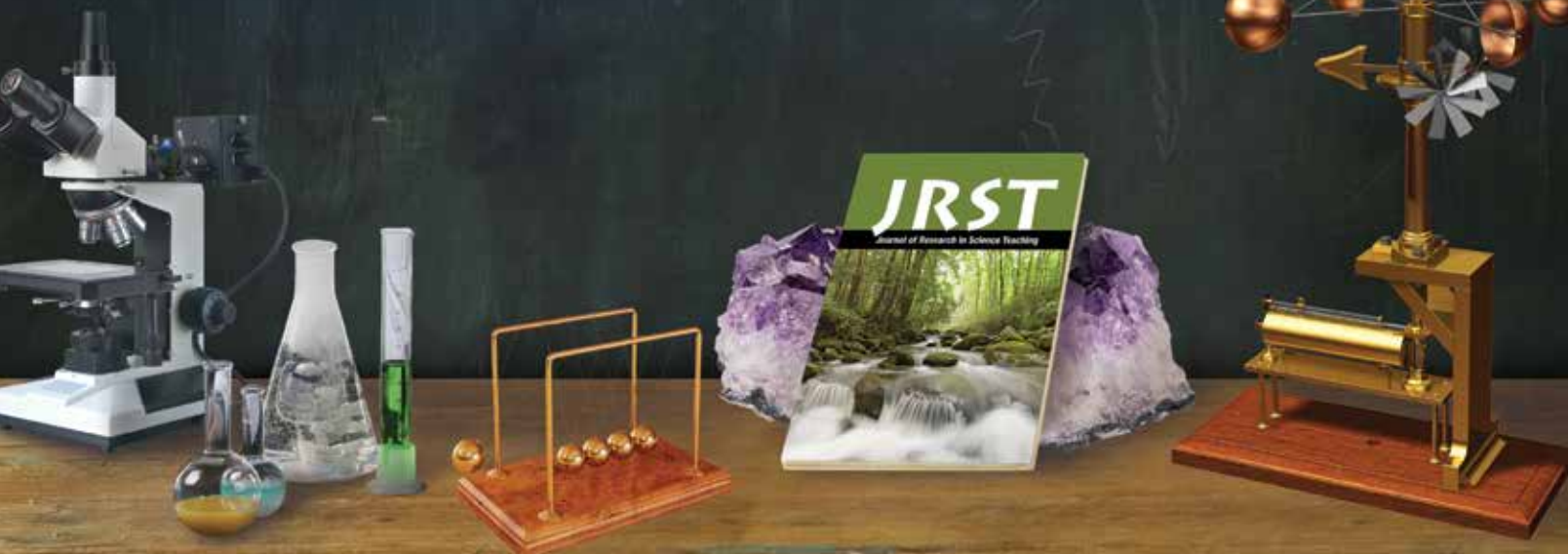


# 2016 NARST Annual International Conference

## **Toward Equity and Justice:**

Many Different Voices, Cultures, and Languages  
in Science Education Research for Quality  
Science Learning and Teaching



Renaissance Baltimore Harborplace Hotel | Baltimore, MD, USA

**NARST**

**APRIL 14–17, 2016**

# 2016 NARST Annual International Conference

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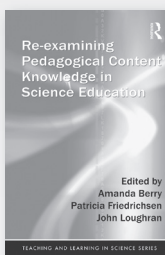
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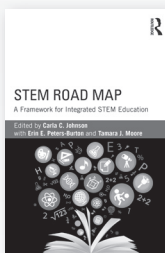
Handbook of Research on Science Education, Volume II

Edited by Norman Lederman, Sandra K. Abell



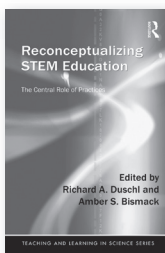
Re-Examining Pedagogical Content Knowledge in Science Education

Edited by Amanda Berry, Patricia Freidrichsen, John Loughran



STEM Road Map: A Framework for Integrated STEM Education

Edited by Carla C. Johnson with Erin E. Peters-Burton, Tamara J. Moore



Reconceptualizing STEM Education: The Central Role of Practices

Edited by Richard A. Duschl, Amber S. Bismack

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# NARST 2016

89th Annual International Conference

Renaissance Baltimore Harborplace Hotel | Baltimore, MD, USA

April 14-17, 2016

Toward Equity and Justice:

Many Different Voices, Cultures, and Languages in Science  
Education Research for Quality Science Learning and Teaching

## ACKNOWLEDGMENTS

The following members of the Program Committee helped in preparing and editing the 2016 NARST Annual International Conference Program Book.

Mary M. Atwater, President and Program  
Committee Co-Chair

Mei-Hung Chiu, President-Elect and Program  
Committee Co-Chair

William C. Kyle, Jr., Executive Director  
Toni A. Sondergeld, NARST Scheduling Coordinator

## Notes

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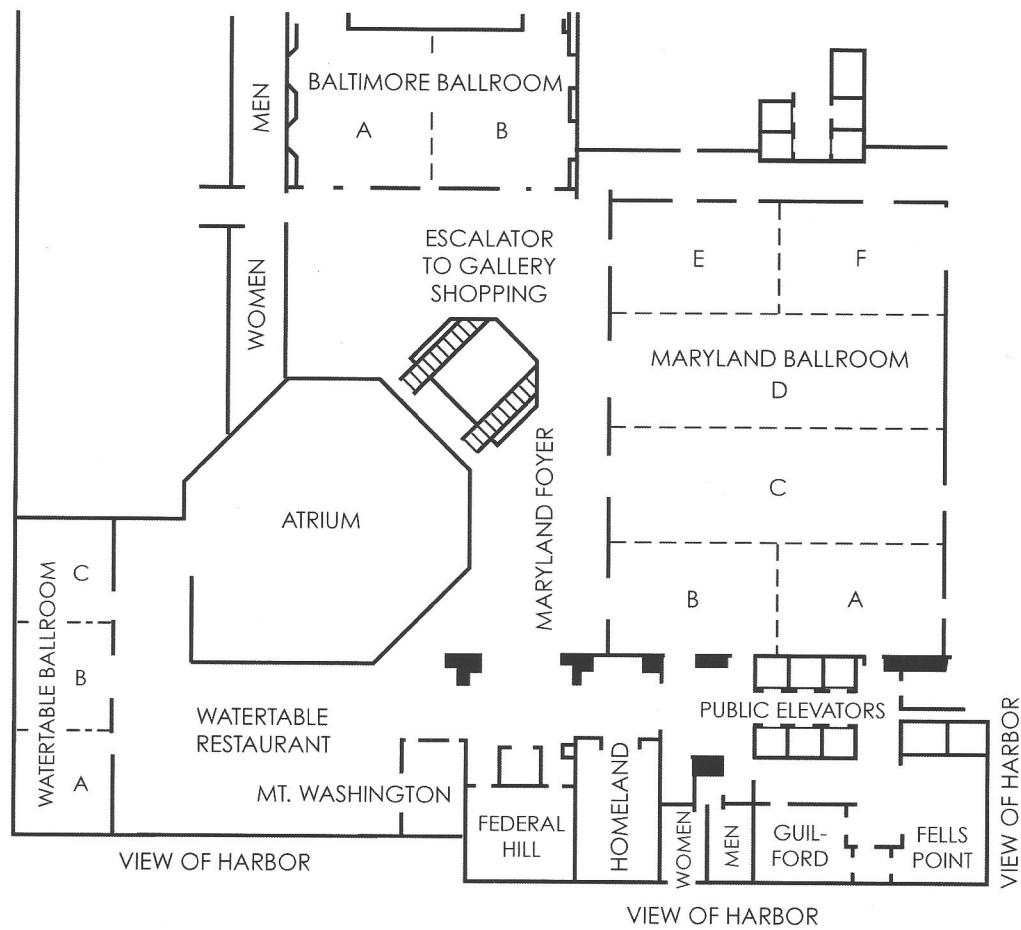


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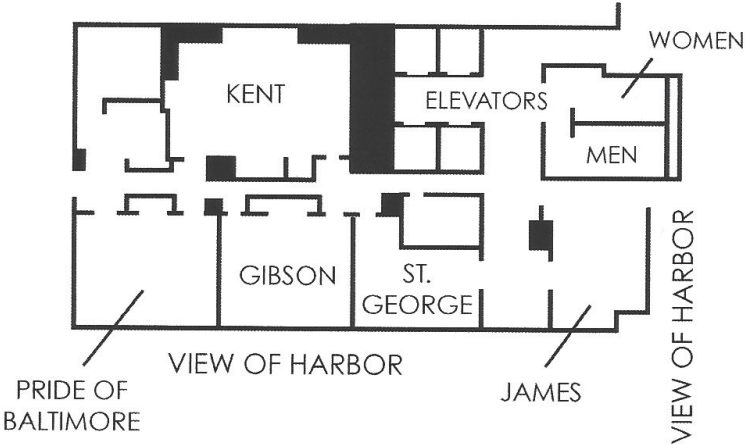
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FLOOR PLANS

Fifth Floor



Sixth Floor



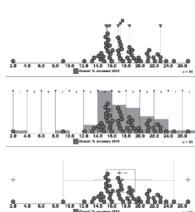


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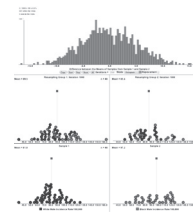
## Educational Analytics

The growing availability of historical data and the development of increasingly sophisticated analytical tools offer new ways to identify, measure and research factors that promote or inhibit the effectiveness of education. One of our missions is to enhance evidence-based teaching methodology and policy by developing and sharing new technologies. We developed a series of visualization tools aimed at providing research/practitioners innovative ways to look at educational data.

### Seelt



Seelt is a free, internally developed web-based graphical analysis tool for visualization and basic analysis of univariate and bivariate data. Usable online and on tablets, Seelt imports data from any spreadsheet, or through manual or graphical input.

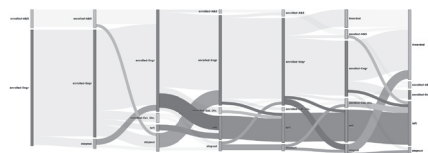


### GORP

The Ribbon tool is a visualization system used to understand the pathways that students take between majors or disciplinary clusters. It aggregates student data based on user-defined categories and shows the population flows between these categories over user-defined spans of time. Understanding the factors that cause major migration can inform research into universities' retention practices.



### Ribbon Tool



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### More information?

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# General Information

## Information about NARST

The National Association for Research in Science Teaching was founded in 1928 for the purpose of promoting research in science education at all educational levels and disseminating the findings of this research in such ways as to improve science teaching and learning. The Association is incorporated as a non-profit corporation in the State of Minnesota. The official publication is the Journal of Research in Science Teaching. NARST encourages presentations of a wide variety of investigations in all aspects of science education, including action, historical, philosophical, ethnographic, experimental, and evaluative research studies. Reports of empirical research, critical reviews, and theoretical works are encouraged. In October 2010, to reflect the Association's growing international focus and membership, the Board approved referring to the Association by its acronym only. At the April 2011 Board Meeting, the tagline for the Association was approved by the Board. Thus, the Association's name and tagline is: NARST - A worldwide organization for improving science teaching and learning through research.

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

## NARST Mission Statement

NARST is a worldwide organization of professionals committed to the improvement of science teaching and learning through research. Since its inception in 1928, NARST has promoted research in science education and the communication of knowledge generated by the research. The ultimate goal of NARST is to help all learners achieve science literacy. NARST promotes this goal by: 1) encouraging and supporting the application of diverse research methods and theoretical perspectives from multiple disciplines to the investigation of teaching and learning in science; 2) communicating science education research findings to researchers, practitioners, and policy makers; and 3) cooperating with other educational and scientific societies to influence educational policies. To learn more about NARST you may visit the Association's website at <http://narst.org/> and read the Bylaws approved by the membership in October 2008 at [http://www.narst.org/about/NARST\\_bylaws.pdf](http://www.narst.org/about/NARST_bylaws.pdf).

## Member Benefits

- Ten issues of the Journal of Research in Science Teaching (JRST) are published each volume year. JRST has been ranked as one of the highest quality educational journals according to studies published by War, Holland and Schramm (American Educational Research Journal) and Guba and Clark (Educational Researcher) for the American Educational Research Association (AERA). These authors identified JRST as clearly the top research journal in science education.
- The NARST Annual International Conference Program and Abstracts are available on the conference page of the NARST website.
- Members have access to E-NARST News, which is published twice a year and available on the NARST website.
- Website and Listserv, allowing access to further information about the Association. You may access this site at the following URL: <http://www.narst.org>. There is further information about subscribing to the listserv on this site.

## Explanation of Program Session Formats

### Paper Sessions Organized by the Program Committee

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

### Symposium

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

## Related Paper Set

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

## Interactive Poster Sessions

This format offers presenters the opportunity to display their work graphically in a traditional poster session format. Displays should fit on the 48" (long) x 36" (high) tri-fold boards provided and should include a brief abstract in large typescript. Each presenter must set up the display prior to the start of the Poster Session and then remove it promptly at the end of the Poster Session. Each presenter is expected to have a manuscript for distribution to attendees. The manuscript may be available either via hard copy distribution at the session or via electronic access provided by the author.

## Guidelines for Meeting Presenters

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

## Guidelines for Presiders and Discussants

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

The role of the Presider includes:

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

**The role of the Discussant includes:**

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

# Strand Key

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

## A Special Thanks to our Sponsors and Exhibitors

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Wiley & Sons

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

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University of Illinois at Urbana-Champaign  
Dana L. Zeidler  
University of South Florida–Tampa Bay

#### E-NARST News Editor

Gillian Roehrig, University of Minnesota

#### Association Management

Robin Turner, Drohan Management Group  
Jessica Harper, Drohan Management Group

# 2017 NARST Annual International Conference

The Program Chair invites NARST members and others to participate in the 2017 NARST Annual International Conference and to contribute to the 2017 conference by submitting program proposals.

## VENUE:

**NARST 2017 Annual International Conference**

**GRAND HYATT SAN ANTONIO**

**600 East Market Street**

**San Antonio, TX 78205 USA**

**April 22 – 25, 2017**

## THEME:

**Glocalization and Sustainability of Science Education Research and Practice**

NARST is a worldwide organization focused on improving science teaching and learning through research in order to help all learners, regardless of race, gender, or culture, achieve science literacy.

Over the past few decades, globalization has impacted many academic disciplines, as well as the social, cultural, and economic development of countries across the world. Science education is not an exception to this trend. To this point, NARST's official journal, *Journal of Research in Science Teaching*, launched a special issue on Globalization in Science Education in 2011, in which it highlighted the need to better prepare the world's children with high quality scientific literacy through research and practice. To this end, results of big data collections from international monitoring systems (such as TIMSS and PISA) show how successful science education programs are from one country to another, and research published in international journals combines academic resources coordinated across countries and pushes the field of science education forward on a larger scale. What does this mean in terms of science practice? Effective science education helps children benefit from local science efforts and also global interaction. This dual perspective is represented by the concept of glocalization, which combines the ideals of globalization with the importance of localization. Glocalization recognizes that the international science community benefits from countries sharing their research and educational outcomes, as well as using international monitoring systems, but that science learning is most effective when science concepts are taught via application to the local contexts in which students regularly interact and are familiar. Every country and every child should possess science literacy. Developing glocal literacy, glocal strategy, glocal leadership, and glocal vision in science education will help researchers and policymakers to co-construct a healthy learning environment that provides a collaborative atmosphere for eliciting global citizens' scientific literacy. Furthermore, this glocalization should continuously play a role to facilitate a dynamic and interconnected community and sustain research and practice outcomes. Glocalization will move the science field toward greater collaboration (and communication), rather than simply competition among children, science teachers, science education researchers, and policymakers.

