent/Child Workshop Series*

**Meghan Marrero**, Mercy College, USA
**Kristen Napolitano**, Mercy College, USA
**Amanda Gunning**, Mercy College, USA

*Cohetes y Rábanos /Rockets and Radishes: Pilot Participant Perspectives of Parent-Daughter Programs*

**Peter Rillero**, Arizona State University, USA
**Margarita Silva**, UC Davis, USA
**Mila Librea-Carden**, University of North Texas, USA

**Strand 7: Pre-service Science Teacher Education**

SC-Organized Paper Set: Supporting Inclusive, Equitable, and culturally responsive Teaching
4/18/23, 15:00-16:30, Salon A2 (LL)

*Development and use of assessment tool to understand equity outcomes in a teacher education program*

**Allyson Rogan-Klyve**, Central Washington University, USA
**Adrienne Pinsoneault**, Central Washington University, USA
**Danielle Wadlington**, Quetzal Education Consulting, USA
**Jennifer Dechaine**, Central Washington University, USA

Noticing for Equity: Supporting Preservice Science Teachers for Inclusive and Equitable Teaching

**Mutiara Syifa**, The Ohio State University, USA
**Sophia Jeong**, The Ohio State University, USA
**Ashlyn Pierson**, The Ohio State University, USA

*Exploring Culturally Responsive Teaching in an Urban Teacher Residency Through Program Structures*

**Elaine Howes**, American Museum of Natural History, USA
**Jamie Wallace**, American Museum of Natural History, USA

*Investigating Teacher Educator Practices for Pre-Service Teachers' Enactment of Justice-Oriented Science Teaching*

**Grace Tukurah**, Michigan State University, USA
**Matthew Adams**, Michigan State University, USA
**Kate Miller**, Michigan State University, USA

Strand 7: Pre-service Science Teacher Education

SC-Organized Paper Set: Exploring Knowledge and Pedagogical Content Knowledge Development in Preservice Teacher Education
4/18/23, 15:00-16:30, Salon A3 (LL)

*Supporting Preservice Teachers' Science Content Knowledge for Teaching (CKT)*

**Dustin Van Orman**, Western Washington University, USA
**Josie Melton**, Western Washington University, USA
**Deborah Hanuscin**, Western Washington University, USA
**Daniel Hanley**, Western Washington University, USA
Concurrent Session 1, 4/18/23, 15:00-16:30

Katherine Castellano, Educational Testing Service (ETS), USA
Jamie Mikeska, Educational Testing Service (ETS), USA
Emily Borda, Western Washington University, USA

Pedagogical content knowledge and content knowledge in elementary in-service teachers.
David Santibáñez*, Universidad Finis Terrae, Chile

The influence of cPCK- and pPCK-Scaffolds on video analysis skills in early pre-service teacher education
Marie Irmer, Ludwig-Maximilians-University, Germany
Dagmar Traub*, Ludwig-Maximilians-University, Germany
Christian Förtsch, Ludwig-Maximilians-University, Germany
Birgit Neuhaus, Ludwig-Maximilians-University, Germany

Using video reflection as research tools to more equitably engage students and families
May Lee*, The Pennsylvania State Univers, USA
Jennifer Cody, The Pennsylvania State Univers, USA
Carla Zembal-Saul, The Pennsylvania State Univers, USA

Envisioning equity: Teacher conceptualization of an inclusive science classroom
Jackson Jackson, The Pennsylvania State University, USA
Brandin Conrath*, The Pennsylvania State University, USA
Scott McDonald, The Pennsylvania State University, USA

Designing a More Socially Just Science Through Community Mapping
Kathryn Bateman*, Michigan State University, USA
Jonathan McCausland*, New Mexico Highlands University, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Asset Perspectives of In-Service Teacher Education Towards Equitable Teaching
4/18/23, 15:00-16:30, Salon A1 (LL)

Adapting Designed Curriculum to Local Contexts through Professional Learning Communities
Cory Miller*, Michigan State University, USA
Kathryn Bateman*, Michigan State University, USA
Joseph Krajcik, Michigan State University, USA

Strand 10: Curriculum and Assessment
SC-Organized Paper Set: Promoting quality in science education with evolutionary assessment
4/18/23, 15:00-16:30, Astoria (L3)

The PISA Science Assessment for 2025
Jonathan Osborne*, Stanford University, USA

A data-driven justification for scientific inquiry in promoting students' scientific literacy
Jing Lin*, Beijing Normal University, China
Concurrent Session 1, 4/18/23, 15:00-16:30

Weiwei He, Beijing Normal University, China
Letong Zhang, Beijing Normal University, China
Ren Liu, Shandong University, China

A new instructionally-meaningful rubric designed for the NGSS
Jill Wertheim*, WestEd, USA
Lauren Stoll, WestEd, USA
Cathy Zozakiewicz, WestEd, USA

Reality Vs Expectations of Assessment in STEM Education: An exploratory case study
Mohamed El Nagdi*, American University in Cairo, Egypt
Gillian Roehrig*, University of Minnesota, Twin Cities, USA

Strand 11: Cultural, Social, and Gender Issues
Symposium: Equity in STEM Education Research and Praxis Post "2020"
4/18/23, 15:00-16:30, Salon A4 (LL)

Equity in STEM Education Research and Praxis Post "2020"
Tia Madkins*, The University of Texas at Austin, USA
Natalie King, Georgia State University, USA
Andrea Dziengue, Georgia State University, USA
Remy Dou*, Florida International University, USA
Heidi Cian*, Florida International University, USA
Terrell Morton*, University of Illinois Chicago, USA
NaTashua Davis, University of Missouri, USA

Strand 11: Cultural, Social, and Gender Issues
4/18/23, 15:00-16:30, Waldorf (L3)

Relationships as Resistance: Pedagogy and Praxis Among Black STEM Teachers from Alternative Pathways
Mia Pungello*, Davidson College, USA
Brittany Murray, Davidson College, USA
Terrance Burgess, Michigan State University, USA
Jerry Wilson, University of North Carolina, USA

Learning to teach students science in anti-racist Ways: Self-reflection, curricular planning, and interactions
Kathleen Schenkel*, San Diego State University, USA
Lucyann Atkins, San Diego State University, USA

Biking to Uncover Science in Urban Communities: Pre-service Science Teachers' Critical Conscientization of Science-Community
Noemi Waight*, University at Buffalo, USA
Jennifer Tripp*, Buffalo Public Schools, USA
Ryan Rish, University at Buffalo, USA
Monica Miles, Teachers College, USA
Kellyann Ramdath*, University at Buffalo, USA
Sarah Robert, University at Buffalo, USA
Seamus Gallivan, Slow Roll Buffalo, USA

“A Good Stepping Stone”: How Novice Teachers Navigate Tensions While Moving Towards Equitable Field-Based Education
Concurrent Session 1, 4/18/23, 15:00-16:30

**Alexandra Race**, University of California, Santa Cruz, USA

**Doris Ash**, University of California, Santa Cruz, USA

Strand 12: Technology for Teaching, Learning, and Research
SC-Organized Paper Set: Extended Reality in Teaching and Learning
4/18/23, 15:00-16:30, PDR 2 (L3)

The Food-Energy-Water Nexus: Using [the tool] to Support Undergraduate Students' Learning about Complex Socio-Hydrologic Issues

**Silvia-Jessica Mostacedo-Marasovic**, University of Texas at Arlington, USA

**Holly White**, University of Maine, USA

**Cory Forbes**, University of Texas at Arlington, USA

Elementary Preservice Teachers Learn Cardiac Form and Function with 3-D, Haptically-Enabled, Virtual Reality

**Darby Drageset**, University of Florida, USA

**Kent Crippen**, University of Florida, USA

**Jeungtae Eom**, University of Florida, USA

**Hada Herring**, University of Florida, USA

**Niki Koukoulidis**, University of Florida, USA

Home Far Away: Exploring Virtual Field Trips as a Tool for Social Justice-Based Science Education

**Bryan Brown**, Stanford University, USA

**Kathryn Ribay**, San Jose State University, USA

**Kendra Sobomehin**, Stanford University, USA

**Tamara Sobomehin**, Stanford University, USA

Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-Organized Paper Set: Developing Teachers' NOS Views
4/18/23, 15:00-16:30, Salon C7-8 (LL)

Preservice SPED Teachers' Nature of Science Conceptions and Lesson Planning

**Mila Rosa Carden**, University of North Texas, USA

**Bridget Mulvey**, Kent State University, USA

**Laura Corr**, Arizona State University, USA

Exploring the view of NOS and PCK of NOS in a group of biology teachers.

**Carolina Parraguez**, Universidad Catolica de Valparaiso, Chile

**Paola Nuñez**, Universidad Catolica de Valparaiso, Chile

**Hernan Cofre**, Universidad Catolica de Valparaiso, Chile

Leveraging a History and Philosophy of Science Course to Develop PCK for Teaching NOS

**Khadija Fouad**, Appalachian State University, USA

**Alan King**, Appalachian State University, USA

**Matthew Lance**, Appalachian State University, USA

Pre-Service Teachers' Scientific Content Knowledge and Nature of Science Views after a Socioscientific Issues-based Unit

**Savannah Graham**, Texas Christian University, USA

**Hayat Hokayem**, Texas Christian University, USA
Concurrent Session 2
4/18/23, 16:45-18:15

Contemporary Methods RIG
Sponsored Session: Measurement, Methodologies, and Methods in Science Education Research
4/18/23, 16:45-18:15, Salon A5 (LL)

ORGANIZERS
Francesca Williamson, Indiana University School of Medicine, USA
Brock Couch, University of New Hampshire, USA
Robert Talbot, University of Colorado, Denver, USA
Stanley Lo, University of California, San Diego, USA
Glenn Dolphin, University of Calgary, Canada
Joseph Taylor, University of Colorado, Colorado Springs, USA

PANELISTS
Nancy Staus, Oregon State University, USA
Samia Khan, University of British Columbia, Canada
Ben Van Dusen, Iowa State University, USA
Rou-Jia Sung, Carleton College, USA
Tiffany-Rose Sikorski, The George Washington University, USA
Megan Ennes, University of Florida, USA
Haider Ali Bhatti, University of California, Berkeley, USA
John Russell, EL Education, USA
Sophia Jeong, The Ohio State University, USA
Kathryn M. Bateman, The Pennsylvania State University, USA

Strand 1: Science Learning:
Development of student understanding
SC-Organized Paper Set: Conceptual Understandings in Biological Contexts
4/18/23, 16:45-18:15, Salon C1-2 (LL)

Influence of Self-Assessment and Conditional Metaconceptual Knowledge on Students' Conceptual Understanding of Evolution
Tim Hartelt*, University of Kassel, Germany
Helge Martens, University of Kassel, Germany

Exploring how students evaluate explanations about biological phenomena in different grades of elementary school
Yael Shtechman, Department of Science Teaching, Weizmann Institute of Science, Israel
Marida Ergazaki, Department of Educational Sciences and Early Childhood Education, University of Patras, Greece
Michal Haskel-Ittah*, Department of Science Teaching, Weizmann Institute of Science, Israel

Benefits of learning about the threshold concepts of randomness and probability in biological contexts
Helena Aptyka*, Institute for Biology Education, Faculty of Mathematics and Natural Sciences, University of Cologne, Germany
Daniela Fiedler, IPN – Leibniz Institute for Science and Mathematics Education, Germany
Jörg Großschedl, Institute for Biology Education, Faculty of Mathematics and Natural Sciences, University of Cologne, Germany
Experimentally Comparing Student Interest in, Engagement in, and Comprehension of Expository and Narrative Biology Videos.

Matthew Kloser*, University of Notre Dame, USA
Michael Szopiak, University of Notre Dame, USA
Catherine Wagner*, University of Notre Dame, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-Organized Paper Set: Context and Learning Science
4/18/23, 16:45-18:15, Salon C3-4 (LL)

Ties That Bind: Identifying Influential Scholarship in Contextualized Science Learning Research Through Bibliometric Network Analysis
Michael Giamellaro*, Oregon State University, USA

The Importance of Classroom Emotional Climate in STEM Education Research
Felicity McLure*, Charles Darwin University, Australia
Barry Fraser, Curtin University, Australia
Rekha Koul, Curtin University, Australia

Ways to Learning Science are Undergoing Mutation: Would the Culturo-Techno-Contextual Approach be an Effective Variant?
Adekunle Oladejo*, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Peter Okebukola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria

Juma Shabani, University of Burundi, Burundi
Yinka Ogunlade, Ekiti State University, Nigeria
Bugoma Suwadu, University of Burundi, Burundi
Ibukunolu Ademola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Deborah Agbanimu, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Franklin Onowugbeda, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Olasunkanmi Gbeleyi, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria

Interest-Based Differentiated Instruction Through Varied Contextual Tasks in Chemistry Education
Fabien Gueth*, University of Duisburg-Essen, Germany
Helena van Vorst, University of Duisburg-Essen, Germany

Strand 3: Science Teaching - Primary School (Grades preK-6): Characteristics and Strategies
SC-Organized Paper Set: Modeling in Elementary Science Classrooms and Informal Science
4/18/23, 16:45-18:15, PDR 2 (L3)
Kindergarten Students' Constructed Models as Tools for Modeling-Based Investigations and Learning
Loucas Louca*, European University Cyprus, Cyprus

Modeling to (Re)think Scientific Language: A Case of Preservice Elementary Teachers Building Knowledge
Ayca Fackler*, University of Georgia, USA

Elementary Teachers as Collaborators: Developing Educative Supports for Citizen Science Projects
Sarah Carrier*, North Carolina State University, USA
Jill McGowan, North Carolina State University, USA
Lindsey Sachs*, Horizon Research, Inc., USA
Meredith Hayes, Horizon Research, Inc., USA
P. Smith*, Horizon Research, Inc., USA

The space between: Teacher perceptions of an interformal elementary science education program
Rachel Stronach*, University of Massachusetts Dartmouth, USA
Hamza Malik*, University of Massachusetts Dartmouth, USA
Stephen Witzig*, University of Massachusetts Dartmouth, USA

From bench scientist to middle school science educator: Lessons learned from Black STEM PhD holders
Monica Miles*, Teachers College, Columbia University, USA
Patricia Buenrostro*, Lake Forest College, USA

Understanding asset-based pedagogies through funds of knowledge and identity: A case for rural science teaching
Khanh Tran*, Purdue University, USA
Selcen Guzey*, Purdue University, USA

Inquiry (co)Learning: Science teachers’ exemplary inquiry-based teaching
Shani Zur*, Technion, Israel
Tali Tal, Technion, Israel

Strand 4: Science Teaching - Middle and High School (Grades 5-12): Characteristics and Strategies
SC-Organized Paper Set: Teacher Professional Identities and Reflective Teaching
4/18/23, 16:45-18:15, Blvd A (L2)

Equity Considerations for Post-Secondary STEM Education
Jennifer Adams*, University of Calgary, Canada
Sarah El Halwany*, University of Calgary, Canada
Kristal Turner, University of Calgary, Canada
Nadia Qureshi, University of Toronto, Canada
Takeshia Pierre*, University of Florida, USA
Rose Pringle, University of Florida, USA
Paulette Vincent-Ruz, New Mexico State University, USA
Katy Hosbein, Middle Tennessee State University, USA
Lucy Avraamidou, University of Groningen, Netherlands
Phillip Boda, University of Illinois Chicago, USA
Geraldine Cochrane, Rutgers, USA

Strand 7: Pre-service Science Teacher Education
SC-Organized Paper Set: Formal and informal science curriculum in pre-service science teacher education
4/18/23, 16:45-18:15, Salon A2 (LL)

Integrating non-formal activities in a formal pre-service science teacher education program
Isabel Borges*, Institute of Education - University of Lisbon, Portugal
Isabel Chagas, Institute of Education - University of Lisbon, Portugal

Recomposing the Practice of Teaching Elementary Science
Marti Canipe*, Northern Arizona University, USA

Differential effects of internal and external feedback on different types of teachers' professional knowledge
Büsra Tonyali*, University of Duisburg-Essen, Germany
Mathias Ropohl, University of Duisburg-Essen, Germany
Julia Schwanewedel, University of Hamburg, Germany

An Overview of STEM in Bachelor of Education Programs in Canada
G. Michael Bowen*, Mount Saint Vincent University, Canada
Dawn Wiseman, Bishop's University, Canada
Marie-Claire Shanahan, University of Calgary, Canada
Samia Khan, University of British Columbia, Canada
Allison Gonsalves, McGill University, Canada
Pratim Sengupta, University of Calgary, Canada
Wendy Simms, Vancouver Island University, Canada
Eva Knoll, Université du Québec à Montréal, Canada
Ashley Carter, Mount Saint Vincent University, Canada

The STEM Problems Distinction Toward STEM Teacher Identity Development of Indonesia Pre-Service Science Teacher
Anjar Utomo*, University of Minnesota, USA
Gillian Roehrig, University of Minnesota, USA

The impact of STEM camp on prospective science teachers' identity development
Danielle Dani*, Ohio University, USA
Courtney Koestler, Ohio University, USA
Lizhen Chen, Ohio University, USA
Concurrent Session 2, 4/18/23, 16:45-18:15

Allyson Hallman Thrasher, Ohio University, USA
Kayla Heacock, Ohio University, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Supporting Beginning through Experienced Science Teachers in Implementing Culturally Relevant Instruction
4/18/23, 16:45-18:15, Salon A3 (LL)

Science Teacher Preparation Through Abolitionist Teaching: A Narrative Inquiry Study
Vanessa Louis, Georgia State University, USA
Natalie King, Georgia State University, USA

Noyce Scholars Retention and Culturally Competent Teaching Practices
Peter Garik*, Boston University, USA
Donald DeRosa, Boston University, USA
Russell Faux, Davis Square Research Associates, LLC, USA
Anna Victoria Garik, Boston University, USA

Promoting culturally responsive STEM education in Indigenous serving schools through in-service teacher professional development.
Pradeep Dass*, Northern Arizona University, USA
Angelina Castagno, Northern Arizona University, USA
Darold Joseph, Northern Arizona University, USA
Chesleigh Keene, Northern Arizona University, USA

Crystal Macias, Northern Arizona University, USA

School-University partnerships in support of equitable primary science education
Maiza Trigo, The University of Luxembourg, Luxembourg
Ragnhild Barbu, The University of Luxembourg, Luxembourg
Sara Wilmes, The University of Luxembourg, Luxembourg
Kerstin te Heesen, The University of Luxembourg, Luxembourg
Christina Siry*, The University of Luxembourg, Luxembourg

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Developing and Assessing Science Teacher Learning
4/18/23, 16:45-18:15, Salon A4 (LL)

Towards a Typology of Science Teachers Engagement in Learning
Irit Vivante*, Ben Gurion University in the Negev, Israel
Dana Vedder-Weiss*, Ben Gurion University in the Negev, Israel

Developing biology teachers' pedagogical content knowledge in evolution: a case study with two experienced teachers
Arlette Bassaber*, Universidad Católica de Valparaiso, Chile
Claudia Vergara, Alberto Hurtado University, Chile
Hernan Cofre, Universidad Católica de Valparaiso, Chile
Concurrent Session 2, 4/18/23, 16:45-18:15

**Exploring power amidst curricular reform through the language of teachers' episodes of pedagogical reasoning**

**Kevin Fleming**, The George Washington University, USA

**Jonathon Grooms**, The George Washington University, USA

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

**Application of implementation criteria to evaluate the outcomes of science teacher action research**

**Dace Namsone**, University of Latvia, Latvia

**Kārlis Greitāns**, University of Latvia, Latvia

---

**Strand 10: Curriculum and Assessment**

**SC-Organized Paper Set: Evidence-based designing for science instruction**

4/18/23, 16:45-18:15, Astoria (L3)

**Fields in middle school energy instruction to support continued learning of energy**

**Kristin Fiedler**, Leibniz Institute for Science and Mathematics Education, Germany

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

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

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

**Tracking the Collaborative Design of a Culturally Relevant Environmental Chemistry Unit**

**Jeffrey Spencer**, University of Michigan, USA

**Danielle Maxwell**, University of Michigan, USA

**Kaare Sikuak Erickson**, Ikaagun Engagement, USA

**Linda Nicholas-Figueroa**, I_isa_vik College, USA

**Kerri Pratt**, University of Michigan, USA

**Ginger Shultz**, University of Michigan, USA

---

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

**Related Paper Set: Centering the Experiences, Pedagogies, and Needs of Black Women Science Teachers**

4/18/23, 16:45-18:15, Salon A1 (LL)

**But That's Just Good Science Teaching!: An Argument for Historically Relevant Science Pedagogy**

**Alexis Riley**, Cal State LA, USA
Concurrent Session 2, 4/18/23, 16:45-18:15

**Racialized Gendered Experiences Black Women Science Teachers Endure Both With and Outside of the Classroom**

**Olayinka Mohorn-Mintah**, The University of Memphis, USA

**The Need for Black Women Only Spaces in Science**

**Jordan Henley**, University of Georgia, USA

**Mary Atwater**, University of Georgia, USA

**Developing Racial Literacy with a Black Woman Science Teacher: A Counterstory**

**Felicia Mensah**, Columbia University, USA

**Alexis Riley**, Cal State University - Los Angeles, USA

**Jordan Henley**, University of Georgia, USA

**Olayinka Mintah**, University of Detroit, USA

**Althea Hoard**, Relay Graduate School of Education, USA

**Strand 14: Environmental Education and Sustainability**

**SC-Organized Paper Set: Exploring the urgency of climate change literacy**

**Andrea Moeller**, University of Vienna, Austria

**Johanna Kranz**, Center of Excellence for Climate Change Impacts, Germany

**Veronika Winter**, University of Vienna, Austria

"I am very disappointed in humankind." – Students' Perspectives and Emotions on Current Climate Change Education

**Andrea Moeller**, University of Vienna, Austria

**Johanna Kranz**, Center of Excellence for Climate Change Impacts, Germany

**Veronika Winter**, University of Vienna, Austria

**Teachers' rationales and approaches for teaching for climate change actions in secondary science classrooms**

**Lisa Borgerding**, Kent State University, USA

**Breanna Beaver**, Kent State University, USA

**Adepeju Prince**, Kent State University, USA

**Jennifer Heisler**, Kent State University, USA

**Strand 15: Policy, Reform, and Program Evaluation**

**Related Paper Set: Leadership for the Promotion of Equity in Science and STEM Education**

**4/18/23, 16:45-18:15, Salon C7-8 (LL)**

**District Science Coordinators' Conceptions of and Levers for Advancing Equity Agendas**

**Christa Haverly**, Northwestern University, USA

**Elizabeth Davis**, University of Michigan, USA

**Angela Lyle**, University of Michigan, USA

**Emily Seeber**, University of Michigan, USA

**How Elementary Principals Support Equity-Focused STEM Teaching and Learning**

**Tia Madkins**, The University of Texas at Austin, USA

**Joshua Childs**, The University of Texas at Austin, USA

**Ain Grooms**, University of Wisconsin, Madison, USA

**Stefanie Marshall**, University of Minnesota, USA

**Developing Elementary STEM Teacher Leaders**

**Amanda Gunning**, Mercy College, USA

**Kristen Napolitano**, Mercy College Center for STEM Education, USA

**Elena Nitecki**, Mercy College, USA

**Meghan Marrero**, Mercy College, USA
District Science Coordinators' Promotion of Equity in an Organization

Shaugnessy McCann*, University of Georgia, USA
Yamil Ruiz, Clemson University, USA
Brooke Whitworth, Clemson University, USA
Julie Luft, University of Georgia, USA
Joon Kum, University of Georgia, USA

Presidential Reception
4/18/23, 19:00-20:30, Grand Ballroom (L2)

Presidential Reception

Conference attendees, please join us for a reception in the Grand Ballroom!
Social Event
Mind and Sole Fun Run
4/19/2023 6:00-8:00
Meet in the conference hotel lobby!

Research Interest Group
Business Meetings
4/19/2023 7:00-8:15

Salon A1 (LL)
Asian and Pacific Islander Science Education Research (APISER) RIG Meeting

Salon A2 (LL)
Latino/a RIG (LARIG) Meeting

Salon A3 (LL)
Contemporary Methods for Science Education Research RIG Meeting

Salon A4 (LL)
Engineering Education RIG (ENE-RIG) Meeting

Salon A5 (LL)
Indigenous Science Knowledge RIG (ISK-RIG) Meeting

Salon C1-2 (LL)
Research in Artificial Intelligence-Involved Science Education (RAISE) RIG Meeting

Salon C3-4 (LL)
Continental and Diasporic Africa in Science Education RIG (CADASE) Meeting
Concurrent Session 3
4/19/23, 8:25-9:55

Roundtables Session 1
4/19/23, 8:25-9:55, Salon A5 (LL)

Topic 1: Middle School Science

Strand 15: Policy, Reform, and Program Evaluation
Shifting Expectations for Authentic Inquiry in Namibian Junior Secondary Life Science Designated Curriculum
Rachel van Aswegen*, University of Virginia, USA
Lillian Bentley, University of Virginia, USA

Strand 12: Technology for Teaching, Learning, and Research
Enhancing middle school physical science lessons with embodied learning
Jonathan Margolin*, American Institutes for Research, USA
Connie Chandra, American Institutes for Research, USA
Lawrence Friedman, American Institutes for Research, USA
Katherine Guyot, American Institutes for Research, USA
Michaela Labriole, New York Hall of Science, USA
Megan Legault, American Institutes for Research, USA
Amelia Roach, American Institutes for Research, USA
Laycca Umer, New York Hall of Science, USA
Stephen Uzzo, National Museum of Mathematics, USA

Topic 2: Affective issues in teaching and learning

Strand 2: Science Learning: Contexts, Characteristics and Interactions
A qualitative analysis of impostor phenomenon among discipline-based education researchers
Devasmita Chakraverty*, Indian Institute of Management Ahmedabad, India

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Misery Creates Company: Female Student-Developed Support Systems in Physics Classes
Mihwa Park*, Texas Tech University, USA

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
Attention to Student Emotions and Teacher Vulnerability as Tools to Maintain Student Disciplinary Engagement
Jennifer Schellinger*, Florida State University, USA
Lama Jaber*, Florida State University, USA
Sherry Southerland*, Florida State University, USA
Concurrent Session 3, 4/19/23, 8:25-9:55

**Strand 10: Curriculum and Assessment**

*Embedding Formative Assessment in Inquiry-Based Teaching: Students' Conceptual Learning*

Feral Ogan-Bekiroglu*, Marmara University, Turkey  
Simay Koksalan, Middle East Technical University, Turkey

**Topic 3: Issues in College STEM Teaching**

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

*Pedagogical Partnership: Collaborative Design of a Program to Support Pedagogical Improvement for University Engineering Instructors.*

Kerry Rose*, University of Alberta, Canada  
Mijung Kim*, University of Alberta, Canada  
Janelle McFeetors*, University of Alberta, Canada  
Qingna Jin*, University of Alberta, Canada

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

*Scientific Caricatures in Online Science Classrooms: Alternative Assessment Effectiveness in Virtual Environments*

Renee Clary*, Mississippi State University, USA

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

*Teaching Biology: A review about the contribution of Research*

Claudia Vergara*, Alberto Hurtado University, Chile  
Beatriz Becerra, Universidad Catolica de Valparaiso, Chile  
Paola Nuñez, Universidad Catolica de Valparaiso, Chile

**Topic 4: Clarifying the Nature of Science**

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

*Definition vs. Objective: A Century Old Struggle of Nature of Science Framework*

Caglin Akıllıoğlu*, Middle East Technical University, Turkey  
Semra Sungur, Middle East Technical University, Turkey  
Jale Cakıroğlu, Middle East Technical University, Turkey

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

*An image of science practices from an ethnography of professional coffee roasters*

Bradley Davey*, Northwestern University, USA  
Reed Stevens, Northwestern University, USA

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

*Representation of social-institutional aspects of science in the science textbooks: Textbook analysis and teachers' views*

Beyza Okan*, Bogazici University, Turkey  
Ebru Kaya, Bogazici University, Turkey
Concurrent Session 3, 4/19/23, 8:25-9:55

**Topic 5: Science Teacher Preparation**

**Strand 7: Pre-service Science Teacher Education**

*Feeling Like a First Year Teacher All Over Again: Teaching Elementary Science Methods During Covid-19*

Valarie Akerson*, Indiana University, USA

Ingrid Carter, Metropolitan State University of Denver, USA

Claire Cesijarev, Indiana University, USA

**Strand 7: Pre-service Science Teacher Education**

*Preparing Pre-Service Chemistry Teachers to Teach STEM Skills in Chemistry Classes*

Aviva Klieger*, Beit Berl College, Israel

Tamar Yaron, Beit Berl College, Israel

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

*A Science Teacher Looks in the Mirror*

Kady Lane*, Indiana University, USA

**Strand 1: Science Learning: Development of student understanding**

SC-Organized Paper Set: Data and Investigations in Scientific Inquiry

4/19/23, 8:25-9:55, Salon C7-8 (LL)

*Promoting students' writing in the context of scientific inquiry*

Jan-Martin Österlein*, University of Duisburg-Essen, Germany

Mathias Ropohl, University of Duisburg-Essen, Germany

Sebastian Habig, University of Erlangen-Nuremberg, Germany

Miriam Morek, University of Duisburg-Essen, Germany

**Balancing Authenticity and Personal Relevance of Science Through Student-Driven Neuroscience Investigations**

Ido Davidesco, University of Connecticut, USA

Steven Azeka, Columbia University Teachers College, USA

Jimmy Couzens, University of Worcester, United Kingdom

Eric Loken, University of Connecticut, USA

Steven Carter, Columbia University, USA

Emma Laurent, Harvard University, USA

Henry Valk, Pison Technology, Inc, USA

Suzanne Dikker, New York University, USA

Wendy Suzuki, New York University, USA

Sarah Gilmore, University of Connecticut, USA

*A Comparison of Undergraduate Students' Thinking about Carbon Cycling in Trees Using a Picture Walk*

Rebecca Krall*, University of Kentucky, USA

Katherine Sharp*, Stephens College, USA

Sagan Goodpaster, University of Kentucky, USA

Moria Peel, University of Kentucky, USA

Amber Keene, University of Kentucky, USA

**Strand 2: Science Learning: Contexts, Characteristics and Interactions**

Related Paper Set: Rethinking Epistemic Agency: Examining tensions and perspectives among scholars, teachers, and students

4/19/23, 8:25-9:55, Salon C1-2 (LL)

*Do we have the same definition? Variations in published transcripts showcasing students' epistemic agency*

Christina Krist*, University of Illinois Urbana-Champaign, USA
Concurrent Session 3, 4/19/23, 8:25-9:55

**Nitasha Mathayas**, Indiana University Bloomington, USA

**What do Different Figured Worlds Mean for Epistemic Agency in Science Class?**

**Jessica Alzen**, University of Colorado Boulder, USA  
**Kelsey Edwards**, Northwestern University, USA  
**Jason Buell**, Northwestern University, USA  
**Chris Griesemer**, University of California Davis, USA  
**Cynthia Passmore**, University of California Davis, USA  
**William Penuel**, University of Colorado Boulder, USA  
**Brian Reiser**, Northwestern University, USA

**Conceptualizing teacher learning for supporting students' epistemic agency in science as an ideological process**

**Mon-Lin Monica Ko**, University of Illinois Chicago, USA  
**Christina Krist**, University of Illinois Urbana Champaigne, USA  
**Barbara Hug**, University of Illinois Urbana Champaigne, USA  
**Nessrine Machaka**, University of Illinois Urbana Champaigne, USA

**How teachers' high-level goals related to supporting student epistemic agency change during professional learning**

**Cynthia Passmore**, University of California, Davis, USA  
**Jason Buell**, Northwestern University, USA  
**Jessica Alzen**, University of Colorado Boulder, USA  
**Kelsey Edwards**, Northwestern University, USA  
**Chris Griesemer**, University of California, Davis, USA

---

Strand 5: College Science Teaching and Learning (Grades 13-20)  
SC-Organized Paper Set: Culturally Responsive and Inclusive STEM Instruction  
4/19/23, 8:25-9:55, Salon A1 (LL)

**Culturally Responsive Undergraduate Science Education (Cruse): A Pedagogical Training Framework for Academic Biology**

**Hillary Barron**, Bemidji State University, USA

**A Framework for Equitable, Student-centered Undergraduate STEM Instruction**

**Daniel Hanley**, Western Washington University, USA  
**Shannon Warren**, Western Washington University, USA  
**Dustin Van Orman**, Western Washington University, USA
Concurrent Session 3, 4/19/23, 8:25-9:55

**Xyan Neider**, Whatcom Community College, USA

**Alyssa Cavazos**, University of Texas- Rio Grande Valley, USA

**Shevell Thibou**, Western Washington University, USA

Learning from the Past; Building a Framework of Physics Identity

**Alia Hamdan**, University of Arizona, USA

**Sanlyn Buxner**, University of Arizona, USA

Investigating Active Learning and Inclusive Practices in Introductory College Science Courses

**Mojtaba Khajeloo**, University of Nebraska Lincoln, USA

**Deepika Menon**, University of Nebraska Lincoln, USA

**Deef Allah Al Shorman**, University of Nebraska Lincoln, USA

Strand 6: Science Learning in Informal Contexts

Symposium: Once upon a time... The use of narratives in informal learning environments

4/19/23, 8:25-9:55, PDR 2 (L3)

Once upon a time... The use of narratives in informal learning environments

**Neta Shaby**, University of Southampton, United Kingdom

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

**Maya Barzilay**, Ben Gurion University of the Negev, Israel

**Palmyre Pierroux**, University of Oslo, Norway

**Rolf Steier**, OsloMet University, Norway

**Ran Peleg**, University of Southampton, United Kingdom

Strand 7: Pre-service Science Teacher Education

Related Paper Set: Operationalizing Justice-Centered Science Education By Teaching Through Science and Engineering Practices

Planning Enacting and Reflecting Science and Engineering Practices in K-5 Classrooms: Towards Justice-Oriented Science Teaching

**Meenakshi Sharma**, Mercer University, USA

Elementary Preservice Teachers' Becomings Towards Equitable and Inclusive Science Teaching

**Sophia Jeong**, The Ohio State University, USA

Pre-service Science Teachers of Color: Connecting the NGSS Practices with Justice-Centered Science Pedagogy

**Valerie Valdez**, Stevenson University, USA

**Matthew Bennett**, University of California, Santa Barbara, USA

**Royce Olarte**, University of California, Santa Barbara, USA

**Cameron Dexter Torti**, University of California, Santa Barbara, USA

**Donald McNish**, University of California, Santa Barbara, USA

**Muriel Grenon**, National University of Ireland Galway, Ireland

**Scott Pattison**, TERC, USA

**Gina Svarovsky**, University of Notre Dame, USA

**Justin Dillon**, University College London, United Kingdom
Concurrent Session 3, 4/19/23, 8:25-9:55

**Liliana Garcia**, University of California, Santa Barbara, USA  
**Sarah Roberts**, University of California, Santa Barbara, USA  
**Julie Bianchini**, University of California, Santa Barbara, USA

*Working to Hear Diverse Ways of Knowing: Development of Skills for Enacting Justice-Centered Science Pedagogy*

**Tierney Hinman**, Auburn University, USA  
**Alison Mercier**, University of Wyoming, USA

*Symmetry in Learning: Using Methods Courses to Model Justice-centered Science Education Approaches for Pre-service Teachers*

**David Steele**, Alder Graduate School of Education, USA

Strand 7: Pre-service Science Teacher Education  
SC-Organized Paper Set: Approaches of Preservice Teachers Developing Self-efficacy & Motivation for Science Learning and Teaching  
4/19/23, 8:25-9:55, Waldorf (L3)

*Elementary PSTs’ summer field experience: Developing self-efficacy and science best practices*

**Jacquelyn Duran**, Teachers College, USA  
**Alison Matthews**, Teachers College, USA  
**Minjung Lee**, Old Dominion University, USA  
**Allison Bookbinder**, Teachers College, USA

Strand 8: In-service Science Teacher Education  
SC-Organized Paper Set: Strengthening Science Teachers’ NGSS-Aligned Instruction by Focusing on Students  
4/19/23, 8:25-9:55, Salon C5-6 (LL)

**The Effects of Work and Academic Experiences on Paraeducator Preservice Teachers’ Science Teaching Self-Efficacy**  
**Lindsay Lightner**, Washington State University, USA

*Pre-service biology teachers’ development of research competence and motivation affected by (non-)restrictive learning opportunities*

**Lea Gussen**, Institute for Biology Education, Faculty of Mathematics and Natural Sciences, University of Cologne, Germany  
**Fabian Schumacher**, Center for Teaching and Learning (ZLL) / University Teaching and Instructional Development, Bielefeld University, Germany  
**Laura Ferreira González**, Chair of Educational Support and Social-Emotional Development, Department of Special Education and Rehabilitation, Faculty of Human Sciences, University of Cologne, Germany  
**Kirsten Schlüter**, Institute for Biology Education, Faculty of Mathematics and Natural Sciences, University of Cologne, Germany  
**Jörg Großschedl**, Institute for Biology Education, Faculty of Mathematics and Natural Sciences, University of Cologne, Germany
Concurrent Session 3, 4/19/23, 8:25-9:55

Building on Students' Assets in Science and Engineering Classrooms
Selcen Guzey*, Purdue University, USA
Khanh Tran*, Purdue University, USA
Soo Won Shim*, Purdue University, USA
William Walker*, Purdue University, USA
Sedef Cabazoglu Bilici, Gazi University, Turkey

Science Teachers' Assessment Strategies of their Students' Models
Alexis Gonzalez, University of British Columbia, Canada
Samia Khan*, University of British Columbia, Canada

Make Graphs? A Survey of Teachers on How Their Students Analyze and Interpret Data
Omiya Sultana*, University of Tennessee, USA
Joshua Rosenberg, University of Tennessee, USA
Elizabeth Schultheis, Michigan State University, USA
Melissa Kjelvik, Michigan State University, USA
Aaron Reedy, Data Classroom, USA

Teacher-driven Adaptations: Seeding Productive Uncertainty and Moving Toward Equity-Oriented Practices
Emily Adah Miller, University of Georgia, USA
Susan Kelly*, Michigan State University, USA
Selin Akgun, Michigan State University, USA

Strand 10: Curriculum and Assessment SC-Organized Paper Set: Assessments to promote reform based science education
4/19/23, 8:25-9:55, Salon C3-4 (LL)

New NGSS-aligned Early Childhood Assessment Instrument: An Exploratory Rasch/IRT Analysis of the KinderSci
Christopher Wojciechowski*, University of Toledo, USA
Susanna Hapgood, University of Toledo, USA
Charlene Czerniak, University of Toledo, USA
Scott Molitor, University of Toledo, USA
Joan Kaderavek, University of Toledo, USA
Grant Wilson, University of Toledo, USA

Measuring Claim-Evidence-Reasoning Using Scenario-based Assessments Grounded in Real-world Issues
William Romine*, Wright State University, USA
Ankita Agarwal, Wright State University, USA
Emily Burwell, Wright State University, USA
Maha Kareem, University of Missouri, USA
Amy Lannin, University of Missouri, USA

Assessing Data Practices in High School Science Courses
Peter Rich*, Brigham Young University, USA
Erin Peters-Burton, George Mason University, USA
Timothy Cleary, Rutgers University, USA
Anastasia Kitsantis, George Mason University, USA
Laura Laclede, George Mason University, USA
Jessica Yauney, Brigham Young University, USA
Connor Reynolds, Brigham Young University, USA

Development and evaluation of a competence test in organic chemistry at university level

Martin Steinbach*, University of Duisburg-Essen, Germany
Carolin Eitemüller, University of Duisburg-Essen, Germany
Marc Rodemer, University of Duisburg-Essen, Germany
Maik Walpuski, University of Duisburg-Essen, Germany

Strand 11: Cultural, Social, and Gender Issues
SC-Organized Paper Set: Breaking Barriers: Broadening the Contextualization of Science Pedagogies and Professional Development
4/19/23, 8:25-9:55, Salon A2 (LL)

Declining Achievement in STEM Gasping for Breath – Longitudinal Study of Choking Impact of Culturo-Techno-Contextual Approach

Peter Okebukola*, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Juma Shabani, University of Burundi, Burundi
Adekuolu Oladadejo, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Ibukunolu Ademola, Africa Centre of Excellence for Innovative and Transformational STEM Education, Lagos State University, Nigeria

Transformative STEM Education, Lagos State University, Nigeria
Deborah Agbanimu, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Olasunkanmi Gbeleyi, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Franklin Onowugbeda, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Fred Awaah, University of Professional Studies, Ghana
Rose Agholor, STEM International Research Group, Nigeria
Angela Irene, National Universities Commission, Nigeria
Ibiyinka Ogunlade, University of Ado-Ekiti, Nigeria

Combating Students’ Anxiety and Promoting Meaningful Learning of Computer Networking: Should we trust CTCA?