The 2017 NARST Annual International Conference theme is meant to bring science education researchers and educators together to ponder how we can connect with each other through research, make good use of international big data, and produce healthy and successful local learning environments.

Please make your plans to participate in the 2017 NARST Annual International Conference in San Antonio, Texas, where we will have various kinds of research presentations, workshops, symposia, and informal conversations with colleagues and others. We want educators from around the world to share with each other at the 2017 conference.

## SUBMISSION DEADLINE:

The Program Chair or designate must receive your program proposals for the 2017 Annual International Conference by August 15, 2016. This deadline allows sufficient time for processing, reviewing, and evaluating the many submitted proposals in a fair manner. By early July 2016, the call for program proposals will appear on the NARST website.

## CONFERENCE CHAIR:

Mei-Hung Chiu, President-Elect

# Future Meeting Dates for NARST, NSTA, and AERA

## 2016

NSTA Nashville, TN, March 31 – April 3  
AERA Washington, DC, April 8 – April 12  
NARST Baltimore, MD, April 14 – April 17

## 2017

NSTA Los Angeles, CA, March 30 – April 2  
NARST San Antonio, TX, April 22 – 25  
AERA San Antonio, TX, April 27 – May 1

## 2015-2016 Strand Coordinators

### **Strand 1: Science Learning, Understanding, and Conceptual Change**

Ibrahim Delen, Lauren Barth-Cohen

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

Christopher G. Wright, Ananda Marin

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

Mandy Biggers, Alicia McDyre

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

Dante Cisterna, Hui Jin, Regina L. Surriel

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

Rebekka Darner-Gougis, David Osmond

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

Joy A. Kubarek, Gary Holliday

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

David Stroupe, Eunjin Bang

### **Strand 8: In-service Science Teacher Education**

Lisa A. Borgerding, Sevgi Aydin

### **Strand 9: Reflective Practice**

Gail Buck, Funmi Amosun

### **Strand 10: Curriculum, Evaluation, and Assessment**

Jeff Nordine, Amy Trauth-Nare

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

Neporcha Cone, Angela Chapman

### **Strand 12: Educational Technology**

Diana Jass Ketelhut, Richard Lamb

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

Christine McDonald, Alison Meyers

### **Strand 14: Environmental Education**

Cassie Quigley, Stacey Britton

### **Strand 15: Policy**

Jacob Foster, Heidi Carlone

# Program Proposal Reviewers

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Judson, Eugene	Lee, Christine	Menon, Deepika	Pacheco-Guffrey, Heather
Jurkiewicz, Melissa	Lee, Jade	Menon, Preetha	Park, Soonhye
Kademian, Sylvie	Lee, May	Mercan, Fatih	Parker, Loran
Kahraman, Nurcan	Lee, Soonchun	Mesa, Jennifer	Patrick, Patricia
Kamarainen, Amy	Lee, Yonghee	Metin, Duygu	Pesman, Haki
Kampourakis, Kostas	LePretre, Dawnne	Meyer, Daniel	Philipp, Stephanie
Kang, Emily	Leung, Jessica Shuk Ching	Mikeska, Jamie	Phillips, Marianne
Kang, Hosun	Levy, Sharona	Miller, Alison	Pietrocola, Mauricio
Kang, Nam-Hwa	Lewis, Elizabeth	Miller, Brian	Pitts, Wesley
Kara, Yilmaz	Li, Min	Miller-Friedmann, Jaimie	Plankis, Brian
Katsh-Singer, Rebecca	Li, Xiuju	Mishra, Chandrani	Plummer, Julia
Katz, Phyllis	Liebetrau, Marie	Moemeke, Clara	Poland, Susan
Kawasaki, Jarod	Lightner, Lindsay	Mohorn-Mintah, Olayinka	Popejoy, Kate
Kayumova, Shakhnoza	Lin, Jing-Wen	Moll, Rachel	Price, Aaron
Ke, Li	Lin, Joyce	Mollohan, Katherine	Purzer, Senay
Keast, Stephen	Litster, Megan	Monteiro, Anna	Putra, Gde Buana Sandila
Keck, Andrew	Liu, Shiyu	Montrosse-Moorhead, Bianca	Quarderer, Nathan
Keifert, Danielle	Lo, Abraham	Moote, Julie	Quardokus Fisher, Kathleen
KELES, NURCAN	Lo, Stanley	Morabito, Nancy	Qureshi, Azhar
Kelley, Sybil	Lohwasser, Karin	Morrison, Deb	Radoff, Jennifer
Kelly, Gregory	Louis, Natacha	Moscarella, Rosa	Rahm, Jrene
Kenyon, Lisa	Lucero, Margaret	Mourning-Star, Phoenix	Raish, Victoria
Kerr, Karen	Ludwig, Tobias	Mouza, Chrystalla	Ramnarain, Umesh
Khalid, Tahsin	Luft, Julie	Msimanga, Audrey	Rannikmae, Miia
Kharatmal, Meena	Luh, Amanda	Mulvey, Bridget	Rebello, Carina
Khishfe, Rola	Lunsford, Adriana	Mumba, Frackson	Reece, Amber
Kier, Meredith	Lynch, Sharon	Murakami, Christopher	Rennie, Leonie
Kim, Mijung	Ma, Guanzhong	Murray, Jaclyn	Restrepo Nazar, Christina
KIMORI, DAVID	Ma, Hongming	Muslu, Nilay	Richardson, Greer
King, Natalie	Madden, Lauren	Myers, John	Richmond, Gail
Kiran, Dekant	Makki, Nidaa	Myszkal, Philip	Ridgeway, Elizabeth
Kirch, Susan	Malkoc, Ummuhan	Nakedi, Mmamontle	Riedinger, Kelly
Kirn, Adam	Manz, Eve	Nargund-Joshi, Vanashri	Ringbauer, Sara
Kisiel, James	Marbach-Ad, Gili	Nelson, Tamara	Rivet, Ann
Klein, Vanessa	Marco-Bujosa, Lisa	Nelson-Baraber, Sharon	Robinson-Hill, Rona
Knox, Kerry	Maroo, Jill	Neumann, Irene	Roehrig, Gillian
Koch, Bernard	Marshall, Stefanie	Neumann, Knut	Rollnick, Marissa
Kolonich, Angela	Martin, Jenny	Newell, Alana	Romine, William
Kornreich-Leshem, Hagit	Martin-Hansen, Lisa	Nicholas, Lori	Ronan, Darcy
Krall, Rebecca	Maruyama Tank, Kristina	Nixon, Ryan	Ropohl, Mathias
Krist, Christina	Massaro, David	Nyachwaya, James	Ross, Danielle
Kruse, Jerrid	Masters, Heidi	Nyeggen, Colleen	Rudolph, Heather
Kubarek-Sandor, Joy	Matthews, Michael	Oates, Karen	Ruggirello, Rachel
Kulgemeyer, Christoph	Matz, Rebecca	Ohana, Chris	Russell, Melody
Kuo, Che-Yu	Mawyer, Kirsten	Okebukola, Peter	Ryu, Minjung
Lachapelle, Cathy	McBeath, Jasmine Kyle	Olimpo, Jeffrey	Sabel, Jaime
Lacy, Jennifer	Mcclafferty, Terence	Olukayode, Akinrolabu	Sadeck, Melanie
Lamar, Mary	McClain, Lucy	Omoifo, Christiana	Sadler, Kim
Lamb, Richard	McCollough, Cherie	Oner, Ayse	Sahin, Alpaslan

Saint-Hilaire, Line  
 Sanchez-Tapia, Ingrid  
 Santibanez, David  
 Sato, Takumi  
 Sawtelle, Vashti  
 Scalone, Giovanna  
 Schaffer, Dannah  
 Scherz, Zahava  
 Schnittka, Christine  
 Schreiber, Catherina  
 Schuchardt, Anita  
 Schwartz, Renee  
 Scott, Catherine  
 Seiler, Gale  
 Sen, Hanife  
 Sengul, Ozden  
 Seo, Kyungwoon  
 Seung, Eulsun  
 Shah, Ashima  
 Shama, Ajay  
 Shapiro, Marina  
 Sharma, Meenakshi  
 Sheffield, Adriane  
 Shehab, Saadeddine  
 Shemwell, Jonathan  
 Sherwood, Carrie-Anne  
 Sheth, Manali  
 Shimek, Christine  
 Shin, Myunghwan  
 Shofner, Marcia  
 Siatras, Anastasios  
 Siegel, Marcelle  
 Smith, Mike  
 Smith, Patrick  
 Smolek, Tamara  
 Sondergeld, Toni  
 Soobard, Regina  
 Spray, Jason  
 Staus, Nancy  
 Stefanile, Adam  
 Strimaitis, Anna  
 Strippel, Christian Georg  
 Strohl, Carrie  
 Stromholt, Shelley  
 Stroupe, David  
 Stuessy, Carol  
 Subramaniam, Karthigeyan  
 Suh, Jee Kyung  
 Summers, Ryan  
 Sun, Baoling  
 Sung, Shannon  
 Swanson, Lauren  
 Szyjka, Sebastian  
 Tal, Tali  
 Tan, Yuen Sze Michelle  
 Tanis Ozcelik, Arzu  
 Telli, Sibel  
 Thummaphan, Phonraphee  
 Todd, Amber

Tolbert, Sara  
 Topcu, Mustafa  
 Towns, Leonard  
 Tran, Lynn  
 Trujillo, Caleb  
 Tucker-Raymond, Eli  
 Tuncay-Yuksel, Busra  
 Tunncliffe, Sue  
 Tupper, Benjamin  
 Tutwiler, Michael  
 Upadhyay, Bhaskar  
 Urueta, Tathali  
 Vallett, David  
 Van Duzor, Andrea  
 Vanmali, Binaben  
 Vaughn, Ashley  
 Vergara, Claudia  
 Verma, Geeta  
 Veron, Dana  
 Vesterinen, Veli-Matti  
 Vhurumuku, Elaosi  
 Vieira, Rodrigo  
 Waight, Noemi  
 Waldrip, Bruce  
 Walter, Emily  
 Wan, Zhi Hong  
 Wang, Jian  
 Wang, Jianlan  
 Wang, Jing-Ru  
 Wardrip, Peter  
 Webb, Aubree  
 Weeks, Faith  
 Weible, Jennifer  
 Weiland, Ingrid  
 Wendel, Paul  
 Wendell, Kristen  
 Wengrowicz, Niva  
 Wenner, Julianne  
 Wertheim, Jill  
 Wessnigk, Susanne  
 Wetzstein, Lia  
 Wheeler, Lindsay  
 Whittington, Kirby  
 Whitworth, Brooke  
 Wild, Andrew  
 Wilkerson-Jerde, Michelle  
 Williams, Grant  
 Witzig, Stephen  
 Wizner, Francine  
 Wolfe, Teresa  
 Wong, Sissy  
 Wood, Krista  
 Wortel, Stephanie  
 Wray, Kraig  
 Wright, Ann  
 Wright, Christopher  
 Wright, Elizabeth  
 Wu, Jason  
 Yang, Yang

Yarema, Sandra  
 Yarker, Morgan  
 Yerrick, Randy  
 Yoho, Rachel  
 Yoon, Sae Yeol  
 You, Hye Sun  
 Young, Tyron  
 Zangori, Laura  
 Zastavker, Yevgeniya  
 Zhai, Xiaoming  
 Zisk, Robert  
 Zoellick, Bill  
 Zwiep, Susan  
 Wang, Jianlan  
 Webb, Angela  
 Webb, Aubree  
 Weitzel, Holger  
 Wendt, Jillian  
 Wengrowicz, Niva  
 Wessnigk, Susanne  
 West, Andrew  
 Wheeler, Lindsay  
 White, Francesca  
 Whitworth, Brooke  
 Wiebke, Heidi  
 Wiggins, Benjamin  
 Wild, Andrew  
 Wilhelm, Jennifer  
 Williams, Grant  
 Wilmes, Sara  
 Wilson, Rachel  
 Wingert, Kerri  
 Wiseman, Dawn  
 Witzig, Stephen  
 Wizner, Francine  
 Wong, Sissy  
 Wood, Krista  
 Woods-Townsend, Kathryn  
 Woolcott, Geoff  
 Wright, Ann  
 Wyner, Yael  
 Xiao, Sihan  
 Yalaki, Yalcin  
 Yamaguchi, Etsuji  
 Yan, Xiaomei  
 Yarden, Anat  
 Yarema, Sandra  
 Yarker, Morgan  
 Yerdelen, Sündüs  
 Yestness, Nissa  
 Yeung, Yau-yuen  
 Yilmaz-Tuzun, Ozgul  
 Yin, Xinying  
 Yin, Yue  
 Yoon, Sae Yeol  
 Zaidi, Sania  
 Zangori, Laura  
 Zastavker, Yevgeniya  
 Zhang, Chunlei

Zimmerman, Randi  
 Zisk, Robert  
 Zoellick, Bill

## NARST Presidents

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

## NARST Executive Directors

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

Paul H. Joslin 1975 – 1980  
William G. Holliday 1980 – 1985  
Glenn C. Markle 1985 – 1990  
John R. Staver 1990 – 1995  
Arthur L. White 1995 – 2000  
David L. Haury 2000 – 2002  
John W. Tillotson 2002 – 2007  
William C. Kyle, Jr. 2007 – 2017

## JRST Editors

J. Stanley Marshall 1963 – 1966  
H. Craig Sipe 1976 – 1968  
James T. Robinson 1969  
O. Roger Anderson 1970 – 1974  
David P. Butts 1975 – 1979  
James A. Shymansky 1980 – 1984  
Russell H. Yeany, Jr. 1985 – 1989  
Ronald G. Good 1990 – 1993  
William C. Kyle, Jr. 1994 – May 1999  
Charles W. (Andy) Anderson and James J. Gallagher August 1999 – 2001  
Dale R. Baker and Michael D. Piburn 2002 – 2005  
J. Randy McGinnis and Angelo Collins 2006 – 2010  
Joseph S. Krajcik and Angela Calabrese Barton 2011 – 2015  
Fouad Abd-El-Khalick and Dana L. Zeidler 2016 - 2020