Esther Peter*, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Peter Okebukola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
David Peter, Lagos State University, Nigeria
Deborah Agbanimu, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Franklin Onowugbeda, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Concurrent Session 3, 4/19/23, 8:25-9:55

Olasunkanmi Gbeleyi, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Sue Dale Tunnicliffe, University College London, United Kingdom
Fred Awaaah, University of Professional Studies, Ghana
Adekunle Oladejo, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Ibukunolu Ademola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Fiacre Muhimpundu, Universite du Burundi, Burundi

Socio-Scientific Modeling as an Approach Towards Equitable Modeling
Rebecca Lesnefsky*, University of North Carolina, USA
Eric Kirk, University of North Carolina, USA
Troy Sadler, University of North Carolina, USA
Li Ke, University of North Carolina, USA
Jasmyne Yeldell, University of North Carolina, USA

Talking STEM in the hallways: Professional development for engaging students in SSI and social justice
Lisa Marco-Bujosa*, Villanova University, USA
Becky Mathers-Lowery*, Arcadia University, USA
Joseph Johnson*, Mercyhurst University, USA
Victoria Araco, Villanova University, USA

Strand 11: Cultural, Social, and Gender Issues
4/19/23, 8:25-9:55, Salon A3 (LL)

STEM, Equity, and Justice: Trends from the last decade in science education research
Rachel Gisewhite*, University of Southern Mississippi, USA
Fatlime Berisha, University of Prishtina "Hasan Prishtina", Albania
Hannah McDuffie, University of Southern Mississippi, USA

Strengthening visions of equity through science and math integration
Andrew Gilbert*, George Mason University, USA
Jennifer Suh, George Mason University, USA

Investigating the Effects of an At-home, Justice-centered STEM Curriculum: A Pilot Study
Margaret Blanchard*, NC State University, USA
Karen Collier*, NC State University, USA
Donna Farland-Smith, The Ohio State University, USA
Ana-Marie Topliceanu, North Carolina State University, USA

Culturally Responsive Early Science Education—Perceptions and Practices of Bedouin Minority Teachers
Ornit Spektor-Levy*, Bar Ilan University, Israel
Idit Shaul, Bar Ilan University, Israel
Concurrent Session 3, 4/19/23, 8:25-9:55

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

*SC-Organized Paper Set: Extended Reality to Support Science Learning*

*4/19/23, 8:25-9:55, Blvd A (L2)*

**How Do Chemistry Students Bridge Macro-Micro Scale with Magnetic Models and Immersive Virtual Reality?**

*Dewi Ungu*, Curtin University, Australia  
*Mihye Won*, Curtin University, Australia  
*David Treakust*, Curtin University, Australia  
*Mauro Mocerino*, Curtin University, Australia  
*Henry Matovu*, Curtin University, Australia  
*Chin-Chung Tsai*, National Taiwan Normal University, Taiwan  
*Roy Tasker*, Western Sydney University, Australia

*Influence of an immersive virtual reality experience on students' understanding of the shape of snowflakes*

*Henry Matovu*, Curtin University, Australia  
*Won Mihye*, Curtin University, Australia  
*David Treakust*, Curtin University, Australia  
*Mauro Mocerino*, Curtin University, Australia  
*Dewi Ungu*, Curtin University, Australia  
*Chin-Chung Tsai*, National Taiwan Normal University, Taiwan  
*Roy Tasker*, University of Western Sydney, Australia

*Using Extended Reality Technologies Within a Socioscientific Issues Unit on Climate Change*

*Mark Newton*, East Carolina University, USA  
*Len Annetta*, East Carolina University, USA  
*Denise Bressler*, Educational Testing Services, USA

**Strand 14: Environmental Education and Sustainability**

*Related Paper Set: Preparing for a warming world: Modeling and promoting climate literacy*

*4/19/23, 8:25-9:55, Blvd C (L2)*

**What is needed? Investigating drivers for students' climate-friendly intentions to act**

*Carola Garrecht*, IPN – Leibniz-Institute for Science and Mathematics Education, Germany  
*Jesper Haglund*, Karlstad University, Sweden  
*Ute Harms*, IPN – Leibniz-Institute for Science and Mathematics Education, Germany

*Climate action in the eyes of young activists – from direct individual to collective indirect actions*

*Niklas Gericke*, Department of Environmental and Life Sciences, Karlstad University, Sweden  
*Nina Christenson*, Department of Geography, Media and Communication, Karlstad University, Sweden
Concurrent Session 3, 4/19/23, 8:25-9:55

Carola Garrecht, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Preparing teachers for a warming future – an interdisciplinary approach to address Climate Literacy
Kathryn Leve*, IPN - Leibniz Institute for Science and Mathematics Education, Germany
Ute Harms, IPN - Leibniz Institute for Science and Mathematics Education, Germany

Dilemmas in teaching climate change - preservice science teachers beliefs
Mikael Rydin*, Department of Environmental and Life Sciences, Sweden
Niklas Gericke, Department of Environmental and Life Sciences, Sweden
Nina Christenson, Department of Geography, Media and Communication, Sweden
Jesper Haglund, Department of Engineering and Physics, Sweden

Restructuring Middle School Science Education around the Grand Challenges
David Fortus*, Weizmann Institute of Science, Israel
Jeffrey Nordine, University of Iowa, USA

Funding Patterns of the National Science Foundation’s ITEST Program in the Affective Domain: 2002-2022
Gavin Fulmer*, University of Iowa, USA
Asli Sezen-Barrie, National Science Foundation, USA
Jennifer Noll, National Science Foundation, USA

Strand 15: Policy, Reform, and Program Evaluation
SC-Organized Paper Set: Standards and Policy
4/19/23, 8:25-9:55, Astoria (L3)

Testing the Assumption of Equivalence of State Science Standards
Eugene Judson*, Arizona State University, USA

Changing science education standards: How the policy environments changed from NSES to NGSS
Laura Pirkle Howd*, The Pennsylvania State University, USA
Concurrent Session 4
4/19/23, 10:20-11:50

Continental and Diasporic Africa in Science Education (CADASE)
Sponsored Session: Reflecting on Reform: Movements that Value and Expand the Science Education Experiences of African People and People of African Descent
4/19/23, 10:20-11:50, Grand Ballroom (L2)

ORGANIZERS
Mary Atwater, University of Georgia, Athens, GA, USA
Rona Robinson-Hill, Ball State University, Muncie, IN, USA
Brenda Brand, Virginia Tech, Blacksburg, VA, USA

PANELISTS
Peter Okebukola, Lagos State University, Nigeria

Board of Directors
Sponsored Session: International collaborative study of Sustainability and Social Justice in Science Education
4/19/23, 10:20-11:50, Salon A5 (LL)

ORGANIZERS
Tali Tal, Technion, Israel Institute of Technology, Haifa, Israel
Gail Richmond, Michigan State University, East Lansing, MI, USA
Joseph Krajcik, Michigan State University, East Lansing, MI, USA
Irene Bayer, Michigan State University, East Lansing, MI, USA

PANELISTS
Orit Ben-Zvi Assaraf, Ben Gurion University of the Negev, Israel
Heather Toomey Zimmerman, Pennsylvania State University, PA, USA

Efrat Nativ Ronen, Technion-Israel Institute of Technology, Israel
Anat Shauly, Technion-Israel Institute of Technology, Israel
Yael Eshed Silver, Technion-Israel Institute of Technology, Israel
Abir Saleh, Technion-Israel Institute of Technology, Israel
Avivit Arvatz, Technion-Israel Institute of Technology, Israel
Odelia Schrire, Technion-Israel Institute of Technology, Israel
Tamar Ginzburg, Technion-Israel Institute of Technology, Israel
Anna Pshenichny Mamo, Technion-Israel Institute of Technology, Israel
Lulu Garah, Technion-Israel Institute of Technology, Israel
Yaron Charka, Technion-Israel Institute of Technology, Israel
Ruth Edri, Technion-Israel Institute of Technology, Israel
Jonathan Bowers, Michigan State University, USA
Maggie Demarse, Michigan State University, USA
Kara Haas, Michigan State University, USA
Kayla Bartz, Michigan State University, USA
Lydia Bradford, Michigan State University, USA
Tatiana Iretskaia, Michigan State University, USA
Jaime Garcia Vila, Michigan State University, USA
Roberta Hunter, Michigan State University, USA
Renee Bayer, Michigan State University, USA
Concurrent Session 4, 4/19/23, 10:20-11:50

Consuelo Morales, Michigan State University, USA

National Science Teaching Association (NSTA)
Sponsored Session: Translating (Y)our Research into Forms that are Useful to K-12 Science Educators
4/19/23, 10:20-11:50, Waldorf (L3)

ORGANIZERS
G. Michael Bowen, Mount Saint Vincent University, Halifax, Nova Scotia, Canada

PANELISTS
Julie Luft, University of Georgia, GA, USA
Valarie Akerson, Indiana University, IN, USA
David Crowther, University of Nevada, Reno, NV, USA
Judith Lederman, Illinois Institute of Technology, IL, USA
Victor Sampson, University of Texas, Austin, TX, USA
Kathy Trundle, Utah State University, UT, USA

Strand 1: Science Learning:
Development of student understanding
SC-Organized Paper Set: Evaluating Information and Transforming Learning in Science Classrooms
4/19/23, 10:20-11:50, Salon C7-8 (LL)

Students' Evaluations of Science (Dis)Information
Daniel Pimentel*, Stanford University, USA

Geoscience for justice: a pedagogical model of transformative science learning
Shondricka Burrell*, Morgan State University, USA

Affordances for Multimodal Representations in a Photosynthesis Unit: Tale of Two Linguistically Diverse Classrooms.
Preetha Menon*, Stanford University, USA

Students' Use of Crosscutting Concepts to Develop Questions from an Anchoring Phenomenon
Daniel Voss*, Northwestern University, USA
Brian Reiser*, Northwestern University, Learning Sciences, USA
Joe Kremer, Denver Public Schools, USA
Jamie Noll*, BSCS Science Learning, USA
Dawn Novak, Northwestern University, USA
Michael Novak*, Northwestern University, USA
Nicole Vick, Northwestern University, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-Organized Paper Set: Students' Ways of Learning Science
4/19/23, 10:20-11:50, Salon C1-2 (LL)

Preschool-age Children's Use of Spatial Thinking When Making Sense of Astronomical Phenomena
Hannah Lewis*, Wesleyan University, USA
Julia Plummer*, The Pennsylvania State University, USA

Elementary Children Learn Astronomy Through Drawing
Qingna Jin*, University of Alberta, Canada
Mijung Kim*, University of Alberta, Canada
A Case Study of How Fifth Grade Students Develop Their 21st-Century-Skills during Integrated STEM Unit
Muhammad Purwanto*, University of Minnesota, USA
Gillian Roehrig, University of Minnesota, USA
Elizabeth Stretch, University of Minnesota, USA

Interest and Effort: Exploring the Ways Students Obtain and Evaluate COVID-19 Information
Eric Kirk*, University of North Carolina at Chapel Hill, USA
Jamie Elsner, University of North Carolina at Chapel Hill, USA
William Romine, Wright State University, USA
Li Ke, University of Nevada, Reno, USA
Laura Zangori, University of Missouri Columbia, USA
Troy Sadler, University of North Carolina at Chapel Hill, USA

Teaching High School Students about Bronsted-Lowry Acid-Base Reactions
Rita Krebs*, University of Vienna, Austria
Marvin Rost, University of Vienna, Austria
Anja Lembens, University of Vienna, Austria

Exploring high school students' systems thinking and explanation of chromatography through analogy
Yu-Jan Tseng*, Institute of Education, National Sun Yat-sen University, Taiwan
Huann-shyang Lin, Centre for General Education, National Sun Yat-sen University, Taiwan
Zuway-R Hong, Centre for General Education, Kaohsiung Medical University, Taiwan

The Wonders of CTCA in Making Learning of Science Easy: A study of Nuclear Chemistry
Ibukunolu Ademola*, Lagos State University, Africa Centre of Excellence for Innovative and Transformative STEM Education, Nigeria
Peter Okebukola, Lagos State University, Africa Centre of Excellence for Innovative and Transformative STEM Education, Nigeria
Olasunkanmi Gbeleyi, Lagos State University, Africa Centre of Excellence for Innovative and Transformative STEM Education, Nigeria
Sue Tunnicliffe, University College London, United Kingdom
Adekunle Oladejo, Lagos State University, Africa Centre of Excellence for Innovative and Transformative STEM Education, Nigeria
Franklin Onowugbeda, Lagos State University, Africa Centre of Excellence for Innovative and Transformative STEM Education, Nigeria

How Different Approaches to Science Teaching Affect Content Knowledge-Linking Concerning the Energy Concept
Dennis Dietz*, Freie Universität Berlin, Germany
Claus Bolte, Freie Universität Berlin, Germany
Concurrent Session 4, 4/19/23, 10:20-11:50

Deborah Agbanimu, Lagos State University, Africa Centre of Excellence for Innovative and Transformative STEM Education, Nigeria

Esther Peter, Lagos State University, Africa Centre of Excellence for Innovative and Transformative STEM Education, Nigeria

David Byamungu, University of Burundi, Burundi

Chinyere Ikpah, Lagos State University, Africa Centre of Excellence for Innovative and Transformative STEM Education, Nigeria

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-Organized Paper Set: Graduate Student Professional Development
4/19/23, 10:20-11:50, Blvd A (L2)

Learning and Leading: Doctoral Students’ Perceptions of Imposterism and Academic Challenges in an Interdisciplinary Program
M. Gail Jones*, NC State University, USA
Juliana Nieuwsma, NC State University, USA
Rebecca Ward, NC State University, USA
Kathleen Bordewieck, NC State University, USA
Emma Refvem, NC State University, USA

Supports and Challenges in the Phases of Doctoral Education: Physical Science Doctoral Student Perspectives
Anne McAlister*, University at Buffalo, USA
Sarah Lilly*, University of Virginia, USA

Graduate Students’ Interpersonal Communication Skills: Assessing an Online Course
Yehudit Judy Dori*, Technion, Israel
Shahaf Rocker Yoel, Technion, Israel

Teaching Assistant Talk Move Sequences Associated with Rigorous Elicitation Discussions in an Undergraduate Biology Laboratory
Evan Barnes, Northern Arizona University, USA
Ron Gray, Northern Arizona University, USA
Anna Grinath*, Idaho State University, USA

Strand 7: Pre-service Science Teacher Education
Related Paper Set: Using Principles of Engineering Design to Advance Elementary Science Teacher Preparation
4/19/23, 10:20-11:50, Salon A1 (LL)

Integrating Learning of Science with Engineering Design in a Physics Course for Elementary Preservice Teachers
N. Sanjay Rebello*, Purdue University, USA
Zeynep Akdemir, Purdue University, USA

The Impact of Engineering Design on Elementary Preservice Teachers’ Achievement in Science
Selcen Guzey*, Purdue University, USA

Measuring Elementary Preservice Teachers’ Conceptualizations of Engineering and Perceived Abilities to Teach Science Using Design
Yue Li*, Miami University, USA
Brenda Capobianco, Purdue University, USA
Elementary Preservice Teachers' Shifts as Learners to Teachers to Designers
Brenda Capobianco*, Purdue University, USA
Jenna Gist, Purdue University, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Communities of Practice: Sites for Teacher Learning
4/19/23, 10:20-11:50, Salon C5-6 (LL)

Communities of Practice to Enhance Preschool Teachers' Science Ways of Seeing and Identity
Jenny Ingber*, American Museum of Natural History, USA
Veena Vasudevan, University of Pittsburgh School of Education, USA
Jacqueline Horgan, American Museum of Natural History, USA

Responding to High School Physics Teachers' Needs in a Professional Community of Practice
Hamideh Talaian*, University of Illinois at Urbana Champaign, USA
Tim Stelzer, University of Illinois at Urbana Champaign, USA

Identifying Valued Outcomes of Science Teacher Leaders' Participation in Communities of Practice
Michelle Phillips*, Exploratorium, USA
Sara Heredia, University of North Carolina Greensboro, USA

It's the First Time it's Authentic: Developing Rightful Presence within a Critical Community of Practice
Desiré Whitmore, Exploratorium, USA

Ti' Era Worsley*, The University of North Carolina at Greensboro, USA
Rita Barrera, Stockton Unified School District, USA
Eric Cross, San Diego Unified, USA
Melody Ewely, Davis Joint Unified School District, USA
Camille Fowler, San Diego Unified, USA
Amy Kraft, Sacramento County Office of Education, USA
Tara Sikorski, Santa Clara County Office of Education, USA
Sara Heredia, The University of North Carolina at Greensboro, USA
Science teachers' conceptualization of student resources during and after involvement in curriculum-based professional development

Sarah Fogelman*, Boston College, USA
Samuel Lee*, Boston College, USA
Katherine McNeill*, Boston College, USA
Caitlin Fine*, Metropolitan State University of Denver, USA

What Constitutes Program Success? An exploration of findings 2.5 years after a Teacher Professional Development

Joanna Philippoff*, University of Hawaii at Manoa, USA

High School Science Resources on Teachers Pay Teachers: Buyers and Sellers
Adepeju Prince*, Kent State University, USA
Shannon Navy*, Kent State University, USA

Grading and Retention in CS Service Courses: A Systematic Review
Robert Lightfoot*, Texas A&M University, USA
Saira Anwar, Texas A&M University, USA
Tracy Hammond, Texas A&M University, USA

Towards assessment for playful learning in early childhood: Influences on teachers' science assessment practices

Cristina Guarrella*, The University of Melbourne, Australia
Jan van Driel, The University of Melbourne, Australia
Caroline Cohrssen, University of New England, Australia

Educative Curriculum Materials for Science Teacher Educators: Uptake of Different Types of Educative Supports
Deborah Hanuscin*, Western Washington University, USA
Josie Melton*, Western Washington University, USA
Dustin Van Orman*, Western Washington University, USA

Gender Differences in a Physics Research Experience for Undergraduates Program
Andrea Ratcliff*, University of Kentucky, USA
Tracy Gastineau-Stevens*, University of Kentucky, USA
Cameron Richards, University of Kentucky, USA
Jennifer Wilhelm, University of Kentucky, USA

Investigating Motivational Supports for Graduate Students through Structural Equation Modeling
Karen Collier*, North Carolina State University, USA
Margaret Blanchard*, North Carolina State University, USA
**I am (sort of) a STEM person: College STEM students' self-assessment of STEM identities**

**Heidi Cian**, Florida International University, USA

**Remy Dou**, Florida International University, USA

---

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

**SC-Organized Paper Set: Supporting Multilingual and Refugee Learners through Translanguaging and Culturally Sustaining Pedagogies**

4/19/23, 10:20-11:50, Salon A3 (LL)

*Shifting between languages during inquiry process*

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

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

---

**The Role of Language in Understanding Abstract Chemical Concepts in Multilingual Classrooms**

**Salwa Ali**, American University of Beirut, Lebanon

**Saouma BouJaoude**, American University of Beirut, Lebanon

---

*Insights on culturally sustaining science pedagogy in an after school program for refugee youth.*

**Bolaji Bamidele**, Utah State University, USA

**Sarah Braden**, Utah State University, USA

**Tino Nyawelo**, University of Utah, USA

**Sherry Marx**, Utah State University, USA

**Aryn Dotterer**, Utah State University, USA

**Raquel Goldrup**, Utah State University, USA

---

**Melanie Valera**, Utah State University, USA

**Ricardo Gonzalez Montalvo**, University of Utah, USA

---

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

**SC-Organized Paper Set: Issues & Trends in NOS Research**

4/19/23, 10:20-11:50, Astoria (L3)

*Review of the Research on Teaching, Learning, and Assessment of Nature of Science: 2013–2021*

**Fouad Abd-El-Khalick**, University of North Carolina at Chapel Hill, USA

**Norman Lederman**, Illinois Institute of Technology, USA

---

*A Systematic Review of NOS Research in Science Education: Varieties of Scholarship, Trends and Considerations*

**Noushin Nouri**, University of Texas Rio Grande Valley, USA

**William McComas**, University of Arkansas, USA

**Maryam Saberi**, Ministry of education, Iran, Islamic Republic of

---

*Synthesis of Variations in Nature of Science (NOS) Among Adult Learners*

**Joseph Watts**, University of Florida, USA

**Kent Crippen**, University of Florida, USA

---

*Nature of Science Assessment Efforts: Interplay Between Contemporary Frameworks and Curricular Tensions*

**Alex Sobotka**, Texas A&M University, USA

**Michael Clough**, Texas A&M University, USA
Elementary Science and Teacher Education Standards in the U.S.: Implementation and Future Directions

Katie Brkich, Georgia Southern University, USA
Terrance Burgess, Michigan State University, USA
Iliana De La Cruz*, Texas A&M, USA
Melissa Luna, West Virginia University, USA
TJ McKenna, Boston University, USA
Alesia Mickle Moldavan, Georgia Southern University, USA
Bailey Nafzinger, Georgia Southern University, USA
Christina Schwarz, Michigan State University, USA
Meenakshi Sharma, Mercer University, USA
Mary Starr, Michigan Math and Science Leadership Network, USA
Concurrent Session 5
4/19/23, 13:00-14:30

Publications Advisory Committee
Sponsored Session: Publishing, Reviewing, and Writing for JRST
4/19/23, 13:00-14:30, Salon A5 (LL)

ORGANIZERS
Felicia Mensah, Teachers College, Columbia University, USA
Troy Sadler, University of North Carolina at Chapel Hill, USA
Li Ke, University of North Carolina at Chapel Hill, USA

PANELISTS
Lucy Avraamidou, University of Groningen, Netherlands

Strand 1: Science Learning:
Development of student understanding
SC-Organized Paper Set: Uncertainty and Sensemaking in Science Classrooms
4/19/23, 13:00-14:30, Salon C1-2 (LL)

A Bayesian Approach to Making Sense of Uncertainty in the Science Classroom
Marcus Kubsch*, IPN – Leibniz Institute for Science and Mathematics Education, Germany
Joshua Rosenberg, University of Tennessee, USA
Eric-Jan Wagenmakers, University of Amsterdam, Netherlands
Mine Dogucu, University of California, USA

Conceptual Framework for Incorporating Student Uncertainties Into Science Learning
Ying-Chih Chen, Arizona State University, USA

Jongchan Park*, Arizona State University, USA
Emily Starrett, Arizona State University, USA
Michelle Jordan, Arizona State University, USA
Carlos Meza-Torres, Arizona State University, USA

A Case Study of Undergraduate Biology Students' Engagement in Blended Sensemaking During Mathematical Modeling Tasks
Desi*, University of Minnesota, USA
Gillian Roehrig, University of Minnesota, USA
Anita Schuchardt, University of Minnesota, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-Organized Paper Set: The Role of Sensemaking in Learning Science
4/19/23, 13:00-14:30, Salon C7-8 (LL)

Exploring opportunities for Students’ Sensemaking Across Investigation Types in a Storyline Curriculum
Sage Andersen*, The University of Texas at Austin, USA
Karina Méndez Pérez*, The University of Texas at Austin, USA
María González-Howard*, The University of Texas at Austin, USA

Supporting the Enactment of Ecological Concepts in Sense-making of Ecological Phenomena
Heesoo Ha*, Center for Educational Research, Seoul National University, Korea, Republic of
Yunhee Choi, Ewha Womans University, Korea, Republic of
Sensemaking as a balance between dialogic tension and making sense

Ylva Hamnell-Pamment*, Lund University, Sweden

Strand 6: Science Learning in Informal Contexts
SC-Organized Paper Set: Patterns of Participation in Youth Informal Science Learning
4/19/23, 13:00-14:30, Blvd C (L2)

Strategies for broadening participation of historically underrepresented groups: A meta-synthesis of informal STEM education programs

Bobby Habig*, American Museum of Natural History, USA
Franny Geller, CUNY, USA
Preeti Gupta, American Museum of Natural History, USA
Jennifer Adams, University of Calgary, Canada
Mandë Holford, CUNY Hunter College, USA

Nature Capital Effects on Middle School Nature Identities

Laura Wheeler*, Utah State University, USA
Kathy Trundle*, Utah State University, USA
Rita Hagevik*, University of North Carolina Pembroke, USA
Katherine Vela, Utah State University, USA
David Joy, Wahlquist Jr. High School, USA
Michelle Parslow, Utah State University, USA

Pipeline Schmipeline: Exploring Youth Pathways in Science

Anna MacPherson*, American Museum of Natural History, USA
Rachel Chaffee, American Museum of Natural History, USA
Peter Bjorklund, University of California San Diego, USA
Alan Daly, University of California San Diego, USA
Jennifer Adams, University of Calgary, Canada
Preeti Gupta, American Museum of Natural History, USA
Karen Hammerness, American Museum of Natural History, USA

Strand 7: Pre-service Science Teacher Education
SC-Organized Paper Set: Approaches to Exploring Learning and Teaching about socio-scientific issues
4/19/23, 13:00-14:30, Salon A2 (LL)

Assessing preservice science teachers' socioscientific argumentation

Moritz Krell*, IPN - Leibniz Institute for Science and Mathematics Education, Germany
Carola Garrecht, IPN - Leibniz Institute for Science and Mathematics Education, Germany
Nina Minkley, Ruhr-Universität Bochum, Germany

Understanding Preservice Teacher’s Knowledge and Emotions Related to Climate Change

Catherine Bohn-Gettler*, College of St. Benedict, USA
Diana Fenton*, College of St. Benedict, USA
Carly Mastrian, College of St. Benedict, USA
Using News Articles about COVID-19 as a Context for Promoting Pre-service Science Teachers' Argumentation Skills
Resmiye Uzun*, Hacettepe University, Turkey
Metin Şardağ, Van Yüzüncü Yıl University, Turkey
Gültekin Çakmakçı, Hacettepe University, Turkey

Strand 7: Pre-service Science Teacher Education
4/19/23, 13:00-14:30, Salon A3 (LL)

"I 100% see myself teaching engineering": An exploration of elementary PSTs' intentions to integrate engineering
Min Jung Lee*, Old Dominion University, USA
Pilar Pazos-Lago, Old Dominion University, USA
Jennifer Kidd, Old Dominion University, USA
Kristie Gutierrez, Old Dominion University, USA
Francisco Cima, Old Dominion University, USA
Stacie Ringleb, Old Dominion University, USA
Krishnanand Kaipa, Old Dominion University, USA
Orlando Ayala, Old Dominion University, USA

Preservice Elementary Teachers' Understandings of Science and Engineering Practices as Vehicles for Sensemaking
Amy Ricketts*, California State University, Long Beach, USA
Michele Korb*, California State University, East Bay, USA

Preservice Middle Grades Teachers Supporting English Learners in Science and Engineering
Romola Bernard*, University of North Georgia, USA
Lorraine Ramirez Villarin, University of North Georgia, USA
Max Vazquez Domínguez, University of North Georgia, USA
Sheri Hardee, University of North Georgia, USA
Magda Guzman, University of North Georgia, USA
Maggie Lewis, University of North Georgia, USA
Victoria Hunter, University of North Georgia, USA

Strand 8: In-service Science Teacher Education
4/19/23, 13:00-14:30, Waldorf (L3)

Exploring Urban Educators' Entry and Early Trajectories Into Place-Based and "Place-Powerful" Teaching and Learning.
Roberta Hunter*, Michigan State University, USA
Gail Richmond, Michigan State University, USA
Concurrent Session 5, 4/19/23, 13:00-14:30

Teachers’ meaning making of cultivating learners to become scientifically literate citizens

Mandi Collins*, University of Nevada, Reno, USA
Elizabeth de los Santos, University of Nevada, Reno, USA

Middle Grades STEM Teachers’ Socioscientific Perspective Taking Concerning Socioscientific Issues

Melanie Kinskey*, Sam Houston State University, USA

Description of personal preconceptions and dispositions about climate change in science teachers in Chile

Veronica Abasto*, Universidad Catolica de Valparaiso, Chile
Antonia Larrain, Universidad Alberto Hurtado, Chile
Hernan Cofre, Universidad Catolica de Valparaiso, Chile

Strand 10: Curriculum and Assessment SC-Organized Paper Set: Expanding technology-enhanced pathways for science assessment
4/19/23, 13:00-14:30, Salon C3-4 (LL)

Automatically Assess Elementary Students’ Hand-Drawn Scientific Models Using Machine Learning: Is It Possible?

Tingting Li*, Michigan State University, USA
Feng Liu, Michigan State University, USA
Joseph Krajcik, Michigan State University, USA

Exploring student responses in the context of automated-generated feedback on science reasoning patterns

Dante Cisterna*, ETS, USA
Lei Liu, ETS, USA
David Baidoo-Anu, Queen’s University, Canada
Devon Kinsley, ETS, USA
Yi Qi, ETS, USA

Scientific modeling of the solar system (SMSS) version 2.0: Developing an instrument from four-element process

Letong Zhang*, Beijing Normal University, China
Jing Lin, Beijing Normal University, China
Weiwei He, Beijing Normal University, China

Assessing curriculum representations in pre-service physics teachers’ teaching reports with machine learning

Peter Wulff*, Heidelberg University of Education, Germany
Lukas Mientus, University of Potsdam, Germany
Anna Nowak, University of Potsdam, Germany
Andreas Borowski, University of Potsdam, Germany

Strand 11: Cultural, Social, and Gender Issues
Related Paper Set: Consequential Arrangements for Becoming: Considering Identity Work in STEM Across Social, Institutional, and Practice Spaces
4/19/23, 13:00-14:30, Salon A1 (LL)

Weaving in-and-out of School Experiences to Craft STEM Identities

Carrie Allen*, University of North Texas, USA
Using familial STEM identity to understand identity development through social units
Remy Dou*, Florida International University, USA
Heidi Cian*, Florida International University, USA

"Those kinds of students": Designing for Teachers' Sensemaking of Students' STEM Identities
Sara Heredia*, University of North Carolina at Greensboro, USA
Carrie Allen, University of North Texas, USA

Contextual Cues of Learning Experiences and their Influences on Expressions and Development of STEM Identities
Heidi Cian*, Florida International University, USA
Remy Dou*, Florida International University, USA

Informal STEM Education Spaces as Frames for Women's STEM Identity Stories
Roxanne Hughes, National High Magnetic Field Laboratory, USA
Amal Ibourk*, Florida State University, USA
Lauren Wagner, Florida State University, USA

Linking Science and Literacy Through Multimodal Text Sets: Student Perspectives
William Romine*, Wright State University, USA
Heba Abdelnaby*, University of Missouri-Columbia, USA
Delinda van Garderen, University of Missouri-Columbia, USA
Tracey Milarsky, University of Missouri-Columbia, USA
Cassandra Smith, University of Missouri-Columbia, USA
Amy Lannin, University of Missouri-Columbia, USA
William Folk, University of Missouri-Columbia, USA
**Concurrent Session 5, 4/19/23, 13:00-14:30**

*Downplaying Achievement and Retention of (HiS) in STEM! What can (CTCA) do in Logic Gate?*

**Olasunkanmi Gbeleyi***, Lagos State University, Nigeria  
**Peter Okebukola**, Lagos State University, Nigeria  
**Ibukunolu Ademola**, Lagos State University, Nigeria  
**Agbanimu Deborah**, Lagos State University, Nigeria  
**Peter Esther**, Lagos State University, Nigeria  
**Franklin Onowugbeda**, Lagos State University, Nigeria  
**Bugoma Suwadu**, University of Burundi, Burundi  
**Juma Shabani**, University of Burundi, Burundi  
**Adekunle Oladejo**, Lagos State University, Nigeria  
**David Byamungu**, University of Burundi, Burundi  
**Fiacre Muhimpundu**, University of Burundi, Burundi  

**Man Zhang**, Utah State University, USA  
**Assessing an Online Module to Support Nature of Technology Learning of Preservice Teachers**  
**Jerrid Kruse***, Drake University, USA  
**Marco Arreola**, Drake University, USA  
**Mitch Klocke**, Drake University, USA  
**Sarah Voss***, Drake University, USA  
**Isaiah Kent-Schneider**, Drake University, USA  

*Assessing students' motivation to learn in technology-enhanced science classes through a sociocultural lens*

**Tamar Ginzburg***, Technion - Israel Institute of Technology, Israel  
**Miri Barak**, Technion - Israel Institute of Technology, Israel  

---

**Strand 12: Technology for Teaching, Learning, and Research**  
**SC-Organized Paper Set: Assessment and Evaluation of Learning**  
4/19/23, 13:00-14:30, Salon C5-6 (LL)

*Development And Usability Evaluation of an App for Inquiry-Based Science Education*

**Toma Bogdan***, University of Burgos, Spain  
**Meneses Villagrá Ángel**, University of Burgos, Spain  

*Social network analysis shows equal numbers of public, educators, and scientists within an online world*

**Lisa Lundgren***, Utah State University, USA  

---

**Strand 15: Policy, Reform, and Program Evaluation**  
**SC-Organized Paper Set: Teacher Education**  
4/19/23, 13:00-14:30, Blvd A (L2)

*The "Moneyball" Problem in Teacher Education: Predictor Variables to Build a Better Teacher*

**Joanne Olson***, Texas A&M University, USA  
**Allison Esparza***, Texas A&M University, USA  
**Syahrul Amin***, Texas A&M University, USA  
**Jacob Pleasants**, The University of Oklahoma, USA  
**Iliana De La Cruz**, Texas A&M University, USA  

*Results of an Impact Evaluation Study of Early Career Teachers Engaging in Summer Modeling Institutes*
Concurrent Session 5, 4/19/23, 13:00-14:30

Sanlyn Buxner*, Planetary Science Institute, USA  
Larry Horvath, San Francisco State University, USA  
Bridina Lemmer, American Institutes for Research, USA  
Melissa Yisak, American Institutes for Research, USA  
Maya Bakerman, Planetary Science Institute, USA  
Jennifer Nelson, San Francisco State University, USA

* Which Organizational Conditions Predict the Translation of Professional Development to Science Instructional Practice?  
Kathryn Hayes*, California University East Bay, USA  
Jessica Gladstone, Virginia Commonwealth University, USA  
Brit Toven-Lindsey, UCLA, USA  
Christine Bae, Virginia Commonwealth University, USA  
Eric Nolan, California University East Bay, USA

Nature of Engineering in the Framework and the Next Generation Science Standards  
Hasan Deniz*, University of Nevada Las Vegas, USA  
Erdogan Kaya, George Mason University, USA  
Ezgi Yesilyurt, Weber State University, USA

Social Event  
Awards Desert Reception  
4/19/23, 14:45-16:15, Grand Ballroom (L2)  

Please join us in the Grand Ballroom in celebration of recipients of the Distinguished Contributions to Research Award (DCRA), Early Career Research Award (ECRA), Outstanding Dissertations Research Award (ODRA), and NARST Fellows.
**Concurrent Session 6**  
**4/19/23, 16:40-18:00**

Research in Artificial Intelligence-Involved Science Education (RAISE)  
Sponsored Session: Research in Artificial Intelligence-involved Science Education  
4/19/23, 16:30-18:00, Salon A5 (LL)

**ORGANIZERS**  
**Xiaoming Zhai**, University of Georgia, Athens, GA, USA  
**Kent Crippen**, University of Florida, FL, USA

**PANELISTS**  
**Joseph Krajcik**, Michigan State University, USA  
**Knut Neumann**, Leibniz Institute for Science and Mathematics Education, Germany

---

**Strand 1: Science Learning:**  
Development of student understanding  
SC-Organized Paper Set: Disciplinary Knowledge and Technology in Science Classes  
4/19/23, 16:30-18:00, Salon A4 (LL)

*Lebanese Students' Reasoning of the Immune System in Grades 8 and 12*  
**Ihsan Ghazal**, Texas Christian University, USA  
**Hayat Hokayem**, Texas Christian University, USA

*Accessing Quantum Mechanics in the Secondary Classroom*  
**Zac Patterson**, The Ohio State University, USA

---

**Lin Ding**, The Ohio State University, USA  
*Computer Studies Made Easy: Improving Students Achievement through the Culturo-Techno-Contextual Approach*

**Chinyere I kpah**, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria  
**Peter O kebukola**, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria  
**Rasheed Sanni**, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria  
**Adekunle Oladejo**, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria  
**Olasunkanmi Gbeleyi**, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria  
**Ibukunolu Ademola**, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria  
**Esther Peter**, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria  
**Henry Okorie**, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria  
**Fred Awaah**, University of Professional Studies, Ghana
Concurrent Session 6, 4/19/23, 16:40-18:00

Examining Student Perceptions of Accountable Disciplinary Knowledge in their Science Class versus Data Jam
Isabel Delgado*, The Learning Partnership, USA
Steven McGee*, The Learning Partnership, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-Organized Paper Set: Impact of Interactions on Learning Science
4/19/23, 16:30-18:00, Blvd C (L2)