## NARST Emeritus Members

Agin, Michael	Gunstone, Richard	McFadden, Charles	Simmons, Ellen
Andersen, Hans	Haney, Richard	McRobbie, Campbell	Simonis, Doris
Anderson, Ronald	Hassan, Abdelmoneim	Merzyn, Gottfried	Smith, Edward
Barnes, Marianne	Helgeson, Stanley	Nous, Albert	Swift, J.
Bartlett, Guilford	Hewson, Peter	Novak, Joseph	Thier, Marlene
Berkheimer, Glenn	Hill, Todd	Olstad, Roger	Thier, Herbert
Bethel, Lowell	Hofstein, Avi	Padilla, Michael	Walding, Richard
Christopher, John	Holbrook, Jack	Pak, Sung Jae	Welch, Wayne
Dahncke, Helmut	Holliday, William	Pedemonte, Gian	Williams, Robert
De Jong, Onno	Jaffarian, Bill	Piburn, Michael	Yore, Larry
Dehaan, Robert	Joslin, Paul	Poel, Robert	Zoller, Uri
Doran, Rodney	Kahle, Jane	Poth, James	
Enochs, Larry	Kennedy, David	Prather, J.	
Feher, Elsa	Krockover, Gerald	Rennie, Leonie	
Fensham, Peter	Lemke, Jay	Riechard, Donald	
Ganiel, Uri	Lindauer, Ivo	Ritz, William	
Gilbert, John	Lunetta, Vincent	Roberts, Douglas	
Gilmer, Penny	Mallinson, Jacqueline	Rose, Ryda	
Glynn, Shawn	Markle, Glenn	Schmidt, Donald	
Good, Ron	McCormack, Alan	Sequeira, Manuel	

## 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, have 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.

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

## Outstanding Doctoral Research Award

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

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

## Early Career Research Award

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

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

# 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.

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



# The NARST Outstanding Paper Award

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

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

## Outstanding Master's Thesis Award

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

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

## Classroom Applications Award

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

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

# NARST Leadership Team & Committees

## 2015-2016

### Officers

#### President

#### President-elect

#### Immediate Past President

#### Executive Director

Mary M. Atwater (2017)

Mei-Hung Chiu (2018)

Valarie Akerson (2016)

William C. Kyle, Jr. (2017)

The University of Georgia

National Taiwan Normal University

Indiana University

University of Missouri - St. Louis

#### Executive Board Members:

Alicia C. Alonzo (2018)

Nam-Hwa Kang (2018)

Eileen Carlton Parsons (2018)

Gregory Kelly (2017)

Jomo W. Mutegi (2017)

Tali Tal (2017)

Pauline W. U. Chinn (2016)

Gillian Roehrig (2016)

Jerome Shaw (2016)

Michigan State University

Korea National University of Education (KNUE)

The University of North Carolina at Chapel Hill

Pennsylvania State University

Indiana University, IUPUI

Technion, Israel Institute of Technology

University of Hawaii – Manoa

University of Minnesota

University of California - Santa Cruz

#### International Coordinator

#### Graduate Student Representative

#### NARST Liaison to NSTA

#### NSTA Representative

#### JRST Editors (term ends 2020)

Hsiao-Lin Tuan (2016)

Selina L. Bartels (2017)

Deborah Hanuscin (2018)

John W. Tillotson (2017)

Fouad Abd-El-Khalick

Dana L. Zeidler

National Changhua University of Education

Illinois Institute of Technology

University of Missouri

Syracuse University

University of Illinois at Urbana-Champaign

University of South Florida-Tampa Bay

## Equity and Ethics Committee

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(18) Deniz Saribas

(18) Sanghee Cho

(16) Leon Walls

(16) Deb Morrison

(16) Brian Fortney

(17) Francesca White

(17) Miri Barak

(17) Enrique Lopez

(17) Rhea Miles

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Istanbul Aydin University

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# External Policy and Relations Committee

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## Publications Advisory Committee

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# Research Committee

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# Program Committee

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## Members (Strand Co-Coordinator):

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

(17) Christopher G. Wright	University of Tennessee	cwrigh48@utk.edu
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### Strand 3: Science Teaching—Primary School (Grades preK-6)

(17) Mandy Biggers	Penn State University	msb33@psu.edu
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### Strand 4: Science Teaching—Middle and High School (Grades 5-12)

(16) Dante Cisterna	The Catholic University of Chile	dicister@gmail.com
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### Strand 5: College Science Teaching and Learning (Grades 13-20)

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### Strand 6: Science Learning in Informal Contexts

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

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**Strand 8: In-service Science Teacher Education**

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**Strand 9: Reflective Practice**

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## Awards Committee

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## NARST Outstanding Doctoral Research Award Selection Committee

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## Early Career Research Award Selection Committee

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# Distinguished Contributions in Research Award Committee

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(18) Anita Roychoudhury  
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(17) Robert Sherwood  
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# NARST Annual International Conference

## Schedule at a Glance - 2016

Renaissance Baltimore Harborplace Hotel  
Baltimore, MD USA

Date/Time	Event	Room
<b>Wednesday, April 13</b>		
7:30 AM – 5:00 PM	<b>NARST Executive Board Meeting #1</b>	Homeland
2:00 PM - 5:00 PM	<b>Conference Registration</b>	Maryland Foyer
<b>Thursday, April 14</b>		
7:30 AM – 11:45 AM	<b>NARST Executive Board Meeting #2</b>	Homeland
7:00 AM – 5:00 PM	<b>Conference Registration</b>	Maryland Foyer
<i>Please note:</i> You must register for the Pre-conference Workshops with your Advance Conference Registration. You may only register for one workshop.		
8:00 AM – 11:45 AM	<b>Pre-Conference Workshop #1: Equity and Ethics Committee</b> Free Maximum registration - 90 <b>Title:</b> Toward Equity & Justice: Scientific Literacy as a Human Right Organizers: Enrique Lopez, Senetta Bancroft, Miri Barak, Phillip Boda, Tam'ra-Kay Francis, Nam-Hwa Kang, Cassie Quigley, Deniz Saribas, Jerome Shaw, and Francesca White	Baltimore Salon A
8:00 AM – 11:45 AM	<b>Pre-Conference Workshop #2: Research Committee</b> Student Membership and Non-collegiate Educator Membership Free All other member categories \$25 Maximum registration - 40 <b>Title:</b> Supporting the Success of Latin@ Scholars in Science Education Presenters: Alejandro Gallard, Alberto Rodriguez, Katemari Rosa, María Araceli Ruiz Primo, Regina Suriel, and Ingrid Sánchez-Tapia	Maryland Ballroom F
8:00 AM – 11:45 AM	<b>Pre-Conference Workshop #3: Research Committee</b> Free Maximum registration - 40 <b>Title:</b> Videocase-based, Analysis-of-Practice for Teacher and Student Learning: How To's from a 10-year Line of Research Presenters: Jody Bintz, Chris Wilson, Kathy Roth, Molly Stuhlsatz, Connie Hvidsten, and Betty Stennett	Maryland Ballroom B
8:00 AM – 11:45 AM	<b>Pre-Conference Workshop #4: Research Committee</b> Free Maximum registration - 40 <b>Title:</b> Science and Art-Research for Creativity and Inclusion Presenters: Nathan Carnes, Eddie Goldstein, Emily Hestness, Phyllis Katz, Holly Walter Kerby, J. Randy McGinnis, Lucinda Presley, Robert Root-Bernstein, and Harvey Seifert	Maryland Ballroom A
8:00 AM – 11:45 AM	<b>Pre-Conference Workshop #5: Research Committee</b> Participant Fee: \$25 Maximum registration - 30 <b>Title:</b> Building an Equity-Focused Knowledge Base for NGSS by Fostering Partnerships between Research and Practice Presenters: Philip Bell, Bill Penuel, Peter McLaren, Dan Gallagher, Tammy Clegg, and June Ahn	Kent

Date/Time	Event	Room
8:00 AM – 11:45 AM	<b>Pre-Conference Workshop #6: Publication Advisory Committee and NSTA Research Committee</b> Free Maximum registration - 60 <b>Title:</b> Publishing for Practitioner Audiences – Disseminating Your Research to Create Broader Impacts  Presenters: Phillip Bell, Bill Penuel, Deborah L. Hanuscin, and John Tillotson	Baltimore Salon B
8:00 AM – 11:45 AM	<b>Pre-Conference Workshop #7: International Committee</b> Free Maximum registration - 60 <b>Title:</b> How to Conduct Cross-culture Science Education Research  Organizers: Hsiao-Lin Tuan, Binaben Vanmali, and May May Hung Cheng Presenters: Norman G. Lederman; Judith Lederman; Katrin Englen; Mariona Espinet; Hye-Eun Chu, Sonya Martin, David Treagust, Jennifer Park, Wanjo Ahn, and Dayeon Kang	Maryland Ballroom
11:45 AM – 12:50 PM	<b>Attendees</b>	Lunch on your own
11:45 AM – 12:50 PM	<b>Committee Meetings</b>	Concurrent Session Rooms
1:00 PM – 2:30 PM	<b>Plenary Session</b> <b>Speaker:</b> Arnetha F. Ball Professor, Graduate School of Education and Co-Director of the Center for the Study of Race, Ethnicity and Language, Stanford University, USA <b>Title:</b> Equity, Justice and Generativity in Education Research for Quality Teaching and Learning Plenary Session Panel: André Green, University of South Alabama, USA Nam-Hwa Kang, Korean National University of Education Femi Otulaja, University of Witwatersrand, South Africa Ingrid Sánchez Tapia, Regional Education Specialist, UNICEF Latin America and Caribbean	Maryland Ballroom C and D
2:40 PM – 4:10 PM	<b>Concurrent Session # 1</b>	Concurrent Session Rooms
4:20 PM – 5:50 PM	<b>Concurrent Session # 2</b>	Concurrent Session Rooms
6:00 PM - 7:00 PM	<b>Research Interest Groups (RIGs) Meetings</b> Continental and Diasporic Africa in Science Education (CADASE) Latino/a RIG (LARIG) Engineering Education Contemporary Methods for Science Education Research	Baltimore Salon A Baltimore Salon B Kent Federal Hill
7:00 PM – 9:30 PM	<b>Presidential / Welcome Reception</b> (Appetizers served and cash bar)	Maryland Ballroom C and D

## Friday, April 15

6:00AM - 7:15 AM	<b>Mind and Sole (Off-site)*</b> <i>*This event is not sponsored nor endorsed by NARST</i>	Lobby
7:00 AM – 5:00 PM	<b>Conference Registration</b>	Maryland Foyer
8:30 AM – 10:00 AM	<b>Concurrent Session # 3</b>	Concurrent Session Rooms
10:15 AM – 11:45 AM	<b>Concurrent Session # 4</b>	Concurrent Session Rooms
12:00 – 1:00 PM	<b>NARST Annual Membership Meeting</b> (formerly NARST Business Meeting) (Box lunch provided for 1st 100 attendees who sign up)	Baltimore Salon A

Date/Time	Event	Room
12:00 PM – 1:00 PM	<b>Lunch</b>	On your own
1:15 PM – 2:45 PM	<b>Concurrent Session # 5</b>	Concurrent Session Rooms
2:45 PM - 3:15 PM	<b>Coffee Break</b>	Ballroom Foyer
3:15 PM - 4:15 PM	<b>Concurrent Session # 6A: Poster Session</b>	Maryland Ballroom A, B, C and D
4:15 PM - 5:15 PM	<b>Concurrent Session # 6B: Poster Session</b>	Maryland Ballroom A, B, C and D
5:30 PM - 7:00 PM	<b>Graduate Student Forum</b>	Baltimore Salon A
5:30 PM - 7:00 PM	<b>Graduate Student Forum</b>	Grand B
5:30 PM - 7:00 PM	<b>Early Career Faculty Forum</b>	Columbus I J
6:00 PM – 8:30 PM	<b>JRST Editorial Team Meeting / Dinner</b> Sponsored by Wiley-Blackwell (By invitation only)	Watertable A and B
6:00 PM – 7:30 PM	<b>Reception: <i>International Journal of Science and Mathematics Education</i></b> Sponsored by Springer (By invitation only)	Homeland

## Saturday, April 16

7:00 AM – 5:00 PM	<b>Registration</b>	Maryland Foyer
8:30 AM – 10:00 PM	<b>Concurrent Session # 7</b>	Concurrent Session Rooms
10:00 AM - 10:30 AM	<b>Coffee Break</b>	Ballroom Foyer
10:30 AM – 11:45 AM	<b>Committee Meetings</b>	Concurrent Session Rooms
12:00 PM – 2:00 PM	<b>Awards Luncheon</b>	Maryland Ballroom
2:15 PM – 3:45 PM	<b>Concurrent Session # 8</b>	Concurrent Session Rooms
4:00 PM - 5:30 PM	<b>Concurrent Session # 9</b>	Concurrent Session Rooms
6:30 PM – 9:00 PM	<b>Equity Dinner</b>  (Maximum attendance: 100) Dinner, including tax and gratuity, is \$45. Please note: You must register for this event with your Advance Conference Registration. Tickets purchased for this event are not refundable. NOTE: The Spirit of Baltimore will depart from the west wall of Baltimore's Inner Harbor. The distance from the Renaissance Baltimore Harborplace Hotel is about 3 blocks, mostly along the harbor. No transportation services will be provided.	Off-site: Spirit of Baltimore Dinner Cruise Address: Baltimore Inner Harbor Boarding is at 6:30 PM

## Sunday, April 17

7:00 AM – 8:15 AM	<b>Strand Meetings</b>	Concurrent Session Rooms
7:00 AM – 12:00 PM	<b>Registration</b>	Maryland Foyer
8:30 AM – 10:00 AM	<b>Concurrent Session # 10</b>	Concurrent Session Rooms
10:15 AM - 11:45 AM	<b>Concurrent Session # 11</b>	Concurrent Session Rooms
12:00 PM – 1:00 PM	<b>Lunch</b>	On your own
1:00 PM – 2:30 PM	<b>Concurrent Session # 12</b>	Concurrent Session Rooms
2:45 PM - 4:15 PM	<b>Concurrent Session # 13</b>	Concurrent Session Rooms
5:00 PM - 10:00 PM	<b>NARST Executive Board Meeting #3</b>	Watertable A and B





# **PROGRAM**

**Wednesday, April 13, 2016**



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

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



**Thursday, April 14, 2016**





## Conference Registration

7:00am – 5:00pm, Maryland Foyer

## NARST Executive Board Meeting

### Session #2

7:30am – 11:45pm, Homeland

## Pre-Conference Workshops

8:00am – 11:45am

### Pre-Conference Workshop: Equity and Ethics Committee (Free – 90 participants maximum)

*Toward Equity & Justice: Scientific Literacy as a Human Right*

8:00am – 11:45am, Baltimore Salon A

#### Organizers:

Enrique Lopez, University of Colorado, Boulder  
Senetta Bancroft, Grand Valley State University  
Miri Barak, Israel Institute of Technology  
Phillip Boda, Teachers College, Columbia University  
Tam'ra-Kay Francis, University of Tennessee, Knoxville  
Nam-Hwa Kang, Korea National University of Education  
Deniz Saribas, Marmara University, Institute of Educational Sciences  
Jerome Shaw, University of California, Santa Cruz  
Ibrahim Yeter, Texas Tech University

### Pre-Conference Workshop: Research Committee Student Membership and Non-collegiate Educator Membership Free

All other member categories \$25

40 participants maximum

*Supporting the Success of Latin@ Scholars in Science Education*

8:00am – 11:45am, Maryland Ballroom F

#### Presenters:

Alejandro Gallard, Georgia Southern University  
Alberto Rodriguez, Purdue University  
Katemari Rosa, Federal University of Campina Grande  
María Araceli Ruiz Primo, University of Colorado Denver  
Regina Suriel, Valdosta State University  
Ingrid Sánchez Tapia, UNICEF Latin America and Caribbean