Positioning in small groups around a Black Woman and equipment handling in physics lab
Mark Akubo*, Cornell University, USA
Emily Stump, Cornell University, USA
Natasha Holmes, Cornell University, USA

How positioning affects students' engineering experience during small group engineering design activities
Minyoung Gil*, Penn State University, USA
Gregory Kelly, Penn State University, USA
Matthew Johnson, Penn State University, USA

Noticing Beyond Disciplinary Ideas Prompts Re-imagination of Classroom Interactions that Foreground Students' Classroom Experience
Laura Blue*, Dublin City Schools, USA
Sophia Jeong*, The Ohio State University, USA
Ashlyn Pierson, The Ohio State University, USA

Strand 4: Science Teaching - Middle and High School (Grades 5-12): Characteristics and Strategies
SC-Organized Paper Set: Student Engagement, Epistemology, and Socioscientific Approaches
4/19/23, 16:30-18:00, PDR 2 (L3)

Stimulating Students' Socio-Scientific Perspective Taking through Personas
Dury Bayram Jacobs*, Eindhoven University of Technology, Netherlands
Ineke Henze, Radboud University, Netherlands
Erik Barendsen, Radboud University, Netherlands

"Creative vibes:" Using a comic in science curriculum and teaching to promote student engagement
Consuelo Morales*, Michigan State University, USA
Tania Jarosewich, Censeo Group, USA
Hildah Makori*, Michigan State University, USA
Maria Salinas, Michigan State University, USA
Irene Bayer, Michigan State University, USA

Designing and Enacting Lessons to Promote Students' Epistemic Agency in a Middle School Biology Classroom
Ozlem Akcil-Okan*, Florida State University, USA
Miray Tekkumru-Kisa, Florida State University, USA
Sherry Southerland, Florida State University, USA
Concurrent Session 6, 4/19/23, 16:40-18:00

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-Organized Paper Set: Student Development of Research Skills
4/19/23, 16:30-18:00, Salon C7-8 (LL)

Research Deconstruction: A Scalable Model for Promoting Scientific Literacy Skills in Introductory Biology Classes
Casey Shapiro*, UCLA, USA
Brit Toven-Lindsey*, UCLA, USA
Marc Levis-Fitzgerald*, UCLA, USA
Ira Clark, UCLA, USA

Understanding how a college instructor led science majors to write using a situated learning perspective
Austin Heil*, University of Georgia, USA
Julie Kittleson, University of Georgia, USA

College Student Conceptions of Experimental Design and Argumentation in the Earth Sciences
Danielle Ford*, University of Delaware, USA
Christy Metzger*, University of Delaware, USA

Critical Thinking: Perceptions and Experiences of Science and Engineering Instructors and Students
Carmella Shahab, The Technion Israel Institute of Technology, Israel
Miriam Barak*, The Technion Israel Institute of Technology, Israel

Strand 7: Pre-service Science Teacher Education
SC-Organized Paper Set: Understanding the use of models and representations in science learning
4/19/23, 16:30-18:00, Salon A2 (LL)

Exploring Elementary Preservice Teachers’ Use of Drawings to Reason about Force-Related Phenomena
Teresa Leavens*, College of Education, North Carolina State University, USA
James Minogue, College of Education, North Carolina State University, USA

Supporting Pre-Service Science Teachers in Designing and Reflecting on Coherent Instruction
Stefan Sorge*, IPN - Leibniz-Institute for Science and Mathematics Education, Germany
Dustin Schiering, IPN - Leibniz-Institute for Science and Mathematics Education, Germany
Mathias Ropohl, University of Duisburg-Essen, Germany
Christopher Like, University of Iowa, USA
Jeffrey Nordine, University of Iowa, USA

Analysis of Pre-Service Teachers’ Choices of Multiple Visual Representations for Teaching about the Cardiovascular System
Narendra Deshmukh*, Homi Bhabha Centre for Science Education, TIFR, India
Eunice Nyamupangedengu, Marang Centre for Mathematics and Science Education, School of Education, Wits University, South Africa
Concurrent Session 6, 4/19/23, 16:40-18:00

Strand 7: Pre-service Science Teacher Education
SC-Organized Paper Set: The role of Creativity, Computational & Design Thinking in pre-service teacher learning
4/19/23, 16:30-18:00, Salon C1-2 (LL)

Using artificial intelligence (AI) to foster preservice teachers' understandings of computational thinking (CT) and AI
**Jeffrey Radloff**, SUNY Cortland, USA
**Ibrahim Yeter**, National Institute of Education (NIE), Singapore, Singapore
**Gregorio Robles**, University of Madrid, Spain

Design Thinking for Human-Centered Engineering: Preservice Teachers' Engineering Design Projects for Underserved Communities
**Myunghwan Shin**, California State University, Fresno, USA
**Jane Lee**, Michigan State University, USA

Supporting Preservice Teachers to Conceptualize Computational Thinking as a Sensemaking Practice in an Engineering Course
**Gozde Tosun**, Penn State University, USA
**Amy Farris**, Penn State University, USA

Fostering Preservice Teachers' Creativity and Innovation Through 3D Printing: Individual and Group Outcomes
**Shannon Navy**, Kent State University, USA
**Elena Novak**, Kent State University, USA
**Ilker Soyturk**, Kent State University, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Professional Learning Communities Supporting Science Teacher Learning
4/19/23, 16:30-18:00, Salon A1 (LL)

Understanding science teacher perceptions of the influence of vertically and horizontally aligned collaborative teams
**Sharfun Islam Nancy**, University of South Florida, USA
**Karl Jung**, Bradley University, USA
**David Rosengrant**, University of South Florida, USA
**Allan Feldman**, University of South Florida, USA

The Value of Participation in Professional Learning Communities (PLCs) for High-School Chemistry Teachers
**Anat Shauly**, Technion - Israel institute of technology, Israel
**Shirly Avargil**, Technion - Israel institute of technology, Israel

Navigating Tensions Between Social Justice Theory and Practice in a Chemistry Education Professional Learning Community
**Kathryn Ribay**, San Jose State University, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Personal Dynamics of Learning for Elementary Science Teachers
4/19/23, 16:30-18:00, Salon C3-4 (LL)

Now I'm a Science Teacher: Shifting Professional Identities of Elementary Teachers in Long-Term PD
Toward a Future Science Teacher: Using Teaching Debriefs to Support a Veteran Elementary Teacher
Terrance Burgess*, Michigan State University, USA

Agency of In-Service Elementary Science Teachers During a Global Pandemic
Anica Miller-Rushing*, University of Maine, USA
Christine Goonan, In-service teacher, USA

Implementing engineering aspects in chemistry lessons using a nanoscience student lab
Tim Goebel*, University of Kassel, Germany
David-S. Di Fuccia, University of Kassel, Germany

Implementing engineering aspects in chemistry lessons using a nanoscience student lab
Tim Goebel*, University of Kassel, Germany
David-S. Di Fuccia, University of Kassel, Germany

Remote-Accessible Quantum Photonics Lab for Improving Learning Outcomes
Sahil Patel*, University of California, Santa Barbara, USA
Concurrent Session 6, 4/19/23, 16:40-18:00

Lenora Crabtree, University of North Carolina, USA
Angela Calabrese Barton, University of Michigan, USA
Day Greenberg, Indiana University, USA
Scott McDonald, Pennsylvania State University, USA
Jonathan Mccausland, New Mexico Highlands University, USA
Jennifer Jackson, Pennsylvania State University, USA
Hosun Kang, University of California Irvine, USA
Heather Clark

Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-Organized Paper Set: NOS and Decision-Making
4/19/23, 16:30-18:00, Waldorf (L3)

The Impact of Understanding Nature of Scientific Knowledge and Scientific Inquiry on Learning about Evolution
Juan Jimenez*, University of Talca, Chile
Norman Lederman, Illinois Institute of Technology, USA

Beyond the Science: Factors that Influence University Biology Students' COVID-19 Actions and Vaccine Acceptance
Benjamin Herman*, Texas A&M University, USA
Michael Clough, Texas A&M University, USA
Asha Rao, Texas A&M University, USA
Alex Sobotka, Texas A&M University, USA
Ben Janney, Texas A&M University, USA
Alister Olson, Texas A&M University, USA
Aaron Kidd, Texas A&M University, USA
Sarah Poor, Texas A&M University, USA

Patterns for managing potential conflict between religion and evolution among Muslim undergraduate biology students
Rahmi Aini*, Middle Tennessee State University, USA
Sara Brownell, Arizona State University, USA
M. Elizabeth Barnes, Middle Tennessee State University, USA

Strand 14: Environmental Education and Sustainability
SC-Organized Paper Set: Building pedagogical capacity in preservice teachers
4/19/23, 16:30-18:00, Blvd A (L2)

Helping Preservice Teachers Develop an Expanded Functional Scientific Literacy Using an Online Module
Sarah Voss*, Drake University, USA
Lucas Menke, Drake University, USA
Jerrid Kruse*, Drake University, USA
Colin Coulter, Drake University, USA
Isaiah Kent-Schneider, Drake University, USA

Using Photovoice to Prompt Preservice Science Teachers' Reasoning Skills
Conghui Liu*, Indiana University, USA
Gayle Buck, Indiana University, USA

Indonesian Preservice Teachers and Climate Change: Awareness, Beliefs, Values, and Behaviors
Kathy Trundle*, Utah State University, USA
Rita Hagevik*, UNC-Pembroke, USA
Laura Wheeler*, Utah State University, USA
Ryan Knowles, Utah State University, USA
Sary Silvhiany, Sriwijaya University, Indonesia
Concurrent Session 6, 4/19/23, 16:40-18:00

**Rita Rudi**, Sriwijaya University, Indonesia  
**Hartono Hartono**, Sriwijaya University, Indonesia  
**Sofendi Sofendi**, Sriwijaya University, Indonesia

---

**Graduate Student Committee**  
**Sponsored Session: Graduate Student Forum**  
*4/19/23, 18:30-19:30, Salon A5 (LL)*

---

**Social Event: JRST Dinner**  
*4/19/23, 18:30-19:30, Astoria (L3)*  
By invitation.
Committee Meetings, 4/20/23, 7:00-8:00

**Committee Meetings**

4/20/2023 7:00-8:00

Salon A1 (LL): *Membership Committee*

Salon A2 (LL): *Elections Committee*

Salon A3 (LL): *Awards Committee*

Salon A4 (LL): *Research Committee*

Salon A5 (LL): *Publications Advisory Committee*

Salon C1-2 (LL): *Equity and Ethics Committee*

Salon C3-4 (LL): *External Policy and Relations Committee*

Salon C5-6 (LL): *International Committee*

Salon C7-8 (LL): *Graduate Student Committee Meeting*

Blvd A (L2): *Social Media, Website, and Communications Committee*

Blvd C (L2): *Program Committee*
Concurrent Session 7
4/20/23, 8:40-10:10

Equity And Ethics Committee
Sponsored Session: Basu Scholars
Symposium - Presentation of the 2022 Basu Scholars
4/20/23, 8:40-10:10, Salon A5 (LL)

ORGANIZERS
María González-Howard, U Texas - Austin, Austin, TX, USA
Sara Salloum, University of Balmand, Lebanon, Tripoli, Al Koura, Lebanon
Regina McCurdy, Georgia Southern University, Statesboro, GA, United Kingdom

PANELISTS
Takeshia Pierre, U of Florida, Gainesville, FL, USA
Alexis Riley, Cal State U - Los Angeles, Los Angeles, CA, USA
Miguel Rodriquez, California State University Dominguez Hills, Carson, CA, USA
Tatiane Russo-Tait, U of Georgia, Athens, GA, USA
Caroline Spurgin, U California, Merced, Merced, CA, USA
Hong Tran, U of Georgia, Athens, GA, USA
Selene Willis, U of South Florida, Tampa, FL, USA
Ti’Era Worsley, U North Carolina, Greensboro, Greensboro, NC, USA
Gary Wright III, North Carolina State U, Raleigh, NC, USA

Awards Committee
Sponsored Session: A Celebration of NARST Award Recipients: Distinguished Contributions to Research Award [DCRA]
4/20/23, 8:40-10:10, Waldorf (L3)

ORGANIZERS
Amelia Gotwals, Michigan State University, East Lansing, MI, USA

PANELISTS
Dana Zeidler, University of South Florida, USA

Strand 1: Science Learning:
Development of student understanding
Related Paper Set: Explanations in biology: Obstacles and opportunities for teaching and learning
4/20/23, 8:40-10:10, Salon C3-4 (LL)

Revealing reasoning patterns in students’ explanations using analytic grading rubrics and cluster analysis
Moriah Ariely*, Weizmann Institute of Science, Israel
Tanya Nazaretsky, Weizmann Institute of Science, Israel
Giora Alexandron, Weizmann Institute of Science, Israel
Anat Yarden, Weizmann Institute of Science, Israel

Explanatory black boxes in the biological mechanisms
Michal Haskel-Ittah*, Department of Science Teaching, Weizmann Institute of Science institute of science, Israel
Gur Livni Alcasid, Department of Science Teaching, Weizmann Institute of Science institute of science, Israel
Teaching about the structure of evolutionary and developmental explanations in secondary schools
Kostas Kampourakis*, University of Geneva, Switzerland

Epistemic aims, explanation types, and evolution learning
Ross Nehm*, Stony Brook University, USA
Evan Abreu, Stony Brook University, USA
Gena Sbeglia, Stony Brook University, USA

Applying a classroom simulation with chatbot to support pre-service biology teachers' diagnostic competence in evolution
Daniela Fiedler*, IPN Kiel, Germany
Daniel Schönle, Furtwangen University, Germany
Christoph Reich, Furtwangen University, Germany
Ute Harms, IPN Kiel, Germany

Displaying uncertainty in collaborative interaction: a turning point in students' making sense of SSI online
Anne Solli*, University of Gothenburg, Sweden
Miranda Rocksen, University of Gothenburg, Sweden

Pair Dialogue in the Context of Computational Modeling
Linsey Brennan*, Michigan State University, USA

Namsoo Shin, Michigan State University, USA
Emil Eidin, Michigan State University, USA
Daniel Damelin, The Concord Consortium, USA
Joseph Krajcik, Michigan State University, USA

Developing Middle School Students' Socioscientific Reasoning through Integrated STEM Education
Nilay Ozturk*, Bahcesehir University, Turkey
Gillian Roehrig, University of Minnesota, USA

To evoke or not to evoke students' preconceptions in argumentation-based inquiry
Lena Lenz*, University of Education, Germany
Tobias Ludwig, University of Education, Germany

Strand 3: Science Teaching - Primary School (Grades preK-6): Characteristics and Strategies
SC-Organized Paper Set: Supporting Science Content Knowledge for Elementary Teachers
4/20/23, 8:40-10:10, Salon C1-2 (LL)

Exploring how Lived Experiences Mediate Science Identity and Agency of Induction Phase Elementary Teachers
Swarna Mahapatra*, University of Missouri, USA
Rebekah Snyder*, University of Missouri, USA
Sara Bridgewater, University of Missouri, USA
Laura Zangori*, University of Missouri, USA

Preservice Elementary Teachers’ Initial Knowledge for Teaching of the Crosscutting Concepts within Three-Dimensional Teaching

Anna Maria Arias*, Kennesaw State University, USA
Soon Lee*, Kennesaw State University, USA

Exploring Elementary Teachers’ Subject Matter Knowledge Development in the First Year of Teaching

Ryan Nixon*, Brigham Young University, USA
Adam Bennion*, Brigham Young University, USA
Alexandra Swain, Brigham Young University, USA
Elizabeth Tagg, Brigham Young University, USA

Understanding Teachers’ Transition to Knowledge Generation Environments after a Professional Development Program

Jale Ercan-Dursun*, The University of Alabama, USA
Ercin Sahin, University of Iowa, USA
Jee Suh, The University of Alabama, USA
Qi Si, The University of Alabama, USA
Brian Hand, University of Iowa, USA
Gavin Fulmer, University of Iowa, USA

Elementary Science Teachers’ Explicit and Implicit Verbal Support of STEM+CS in an NGSS-Aligned Project

Sarah Lilly*, University of Virginia, USA
Anne McAlister, The State University of New York at Buffalo, USA
Jennifer Chiu, University of Virginia, USA

Teaching science through dialogue and argumentation: practices and challenges identified by Chilean educators and researchers

Florencia Gomez Zaccarelli*, Pontificia Universidad Catolica de Chile, Chile
Natalia Candido Vendrasco, Pontificia Universidad Catolica de Chile, Chile

An Exploratory Study: Understanding Teachers’ Use of Decomposition

Ali Asif*, University of Massachusetts Dartmouth, USA
Hamza Malik*, University of Massachusetts Dartmouth, USA
Chandra Orrill, University of Massachusetts Dartmouth, USA
Ramprasad Balasubramanian, University of Massachusetts Dartmouth, USA
Shakhnoza Kayumova, University of Massachusetts, USA

Strand 3: Science Teaching - Primary School (Grades preK-6): Characteristics and Strategies
SC-Organized Paper Set: Supporting Elementary Teachers to Teach Science 4/20/23, 8:40-10:10, Blvd C (L2)

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

Multiple Case Study of Science and Engineering Integration in Secondary School Across Six School Districts
Concurrent Session 7, 4/20/23, 8:40-10:10

Elizabeth Hasseler*, University of Nebraska-Lincoln, USA
Elizabeth Lewis, University of Nebraska-Lincoln, USA

Balancing Standards Alignment with Educator Needs
Craig Kohn*, Waterford Union High School, USA
Abigail Helmke, Waterford Union High School, USA
Joseph Hendricks, Waterford Union High School, USA

Understanding of Scientific Inquiry and Its' Relation to Academic Achievement: A Large Scale Study
Cigdem Han Tosunoglu, Marmara University, Turkey
Ozgur Dogan, Marmara University, Turkey
Nevin Aslan, Marmara University, Turkey
Mustafa Cakir*, Marmara University, Turkey
Serhat Irez, Marmara University, Turkey

Development of a Measure of Science Teams for NSF CUREs
Joi Walker, East Carolina University, USA
Richard Lamb*, East Carolina University, USA
Heather Vance-Chalcraft, East Carolina University, USA

Instructor conceptions and implementation of course-based undergraduate research experience (CURE) features
Kristine Callis-Duehl*, Donald Danforth Plant Science Center, USA
Ruth Kaggwa, Donald Danforth Plant Science Center, USA
Lisa Walsh, Donald Danforth Plant Science Center, USA

Examining the Activities Associated With Students' Career Clarification During Undergraduate Research Experiences
Alicia Batailles*, Florida State University, USA
Sherry Southerland, Florida State University, USA

Scientific Reasoning Competencies: Fostering and Analyzing Procedural, Content-related and Laboratory-Technical Components in the Undergraduate Lab
Marco Reith*, Institute for Science Education, Leibniz Universität Hannover, Germany
Andreas Nehring, Institute for Science Education, Leibniz Universität Hannover, Germany

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-Organized Paper Set:
Undergraduate Research Experiences
4/20/23, 8:40-10:10, Salon A4 (LL)

From Sepsis Case to Course-based Undergraduate Research Experience: Student Learning Outcomes and Views
Katherine Sharp*, Stephens College, USA
Rebecca Krall*, University of Kentucky, USA
Robin Cooper, University of Kentucky, USA
Melody Danley, University of Kentucky, USA
Jate Bernard, University of Kentucky, USA
Concurrent Session 7, 4/20/23, 8:40-10:10

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Supporting Science Teacher Learning through Interactions with Science Research
4/20/23, 8:40-10:10, Salon A1 (LL)

Creating a community of K-8 teachers to co-design moth research with students
David Stroupe*, Michigan State University, USA
Megan Walser, Michigan State University, USA

Fostering STEM Career Pathways by Creating a Geoscience Education Community Around Local Geologic Phenomena
Tina Vo*, University of Nevada, USA
Adjoa Mensah, University of Nevada, USA
Mayra Marquez-Mendez, University of Nevada, USA
Monique North, University of Nevada, USA
Kristoffer Carroll, Clark County School District, USA
Pamela Burnley, University of Nevada, USA

Making informed decisions: Documenting how physics programs shift towards a culture of assessment
Diana Sachmpazidi*, University of Maryland, USA
Chandra Turpen, University of Maryland, USA
Robert Dalka, University of Maryland, USA
Fatima Abdurrahman, University of Maryland, USA

The Research and Engagement Academy: A Model for STEM Faculty Development
Eleanor Abrams*, University of Massachusetts Lowell, USA

Responsive collaborative design of 3D assessments with science teachers
Miray Tekkumru-Kisa, RAND Corporation, USA
Jill Wertheim*, WestEd, USA
Ozlem Akcil Okan, Florida State University, USA

Strand 10: Curriculum and Assessment
SC-Organized Paper Set: Professional development and support
4/20/23, 8:40-10:10, Salon C7-8 (LL)

A qualitative exploration of Latinx students' impostor experiences in science
Devasmita Chakraverty*, Indian Institution of Management Ahmedabad, India

Transgender and Minority Gender Students' Sense of Belonging in Higher Education
Tulana Ariyaratne*, Indiana University, USA
Gayle Buck, Indiana University, USA
**Concurrent Session 7, 4/20/23, 8:40-10:10**

*Queering the glass ceiling: Gender hierarchies in academic physical science*

**Katherine Doerr**, Malmö University, Sweden

*Movement expressiveness in a chemistry lab as embodied knowledge or off-task behavior*

**Molly Weinburgh**, Texas Christian University, USA

---

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

**SC-Organized Paper Set: Centering STEM Faculty: Supporting Persistence and Leveraging Perspectives toward Antiracist Work**

4/20/23, 8:40-10:10, Salon C5-6 (LL)

*Female Perceptions of STEM: Reflecting on why they matter*

**Mary Curtis**, Independent Researcher, USA

**Carol Waters**, University of Houston-Clear Lake, USA

*Reflections on Inclusive Pedagogy among STEM Faculty during Teaching TRIOS Peer Observation Process*

**O. Theresa Ayangbola**, Middle Tennessee State University, USA

**Sarah Bleiler-Baxter**, Middle Tennessee State University, USA

**Fonya Scott**, Middle Tennessee State University, USA

**Olena James**, Middle Tennessee State University, USA

**Amanda Lake Heath**, Middle Tennessee State University, USA

**Grant Gardner**, Middle Tennessee State University, USA

---

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

**SC-Organized Paper Set: Using Computational and System Thinking to Support Science Learning**

4/20/23, 8:40-10:10, Blvd A (L2)

*CT Integration with science and math curricula through teacher-researcher co-design*

**Amanda Peel**, Northwestern University, USA

**Delan Hao**, Northwestern University, USA

**Michael Horn**, Northwestern University, USA

**Uri Wilensky**, Northwestern University, USA

*K-5 Accessible, Computational Thinking-Integrated Science Education: A Conceptual Framework*

**Janice Mak**, Arizona State University, USA

**Lin Yan**, Arizona State University, USA

**Man Su**, Arizona State University, USA
Concurrent Session 7, 4/20/23, 8:40-10:10

Kristina Kramarczuk, University of Maryland, USA
Ebony Terrell Shockley, University of Maryland, USA
Diane Jass Ketelhut, University of Maryland, USA

Asynchronous Online or Blended/ Hybrid: Implementing Learning Experience Design to Support Students Learning Behaviors
Joseph Wong*, university of california, irvine, USA
Lindsey Richland, university of california, irvine, USA
Brad Hughes, university of california, irvine, USA

Fostering Pre-service Science Teachers’ Systems Thinking via an Asynchronous Online Course
Dov Dori*, MIT, USA
Roee Peretz, Technion, Israel
Yehudit Judy Dori, Technion, Israel

Orit Ben Zvi Assaraf*, Ben-Gurion University, Israel
Wisam Sedawi, Ben-Gurion University, Israel

School-Based Outdoor Science Education K-11 Teachers’ Declared Practices in the Province of Québec, Canada
Jean-Philippe Ayotte-Beaudet, Université de Sherbrooke, Canada
Metzisochil Boily-Ortega, Université de Sherbrooke, Canada
Asmaa Khayat, Université de Sherbrooke, Canada
Élise Rodrigue-Poulin, Université de Sherbrooke, Canada
Marie-Claude Beaudry*, Université de Sherbrooke, Canada
Valérie Vinuesa, Université de Sherbrooke, Canada
Félix Berrigan, Université de Sherbrooke, Canada

Strand 14: Environmental Education and Sustainability
SC-Organized Paper Set: Considering teacher development at the secondary school level
4/20/23, 8:40-10:10, Astoria (L3)

Cross-national survey of science teachers' perceptions of school communities: Implications for curriculum and teacher development
Xavier Fazio*, Brock University, Canada

Unpacking the connections between climate literacy and sense of place among Bedouin teachers in Israel.
Shaima Alokbe*, Ben-Gurion University, Israel
Concurrent Session 8, 4/20/23, 10:30-12:00

Concurrent Session 8
4/20/23, 10:30-12:00

Publications Advisory Committee
Sponsored Session: NARST/NSTA Annual Research Worth Reading Recognition
4/20/23, 10:30-12:00, Salon C1-2 (LL)

ORGANIZERS
Dante Cisterna, Educational Testing Service, USA
Lindsay Lightner, Washington State University, Tri-Cities, USA
Emily Dare, Florida International University, USA
G. Michael Bowen, Mount Saint Vincent University, Halifax, Nova Scotia, Canada
Cynthia Crockett, Harvard-Smithsonian Center for Astrophysics, USA
Knut Neumann, IPN-Leibniz-Institute for Science and Mathematics Education, Kiel, Germany

Awards Committee
Sponsored Session: A Celebration of NARST Award Recipients: Early Career Research Award [ECRA], Outstanding Dissertation Research Award [ODRA], and NARST Fellows Award.
4/20/23, 10:30-12:00, Waldorf (L3)

ORGANIZERS
Amelia Gotwals, Michigan State University, East Lansing, MI, USA

PANELISTS
Heidi Cian, Florida International University, USA
Hsin-Kai Wu, National Taiwan Normal University, Democratic People’s Republic of Korea

Hosun Kang, University of California - Irvine, USA

Roundtables Session 2
4/20/23, 10:30-12:00, Salon A5 (LL)

Topic 1: Supporting beginning teachers

Strand 8: In-service Science Teacher Education
Collaboration as a Key Factor in Secondary Science Teacher Induction
Dennis Sunal*, The University of Alabama, USA
Cynthia Sunal*, The University of Alabama, USA
Sabrina Stanley, The University of Alabama, USA
Marsha Simon, University of West Georgia, USA

Strand 8: In-service Science Teacher Education
"I would go crazy without them": Narrative inquiry into novice science teacher community of practice
Sabrina Stanley*, The University of Alabama, USA

Strand 8: In-service Science Teacher Education
Understanding Science Teacher Persistence: Examining intersections of instructional Quality and Teaching Contexts
Danielle Rhemer*, Florida State University, USA
Jennifer Schellinger, Florida State University, USA
Miray Tekkumru-Kisa, Florida State University, USA
Sherry Southerland, Florida State University, USA
Concurrent Session 8, 4/20/23, 10:30-12:00

Topic 2: Re-situating Science Teaching and STEM Identities within Community and Politicized Care

Strand 11: Cultural, Social, and Gender Issues
We Need Something to Last: Exploring Funds of Knowledge and Community Cultural Wealth
Katherine Wade-Jaimes*, University of Nevada, USA

Strand 11: Cultural, Social, and Gender Issues
Science for Community Well-being, Liberation and Social Transformation: Transformative Learning and Actions for Change
Bhaskar Upadhyay*, University of Minnesota, USA
Marina Aleixo, University of Minnesota, USA

Strand 11: Cultural, Social, and Gender Issues
With Care and in Community: Humanizing STEM for Black and Latina Girls
Laura Peña-Telfer*, Georgia State University, USA
Natalie King, Georgia State University, USA

Strand 7: Pre-service Science Teacher Education
Determination of Integrated STEM Teacher Competencies
Feral Ogan-Bekiroglu*, Marmara University, Turkey
Fatma Caner, Marmara University, Turkey

Topic 3: Informal Science and STEM learning

Strand 6: Science Learning in Informal Contexts
Cultivating Equitable STEM Participation Through an Equity Focused Learning Progression
Lezly Taylor*, Virginia Tech, USA
George Glasson, Virginia Tech, USA
Brenda Brand, Virginia Tech, USA

Strand 6: Science Learning in Informal Contexts
Children's Epistemic Agency in Everyday Family Science Engagement
Irit Vivante*, Ben Gurion University in the Negev, Israel
Dana Vedder-Weiss, Ben Gurion University in the Negev, Israel
Neta Shaby, University of Southampton, United Kingdom

Strand 6: Science Learning in Informal Contexts
Genetic Technology & the Use of an Oral Debate Method to Question Ethics in the Classroom
Chaley Cleckley*, Lamar University, USA
Mamta Singh, Lamar University, USA

Strand 15: Policy, Reform, and Program Evaluation
Development and Evaluation of an Archaeological Afterschool Program to Promote Science Learning
Amber Simpson*, Binghamton University, USA
Laurie Miroff, Binghamton University, USA
Concurrent Session 8, 4/20/23, 10:30-12:00

**Topic 4: Teaching and Learning NOS from Kindergarten through Graduate School**

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

*NOS Conceptions and Identity*

*Development among Graduate Students in Science Education*

**Andrea Phillips**, Indiana University, USA

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

*Influence of engaging texts and immersive experiences on kindergarten students' conceptions of observations and inferences*

**Valarie Akerson**, Indiana University, USA

**Kristen Poindexter**, Allisonville Elementary School, USA

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

*College Students' Views of the Nature of Science*

**Stephanie Rothman**, Indiana University, USA

**Jason Rothman**, UC Irvine, USA

**Strand 2: Science Learning: Contexts, Characteristics and Interactions**

*SC-Organized Paper Set: Computational Modeling and Data Analysis in Learning Science*

4/20/23, 10:30-12:00, Blvd A (L2)

*Telling atoms how to react: Students' learning through computational modeling of chemical reactions using MMM-React*

**Asnat Zohar**, The University of Haifa, Israel

**Sharona Levy**, The University of Haifa, Israel

**The More, the Better? Influence of Different Data Amounts on Cognitive Load and Learning Outcomes**

**Gregor Benz**, Karlsruhe University of Education, Germany

**Tobias Ludwig**, Karlsruhe University of Education, Germany

**Amy Masnick**, Hofstra University, USA

**Strand 1: Science Learning: Development of student understanding**

*SC-Organized Paper Set: Engineering Design and Self-Efficacy to Promote Student Learning*

4/20/23, 10:30-12:00, Salon C3-4 (LL)

*Reasoning through iteration: How do engineering design projects promote student learning and self-efficacy?*

**Senay Purzer**, Purdue University, USA

**Rundong Jiang**, Institute for Future Intelligence, USA

**Isaac Lyss-Loren**, Purdue University, USA

**Filiz Demirci**, Purdue University, USA

**Jenny Quintana-Cifuentes**, University of Louisiana Moroe, USA

*A New Model of the Engineering Design Process from A Conceptual Change Approach*

**Christine McGrail**, University of Massachusetts Amherst, USA

**Strand 1: Science Learning: Development of student understanding**

*What dimensions do students notice through computational modeling and data analysis?: An investigation using [Anonymous]*

**Aditi Wagh**, Massachusetts Institute of Technology, USA

**Adelmo Eloy**, Columbia University, USA
Concurrent Session 8, 4/20/23, 10:30-12:00

**Tamar Fuhrmann**, Columbia University, USA  
**Leah Rosenbaum**, Columbia University, USA  
**Paulo Blikstein**, Columbia University, USA  
**Michelle Wilkerson**, University of California, Berkeley, USA

*A Systematic Review of the Literature on Graphing Statistical Data in STEM Education*

**Verena Ruf***, Technische Universität Kaiserslautern, Germany  
**Sarah Malone**, Saarland University, Germany  
**Dominik Thüs**, Saarland University, Germany  
**Stefan Küchemann**, Ludwig-Maximilians-Universität, Germany  
**Sebastian Becker-Genschow**, University of Cologne, Germany  
**Markus Vogel**, Pädagogische Hochschule Heidelberg, Germany  
**Roland Brünken**, Saarland University, Germany  
**Jochen Kuhn**, Ludwig-Maximilians-Universität, Germany

Strand 6: Science Learning in Informal Contexts  
SC-Organized Paper Set: Honoring Learners' Lives in Informal Science learning  
4/20/23, 10:30-12:00, PDR 2 (L3)

*Creating accessible and inclusive science camp for deaf students*

**Scott Cohen***, Georgia State University, USA

*Supporting Multilingual Children's Learning at Science Museum through Science Talk*

**Wahyu Setioko***, The Ohio State University, USA  
**Lin Ding**, The Ohio State University, USA

*Towards Epistemic Justice in Socio-scientific Decision-Making: How Youth Make Sense of Lively COVID-19 Data*

**Wisam Sedawi***, University of Michigan, USA  
**Angela Barton**, University of Michigan, USA

*Exploring queer and science identities of LGBTQ+ community and citizen science participants*

**Todd Harwell***, University of California, Davis, USA  
**Russanne Low**, Institute for Global Environmental Strategies, USA  
**Allison Mattheis**, California State University, Los Angeles, USA  
**Kelly Riedinger**, STEM Research Center, Oregon State University, USA  
**Heather Fischer**, STEM Research Center, Oregon State University, USA

Strand 7: Pre-service Science Teacher Education  
Related Paper Set: Investigating How Preservice Teachers Learn to Facilitate Argumentation-Focused Discussions through Online Simulations  
4/20/23, 10:30-12:00, Salon A2 (LL)

*Elementary Preservice Teachers' Use of Prompts to Encourage Student-to-Student Talk during Scientific Argumentation Discussions*

**Heidi Masters***, University of Wisconsin - La Crosse, USA  
**Pamela Lottero-Perdue***, Towson University, USA
Concurrent Session 8, 4/20/23, 10:30-12:00

*Examining Preservice Secondary Teachers’ Question Patterns in Support of Argumentation-Focused Discussions in Science and Mathematics*

**Laura Zangori**, University of Missouri, USA

**Meredith Park Rogers**, Indiana University, USA

**Ronald Hermann**, Towson University, USA

**Rachel Snider**, TNCJ The College of New Jersey, USA

**Tracy Hargrove**, University of North Carolina Wilmington, USA

**Shelby Morge**, University of North Carolina Wilmington, USA

**Calii Shekell**, Thiel College, USA

**Heather Howell**, ETS, USA

*Preservice Teachers Noticing and Positioning Students as "Knowers" in Equitable Argumentation-Based Discussions*

**Amanda Benedict-Chambers**, Missouri State University, USA

**Lauren Madden**, The College of New Jersey, USA

*Examining Preservice Teachers’ Performances Facilitating Argumentation in a Teaching Simulator*

**Meredith Park Rogers**, Indiana University, USA

**Kady Lane**, Indiana University, USA

**Taiwo Ogundapo**, Indiana University, USA

**Dionne Cross Francis**, University of North Carolina - Chapel Hill, USA

**Pavneet Kaur Bharaj**, University of North Carolina - Chapel Hill, USA

**Arya Karumanthra**, Indiana University, USA

**Kraig Kitts**, Indiana University, USA

**Spencer Perry**, Indiana University, USA

**Adam Maltese**, Indiana University, USA

**Jamie Mikeska**, ETS, USA

**Calli Shekell**, Thiel College, USA

*Examining What and How Secondary Science Preservice Teachers Learn from Using Online Simulated Teaching Experiences*

**Calli Shekell**, Thiel College, USA

**Jamie Mikeska**, ETS, USA

**Pavneet Kaur Bharaj**, University of North Carolina, USA

*Investigating Science Teachers’ Professional Vision of Science and Engineering Practices*

**Yuxi Huang**, University of Georgia, USA

**Hong Tran**, University of Georgia, USA

**Joseph Deluca**, University of Georgia, USA

**Jose Pavez**, Western Illinois University, USA

**William Gorton**, University of Georgia, USA

**Julie Luft**, University of Georgia, USA

**Brooke Whitworth**, Clemson University, USA

*Do Epistemological Beliefs Matter? Investigating Mentor Teachers’ Perceptions & Approaches to Supporting Model-Based Science Teaching*

**Grace Carroll**, North Carolina State University, USA

**Matt Reynolds**, North Carolina State University, USA

**Soonhye Park**, North Carolina State University, USA
Concurrent Session 8, 4/20/23, 10:30-12:00

Amanda Hall, North Carolina State University, USA
Scott Ragan, North Carolina State University, USA
Jason Painter, North Carolina State University, USA

Exploring Teachers’ Epistemological and Ontological Views throughout a Professional Development

Ercin Sahin*, University of Iowa, USA
Jee Suh, University of Alabama, USA
Jale Dursun, University of Alabama, USA
Brian Hand, University of Iowa, USA
Gavin Fulmer, University of Iowa, USA

Productive Struggle and Epistemic Empathy: Developing Teachers’ Modeling Orientation in a Community Science Context

Lauren Saenz*, Bowdoin College, USA
Alison Miller*, Bowdoin College, USA
Christine Voyer, Gulf of Maine Research Institute, USA
Meggie Harvey, Gulf of Maine Research Institute, USA
Sarah Clarke, Bowdoin College, USA

Examining Aspects of Integrated STEM Education and Student Attitudes

Benny Mart Hiwatig*, University of Minnesota, USA
Gillian Roehrig, University of Minnesota, USA
Mark Rouleau, Michigan Technological University, USA

A Curriculum Analysis of The Sources of Data and Data Engagements of Science Students

Amanda Garner*, University of Tennessee, USA
Joshua Rosenberg, University of Tennessee, USA

Multi-level Structural Equation Modelling for the Factors Affecting Korean Middle School Students’ Science Achievement

Gyeong-Geon Lee*, Seoul National University, Korea, Republic of
Heesoo Ha, Seoul National University Center for Educational Research, Korea, Republic of
Hun-Gi Hong, Seoul National University, Korea, Republic of

Examining Aspects of Integrated STEM Education and Student Attitudes

Benny Mart Hiwatig*, University of Minnesota, USA
Gillian Roehrig, University of Minnesota, USA
Mark Rouleau, Michigan Technological University, USA

Racialized as distant-from-science: U.S. science education research and the pathologization of linguistic diversity

Kathryn Kirchgasler*, University of Wisconsin–Madison, USA
Concurrent Session 8, 4/20/23, 10:30-12:00

**Chushan Wu**, University of Wisconsin–Madison, USA  
**Cynthia Baeza**, University of Wisconsin–Madison, USA  
**Diego Román**, University of Wisconsin–Madison, USA

**Inclusive STEM Education for "English Learners": Racializing Bil/Multilingual Students as Not-From-Here**  
**Cynthia Baeza**, University of Wisconsin-Madison, USA  
**Sam Evans**, University of Wisconsin-Madison, USA