### Pre-Conference Workshop: Research Committee (Free – 40 participants maximum)

*Videocase-based, Analysis-of-Practice for Teacher and Student Learning: How To's from a 10-year Line of Research*

8:00am – 11:45am, Maryland Ballroom B

#### Presenters:

Jody Bintz, BSCS  
Chris Wilson, BSCS  
Kathy Roth, California State Polytechnic University  
Molly Stuhlsatz, BSCS  
Connie Hvidsten, BSCS  
Betty Stennett, BSCS

### Pre-Conference Workshop: Research Committee (Free – 40 participants maximum)

*Science and Art-Research for Creativity and Inclusion*

8:00am – 11:45am, Maryland Ballroom A

#### Presenters:

Nathan Carnes, University of South Carolina  
Eddie Goldstein  
Emily Hestness, University of Maryland  
Phyllis Katz, University of Maryland  
Holly Walter Kerby, Fusion Science Theater  
J. Randy McGinnis, University of Maryland  
Lucinda Presley, Innovation Collaborative  
Robert Root-Bernstein, Michigan State University  
Harvey Seifter, Seifter Associates

### Pre-Conference Workshop: Research Committee (\$25 fee – 30 participants maximum)

*Building an Equity-Focused Knowledge Base for NGSS by Fostering Partnerships between Research Practice*

8:00am – 11:45am, Kent

#### Presenters:

Philip Bell, University of Washington  
Bill Penuel, University of Colorado Boulder  
Peter McLaren, Achieve  
Dan Gallagher, Seattle Public Schools  
Tammy Clegg, University of Maryland, College Park  
June Ahn, University of Maryland, College Park

**Pre-Conference Workshop: Publications Advisory Committee and NSTA Research Committee**  
**(Free – 60 participants maximum)**  
*Publishing for Practitioner Audiences – Disseminating Your Research to Create Broader Impacts*  
 8:00am – 11:45am, Baltimore Salon B

**Presenters:**

Phillip Bell, University of Washington  
 Bill Penuel, University of Colorado Boulder  
 Deborah L. Hanuscin, University of Missouri  
 John Tillotson, Syracuse University

**Pre-Conference Workshop: International Committee**  
**(Free – 60 participants maximum)**  
*How to Conduct Cross-culture Science Education Research*  
 8:00am – 11:45am, Maryland Ballroom E

**Organizers:**

Hsiao-Lin Tuan, National Changhua University of Education  
 Binaben Vanmali, Arizona State University  
 May May Hung Cheng, The Hong Kong Institute of Education

**Presenters:**

Norman G. Lederman, Illionis Institute of Technology  
 Judith Lederman, Illionis Institute of Technology  
 Katrin Englen, Leibniz Institute for Science and Mathematics Education  
 Mariona Espinet, Autonomous University of Barcelona  
 Hye-Eun Chu, Macquarie University  
 Sonya Martin, Seoul National University  
 David Treagust, Curtin University  
 Jennifer Park, Seoul National University  
 Wanjo Ahn, Seoul National University  
 Dayeon Kang, Seoul National University

## Lunch—On Your Own

**12:00pm – 1:00pm**

## Committee Meetings

**11:45am – 12:50pm**

**Awards Committee Chairs & Co-Chairs Meeting**  
 11:45am – 12:50pm, Maryland Salon A

**Equity and Ethics Committee Meeting**  
 11:45am – 12:50pm, Baltimore Salon A

**External Policy and Relations Committee Meeting**  
 11:45am – 12:50pm, Baltimore Salon B

**Research Committee Meeting**  
 11:45am – 12:50pm, Kent

**Membership and Election Committee Meeting**  
 11:45am – 12:50pm, Fells Point

**International Committee Meeting**  
 11:45am – 12:50pm, Federal Hill

**Program Committee Meeting**  
 11:45am – 12:50pm, Watertable Salon A

**Publications Advisory Committee Meeting**  
 11:45am – 12:50pm, Watertable Salon B

## Plenary Session

*Equity, Justice and Generativity in Education Research for Quality Teaching and Learning*

1:00pm – 2:30pm, Maryland Ballroom C and D

**Presider:** Mary M. Atwater, University of Georgia

**Speaker:** Arnetha F. Ball, Stanford University

**Panel:**

André Green, University of South Alabama  
 Nam-Hwa Kang, Korean National University of Education  
 Femi Otulaja, University of Witwatersrand, South Africa  
 Ingrid Sánchez Tapia, UNICEF Latin America and Caribbean

## Concurrent Session #1

2:40pm – 4:10pm

### Research Committee

#### ***Administrative Sponsored Symposium - The Role of Peer Review and Critique in Strengthening Science Education***

2:40pm - 4:10pm, Maryland Salon F

#### **Presenters:**

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

John Settlage, University of Connecticut

Matthew Benus, Indiana University Northwest

Felicia Moore Mensah, Teachers College, Columbia University

Julia V. Clark, National Science Foundation

David F. Treagust, Curtin University

Jomo W. Mutegi, Indiana University

### **Strand 1: Science Learning, Understanding and Conceptual Change**

#### ***Developing an Understanding through Models and Modeling***

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

**Presider:** Christopher Wilson, BSCS

#### ***Middle School Students' Modeling of Projectile Motion***

Nam-Hwa Kang, Korea National University of Education

Heesook Jeong, Korea National University of Education

#### ***Relating Evidence and Models in Genetics: Students' Argumentation Strategies***

Veronica L. Cavera, Rutgers University

Rozaliya Seryapov, Rutgers University

Kira J. Belkin, Rutgers University

Ravit Golan Duncan, Rutgers University

Clark A. Chinn, Rutgers University

#### ***Synthesis Modeling as a Way of Learning through Model Revision***

Daniel K. Capps, University of Georgia

Jonathan T. Shemwell, University of Maine

Edward Lindsey, Old Town High School

Lisa Gagnon, Old Town High School

Jeffrey Owen, Orono High School

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

#### ***Affective and Emotional Engagement in STEM***

2:40pm - 4:10pm, Baltimore Salon A

**Presider:** Tonjua B. Freeman, University of Central Florida

#### ***There's this Appreciation of Just Wondering": The Role of Meta-Affective Learning in Science***

Jennifer A. Radoff, Tufts University

Lama Jaber, Florida State University

#### ***Science with a Smile: Humor as Antidote to Perceived Difficult Science Concepts in Nigerian Schools***

Peter A. Okebukola, Lagos State University

Olatunde Lawal Owolabi, Lagos State University

Sunday Banjoko, Lagos State University

Khadijat Ige, Lagos State University

Temitope Anuoluwapo

Michael Arove, Lagos State University

Foluso Okebukola, Lagos State University

Hakeem Akintoye, Lagos State University

Grace O. Oshun, Lagos State University

#### ***Secondary School Science Teachers' Ideas About Emotions in their Science Classrooms***

Elizabeth Hufnagel, University of Pittsburgh

#### ***Students' Engagement in Different Steps of the Engineering Design Process in a Design-Based Biology Activity***

Miancheng Guo, University of Massachusetts Amherst

Martina Nieswandt, University of Massachusetts, Amherst

Elizabeth H. McEneaney, University of Massachusetts, Amherst

### **Strand 3: Science Teaching--Primary School (Grades preK-6): Characteristics and Strategies Related Paper Set - Exploring Epistemic Practices of Engineering in Elementary Classrooms**

2:40pm - 4:10pm, Baltimore Salon B

#### ***Epistemic Practices of Engineering***

Christine M. Cunningham, Museum of Science, Boston

Gregory J. Kelly, Penn State University

#### ***Fifth Graders' Perceptions About Failure and Mindsets Before and After Learning to Engineer***

Pamela S. Lottero-Perdue, Towson University

***Exploring Ways to Help Urban Elementary Students Meet the Language and Literacy Demands of Collaborative Engineering Design***

Kristen B. Wendell, Tufts University  
Christopher G. Wright, University of Tennessee, Knoxville  
Patricia Paugh, University of Massachusetts, Boston

***Elementary Students' Use of Reasoning, Evidence, and Justification During Engineering Design***

Cathy P. Lachapelle, Museum of Science  
Christine M. Cunningham, Museum of Science, Boston  
Gregory J. Kelly, Penn State University

***Agentic Narratives, Moral Reasoning, and Social Responsibility in Elementary Engineering***

Heidi B. Carlone, University of North Carolina at Greensboro  
Tess Hegedus, High Point University  
Megan R. Lancaster, University of North Carolina at Greensboro  
Jennifer Mangrum, University of North Carolina at Greensboro

***Strand 4: Science Teaching--Middle and High School (Grades 5-12): Characteristics and Strategies Increasing Learning Opportunities in Curriculum, Assessments and Instruction***

2:40pm - 4:10pm, Homeland

**Presider:** Edward G. Lyon, Sonoma State University

***"It's Happening Now" - Middle School Students' Thinking About Climate Change***

J. Randy McGinnis, University of Maryland  
Wayne Breslyn, University of Maryland  
Emily Hestness, University of Maryland

***Are Textbooks Promoting Scientific Inquiry and Nature of Science Inquiry? - The German Situation***

Christian G. Strippel, Ruhr-University Bochum  
Lutz Tomala, Ruhr-University Bochum  
Katrin Sommer, Ruhr-University Bochum

***Science Education for Learners in Different Academic Streams: Physics Teachers Beliefs and Practices in Singapore***

Yuen Sze Michelle Tan, University of British Columbia  
Imelda S. Caleon, National Institute of Education, Nanyang Technological University

***Supporting Teachers in Using Three-Dimensional Learning to Foster Academic Success for All Students***

Jane J. Lee, Michigan State University  
Angela D. Kolonich, Michigan State University  
Kristin Mayer, Michigan State University  
Joseph S. Krajcik, Michigan State University

***Identifying a Trajectory for In-service Science Teacher Implementation of Model-Based Teaching***

Christopher A. Bogiages, Knowles Science Teaching Foundation  
Christine R. Lotter, University of South Carolina

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

***Advancing Understanding Through Varied Pedagogy***

2:40pm - 4:10pm, Maryland Salon E

**Presider:** Carina M. Rebello, Purdue University

***Comparing the Effect of Visual Cues and Video Solutions on Conceptual Problem Solving in College Physics***

Tianlong Zu, Purdue University  
Elise Agra, Kansas State University  
John Hutson, Kansas State University  
Lester Loschky, Kansas State University  
N. Sanjay Rebello, Purdue University

***Alleles: Limiting Factors in Mechanistic Explanations of Evolution***

Steve Bennett, Michigan State University  
Amelia Wenk Gotwals, Michigan State University  
Tammy Long, Michigan State University

***Should GMOs Be Labeled? A Comparison of Students' and Experts' Ideas***

Shannon Burcks, University of Missouri  
Marcelle Siegel, University of Missouri-Columbia  
Michelle Leigh Klosterman, University of Missouri  
Christopher D. Murakami, University of Missouri-Columbia

***The Effects of Scientific Argumentation on the 11Th Grade Students' Critical Thinking Skills***

Nejla G. Itepe, Dr., Dumlup University, Turkey  
Ziya KIÁ, Prof.Dr., Gazi University, Turkey

***Strand 7: Pre-service Science Teacher Education Preservice Teachers Learning About Science: Subject Matter Knowledge, Socioscientific Issues, NOS, and Science Skills (Argumentation, Reasoning)***

2:40pm - 4:10pm, Kent

**Presider:** Brian J. Plankis, Indiana University Purdue University Indianapolis

***Assessing Pre-Service Teachers' Mathematics and Science Content Knowledge, Perceptions of Self-Efficacy and NOS Conceptions***

Tonya D. Jeffery, Texas A&M University - Corpus Christi  
Cherie McCollough, Texas A&M University-Corpus Christi, Life Sciences  
Kim Moore, Texas A&M University-Corpus Christi, Mathematics

***Perceptions of Students in Teaching Credential Program on Socio-Scientific Issues***

Yilmaz Kara, Karadeniz Technical University

***Pre-Service Science Teachers' Epistemological Beliefs, Knowledge Level and Trustworthiness on Information Sources Regarding Socioscientific Issues***

Asli Saylan, Erciyes University

Ozgul Yilmaz-Tuzun, Middle East Technical University

***Scientific Reasoning and Achievement of Prospective Science Teachers in an Argumentation-Based Guided Inquiry Course***

Amer Acar, Kocaeli University

Bruce Patton, The Ohio State University

***Use of Structured Formative Assessment Assignments to Engage Preservice Teachers with Life Science Concepts***

Jaime L. Sabel, University of Nebraska-Lincoln

Cory T. Forbes, University of Nebraska-Lincoln

Laura Zangori, University of Missouri-Columbia

***Strand 8: In-service Science Teacher Education Related Paper Set - Exploring the Challenges and Successes of Integrating Robotics in K-12 Learning Environments***

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

**Presider:** Timothy A. Goodale, North Carolina State University

***Competition in Robotics Curriculum: Examining Motivation, Self-Efficacy, and Science Content Knowledge***

Christine Schnittka, Auburn University

TJ Nguyen, Auburn University

***The Influence of a Robotics Workshop on Science Teacher Self-Efficacy***

Timothy A. Goodale, North Carolina State University

***Curriculum Developers' Design Challenge: Integrate Engineering and Science Via Robotics***

Mike Ryan, Georgia Tech

Marion Usselman, Georgia Tech

Jessica Gale, Georgia Institute of Technology - CEISMC

***Understanding K-8 Robotics Teams' Collaborative Behaviors and their Performance***

Muhsin Menekse, University of Pittsburgh

Christian D. Schunn, University of Pittsburgh

Ross Higashi, University of Pittsburgh

Emily Baehr, University of Pittsburgh

***Strand 8: In-service Science Teacher Education Teachers' Professional Learning***

2:40pm - 4:10pm, Maryland Salon B

**Presider:** Mary K. Nyaema, University of Iowa

***Understanding the Impact of Conceptual Change Models and Discourse Through Teacher Professional Development***

Tracy L. Huziak-Clark, Bowling Green State University

Toni A. Sondergeld, Drexel University

John Laird, Bowling Green State University

Jacob Burgoon, Bowling Green State University

***A Trajectory of Science Teacher Learning: Charting the Course Path for Researchers, Educators, and Teachers***

Julie A. Luft, University of Georgia

Brooke A. Whitworth, Northern Arizona University

Shannon Dubois, Valparaiso University

Vanessa Kind, Durham University

Mandi Berry, Leiden University

***Contribution of Lesson Study for the Professional Learning of Physics and Chemistry Teachers***

Teresa Conce, Institute of Education, University of Lisbon

Monica Baptista, Institute of Education, University of Lisbon

Jo Pedro da Ponte, Institute of Education, University of Lisbon

***Understanding Shifts in the Beliefs and Practices of One Science Teacher***

Kimberly A. Lebak, Stockton University

***Vertically Articulated Professional Learning Communities: Developing Collaboration and Practice in a K-12 Science Teacher Professional Development Program.***

Amanda M. Gunning, Mercy College

Peter C. Hillman, Mercy College School of Education

Meghan E. Marrero, Mercy College

Arthur Eisenkraft, University of Massachusetts Boston



**Strand 10: Curriculum, Evaluation, and Assessment**  
***Symposium - Methodological Approaches to the Development of Earth and Space Science Learning Progressions***

2:40pm - 4:10pm, Maryland Salon A

**Presider:** Seungho Maeng, Seoul National University of Education

**Presenters:**

Seungho Maeng, Seoul National University of Education

Julia Plummer, Pennsylvania State University

Scott McDonald, The Pennsylvania State University

Kiyoung Lee, Kangwon National University

Christopher Palma, The Pennsylvania State University

Young-Shin Park, Chosun University

Richard A. Duschl, Penn State University

Tanya Furman, The Pennsylvania State University

**Strand 10: Curriculum, Evaluation, and Assessment**  
***Symposium - Correlating Student Drawings and Texts to Assess Understanding of the Particle Model of Matter***

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

**Presenters:**

Joi Merritt, Arizona State University

Elon Langbeheim, Arizona State University

Jennifer Chiu, University of Virginia

Sevil Akaygun, Bogazici University

Jie Chao, Concord Consortium

**Strand 11: Cultural, Social, and Gender Issues**  
***Effective Science Teaching for ELLs***

2:40pm - 4:10pm, James

**Presider:** Gillian U. Bayne, Lehman College CUNY

***Stories Told by Underrepresented Scientists of Color: Themes Revealed and Used as Springboards to Increase Participation in STEM***

Serigne Gningue, Lehman College of the City University of New York

Gillian Bayne, Lehman College of the City University of New York

Sunyata Smith, Lehman College of the City University of New York

***Integrating Science and Language: Engaging Bilingual Middle School Students in Scientific Argumentation and Explanation***

Emily J.S. Kang, Adelphi University

Lauren H. Swanson, Whittier College

Clara V. Bauler, Adelphi University

***STEMELL: Tailoring the STEM Teaching and Learning of ELLs in Mainstream Urban High-Need Secondary Classrooms***

Serigne Gningue, Lehman College

Gillian Bayne, Lehman College

Sunyata Smith, Lehman College

**Strand 11: Cultural, Social, and Gender Issues**  
***Related Paper Set - Integrating Students' Linguistic and Cultural Experiences in an Emergent Science Curriculum***

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

**Presider:** Aria Razfar, University of Illinois at Chicago

***Theoretical Perspectives on Teacher-Researchers as Science Curriculum Developers***

Aria Razfar, University of Illinois at Chicago

Adrian L. Allen, University of Illinois at Chicago

Christian A. Carstensen, University of Illinois at Chicago

Marcine M. Adams, University of Illinois at Chicago

***"Water Issues": An Emergent Culturally-Responsive Science Curriculum in a Diverse Third Grade Classroom***

Adrian L. Allen, University of Illinois at Chicago

***What Changes When a Teacher Fully Embraces Culturally-Responsive Science Teaching?***

Christian A. Carstensen, University of Illinois at Chicago

***Clean Water: A Right or Privilege? Making Connections to Students' Community to Better Understand Water Distribution***

Marcine M. Adams, University of Illinois at Chicago

**Strand 11: Cultural, Social, and Gender Issues**  
***Identity and Science Education***

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

**Presider:** Sara P. Raven, Kent State University

***Empowering Youth of Color as Change Agents: The Importance of a Science Instructor's Pedagogical Vision***

Tammie Visintainer, University of California Berkeley

***Dual Identities: Investigating the Nature of STEM-Focused Catholic Schools***

Matthew Wilsey, University of Notre Dame

Matthew Kloser, University of Notre Dame

Erin Lavin, University of Notre Dame

Dawn Hopkins, University of Notre Dame

Michael Comuniello, University of Notre Dame

***Rural, High Poverty Middle School Students' STEM Career Explorations and Identification***

Meredith W. Kier, College of William and Mary

Margaret R. Blanchard, North Carolina State University

***Setting the Stage: Influencing Sociocultural Consciousness***

Brenda R. Brand, Virginia Tech

Takumi Sato, Virginia Tech

Whitney R. Wright, Virginia Tech

Bakar O. Bey, Virginia Tech

**Strand 12: Educational Technology*****Technology and Teacher Practice***

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

**Presider:** Hillary Z. Lauren, University of Illinois at Urbana-Champaign***Virtual Teacher Learning Community: Developing a Virtual Community of Practice with Google Tools***

Rebecca D. Swanson, University of Colorado, Boulder

Jason Buell, UC Boulder

Erin Marie Furtak, University of Colorado

***How Teachers and Students See Science Taken Up in a "Making" Fab Lab Course***

Jennifer Lacy, University of Wisconsin-Madison

***Flipping the Classroom: A Quasi-Experimental Examination of the Effect of Flipped Instruction in STEM Classrooms***

Lynne Zummo, Stanford University

Bryan A. Brown, Stanford University

***Teacher Induction Network: Use of Web 2.0 Tools for Developing Reflective Practices***

Tasneem Anwar, University of Minnesota

Gillian Roehrig, University of Minnesota

**Strand 15: Policy*****Symposium - Inclusive STEM-Focused High Schools: Enhancing Policies and Practices for STEM Readiness--from States to Students***

2:40pm - 4:10pm, Gibson

**Presider:** Barbara Means, SRI International**Presenters:**

Barbara Means, SRI International

Sharon J. Lynch, The George Washington University

Ann House, SRI International

Vanessa Peters, SRI International

Michael Ford, George Washington University

Shari Matray, George Washington University

Lauren Cassidy, SRI International

Rebecca A. Kruse, National Science Foundation

**Concurrent Session #2****4:20pm – 5:50pm****International Committee*****Administrative Sponsored Symposium - Current Challenges about Epistemic Practices and Scientific Practices in Science Education***

4:20pm - 5:50pm, Maryland Salon B

**Organiser:** Maria Pilar Jimenez Aleixandre, University of Santiago de Compostela, Spain**Chair:** Jesus Piqueras, Stockholm University, Sweden**Discussant:** Jim Ryder, University of Leeds, United Kingdom**Presenters:**

Maria Pilar Jimenez Aleixandre, University of Santiago de Compostela, Spain

Richard A. Duschl, Pennsylvania State University, United States

Anat Zohar, Hebrew University, Israel

Sibel Erduran, University of Limerick, Ireland

Zoubeida Dagher, University of Delaware, United States

Karim Hamza, Stockholm University, Sweden

Jesus Piqueras, Stockholm University, Sweden

Per-Olof Wickman, Stockholm University, Sweden

Marcus Angelin, Stockholm University, Sweden

**Strand 1: Science Learning, Understanding and Conceptual Change*****Related Paper Set - Longitudinal Studies of Elementary and Middle School Students' Epistemic Considerations Through Participation in Scientific Practices***

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

***Multi-Year Growth in Mechanistic Reasoning Across Units in Biology, Chemistry, and Physics***

Brian J. Reiser, Northwestern University

Jinho Kim, University of California, Berkeley

Yukie Toyama, University of California, Berkeley

Karen Draney, UC Berkeley

***Characterizing Changes Across Model-Based Units and Time in Elementary Students' Epistemic Considerations on Scientific Modeling***

May Lee, Michigan State University

Christina V. Schwarz, Michigan State University

Li Ke, Michigan State University

***Examining How Middle School Students' Epistemic Considerations Change Across Varying Contexts and Over Time***

Jeannette Manger, Wright State University

Lisa Kenyon, Wright State University

***Examining Fifth and Sixth Grade Students' Epistemic Considerations Through an Automated Analysis of Embedded Assessment Items***

Joshua Rosenberg, Michigan State University

Christina V. Schwarz, Michigan State University

**Strand 2: Science Learning: Contexts, Characteristics and Interactions*****Perceptions of Teacher Practice***

4:20pm - 5:50pm, Kent

**Presider:** Gail Richmond, Michigan State University***Student Persistence in Science: Do Science Teacher Credentials Matter?***

Adem Ekmekci, Rice University

Baki Cavlazoglu, Texas A&amp;M University

***High School Science Teachers' Perceptions of How Others Think Science Should Be Taught***

Andrew Wild, Stanford University

***Exemplification in Science Instruction: Teaching and Learning Through Examples***

Alandeom W. Oliveira, University at Albany, SUNY

Adam O. Brown, Dept. of Biology, University of Ottawa

***Physics Inquiry in the Zone of Proximal Development***

Shulamit Kapon, Technion - Israel Institute of Technology

Alon Schapiro, Acheret Center

**Strand 2: Science Learning: Contexts, Characteristics and Interactions*****Symposium - Students Doing Science: Case Studies of Disciplinary Engagement***

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

**Presider:** Jessica Watkins, Tufts University**Presenters:**

Jessica Watkins, Tufts University

Jennifer A. Radoff, Tufts University

Anna Phillips, Tufts University

Lama Jaber, Florida State University

David Hammer, Tufts University

**Strand 4: Science Teaching--Middle and High School,  
(Grades 5-12): Characteristics and Strategies  
Unpacking Pedagogical Content Knowledge**

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

**Presider:** Jared R. Allen, Indiana University

***Experienced and Beginning Physics Teachers'  
Pedagogical Content Knowledge and Instructional  
Practices***

Imelda S. Caleon, National Institute of Education, Nanyang  
Technological University

***Experienced Chemistry Teachers' Assessment Thinking:  
Noticing, Interpreting, and Acting***

Hannah Sevan, University of Massachusetts Boston  
Melissa Weinrich, University of Massachusetts Boston  
Vicente A. Talanquer, University of Arizona  
Michael J. Clinchot, Boston Public Schools  
Rebecca Lewis, Boston Public Schools  
Courtney Ngai, University of Massachusetts Boston  
Robert Huie, Boston Public Schools  
Jennifer Lambert, Boston Public Schools  
Gregory Banks, Boston Public Schools

***Factors Influencing Secondary Science Teachers'  
Orientations for Teaching about STEM Careers***

Jared R. Allen, Indiana University  
Meredith A. Park Rogers, Indiana University  
Adam V. Maltese, Indiana University

***The Validity of an Instrument to Measure Teachers'  
Topic Specific Pedagogical Content Knowledge in  
Stoichiometry***

Stephen Andrew A. Malcolm, University of the Witwatersrand  
Marissa S. Rollnick, Wits University  
Elizabeth Mavhunga, University of Witwatersrand

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

***Related Paper Set - Data for Reform: A Comprehensive  
Examination of Introductory STEM Teaching, Learning,  
and Persistence at a Primarily Undergraduate Institution***

4:20pm - 5:50pm, Maryland Salon A

***Evidence-Based Practices at a Primarily Undergraduate  
Institution: STEM Faculty Awareness and Implementation***

Joan Esson, Otterbein University  
Kathryn Plank, Otterbein University  
Anna Young, Otterbein University  
Paul Wendel, Otterbein University

***Conceptual Gains in STEM at a Primarily Undergraduate  
Institution: A Cross-Departmental Examination***

Anna Young, Otterbein University  
Paul Wendel, Otterbein University  
Joan Esson, Otterbein University  
Kathryn Plank, Otterbein University

***Motivational Decline in STEM at a Primarily  
Undergraduate Institution***

Paul Wendel, Otterbein University  
Anna Young, Otterbein University  
Kathryn Plank, Otterbein University  
Joan Esson, Otterbein University

***Persistence in STEM at a Primarily Undergraduate  
Institution: Student Characteristics and Experiences***

Kathryn Plank, Otterbein University  
Joan Esson, Otterbein University  
Paul Wendel, Otterbein University  
Anna Young, Otterbein University

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

***Active Learning in College Science Classrooms***

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

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

***Can Active Learning Environments be Created in  
Undergraduate Biology Classrooms? A Study to Find Out***

Catherine Martin-Dunlop, Morgan State University

***Measuring the Effectiveness of Using Small-Group,  
Active Engagement Exercises in a Large-Enrollment  
Introductory Biology Course***

Gili Marbach-Ad, University of Maryland  
Carly H. Rietschel, University of Maryland  
Eric Haag, University of Maryland  
Karen Carleton, University of Maryland

***Students' Attitudes, Self-Efficacy and Experiences in  
a Modified Process-Oriented Guided Inquiry Learning  
Undergraduate Chemistry Classroom***

Venkat Rao Vishnumolakala, Curtin University  
David F. Treagust, Curtin University  
Daniel Southam, Curtin University  
Mauro Mocerino, Curtin University  
Sheila S. Qureshi, Weill Cornell Medical College in Qatar  
Katherine Bradley, Weill Cornell Medical College in Qatar

***When Active Learning is Not Active Learning: Conceptions of Teaching Influence Implementations of Active-Learning Approaches***

Stanley M. Lo, University of California, San Diego  
 Rachael R. Baiduc, Northwestern University  
 Su L. Swarat, California State University, Fullerton  
 Denise L. Drane, Northwestern University  
 Greg L. Light, Northwestern University

***Strand 6: Science Learning in Informal Contexts Exhibits and Informal Spaces for Learning Science***

4:20pm - 5:50pm, Homeland

**President:** Aaron Price, Museum of Science and Industry, Chicago

***The Impact of Out-of-School Time Informal Science Education Programs on STEM Trajectories: A Review***

Bobby Habig, University of Notre Dame; American Museum of Natural History  
 Jennifer Adams, Brooklyn College- CUNY  
 Preeti Gupta, American Museum of Natural History

***What Draws Students In? The Particular Aspects of Science Museum Exhibits that Encourage Students' Engagement***

Neta Shaby, Ben-Gurion University of the Negev, Israel  
 Orit Ben Zvi Assaraf, Ben-Gurion University of the Negev, Israel  
 Tali Tal, Technion

***Measuring the Effect of Our World Exhibition on Visitors: A Case of a Science Center***

Mehmet C. Ayar, The Scientific and Technological Research Council of Turkey  
 Kubra Bal Cetinkaya, Tubitak  
 Ahmet Uludag, Tubitak

***Using Thermal Cameras to Teach Middle School Students about Energy Dissipation in an Informal Setting***

Susanne Wessnigk, Leibniz University of Hannover  
 Jeffrey Nordine, IPN-Kiel

***Strand 7: Pre-service Science Teacher Education Preservice Teachers and Mentoring***

4:20pm - 5:50pm, Baltimore Salon A

**President:** Kadir Demir, Georgia State University

***Preservice Elementary Teachers and Science Instruction: Barriers and Supports***

Katherine P. Dabney, Virginia Commonwealth University  
 Michael R. Scott, The University of Texas at Austin  
 Amy C. Hutton, Virginia Commonwealth University  
 Shane J. Perry, Virginia Commonwealth University

***MORE for Teachers: A Research-based Model to Support the Mentoring of Elementary Pre-service Teachers in Science***

Daniel Hanley, Western Washington University  
 Tammy Q. Tasker, Western Washington University  
 Joseph A. Brobst, Western Washington University  
 Matthew Miller, Western Washington University

***Teacher Professional Identity: A Case Study of Pre-service and Mentor Science Teacher Interaction***

Jan Nourollahi, Georgia State University  
 Kadir Demir, Georgia State University  
 Anton Puvirajah, Georgia State University

***Perspectives on Coteaching from the Classroom: Student, Preservice, and Cooperating Teachers' Voices***

Andrea Drewes, University of Delaware  
 Kathryn Scantlebury, University of Delaware

***Strand 7: Pre-service Science Teacher Education Preservice Teachers' Views About the Nature of Science and Scientific Inquiry***