**Multicompetent Learners in engineering: Towards linguistic and cultural justice in design**  
**Greses Pérez**, Tufts University, USA

**Situating African American Language within science teacher education**  
**Quentin Sedlacek**, Southern Methodist University, USA  
**Catherine Lemmi**, California State University, Chico, USA  
**Kimberly Feldman**, University of Maryland, Baltimore County, USA

---

**Strand 11: Cultural, Social, and Gender Issues**  
**SC-Organized Paper Set: Examining the intersections of students' ethnic, racial and science identities in college and beyond**  
4/20/23, 10:30-12:00, Salon A3 (LL)

**Towards understanding the science experiences and identity formation of FilAm students**  
**Johan Tabora**, University of Illinois Chicago, USA

---

**Strand 13: History, Philosophy, Sociology, and Nature of Science**  
**Symposium: The role of nature of science in tackling societal emergencies: An international perspective**  
4/20/23, 10:30-12:00, Blvd C (L2)

**The role of nature of science in tackling societal emergencies: An international perspective**  
**Wonyong Park**, University of Southampton, United Kingdom  
**Hagop Yacoubian**, American University of Armenia, Armenia  
**Alison Cullinane**, University of Edinburgh, United Kingdom  
**Haira Gandolfo**, University of Cambridge, United Kingdom
Concurrent Session 8, 4/20/23, 10:30-12:00

Noemi Waight, University at Buffalo, USA  
Shakhnoza Kayumova, University of Massachusetts, Dartmouth, USA  
Jennifer Tripp, University at Buffalo, USA  
Feyza Achilova, Dartmouth High School, USA  
Andrea Guerra, Centro Federal de Educação Tecnológica Celso Suckow da Fonseca, Brazil  
Cristiano Moura, Centro Federal de Educação Tecnológica Celso Suckow da Fonseca, Brazil

Strand 15: Policy, Reform, and Program Evaluation  
SC-Organized Paper Set: STEM and Problem-Based Instruction  
4/20/23, 10:30-12:00, Salon A4 (LL)

The Experiences of Undergraduate Saudi Students in the STEM Trajectory: Major Choice and Persistence Intentions  
Manal Almalki*, Western Michigan University, USA

A Systematic Review and Meta-Analysis of the 5E Instructional Model for Improving STEM Educational Outcomes  
Joshua Polanin, American Institutes for Research, USA  
Megan Austin, American Institutes for Research, USA  
Joseph Taylor*, American Institutes for Research, USA  
Rebecca Steingut, American Institutes for Research, USA  
Melissa Rodgers, American Institutes for Research, USA  

Impacts of Problem-Based Instruction on Undergraduate Students' Epistemological Beliefs  
May Lee*, University of Groningen, Netherlands  
Cormac Larkin, University of Groningen, Netherlands  
Steven Hoekstra, University of Groningen, Netherlands

Elementary school science: Building a case for urgent action.  
Zoubeida Dagher*, University of Delaware, USA  
Tamara Turski, University of Delaware, USA

---

Zoubeida Dagher*, University of Delaware, USA  
Tamara Turski, University of Delaware, USA
Concurrent Session 9
4/20/23, 13:10-14:40

Equity And Ethics Committee
Sponsored Session: Elevating Voices of Ethnically and Linguistically Diverse Learners: Interrogating Dominant Deficit-oriented Perspectives across Reforms, Policy and Practices in Science Education
4/20/23, 13:10-14:40, Salon A4 (LL)

ORGANIZERS
Sara Salloum, Ohio University, Athens, OH, USA
Regina McCurdy, Georgia Southern University, Statesboro, GA, USA
Marsha Simon, Georgia Western University, Carrollton, GA, USA
Roshni Bano, University of Illinois at Chicago, IL, USA

PANELISTS
Terrell Morton, University of Illinois, Chicago, IL, USA
Peter Okebukola, Lagos State University, Lagos, Nigeria
Sara Wilmes, The University of Luxembourg, Luxembourg

PRESENTERS
Eric Antwi Akuoko, University of Iowa
Amanda Andersen, University of California, Santa Barbara
Ryan Coker, Florida State University
Diana Crespo Camacho, Oregon State University
Bradley Davey, Northwestern University
Ilia De La Cruz, Texas A&M
Desi, University of Minnesota
Sarah Dodoo, University of Illinois, Urbana-Champaign
Hannah Douglas, University of Arizona
Lilana Garcia, University of California, Santa Barbara
Rachel Garcia, Patton College of Education, Ohio University
Emily Helton, West Virginia University
Benjamin Janney, Texas A&M
Rueyde Kaya, Florida State University
Heather Killen, University of Maryland-College Park
Samuel Lee, Boston College
Nelly Marosi, University of Groningen

Sage Andersen, University of Texas at Austin, Texas, USA
Helen Aptyka, University of Cologne, Cologne, North Rhine-Westphalia, Germany
Klaudja Caushi, University of Massachusetts Boston, Massachusetts, USA
Cathy Cullicott, Arizona State University, Arizona, USA
Savannah Graham, Texas Christian University, Texas, USA
Roxanne Gutowski, University of Cologne, Cologne, North Rhine-Westphalia, Germany
Suzanne Poole Patzelt, Montclair State University, New Jersey, USA
Andrea Reeder, Middle Tennessee State University, Tennessee, USA
Hong Tran, University of Georgia, Georgia, USA

Graduate Student Committee
Sponsored Session: Graduate Student Research Symposium
4/20/23, 13:10-14:40, Salon A5 (LL)

ORGANIZERS
Scott Cohen, Georgia State University, Georgia, USA
Theilia Smith, University of Groningen, Netherlands
Ti’Era Worsley, University of North Carolina at Greensboro, USA
Concurrent Session 9, 4/20/23, 13:10-14:40

**Adjoa Mensah**, University of Nevada, Las Vegas  
**Allison Metcalf**, Florida State University  
**Aparajita Rajwade**, North Carolina State University  
**Gerardo Sanchez Gutierrez**, University of Texas-Austin  
**Chelsea Sexton**, University of Georgia  
**Soo Won Shim**, Purdue University  
**Annabel Stoler**, Boston University  
**Joineé Taylor**, Florida International University  
**Lauren Wanger**, Florida State University

**Building Community Agency through Participatory Tech Education**  
**Sepehr Vakil***, Northwestern University, USA  
**Alisa Weith**, Northwestern University, USA  
**Natalie Melo***, Northwestern University, USA

**Learning Progressions in Science: What have we learnt and where next?**  
**Linda Morell***, University of California, USA  
**Jonathan Osborne***, Stanford University, USA  
**Kristin Gunckel***, University of Arizona, USA  
**Richard Lehrer***, Vanderbilt University, USA  
**Mark Wilson***, University of California, USA  
**Alicia Alonzo***, Michigan State University, USA  
**Tiffany-Rose Sikorski**, George Washington University, USA

**Building Community Agency through Participatory Tech Education**  
**Sepehr Vakil***, Northwestern University, USA  
**Alisa Weith**, Northwestern University, USA  
**Natalie Melo***, Northwestern University, USA

**Building Community Agency through Participatory Tech Education**  
**Sepehr Vakil***, Northwestern University, USA  
**Alisa Weith**, Northwestern University, USA  
**Natalie Melo***, Northwestern University, USA

**Seeking Truth Through Technology - Pre-Service Science Teachers' Political Use of Technology in Scientific Inquiry**  
**Natalie De Lucca***, Vanderbilt University, USA  
**Jessica Watkins**, Vanderbilt University, USA  
**Serena Pao**, Vanderbilt University, USA

**Middle Grades Students as Ethical World-Builders: The Cilantro Filter Engineering Challenge**  
**Alejandra Frausto***, Northwestern University, USA

**Middle Grades Students as Ethical World-Builders: The Cilantro Filter Engineering Challenge**  
**Alejandra Frausto***, Northwestern University, USA  
**Mindy Chappell***, Portland State University, USA  
**Tiiffany Childress Price***, University of Illinois Chicago, USA  
**Shelby Hatch***, Northwestern University, USA  
**Nina Hike***, University of Illinois Chicago, USA

**Middle Grades Students as Ethical World-Builders: The Cilantro Filter Engineering Challenge**  
**Alejandra Frausto***, Northwestern University, USA  
**Mindy Chappell***, Portland State University, USA  
**Tiiffany Childress Price***, University of Illinois Chicago, USA  
**Shelby Hatch***, Northwestern University, USA  
**Nina Hike***, University of Illinois Chicago, USA

Strand 1: Science Learning:  
Development of student understanding  
Symposium: Learning Progressions in Science: What have we learnt and where next?  
4/20/23, 13:10-14:40, Salon C7-8 (LL)

**Building Community Agency through Participatory Tech Education**  
**Sepehr Vakil***, Northwestern University, USA  
**Alisa Weith**, Northwestern University, USA  
**Natalie Melo***, Northwestern University, USA

**Learning Progressions in Science: What have we learnt and where next?**  
**Linda Morell***, University of California, USA  
**Jonathan Osborne***, Stanford University, USA  
**Kristin Gunckel***, University of Arizona, USA  
**Richard Lehrer***, Vanderbilt University, USA  
**Mark Wilson***, University of California, USA  
**Alicia Alonzo***, Michigan State University, USA  
**Tiffany-Rose Sikorski**, George Washington University, USA

**Seeking Truth Through Technology - Pre-Service Science Teachers' Political Use of Technology in Scientific Inquiry**  
**Natalie De Lucca***, Vanderbilt University, USA  
**Jessica Watkins**, Vanderbilt University, USA  
**Serena Pao**, Vanderbilt University, USA

**Middle Grades Students as Ethical World-Builders: The Cilantro Filter Engineering Challenge**  
**Alejandra Frausto***, Northwestern University, USA

**Middle Grades Students as Ethical World-Builders: The Cilantro Filter Engineering Challenge**  
**Alejandra Frausto***, Northwestern University, USA  
**Mindy Chappell***, Portland State University, USA  
**Tiiffany Childress Price***, University of Illinois Chicago, USA  
**Shelby Hatch***, Northwestern University, USA  
**Nina Hike***, University of Illinois Chicago, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions  
Related Paper Set: Critical Pedagogies of Science and Technology  
4/20/23, 13:10-14:40, Salon C5-6 (LL)

**Building Community Agency through Participatory Tech Education**  
**Sepehr Vakil***, Northwestern University, USA  
**Alisa Weith**, Northwestern University, USA  
**Natalie Melo***, Northwestern University, USA

**Seeking Truth Through Technology - Pre-Service Science Teachers' Political Use of Technology in Scientific Inquiry**  
**Natalie De Lucca***, Vanderbilt University, USA  
**Jessica Watkins**, Vanderbilt University, USA  
**Serena Pao**, Vanderbilt University, USA

**Middle Grades Students as Ethical World-Builders: The Cilantro Filter Engineering Challenge**  
**Alejandra Frausto***, Northwestern University, USA

**Middle Grades Students as Ethical World-Builders: The Cilantro Filter Engineering Challenge**  
**Alejandra Frausto***, Northwestern University, USA  
**Mindy Chappell***, Portland State University, USA  
**Tiiffany Childress Price***, University of Illinois Chicago, USA  
**Shelby Hatch***, Northwestern University, USA  
**Nina Hike***, University of Illinois Chicago, USA
An analysis of supports in OpenSciEd curriculum materials focused on use of the Crosscutting Concepts

Megan McLean, Washington State University, USA
Sarah Fick*, Washington State University, USA
Abraham Lo, BSCS Science Learning, USA

Patterns in Conceptions of Crosscutting Concepts in Secondary Teachers

Sarah Fick*, Washington State University, USA
Chloe Dydasko, Washington State University, USA
Chad Gotch, Washington State University, USA
Kira Carbonneau, Washington State University, USA

Integrating Scientific Investigations from Three Dimensions? Can We Specify What Goes in the Pedagogy?

Lin Zhang*, Providence College, USA
Zhushan Li, Boston College, USA
Jihang Chen, Boston College, USA

Exploring the Relationship between Teacher Beliefs and Teacher Discourse Approaches in Undergraduate STEM Learning Environments

Abdi Warfa*, University of Minnesota, USA

Impacts of Perceived Leadership on Teacher Identity and Mediation of Student-Centered Practices in College STEM

Sule Aksoy*, Graduate Center, CUNY, USA

Characterizing PCK development among early-career undergraduate biology instructors

Alexander Waugh*, University of Georgia, USA
Tessa Andrews, University of Georgia, USA

Faculty Development to Support Learning about Science Assessments: A Collaborative Self-Study

Lyndsay Munro*, University of Nevada, Reno, USA
Elizabeth de los Santos*, University of Nevada, Reno, USA

Strand 7: Pre-service Science Teacher Education

SC-Organized Paper Set: Beliefs/Perceptions about science teaching and learning across different contexts

4/20/23, 13:10-14:40, Salon A1 (LL)

Elementary Preservice Teachers’ Beliefs about the NGSS Science Practices

Elsun Seung*, Indiana State University, USA

Vance Kite, North Carolina State University, USA
Soonhye Park, North Carolina State University, USA
Concurrent Session 9, 4/20/23, 13:10-14:40

**Aeran Choi**, Ewha Womans University, Korea, Republic of

*Exploring Changes in Pre-Service Science Teachers' Attitudes and Beliefs about Gender & Sexual Diversity-Inclusive Science Teaching*

**Gary Wright***, North Carolina State University, USA

**Cesar Delgado**, North Carolina State University, USA

**Pre-service biology teachers’ conceptions about what it means to understand biology: A phenomenographic study***

**Gregory Thomas***, The University of Alberta, Canada

**What matters?: Beginning secondary science teachers’ perceptions of what influences their instructional practice***

**Matthew Wilsey***, Stanford University, USA

---

**Strand 8: In-service Science Teacher Education**

**SC-Organized Paper Set: Resiliency and Retention of Science Teachers**

4/20/23, 13:10-14:40, Salon A3 (LL)

*The case of new science teachers building up resilience in their early years of teaching.*

**Jose Pavez***, Western Illinois University, USA

**Shannon Navy**, Kent State University, USA

**Julie Luft**, University of Georgia, USA

**Adepeju Prince**, Kent State University, USA

**Elizabeth Ayano**, University of Georgia, USA

**Kelly Kulp**, University of Georgia, USA

**Lisa Borgerling**, Kent State University, USA

**Bo Idsardi**, Eastern Washington University, USA

---

**Strand 8: In-service Science Teacher Education**

**Related Paper Set: Supporting teacher learning in integrated STEM Education**

4/20/23, 13:10-14:40, Waldorf (L3)

*Positioning teachers as active co-researchers examining PBL in STEM Education (Paper 1)*

**Kathleen (Kathy) Smith***, Monash University, Australia

**Jennifer Mansfield***, Monash University, Australia

**Amanda Berry***, Monash University, Australia
Concurrent Session 9, 4/20/23, 13:10-14:40

Peter Ellerton, University of Queensland, Australia
Nicoleta Maynard, Monash University, Australia
Deborah Corrigan, Monash University, Australia
Tabetha Spiteri, Monash University, Australia
Tim Smith, University of Queensland, Australia

Using Design-Based Research as a Means to Build STEM Teacher Collaboration
Tamara Moore*, Purdue University, USA
Kristina Tank*, Iowa State University, USA
S Guzey*, Purdue University, USA
Anne Ottenbreit-Leftwich, Indiana University, USA
Jennifer Kersten Olsen, Richfield High School, USA

A Study of Complex Curriculum Implementation Supported by a Comprehensive Professional Learning Plan
Janet Carlson*, CSET, Stanford University, USA
Rebecca Deutscher, CSET, Stanford University, USA

A complex collection of knowledges: the opportunities and challenges of preparing teachers for STEM education
Emma Stevenson*, The University of Melbourne, Australia

Exploring the Nature of Integrated STEM Throughout a STEM Curriculum Unit
Gillian Roehrig*, University of Minnesota, USA
Emily Dare*, Florida International University, USA
Joshua Ellis*, Florida International University, USA

Elizabeth Ring-Whalen, St. Catherine University, USA
Mark Rouelau, Michigan Technological University, USA

Strand 11: Cultural, Social, and Gender Issues
4/20/23, 13:10-14:40, Salon A2 (LL)

Multilingual Identity: A Novel Intersectional Construct to Elucidate Students' STEM Experiences
Margaret Jeong*, University of Illinois at Chicago, USA
Roshni Bano*, University of Illinois at Chicago, USA
Minjung Ryu, University of Illinois at Chicago, USA

Multilingual Learners’ Science Identities through the Lenses of Recognition, Funds of Knowledge, and Classroom Experience
Molly Staggs*, University of Florida, USA
Julie Brown*, University of Florida, USA

Customizing science curriculum for multilingual learners: Teachers' language beliefs and their customization decisions
Caitlin Fine*, Metropolitan State University of Denver, USA
Samuel Lee, Boston College, USA
Katherine McNeill*, Boston College, USA
Concurrent Session 9, 4/20/23, 13:10-14:40

Making Space for Multilingual Student Epistemic Agency in Science Classrooms

Shakhnoza Kayumova*, University of Massachusetts Dartmouth, USA
Akira Harper*, University of Massachusetts Dartmouth, USA
Eleanor Richard, University of Massachusetts Dartmouth, USA

Strand 11: Cultural, Social, and Gender Issues
Symposium: Centering a Conversation Around Approaches to Studying and Conceptualizing Teachers’ Agency
4/20/23, 13:10-14:40, Salon C1-2 (LL)

Centering a Conversation Around Approaches to Studying and Conceptualizing Teachers’ Agency

Alison Mercier*, University of Wyoming, USA
Anica Miller-Rushing*, University of Maine, USA
Felicia Moore Mensah, Teachers College, Columbia University, USA
Elizabeth Hufnagel, University of Maine, USA
Meena Balgopal, Colorado State University, USA
Jenny Martin, Australian Catholic University, Australia
Megan Bang, Northwestern University, USA
Carrie Tzou, University of Washington Bothell, USA
Leah Bricker, Spencer Foundation, USA
Jordan Sherry-Wagner, University of Washington Seattle, USA
Veronica McGowan, University of Washington Bothell, USA
Asli Sezen-Barrie, National Science Foundation, USA

Jennifer Lingle, University of North Carolina at Greensboro, USA

Strand 12: Technology for Teaching, Learning, and Research
Symposium: Distributing Epistemic Functions and Tasks – Towards a Methodological Approach for Using ML in Science Education
4/20/23, 13:10-14:40, PDR 2 (L3)

Distributing Epistemic Functions and Tasks – Towards a Methodological Approach for Using ML in Science Education

Marcus Kubsch*, IPN – Leibniz Institute for Science and Mathematics Education, Germany
Christina Krist, University of Illinois at Urbana-Champaign, USA
Joshua Rosenberg, University of Tennessee, USA
Stefan Sorge, IPN – Leibniz Institute for Science and Mathematics Education, Germany
Peter Wulff, PH Heidelberg, Germany
Xiaoming Zhai, University of Georgia, USA
Ross Nehm, Stony Brook University, USA
Eugene Cox, University of Illinois Urbana-Champaign, USA
Barbara Hug, University of Illinois Urbana-Champaign, USA
Kevin Hall, University of Illinois Urbana-Champaign, USA
Elizabeth Dyer, University of Tennessee, USA
Strand 13: History, Philosophy, Sociology, and Nature of Science
SC-Organized Paper Set: New Contexts for NOS Teaching and Learning
4/20/23, 13:10-14:40, Blvd C (L2)

Cognitive and Epistemic Account of Nature of Engineering: Implications for Science Education in Schools
Miri Barak*, Technion, Israel
Tamar Ginzburg, Technion, Israel
Sibel Erduran, University of Oxford, United Kingdom

Development of chemical experiments for the explicit reflection of Nature of Science
Janne-Marie Bothor*, University of Kassel, Germany
David-Samuel Di Fuccia, University of Kassel, Germany

E-VNOS: Analysis Framework for Characterizing Enacted Views of the Nature of Science in Student Theses
Annelies Pieterman-Bos*, University Medical Center Utrecht, Netherlands
Marc van Mil, University Medical Center Utrecht, Netherlands

Examining Middle School Students’ Nature of Science Views
Dilara Goren*, Boğaziçi University, Turkey
Ebru Kaya, Boğaziçi University, Turkey

Strand 14: Environmental Education and Sustainability
4/20/23, 13:10-14:40, Salon C3-4 (LL)

Restorying Nature-Culture Relations Towards Multispecies Ecological Caring Across Scales of Implementation
Philip Bell*, University of Washington, USA
Nancy Price, University of Washington, USA

How children engage in just worlding through multispecies design and radical care in engineering education
Anastasia Sanchez*, University of Washington, USA

Socio-ecological Minding: Examining methodological conundrums & neglected narratives with youth
Kelsie Fowler*, University of Washington, USA

Can there be a science of the sacred?
Sara Tolbert*, University of Canterbury, New Zealand
Strand 1: Science Learning: Development of student understanding
On Critiques to Learning Progression Research
Hui Jin*, Georgia Southern University, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Understanding Science Texts is Specific: Cognitive and Motivational Characteristics as Predictors of Students’ Text Comprehension
Hendrik Härtig*, University of Duisburg-Essen, Germany
Nadine Cruz Neri, University of Hamburg, Germany
Sascha Bernholt, Leibniz Institute for Science and Mathematics Education - IPN, Germany
Anke Schmitz, Leuphana University, Germany
Jan Retelsdorf, University of Hamburg, Germany

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Research on Embedded Engineering Education in Science Settings (2011-2021)
Allison Antink-Meyer*, Illinois State University, USA
Melissa Brown, Illinois State University, USA
Margaret Parker, Illinois State University, USA
Jennifer Smith, Illinois State University, USA
Mike Jones, Illinois State University, USA
Ryan Brown, Illinois State University, USA

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Elementary Daily Schedules: Comprehensiveness, Frequency, and Consistency of Science
Elizabeth Davis*, University of Michigan, USA
Christa Haverly, Northwestern University, USA

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Representations of Astronomy in Children’s Picture Books
Julia Plummer*, The Pennsylvania State University, USA
Alison Allen, Rockman et al Cooperative, USA

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
My "go-to" person: Social networks and teaching practice in an elementary science professional learning program
Peter Bjorklund, University of California at San Diego, USA
Bridget Murray, American Museum of Natural History, USA
Jenny Ingber, American Museum of Natural History, USA
Colleen Owen, American Museum of Natural History, USA
Hudson Roditi, American Museum of Natural History, USA
Shannon Haas, New York Botanical Garden, USA
Barbara Kurland, Brooklyn Botanical Garden, USA
Marnie Rackmill, Queens Botanical Garden, USA
Lauren Tecosky, American Museum of Natural History, USA
Poster Session A, 4/20/23, 14:50-15:35

**Anna MacPherson**, American Museum of Natural History, USA

**Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies**
*The Burning Matter: Investigating Data Representations in Wildfire Learning*

**Brandin Conrath**, The Pennsylvania State University, USA

**Scott McDonald**, The Pennsylvania State University, USA

**Amy Farris**, The Pennsylvania State University, USA

**Amy Pallant**, The Concord Consortium, USA

**Strand 5: College Science Teaching and Learning (Grades 13-20)**
*Draw an Earth Scientist: Investigating Undergraduate Students’ Conceptions of Earth Scientists*

**Deef Al Shorman**, University of Nebraska-Lincoln, USA

**Deepika Menon**, University of Nebraska-Lincoln, USA

**Peggy McNeal**, Towson University, USA

**Paulina Schaefer**, Towson University, USA

**Strand 5: College Science Teaching and Learning (Grades 13-20)**
*Interdisciplinary Science and Converging Identities: Minority Graduate Student Experiences in Convergence Settings*

**Kathleen Bordewieck**, North Carolina State University, USA

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

**Strand 5: College Science Teaching and Learning (Grades 13-20)**
*Course-based undergraduate research experiences (CUREs) to advance science communication (SciComm) skills: A systematic review*

**Ebenezer Korkor**, Illinois State University, USA

**Rebekka Darner**, Illinois State University, USA

**Strand 5: College Science Teaching and Learning (Grades 13-20)**
*Departmental fit impacts adoption of evidence-based practices in STEM classes for Tenure and Non-Tenure Professors*

**Trisha Douin**, University of Louisville, USA

**Raymond Chastain**, University of Louisville, USA

**Marc DeCaro**, University of Louisville, USA

**Jeffrey Hieb**, University of Louisville, USA

**Linda Fuselier**, University of Louisville, USA

**Strand 5: College Science Teaching and Learning (Grades 13-20)**
*General Chemistry Students’ Language Fluency in the Context of a Precipitation Reaction*

**James Nyachwaya**, North Dakota State University, USA

**Teri Tran**, Georgia State University, USA

**Tarah Dahl**, West Fargo High School, USA

**Krystal Grieger**, North Dakota State University, USA

**Strand 5: College Science Teaching and Learning (Grades 13-20)**
*Faculty and Graduate Student Perspectives on STEM Undergraduate Education*

**Veronika Rozhenkova**, University of California, Irvine, USA

**Elizabeth Park**, Westat, USA

**Brian Sato**, University of California, Irvine, USA
Poster Session A, 4/20/23, 14:50-15:35

Strand 5: College Science Teaching and Learning (Grades 13-20)
Learning from Peers: Patterns of Talk and Metacognition in a Peer Learning Assistant-supported Biology Course
Brittney Ferrari*, University of Georgia, USA
Masha Kurbatova, Bard College, USA
Julie Kittleson, University of Georgia, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
Becoming a Field Biologist: Perspectives of Mentors and Undergraduate Researchers in a Summer REU Program
Stephen Burgin*, University of Arkansas, USA
Zephaniah Greenwell, University of Arkansas, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
Re-designing Infrastructure to Implement Active Learning in Undergraduate Chemistry
Jonathan Hall*, California State University, San Bernardino, USA
Lisa Lundgren*, Utah State University, USA
Todd Campbell*, University of Connecticut, USA

Strand 6: Science Learning in Informal Contexts
Museum Facilitators of VR Experiences for Middle School Students Approach Constructivist Pedagogy
Leah Metcalf*, The University of North Carolina at Chapel Hill, USA
Janice Anderson, The University of North Carolina at Chapel Hill, USA
Jill Hamm, The University of North Carolina at Chapel Hill, USA

Strand 6: Science Learning in Informal Contexts
Discoveries in Earth science for students with blind and visual impairments
Rhea Miles*, East Carolina University, USA
Alana Zambone, East Carolina University, USA
Alex Manda, East Carolina University, USA
Margaret Blome, East Carolina University, USA

Strand 6: Science Learning in Informal Contexts
Success of Gender-Based STEM Summer Camps: Co-Ed vs Same-Gender
Miriam Sanders*, Texas A&M University, USA
Niyazi Erdogan*, Texas A&M University, USA
Julia Calabrese, Texas A&M University, USA
Mary Capraro, Texas A&M University, USA

Strand 6: Science Learning in Informal Contexts
Towards more individualized support in science competitions: Profiles of participants in the Physics Olympiad
Paul Tschisgale*, Leibniz Institute for Science and Mathematics Education, Germany
Anneke Steegh, Leibniz Institute for Science and Mathematics Education, Germany
Marcus Kubsch, Leibniz Institute for Science and Mathematics Education, Germany
Stefan Petersen, Leibniz Institute for Science and Mathematics Education, Germany
Knut Neumann, Leibniz Institute for Science and Mathematics Education, Germany
Strand 6: Science Learning in Informal Contexts

*Studying Floor Facilitator Conversations in a Natural History Museum*

Preeti Gupta*, American Museum of Natural History, USA

Rachel Chaffee*, American Museum of Natural History, USA

Kevin Crowley, University of Pittsburgh, USA

Karen Knutson, University of Pittsburgh, USA

Abby Perez, American Museum of Natural History, USA

Strand 7: Pre-service Science Teacher Education

"But what can I do?": Science Teaching for Racial and Environmental Justice

Jenny Tilsen*, University of Minnesota, USA

Stefanie Marshall*, University of Minnesota, USA

Seema Rivera, Clarkson University, USA

Preethi Titu*, Kennesaw State University, USA

Strand 7: Pre-service Science Teacher Education

Preservice Teachers' Reflective Practices on Developing Action Research Skills

Karen Seema Rivera, Clarkson University, USA

Preethi Titu*, Kennesaw State University, USA

Strand 7: Pre-service Science Teacher Education

Evaluating divergent thinking and problem discovery among German Chemistry student teachers

Swantje Müller*, Martin-Luther-Universität Halle-Wittenberg, Germany

Strand 8: In-service Science Teacher Education

Inquiry-Based Science Teaching Efficacy of Middle School Science Teachers in a Professional Learning Community

Aeran Choi*, Ewha Womans University, Korea, Republic of

Elsun Seung, Indiana State University, USA

Soonhye Park, North Carolina State University, USA

Soonhye Park*, North Carolina State University, USA

Kennedy Kam Ho Chan, The University of Hong Kong, Hong Kong

Strand 8: In-service Science Teacher Education

Relationships of PCK to Teacher Quality, Teaching Practice, and Student Outcomes: A Systematic Literature Review

Soonhye Park*, North Carolina State University, USA

Sarah Stallings*, University of North Carolina at Greensboro, USA

Sara Heredia, University of North Carolina at Greensboro, USA

Michelle Phillips, Exploratorium, USA

Strand 8: In-service Science Teacher Education

Are We Moving toward Equity in Science Talk?: Evaluating Timing and Positioning of Talk Moves

Sierra Morandi*, Florida State University, USA

Sherry Southerland*, Florida State University, USA

Strand 8: In-service Science Teacher Education

Changes in Rural Science and Mathematics Teachers' Conceptions of Teacher Leadership and Professional Identity
Poster Session A, 4/20/23, 14:50-15:35

Christine Lotter*, University of South Carolina, USA
Jan Yow, University of South Carolina, USA
Steve Barth, University of South Carolina, USA
Denae Kizys, University of South Carolina, USA

Strand 8: In-service Science Teacher Education
High School Teachers’ Use of Technology: Portraiture in Educational Action Research
Gerald Tembrevilla*, Mount Saint Vincent University, Canada
Kimberley Gomez, University of California - Los Angeles, USA
Marina Milner-Bolotin, University of British Columbia, Canada

Strand 10: Curriculum and Assessment
Preservice Teachers’ Answer Changing Behaviors on a Content Knowledge for Teaching Science Assessment across Timepoints
Jamie Mikeska*, ETS, USA
Katherine Castellano, ETS, USA
Steven Holtzman, ETS, USA

Strand 11: Cultural, Social, and Gender Issues
Linsey Brennan*, Michigan State University, USA
Christina Schwarz, Michigan State University, USA

Strand 11: Cultural, Social, and Gender Issues
Virtual Reality for Distance Culturally Revitalizing Pedagogy
Jared Tenbrink*, University of Michigan, USA

Strand 11: Cultural, Social, and Gender Issues
Defining Justice-Oriented Science Teaching: A Domain Model
Megan Walser*, Michigan State University, USA

Strand 11: Cultural, Social, and Gender Issues
Language of science versus language for science: Centering multilingual students’ languaging practices in science education
María González-Howard*, The University of Texas at Austin, USA
Sage Andersen, The University of Texas at Austin, USA
Karina Méndez Pérez, The University of Texas at Austin, USA
Samuel Lee, Boston College, USA

Strand 11: Cultural, Social, and Gender Issues
The impact of various spaces on science majors’ science identities
Allyson Randall*, Boise State University, USA
Sara Hagenah, Boise State University, USA
Karen Viskupic, Boise State University, USA

Strand 12: Technology for Teaching, Learning, and Research
Research-based practice regarding delivery of K-12 science instruction online: A systematic literature review
Carla Johnson*, NC State University, USA
Janet Walton, NC State University, USA

Strand 12: Technology for Teaching, Learning, and Research
Machine Learning to Predict Science Student Outcomes Using Neurological Data
**Poster Session A, 4/20/23, 14:50-15:35**

**Richard Lamb**, East Carolina University, USA  
**Knut Neumann**, IPN, Germany

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

*Using technology to promote student metacognition in large enrollment STEM courses*

**Ted Clark**, The Ohio State University, USA

**Hamza Malik**, University of Massachusetts Dartmouth, USA  
**Rachel Stronach**, University of Massachusetts Dartmouth, USA  
**Stephen Witzig**, University of Massachusetts Dartmouth, USA

**Strand 14: Environmental Education and Sustainability**

*Connecting an Environmental Education Center & Science Standards: A Document Analysis*

**K.C. Busch**, North Carolina State University, USA

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

*Effectively Teaching Nature of Science in a Way that Coexists with Religious Principles*

**Tina Stamper**, Indiana University, USA  
**Nicole Conrad Nelson**, Indiana University, USA

**Strand 14: Environmental Education and Sustainability**

*Narratives of change: Fostering Transformation Toward Sustainability Through Science Education*

**Giulia Tasquier**, University of Bologna, Italy  
**Alfredo Jornet**, University of Oslo, Norway  
**Erik Knain**, University of Oslo, Norway

**Strand 15: Policy, Reform, and Program Evaluation**

*Developing a District Science Assessment: A Case Study of a Local Reform Effort*

**Elizabeth de los Santos**, University of Nevada, Reno, USA  
**Lyndsay Munro**, University of Nevada, Reno, USA  
**Sylvia Scoggin**, Washoe County School District, USA
Poster Session A, 4/20/23, 14:50-15:35

Rebecca Curtright*, Washoe County School District, USA

Dustin Coli*, Washoe County School District, USA
Strand 1: Science Learning: Development of student understanding
A Multiple Case Study of K-2 Students' Understanding of Sequencing
Kristina Tank*, Iowa State University, USA
Tamara Moore, Purdue University, USA
Anne Ottenbreit-Leftwich, Indiana University, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Do students engage in motivated reasoning when evaluating evidence related to socioscientific issues?
Rachel Sparks*, University of Nebraska-Lincoln, USA
Jenny Dauer, University of Nebraska-Lincoln, USA

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Parents' Expectancy Value Factors: Measuring Future Science Task Value and Science Achievement Value
M. Gail Jones*, NC State University, USA
Katherine Chesnutt, App State University, USA
Megan Ennes, University of Florida, USA
Daniel Macher, University of Graz, Austria
Manuela Paechter, University of Graz, Austria

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Learning about the Water Cycle: Establishing an Out-of-School Laboratory in Primary Education
Annika Krüger*, University Duisburg-Essen, Germany
Marc Rodemer, University Duisburg-Essen, Germany
Stefan Rumann, University Duisburg-Essen, Germany

Strand 3: Science Teaching — Primary School (Grades preK-6): Characteristics and Strategies
Investigating how Ambitious Science Teaching and Responsive Moves Support a Science-as-Practice Teaching Approach
Sahar Vali*, West Virginia University, USA
Melissa Luna, West Virginia University, USA

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
Seeing the Forest Through the Trees: Enhancing Phenomenon-based Science Teaching Through Contextualization
Kraig Wray*, Pennsylvania State University, USA
Jonathan McCausland*, New Mexico Highlands University, USA
Emma Jacobson, Pennsylvania State University, USA
Scott McDonald, Pennsylvania State University, USA
Amy Pallant, The Concord Consortium, USA
Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
Success Conditions of effective Problem Solving in Physics and Chemistry Education: A Systematic Review
Adrian Schmidt*, Institut für Didaktik der Mathematik und Physik, Leibniz Universität Hannover, Germany
Gunnar Friege, Institut für Didaktik der Mathematik und Physik, Leibniz Universität Hannover, Germany
Rüdiger Tiemann, Fachdidaktik Chemie, Humboldt-Universität zu Berlin, Germany

Strand 5: College Science Teaching and Learning (Grades 13-20)
The Impact of an International Research Experience on Undergraduate and Graduate Students’ Understandings about Science
Mika Munakata, Montclair State University, USA
Susan Lim*, Montclair State University, USA
Carlos Molina, Montclair State University, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
Development and Validation of an Instrument Measuring Motivation Among Undergraduate Anatomy and Physiology Students
Joey Marion*, North Carolina State University, USA
Soonhye Park, North Carolina State University, USA
Marta Klesath, North Carolina State University, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
Meta-Agency in Problem-Based Learning: How Do Students Exercise Their Agency?
Jongchan Park*, Arizona State University, USA
Yuli Deng, Arizona State University, USA
Garima Agrawal, Arizona State University, USA
Ying-Chih Chen, Arizona State University, USA
Huan Liu, Arizona State University, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
The Effect of Gestures in Teaching and Learning Anatomy and Physiology
Stephanie Wallace*, Texas Christian University, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
Developing a Clicker Question Sequence (CQS) to Improve Students’ Understanding in Quantum Mechanics
Peter Hu*, University of Pittsburgh, USA
Yangqiuting Li, University of Pittsburgh, USA
Chandralekha Singh, University of Pittsburgh, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
Authoritative Discourse Used in Math Integrated Science Instruction and Sensemaking Opportunities
Kristine Squillace Stenlund*, University of MN, USA
Anita Schuchardt, University of MN, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
Distance dilemma: The impacts of the COVID-19 pandemic on student impressions of science instruction
**Strand 5: College Science Teaching and Learning (Grades 13-20)**

**Impact of Study Strategies on Knowledge and Exam Performance in Medical School**

**Markia Black**, Wright State University, USA

**William Romine**, Wright State University, USA

**Molly Simonis**, Wright State University, USA

**Jeff Peters**, Wright State University, USA

**Volker Bahn**, Wright State University, USA

**Amber Todd**, Wright State University, USA

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

**Science Museum Educators’ Teaching Self-Efficacy For Online Programming**

**Megan Ennes**, University of Florida, USA

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

**Learning Talk Among Middle School Students at a Science Museum Exhibit**

**Ross Ramsey***, The University of North Carolina at Chapel Hill, USA

**Mengyi Mao**, The University of North Carolina at Chapel Hill, USA

**Leah Metcalf**, The University of North Carolina at Chapel Hill, USA

**Janice Anderson**, The University of North Carolina at Chapel Hill, USA

**Jill Hamm**, The University of North Carolina at Chapel Hill, USA

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

**Space & Place: How Afrofuturism and Sense of Place Can Revolutionize Outdoor Science Education**

**Brandi Cannon-Force***, Stanford University, USA

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

**Measuring Student and Program Success in STEM Undergraduate Research Programs**

**Jennifer Wilhelm***, University of Kentucky, USA

**Molly Fisher**, University of Kentucky, USA

**Abigail Parham**, University of Kentucky, USA

**Andrea Weidman**, University of Kentucky, USA

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

**Informal Science Educators’ Perspectives on DEI: Implications for Teaching Beyond the Classroom**

**Eleanor Kenimer***, Michigan State University, USA

**Gail Richmond***, Michigan State University, USA

**Strand 7: Pre-service Science Teacher Education**

**Interdisciplinary Pre-service Teacher Training**

**Argyris Nipyrakis***, University of Crete, Greece

**Berta Barquero**, University of Barcelona, Spain
Poster Session B, 4/20/23, 15:35-16:20

Laura Branchetti, University of Milan, Italy
Viviane Durand-Guerrier, University of Montpelier, France
Athanasia Kokolaki, University of Crete, Greece
Dimitris Stavrou, University of Crete, Greece
Olivia Levrini, University of Bologna, Italy