4:20pm - 5:50pm, Maryland Salon E

**President:** Christopher Wilson, BSCS

***Development of Pre-Service Science Teachers' Conceptions About Theories and Models Within a Nature of Science-Seminar***

Bianca Reinisch, Freie Universität Berlin  
 Dirk Krüger, Freie Universität Berlin

***Development and Validation of the Intention to Integrate Nature of Science Questionnaire***

Gulsum Akyol, Aksaray University  
 Ceren Oztekin, Middle East Technical University  
 Semra Sungur, Middle East Technical University  
 Fouad Abd-El-Khalick, University of Illinois at Urbana-Champaign

***A Holistic Approach to Teaching Science as Inquiry in a Pre-Service Teacher Education Methods Course***

Jeanette Bartley, University of Chicago

***Influence of the NGSS Framework on Pre-Service Teachers' Understanding of Science and Science Inquiry***

Julie A. Contino, American Museum of Natural History  
 Rosamond Kinzler, American Museum of Natural History

***Negotiating Tensions: Development of Ambitious Science Teaching Practices***

Arzu Tanis Ozcelik, Penn State University  
 Scott McDonald, Pennsylvania State University



**Strand 8: In-service Science Teacher Education  
Related Paper Set - Supporting Students' Engagement  
in Science and Engineering Practices: Exploring  
Instructional Shifts and Supports for Teachers**

4:20pm - 5:50pm, Maryland Salon F

**Discussant:**

Michael Ford, University of Pittsburgh

**Leveraging Uncertainty to Support Students' Engagement  
in Practice: A Pilot Study**

Eve Manz, Boston University

Enrique Suarez, University of Colorado, Boulder

**Epistemic Agency, Aims, and Considerations: Entry  
Points for Enhancing the Meaningfulness of Students'  
Knowledge-Building Work**

Abraham S. Lo, University of California, Davis

**Preservice Science Teachers' Participation in "Invisible"  
Science Practices**

David Stroupe, Michigan State University

Amelia Wenk Gotwals, Michigan State University

**Leveraging Students' Everyday Engineering Practices  
in the Science Classroom: A Study of Teacher Learning  
About Design Instruction**

Veronica McGowan, University of Washington

Shelley Stromholt, University of Washington

Philip L. Bell, University of Washington

**Strand 10: Curriculum, Evaluation, and Assessment  
Related Paper Set - State of the Art and Viability of  
Formative Assessment in Inquiry-based STEM Education**

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

**Presider:** Jan Alexis Nielsen, University of Copenhagen

**Discussant:** Erin Marie Furtak, University of Colorado

**Current State of the Art in Formative Assessment of  
Inquiry – Results from a Literature Review**

Silke Roennebeck, Leibniz Institute for Science and Mathematics  
Education

Mathias Popohl, Leibniz Institute for Science and Mathematics  
Education

**Methods of Formative Assessment for Inquiry Learning**

Regula Grob, School of Education Northwestern Switzerland

Peter Labudde, Paedagogische Hochschule FHNW

**Formative Assessment in Inquiry-Based Science  
Education Using Interactions 'On-the-Fly'**

Pasi Nieminen, University of Jyväskylä

Catarina Correia, King's College London

**Affordances and Challenges of Written Feedback as  
Formative Assessment in Inquiry-Based STEM Education**

Robert H. Evans, University of Copenhagen

Mathias Ropohl, Leibniz Institute for Science and Mathematics  
Education

Jan Alexis Nielsen, University of Copenhagen

Nicos Papadouris, University of Cyprus

Jan Alexis Nielsen, University of Copenhagen

Erin Marie Furtak, University of Colorado

**Strand 13: History, Philosophy, and Sociology of Science  
Symposium - Nature of Science in the Next Generation  
Science Standards: Translating Recommendations  
into Practice**

4:20pm - 5:50pm, Baltimore Salon B

**Presider:** Kostas Kampourakis, University of Geneva

**Presenters:**

Kostas Kampourakis, University of Geneva

William F. McComas, University of Arkansas

Norman G. Lederman, Illinois Institute of Technology

Gregory J. Kelly, Penn State University

Irene Neumann, Leibniz-Institute for Science and Mathematics  
Education

Alice Siu Ling Wong, The University of Hong Kong

Ross H. Nehm, SUNY Stony Brook

**Strand 14: Environmental Education  
Questions of Curriculum**

4:20pm - 5:50pm, Watertable Salon A

**Presider:** Sybil S. Kelley, Portland State University

**Bioenergy Science and Engineering as Components  
of Agricultural Education Curricula**

Brian Hartman, Oregon State University

Kimi Grzyb, Oregon State University

Tyson Sorensen, Utah State University

Katherine G. Fields, Oregon State University

**Drawing for Ocean Literacy: A Baseline Study**

Meghan E. Marrero, Mercy College

Diana L. Payne, University of Connecticut



***Environmental Education in Israeli Schools: Philosophies, Contents and Pedagogies***

Tali Tal, Technion

Einat Peled, Technion

***Secondary Science Students' Knowledge, Skills and Attitudes Towards Data***

Alan R. Berkowitz, Cary Institute of Ecosystem Studies

Tobias Irish, Cary Institute of Ecosystem Studies

Cornelia Harris, Cary Institute of Ecosystem Studies

## Evening/Social Events

**Membership and Elections Committee Sponsored Session  
*Mentor-Mentee Nexus***

Informal discussion: Early career NARST members are matched with more seasoned members to help launch or expand professional networks.

6:00pm – 7:00pm, Maryland Ballroom E

**Presiders:**

Daniel Dickerson, East Carolina University

Malcolm Butler, University of Central Florida

Rola Khishfe, University of Beirut

Rojana Klechaya, Srinakharinwirot University

## Research Interest Groups (RIGs) Meetings

***The Continental and Diasporic Africa in Science Education (CADASE) RIG***

The mission of CADASE is to support research in science education that will have a positive impact on the lives of children of African ancestry. This is accomplished by, a) encouraging science educators to engage in research aimed at meeting the needs of people of African ancestry; and, b) providing intellectual, professional, and personal space for science educators engaged in such research.

6:00pm – 7:00pm, Baltimore Salon A

**Presiders:** Irene U. Osisioma, California State University,

Carson California

Melody Russell, Auburn University

***Latino/a RIG (LARIG)***

The Latino/a research interest group supports social networks that further research agendas regarding Latino/a science learners. LARIG also serves as a support and mentoring alcoba, space) for Latin@s/Latino science educators and others interested in Latin@ science education. During our business meeting, we seek to plan future presentation formats, themes associated with presentations and online discussions, establish a system for collaborating on paper sets and workshops, update member contact lists, and discuss leadership roles and budget. 6:00pm – 7:00pm, Baltimore Salon B

**Presiders:** Ingrid Sánchez Tapia, UNICEF Latin America and Caribbean

***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. At the 2016 Business Meeting, the RIG members will discuss the following items: a) Updates on membership, (60+ members), listserv, and development of a member directory; b) Discussion on revisions of NARST strands and how this may impact the ENE-RIG; c) Plans for collaborative paper sets, symposiums, and panels; and d) Updates on leadership team, roles, and budget.

6:00pm – 7:00pm, Kent

**Presiders:** Christine Schnittka

***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. At the 2016 Business Meeting, the RIG members will engage in a series of exploratory planning discussions. The intended outcome of these discussions is to elaborate and clarify the RIG's mission, as well as identifying future speakers, future subcommittees, and interest in RIG leadership positions.

6:00pm – 7:00pm, Federal Hill

**Presiders:** Joseph Taylor and Binaben Vanmali

## Presidential/Welcome Reception

Social Event: All NARST conference participants are welcome—free appetizers and cash bar.

7:00pm – 9:30pm, Maryland Ballroom C and D



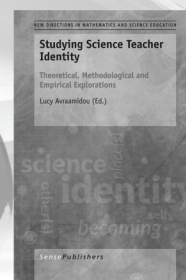
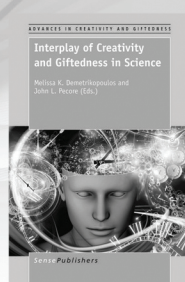
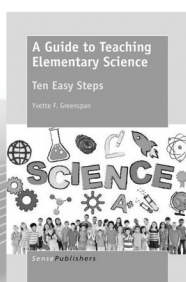
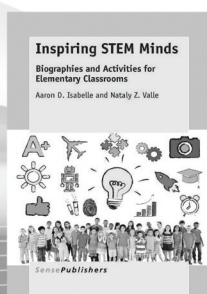
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**Friday, April 15, 2016**



## Mind and Sole (Off-Site)

This event is not sponsored or endorsed by NARST.

6:00am-7:15am, Lobby

## Conference Registration

7:00am – 5:00pm, Maryland Foyer

## Concurrent Session #3

8:30am – 10:00am

### Equity and Ethics Committee

**Administrative Sponsored Symposium – Diversity and Equity in Science Education: Voices From across the Globe**

8:30am - 10:00am, Maryland Salon E

#### Presenters:

Nam-Hwa Kang, Korea National University of Education  
Jerome M. Shaw, University of California - Santa Cruz  
Angela Calabrese Barton, Michigan State University  
Peter Okebukla, Lagos State University, Lagos-Nigeria  
Melody Russell, Auburn University  
Orit Ben Zvi Assaraf, Ben-Gurion University of the Negev Israel  
Jomo W. Mutegi, Indian University  
Sonya N. Martin, Seoul National University  
Christina Siry, University of Luxembourg

### Strand 1: Science Learning, Understanding and Conceptual Change

**Role of Curriculum and Instruction to Support Student Learning**

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

**President:** Cathy P. Lachapelle, Museum of Science

**Features of Instruction Supporting Students' Construction of Pattern Knowledge**

Hillary L. Swanson, Northwestern University

**Investigate Different Achievers' Motivation and Achievement Under Guided Inquiry-Based Instruction**

Yen-Ruey Kuo, National Changhua University of Education  
Hsiao-Lin Tuan, National Changhua University of Education  
Chi-Chin Chin, National Taichung University of Education

**Mapping Science in Discourse-Based Inquiry Classrooms: A Case Study of Three Urban Science Teachers**

Demeke G. Yeneayhu, University of Rochester

**Relating Curricular Content Coherence to Learning: Examining High School Students' Emerging Understanding of Biology**

Candice R. Guy, University of California, Davis  
Julia Gouvea, Tufts University  
Chris D. Griesemer, University of California, Davis  
Emily Harris, University of California, Davis  
Abraham S. Lo, University of California, Davis  
Cynthia Passmore, University of California, Davis

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

**Attitudes and Identity in STEM**

8:30am - 10:00am, Maryland Salon B

**President:** Mei-Hung Chiu, National Taiwan Normal University

**Measuring Science Curiosity in Learning Environments: Developing an Attitudinal Scale**

Jennifer L. Weible, Central Michigan University  
Heather Toomey Zimmerman, Penn State University

**Relationship of Context Characteristics and Chemical Content Areas and Its Impact on Students' Situational Interest**

Sebastian Habig, University of Duisburg-Essen  
Helena Van Vorst, University of Duisburg-Essen  
Elke Sumfleth, Universitaet Duisburg-Essen

**Student Beliefs: Using Cluster Analysis and Self-Organizing Maps to Understand High School Students' Chemistry Self-Concept**

Sara E. Nielsen, Miami University  
Ellen J. Yeziarski, Miami University

**STEM Roles: How Students' Ontological Perspectives Facilitate STEM Identities**

Dina Verdin, Purdue University  
Monique Ross, Purdue University  
Allison Godwin, Purdue University

**Investigating the Role of Students' Goal Orientations on their Understanding of Chemical Equilibrium Concepts**

Esra Sarici, Middle East Technical University  
Esen Uzuntiryaki-Kondakci, Middle East Technical University

**Strand 4: Science Teaching--Middle and High School, (Grades 5-12): Characteristics and Strategies**  
***Related Paper Set - Building Exemplary Teaching Practices: Following the Paths of New Science Teachers***

8:30am - 10:00am, Baltimore Salon B

**Presider:** Elizabeth B. Lewis, University of Nebraska-Lincoln

***Changes in Science Teaching Self-Efficacy from Induction Year 1 to Year 2***

Aaron Musson, University of Nebraska-Lincoln

Ana Margarita Rivero, University of Nebraska-Lincoln

Lyrice Lucas, University of Nebraska-Lincoln

Jia Lu, University of Nebraska-Lincoln

Elizabeth B. Lewis, University of Nebraska-Lincoln

***Instructional Factors and Teaching Self-Efficacy of New Science Teachers***

Lyrice Lucas, University of Nebraska-Lincoln

***Discourse in Beginning Science Teachers' Classrooms***

Jia Lu, University of Nebraska-Lincoln

***Assessment Practices of New Science Teachers***

Ana Margarita Rivero, University of Nebraska-Lincoln

***Curricular Choices of New Science Teachers***

Elizabeth B. Lewis, University of Nebraska-Lincoln

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

***Argumentation and Discourse in Conceptual Development***

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

**Presider:** Sherry A. Southerland, Florida State University

***Affordances of Simulators in Support of Content Knowledge and Argumentation Practice in Engineering Education***

Yonghee Lee, State University of New York at Buffalo

Randy K. Yerrick, SUNY- UB

Carl Lund, SUNY-UB

***Reconciling "Everyday Talk" with "Science Talk" in an Undergraduate Biology Laboratory Course for Nonscience Majors***

Anna M. Strimaitis, Florida State University

Kirby Whittington, Florida State University

Sherry A. Southerland, Florida State University

Carolyn Schultz, Florida State University

***The Role of Undergraduate Modeling Activities in Eliciting Group Interactions, Justification, and Sense-Making***

Andrea M.-K. Bierema, Michigan State University

Jon R. Stoltzfus, Michigan State University

Christina V. Schwarz, Michigan State University

***Relationship between Knowledge and Scientific Argumentation***

Feral Ogan-Bekiroglu, Marmara University

Hanife Hakyolu, Marmara University

**Strand 6: Science Learning in Informal Contexts**  
***Administrative Sponsored Symposium - Global Perspectives on Trends in Informal Science Education Research***

8:30am - 10:00am, Kent

**Presider:** Gary M. Holliday, University of Akron

**Presenters:**

John Falk, Oregon State University

Judith Lederman, Illinois Institute of Technology

Terry McClafferty, Charles Darwin University, Australia

Emma Pegram, Natural History Museum, England

Tali Tal, Israel Institute of Technology, Israel

Jung-Hua Yeh, National Museum of Natural Science, Taiwan

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

***Preservice Teachers and Science Practices***

8:30am - 10:00am, Maryland Salon A

**Presider:** Gale A. Seiler, Iowa State University

***Analyzing Explanation Construction as a Means of Supporting NGSS-Oriented Secondary Science Teaching***

Leonora Kaldaras, Michigan State University

Gail Richmond, Michigan State University

Joyce M. Parker, Michigan State University

***Prospective Teachers' Knowledge Development of Engineering Design and Its Teaching***

Dongmei Zhang, The University of Georgia

Barbara A. Crawford, The University of Georgia

***Methods Courses: A Place to Learn Teaching Now or a Place to Learn How to Teach in the Future***

Mohammad Basir, Assistant Professor

***From Preservice to Inservice: A Longitudinal Study of a Developing Teacher of Science***

Elisebeth Boyer, Ohio State University



***Prospective Science Teachers' Knowledge of the Enactment of Science Practices***

Robert C. Idsardi, University of Georgia  
Barbara A. Crawford, The University of Georgia  
Maria Romero, Simmons College  
Daniel K. Capps, University of Maine  
Jaclyn Murray, University of Georgia  
James Ammons, University of Georgia