Strand 7: Pre-service Science Teacher Education
Implementation of Site-based Middle Grades Physical Science Methods Courses: Lessons Learned over a 6-year Period
Diarra Mosley*, Hilsman Middle School, USA
Shaughnessy McCann, University of Georgia, USA
David Jackson, University of Georgia, USA

Strand 7: Pre-service Science Teacher Education
Using Service-Learning to Prepare Preservice Elementary Teachers to Support Scientific Research in the Elementary Classroom
Matthew Perkins Coppola*, Purdue University Fort Wayne, USA

Strand 8: In-service Science Teacher Education
Newly Hired Science Teachers Professional Learning 4.0: A Conceptual Model
Julie Luft*, University of Georgia, USA

Strand 8: In-service Science Teacher Education
Using community tours and mapping to develop a culturally relevant pedagogy
Nicole Walsh, Cascades High School, USA
Joshua Shipman, James Madison High School, USA
Sarah Lucas, State College Area High School, USA

Noah Shultz, Slippery Rock Area High School, USA
Sarah Bevilacqua, State College Area High School, USA
Cassidy Campolese, Dr. Henry A. Wise, Jr. High School, USA
Molly Mowatt, MESA Charter High School, USA
Kevin Toney, Independent, USA
Jonathan McCausland, New Mexico Highlands University, USA
Kathryn Bateman, The Pennsylvania State University, USA

Strand 8: In-service Science Teacher Education
Construction of agency spaces by elementary science teachers in low autonomy curricular environments
Daniela Scarpa*, University of São Paulo, Brazil
Amanda Magalhães, University of São Paulo, Brazil
Danusa Munford, Federal University of ABC, Brazil

Strand 8: In-service Science Teacher Education
Examining Changes in District Science Coordinators' Communities of Practice
Jennifer Bateman*, Clemson University, USA
Meredith Schwendemann*, Clemson University, USA
Brooke Whitworth, Clemson University, USA
Julie Luft, University of Georgia, USA

Strand 8: In-service Science Teacher Education
"The piece that we were looking for": catalyzing lenses for science teachers' equity-centered unit design
Monica Sircar*, Stanford University, USA
Poster Session B, 4/20/23, 15:35-16:20

Strand 10: Curriculum and Assessment
Using the STEM-OP to explore master teachers' implementation of Naval STEM tasks
Jeffrey Radloff*, SUNY Cortland, USA
Dominick Fantacone, SUNY Cortland, USA

Strand 10: Curriculum and Assessment
Measuring Science Teacher Knowledge of Models and Modeling in Science: Development and Validation
Grace Carroll*, North Carolina State University, USA
Soonhye Park, North Carolina State University, USA
Matt Reynolds, North Carolina State University, USA
Amanda Hall, North Carolina State University, USA
Scott Ragan, North Carolina State University, USA
Jason Painter, North Carolina State University, USA

Strand 10: Curriculum and Assessment
The Impact of Professional Development on A Physics Teachers Identity Towards Equitable Instruction.
Clausell Mathis*, Michigan State University, USA

Strand 11: Cultural, Social, and Gender Issues
Measuring Science Teacher Knowledge of Models and Modeling in Science: Development and Validation
Grace Carroll*, North Carolina State University, USA
Soonhye Park, North Carolina State University, USA
Matt Reynolds, North Carolina State University, USA
Amanda Hall, North Carolina State University, USA
Scott Ragan, North Carolina State University, USA
Jason Painter, North Carolina State University, USA

Strand 11: Cultural, Social, and Gender Issues
Teachers Negotiating Professional Vision around Equity through Material Representations
Kathryn Bateman*, The Pennsylvania State University, USA
Jonathan McCausland*, New Mexico Highlands University, USA
Nicole Walsh, Cascades High School, USA

Strand 11: Cultural, Social, and Gender Issues
How well do undergraduate biology syllabi address culturally responsive curriculum?
Katie Nolan*, The Pennsylvania State University, USA

Strand 11: Cultural, Social, and Gender Issues
Teresa Massey*, Georgia State University, USA

Strand 11: Cultural, Social, and Gender Issues
Homeless Students and the Right to Science Education: Lessons learned from Street Schools
Matthias Fischer*, University of Education Heidelberg, Germany
Manuela Welzel-Breuer, University of Education Heidelberg, Germany

Strand 11: Cultural, Social, and Gender Issues
A bibliometric image of the JRST
Ozgur Dogan*, Marmara University, Turkey

Strand 12: Technology for Teaching, Learning, and Research
An Analysis of Resources Available to Guide Teachers' use of Bee-Bots in Early Learning Settings
G. Michael Bowen*, Mount Saint Vincent University, Canada
Eva Knoll, Université du Québec à Montréal, Canada
Amy Willison, Independent Consultant, Canada
Poster Session B, 4/20/23, 15:35-16:20

Strand 12: Technology for Teaching, Learning, and Research

A Task Awareness Approach to the Assessment of Virtual Learning Environments (VLEs)
Rob Monahan*, NC State University, USA
James Minogue*, NC State University, USA
Amanda MacCormac, NC State University, USA
Emily Brunsen, NC State University, USA
Tabitha Peck, Davidson College, USA
David Borland, RENCI, USA

Untethering Science Interest from Reading Proficiency: Pilot Results from a Microsoft HoloLens Science Reading Intervention
Denise Bressler*, ETS, USA
Leonard Annetta, East Carolina University, USA
Michael Tutwiler, University of Rhode Island, USA

Quickstart Spaceship Programming for Developing Physical Intuition
Jacob Kelter*, Northwestern University, USA
Amanda Peel, Northwestern University, USA
Bradley Davey, Northwestern University, USA
Michael Horn, Northwestern University, USA
Uri Wilensky, Northwestern University, USA

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

The Intersection of NOS and NGSS: A High School Science Educator’s Perspective
Mary Johnston*, Indiana University, USA
Valerie Akerson, Indiana University, USA

Strand 14: Environmental Education and Sustainability

Healing Relationships with the Natural World Through Critical Place Inquiry
Alexandra Schindel*, University at Buffalo-SUNY, USA
Ryan Rish, University at Buffalo-SUNY, USA
Kellyann Ramdath, University at Buffalo-SUNY, USA
Dave Mawer, University at Buffalo-SUNY, USA
Kendra Ormerod, University at Buffalo-SUNY, USA

Community Science Data Talks: The Intersection of Justice, Emotion, and Place
Imogen Herrick*, University of Southern California, USA
Michael Lawson, Kansas State University, USA
Ananya Matewos, St. Norbert College, USA

Pre-service Teachers’ Plausibility Perceptions of Global Climate Change: Results of the updated Plausibility Perception Measure
Melike Hanedar*, Bogazici University, Turkey
Gizem Ozyazici*, Bogazici University, Turkey
Gaye Ceyhan, Bogazici University, Turkey

Strand 15: Policy, Reform, and Program Evaluation

A Framework for K-12 Classroom-Based Opportunity to Learn in Science
Dante Cisterna*, ETS, USA
Farah Qureshi, ETS, USA

Strand 14: Environmental Education and Sustainability

Rural Administrators and STEM Education:
Their Perceptions and Decision-Making

Devan Jones*, Clemson University, USA
Julianne Wenner, Clemson University, USA
Concurrent Session 10
4/20/23, 16:30-18:00

Asian and Pacific Islander Science Education Research (APISER)
Sponsored Session: Science Education Research Involving Learners of Asian And Pacific Islander (API) Heritage
4/20/23, 16:30-18:00, Salon A4 (LL)

ORGANIZERS
Ling Liang, La Salle University, Philadelphia, PA, USA
Xiufeng Liu, University at Buffalo, State University of New York, NY, USA
Xinying Yin, California State University-San Bernardino, CA, USA

PANELISTS
Pauline Chinn, University of Hawaii at Manoa, USA
Jennifer Tripp, University at Buffalo, SUNY, USA
Lei Liu, Educational Testing Service, USA
Mihwa Park, Texas Tech University, USA

Strand 1: Science Learning:
Development of student understanding
SC-Organized Paper Set: Learning Progressions in Science Education Research
4/20/23, 16:30-18:00, Salon C7-8 (LL)

Development and Refinement of Learning Progressions for Fundamental Constructs of Mechanical Waves
Maria Veronica Torralba*, De La Salle University, Philippines
Frederick Talaue, De La Salle University, Philippines
Maricar Prudente, De La Salle University, Philippines

Investigation of a chemistry specific learning progression for upper secondary school
Erika Knack*, University of Duisburg-Essen, Germany
Vanessa Fischer, University of Duisburg-Essen, Germany
Maik Walpuski, University of Duisburg-Essen, Germany

Investigating a Learning Progression for Particle Nature of Matter from Upper Elementary Through High School
Xiuhong Wang*, Northeast Normal University, China
Tingting Li*, Michigan State University, USA
Concurrent Session 10, 4/20/23, 16:30-18:00

**Peng He**, Michigan State University, USA
**Joseph Krajcik**, Michigan State University, USA

*A Learning Progression for Water as a Limited Resource and Human Impacts within Socioecological Systems*

**Kristin Gunckel**, University of Arizona, USA
**Malissa Hubbard**, University of Arizona, USA
**Sean Tan**, University of California Berkeley, USA
**Dan Moreno**, University of Arizona, USA
**Mingfeng Xu**, University of California Berkeley, USA
**Linda Morell**, University of California Berkeley, USA
**Mark Wilson**, University of California Berkeley, USA

**Navigation of personal and disciplinary values in an undergraduate computational biology course**

**Sugat Dabholkar**, Tufts University, USA
**Julia Gouvea**, Tufts University, USA
**Lawrence Uricchio**, Tufts University, USA

*Systematic Review on Learning in STEM Education With More Than Two Visual Representations*

**Eva Rexigel**, Technische Universität Kaiserslautern, Germany
**Sarah Malone**, Saarland University, Germany
**Sebastian Becker-Genschow**, University of Cologne, Germany
**Jochen Kuhn**, Ludwig-Maximilians-Universität, Germany

Strand 2: Science Learning: Contexts, Characteristics and Interactions
SC-Organized Paper Set: Student Learning and Cognition
4/20/23, 16:30-18:00, Salon C5-6 (LL)

**The Role of Cognitive Engagement, Learning Enjoyment, and Epistemology Belief in Building Undergraduates' Science Learning**

**Hsin-Hui Wang**, National Sun Yat-sen University, Taiwan
**Huann-shyang Lin**, National Sun Yat-sen University, Taiwan
**Zuway-R Hong**, Kaohsiung Medical University, Taiwan
**Ling Lee**, National Sun Yat-sen University, Taiwan

**Systematizing student difficulties in organic chemistry as a basis for developing adaptive support**

**Gyde Asmussen**, IPN - Leibniz Institute for Science and Mathematics Education, Germany
**Marc Rodemer**, University of Duisburg-Essen, Germany
**Sascha Bernholt**, IPN - Leibniz Institute for Science and Mathematics Education, Germany
Concurrent Session 10, 4/20/23, 16:30-18:00

Supporting First-Year Students in Learning MO Theory through a Digital-Collaborative Intervention  
David Hauck*, TU Dortmund University, Germany  
Andreas Steffen, TU Dortmund University, Germany  
Insa Melle, TU Dortmund University, Germany

PS-I Instructional Approach’s Effects on Transfer of Learning from an AOT perspective: A Case Study  
Cheng-Wen He*, University of Georgia, USA  
Paula Lemons, University of Georgia, USA  
Logan Fiorella, University of Georgia, USA

Facilitation practices of learning assistants in synchronous hybrid college courses  
Nicolette Maggiore*, Tufts University, USA  
Jessica Karch, Tufts University, USA  
Ira Caspari-Gnann, Tufts University, USA

Pre-Service Primary School Teachers’ Understanding of the Distinction Between Observations and Inferences in Science  
Shingo Uchinokura*, Kagoshima University, Japan  
Kenya Momohara, Kagoshima University, Japan  
Nana Yamanaka, Kagoshima University, Japan

Facilitation practices of learning assistants in synchronous hybrid college courses  
Nicolette Maggiore*, Tufts University, USA  
Jessica Karch, Tufts University, USA  
Ira Caspari-Gnann, Tufts University, USA

Strand 7: Pre-service Science Teacher Education  
SC-Organized Paper Set: Developing inquiry skills in pre-service science teacher education  
4/20/23, 16:30-18:00, Salon A1 (LL)

Developing Global Science Knowledge and Global Competence Skills of Preservice Teachers in a Content Course  
Shukufe Rahman*, Indiana University, USA  
Conghui Liu*, Indiana University, USA  
Gayle Buck, Indiana University, USA

Prospective Science Teachers’ Visions of Scientific Inquiry and Practices, a New Curriculum in Taiwan  
Shiang-Yao Liu*, National Taiwan Normal University, Taiwan  
Ping-Yi Chou, Hwa-Gang Junior High School, Taiwan

Science Teacher Educators’ Collective Inquiry into Practice for Transforming Preservice Teacher Education In South Korea  
Hyekeoung Lee*, Seoul National University, Korea, Republic of  
Hosun Kang, University of California Irvine, USA  
Gyoungho Lee, Seoul National University, Korea, Republic of

Effect of practicum course on science instructional practices of pre-service science teachers  
Iyad Dkeidek*, Al-Quds University, Palestine
Concurrent Session 10, 4/20/23, 16:30-18:00

Preservice Science Teachers' Self-Regulated Learning Practice While Planning and Enacting Classroom Questions
Hong Tran*, University of Georgia, USA
Daniel Capps, University of Georgia, USA
Timothy Cleary, Rutgers, The State University of New Jersey, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Science Teachers' Efforts to Design and Implement Innovative Science Lessons
4/20/23, 16:30-18:00, Salon A3 (LL)

Science Teacher Lesson Planning: A Preliminary Study of Acquisition, Selection, and Modification
Joe DeLuca*, University of Georgia, USA
Julie Luft, University of Georgia, USA
Elizabeth Ayano, University of Georgia, USA

What's In A Word? Teachers' Shifting Conceptualizations of "Authentic" Teaching and Learning in PBL
Tess Bernhard*, University of Pennsylvania, USA
Amy Guillotte, University of Pennsylvania, USA
Sarah Schneider Kavanagh, University of Pennsylvania, USA
Chris Pupik Dean, University of Pennsylvania, USA

Integrated STEM Design and Implementation: a Case with In-service Teachers
Argyris Nipyarakis*, University of Crete, Greece

Dimitris Stavrou, University of Crete, Greece
Lucy Avraamidou, University of Groningen, Netherlands

Exploring Teachers' Design and Enactment of Rigorous Lessons through a Collaborative Design Experience
Ryan Coker*, Florida State University, USA
Danielle Rhemer*, Florida State University, USA
Ozlem Akcil-Okan*, Florida State University, USA
Sierra Morandi*, Florida State University, USA
Jennifer Schellinger, Florida State University, USA
Miray Tekkumru-Kisa, Florida State University, USA
Sherry Southerland, Florida State University, USA

Strand 10: Curriculum and Assessment Symposium: Reinventing Scientific Literacy for an Age of Misinformation: NGSS 2.0
4/20/23, 16:30-18:00, Salon A5 (LL)

Reinventing Scientific Literacy for an Age of Misinformation: NGSS 2.0
Jonathan Osborne*, Stanford University, USA
Douglas Allchin, University of Minnesota, USA
Noah Feinstein*, University of Wisconsin-Madison, USA
Ayelet Baram-Tsabari*, Technion University, Israel
Daniel Plimentel, Stanford University, USA
Concurrent Session 10, 4/20/23, 16:30-18:00

Strand 11: Cultural, Social, and Gender Issues
4/20/23, 16:30-18:00, Salon A2 (LL)

Promoting [Policy] Reform Over Perseverance: Interrogating the Definition of Black Resilience in STEM Education
**Takeshia Pierre**, University of Florida, USA
**Felicia Mensah**, Columbia University, USA

Operationalizing Critical Race Theory to Diversify the Pre-Medical Undergraduate Path: A Theoretical Paper
**Candice Kim**, Stanford University, USA

"Would you comment on my English if I was White?": Asian American Women Experiencing STEM
**Dionne Cross Francis**, University of North Carolina, USA
**Pavneet Kaur Bharaj**, University of North Carolina, USA
**Jasmyne Yeldell**, University of North Carolina, USA
**Kerrie Wilkins-Yel**, University of Massachusetts, USA

Understanding Systemic Racism in Science Teacher Educator Preparation
**Felicia Mensah**, Teachers College, Columbia University, USA

Strand 11: Cultural, Social, and Gender Issues
SC-Organized Paper Set: Explorations of Social Justice and Anti-racist Science Teacher Identity
4/20/23, 16:30-18:00, Salon C1-2 (LL)

White shame and white ambivalence in learning to be a well-started White anti-racist science teacher
**Jonathan McCausland**, New Mexico Highlands University, USA
**Scott McDonald**, Pennsylvania State University, USA

Empowering Science Praxis: Lessons from a Social Justice Science Teacher Inquiry Group
**Alexandra Schindel**, University at Buffalo-SUNY, USA
**Sara Tolbert**, University of Canterbury, New Zealand
**Lauren Urban**, University at Buffalo-SUNY, USA
**Kellyann Ramdath**, University at Buffalo-SUNY, USA

Enacting Social Justice Teaching Identities in Science Classrooms
**Katherine Wade-Jaimes**, University of Nevada, USA
**Rachel Askew**, Freed-Hardeman University, USA

Strand 12: Technology for Teaching, Learning, and Research
SC-Organized Paper Set: Applications of Technology for Data Analysis
4/20/23, 16:30-18:00, Blvd A (L2)
Technology as a tool for supporting indigenous youth’s sense of consequential learning around earth science
**Colby Tofel-Grehl**, Utah State University, USA

Investigating Differential Effects of a Digital Ladder of Learning with Adaptive Support in Chemistry
**Michelle Möhlenkamp**, University of Duisburg-Essen, Germany
**Helena van Vorst**, University of Duisburg-Essen, Germany
**Sebastian Habig**, University of Erlangen-Nuremberg, Germany
**Mathias Ropohl**, University of Duisburg-Essen, Germany

Data-Driven Personas for Community Science in Paleontology
**Richard Bex**, University of Florida, USA
**Kent Crippen**, University of Florida, USA

Designing and Developing an Instrument to Assess Scale Cognition
**Tyler Gampp**, North Carolina State University, USA
**Cesar Delgado**, North Carolina State University, USA
**Matthew Peterson**, North Carolina State University, USA
**Karen Chen**, North Carolina State University, USA

Strand 14: Environmental Education and Sustainability
SC-Organized Paper Set: Socio-scientific issues and Culturally Responsive Environmental Science Education
4/20/23, 16:30-18:00, Blvd C (L2)

Incorporating community and citizen science into schools: How children develop science identity in California forests
**Jadda Miller**, University of California Davis, USA
**Shulong Yan**, University of California Davis, USA
**Heidi Ballard**, University of California Davis, USA

Exploring Elementary Students’ Socio-scientific Argumentation within an Ecosystem Related SSI-based Unit
**Nannan Fan**, University of North Carolina at Chapel Hill, USA
**Li Ke**, University of Nevada at Reno, USA
Concurrent Session 10, 4/20/23, 16:30-18:00

Jamie Elsner, university of north Carolina at Chapel Hill, USA
Troy Sadler, University of North Carolina at Chapel Hill, USA
Laura Zangori, University of Missouri, USA

"Get kids outside!": Integrating Culturally Responsive Teaching with NGSS-aligned Environmental Science
Marisa Ritchie*, California Polytechnic State University, USA
Spencer Paine*, California Polytechnic State University, USA
Sierra Martin*, California Polytechnic State University, USA
Jasmine Nation, California Polytechnic State University, USA
Kurt Holland, California Polytechnic State University, USA

Environmental Health Investigators: developing science interest with a diverse group of middle school students
Andreia Dexheimer*, Southern Illinois University Edwardsville, USA
Sharon Locke, Southern Illinois University Edwardsville, USA
Georgia Bracey, Southern Illinois University Edwardsville, USA
Ben Greenfield, University of Southern Maine, USA
Jennifer Zuercher, Southern Illinois University Edwardsville, USA
Carol Colaninno, Southern Illinois University Edwardsville, USA
Candice Johnson, Southern Illinois University Edwardsville, USA
Charlie Blake, Southern Illinois University Edwardsville, USA

Equity And Ethics Committee
Social Event: Equity and Ethics Dinner
Grant Park Bistro
4/20/23, 18:10-21:00
Concurrent Session 11, 4/21/23, 9:00-10:30

Board of Directors
Membership and Business Meeting
4/21/23, 8:00-8:50, Salon A1 (LL)

Concurrent Session 11
4/21/23, 9:00-10:30

Southern African Association for Research in Mathematics, Science and Technology Education (SAARMSTE)
Sponsored Session: Twenty years of growth in science education capacity in Southern Africa - SAARMSTE Research School
4/21/23, 9:00-10:30, Salon C5-6 (LL)

ORGANIZERS
Marissa Rollnick, Wits University, South Africa

PANELISTS
Elizabeth Mavhunga, Wits University, South Africa
Peter Hewson, University of Wisconsin, USA
Julie Luft, University of Georgia, USA
Ryan Nixon, Brigham Young University, USA
Regina McCurdy, Georgia Southern University, USA

Strand 1: Science Learning:
Development of student understanding
Related Paper Set: It’s never too early: Insights from empirical studies concerning evolution in kindergarten and elementary school
4/21/23, 9:00-10:30, Salon A1 (LL)

Young Children’s Understandings of Camouflage as an Adaptation
Lisa Borgerding*, Kent State University, USA

Elementary-school students’ can develop understanding of evolution by natural selection based on a storybook-based curriculum
Deborah Kelemen*, Boston University, USA
Sarah Brown, Boston University, USA
Alden Burnham, Boston University, USA
Gillian Puttick, TERC, USA
Sally Crissman, TERC, USA
Sara Lacy, TERC, USA
Jessica Findlay, University of Surrey, United Kingdom
Aarti Bodas, Boston University, USA
Learning evolution at home: Virtual intervention for elementary school students and their parents
David Menendez*, University of Michigan, USA

Dialogues about evolution: Interviewing young children to assess their ideas about evolutionary concepts
Isabell Adler*, IPN - Leibniz Institute for Science and Mathematics Education, Germany
Daniela Fiedler, IPN - Leibniz Institute for Science and Mathematics Education, Germany
Ute Harms, IPN - Leibniz Institute for Science and Mathematics Education, Germany
Impact of Choice in Lab Exercises on Students of Different Grade, Ability, and Sociocultural Background
Laura Sührig*, Goethe University Frankfurt, Germany
Katja Hartig, Goethe University Frankfurt, Germany
Albert Teichrew, Goethe University Frankfurt, Germany
Roger Erb, Goethe University Frankfurt, Germany
Jan Winkelmann, University of Education Schwäbisch Gmünd, Germany
Mark Ullrich, Goethe University Frankfurt, Germany
Holger Horz, Goethe University Frankfurt, Germany

A State-of-Affairs Review of Science-specific Disciplinary Literacies
Molly Marek*, University of Texas, USA
Misty Sailors, Colorado State University Pueblo, USA
Chris Ham, University of North Texas, USA
Mariyeni Matariro, University of the Witwatersrand, South Africa
Alana Newell, Baylor College of Medicine: Center for Educational Outreach, USA

A historical analysis of the standards for graph construction in the US
Cesar Delgado*, North Carolina State University, USA
Alonzo Alexander, North Carolina State University, USA

A Theoretical Model for Pedagogical Design Capacity for Phenomenon Adaptation
Katahdin Cook Whitt*, Maine Mathematics and Science Alliance, USA
Lisa Kenyon, Maine Mathematics and Science Alliance, USA
Emily Harris, BSCS Science Learning, USA

Designing Storyline Units for Phenomenon Adaptation
Emily Harris*, BSCS Science Learning, USA
Lindsey Mohan, BSCS Science Learning, USA
Candice Guy-Gaytán, BSCS Science Learning, USA
Katahdin Cook Whitt, Maine Mathematics and Science Alliance, USA
Lisa Kenyon, Maine Mathematics and Science Alliance, USA
Darryl Reano, Arizona State University, USA
Cindy Soule, Portland Public Schools, USA

Supporting Teachers Pedagogical Design Capacity to Make Phenomena Adaptations
Lisa Kenyon*, Maine Mathematics and Science Alliance, USA
Katahdin Cook Whitt, Maine Mathematics and Science Alliance, USA
Adrienne Hanson, Maine Mathematics and Science Alliance, USA
Emily Harris, BSCS Science Learning, USA
F. Leonard Kenyon, Maine Mathematics and Science Alliance, USA  
Rhonda Tate, Maine Mathematics and Science Alliance, USA

Teachers' Design and Enactment of Phenomena Adaptations  
Adrienne Hanson*, Maine Mathematics and Science Alliance, USA  
Lisa Kenyon, Maine Mathematics and Science Alliance, USA  
Katahdin Cook Whitt, Maine Mathematics and Science Alliance, USA  
Emily Harris, BSCS Science Learning, USA  
Lisa Kenyon, Maine Mathematics and Science Alliance, USA  
Katahdin Cook Whitt, Maine Mathematics and Science Alliance, USA  
Emily Harris, BSCS Science Learning, USA  
Seth Van Doren, BSCS Science Learning, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)  
SC-Organized Paper Set: Achievement Gaps and Cultural Considerations in STEM Instruction  
4/21/23, 9:00-10:30, Salon C1-2 (LL)

Addressing Asymmetries in General Chemistry through an Asset-Based Approach  
Hannah Sevian*, University of Massachusetts Boston, USA  
Klaudja Caushi, University of Massachusetts Boston, USA  
Jessica Karch, Tufts University, USA  
Tamari Kakhoidze, University of Massachusetts Boston, USA  
Vishakha Agarwal, University of Massachusetts Boston, USA  
Tyson King-Meadows, University of Massachusetts Boston, USA

Narrowing achievement gaps in reformed general chemistry courses with and without in-class active learning  
Ted Clark*, The Ohio State University, USA

Using Cultural Historical Activity Theory to Characterize Different Enactments of the LA Model  
Jessica Karch*, Tufts University, USA  
Sedrah Mashhour, Tufts University, USA  
Ira Caspari-Gnann, Tufts University, USA

Strand 6: Science Learning in Informal Contexts  
SC-Organized Paper Set: Understanding Participation in Citizen Science and Science Communication  
4/21/23, 9:00-10:30, PDR 2 (L3)

The relevance of science education to science-informed behavior: The case of COVID-19 in Israel  
Ayelet Baram-Tsabari*, Technion - Israel Institute of Technology, Israel  
Yael Rozenblum, Technion - Israel Institute of Technology, Israel  
Wild Boars and Humans in Haifa: Media Framing of Socio-scientific Issues  
Tali Tal*, Technion, Israel Institute of Technology, Israel  
Avshalom Ginosar, The Max Stern Yezreel Valley College, Israel

Mapping the Training Ground: LCA of Graduate Student Perceptions of Scicomm  
Brenda Guerrero*, FIU, USA  
Remy Dou, FIU, USA  
Melissa McCartney, FIU, USA
Knowledge, curiosity, and relevance: Using the Elaboration Likelihood Model to help identify COVID-19 misinformation

Yael Rozenblum*, Technion – Israel Institute of Technology, Israel
Keren Dalyot, Technion – Israel Institute of Technology, Israel

---

Strand 7: Pre-service Science Teacher Education
SC-Organized Paper Set: Using Virtual Platforms and Online Experiences in preparing future science teachers
4/21/23, 9:00-10:30, Salon C3-4 (LL)

Using Virtual Platforms as Out of School Environment: Examine the shift in student teachers’ perspectives
Tugba Yuksel*, Recep Tayyip Erdogan University, Turkey

Virtual Elementary Science Teacher Preparation: Exploring Summer Science Institute Design Structures and Outcomes
Stephen Thompson*, University of South Carolina, USA

Digital or conventional? Impact measurements and expectations of STEAM-pre-service teachers in a German Outreach Lab
Michaela Maurer*, Didactic Biology, Carl von Ossietzky University Oldenburg, Germany

From Remote to In-Person Learning: Changes in Teaching Resources Used by Preservice Secondary Science Teachers
Donald McNish*, University of California, Santa Barbara, USA
Matthew Bennett, University of California, Santa Barbara, USA

Royce Olarte, University of California, Santa Barbara, USA
Valerie Valdez, University of California, Santa Barbara, USA
Cameron Dexter-Torti, University of California, Santa Barbara, USA
Liliana Garcia, University of California, Santa Barbara, USA
Sarah Roberts, University of California, Santa Barbara, USA
Julie Bianchini, University of California, Santa Barbara, USA

Factors influencing formative diagnostic skills of pre-service chemistry teachers
Marc Rodemer*, University of Duisburg-Essen, Germany
Stefan Rumann, University of Duisburg-Essen, Germany
Comparing Assessments of Instructional Quality by Chemistry Teacher Candidates and their Domain Specific Advisors
Benjamin Heinitz*, Leibniz University Hannover, Germany
Andreas Nehring, Leibniz University Hannover, Germany
Concurrent Session 11, 4/21/23, 9:00-10:30

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Science Teachers' Understanding and Implementation of the Next Generation Science Standards
4/21/23, 9:00-10:30, Salon A3 (LL)

A Content Analysis of Next Generation Science Standards Alignment Messages
Jamie Tanas*, University of Iowa, USA
Gavin Fulmer, University of Iowa, USA

The Role of Professional Learning and Enactment Experience in Teaching Storyline Curricula: Nationwide Survey Results
Benjamin Lowell*, Boston College, USA
Renee Affolter, Boston College, USA
Katherine McNeill, Boston College, USA
Caitlin Fine, Metropolitan State University of Denver, USA

"By now I haven't told them about insulin/pancreas?": Veteran teacher grappling with NGSS teaching.
Hildah Makori*, Michigan State University, USA
Consuelo Morales*, Michigan State University, USA
Irene Bayer*, Michigan State University, USA
Tania Jarosewich*, Censeo Group, USA
Maria Salinas, Michigan State University, USA

Identifying Impacts of Administrative Support on Physics Teachers' Professional Learning
James Hancock II*, Alma College, USA
Jack Poling, Alma College, USA

Differences in STEM Teacher Education Needs According to School-Level and Geographically Diverse Administrators
Doug Ball, Utah State University, USA
Kellie Yates, Utah STEM Action Center, USA
Soojong Jeong, Utah State University, USA
Tami Goetz, Utah STEM Action Center, USA
Colby Tofel-Grehl*, Utah State University, USA

Enacting Teacher Leadership: How teacher leaders influence others and understand leadership in an online community
Preethi Titu*, Kennesaw State University, USA
Fatma Kaya, Kent State University, USA
Gregory Rushton, Middle Tennessee State University, USA
David Yaron, Carnegie Mellon University, USA
Chinmay Kulkarni, Carnegie Mellon University, USA
Wei Zhu, Stony Brook University, USA

Science Teacher Leadership: Practices leading to empowerment and equitable opportunities in and beyond the classroom.
Tammy Moriarty, Stanford University, USA
Preetha Menon, Stanford University, USA
Brandi Cannon, Stanford University, USA
Janet Carlson*, Stanford University, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Administrators and Teacher Leaders Support of Science Teacher Learning
4/21/23, 9:00-10:30, Salon C7-8 (LL)
Concurrent Session 11, 4/21/23, 9:00-10:30

Strand 11: Cultural, Social, and Gender Issues
SC-Organized Paper Set: Identity and belonging in science education across varied spaces
4/21/23, 9:00-10:30, Salon A4 (LL)

**Contemporary Colonization: How Gentrification of Urban Communities Impacts Science Education in the new "Urban" Schools**

Kendra Sobomehin*, Stanford University, USA
Bryan Brown*, Stanford University, USA
Tamara Sobomehin*, Stanford University, USA

**Recognition as an equal or superior being? Science identity and Rousseau's theory of self-love**

Wonyong Park*, University of Southampton, United Kingdom
Lucy Avraamidou, University of Groningen, Netherlands

**Promoting science capital in young Arabs in Israel**

Wisal Ganaiem*, Technion- Israel institute of technology, Israel
Shulamit Kapon, Technion- Israel institute of technology, Israel

**In This Space, I Got You: Exploring the Coding Trajectories of Two Black Boys**

Ti’Era Worsley*, The University of North Carolina at Greensboro, USA

---

Strand 15: Policy, Reform, and Program Evaluation
Symposium: Scaling up innovative pedagogies in science education: A national perspective
4/21/23, 9:00-10:30, Salon A5 (LL)

**Scaling up innovative pedagogies in science education: A national perspective**

Anat Zohar*, Seymour Fox School of Education, Hebrew University of Jerusalem, Israel
Dana Vedder-Weiss*, School of Education, Ben Gurion University of the Negev, Israel
Rotem Trachtenberg-Maslaton*, School of Education, Ben Gurion University of the Negev, Israel
Hagit Kuperstein, School of Education, Ben Gurion University of the Negev, Israel
Aliza Segal, School of Education, Ben Gurion University of the Negev, Israel
Eran Zafrani*, Weizmann Institute of Science, Israel
Anat Yarden, Weizmann Institute of Science, Israel
Yehudit Dori*, Faculty of Education in Science and Technology, Technion, Israel
Orit Herscovitz, Faculty of Education in Science and Technology, Technion, Israel
Jonathan Osborne, Stanford Graduate School of Education, Stanford University, USA
Concurrent Session 12
4/21/23, 10:45-12:15

Roundtables Session 3
4/21/23, 10:45-12:15, Salon A5 (LL)

Topic 1: Student and teacher identity

Strand 11: Cultural, Social, and Gender Issues

Social Justice and Identity in Science
Teaching: Perspectives of White Men Teaching Science
Maizie Dyess*, UNLV, USA
Katie Wade-Jaimes, UNLV, USA

Strand 11: Cultural, Social, and Gender Issues

How Indigenous Islanders Identify With STEM
Jonathan Boxerman*, WestEd, USA
Sharon Nelson-Barber, WestEd, USA
Kimberly Nguyen, WestEd, USA

Strand 1: Science Learning: Development of student understanding

The Role of Children's Racial Identity and it's Impact on their Science Education
Lisa McDonald, Teachers College, Columbia University, USA
Felicia Mensah*, Teachers College, Columbia University, USA

Topic 2: NOS Goals and Strategies
4/21/23, 10:45-12:15, Salon A5 (LL)

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

American Scientists' Views about Nature of Science in the Context of Socioscientific Issues
Rola Khishfe*, American University of Beirut, Lebanon

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

High School Students' Images of Science: A Decade into NGSS
Catherine Wagner*, University of Notre Dame, USA
Matthew Kloser*, University of Notre Dame, USA
Michael Szopiak*, University of Notre Dame, USA

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

Socioscientific Literacy: An Emancipatory Goal for Science Education
Kory Bennett*, University of South Florida, USA
Dana Zeidler, University of South Florida, USA

Topic 3: Climate change awareness and conservation

Strand 14: Environmental Education and Sustainability

Examining secondary students' awareness of bee conservation in the U.S.
Rita Hagevik*, UNC-Pembroke, USA
Kathy Trundle, Utah State University University, USA
Kaitlin Campbell, UNC-P, USA
Katherine Vela, Utah State University, USA
Laura Wheeler, Utah State University, USA
Concurrent Session 12, 4/21/23, 10:45-12:15

**Strand 1: Science Learning: Development of student understanding**
*

**Exploring the critical reading of a climate change topic using multimodal texts**
*

**Xavier Fazio**, Brock University, Canada

**Tiffany Gallagher**, Brock University, Canada

**Strand 2: Science Learning: Contexts, Characteristics and Interactions**

**SC-Organized Paper Set: Students Ways of Thinking**

4/21/23, 10:45-12:15, Salon C5-6 (LL)

**Strand 8: In-service Science Teacher Education**

**Using a Teacher Learning Progression of Instructional Skills to Examine Geospatial Curriculum Adoption**
*

**Danielle Malone**, Washington State University Tri-Cities, USA

**Kate Popejoy**, Popejoy STEM LLC, USA

**Molly Weinburgh**, Texas Christian University, USA

**Kristen Brown**, Texas Christian University, USA

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

**Alec Bodzin**, Lehigh University, USA

**Thomas Hammond**, Lehigh University, USA

**Strand 15: Policy, Reform, and Program Evaluation**

**Investigating the Effect of Classroom Facilities and Technology on Teachers’ NGSS Aligned Instruction**
*

**Tess Bernhard**, University of Pennsylvania, USA

**Strand 7: Pre-service Science Teacher Education**

**Exploring the use of a math modeling-based activity to introduce the idea of energy**
*

**Cynthia Lima**, University of Texas at San Antonio, USA

**Investigating secondary school students’ knowledge about and acceptance of evolution, personal religious faith, and denomination**
*

**Roxanne Gutowski**, Institute for Biology Education, Faculty of Mathematics and Natural Sciences, University of Cologne, Germany

**Helena Aptyka**, Institute for Biology Education, Faculty of Mathematics and Natural Sciences, University of Cologne, Germany

**Jörg Großschedl**, Institute for Biology Education, Faculty of Mathematics and Natural Sciences, University of Cologne, Germany
Middle Schools Students’ challenges performing the Control-of-Variables Strategy: Recognizing errors in third-party experiments is easier.
Linda Hämmerle*, University of Vienna, Austria
Alexander Bergmann, University of Leipzig, Germany
Andrea Möller, University of Vienna, Austria

Three types of FIRST mentors: interpersonal skills and STEM career choice
Shahaf Rocker Yoel*, Technion – Israel Institute of Technology, Israel
Yehudit Dori, Technion – Israel Institute of Technology, Israel

Strand 4: Science Teaching - Middle and High School (Grades 5-12):
Characteristics and Strategies
SC-Organized Paper Set: Cultural and Cognitive Approaches to Student Learning
4/21/23, 10:45-12:15, PDR 2 (L3)

Liberating Students from Anxiety and Underachievement in Flowchart and Algorithm: CTCA a Stitch in Time
Deborah Agbanimu*, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Peter Okebukola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Franklin Onowugbeda, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Juma Shabani, Université du Burundi, Burundi

Esther Peter, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Olasunkanmi Gbeleyi, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Adekunle Oladejo, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Ibukunolu Ademola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Yinka Ogunlade, Ekiti State University, Nigeria
Eunice Ikpah, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Bugoma Suwadu, Université du Burundi, Burundi
Fred Awaah, University of Professor Studies, Ghana