***Strand 8: In-service Science Teacher Education  
Teacher Education for STEM Education***

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

**President:** Mary K. Nyaema, University of Iowa

***Models of STEM Integration and Student Achievement  
Gains in Engineering***

Elizabeth A. Crotty, University of Minnesota  
Selcen S. Guzey, Purdue University  
Aran W. Glancy, University of Minnesota  
Tamara J. Moore, Purdue University  
Elizabeth A. Ring, University of Minnesota

***Science Teachers' Misconceptions about Science and  
Engineering Practice***

Allison Antink-Meyer, Illinois State University  
Daniel Z. Meyer, Illinois College

***Shifting Conceptions: Identifying and Understanding  
Teachers' Conceptual Models of Integrated STEM Education***

Elizabeth A. Ring, University of Minnesota  
Emily A. Dare, Michigan Technological University  
Elizabeth A. Crotty, University of Minnesota  
Gillian H. Roehrig, University of Minnesota

***Supporting New STEM Teachers in Urban Schools:  
Attending to Motivational Self-Talk, Identity, and Agency***

Stacy Olitsky, Saint Joseph's University

**Strand 9: Reflective Practice**

***Administrative Sponsored Symposium - Allowing Our  
Professional Knowledge of Teacher Education to be  
Enhanced by Self-Study Research***

8:30am - 10:00am, Maryland Salon F

**Discussant:**

Funmi Amosun, University of Western Cape

**Presenters:**

Gayle Buck, Indiana University  
Valarie Akerson, Indiana University  
Allan Feldman, University of South Florida  
Norman Lederman, Illinois Institute of Technology  
Judith Lederman, Illinois Institute of Technology  
G. Michael Bowen, Mount Saint Vincent University  
Brenda Capobianco, Purdue University  
Elizabeth Davis, University of Michigan  
Brent Gilles, Indiana University  
Anne Hume, University of Waikato  
Nidaa Makki, University of Akron  
Stephen Marble, Southwestern University  
Karthigeyan Subramania, University of North Texas  
Amy Trauth-Nare, University of Delaware  
Maria Wallace, Louisiana State University

**Strand 10: Curriculum, Evaluation, and Assessment  
Assessment Tools: Development and Validation**

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

**President:** Christopher Wilson, BSCS

***Development of a Multiple Choice Test for Measuring  
Inquiry Skills of Fifth Graders: Inquiry Skills Test (IST)***

Yalcin Yalaki, Hacettepe University  
Gultekin Cakmakci, Hacettepe University  
Betul Sen Gumus, Science Teacher  
Derya Yahsi, Science Teacher  
Ayse Gurel, Science Teacher  
Gamze Kavak Yuksel, Science Teacher  
Ipek Ince Sungur, Science Teacher

***What Students Write Versus What they Draw:  
Implications for Science Assessments***

Osman Aksit, NC State University  
Courtney Behrle, NC State University  
Eric N. Wiebe, North Carolina State University



***Using the Inquiry-Based Teaching and Learning Mapping (I-MAP) Tool for Evaluating High School Biotechnology Majors Program***

Tom Bielik, Weizmann Institute  
Anat Yarden, Weizmann Institute of Science  
Yael Schwartz, The Weizmann Institute of Science

***Development and Validation of the Learning Progression-Based Assessment of Molecular Genetics (LPA-MG)***

Amber Todd, Wright State University  
William L. Romine, Wright State University

**Strand 11: Cultural, Social, and Gender Issues**  
***Related Paper Set - What is Contextualization of Science-Learning Environments After All? an Exploration Across Cultural Contexts***

8:30am - 10:00am, Baltimore Salon A

**President:** Ingrid M. Sanchez-Tapia, Fundaci n Yopo

**Discussants:**

Marlynne Nishimura, University of Illinois

***Promoting Student Engagement: A Case Study of a Middle School Science Teacher Making Sense of the NGSS Through Contextualization***

Consuelo J. Morales, University of Michigan

***Critical Contextualization: Confronting the Root Causes of Inequity in Science Education Through the Curriculum***

Daniel Morales-Doyle, University of Illinois at Chicago

***What to Eat Here and Now: Contextualization of Scientific Argumentation from a Place-Based Perspective***

Pablo Brocos, University of Santiago de Compostela  
Maria-Pilar Jimenez Aleixandre, Universidade De Santiago De Compostela

***Framing, Adapting, and Applying: How Can Novice Science Teachers Construct Authentic Science Learning Contexts for/with Students in Multilingual Science Classrooms?***

Corey Knox, University of Arizona  
Ivan Salinas Barrios, CIAE – Universidad de Chile  
Sara E. Tolbert, University of Arizona

***Curricular Contextualization as a Strategy to Support Indigenous Students to Learn About Natural Selection***

Ingrid M. Sanchez-Tapia, Fundaci n Yopo  
Marlynne Nishimura, University of Illinois

**Strand 11: Cultural, Social, and Gender Issues**  
***Aspirations, Motivation, and Achievement in Science***

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

**President:** Jacqueline Theresa McDonnough, Virginia Commonwealth University

***Gender Differences of Motivational Beliefs and Science Achievement in 26 Countries***

Pey-Yan Liou, National Central University

***Peer-Led Team Learning: Improving Achievement for Underrepresented Minorities in Post-Secondary Biology***

Julia J. Snyder, Syracuse University  
Jeremy D. Sloane, Syracuse University  
Jason R. Wiles, Syracuse University

***Who Holds Science Aspirations? Investigating Factors Influencing Science Aspirations Among Students Aged 15/16 in England***

Julie K. Moote, King's College London  
Jennifer Dewitt, King's College London  
Louise Archer, King's College London

***A Group Story Reflection of Minority Scientist Perspectives on Science Education***

David Segura, University of Illinois at Chicago  
Olayinka A. Mohorn-Mintah, University of Illinois-Chicago  
Janice Mejia, University of Illinois-Chicago

***Resisting Racist, Classist Neoliberalism in Science Education: Counter-Stories of an African-American Teacher and Her Students***

Jean R. Aguilar-Valdez, Portland State University

**Strand 12: Educational Technology**  
***Technology and Student Learning***

8:30am - 10:00am, Homeland

**President:** Eva Erdosne Toth, West Virginia University

***Developing a Project Based Learning Progression in a Serious Educational Game Design and Development Project***

Len Annetta, George Mason University  
Marina Shapiro, George Mason University  
Stacia Stribling, George Mason University  
Anna Menditto, George Mason University  
Leigh Ann Kurz, George Mason University  
Sheri Berkeley, George Mason University  
Amanda Luh, George Mason University

***Psychosocial Factors Affecting STEM Career Selection in Computer Science and Engineering***

Richard L. Lamb, Washington State University

Len Annetta, George Mason University

Jonah B. Firestone, Washington State University-Tricities

David B. Vallett, University of Nevada Las Vegas

Reanne Cunningham, Washington State University

***Discovering Children's Intuitive Ideas about Energy Through a Full-Body Museum Game and Multi-Modal Study Design***

Christina Silliman, University of Illinois, Urbana-Champaign

Sahar K. Alameh, University of Illinois, Urbana-Champaign

Robb Lindgren, University of Illinois Urbana-Champaign

***Learning Outcomes in an Online Chemistry Simulation: Effects of Visual-Scaffolds and Self-Reported Home Language (SRL1)***

Anna G. Brady, New York University

Ruth Schwartz, Quinnipiac University

Catherine E. Milne, New York University

Jan Plass, New York University

Bruce Homer, CUNY Graduate Center

Trace Jordan, New York University

Susan Letourneau, Brown University

***Strand 13: History, Philosophy, and Sociology of Science Symposium - Global Perspectives on Nature of Science in School Science Textbooks: Representations, Methodologies, Contexts, and Implications***

8:30am - 10:00am, Gibson

**Presider:** Christine V. McDonald, Griffith University

**Presenters:**

Christine V. McDonald, Griffith University

Fouad Abd-El-Khalick, University of Illinois at Urbana-Champaign

Saouma B. Boujaoude, American University of Beirut

Zoubeida R. Dagher, University of Delaware

Jeanne Brunner, University of Illinois at Urbana-Champaign

Maurice Di Giuseppe, University of Ontario Institute of Technology (UOIT)

Umesh Ramnarain, University of Johannesburg

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

8:30am - 10:00am, James

**Presider:** Dionysius T. Gnanakkan, Illinois Institute of Technology

***Secondary Students' Understanding of Nature of Science in a Socioscientific Issues Context***

Dawnne M. LePrete, Illinois Institute of Technology-MSED

***Quantum Physics, History, Philosophy and NOS in Traditional Physics Classrooms***

Maria Vetleseter Vetleseter Boe, Norwegian Centre for Science Education

Ellen K. Henriksen, University of Oslo

Carl Angell, University of Oslo

***The Use of NOS Understandings in the Evaluation of Science News by Non-Science Majors***

Jessica Shuk Ching Leung, The University of Hong Kong

Alice Siu Ling Wong, The University of Hong Kong

Benny Hin Wai Yung, The University of Hong Kong

***The Effect of Teaching Nature of Science on Students' Acceptance and Understanding of Evolution: Myth or Reality?***

Hernan Cofre, Pontificia Universidad Católica de Valparaíso

Claudia Vergara, University Alberto Hurtado

David Santibanez, Illinois Institute of Technology & Universidad Católica Silva Henríquez

Juan Jimenez, Illinois Institute of Technology

Angel Spotorno, Universidad de Chile

***Strand 14: Environmental Education***

***Sustainability in Secondary and Post-Secondary Education***

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

**Presider:** Karen M. Kerr, Queen's University Belfast

***Engaging High School Youth in Conservation Biology Science Research***

Preeti Gupta, American Museum of Natural History

***Humans as an Integrated Component of Ecosystems: Measuring Ecological Literacy of Natural Resource Management Students***

Anne Marie A. Casper, Colorado State University

Meena M. Balgopal, Colorado State University

Maria E. Fernandez-Gimenez, Colorado State University

***Improving Students' Knowledge of Science and the Environment: Challenges of an International Science Club Collaborative***

Brian J. Plankis, Indiana University Purdue University Indianapolis

Pamela Martine, Indiana University Purdue University Indianapolis

***Sustainability and Culture: A Freshman Experience Design Study***

Cindy L. Kern, Quinnipiac University

Rosemary Whelan, University of New Haven

Beth Markello, University of New Haven

***Understanding Sustainability: Teachers' Representation and Students' Understanding of Sustainability within a Project-Based, Environmental Science Course***

Lia Wetzstein, University of Washington  
Susan Nolen, University of Washington

## Concurrent Session #4

### 10:15am – 11:45am

#### Research Committee

***Administrative Sponsored Symposium - STEM Education for Liberation: The Key to Achieving Equity and Social Justice for People of African Ancestry***

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

#### Presiders:

Irene U. Osisioma, California State University, Dominguez Hills  
Melody Russell, Auburn University

#### Presenter:

Julius Davis, Bowie State University

#### Strand 1: Science Learning, Understanding and Conceptual Change

***Learning Progressions and Student Understanding in Chemistry***

10:15am - 11:45am, Kent

**Presider:** May Lee, Michigan State University

***A Study of the Capacity of 9-Year-Olds to Understand and Apply Atomic Theory***

Carole E. Haeusler, University of Southern Queensland  
Jennifer Donovan, University of Southern Queensland

***A Study on Secondary School Students' Understanding of Energy in Chemical Reactions—Based on Learning Progression***

Weizhen Wang, Beijing Normal University  
Lei Wang, Beijing Normal University

***Developing and Validating a Learning Progression on Chemical Reactions***

Katrin Weber, University of Duisburg-Essen  
Markus Emden, Pädagogische Hochschule Schwabisch Gmünd  
Elke Sumfleth, University of Duisburg-Essen

***Use of a Card Sort Task to Define a Progression for Coordinating Three Levels of Representation in Chemistry***

Emily J. Borda, Western Washington University  
Stefan M. Irby, Purdue University  
Andy L. Phu, Western Washington University  
Todd R. Haskell and Andy Phu

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

***The Role of Explanation and Argumentation in Science Learning***

10:15am - 11:45am, Homeland

**Presider:** Martina Nieswandt, University of Massachusetts, Amherst

***Exploring the Relationship Between Native Language Use and Science Learning***

Jason S. Wu, Columbia University  
Kok-Sing Tang, National Institute of Education

***Constructing and Critiquing Arguments in Science Classrooms: Perspectives From Both Sociocultural Development and Linguistics***

Ying-Chih Chen, Arizona State University

***High School Students' Assessments of Science Concepts and Explanations through Peer Review of Writing***

Anita Schuchardt, University of Pittsburgh  
Christian D. Schunn, University of Pittsburgh  
Amanda J. Godley, University of Pittsburgh

***Student Gestures During Shifts from Descriptions to Explanations of Gas Pressure***

Robert C. Wallon, University of Illinois at Urbana-Champaign  
David E. Brown, University of Illinois  
Robb Lindgren, University of Illinois Urbana-Champaign

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

***Related Paper Set - Supporting Teachers to Facilitate Student Sensemaking in Elementary Science Classrooms***

10:15am - 11:45am, Maryland Salon A

**Discussant:** Cory Forbes, University of Nebraska

***Examining Videos of their Rehearsals: Helping Teacher Candidates Notice and Reason about Ambitious Teaching***

Amanda Benedict-Chambers, Missouri State University  
Diana Piccolo, Missouri State University  
Gina Wood, Missouri State University  
Cindy McMeley, Missouri State University

***Lessons from an Experienced Teacher: Using Sensemaking Discussions to Support First Graders' Scientific Explanations***

Amber S. Bismack, University of Michigan  
Leigh A. Haefner, Penn State Altoona  
Carla Zembal-Saul, Penn State University

***Learning to Support Elementary Children to Analyze Data in a Practice-Based Teacher Education Program***

Anna Maria Arias, Illinois State University

***Supporting Beginning Teacher Planning of Investigation-Based Science Discussions***

Sylvie M. Kademian, University of Michigan

Elizabeth A. Davis, University of Michigan

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

***Related Paper Set - Viewpoints on Experimentation from the Perspectives of Teachers and Students***

10:15am - 11:45am, Baltimore Salon A

**Discussant:**

Suparna Sinha, Rutgers University

***Examining Middle School Students' Pathways through Experimentation Via a Virtual Simulation***

Meredith Thompson, Harvard University

Patrick Sedney, Harvard University

Amy M. Kamarainen, Harvard

Shari Jackson Metcalf, Harvard University

Michael S. Tutwiler, Harvard

Tina Grotzer, Harvard University

Christopher Dede, Harvard

Suparna Sinha, Rutgers University

***Student Understanding of Scientific Practices and Crosscutting Themes Via an NGSS--Targeted Curriculum and Instruction Project***