Students’ knowledge retention in biology through the action of CTCA
Franklin Onowugbeda*, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Peter Okebukola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Deborah Agbanimu, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Esther Peter, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Olasunkanmi Gbeleyi, Africa Centre of Excellence for Innovative and
Transformative STEM Education, Lagos State University, Nigeria
Fred Awaah, University of Professional Studies, Ghana
Juma Shabani, University of Burundi, Burundi
Ibukunolu Ademola, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
Umar Adam, Lagos State University, Nigeria
Adekunle Oladejo, Africa Centre of Excellence for Innovative and Transformative STEM Education, Lagos State University, Nigeria
David Byamungu, University of Burundi, Burundi

Investigating Student Systems Thinking While Building and Revising Models
Jonathan Bowers*, Michigan State University, USA
Emanuel Eidin, Michigan State University, USA
Linsey Brennan, Michigan State University, USA

A Literature Review: Analyzing Barriers Hindering the Implementation of Self-Regulated Learning in the Classroom
Jayme Del Mario*, Texas Christian University, USA
Hong Tran*, University of Georgia, USA

Does evolution coursework mitigate, maintain, or exacerbate educational debt? Equity implications in the evolutionary sciences
Gena Sbeglia*, San Diego State University, USA
Ross Nehm, Stony Brook University, USA

Understanding the Connection Between Students' Acceptance of Socioscientific Issues and Information Sources
Brock Couch*, University of New Hampshire, USA
Grant Gardner, Middle Tennessee State University, USA

Assessing College Students' Uncertainty Management in Problem-Based Learning: Development of a Questionnaire Instrument
Jongchan Park*, Arizona State University, USA
Yuli Deng, Arizona State University, USA
Garima Agrawal, Arizona State University, USA
Ying-Chih Chen, Arizona State University, USA
Huan Liu, Arizona State University, USA
Strand 7: Pre-service Science Teacher Education
Symposium: Internationalization of Rural Science Teacher Preparation in the United States
4/21/23, 10:45-12:15, Salon C3-4 (LL)

Internationalization of Rural Science Teacher Preparation in the United States
Gayle Buck*, Indiana University, United Kingdom
Sumreen Asim, Indiana University Southeast, USA
Selina Bartels, Valparaiso University, USA
Khadija Foud, Appalachian State University, USA
Allison Freed, University of Central Arkansas, USA
Robbie Higdon, James Madison University, USA
Lacey Huffing, Georgia Southern University, USA
Jessica Stephenson Reaves, Kennesaw State University, USA
Heather Scott, Georgian Southern University, USA
Ryan Summers, University of North Dakota, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Science Teachers' Views and Enactment of Culturally and Linguistically Responsive Instruction
4/21/23, 10:45-12:15, Salon A2 (LL)

Examining the Impact of Professional Learning Experiences on Understanding around Diversity, Equity, and Inclusion Principles
Cindy Kern*, Quinnipiac University, USA
Anna Brady*, Quinnipiac University, USA
Carrie DePetris Duell, Lincoln Middle School, USA
Jennifer DePetris Duell, Francis T Maloney High School, USA

Evaluation of Teacher Designed Integrated STEM Unit For Multilingual Learners after Receiving Professional Development
Stephanie Erickson*, University of Minnesota, USA
Gillian Roehrig, University of Minnesota, USA

Designing and Validating an Observation Protocol for Responsive Science Instruction
Niki Koukoulidis*, University of Florida, USA
Julie Brown, University of Florida, USA
Mark Pacheco, University of Florida, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Teacher Learning at the Intersections of Science and Technology
4/21/23, 10:45-12:15, Salon A3 (LL)

Teachers Create and Implement Augmented Reality Experiments for Physics Lessons
Mareike Freese*, Goethe University, Germany
Albert Teichrew, Goethe University, Germany
Jan Winkelmann, University of Education, Germany
Roger Erb, Goethe University, Germany
Michael Tremmel, Goethe University, Germany
Mark Ullrich, Goethe University, Germany

Building Lessons that Bridge Instructional Practices and Science Innovations
Concurrent Session 12, 4/21/23, 10:45-12:15

**Research Practice Partnership: Culturally Responsive Computational Thinking Professional Development**

**Eleanor Richard**, University of Massachusetts Dartmouth, USA
**Shakhnoza Kayumova**, University of Massachusetts Dartmouth, USA
**Mia Dubosarsky**, Worcester Polytechnic Institute, USA
**Gillian Smith**, Worcester Polytechnic Institute, USA
**Tiffany Davis**, Ashburnham Westminster Regional Schools Public Schools, USA

*Advancing design-based pedagogy using theme of 'presence' for STEM teachers using robotics*

**Adam Devitt**, California State University, USA
**Moyu Zhang**, New York University, USA

---

**Strand 10: Curriculum and Assessment**

**SC-Organized Paper Set: Evidence based Instructional strategies to improve student learning**

4/21/23, 10:45-12:15, Salon A1 (LL)

*Developing Three-Dimensional Instructional Strategies Based on Students' Performance on Classroom Assessments*

**Peng He**, Michigan State University, USA
**Namsoo Shin**, Michigan State University, USA

**Katy Nilsen**, WestEd, USA
**Holly Amerman**, University of Georgia, USA
**Joseph Krajcik**, Michigan State University, USA

*Enacting curriculum that are coherent from the student perspective: Exploring the teacher-storyline relationship*

**Kevin Cherbow**, BSCS, USA
**Katherine McNeill**, Boston College, USA
**Benjamin Lowell**, Boston College, USA

*Analyzing Educative Features in NGSS-aligned Science Curricular Materials*

**Tania Jarosewich**, Censeo Group, USA
**Kevin Hall**, University of Illinois, USA
**Barbara Hug**, University of Illinois, USA

*Systematic Validation in Science Learning Progression Research*

**Hui Jin**, Georgia Southern University, USA
**Hyo Joeng Shin**, Sogang University, Korea, Republic of

---

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

**Related Paper Set: Leveraging the Arts to Center Equity, Justice, and People of Color in Science Education**

4/21/23, 10:45-12:15, Blvd C (L2)

*Broadening Under-Represented Students' Interest and Participation in Science Through Drama*

**Maria Kolovou**, University of Miami, USA

*The Arts in a Social-Justice-Centered Middle School Science Class*

**Stephanie Spezza**, University of Illinois Chicago, USA
**Concurrent Session 12, 4/21/23, 10:45-12:15**

*Children's Identity Work Within an Embodied Arts-Based Approach to Science Education*

- **Rebecca Kotler***, University of Illinois Chicago, USA
- **Ronan Rock**, University of Illinois Chicago, USA
- **Maria Varelas**, University of Illinois Chicago, USA
- **Amanda Diaz**, University of Illinois Chicago, USA
- **Hannah Natividad**, University of Illinois Chicago, USA
- **Phillip Bowen**, Chicago Public Schools, USA
- **Rachelle Tsachor**, University of Illinois Chicago, USA
- **Nathan Phillips**, University of Illinois Chicago, USA
- **Rebecca Woodard**, University of Illinois Chicago, USA
- **Jaegen Ellison**, University of Illinois Chicago, USA

*Embodying Physics: Exploring the power of dance as a resource for physics learning and engagement*

- **Folashade Solomon***, TERC, USA
- **Dionne Champion**, University of Florida, USA

*Ethnodances of Black Students' Science Identity Authoring as Windows into their Science Experiencing*

- **Mindy Chappell***, Portland State University, USA

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

SC-Organized Paper Set: Artificial Intelligence and Machine Learning in Science Education

*Using Machine Learning for a qualitative evaluation of Concept Maps: New opportunities for formative assessment?*

- **Tom Bleckmann***, Leibniz University Hannover – Institute for Didactics of Mathematics and Physics, Germany
- **Gunnar Friege**, Leibniz University Hannover – Institute for Didactics of Mathematics and Physics, Germany
- **Wolfgang Gritz**, L3S Research Center, Leibniz University Hannover, Germany

*Rethinking Science Education through Applications of Artificial Intelligence: Unpacking Ethical and Societal Aspects*

- **Selin Akgun***, Michigan State University, USA
- **Joseph Krajcik**, Michigan State University, USA

*Teacher Acceptance of Artificial Intelligence Technologies for Teaching and Learning: A Systematic Review*

- **Holly Amermann***, University of Georgia, USA
- **Xiaoming Zhai**, University of Georgia, USA

*Computational Model of Teacher Adaptive Expertise in the Development of Epistemic Tools*

- **Richard Lamb***, East Carolina University, USA
- **Brian Hand**, University of Iowa, USA
- **Jee Kyung Suh**, University of Alabama, USA
Concurrent Session 12, 4/21/23, 10:45-12:15

**Gavin Fulmer**, University of Iowa, USA

Strand 14: Environmental Education and Sustainability
SC-Organized Paper Set: Promoting students' interest in sustainability
4/21/23, 10:45-12:15, Salon A4 (LL)

Promoting Public Concern Towards Unpopular Endangered Species: Studying the Impact of In-Situ Mediated Shark Observation
**Nurit Carmi***, Tel-Hai Academic College, Israel

**Bryan Nichols***, Florida Atlantic University, USA

Measuring Rural High School Students' Beliefs about the Bioeconomy and Career Interests
**Katherine McCance***, North Carolina State University, USA
**Karen Collier**, North Carolina State University, USA
**Margaret Blanchard**, North Carolina State University, USA
**Richard Venditti**, North Carolina State University, USA

Building Students' Understanding of Natural Hazards and Confidence to Engage in Community Resilience Efforts
**Megan Littrell***, CIRES Education & Outreach, USA
**Kathryn Boyd**, CIRES Education & Outreach, USA
**Katya Schloessser**, CIRES Education & Outreach, USA

**Alica Christensen**, CIRES Education & Outreach, USA
**Anne Gold**, CIRES Education & Outreach, USA
**Irfanul Alam**, CIRES Education & Outreach, USA
**Casey Marsh**, CIRES Education & Outreach, USA

Strand 15: Policy, Reform, and Program Evaluation
SC-Organized Paper Set: Equity and Community
4/21/23, 10:45-12:15, Blvd A (L2)

What is "Community Level" Scientific Literacy? A Systematic Literature Review and Delphi Method Study
**K.C. Busch***, North Carolina State University, USA
**Aparajita Rajwade***, North Carolina State University, USA

Why did it work? Using the Most Significant Change Method to Understand a Science Partnership
**Maia Elkana***, Washington University in St. Louis, USA
**Rachel Ruggirello***, Washington University in St. Louis, USA
**Alison Brockhouse**, Washington University in St. Louis, USA

Equity-Focused Computer Science Education: An Analysis of State Policy Infrastructures Designed to Achieve Equity
**Stefanie Marshall***, University of Minnesota, USA
**Ain Grooms***, University of Wisconsin, USA
**Joshua Childs**, University of Texas- Austin, USA
Concurrent Session 12, 4/21/23, 10:45-12:15

Perspectives on heterogeneity in the context of vocational education and training

Simone Rueckert*, University of Duisburg-Essen, Germany

Helena van Vorst, University of Duisburg-Essen, Germany
Concurrent Session 13
4/21/23, 13:45-15:15

Strand 1: Science Learning:
Development of student understanding
SC-Organized Paper Set: Ontology and Epistemology in Science Classrooms
4/21/23, 13:45-15:15, Salon C7-8 (LL)

"Complex is useful": the epistemology of physics of complex systems as scaffolding for identity development
Francesco De Zuani Cassina*, University of Bologna, Italy
Olivia Levrini, University of Bologna, Italy

Gesture Complements Language as a Window onto Novices and Experts' Ontological Categorization of Scientific Concepts
Mariam Yamout*, University of Calgary, Canada
Tamer Amin, American University of Beirut, Lebanon

Epistemic Dispositions in Socioscientific Issues-Based Systems Modeling
Jamie Elsner*, University of North Carolina at Chapel Hill, USA
Eric Kirk, University of North Carolina at Chapel Hill, USA
Li Ke, University of Nevada Reno, USA
Troy Sadler, University of North Carolina at Chapel Hill, USA

Strand 2: Science Learning: Contexts, Characteristics and Interactions
Symposium: 10 years on: Rethinking NGSS's Underlying Principles from Ethical and Posthuman Perspectives
4/21/23, 13:45-15:15, Salon A5 (LL)

10 years on: Rethinking NGSS's Underlying Principles from Ethical and Posthuman Perspectives
Catherine Milne*, New York University, USA
Kathryn Scantlebury*, University of Delaware, USA
John Lupinacci, Washington State University, USA
Marc Higgins, University of Alberta, Canada
Anna Skorupa*, New York University, USA
Shakhnoza Kayumova, University of Massachusetts, USA
Jesse Bazzul, University of Regina, Canada
Sophia Jeong*, Ohio State University, USA
Elena Silverman, Indiana University, USA
Nickie Coomer, Colorado College, USA
Rouhollah Aghasaleh, California State Polytechnic University, USA
Jenny Tilsen, University of Minnesota, USA
Matthew Weinstein, University of Washington, USA

Strand 3: Science Teaching - Primary School (Grades preK-6): Characteristics and Strategies
SC-Organized Paper Set: Language and Elementary Science Teaching
4/21/23, 13:45-15:15, Blvd A (L2)
Examining Elementary Teachers’ Reflections on Their Ability to Facilitate Argumentation-Focused Discussions in a Simulated Classroom
Jamie Mikeska*, ETS, USA
Pamela Lottero-Perdue, Towson University, USA
Devon Kinsey, ETS, USA

Science Discourse Patterns Compared with Instructional Practices During a Maker Activity in an Elementary Classroom
Tyler Hansen*, Utah State University, USA
Colby Tofel-Grehl, Utah State University, USA

Integrating Science and Language for Multilingual Learners: Results of a Two-Year Professional Development Collaboration
David Crowther*, University of Nevada, Reno, USA

Supporting Language in Science through Encouraging Teacher Criticality
Emily Reigh*, University of California, Berkeley, USA
Emily Miller, University of Georgia, USA
Maria Simani*, University of California, Riverside, USA
Ayça Fackler*, University of Georgia, USA

Building Pathways to Undergraduate STEM Success: Supporting Science Identity, Research, and Community for Minoritized Students
Brit Toven-Lindsey*, University of California Los Angeles, USA
London Williams, University of California Los Angeles, USA
Casey Shapiro*, University of California Los Angeles, USA
Denise Ortiz, University of California Los Angeles, USA
Marc Levis-Fitzgerald*, University of California Los Angeles, USA
Tracy Johnson, University of California Los Angeles, USA

Teaching novices expert strategies – Evaluation of a physics course concept
Katja Plicht*, Ruhr West University of Applied Sciences, Germany
Hendrik Härtig, University of Duisburg-Essen, Germany
Alexandra Dorschu, Ruhr West University of Applied Sciences, Germany

Modeling and Measuring Visual Attention and Learning in an Online Instructional Module in Physics
Razan Hamed*, Purdue University, USA
Yifeng Huang, Stony Brook University, USA
Lester Loschky, Kansas State University, USA
Minh Nguyen, Stony Brook University, USA
N. Sanjay Rebello, Purdue University, USA

Characterizing student thinking and evidence-based reasoning during an engineering design activity in introductory physics
Ravishankar Chatta Subramaniam*, Purdue University, USA
Amir Bralin, Purdue University, USA
Jason Morphew, Purdue University, USA
Carina Rebello, Toronto Metropolitan University, Canada

Strand 5: College Science Teaching and Learning (Grades 13-20)
SC-Organized Paper Set: Special Topics in Physics Education Research
4/21/23, 13:45-15:15, PDR 2 (L3)
Strand 7: Pre-service Science Teacher Education
SC-Organized Paper Set: Types of talk: insights into the role of Discourse and Talk in science teacher preparation
4/21/23, 13:45-15:15, Salon A2 (LL)

**N. Sanjay Rebello**, Purdue University, USA

*Identifying the characteristics hybrid discourse in undergraduate courses for pre-service science teachers*

**Hadeel Edrees Dabbah***, Ben Gurion university, Israel

**Orit Ben Zvi Assaraf**, Ben Gurion university, Israel

*Analyzing Discourse Moves Utilized by Preservice Teachers During Enactments of Discussions for Different Epistemic Purposes*

**Ron Gray***, Northern Arizona University, USA

*Using the ORID Method to Facilitate Critical Discussions in Science Teacher Education*

**Rachel Garcia***, Ohio University, USA

**Danielle Dani**, Ohio University, USA

Strand 7: Pre-service Science Teacher Education
SC-Organized Paper Set: Research investigating self-efficacy in preparing STEM teachers
4/21/23, 13:45-15:15, Salon A3 (LL)

**Exploring Elementary Pre-service Teachers’ Science and Engineering Teaching Efficacy Beliefs**

**Christine Pavlovich***, Montana State University, USA

**Rebekah Hammack***, Montana State University, USA

**Ibrahim Yeter**, Nanyang Technical University, Singapore

*Investigating Preservice Elementary Teachers Integrated STEM Teaching Self-efficacy*

**Deepika Menon***, University of Nebraska-Lincoln, USA

**Deef Al Shorman***, University of Nebraska-Lincoln, USA

*Effects of Virtual Lab Activities on Elementary Pre-Service Teachers’ Self-Efficacy in Teaching Science*

**Soon Lee***, Kennesaw State University, USA

Strand 8: In-service Science Teacher Education
SC-Organized Paper Set: Supporting Teachers To Support Student Talk: Multidimensional Examination of Collaborative and Participatory Professional Learning Contexts
4/21/23, 13:45-15:15, Salon C1-2 (LL)

*Exploring the Personal Domain: Noticing Task as New Method and Descriptive Analyses of Change*

**Jennifer Schellinger***, Florida State University, USA

**Asli Kaya**, Florida State University, USA

**Ryan Coker**, Florida State University, USA

**Sherry Southerland**, Florida State University, USA
Concurrent Session 13, 4/21/23, 13:45-15:15

Exploring the Domain of Practice:
Documenting Outcomes of PDs by Examining Teachers’ Instructional Practices
Patrick Enderle*, Georgia State University, USA
Ozlem Okan, Florida State University, USA
Ryan Coker, Florida State University, USA
Sierra Morandi, Florida State University, USA
Jennifer Schellinger, Florida State University, USA
Miray Tekkumru-Kisa, RAND, USA
Sherry Southerland, Florida State University, USA

Exploring the Domain of Consequence:
Examining Changes in Students’ Scientific Reasoning and Affect
Kari Roberts*, Florida State University, USA
Jennifer Schellinger*, Florida State University, USA
Patrick Enderle*, Georgia State University, USA
Sierra Morandi*, Florida State University, USA
Harini Krishnan, Florida State University, USA
Sherry Southerland*, Florida State University, USA

Exploring the External Domain: Describing the Role of Collaboration on Teacher Learning
Sherry Southerland*, Florida State University, USA
Allison Metcalf*, Florida State University, USA
Jennifer Schellinger, Florida State University, USA
Harini Krishnan, University of Utah, USA

Exploring the Personal/External Domains:
Investigating Changes in Epistemic Orientations During Sustained Collaborative Professional Learning
Sierra Morandi*, Florida State University, USA
Jennifer Schellinger*, Florida State University, USA
Kari Roberts*, Florida State University, USA
Patrick Enderle*, Georgia State University, USA
Ellen Granger, Florida State University, USA
Sherry Southerland, Florida State University, USA

Strand 8: In-service Science Teacher Education
Symposium: Symposium on Science Teacher Leadership from Research and Practice Perspectives
4/21/23, 13:45-15:15, Salon C3-4 (LL)

Symposium on Science Teacher Leadership from Research and Practice Perspectives
Sara Heredia*, University of North Carolina at Greensboro, USA
Michelle Phillips, Exploratorium, USA
Tammy Cook-Endres, Exploratorium, USA
Corene Duarte, Oxnard Union High School District, USA
Brooke Whitworth, Clemson University, USA
Meredith Schwendemann, Clemson, USA
Amanda Gonczi, Michigan Technological University, USA
Laura Ruelas, Kalamazoo Public Schools, USA
Todd Campbell, University of Connecticut, USA
Concurrent Session 13, 4/21/23, 13:45-15:15

**Strand 10: Curriculum and Assessment**

Related Paper Set: Unpacking “Relevance” as a Design Aim for Instructional Materials: In What Ways? For Whom?

4/21/23, 13:45-15:15, Salon A4 (LL)

*Relevance in Teachers’ Customization: Data from a Pilot Survey on PCK for Equitable Sensemaking*

**Jason Buell**, Northwestern University, USA

**Yang Zhang**, Northwestern University, USA

**Brian Reiser**, Northwestern University, USA

**Kelsey Edwards**, Northwestern University, USA

*From Superficial to Foundational: Integrating Cultural Relevance with Computer Science Content and Pedagogy*

**Amanda Nolte**, University of Delaware, USA

**Diane Codding**, Northwestern University, USA

**Rosalie Rolon-Dow**, University of Delaware, USA

**Chrystalla Mouza**, University of Illinois Urbana-Champaign, USA

**Lori Pollock**, University of Delaware, USA

*Agentic Teaching: Strategic Science Curriculum Adaptation for Relevance*

**Nicholas Leonardi**, University of Illinois at Urbana-Champaign, USA

**Barbara Hug**, University of Illinois at Urbana-Champaign, USA

**Christina Krist**, University of Illinois at Urbana-Champaign, USA

*Co-Designing for Relevance in NGSS-Aligned Performance Assessments*

**Jennifer Richards**, Northwestern University, USA

**Kevin Cherbow**, BSCS, USA

**Miray Tekkumru-Kisa**, Florida State University, USA

**J. Richey**, University of Pittsburgh, USA

*Attending to Student Interest and Identity in Instructional Phenomenon*

**Kate Henson**, University of Colorado, USA

**William Penuel**, University of Colorado, USA

*Exploring the ‘What’ and ‘Why’ in Student Co-Created Computer Science Curricula*

**Bradley Davey**, Northwestern University, USA

**Sepehr Vakil**, Northwestern University, USA

*Determining Relevance in A Nation-Wide Curriculum Co-Design Process*

**Katarzyna Pomian Bogdanov**, Northwestern University, USA

---

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

**Symposium: Creating reflexive and critical spaces: International perspectives on working with teachers towards equitable science education**

4/21/23, 13:45-15:15, Salon C5-6 (LL)

*Creating reflexive and critical spaces: International perspectives on working with teachers towards equitable science education*

**Christina Siry**, University of Luxembourg, Luxembourg

**Sara Wilmes**, University of Luxembourg, Luxembourg
Concurrent Session 13, 4/21/23, 13:45-15:15

Carla Zembal-Saul, The Pennsylvania State University, USA
David Segura, Beloit College, USA
Maria Varelas, University of Illinois, USA
Nina Hike, University of Illinois, USA
Darrin Collins, University of Illinois, USA
Daniel Morales-Doyle, University of Illinois, USA
Jennifer Adams, University of Calgary, Canada
Sarah El Halwany, University of Calgary, Canada
Sophia Marlow, University of Calgary, Canada
Kristal Turner, University of Calgary, Canada

Strand 11: Cultural, Social, and Gender Issues
SC-Organized Paper Set: Science Identity for k-12 Learners: Where we’ve been, where we’re going
4/21/23, 13:45-15:15, Salon A1 (LL)

A Brief Review of Secondary Physics Identity Research in the United States
Kate Miller*, Michigan State University, USA
Terrance Burgess*, Michigan State University, USA

How do Students’ Science, Mathematics, and Nature Identities Impact Students’ Interest in STEAM Careers?
Michelle Parslow*, Utah State University, USA
Katherine Vela*, Utah State University, USA
Kathy Trundle, Utah State University, USA
Rita Hagevik, University of North Carolina, USA
Laura Wheeler, Utah State University, USA

David Joy, Wahlquist Junior High School, USA

Who Can be a Scientist?: Youth perceptions of STEM pathways
Alexandria Muller*, University of California, Santa Barbara, USA
Natalie Churchley, University of California, Santa Barbara, USA
Tiffany Yun, University of California, Santa Barbara, USA
Liliana Garcia, University of California, Santa Barbara, USA
Considering Possibilities for Identity Expansion: A Grounded Theory of Youths’ STEM Identity Play
Alison Mercier*, University of Wyoming, USA
Heidi Carlone, Vanderbilt University, USA

Strand 14: Environmental Education and Sustainability
SC-Organized Paper Set: Community environmental issues
4/21/23, 13:45-15:15, Blvd C (L2)

Epistemological Plurality for Globally Situated Science Discourse
Mary Short*, George Washington University, USA

Co-creating the Discourse of Environmental Consciousness toward Justice in Science Classrooms
Won Jung Kim*, Santa Clara University, USA
Lisa Archuleta, Santa Clara University, USA
Concurrent Session 13, 4/21/23, 13:45-15:15

Centering Social Justice in K-12 Place-Based Education

Meena Balgopal, Colorado State University, USA
Elizabeth Diaz-Clark*, Colorado State University, USA
Laura Sample McMeeking, Colorado State University, USA
Andrea Weinberg, Arizona State University, USA

Community science literacy as a sociomaterial practice rooted in place

Christopher Jadallah*, University of California, Davis, USA
Heidi Ballard, University of California, Davis, USA
**Closing Session**
4/21/23, 15:15-16:15, Salon A1 (LL)

*Looking ahead to the 2024 Conference*

**Gillian Roehrig**, outgoing NARST President: Showing appreciation for Board and Committee leadership

**Jomo Mutegi**, incoming NARST President: NARST Goals and Inspiration
Virtual Conference Day
Opening Session
7:00-7:30, Zoom A

The all-virtual conference day will open with remarks by outgoing President Gillian Roehrig, and incoming President Jomo Mutegi.
Concurrent Session 1
4/28/23, 7:45-8:45

Multi-Strand Paper Set
Representations of Science
4/28/23, 7:45-8:45, Zoom A

Strand 13: History, Philosophy, Sociology, and Nature of Science
The representation of nature of science in grade 6 French, American and CountryL science textbooks
Marie-Noel Salem*, American University of Beirut, Lebanon
Saouma BouJaoude*, American University of Beirut, Lebanon

Strand 1: Science Learning: Development of student understanding
Investigating Science Process Skills of Middle School Students
Fatma Uçar*, Hasan Kalyoncu University, Turkey
Semra Sungur, Middle East Technical University, Turkey

Multi-Strand Paper Set
Exploring Ideas in STEM
4/28/23, 7:45-8:45, Zoom B

Strand 7: Pre-service Science Teacher Education
Adaptive Expertise in Math and Science Teaching: Differential Impact on Preservice Teachers' iSTEM Teaching Attitudes
Mounir Saleh*, UOB, Bahrain
Bashirah Ibrahim, UOB, Bahrain

Breakout Room Discussions
8:45-9:15
Zoom A and Zoom B

Multiple breakout rooms will be available for open discussion.
Concurrent Session 2
4/28/23, 9:30-10:30

Multi-Strand Paper Set
Science Education Research Innovations
4/28/23, 9:30-10:30, Zoom A

Strand 12: Technology for Teaching, Learning, and Research
Augmented Culturo-Techno-Contextual Approach (CTCA) for Teaching and Learning a Concept in Computer Study
Michael Adewusi*, Lagos State University (LASU), Ojo ACEITSE, Nigeria
Ola Tokunbo Odekeye, Lagos State University (LASU), Ojo ACEITSE, Nigeria
Olugbenga Akindju, Lagos State University (LASU), Ojo, Nigeria
Silas Egbowon, Lagos State University (LASU), Ojo, Nigeria
Mukaila Rahman, Lagos State University (LASU), Ojo, Nigeria
Michael Ahove, Lagos State University (LASU), Ojo ACEITSE, Nigeria

Strand 14: Environmental Education and Sustainability
Using Place-Based SSI Instruction that Utilizes Role-Playing to Promote Preservice Teachers’ Socioscientific Accountability and NOS
Banu Avsar Erumit*, Recep Tayyip Erdogan University, Turkey
Bahadir Namdar, Ege University, Turkey
Aysegul Oguz Namdar, Recep Tayyip Erdogan University, Turkey

Strand 12: Technology for Teaching, Learning, and Research
Quality Assessment of Written Reflections by Computer-Based Structural Analysis
Lukas Mientus*, University of Potsdam, Germany

Peter Wulff, Heidelberg University of Education, Germany
Anna Nowak, University of Potsdam, Germany
Andreas Borowski, University of Potsdam, Germany

Strand 11: Cultural, Social, and Gender Issues
ITPOP: Development of an instrument for observing inclusive teaching practices in undergraduate science classrooms
Hai Nguyen*, Department of Learning, Teaching, and Curriculum, College of Education and Human Development, University of Missouri-Columbia, USA
Marcelle Siegel, Department of Learning, Teaching, and Curriculum, College of Education and Human Development, and Department of Biochemistry, University of Missouri-Columbia, USA
Natalia Franca, Department of Learning, Teaching, and Curriculum, College of Education and Human Development, University of Missouri-Columbia, USA
Saaedah Albishi, Department of Learning, Teaching, and Curriculum, College of Education and Human Development, University of Missouri-Columbia, USA
Ritesh Sharma, Department of Learning, Teaching, and Curriculum, College of Education and Human Development, University of Missouri-Columbia, USA
Yejun Bae, Moore School of Education, Carolina University, USA

Multi-Strand Paper Set
Seeing Science Education Differently
4/28/23, 9:30-10:30, Zoom B

Strand 5: College Science Teaching and Learning (Grades 13-20)
Sequential Synthesis Problem-Solving: Do Correct and Incorrect Problem Solvers’ Gaze Patterns Differ?
Virtual Conference Day, Concurrent Session 2, 4/28/23, 9:30-10:30

**Bashirah Ibrahim**, Bahrain Teachers College, University of Bahrain, Bahrain

**Lin Ding**, The Ohio State University, USA

**Strand 7: Pre-service Science Teacher Education**

A model of Two-Eyed Seeing in science education developed with teacher students through action research

**Albert Zeyer**, University of Teacher Education Lucerne, Switzerland

**Strand 7: Pre-service Science Teacher Education**

Pre-service Primary teachers' training through Model-Based Inquiry: What do they perceive to feel and learn?

**Manuela González-Herrera**, Universidad de Almería, Spain

**María Martínez-Chico**, Universidad de Almería, Spain

**Francisco José Castillo-Hernández**, Universidad de Almería, Spain

**Strand 2: Science Learning: Contexts, Characteristics and Interactions**

Using digital platforms to assist with teaching and learning during COVID-19 lockdown in South Africa

**Magdeline Stephen**, University of the Witwatersrand, South Africa

**Nomfundo Radebe**, University of the Witwatersrand, South Africa


Concurrent Session 3
4/28/23, 10:45-12:00

Multistrand Related Paper Set
Beyond Absolutes: Expanding Conceptions of Science and Teaching with Preservice Science Teachers
4/28/23, 10:45-12:00, Zoom A

Strand 7: Pre-service Science Teacher Education
Examining Opportunities for Expansiveness in a PST Science Modeling Course
Jessica Watkins*, Vanderbilt University, USA
Natalie De Lucca, Vanderbilt University, USA
Serena Pao, Metro Nashville Public Schools, USA

Strand 7: Pre-service Science Teacher Education
Expanding Pre-service Teachers' Conceptions of Science, Learning, and Teaching
Allison Metcalf*, Florida State University, USA
Lama Jaber, Florida State University, USA
Shannon Davidson, University of Alabama, USA

Strand 7: Pre-service Science Teacher Education
Examining Opportunities for Expansiveness in a PST Science Modeling Course
Déana Scipio*, IslandWood, USA
Priya Pugh, IslandWood, USA

Strand 10: Curriculum and Assessment
Chemistry Teachers' Knowledge of Assessment in a Collaborative and Dynamic Learning Environment
Abir Saleh*, Technion, Israel

Shirly Avargil, Technion, Israel

Multi-Strand Paper Set
STEM and Identity
4/28/23, 10:45-11:45, Zoom B

Strand 11: Cultural, Social, and Gender Issues
Taking Up a Theoretical Framework to Support Student/Teacher STEM Identities
Rachel Askew*, Freed Hardeman University, USA
Katie Wade-Jaimes, University of Nevada - Las Vegas, USA
Heidi Carlone, Vanderbilt University, USA

Strand 7: Pre-service Science Teacher Education
The middle of the STEM sandwich: Investigating, modeling, analyzing, arguing, and explaining
Christine Schnittka*, Auburn University, USA
Mark Brenneman, Auburn University, USA
Virtual Poster Session
4/28/23, 12:15-13:00, Zoom A

Strand 7: Pre-service Science Teacher Education
Physics Experiences of Elementary Teacher Candidates for Empowerment: A Case Study Survey Design
E.J. Bahng*, Iowa State University, USA
John Hauptman, Iowa State University, USA

Strand 11: Cultural, Social, and Gender Issues
Discourse around Creationism in an evolution textbook: A critical discourse analysis
Andrea Phillips*, Indiana University, USA

Strand 4: Science Teaching — Middle and High School (Grades 5-12): Characteristics and Strategies
The Impact of STEM Curriculum on Students' Abilities of Engineering Design and Attitudes Toward STEM
Meng-Fei Cheng*, National Changhua University of Education, Taiwan
Yu-Heng Lo, National Changhua University of Education, Taiwan

Strand 5: College Science Teaching and Learning (Grades 13-20)
Analysis of Graduate Physics and Astronomy Programs
Andria Schwortz*, Quinsigamond Community College, USA
Andrea Burrows, University of Central Florida, USA
Adam Myers, University of Wyoming, USA
Daniel Dale, University of Wyoming, USA

Strand 15: Policy, Reform, and Program Evaluation
Why NOT Become a Teacher? Perspectives from Undergraduate Students
Jacob Pleasants*, University of Oklahoma, USA

Strand 10: Curriculum and Assessment
The alchemy of university-school relations through an experience of Brazil’s initial Biology teacher training
Beatriz Pereira, Universidade Federal de Santa Catarina, Brazil
Gabriel Pedro*, Universidade Federal do Rio de Janeiro, Brazil
Marcia Ferreira, Universidade Federal do Rio de Janeiro, Brazil

Strand 5: College Science Teaching and Learning (Grades 13-20)
Exploring Epistemic Performance in Different Task Contexts
Alp Köksal*, Bo_aziçi University, Turkey
Fatih Mercan, Bo_aziçi University, Turkey

Strand 6: Science Learning in Informal Contexts
STEM interest patterns during adolescence: A latent profile analysis
Nancy Staus*, Oregon State University, USA
Lynn Dierking, Institute for Learning Innovation, USA
John Falk, Institute for Learning Innovation, USA
Concurrent Session 4
4/28/23, 14:00-15:00

Multi-Strand Paper Set
Creating Connections in Science
Teaching and Learning
4/28/23, 14:00-15:00, Zoom A

Strand 13: History, Philosophy, Sociology, and Nature of Science
Epistemic belief and science career expectancy in China: Using PISA data to understand gender differences
Xuerong Lin*, East China Normal University, China

Strand 5: College Science Teaching and Learning (Grades 13-20)
Retaining Students from Minoritized Groups in STEM Majors: The Role of Counterspaces and Distributed Mentoring
Stacy Olitsky*, Saint Joseph’s University, USA

Strand 7: Pre-service Science Teacher Education
Looking for science: Preservice science teachers journaling about science in daily life
Danielle Hudson*, Auburn University, USA
Christine Schnittka, Auburn University, USA

Strand 11: Cultural, Social, and Gender Issues
Bridging Science and Language: Responsive Curricula for Refugee Multilingual Learners
Rena Al Debs*, University of Balamand, Lebanon
Sara Salloum, University of Balamand, Lebanon

Multi-Strand Paper Set
Integrating Engineering and Science
4/28/23, 14:00-15:00, Zoom B

Strand 13: History, Philosophy, Sociology, and Nature of Science
Erdogan Kaya*, George Mason University, USA
Ezgi Yesilyurt, Weber State University, USA
Hasan Deniz*, University of Nevada Las Vegas, USA

Strand 8: In-service Science Teacher Education
A Systematic Review of Engineering Design for Authentic Integrated Science and Engineering Instruction: 1997-2021
Sandra Richy John*, Southern Illinois University Carbondale, USA
Senetta Bancroft, Southern Illinois University Carbondale, USA
Cody Maze, Southern Illinois University Carbondale, USA

Strand 7: Pre-service Science Teacher Education
Middle and High School Pre-service Science Teachers’ Engineering Design Self-Efficacy
John Ojeogwu*, University of Virginia, USA
Frackson Mumba, University of Virginia, USA

Strand 7: Pre-service Science Teacher Education
Linear Growth Model Analysis of Pre-service Science Teachers’ Self-Efficacy
Frackson Mumba, University of Virginia, USA
John Ojeogwu*, University of Virginia, USA
Concurrent Session 5
4/28/23, 15:15-16:15

Multi-Strand Paper Set
Pedagogical Innovations in Science Education
4/28/23, 15:15-16:15, Zoom A

Strand 7: Pre-service Science Teacher Education
Preparing preservice science teachers to enact scientific modeling-based instruction: A literature review on existing interventions
Kennedy Chan*, The University of Hong Kong, Hong Kong
David Lau*, The University of Hong Kong, Hong Kong

Strand 7: Pre-service Science Teacher Education
The Science Practice of Asking Questions About Phenomena: Shifting Towards Generating Explanatory Questions
Jaclyn Murray*, Augusta University, USA

Strand 5: College Science Teaching and Learning (Grades 13-20)
Development and Initial Validation of the Quantitative Modeling Observation Protocol (QMOP) for Undergraduate Biology Courses
Lyrica Lucas*, University of Nebraska-Lincoln, USA
Anum Khushal*, University of Nebraska-Lincoln, USA
Joseph Dauer, University of Nebraska-Lincoln, USA
Brian Couch, University of Nebraska-Lincoln, USA
Robert Mayes, Georgia Southern University, USA

Multi-Strand Paper Set
The Power of Relationships in Science
4/28/23, 15:15-16:15, Zoom B

Strand 6: Science Learning in Informal Contexts
Relationships with pets as a context for science learning
Priyanka Parekh*, University of Colorado Boulder, USA
Joseph Polman, University of Colorado Boulder, USA
Shaun Kane, University of Colorado Boulder, USA
Ben Shapiro, University of Colorado Boulder, USA

Strand 6: Science Learning in Informal Contexts
Networks and Ecosystems: Plant/Gardening Enthusiasts' Use of Community Spaces to Support their Learning
Elysa Corin*, Institute for Learning Innovation, USA
Eric Jones, University of Texas Health Science Center at Houston (UTHealth) School of Public Health, USA
David Meier, Institute for Learning Innovation, USA

Strand 11: Cultural, Social, and Gender Issues
Equity in rural physics education: Voices of a student, a teacher, and an immigrant parent
Izzah Mardhiya Mohammad Isa*, Universiti Teknologi Malaysia, Malaysia
Muhammad Abd Hadi Bunyamin, Universiti Teknologi Malaysia, Malaysia
Fatin Aliah Phang, Universiti Teknologi Malaysia, Malaysia
Virtual Conference Day, Concurrent Session 5, 4/28/23, 15:15-16:15

Strand 14: Environmental Education and Sustainability

Navigating Relational Perspectives through Collaboration to Expand Students’ Experiences of/within Places and Cultures

Beth Covitt*, University of Montana, USA
Nicollette Frank, University of Montana, USA
Noelani Puniwai, University of Hawai‘i, USA
Ho‘oulul_hui Perry, University of Hawai‘i, USA
Bruce Watson, University of Hawai‘i, USA
Sarah Haavind, Concord Consortium, USA
Dale Cope, Independent Education Consultant, USA
Carolyn Staudt, Concord Consortium, USA

Breakout Room Discussions
16:15-8:45-16:40
Zoom A and Zoom B

Multiple breakout rooms will be available for open discussion.

Closing Session

Join the closing session for remarks by outgoing President Gillian Roehrig and incoming President Jomo Mutegi
<table>
<thead>
<tr>
<th>Author</th>
<th>Page Numbers</th>
<th>Co-Author(s)</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abasto, Veronica</td>
<td>87</td>
<td>Allen, Alison</td>
<td>124</td>
</tr>
<tr>
<td>Abd-El-Khalick, Fouad</td>
<td>83</td>
<td>Allen, Carrie</td>
<td>88</td>
</tr>
<tr>
<td>Abdelnaby, Heba</td>
<td>89</td>
<td>Almalki, Manal</td>
<td>114</td>
</tr>
<tr>
<td>Abdurrahman, Fatima</td>
<td>103</td>
<td>Alokbe, Shaima</td>
<td>105</td>
</tr>
<tr>
<td>Abels, Simone</td>
<td>43</td>
<td>Alonzo, Alicia</td>
<td>117</td>
</tr>
<tr>
<td>Abrams, Eleanor</td>
<td>103</td>
<td>Alozie, Nonye</td>
<td>152</td>
</tr>
<tr>
<td>Abreu, Evan</td>
<td>100</td>
<td>Alzen, Jessica</td>
<td>67</td>
</tr>
<tr>
<td>Achilova, Feyza</td>
<td>114</td>
<td>Amerman, Holly</td>
<td>156, 158</td>
</tr>
<tr>
<td>Adah Miller, Emily</td>
<td>70</td>
<td>Amin, Syahrul</td>
<td>90</td>
</tr>
<tr>
<td>Adam, Umar</td>
<td>154</td>
<td>Amin, Tamer</td>
<td>160</td>
</tr>
<tr>
<td>Adams, Jennifer</td>
<td>57, 85, 133, 165</td>
<td>Andersen, Sage</td>
<td>48, 84, 116, 129</td>
</tr>
<tr>
<td>Adams, Matthew</td>
<td>50</td>
<td>Anderson, Janice</td>
<td>126, 133</td>
</tr>
<tr>
<td>Ademola, Ibukunolu</td>
<td>56, 71, 72, 79, 89, 91, 153, 154</td>
<td>Andrews, Tessa</td>
<td>118</td>
</tr>
<tr>
<td>Adewusi, Michael</td>
<td>170</td>
<td>Ángel, Meneses Villagrá</td>
<td>89</td>
</tr>
<tr>
<td>Adler, Isabell</td>
<td>145</td>
<td>Annetta, Len</td>
<td>73</td>
</tr>
<tr>
<td>Affolter, Renee</td>
<td>61, 149</td>
<td>Annetta, Leonard</td>
<td>136</td>
</tr>
<tr>
<td>Agarwal, Ankita</td>
<td>71</td>
<td>Antink-Meyer, Allison</td>
<td>124</td>
</tr>
<tr>
<td>Agarwal, Vishakha</td>
<td>147</td>
<td>Anwar, Saira</td>
<td>82</td>
</tr>
<tr>
<td>Agbanimu, Deborah</td>
<td>50, 56, 71, 72, 79, 89, 91, 153, 154</td>
<td>Anwar, Tasneem</td>
<td>169</td>
</tr>
<tr>
<td>Aghasaleh, Rouollah</td>
<td>44, 160</td>
<td>Aptyka, Helen</td>
<td>116</td>
</tr>
<tr>
<td>Agholor, Rose</td>
<td>50, 72</td>
<td>Aptyka, Helena</td>
<td>55, 152</td>
</tr>
<tr>
<td>Agrawal, Garima</td>
<td>132, 155</td>
<td>Araco, Victoria</td>
<td>72</td>
</tr>
<tr>
<td>Ahne, Natalie</td>
<td>151</td>
<td>Arango-Caro, Sandra</td>
<td>43</td>
</tr>
<tr>
<td>Ahohe, Michael</td>
<td>170</td>
<td>Archuleta, Lisa</td>
<td>166</td>
</tr>
<tr>
<td>Ahne, Natalie</td>
<td>151</td>
<td>Arias, Anna Maria</td>
<td>101</td>
</tr>
<tr>
<td>Ahohe, Michael</td>
<td>170</td>
<td>Ariely, Moriah</td>
<td>99</td>
</tr>
<tr>
<td>Aini, Rahmi</td>
<td>96</td>
<td>Ariyaratne, Tulana</td>
<td>104</td>
</tr>
<tr>
<td>Akcil-Okan, Ozlem</td>
<td>93, 103, 141</td>
<td>Arreola, Marco</td>
<td>89</td>
</tr>
<tr>
<td>Akdemir, Zeynep</td>
<td>80</td>
<td>Ash, Doris</td>
<td>53</td>
</tr>
<tr>
<td>Akerson, Valarie</td>
<td>66, 77, 109, 143</td>
<td>Asif, Ali</td>
<td>101</td>
</tr>
<tr>
<td>Akerson, Valerie</td>
<td>136</td>
<td>Asim, Sumreen</td>
<td>119, 155</td>
</tr>
<tr>
<td>Akgun, Selin</td>
<td>70, 158</td>
<td>Askew, Rachel</td>
<td>142, 172</td>
</tr>
<tr>
<td>Akkillioglu, Caglin</td>
<td>65</td>
<td>Aslan, Nevin</td>
<td>102</td>
</tr>
<tr>
<td>Akindoju, Olubenga</td>
<td>170</td>
<td>Asmussen, Gyde</td>
<td>139</td>
</tr>
<tr>
<td>Aksoy, Sule</td>
<td>118</td>
<td>Atkins, Lucyann</td>
<td>52</td>
</tr>
<tr>
<td>Akubo, Mark</td>
<td>92</td>
<td>Atwater, Mary</td>
<td>61, 76</td>
</tr>
<tr>
<td>Al Debs, Rena</td>
<td>174</td>
<td>Austin, Megan</td>
<td>114</td>
</tr>
<tr>
<td>Al Shorman, Deef</td>
<td>125, 162</td>
<td>Avargil, Shirly</td>
<td>94, 172</td>
</tr>
<tr>
<td>Al Shorman, Deef Allah</td>
<td>68</td>
<td>Avraamidou, Lucy</td>
<td>58, 84, 141, 150</td>
</tr>
<tr>
<td>Alam, Irfanul</td>
<td>158</td>
<td>Avsar Erumit, Banu</td>
<td>170</td>
</tr>
<tr>
<td>Albishi, Saaedah</td>
<td>88, 170</td>
<td>Awaah, Fred</td>
<td>71, 72, 92, 153, 154</td>
</tr>
<tr>
<td>Aleixo, Marina</td>
<td>108</td>
<td>Ayala, Orlando</td>
<td>86</td>
</tr>
<tr>
<td>Alexander, Alonzo</td>
<td>146</td>
<td>Ayangbola, O. Theresa</td>
<td>104</td>
</tr>
<tr>
<td>Alexandron, Giora</td>
<td>99</td>
<td>Ayano, Elizabeth</td>
<td>119, 141</td>
</tr>
<tr>
<td>Ali Bhatti, Haider</td>
<td>55</td>
<td>Ayotte-Beaudet, Jean-Philippe</td>
<td>105</td>
</tr>
<tr>
<td>Ali, Salwa</td>
<td>82</td>
<td>Azeka, Steven</td>
<td>66</td>
</tr>
<tr>
<td>Allchin, Douglas</td>
<td>141</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bae, Christine 90
Bae, Yejun 170
Baeza, Cynthia 113
Bahn, Volker 133
Bahng, E.J. 173
Baidoo-Anu, David 87
Bakerman, Maya 90
Balasubramanian, Ramprasad 101
Balgopal, Meena 49, 121, 166
Ball, Doug 149
Ballard, Heidi 144, 166
Barnidele, Bolaji 82
Bancroft, Senetta 174
Bang, Megan 44, 121
Bano, Roshni 121
Barak, Mimi 90, 122
Barak, Miriam 93
Baram-Tsabarai, Ayelet 142, 147
Barbu, Ragnhild 59
Barendsen, Erik 92
Barnes, Evan 79
Barnes, M. Elizabeth 96
Barquero, Berta 134
Barrera, Rita 80
Barron, Hillary 67
Bartels, Selina 44, 143, 155
Barth, Steve 128
Barton, Angela 110
Barzilay, Maya 68
Bassaber, Arlette 60
Batailles, Alicia 103
Bateman, Jennifer 135
Bateman, Kathryn 51, 134, 135
Bateman, Kathryn M. 55
Bayer, Irene 76, 92, 149
Bayram Jacobs, Dury 92
Bazzul, Jesse 160
Beaudry, Marie-Claude 106
Beaver, Breanna 61
Becerra, Beatriz 65
Becker-Genschow, Sebastian 110, 139
Bell, Philip 122
Ben Simon, Haya 129
Ben Zvi Assaraf, Orit 68, 105, 162
Benedict-Chambers, Amanda 111
Bennion, Adam 101
Bentley, Lillian 64
Bentley, Meg 104
Benz, Gregor 109
Ben-Zvi Assaraf, Orit 76
Bergmann, Alexander 153
Berisha, Fatlume 72
Bernard, Alan 60
Bernard, Jane 102
Bernard, Romola 86
Bernhard, Tess 141, 152
Bernholt, Sascha 124, 140
Berrigan, Félix 106
Berry, Amanda 120
Bestival, Sarah 134
Bex, Richard 143
Bianchini, Julie 69, 148
 Bjorklund, Peter 85, 124
Black, Markia 133
Blake, Charlie 144
Blanchard, Margaret 73, 82, 158
Bleckmann, Tom 157
Bleiler-Baxter, Sarah 104
Blikstein, Paulo 47, 110
Bleme, Margaret 126
Blue, Laura 92
Boada, Phillip 43, 58
Bodas, Aarti 145
Bodzin, Alec 152
Bogdan, Toma 89
Bohn-Gettler, Catherine 86
Boily-Ortega, Metzisochil 105
Bolte, Claus 48, 78
Bookbinder, Allison 69
Borda, Emily 51
Bordewieck, Kathleen 79, 125, 156
Borgering, Lisa 61, 119, 145
Borges, Isabel 58
Borland, David 136
Borowski, Andreas 88, 170
Bothor, Janne-Marie 122
BouJaoude, Saouma 82, 169
Bowen, G. Michael 58, 77, 107, 136
Bowen, Phillip 157
Bowers, Jonathan 47, 76, 154
Bowles, Stephanie 49
Boxerman, Jonathan 151
Boyd, Kathryn 158
Bracey, Georgia 144
Braden, Sarah 82
Brady, Anna 155
Bralin, Amir 162
Branchetti, Laura 134
Brand, Brenda 76, 108
Brennan, Linsey 100, 128, 154
Brenneman, Mark 172
Bressler, Denise 73, 136
Bricker, Leah 121
Bridgewater, Sara 101
Brkich, Katie 83
Brockhouse, Alison 159
Brown, Bryan 53, 150
Brown, Julie 121, 155
Brown, Kristen 152
Brown, Melissa 124
Brown, Ryan 124
Brown, Sarah 145
Brownell, Sara 96
Brünken, Roland 110
Brunsden, Emily 136
Buck, Gayle 97, 104, 140, 155
Bucknor, Carmen 114
Buell, Jason 67, 164
Buenrostro, Patricia 57
Bullinger, Spencer 48
Bunyamin, Muhammad Abd Hadi 176
Burgess, Terrance 52, 83, 95, 165
Burgin, Stephen 126
Burke, Lydia 88
Burnham, Alden 145
Burnley, Pamela 103
Burrell, Shondricka 77
Burrows, Andrea 173
Burwell, Emily 71
Busch, K.C. 45, 129, 159
Butler, Amy 104
Butterfield, Sylvia 114
Buxner, Sanlyn 68, 90
Byamungu, David 79, 89, 154
Byrd, Christyn 114
Cabazoglu Bilici, Sedef 70
Cakir, Mustafa 102
Cakiroglu, Jale 65
Çakmakçı, Gültekin 86
Calabrese, Julia 126
Callis-Duehl, Kristine 43, 102
Campbell, Kaitlin 152
Campbell, Todd 96, 126, 164
Campese, Cassidy 134
Candido Vendrasco, Natalia 101
Caner, Fatma 108
Canipe, Marti 58
Cannon-Force, Brandi 133, 150
Capobianco, Brenda 80
Capps, Daniel 141
Capraro, Mary 126
Carbonneau, Kira 118
Carden, Mila Rosa 53
Carletta, Liz 119
Carlone, Heidi 166, 172
Carlson, Janet 120, 150
Carmi, Nurit 158
Carrier, Sarah 57
Carroll, Grace 112, 135
Carroll, Kristoffer 103
Carter, Ashley 58
Carter, Ingrid 66
Carter, Steven 66
Caspari-Gnann, Ira 140, 147
Cassone McGowan, Veronica 96
Castagno, Angelina 59
Castellano, Katherine 51, 128
Castillo-Hernández, Francisco José 171
Caushi, Klaudja 116, 147
Cavazos, Alyssa 68
Cesljarev, Claire 66
Ceyhan, Gaye 137
Chaffee, Rachel 85, 127
Chagas, Isabel 58
Chakraverty, Devasmita 64, 104
Champion, Dionne 157
Chan, Kennedy 127, 176
Chandra, Connie 64
Chapman, Angela 138
Chappell, Mindy 117, 157
Chastain, Raymond 125  Cook Whitt, Katahdin 146, 147
Chatta Subramaniam, Ravishankar 162  Cooke, Hannah 96
Chen, Jihang 118  Cook-Endres, Tammy 164
Chen, Karen 143  Coomer, Nickie 160
Chen, Lizhen 59  Cooper, Robin 102
Chen, Ying-Chih 84, 132, 155  Cope, Dale 177
Cheng, Meng-Fei 173  Corin, Elysa 176
Cherbow, Kevin 156, 164  Corr, Laura 53
Chesnutt, Katherine 131  Corrigan, Deborah 120
Childress Price, Tiffany 118  Couch, Brian 176
Childs, Joshua 62, 159  Couch, Brock 55, 154
Chinn, Pauline 44, 47, 138  Coulter, Colin 97
Chiu, Jennifer 101  Couzens, Jimmy 66
Chiu, Yu-Chen 49  Covitt, Beth 177
Choi, Aeran 119, 127  Cox, Eugene 122
Choi, Yunhee 85  Crippen, Kent 53, 83, 91, 143
Chou, Ping-Yi 140  Crissman, Sally 145
Christensen, Alica 158  Crockett, Cynthia 107
Christenson, Nina 74  Cross Francis, Dionne 111, 142
Chu, Hye-Eun 95  Cross, Eric 80
Churchley, Natalie 165  Crowley, Kevin 127
Cian, Heidi 52, 82, 88, 107  Crowther, David 77, 161
Cima, Francisco 86  Cruz Neri, Nadine 124
Cisterna, Dante 87, 107, 137  Culicott, Cathy 116
Clark, Ira 93  Cullinane, Alison 114
Clark, Ted 129, 147  Cunningham, Christine 46
Clarke, Sarah 112  Curtis, Mary 104
Clary, Renee 65  Curtright, Rebecca 130
Cleary, Timothy 71, 141  Czerniak, Charlene 70
Cleckley, Chaley 108
Clough, Michael 83, 96
Coddng, Diane 164
Cody, Jennifer 51
Cofre, Hernan 54, 60, 65, 87
Cohen, Scott 110, 116
Cohrsen, Caroline 81
Coker, Ryan 116, 141, 163
Colaninno, Carol 144
Cole, Merryn 48
Coli, Dustin 130
Collier, Karen 73, 82, 158
Collins, Darrin 165
Collins, Mandi 87
Colson, Gianna 138
Colyer, Ruth 138
Conrad Nelson, Nicole 129
Conrath, Brandin 51, 125
Conrath, Brandin 51, 125
Cook Whitt, Katahdin 146, 147
Cook-Endres, Tammy 164
Coomer, Nickie 160
Coooper, Robin 102
Childress Price, Tiffany 118
Childs, Joshua 62, 159
Chinn, Pauline 44, 47, 138
Chiu, Jennifer 101
Chiu, Yu-Chen 49
Coch, Aeran 119, 127
Choi, Yunhee 85
Chou, Ping-Yi 140
Christensen, Alica 158
Christenson, Nina 74
Chu, Hye-Eun 95
Churchley, Natalie 165
Cian, Heidi 52, 82, 88, 107
Cima, Francisco 86
Cisterna, Dante 87, 107, 137
Clark, Ira 93
Clark, Ted 129, 147
Clarke, Sarah 112
Clary, Renee 65
Cleary, Timothy 71, 141
Cleckley, Chaley 108
Clough, Michael 83, 96
Coddng, Diane 164
Cody, Jennifer 51
Cofre, Hernan 54, 60, 65, 87
Cohen, Scott 110, 116
Cohrsen, Caroline 81
Coker, Ryan 116, 141, 163
Colaninno, Carol 144
Cole, Merryn 48
Coli, Dustin 130
Collier, Karen 73, 82, 158
Collins, Darrin 165
Collins, Mandi 87
Colson, Gianna 138
Colyer, Ruth 138
Conrad Nelson, Nicole 129
Conrath, Brandin 51, 125
<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ackler, Ayça</td>
<td>57, 161</td>
</tr>
<tr>
<td>Faimon, Lillyanna</td>
<td>49</td>
</tr>
<tr>
<td>Falk, John</td>
<td>173</td>
</tr>
<tr>
<td>Fan, Nannan</td>
<td>144</td>
</tr>
<tr>
<td>Fantone, Dominick</td>
<td>135</td>
</tr>
<tr>
<td>Farland-Smith, Donna</td>
<td>73</td>
</tr>
<tr>
<td>Farris, Amy</td>
<td>47, 94, 125</td>
</tr>
<tr>
<td>Faux, Russell</td>
<td>59</td>
</tr>
<tr>
<td>Fazio, Xavier</td>
<td>105, 152</td>
</tr>
<tr>
<td>Feder, Ellen</td>
<td>104</td>
</tr>
<tr>
<td>Feinstein, Noah</td>
<td>141</td>
</tr>
<tr>
<td>Feldman, Allan</td>
<td>94</td>
</tr>
<tr>
<td>Feldman, Kimberly</td>
<td>113</td>
</tr>
<tr>
<td>Fenton, Diana</td>
<td>86</td>
</tr>
<tr>
<td>Ferrari, Brittney</td>
<td>126</td>
</tr>
<tr>
<td>Ferreira González, Laura</td>
<td>69</td>
</tr>
<tr>
<td>Ferreira, Marcia</td>
<td>173</td>
</tr>
<tr>
<td>Fick, Sarah</td>
<td>118</td>
</tr>
<tr>
<td>Fiedler, Daniela</td>
<td>55, 100, 145</td>
</tr>
<tr>
<td>Fiedler, Kristin</td>
<td>60</td>
</tr>
<tr>
<td>Findlay, Jessica</td>
<td>145</td>
</tr>
<tr>
<td>Fine, Caitlin</td>
<td>60, 81, 121, 149</td>
</tr>
<tr>
<td>Fiorella, Logan</td>
<td>140</td>
</tr>
<tr>
<td>Firestone, Jonah</td>
<td>152</td>
</tr>
<tr>
<td>Fischer, Heather</td>
<td>110</td>
</tr>
<tr>
<td>Fischer, Matthias</td>
<td>136</td>
</tr>
<tr>
<td>Fischer, Vanessa</td>
<td>138</td>
</tr>
<tr>
<td>Fisher, Molly</td>
<td>133</td>
</tr>
<tr>
<td>Fleming, Kevin</td>
<td>60</td>
</tr>
<tr>
<td>Fogelman, Sarah</td>
<td>81</td>
</tr>
<tr>
<td>Folk, William</td>
<td>89</td>
</tr>
<tr>
<td>Forbes, Cory</td>
<td>53</td>
</tr>
<tr>
<td>Ford, Danielle</td>
<td>93</td>
</tr>
<tr>
<td>Förtsch, Christian</td>
<td>51</td>
</tr>
<tr>
<td>Fortus, David</td>
<td>74</td>
</tr>
<tr>
<td>Fouad, Khadija</td>
<td>54, 155</td>
</tr>
<tr>
<td>Fowler, Camille</td>
<td>80</td>
</tr>
<tr>
<td>Fowler, Kelsie</td>
<td>123</td>
</tr>
<tr>
<td>Franca, Natalia</td>
<td>88, 170</td>
</tr>
<tr>
<td>Frank, Nicollette</td>
<td>177</td>
</tr>
<tr>
<td>Fraser, Barry</td>
<td>56</td>
</tr>
<tr>
<td>Frausto Aceves, Alejandra</td>
<td>117</td>
</tr>
<tr>
<td>Freed, Allison</td>
<td>155</td>
</tr>
<tr>
<td>Freese, Mareike</td>
<td>156</td>
</tr>
<tr>
<td>Friedman, Lawrence</td>
<td>64</td>
</tr>
<tr>
<td>Friege, Gunnar</td>
<td>132, 157</td>
</tr>
<tr>
<td>Fuhrmann, Tamar</td>
<td>47, 110</td>
</tr>
<tr>
<td>Fulmer, Gavin</td>
<td>75, 101, 112, 149, 158</td>
</tr>
<tr>
<td>Fuselier, Linda</td>
<td>125</td>
</tr>
<tr>
<td>Gallagher, Tiffany</td>
<td>152</td>
</tr>
<tr>
<td>Gallard, Alejandro</td>
<td>138</td>
</tr>
<tr>
<td>Gallivan, Seamus</td>
<td>53</td>
</tr>
<tr>
<td>Gamp, Tyler</td>
<td>143</td>
</tr>
<tr>
<td>Ganaiem, Wisal</td>
<td>150</td>
</tr>
<tr>
<td>Gandolfi, Haira</td>
<td>114</td>
</tr>
<tr>
<td>Gar, Lulu</td>
<td>76, 82</td>
</tr>
<tr>
<td>Garcia, Liliana</td>
<td>69, 148, 165</td>
</tr>
<tr>
<td>Garcia, Rachel</td>
<td>116, 162</td>
</tr>
<tr>
<td>Gardner, Grant</td>
<td>104, 154</td>
</tr>
<tr>
<td>Garik, Anna Victoria</td>
<td>59</td>
</tr>
<tr>
<td>Garik, Peter</td>
<td>59</td>
</tr>
<tr>
<td>Garner, Amanda</td>
<td>113</td>
</tr>
<tr>
<td>Garrecht, Carola</td>
<td>74, 85</td>
</tr>
<tr>
<td>Gastineau-Stevens, Tracy</td>
<td>82</td>
</tr>
<tr>
<td>Gbeleyi, Olasunkanmi</td>
<td>56, 71, 72, 79, 89, 91, 153, 154</td>
</tr>
<tr>
<td>Geller, Franny</td>
<td>85</td>
</tr>
<tr>
<td>Gericke, Niklas</td>
<td>74</td>
</tr>
<tr>
<td>Ghazal, Ihsan</td>
<td>91</td>
</tr>
<tr>
<td>Giamellaro, Michael</td>
<td>56</td>
</tr>
<tr>
<td>Gieske, Robert</td>
<td>48</td>
</tr>
<tr>
<td>Gil, Minyoung</td>
<td>92</td>
</tr>
<tr>
<td>Gilbert, Andrew</td>
<td>73</td>
</tr>
<tr>
<td>Gilmore, Sarah</td>
<td>66</td>
</tr>
<tr>
<td>Ginosar, Avshalom</td>
<td>147</td>
</tr>
<tr>
<td>Ginzburg, Tamar</td>
<td>76, 90, 122</td>
</tr>
<tr>
<td>Gisewhite, Rachel</td>
<td>72</td>
</tr>
<tr>
<td>Gist, Jenna</td>
<td>80</td>
</tr>
<tr>
<td>Gladstone, Jessica</td>
<td>90</td>
</tr>
<tr>
<td>Glasson, George</td>
<td>108</td>
</tr>
<tr>
<td>Glatz, Lion</td>
<td>48</td>
</tr>
<tr>
<td>Gliese, Sara</td>
<td>49</td>
</tr>
<tr>
<td>Goebel, Tim</td>
<td>95</td>
</tr>
<tr>
<td>Goetz, Tami</td>
<td>149</td>
</tr>
<tr>
<td>Gold, Anne</td>
<td>158</td>
</tr>
<tr>
<td>Goldrup, Raquel</td>
<td>82</td>
</tr>
<tr>
<td>Gomez Zaccarelli, Florencia</td>
<td>101</td>
</tr>
<tr>
<td>Gomez, Kimberley</td>
<td>128</td>
</tr>
<tr>
<td>Goncz, Amanda</td>
<td>164</td>
</tr>
<tr>
<td>Gonsalves, Allison</td>
<td>58</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Gonzalez Montalvo, Ricardo</td>
<td>82</td>
</tr>
<tr>
<td>Gonzalez, Alexis</td>
<td>70</td>
</tr>
<tr>
<td>González-Herrera, Manuela</td>
<td>171</td>
</tr>
<tr>
<td>González-Howard, Maria</td>
<td>48, 84, 99, 129</td>
</tr>
<tr>
<td>Goodpater, Sagan</td>
<td>66</td>
</tr>
<tr>
<td>Goonan, Christine</td>
<td>95</td>
</tr>
<tr>
<td>Goren, Dilara</td>
<td>122</td>
</tr>
<tr>
<td>Gorton, William</td>
<td>112</td>
</tr>
<tr>
<td>Gotch, Chad</td>
<td>118</td>
</tr>
<tr>
<td>Gotwals, Amelia</td>
<td>99, 107</td>
</tr>
<tr>
<td>Gouvea, Julia</td>
<td>139</td>
</tr>
<tr>
<td>Graham, Savannah</td>
<td>54, 116</td>
</tr>
<tr>
<td>Granger, Ellen</td>
<td>163</td>
</tr>
<tr>
<td>Gray, Ron</td>
<td>79, 162</td>
</tr>
<tr>
<td>Greenberg, Day</td>
<td>96</td>
</tr>
<tr>
<td>Greenfield, Ben</td>
<td>144</td>
</tr>
<tr>
<td>Greenwell, Zephaniah</td>
<td>126</td>
</tr>
<tr>
<td>Greitäns, Kärlis</td>
<td>60</td>
</tr>
<tr>
<td>Grenon, Muriel</td>
<td>68</td>
</tr>
<tr>
<td>Grieger, Krystal</td>
<td>125</td>
</tr>
<tr>
<td>Griesemer, Chris</td>
<td>67</td>
</tr>
<tr>
<td>Grinath, Anna</td>
<td>79</td>
</tr>
<tr>
<td>Gritz, Wolfgang</td>
<td>158</td>
</tr>
<tr>
<td>Grooms, Ain</td>
<td>62, 159</td>
</tr>
<tr>
<td>Grooms, Jonathon</td>
<td>60</td>
</tr>
<tr>
<td>Großschedl, Jörg</td>
<td>55, 70, 153</td>
</tr>
<tr>
<td>Guarrella, Cristina</td>
<td>81</td>
</tr>
<tr>
<td>Guerra, Andreia</td>
<td>114</td>
</tr>
<tr>
<td>Guerrero, Brenda</td>
<td>147</td>
</tr>
<tr>
<td>Gueth, Fabien</td>
<td>56</td>
</tr>
<tr>
<td>Guillotte, Amy</td>
<td>141</td>
</tr>
<tr>
<td>Gunckel, Kristin</td>
<td>117, 139</td>
</tr>
<tr>
<td>Gunning, Amanda</td>
<td>50, 62</td>
</tr>
<tr>
<td>Gupta, Preeti</td>
<td>85, 127</td>
</tr>
<tr>
<td>Gussen, Lea</td>
<td>69</td>
</tr>
<tr>
<td>Gutierrez, Kristie</td>
<td>86</td>
</tr>
<tr>
<td>Gutowski, Roxanne</td>
<td>116, 152</td>
</tr>
<tr>
<td>Guy-Gaytán, Candice</td>
<td>146</td>
</tr>
<tr>
<td>Guyot, Katherine</td>
<td>64</td>
</tr>
<tr>
<td>Guzy, Selcen</td>
<td>57, 70, 80, 120</td>
</tr>
<tr>
<td>Guzman, Magda</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Ha, Heesoo</td>
<td>85, 113</td>
</tr>
<tr>
<td>Haas, Shannon</td>
<td>124</td>
</tr>
<tr>
<td>Haavind, Sarah</td>
<td>177</td>
</tr>
<tr>
<td>Habig, Bobby</td>
<td>85</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>--------------</td>
<td>-------</td>
</tr>
<tr>
<td>Hayes, Kathryn</td>
<td>90, 95</td>
</tr>
<tr>
<td>Hayes, Meredith</td>
<td>57</td>
</tr>
<tr>
<td>He, Cheng-Wen</td>
<td>140</td>
</tr>
<tr>
<td>He, Peng</td>
<td>112, 139, 156</td>
</tr>
<tr>
<td>He, Weiwei</td>
<td>52, 87</td>
</tr>
<tr>
<td>Heacock, Kayla</td>
<td>59</td>
</tr>
<tr>
<td>Heath, Amanda Lake</td>
<td>104</td>
</tr>
<tr>
<td>Heil, Austin</td>
<td>93</td>
</tr>
<tr>
<td>Heinitz, Benjamin</td>
<td>148</td>
</tr>
<tr>
<td>Heisler, Jennifer</td>
<td>61</td>
</tr>
<tr>
<td>Helmke, Abigail</td>
<td>102</td>
</tr>
<tr>
<td>Hendricks, Joseph</td>
<td>102</td>
</tr>
<tr>
<td>Henley, Jordan</td>
<td>61</td>
</tr>
<tr>
<td>Henson, Kate</td>
<td>164</td>
</tr>
<tr>
<td>Henze, Ineke</td>
<td>92</td>
</tr>
<tr>
<td>Heredia, Sara</td>
<td>80, 81, 88, 128, 164</td>
</tr>
<tr>
<td>Herman, Benjamin</td>
<td>96</td>
</tr>
<tr>
<td>Hermann, Ronald</td>
<td>111</td>
</tr>
<tr>
<td>Herrick, Imogen</td>
<td>137</td>
</tr>
<tr>
<td>Herring, Hada</td>
<td>53</td>
</tr>
<tr>
<td>Herscovitz, Orit</td>
<td>150</td>
</tr>
<tr>
<td>Hester, Josiah</td>
<td>44</td>
</tr>
<tr>
<td>Hieb, Jeffrey</td>
<td>125</td>
</tr>
<tr>
<td>Higdon, Robbie</td>
<td>155</td>
</tr>
<tr>
<td>Higgins, Marc</td>
<td>160</td>
</tr>
<tr>
<td>Hike, Nina</td>
<td>118, 165</td>
</tr>
<tr>
<td>Hinman, Tierney</td>
<td>69</td>
</tr>
<tr>
<td>Hiwatig, Benny</td>
<td>44, 112</td>
</tr>
<tr>
<td>Hoard, Althea</td>
<td>61</td>
</tr>
<tr>
<td>Hoekstra, Steven</td>
<td>115</td>
</tr>
<tr>
<td>Hokayem, Hayat</td>
<td>54, 91, 132</td>
</tr>
<tr>
<td>Holford, Mandé</td>
<td>85</td>
</tr>
<tr>
<td>Holland, Kurt</td>
<td>144</td>
</tr>
<tr>
<td>Holmes, Natasha</td>
<td>92</td>
</tr>
<tr>
<td>Holtzman, Steven</td>
<td>128</td>
</tr>
<tr>
<td>Hong, Hun-Gi</td>
<td>113</td>
</tr>
<tr>
<td>Hong, Zuway-R</td>
<td>78, 139</td>
</tr>
<tr>
<td>Horgan, Jacqueline</td>
<td>80</td>
</tr>
<tr>
<td>Horn, Michael</td>
<td>105, 136</td>
</tr>
<tr>
<td>Horvath, Larry</td>
<td>90</td>
</tr>
<tr>
<td>Horz, Holger</td>
<td>146</td>
</tr>
<tr>
<td>Hossein, Kathrynn</td>
<td>58, 114</td>
</tr>
<tr>
<td>Howell, Heather</td>
<td>111</td>
</tr>
<tr>
<td>Howes, Elaine</td>
<td>50</td>
</tr>
<tr>
<td>Hu, Peter</td>
<td>132</td>
</tr>
<tr>
<td>Huang, Yifeng</td>
<td>161</td>
</tr>
<tr>
<td>Huang, Yuxi</td>
<td>112</td>
</tr>
<tr>
<td>Name</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Johnson, Joseph</td>
<td>72</td>
</tr>
<tr>
<td>Johnson, Matthew</td>
<td>92</td>
</tr>
<tr>
<td>Johnson, Tracy</td>
<td>161</td>
</tr>
<tr>
<td>Johnston, Mary</td>
<td>136</td>
</tr>
<tr>
<td>Jones, Devan</td>
<td>137</td>
</tr>
<tr>
<td>Jones, Eric</td>
<td>176</td>
</tr>
<tr>
<td>Jones, M. Gail</td>
<td>79, 125, 131, 156</td>
</tr>
<tr>
<td>Jones, Mike</td>
<td>124</td>
</tr>
<tr>
<td>Jordan, Michelle</td>
<td>84</td>
</tr>
<tr>
<td>Jornet, Alfredo</td>
<td>130</td>
</tr>
<tr>
<td>Joseph, Darold</td>
<td>59</td>
</tr>
<tr>
<td>Joy, David</td>
<td>85, 152, 165</td>
</tr>
<tr>
<td>Judson, Eugene</td>
<td>74</td>
</tr>
<tr>
<td>Jung, Karl</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Korkor, Ebenezer</td>
<td>125</td>
</tr>
<tr>
<td>Kotler, Rebecca</td>
<td>157</td>
</tr>
<tr>
<td>Koukoulidis, Niki</td>
<td>53, 155</td>
</tr>
<tr>
<td>Koul, Rekha</td>
<td>56</td>
</tr>
<tr>
<td>Kraft, Amy</td>
<td>80</td>
</tr>
<tr>
<td>Krajcik, Joseph</td>
<td>51, 76, 87, 91, 100, 139, 156, 158</td>
</tr>
<tr>
<td>Krall, Rebecca</td>
<td>66, 102</td>
</tr>
<tr>
<td>Kramarczuk, Kristina</td>
<td>105</td>
</tr>
<tr>
<td>Kranz, Johanna</td>
<td>61</td>
</tr>
<tr>
<td>Krebs, Rita</td>
<td>78</td>
</tr>
<tr>
<td>Krell, Moritz</td>
<td>85</td>
</tr>
<tr>
<td>Kremer, Joe</td>
<td>77</td>
</tr>
<tr>
<td>Kremer, Kerstin</td>
<td>143</td>
</tr>
<tr>
<td>Krishnan, Harini</td>
<td>45, 163</td>
</tr>
<tr>
<td>Krist, Christina</td>
<td>67, 122, 164</td>
</tr>
<tr>
<td>Krüger, Annika</td>
<td>131</td>
</tr>
<tr>
<td>Kruse, Jerrid</td>
<td>89, 97</td>
</tr>
<tr>
<td>Kubsch, Marcus</td>
<td>60, 84, 122, 127</td>
</tr>
<tr>
<td>Küchemann, Stefan</td>
<td>110</td>
</tr>
<tr>
<td>Kuhn, Jochen</td>
<td>110, 139</td>
</tr>
<tr>
<td>Kulkarni, Chinmay</td>
<td>149</td>
</tr>
<tr>
<td>Kulp, Kelly</td>
<td>119</td>
</tr>
<tr>
<td>Kum, Joon</td>
<td>62</td>
</tr>
<tr>
<td>Kuo, Tzu Yu</td>
<td>47</td>
</tr>
<tr>
<td>Kuperstein, Hagit</td>
<td>150</td>
</tr>
<tr>
<td>Kurbatova, Masha</td>
<td>126</td>
</tr>
<tr>
<td>Kurland, Barbara</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Labriole, Michaela</td>
<td>64</td>
</tr>
<tr>
<td>Laclede, Laura</td>
<td>71</td>
</tr>
<tr>
<td>Lacy, Sara</td>
<td>145</td>
</tr>
<tr>
<td>Lamb, Richard</td>
<td>102, 129, 158</td>
</tr>
<tr>
<td>Lance, Matthew</td>
<td>54</td>
</tr>
<tr>
<td>Land, Susan</td>
<td>49</td>
</tr>
<tr>
<td>Lane, Kady</td>
<td>66, 111</td>
</tr>
<tr>
<td>Lannin, Amy</td>
<td>71, 89</td>
</tr>
<tr>
<td>Larkin, Cormac</td>
<td>115</td>
</tr>
<tr>
<td>Larkin, Douglas</td>
<td>119</td>
</tr>
<tr>
<td>Larrain, Antonia</td>
<td>87</td>
</tr>
<tr>
<td>Lau, David</td>
<td>176</td>
</tr>
<tr>
<td>Laurent, Emma</td>
<td>66</td>
</tr>
<tr>
<td>Lawson, Michael</td>
<td>137</td>
</tr>
<tr>
<td>Leammukda, Felicia</td>
<td>133</td>
</tr>
<tr>
<td>Leavens, Teresa</td>
<td>93</td>
</tr>
<tr>
<td>Lederman, Judith</td>
<td>44, 77, 143</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Liu, Conghui</td>
<td>97, 140</td>
</tr>
<tr>
<td>Liu, Feng</td>
<td>87</td>
</tr>
<tr>
<td>Liu, Huan</td>
<td>132, 155</td>
</tr>
<tr>
<td>Liu, Lei</td>
<td>87, 138</td>
</tr>
<tr>
<td>Liu, Ren</td>
<td>52</td>
</tr>
<tr>
<td>Liu, Shiang-Yao</td>
<td>45, 140</td>
</tr>
<tr>
<td>Liu, Xiufeng</td>
<td>138</td>
</tr>
<tr>
<td>Livni Alcasid, Gur</td>
<td>100</td>
</tr>
<tr>
<td>Lo, Abraham</td>
<td>118</td>
</tr>
<tr>
<td>Lo, Stanley</td>
<td>55</td>
</tr>
<tr>
<td>Lo, Yu-Heng</td>
<td>173</td>
</tr>
<tr>
<td>Locke, Sharon</td>
<td>144</td>
</tr>
<tr>
<td>Loken, Eric</td>
<td>66</td>
</tr>
<tr>
<td>López López, Mónica</td>
<td>134</td>
</tr>
<tr>
<td>Losschky, Lester</td>
<td>161</td>
</tr>
<tr>
<td>Lotter, Christine</td>
<td>128</td>
</tr>
<tr>
<td>Lottero-Perdue, Pamela</td>
<td>111, 161</td>
</tr>
<tr>
<td>Louca, Lucas</td>
<td>57</td>
</tr>
<tr>
<td>Louis, Vanessa</td>
<td>59</td>
</tr>
<tr>
<td>Low, Russanne</td>
<td>110</td>
</tr>
<tr>
<td>Lowell, Benjamin</td>
<td>60, 149, 156</td>
</tr>
<tr>
<td>Lucas, Lyrica</td>
<td>176</td>
</tr>
<tr>
<td>Lucas, Sarah</td>
<td>134</td>
</tr>
<tr>
<td>Ludwig, Tobias</td>
<td>49, 100, 109</td>
</tr>
<tr>
<td>Luehmann, April</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
McCartney, Melissa 148  Miller, Emily 161
McCausland, Jonathan 51, 131, 134, 135, 142  Miller, Jadda 143
McClain, Lucy 49  Miller, Kate 50, 165
McComas, William 83  Miller-Rushing, Anica 95, 121
McCurdy, Regina 99, 116, 145  Milne, Catherine 160
McDonald, Lisa 151  Milner-Bolotin, Marina 128
McDonald, Scott 51, 96, 125, 131, 142  Minkley, Nina 85
McDowell, Gary 49  Minogue, James 93, 136
McDuffie, Hannah 73  Mintah, Olayinka 61
McFeetors, Janelle 65  Miroff, Laurie 109
McGee, Steven 92  Mocerino, Mauro 73, 74
McGowan, Jill 57  Moeller, Andrea 61
McGrail, Christine 109  Mohammad Isa, Izzah Mardhiya 176
McKenna, TJ 83  Mohan, Lindsey 146
McLean, Megan 118  Möhlenkamp, Michelle 143
McLure, Felicity 56  Mohorn-Mintah, Olayinka 61
McNeal, Peggy 125  Molina, Carlos 132
McNeill, Katherine 60, 81, 121, 149, 156  Molitor, Scott 70
McNish, Donald 69, 148  Möller, Andrea 153
Meier, David 176  Momohara, Kenya 140
Melle, Insa 140  Monahan, Rob 136
Melo, Natalie 117  Moody, Galan 95
Meltzer, Joie 51, 81  Moore Mensah, Felicia 121
Méndez Pérez, Karina 48, 84, 129  Moore, Tamara 120, 131
Menendez, David 145  Morales, Consuelo 77, 92, 149
Menke, Lucas 97  Morales-Doyle, Daniel 117, 165
Menon, Deepika 68, 119, 125, 162  Morandi, Sierra 128, 141, 163
Menon, Preetha 77, 150  Morek, Miriam 66
Mensah, Adjoa 103, 117  Morell, Linda 117, 139
Mensah, Felicia 61, 84, 142, 151  Moreno, Dan 139
Mensah, Felicia Moore 121  Morge, Shelby 111
Mercan, Fatih 173  Moriarty, Tammy 150
Mercier, Alison 69, 121, 166  Morphew, Jason 162
Merliss, Gena 96  Morton, Terrell 52, 116
Metcalf, Allison 117, 163, 172  Mosley, Diarra 134
Metcalf, Leah 126, 133  Mostacedo-Marasovic, Silvia-Jessica 53
Metzger, Christy 93  Moura, Cristiano 114
Meza-Torres, Carlos 84  Mouza, Chrystalla 164
Mickle Moldavan, Alesia 83  Mowatt, Molly 134
Mientus, Lukas 87, 170  Muller, Alexandria 165
Mihye, Won 73  Müller, Swantje 127
Mikeska, Jamie 51, 111, 128, 161  Mulvey, Bridget 53
Molarsky, Tracey 89  Mumba, Frackson 174, 175
Miles, Monica 53, 57  Munakata, Mika 132
Miles, Rhea 126  Munford, Danusa 134
Miller, Alison 112  Munoz, Mayra 120
Miller, Cory 51  Munro, Lyndsay 118, 130
Murray, Bridget 124  Novak, Michael 77
Murray, Brittany 52  Nowak, Anna 88, 170
Murray, Jaclyn 176  Nuñez, Paola 54, 65
Mutegi, Jomo 167  Nyachwaya, James 125
Myers, Adam 173  Nyaema, Mary 64

N
Nafzinger, Bailey 83  Nyamupangedengu, Eunice 94
Namdar, Bahadir 170  Nyawelo, Tino 82
Namsonsone, Dace 60, 81
Nancy, Sharfun Islam 94  O’Connor, Dawn 95
Napolitano, Kristen 50, 62  Odekeye, Ola Tokunbo 170
Nation, Jasmine 144  Ogan-Bekiroglu, Feral 65, 108
Natividad, Hannah 157  Ogundapo, Taiwo 111
Navy, Shannon 81, 94, 119  Ogunlade, Yinka 49, 56, 153
Nazaretssky, Tanya 99  Ozan, Beyza 65
Nehm, Ross 100, 122, 154  Ozan, Ozlem 163
Nehring, Andreas 43, 103, 148
Neider, Xyan 68  Okebukola, Peter 49, 56, 71, 72, 76, 79, 89, 91, 153, 154
Nelson, Jennifer 90
Nelson-Barber, Sharon 44, 47, 151  Okorie, Henry 92
Neuhaus, Birgit 51  Oladejo, Adekunle 49, 56, 71, 72, 79, 89, 91, 153, 154
Neumann, Irene 143
Neumann, Knut 60, 91, 107, 127, 129  Olarte, Royce 69, 148
Newell, Alana 146  Olitsky, Stacy 174
Newton, Mark 73  Olson, Alister 96
Ngai, Courtney 89  Olson, Joanne 90
Nguyen, Hai 88, 170  Onowugbeda, Franklin 56, 71, 72, 79, 89, 91, 153
Nguyen, Kimberly 151
Nguyen, Minh 161  Ormerod, Kendra 136
Nicholas-Figueroa, Linda 60  Orrill, Chandra 101
Nichols, Bryan 158  Ortiz, Denise 161
Nieuwsma, Julianna 79, 156  Ortiz, Miriam 138
Nilsen, Katy 156  Osborne, Jonathan 52, 117, 141, 150
Nipyrakis, Argyris 134, 141  Ostdiek, Lauren 48
Nitecki, Elena 62  Österlein, Jan-Martin 66
Nixon, Ryan 101, 145  Ottenbreit-Leftwich, Anne 120, 131
Nolan, Eric 90  Owen, Colleen 124
Nolan, Katie 135  Owens, David 60
Noll, Jamie 77  Ozen-Tasdemir, Hatice 48
Noll, Jennifer 75  Ozturk, Nilay 100
Nolte, Amanda 164  Özülkü, Elif 48
Nordine, Jeffrey 60, 74, 93  Ozyazici, Gizem 137
North, Monique 103
Nouri, Noushin 83
Novak, Dawn 77  Pacheco, Mark 155
Novak, Elena 94
<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paechter, Manuela</td>
<td>131</td>
<td>Phillips, Michelle</td>
<td>80, 128, 164</td>
</tr>
<tr>
<td>Paine, Spencer</td>
<td>144</td>
<td>Phillips, Nathan</td>
<td>157</td>
</tr>
<tr>
<td>Painter, Jason</td>
<td>112, 135</td>
<td>Pierre, Takeshia</td>
<td>58, 99, 142</td>
</tr>
<tr>
<td>Pallant, Amy</td>
<td>125, 131</td>
<td>Pierroux, Palmyre</td>
<td>68</td>
</tr>
<tr>
<td>Pao, Serena</td>
<td>117, 172</td>
<td>Pierson, Ashlyn</td>
<td>50, 92</td>
</tr>
<tr>
<td>Parekh, Priyanka</td>
<td>176</td>
<td>Pieterman-Bos, Annelies</td>
<td>122</td>
</tr>
<tr>
<td>Parham, Abigayle</td>
<td>133</td>
<td>Pimentel, Daniel</td>
<td>77</td>
</tr>
<tr>
<td>Park, Elizabeth</td>
<td>126</td>
<td>Pinsoneau, Adrienne</td>
<td>50</td>
</tr>
<tr>
<td>Park, Jongchan</td>
<td>84, 132, 155</td>
<td>Pirkle Howd, Laura</td>
<td>74</td>
</tr>
<tr>
<td>Park, Soonhy</td>
<td>112, 119, 127, 132, 135, 156</td>
<td>Pleasants, Jacob</td>
<td>90, 169, 173</td>
</tr>
<tr>
<td>Park, Wonyong</td>
<td>114, 150</td>
<td>Plitch, Katja</td>
<td>161</td>
</tr>
<tr>
<td>Parker, Margaret</td>
<td>124</td>
<td>Plummer, Julia</td>
<td>78, 124</td>
</tr>
<tr>
<td>Parraguez, Carolina</td>
<td>53</td>
<td>Polanin, Joseph</td>
<td>176</td>
</tr>
<tr>
<td>Parslow, Michelle</td>
<td>85, 152, 165</td>
<td>Poling, Jack</td>
<td>149</td>
</tr>
<tr>
<td>Passmore, Cynthia</td>
<td>67</td>
<td>Pollock, Lori</td>
<td>164</td>
</tr>
<tr>
<td>Patel, Sahil</td>
<td>95</td>
<td>Polman, Joseph</td>
<td>176</td>
</tr>
<tr>
<td>Patterson, Zac</td>
<td>91</td>
<td>Pomeran Bogdanov, Katarzyna</td>
<td>165</td>
</tr>
<tr>
<td>Pattison, Scott</td>
<td>68</td>
<td>Poole Patzelt, Suzanne</td>
<td>116</td>
</tr>
<tr>
<td>Patzelt, Suzanne</td>
<td>103, 119</td>
<td>Poor, Sarah</td>
<td>96</td>
</tr>
<tr>
<td>Pavez, Jose</td>
<td>112, 119</td>
<td>Popejoy, Kate</td>
<td>152</td>
</tr>
<tr>
<td>Pavlovich, Christine</td>
<td>162</td>
<td>Pratt, Kerri</td>
<td>60</td>
</tr>
<tr>
<td>Pazos-Lago, Pilar</td>
<td>86</td>
<td>Preminger, Linda</td>
<td>95</td>
</tr>
<tr>
<td>Peck, Tabitha</td>
<td>136</td>
<td>Price, Nancy</td>
<td>122</td>
</tr>
<tr>
<td>Pedro, Gabriel</td>
<td>173</td>
<td>Prince, Adepeju</td>
<td>61, 81, 119</td>
</tr>
<tr>
<td>Peel, Amelia</td>
<td>105, 136</td>
<td>Pringle, Rose</td>
<td>58</td>
</tr>
<tr>
<td>Peel, Moria</td>
<td>66</td>
<td>Pugh, Priya</td>
<td>96, 172</td>
</tr>
<tr>
<td>Peleg, Ran</td>
<td>68</td>
<td>Pungello, Mia</td>
<td>52</td>
</tr>
<tr>
<td>Peña-Telfer, Laura</td>
<td>108</td>
<td>Punwai, Noelani</td>
<td>177</td>
</tr>
<tr>
<td>Penuel, William</td>
<td>67, 164</td>
<td>Pupik Dean, Chris</td>
<td>141</td>
</tr>
<tr>
<td>Pereira, Beatriz</td>
<td>173</td>
<td>Purwanto, Muhammad</td>
<td>78</td>
</tr>
<tr>
<td>Peretz, Roee</td>
<td>105</td>
<td>Purzer, Senay</td>
<td>109</td>
</tr>
<tr>
<td>Perez, Abby</td>
<td>127</td>
<td>Puttick, Gillian</td>
<td>145</td>
</tr>
<tr>
<td>Pérez, Greses</td>
<td>113</td>
<td>Q</td>
<td></td>
</tr>
<tr>
<td>Perkins Coppola, Matthew</td>
<td>134</td>
<td>Qi, Yi</td>
<td>87</td>
</tr>
<tr>
<td>Perry, Spencer</td>
<td>111</td>
<td>Quintana-Cifuentes, Jenny</td>
<td>109</td>
</tr>
<tr>
<td>Peter, David</td>
<td>72</td>
<td>Qureshi, Farah</td>
<td>137</td>
</tr>
<tr>
<td>Peter, Esther</td>
<td>56, 72, 79, 92, 153, 154</td>
<td>Qureshi, Nadia</td>
<td>58</td>
</tr>
<tr>
<td>Peters, Jeff</td>
<td>133</td>
<td>Q</td>
<td></td>
</tr>
<tr>
<td>Peters, Michelle</td>
<td>130</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Peters-Burton, Erin</td>
<td>71</td>
<td>Race, Alexandra</td>
<td>53</td>
</tr>
<tr>
<td>Petersen, Stefan</td>
<td>127</td>
<td>Rachmatullah, Arif</td>
<td>152</td>
</tr>
<tr>
<td>Peterson, Matthew</td>
<td>143</td>
<td>Rackmill, Marnie</td>
<td>125</td>
</tr>
<tr>
<td>Phang, Fatin Aliah</td>
<td>176</td>
<td>Radebe, Nomfundo</td>
<td>171</td>
</tr>
<tr>
<td>Philippoff, Joanna</td>
<td>81</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Phillips, Andrea</td>
<td>109, 173</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------</td>
<td>-------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Radloff, Jeffrey</td>
<td>94, 135</td>
<td>Roberts, Kari</td>
<td>163</td>
</tr>
<tr>
<td>Ragan, Scott</td>
<td>112, 135</td>
<td>Roberts, Sarah</td>
<td>69, 148</td>
</tr>
<tr>
<td>Rahman, Mukaila</td>
<td>170</td>
<td>Robinson, Julie</td>
<td>44, 47</td>
</tr>
<tr>
<td>Rahman, Shukufi</td>
<td>140</td>
<td>Robinson-Hill, Rona</td>
<td>76</td>
</tr>
<tr>
<td>Rajwade, Aparajita</td>
<td>117, 129, 159</td>
<td>Robles, Gregorio</td>
<td>94</td>
</tr>
<tr>
<td>Ramdath, Kellyann</td>
<td>53, 136, 142</td>
<td>Rock, Ronan</td>
<td>157</td>
</tr>
<tr>
<td>Ramirez Villarin, Lorraine</td>
<td>86</td>
<td>Rocker Yoel, Shahaf</td>
<td>79, 153</td>
</tr>
<tr>
<td>Ramsey, Ross</td>
<td>133</td>
<td>Rocksen, Miranda</td>
<td>100</td>
</tr>
<tr>
<td>Randall, Allyson</td>
<td>129</td>
<td>Rodemer, Marc</td>
<td>71, 131, 139, 148</td>
</tr>
<tr>
<td>Rao, Asha</td>
<td>96</td>
<td>Rodgers, Melissa</td>
<td>114</td>
</tr>
<tr>
<td>Ratcliff, Andrea</td>
<td>82</td>
<td>Roditi, Hudson</td>
<td>124</td>
</tr>
<tr>
<td>Reano, Darryl</td>
<td>146</td>
<td>Rodrigue-Poulin, Élise</td>
<td>105</td>
</tr>
<tr>
<td>Rebello, Carina</td>
<td>162</td>
<td>Rodriguez, Miguel</td>
<td>99</td>
</tr>
<tr>
<td>Rebello, N. Sanjay</td>
<td>80, 162</td>
<td>Roehrig, Gillian</td>
<td>44, 46, 52, 59, 78, 84, 100, 112, 120, 155, 167</td>
</tr>
<tr>
<td>Reeder, Andrea</td>
<td>116</td>
<td>Rledy, Aaron</td>
<td>50</td>
</tr>
<tr>
<td>Reedy, Aaron</td>
<td>70</td>
<td>Rogn-Klyve, Allyson</td>
<td>50</td>
</tr>
<tr>
<td>Refvem, Emma</td>
<td>79, 156</td>
<td>Rolon-Dow, Rosalie</td>
<td>164</td>
</tr>
<tr>
<td>Reich, Christoph</td>
<td>100</td>
<td>Román, Diego</td>
<td>113</td>
</tr>
<tr>
<td>Reigh, Emily</td>
<td>161</td>
<td>Romine, William</td>
<td>70, 78, 89, 133</td>
</tr>
<tr>
<td>Reiser, Brian</td>
<td>67, 77, 164</td>
<td>Roplth, Mathias</td>
<td>58, 66, 93, 143</td>
</tr>
<tr>
<td>Reiss, Michael</td>
<td>60</td>
<td>Rose, Kerry</td>
<td>65</td>
</tr>
<tr>
<td>Reith, Marco</td>
<td>103</td>
<td>Rosenbaum, Leah</td>
<td>47, 110</td>
</tr>
<tr>
<td>Retelsdorf, Jan</td>
<td>124</td>
<td>Rosenberg, Joshua</td>
<td>70, 84, 113, 122</td>
</tr>
<tr>
<td>Rexigel, Eva</td>
<td>139</td>
<td>Rosengrant, David</td>
<td>94</td>
</tr>
<tr>
<td>Reynolds, Connor</td>
<td>71</td>
<td>Rost, Marvin</td>
<td>78</td>
</tr>
<tr>
<td>Reynolds, Matt</td>
<td>112, 135</td>
<td>Rothman, Jason</td>
<td>109</td>
</tr>
<tr>
<td>Rheemer, Danielle</td>
<td>81, 107, 141</td>
<td>Rothman, Stephanie</td>
<td>109</td>
</tr>
<tr>
<td>Ribay, Kathryn</td>
<td>53, 94</td>
<td>Rouleau, Mark</td>
<td>44, 112, 120</td>
</tr>
<tr>
<td>Rich, Peter</td>
<td>71</td>
<td>Rozenblum, Yael</td>
<td>147, 148</td>
</tr>
<tr>
<td>Richard, Eleanor</td>
<td>121, 156</td>
<td>Rozhenkova, Veronika</td>
<td>126</td>
</tr>
<tr>
<td>Richards, Cameron</td>
<td>82</td>
<td>Rudi, Rita</td>
<td>97</td>
</tr>
<tr>
<td>Richards, Jennifer</td>
<td>164</td>
<td>Rueckert, Simone</td>
<td>159</td>
</tr>
<tr>
<td>Richey, J.</td>
<td>164</td>
<td>Ruelas, Laura</td>
<td>164</td>
</tr>
<tr>
<td>Richland, Lindsey</td>
<td>105</td>
<td>Ruf, Verena</td>
<td>110</td>
</tr>
<tr>
<td>Richmond, Gail</td>
<td>76, 87, 133</td>
<td>Ruggirello, Rachel</td>
<td>159</td>
</tr>
<tr>
<td>Ricketts, Amy</td>
<td>86</td>
<td>Ruiz, Yamil</td>
<td>62</td>
</tr>
<tr>
<td>Riedinger, Kelly</td>
<td>110</td>
<td>Rumann, Stefan</td>
<td>131, 148</td>
</tr>
<tr>
<td>Riley, Alexis</td>
<td>61, 99</td>
<td>Rushton, Gregory</td>
<td>104, 149</td>
</tr>
<tr>
<td>Rillero, Peter</td>
<td>50</td>
<td>Russell, John</td>
<td>55</td>
</tr>
<tr>
<td>Ringleb, Stacie</td>
<td>86</td>
<td>Russo-Tait, Tatiane</td>
<td>99</td>
</tr>
<tr>
<td>Ring-Whalen, Elizabeth</td>
<td>120</td>
<td>Ryan, Tom</td>
<td>48</td>
</tr>
<tr>
<td>Ring-Whelan, Elizabeth</td>
<td>44</td>
<td>Rydin, Mikael</td>
<td>74</td>
</tr>
<tr>
<td>Rish, Ryan</td>
<td>53, 136</td>
<td>Ryu, Minjung</td>
<td>121</td>
</tr>
<tr>
<td>Ritchie, Marisa</td>
<td>144</td>
<td>Saberi, Maryam</td>
<td>83</td>
</tr>
<tr>
<td>Rivera, Seema</td>
<td>127</td>
<td>Sachmpazidi, Diana</td>
<td>103</td>
</tr>
<tr>
<td>Name</td>
<td>Page Numbers</td>
<td>Name</td>
<td>Page Numbers</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------</td>
<td>-----------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Sachs, Lindsey</td>
<td>57</td>
<td>Peddy, David</td>
<td>182</td>
</tr>
<tr>
<td>Sadler, Troy</td>
<td>72, 78, 84, 144, 160</td>
<td>Seeks, Christine</td>
<td>107, 116</td>
</tr>
<tr>
<td>Saenz, Lauren</td>
<td>112</td>
<td>Segal, Aliza</td>
<td>150</td>
</tr>
<tr>
<td>Sahin, Burak</td>
<td>43</td>
<td>Segura, David</td>
<td>165</td>
</tr>
<tr>
<td>Sahin, Ercin</td>
<td>101, 112</td>
<td>Sengupta, Pratim</td>
<td>58</td>
</tr>
<tr>
<td>Sailors, Misty</td>
<td>146</td>
<td>Setioko, Wahyu</td>
<td>110</td>
</tr>
<tr>
<td>Saleh, Abir</td>
<td>76, 172</td>
<td>Seung, Elsun</td>
<td>119, 127</td>
</tr>
<tr>
<td>Saleh, Mounir</td>
<td>169</td>
<td>Sevian, Hannah</td>
<td>147</td>
</tr>
<tr>
<td>Salem, Marie-Noel</td>
<td>169</td>
<td>Sezen-Barrie, Asli</td>
<td>75, 121</td>
</tr>
<tr>
<td>Salinas, Maria</td>
<td>92, 149</td>
<td>Shabani, Juma</td>
<td>49, 56, 71, 89, 153, 154</td>
</tr>
<tr>
<td>Salloum, Sara</td>
<td>99, 116, 174</td>
<td>Shaby, Neta</td>
<td>68, 108</td>
</tr>
<tr>
<td>Sample McMeeking, Laura</td>
<td>166</td>
<td>Shahab, Carmella</td>
<td>93</td>
</tr>
<tr>
<td>Sampson, Victor</td>
<td>77</td>
<td>Shanahan, Marie-Claire</td>
<td>58</td>
</tr>
<tr>
<td>Sanchez, Anastasia</td>
<td>122</td>
<td>Shapiro, Ben</td>
<td>176</td>
</tr>
<tr>
<td>Sanders, Miriam</td>
<td>126</td>
<td>Shapiro, Casey</td>
<td>93, 161</td>
</tr>
<tr>
<td>Sanni, Rasheed</td>
<td>91</td>
<td>Sharma, Meenakshi</td>
<td>68, 83</td>
</tr>
<tr>
<td>Santibanez, David</td>
<td>65</td>
<td>Sharma, Ritesh</td>
<td>88, 170</td>
</tr>
<tr>
<td>Santibáñez, David</td>
<td>51</td>
<td>Sharp, Katherine</td>
<td>66, 102</td>
</tr>
<tr>
<td>Sato, Brian</td>
<td>126</td>
<td>Shaul, Idit</td>
<td>73</td>
</tr>
<tr>
<td>Sbeglia, Gena</td>
<td>100, 154</td>
<td>Shauly, Anat</td>
<td>76, 94</td>
</tr>
<tr>
<td>Scantlebury, Kathryn</td>
<td>160</td>
<td>Shein, Paichi</td>
<td>47</td>
</tr>
<tr>
<td>Scarpa, Daniela</td>
<td>134</td>
<td>Shekell, Calli</td>
<td>111</td>
</tr>
<tr>
<td>Schaefer, Paulina</td>
<td>125</td>
<td>Shen, Max</td>
<td>95</td>
</tr>
<tr>
<td>Schellinger, Jennifer</td>
<td>64, 107, 141, 163</td>
<td>Sherry-Wagner, Jordan</td>
<td>121</td>
</tr>
<tr>
<td>Schenkel, Kathleen</td>
<td>52</td>
<td>Shim, Soo Won</td>
<td>70, 117</td>
</tr>
<tr>
<td>Schiering, Dustin</td>
<td>93</td>
<td>Shin, Hyo Joeng</td>
<td>157</td>
</tr>
<tr>
<td>Schindel, Alexandra</td>
<td>136, 142</td>
<td>Shin, Myunghwan</td>
<td>94</td>
</tr>
<tr>
<td>Schloesser, Katya</td>
<td>158</td>
<td>Shin, Namsoo</td>
<td>100, 156</td>
</tr>
<tr>
<td>Schlüter, Kirsten</td>
<td>70</td>
<td>Shipman, Joshua</td>
<td>134</td>
</tr>
<tr>
<td>Schmidt, Adrian</td>
<td>132</td>
<td>Short, Mary</td>
<td>166</td>
</tr>
<tr>
<td>Schmitz, Anke</td>
<td>124</td>
<td>Shtechman, Yael</td>
<td>55</td>
</tr>
<tr>
<td>Schneider Kavanagh, Sarah</td>
<td>141</td>
<td>Shultz, Ginger</td>
<td>60, 114</td>
</tr>
<tr>
<td>Schnittka, Christine</td>
<td>172, 174</td>
<td>Shultz, Noah</td>
<td>134</td>
</tr>
<tr>
<td>Schönle, Daniel</td>
<td>100</td>
<td>Si, Qi</td>
<td>101</td>
</tr>
<tr>
<td>Schuchardt, Anita</td>
<td>84, 132</td>
<td>Siegel, Marcelle</td>
<td>89, 170</td>
</tr>
<tr>
<td>Schultheis, Elizabeth</td>
<td>70</td>
<td>Sikorski, Tar</td>
<td>80</td>
</tr>
<tr>
<td>Schumacher, Fabian</td>
<td>69</td>
<td>Sikorski, Tiffany-Rose</td>
<td>55, 117</td>
</tr>
<tr>
<td>Schwanewedel, Julia</td>
<td>58</td>
<td>Sikuaq Erickson, Kaare</td>
<td>60</td>
</tr>
<tr>
<td>Schwartz, Renée´</td>
<td>143</td>
<td>Silva, Margarita</td>
<td>50</td>
</tr>
<tr>
<td>Schwarz, Christina</td>
<td>83, 128</td>
<td>Silverman, Elena</td>
<td>160</td>
</tr>
<tr>
<td>Schwendemann, Meredith</td>
<td>135, 164</td>
<td>Silvhiyan, Sary</td>
<td>97</td>
</tr>
<tr>
<td>Schwortz, Andria</td>
<td>173</td>
<td>Simani, Maria</td>
<td>161</td>
</tr>
<tr>
<td>Scipio, Déana</td>
<td>96, 172</td>
<td>Simms, Wendy</td>
<td>58</td>
</tr>
<tr>
<td>Scoggin, Sylvia</td>
<td>130</td>
<td>Simon, Marsha</td>
<td>107, 116</td>
</tr>
<tr>
<td>Scott, Fonya</td>
<td>104</td>
<td>Simonis, Molly</td>
<td>133</td>
</tr>
<tr>
<td>Scott, Heather</td>
<td>155</td>
<td>Simpson, Amber</td>
<td>108</td>
</tr>
<tr>
<td>Sedawi, Wisam</td>
<td>105, 110</td>
<td>Singh, Chandralekha</td>
<td>132</td>
</tr>
</tbody>
</table>
Singh, Harleen 45, 48 Steinbach, Martin 71
Singh, Mamta 108 Steingut, Rebecca 114
Sircar, Monica 135 Stelzer, Tim 80
Siry, Christina 59, 165 Stephen, Magdeline 171
Skorupa, Anna 160 Stephenson Reaves, Jessica 155
Skrob-Martin, Sam 154 Stevens, Reed 65
Smith, Cassandra 89 Stevenson, Emma 120
Smith, Gillian 156 Stinken-Rösner, Lisa 43
Smith, Jennifer 124 Stoll, Lauren 52
Smith, Josie 49 Stretch, Elizabeth 78
Smith, Kathleen (Kathy) 120 Stronach, Rachel 57, 130
Smith, P. 57 Stroupe, David 103
Smith, Theila 116, 133 Stump, Emily 92
Smith, Tim 120 Su, Man 105
Snider, Rachel 111 Suh, Jee Kyung 101, 112, 158
Snyder, Rebekah 101 Suh, Jennifer 73
Sobomehin, Kendra 53, 150 Sührig, Laura 43, 146
Sobomehin, Tamara 53, 150 Sukinarhimi, Peresang 47
Sobotka, Alex 83, 96 Sullivan, Kyle 96
Sofendi, Sofendi 97 Sultana, Omiya 70
Solli, Anne 100 Summers, Ryan 155
Solomon, Folashade 157 Sunal, Cynthia 107
Sorge, Stefan 93, 122 Sunal, Dennis 107
Soule, Cindy 146 Sung, Rou-Jia 55
Southerland, Sherry 64, 81, 93, 103, 108, 128, 141, 154, 163 Suwadu, Bugoma 50, 56, 89, 153
Soyturk, Ilker 94 Suzuki, Wendy 66
Sparks, Rachel 131 Svarovsky, Gina 68
Spektor-Levy, Ornit 73 Swain, Alexandra 101
Spencer, Jeffrey 60 Syifa, Mutiara 50
Spezza, Stephanie 157 Szopiak, Michael 56, 151
Spiteri, Tabetha 120 T
Spurgin, Caroline 99 Tabora, Johan 113
Squillace Stenlund, Kristine 132 Tagg, Elizabeth 101
Staggs, Molly 121 Tal, Tali 57, 76, 147
Stallings, Sarah 128 Talaian, Hamideh 80
Stamper, Tina 129 Talaue, Frederick 138
Stanley, Sabrina 107 Talbot, Robert 55
Starr, Mary 83 Tan, Sean 139
Starrett, Emily 84 Tana, Jamie 149
Staudt, Carolyn 177 Tank, Kristina 120, 131
Staus, Nancy 55, 173 Tasker, Roy 73, 74
Stavrou, Dimitris 134, 141 Tasquier, Giulia 130
Steegh, Anneke 127 Tate, Rhonda 147
Steele, David 69 Taylor, Joseph 55, 114
Steffen, Andreas 140 Taylor, Lezly 108
te Heesen, Kerstin 59
<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vogt, Patrik</td>
<td>48</td>
</tr>
<tr>
<td>Voitl, Frauke</td>
<td>143</td>
</tr>
<tr>
<td>Voss, Daniel</td>
<td>77</td>
</tr>
<tr>
<td>Voss, Sarah</td>
<td>89, 97</td>
</tr>
<tr>
<td>Voyer, Christine</td>
<td>112</td>
</tr>
<tr>
<td>Wade-Jaimes, Katherine</td>
<td>108, 142, 151, 172</td>
</tr>
<tr>
<td>Wadlington, Danielle</td>
<td>50</td>
</tr>
<tr>
<td>Wagenmakers, Eric-Jan</td>
<td>84</td>
</tr>
<tr>
<td>Wagh, Aditi</td>
<td>47, 110</td>
</tr>
<tr>
<td>Wagner, Catherine</td>
<td>48, 56, 151</td>
</tr>
<tr>
<td>Wagner, Lauren</td>
<td>88</td>
</tr>
<tr>
<td>Waight, Noemi</td>
<td>53, 114</td>
</tr>
<tr>
<td>Walker, Joi</td>
<td>102</td>
</tr>
<tr>
<td>Walker, Justice</td>
<td>43</td>
</tr>
<tr>
<td>Walker, William</td>
<td>70</td>
</tr>
<tr>
<td>Wallace, Jamie</td>
<td>50</td>
</tr>
<tr>
<td>Wallace, Stephanie</td>
<td>132</td>
</tr>
<tr>
<td>Waipuski, Maik</td>
<td>71, 138</td>
</tr>
<tr>
<td>Walser, Megan</td>
<td>103, 128</td>
</tr>
<tr>
<td>Walsh, Lisa</td>
<td>102</td>
</tr>
<tr>
<td>Walsh, Nicole</td>
<td>134, 135</td>
</tr>
<tr>
<td>Walton, Janet</td>
<td>129</td>
</tr>
<tr>
<td>Wang, Hsin-Hui</td>
<td>139</td>
</tr>
<tr>
<td>Wang, Xiuhong</td>
<td>139</td>
</tr>
<tr>
<td>Ward, Rebecca</td>
<td>79</td>
</tr>
<tr>
<td>Warfa, Abdi</td>
<td>118</td>
</tr>
<tr>
<td>Warren, Shannon</td>
<td>68</td>
</tr>
<tr>
<td>Water-Conte, Kathryn</td>
<td>104</td>
</tr>
<tr>
<td>Waters, Carol</td>
<td>104, 130</td>
</tr>
<tr>
<td>Watkins, Jessica</td>
<td>117, 172</td>
</tr>
<tr>
<td>Watkins, Shari</td>
<td>104</td>
</tr>
<tr>
<td>Watson, Bruce</td>
<td>177</td>
</tr>
<tr>
<td>Watts, Joseph</td>
<td>83</td>
</tr>
<tr>
<td>Waugh, Alexander</td>
<td>118</td>
</tr>
<tr>
<td>Weidman, Andrea</td>
<td>133</td>
</tr>
<tr>
<td>Weinberg, Andrea</td>
<td>166</td>
</tr>
<tr>
<td>Weineburgh, Molly</td>
<td>104, 152</td>
</tr>
<tr>
<td>Weinstein, Matthew</td>
<td>160</td>
</tr>
<tr>
<td>Weis, Lauren</td>
<td>104</td>
</tr>
<tr>
<td>Weith, Alisa</td>
<td>117</td>
</tr>
<tr>
<td>Welzel-Breuer, Manuela</td>
<td>136</td>
</tr>
<tr>
<td>Wenner, Julianne</td>
<td>137</td>
</tr>
<tr>
<td>Wertheim, Jill</td>
<td>52, 103</td>
</tr>
<tr>
<td>Wheeler, Laura</td>
<td>85, 97, 152, 165</td>
</tr>
<tr>
<td>White, Holly</td>
<td>53</td>
</tr>
<tr>
<td>Whitmore, Desiré</td>
<td>80</td>
</tr>
<tr>
<td>Whitworth, Brooke</td>
<td>45, 48, 62, 112, 135, 164</td>
</tr>
<tr>
<td>Wieselmann, Jeanna</td>
<td>119</td>
</tr>
<tr>
<td>Wilensky, Uri</td>
<td>105, 136</td>
</tr>
<tr>
<td>Wiles, Jason</td>
<td>49</td>
</tr>
<tr>
<td>Wilhelm, Jennifer</td>
<td>48, 82, 133</td>
</tr>
<tr>
<td>Wilkerson, Michelle</td>
<td>47, 110</td>
</tr>
<tr>
<td>Wilkins-Yel, Kerrie</td>
<td>142</td>
</tr>
<tr>
<td>Williams, London</td>
<td>161</td>
</tr>
<tr>
<td>Williamson, Francesca</td>
<td>55</td>
</tr>
<tr>
<td>Willis, Selene</td>
<td>99</td>
</tr>
<tr>
<td>Willison, Amy</td>
<td>136</td>
</tr>
<tr>
<td>Wilmes, Sara</td>
<td>59, 165</td>
</tr>
<tr>
<td>Wilson, Grant</td>
<td>70</td>
</tr>
<tr>
<td>Wilson, Jerry</td>
<td>52</td>
</tr>
<tr>
<td>Wilson, Mark</td>
<td>117, 139</td>
</tr>
<tr>
<td>Winkelman, Jan</td>
<td>146, 156</td>
</tr>
<tr>
<td>Winter, Veronika</td>
<td>61</td>
</tr>
<tr>
<td>Wiseman, Dawn</td>
<td>58</td>
</tr>
<tr>
<td>Witzig, Stephen</td>
<td>57, 130</td>
</tr>
<tr>
<td>Wojciechowski, Christopher</td>
<td>70</td>
</tr>
<tr>
<td>Wolf, Jacob</td>
<td>47</td>
</tr>
<tr>
<td>Won, Mihye</td>
<td>73</td>
</tr>
<tr>
<td>Wong, Joseph</td>
<td>105</td>
</tr>
<tr>
<td>Woodard, Rebecca</td>
<td>157</td>
</tr>
<tr>
<td>Woodruff, Karen</td>
<td>103</td>
</tr>
<tr>
<td>Worsley, Ti’Era</td>
<td>80, 99, 150</td>
</tr>
<tr>
<td>Wray, Kraig</td>
<td>131</td>
</tr>
<tr>
<td>Wright III, Gary</td>
<td>99</td>
</tr>
<tr>
<td>Wright, Gary</td>
<td>43, 99, 119</td>
</tr>
<tr>
<td>Wu, Chushan</td>
<td>113</td>
</tr>
<tr>
<td>Wu, Hsin-Kai</td>
<td>107</td>
</tr>
<tr>
<td>Wulff, Peter</td>
<td>87, 122, 170</td>
</tr>
</tbody>
</table>

X

<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xu, Mingfeng</td>
<td>139</td>
</tr>
</tbody>
</table>

Y

<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yacoubian, Hagop</td>
<td>114</td>
</tr>
<tr>
<td>Yamanaka, Nana</td>
<td>140</td>
</tr>
<tr>
<td>Yamout, Mariam</td>
<td>160</td>
</tr>
<tr>
<td>Yan, Lin</td>
<td>105</td>
</tr>
<tr>
<td>Yan, Shulong</td>
<td>143</td>
</tr>
<tr>
<td>Yang, Hui</td>
<td>152</td>
</tr>
<tr>
<td>Yarden, Anat</td>
<td>99, 150</td>
</tr>
</tbody>
</table>
Yaron, David 149
Yaron, Tamar 66
Yates, Kellie 149
Yauney, Jessica 71
Yeldell, Jasmyne 72, 142
Yesilyurt, Ezgi 43, 90, 174
Yeter, Ibrahim 94, 162
Yin, Xinying 138
Yisak, Melissa 90
Yow, Jan 128
Yuksel, Tugba 148
Yüksel, Tuğba 45
Yun, Tiffany 165

Z
Zafrani, Eran 150
Zambone, Alana 126
Zandvliet, David 44, 47
Zangori, Laura 78, 101, 111, 144
Zeidler, Dana 99, 151
Zembal-Saul, Carla 51, 165
Zeyer, Albert 171
Zhai, Xiaoming 91, 122, 158
Zhang, Letong 52, 87
Zhang, Lin 118
Zhang, Man 89
Zhang, Moyu 156
Zhang, Yang 96, 164
Zhang, Yu 112
Zhu, Wei 149
Zimmerman, Heather 49, 76
Zohar, Asnat 109, 150
Zozakiewicz, Cathy 52
Zuercher, Jennifer 144
Zur, Shani 57