Josh Sheldon, Massachusetts Institute of Technology

Susan Yoon, University of Pennsylvania

Jessica Koehler, University of Pennsylvania

Murat Oztok, Lancaster University

Emma Anderson, University of Pennsylvania

Ilana Schoenfeld, Massachusetts Institute of Technology

Hal Scheintaub, Governor's Academy

Daniel Wendel, Massachusetts Institute of Technology

Eric D. Klopfer, Massachusetts Institute of Technology

***Teacher Views on Experimentation in Ecosystem Science and the Classroom***

Amy M. Kamarainen, Harvard University

David Sabey, Harvard University

Tina Grotzer, Harvard University

Meredith Thompson, Harvard University

Eva Shultis, Harvard University

Ilana Schoenfeld, Massachusetts Institute of Technology

Daniel Wendel, Massachusetts Institute of Technology

Eric D. Klopfer, Massachusetts Institute of Technology

***Authentic Scientific Research Experiences (ASREs) Influence on Teachers' Ideas About Experimentation, Observation, and the Nature of Science (NOS)***

Meghan Moriarty, Boston University

Meredith Thompson, Harvard University

Donald DeRosa, Boston University

Meredith Thompson, Harvard

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

***Communicating in the Sciences***

10:15am - 11:45am, Maryland Salon E

**Presider:** Rhea L. G. Miles, East Carolina University

***Developing Ecoliteracy Through Photojournals in a Blended Environmental Science Course***

Lauren Madden, The College of New Jersey

Tabitha Dell'Angelo, The College of New Jersey

***Engaging Students with Primary Literature Improves Nature of Science Conceptions and Confidence in Reading Science***

B. Elijah Carter, University of Georgia

Jason R. Wiles, Syracuse University

***The Effects of Feedback From Younger Readers in Writing-To-Learn Approach in College***

Sae Yeol Yoon, Delaware State University

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

***Related Paper Set - Studying and Supporting the Work of Informal STEM Educators***

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

**Presider:** Scott A. Pattison, Institute for Learning Innovation; Oregon Museum of Science and Industry

***Researching the Value of Educator Actions for Learning, (REVEAL)***

Scott A. Pattison, Oregon Museum of Science and Industry

***Facilitation Research for Engineering Design Education, (FREDE)***

Ryan Auster, Museum of Science, Boston

***An Online Video-Sharing Model for Afterschool STEM Educators***

Sue Allen, Allen & Associates



***Using Communities-of-Practice to Support Informal Educators' Professional Development***

Joe Heimlich, Center of Science and Industry  
Cathlyn Stylinski, University of Maryland  
Sasha Palmquist, Palmquist & Associates, LLC  
Deborah Wasserman, Lifelong Learning Group

***Strand 7: Pre-service Science Teacher Education Preservice Teachers' Beliefs***

10:15am - 11:45am, Maryland Salon B

**Presider:** Saiqa Azam, Memorial University of Newfoundland

***Changes in Preservice Elementary Teachers' Science Self-Efficacy Beliefs and Its Relation to Science Conceptual Understandings in a Science Content Course***

Deepika Menon, Towson University  
Troy Sadler, University of Missouri-Columbia

***Making Learning Visible: Developing Preservice Teachers' Environmental Education Pedagogical Content Knowledge and Teaching Efficacy Beliefs***

Greer M. Richardson, La Salle University  
Ling L. Liang, La Salle University  
Laurel L. Byrne, La Salle University

***A Study on Collective Efficacy Among Preservice Science Teachers***

Volkan Atasoy, Middle East Technical University  
Jale Cakiroglu, Middle East Technical University

***Why do Undergraduate Science Majors Decide to Pursue a Science Teaching Credential?***

Ashley N. Coon, University of Maryland  
Diane Jass Ketelhut, University of Maryland

***Pre-Service Middle Grades Teachers' Understandings About Scientific Creativity: Perspectives on Teaching for Student Scientific Creativity***

Gary M. Holliday, University of Akron  
Allison Antink-Meyer, Illinois State University

***Strand 8: In-service Science Teacher Education Professional Development Models and their Influence on Learners' Outcomes***

10:15am - 11:45am, Maryland Salon F

**Presider:** Mary K. Nyaema, University of Iowa

***From Professional Development to Practice: Elementary Teachers' Understandings and Enactment of Nature of Science Instruction***

Jennifer Maeng, University of Virginia  
Randy L. Bell, Oregon State University  
Tyler L. St.Clair, Oregon State University  
Brooke A. Whitworth, Northern Arizona University  
Amanda L. Gonczy, University of Virginia

***Analyzing Teaching Practices in the Korean Science Classroom Utilizing RTOP and SIOP Observational Tools: Implication of Professional Development Model for the Inclusion of Culturally and Linguistically Diverse, (CLD) Students in Science***

Jennifer Park, Seoul National University  
Wanjoo Ahn, Seoul National University  
Sonya N. Martin, Seoul National University

***Climate Science Professional Development: Curriculum Design Considerations and Student Learning Outcomes***

Andrea Drewes, University of Delaware  
Chrystalla Mouza, University of Delaware  
Joseph Henderson, University of Delaware

***Coteaching in the Outdoors: A Blended Continuing Professional Development (CPD) Model***

Karen M. Kerr, Queen's University Belfast

***The Effect of an Analysis-of-Practice, Videocase-Based, Teacher Professional Development Program on Teacher and Student Outcomes***

Christopher Wilson, BSCS  
Joseph A. Taylor, ABT Associates  
Kathleen J. Roth, Cal Poly Pomona Foundation  
Molly Stuhlsatz, BSCS  
Connie Hvidsten, Biological Science Curriculum Study

**Strand 10: Curriculum, Evaluation, and Assessment*****Curriculum Development and Implementation***

10:15am - 11:45am, Watertable Salon A

**Presider:** William L. Romine, Wright State University***Addressing the Achievement Gap Through Hands-On Brain, Learning, Behavior, and Traits Curriculum for Grades 4-5***

Nancy Moreno, Baylor College of Medicine

Alana Newell, Baylor College of Medicine

Christopher Burnett, Baylor College of Medicine

***Curriculum Implementation for Scientific Argumentation: Fidelity to Procedure Versus Fidelity to Goals***

Katherine L. McNeill, Boston College

Lisa Marco-Bujosa, Boston College

Maria Gonzalez-Howard, Boston College

Suzanna Loper, Lawrence Hall of Science/University of California

***Exploring Variation in Curriculum Implementation Through Data Visualization of Teacher Talk***

Cynthia M. D'Angelo, SRI International

Savitha Moorthy, SRI International

Carrie D. Allen, University of Colorado - Boulder

Christopher J. Harris, SRI International

William R. Penuel, University of Colorado

***The Development and Analysis of a Preschool Science Task: Observing and Explaining Sinking and Floating***

Christina V. Schwarz, Michigan State University

Laurie Van Egeren, Michigan State University

***Secondary Science Teachers as Curriculum Makers: Mapping and Designing Scotland's New Curriculum for Excellence***

Carolyn S. Wallace, Kennesaw State University

**Strand 10: Curriculum, Evaluation, and Assessment  
*Statistical Modeling***

10:15am - 11:45am, Federal Hill

**Presider:** Gavin W. Fulmer, National Institute of Education***Validation of an Instrument for Measuring Students' Understanding of Science in Grades 4-8 Over Multiple Semesters: A Rasch Measurement Study***

Yang Yang, University at Buffalo

Peng He, Northeast Normal University

Xiufeng Liu, State University of New York at Buffalo

Michelle R. Eades-Baird, State University of New York at Buffalo

***Using Stochastic Ordering to Evaluate Changes in Physics Students' Conceptual Understanding***

Brian D. Gane, University of Illinois at Chicago

Lou DiBello, Learning Sciences Research Institute-UIC

Chiaka Okoroh, University of Illinois at Chicago

Jim A. Minstrell, FACET Innovations

James W. Pellegrino, University of Illinois at Chicago

***Using Rasch Modeling to Investigate a Learning Progression for Energy Ideas***

Cari F. Herrmann Abell, AAAS Project 2061

George E. De Boer, AAAS Project 2061

***Testing Validity Inferences for Genetic Drift Concept Inventory Scores Using Rasch and Item Order Analyses***

Robyn Tornabene, Stony Brook University

Erik Lavington, Stony Brook University

Ross H. Nehm, SUNY Stony Brook

**Strand 10: Curriculum, Evaluation, and Assessment  
*STEM Integration in Curriculum and Assessment***

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

**Presider:** Christine M. Cunningham, Museum of Science, Boston***Operationalizing Applied Science: Developing Measures for Elementary Students' Understanding of STEM Dimensions of Food Systems***

Molly Brandt, University of Nebraska-Lincoln

Cory T. Forbes, University of Nebraska-Lincoln

Jennifer Keshwani, University of Nebraska-Lincoln

***Evaluation of STEM-Integrated Lessons Using a Modified RTOP***

Gillian Roehrig, University of Minnesota

Joshua A. Ellis, Michigan Technological University

Emily A. Dare, Michigan Technological University

Tim Sheldon, University of Minnesota

***The Effects of Engineering Integration on Student Achievement in Science, Engineering, and Mathematics***

Selcen Guzey, Purdue University

Tamara J. Moore, Purdue University

Michael Harwell, University of Minnesota

Mario Moreno, University of Minnesota

Aran W. Glancy, University of Minnesota

***Integrating Science and Engineering Curriculum in Elementary Classrooms***

Mandy Biggers, The Pennsylvania State University

Leigh A. Haefner, Penn State Altoona

**Strand 11: Cultural, Social, and Gender Issues*****Mobilizing Students' Cultural and Community Resources***

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

**Presider:** Jomo W. Mutegi, Indian University***Lasting Impacts of Cross-Cultural Research on Science and STEM Teaching and Research in the U.S.***

Nicole Beeman-Cadwallader, Project Lead the Way

Cassie Quigley, Clemson University

Ingrid S. Weiland, Metropolitan State University of Denver

***Building Culturally Relevant Ambitious Science Teaching (CRAT) for Diverse Students***

Ebenezar M. Mbachu, McGill University

***Family Science Night: Experiencing Democratic Science Education in a Middle School***

Michelle A. Fleming, Wright State University

Lisa O. Kenyon, Wright State University

Leonard Kenyon, Wright State University

Bhaskar Upadhyay, University of Minnesota

***Community Organizations' Programming and the Development of Community Science Teachers***

Maria Varelas, University of Illinois at Chicago

Syeda Raza, University of Illinois at Chicago

Daniel Morales-Doyle, University of Illinois at Chicago

Carole P. Mitchener, University of Illinois at Chicago

David Segura, University of Illinois at Chicago

Karen Canales, Harold Washington College

**Strand 12: Educational Technology*****Models and Design Using Technology***

10:15am - 11:45am, Baltimore Salon B

**Presider:** David B. Vallett, University of Nevada, Las Vegas***Including Blind Students in Science Education: Sound-Based Computer Models as an Exploratory Learning Environment***

Sharona T. Levy, University of Haifa

Ran Peleg, University of Haifa

Orly Lahav, Tel-Aviv University

Noha Chagab, Tel-Aviv University

Vadim Talis, Tel-Aviv University

***Integrating Agent-Based Modeling & Case Study to Learn About Population Dynamics: A Design Framework***

Aditi Wagh, Northwestern University

Michael J. Novak, Park View School and Northwestern University

Firat Soylu, University of Alabama

Uri Wilensky, Northwestern University

***Intersection of Creativity and the Design Process in SEG Design-Based Research***

David B. Vallett, University of Nevada, Las Vegas

Richard L. Lamb, Washington State University

Len Annetta, George Mason University

Marina Shapiro, George Mason University

***Failing Better – Reflecting on an Activity in Which Students Analyze Common Mistakes***

Elon Langbeheim, Arizona State University

Menashe Puterkovsky, Jerusalem Institute of Technology

Esther Bagno, Weizmann Institute of Science

Edit Yerushalmi, Weizmann Institute of Science

**Strand 15: Policy*****Building Capacity for STEM Reform: Policy, Partnerships, and Capital***

10:15am - 11:45am, Gibson

**Presider:** Sharon J. Lynch, The George Washington University***Activating Capacity for Urban Science Education Reform: The Role of Resource Chains and Constellations***

Kathryn N. Hayes, California State University, East Bay

Christine Lee, California State University East Bay

Rachelle DiStefano, Cal State University East Bay

Jeff Seitz, California State University, East Bay

Dawn O'Connor, California State University, East Bay

***Mismatch Between Important STEM Competencies and STEM Education***

Hyewon Jang, Harvard University

***Industrial Engagement in STEM-Initiatives: Three Case Studies***

Maria Andrée, Stockholm University

Lena Hansson, Kristianstad University, Sweden

**NARST Annual Membership Meeting  
(formerly NARST Business Meeting)**Box lunch provided for 1<sup>st</sup> 100 attendees who sign up.

12:00pm – 1:00pm, Baltimore Salon A

**Lunch—On Your Own  
12:00pm – 1:00pm**

## Concurrent Session #5

1:15pm – 2:45pm

### Presidential Sponsored Session

#### *Engagement, Disengagement, and Alienation of Student in Science Education*

1:15pm - 2:45pm, Baltimore Salon A

**Presider:** Mary M. Atwater, University of Georgia

#### **Presenters:**

Pauline Chinn, University of Hawaii at Manoa

Meshach B. Ogunniyi, University of the Western Cape

Xicotencatl Martinez Ruiz, Revista Innovacion Educativa

Liyu Fu, National Tsing Hua University

Henriette Tolstrup Holmegaard, University of Copenhagen

### Strand 1: Science Learning, Understanding and Conceptual Change

#### *Large Scale Assessment of Student Understanding*

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

**Presider:** Mei-Hung Chiu, National Taiwan Normal University

#### *Decision Tree as a Model for the Prediction of Student Performance on Diffusion*

Mei-Hung Chiu, National Taiwan Normal University

Yuh-Ru Yu, National Taiwan Normal University

Hongming L. Liaw, National Applied Research Laboratories, Taiwan

#### *Improving Science Learning Through Integrating the Arts*

Brad Hughes, UCI

Robert Kalinowski, University of California, Irvine

Doron Zinger, University of California, Irvine

Alex Ray, University of California, Irvine

Doug Grove, Multi-Dimensional Education Inc.

Drew H. Bailey, University of California, Irvine

Christa Mulker Greenfader, University of California Irvine

#### *Inequitable Foundations and Adaptation: Educational Equality in Evolution*

Jaimie Miller-Friedmann, University of Oxford

Sue Sunbury, Harvard University

Philip M. Sadler, Harvard Smithsonian Center for Astrophysics

#### *Psychometric Evaluation of the Nature of Solutions and Solubility—Diagnostic Instrument English Version.*

Mandy McCormick Smith, Capital University

Lin Ding, The Ohio State University

Kathy Cabe Trundle, North Carolina State University

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

#### *Symposium - Pathways towards Engaging and Equitable Sense-Making for Elementary Teachers and their Students*

1:15pm - 2:45pm, Maryland Salon E

**Presider:** Christina V. Schwarz, Michigan State University

#### **Presenters:**

Christina V. Schwarz, Michigan State University

Angela Calabrese Barton, Michigan State University

Carrie T. Tzou, University of Washington Bothell

Carolyn Colley, University of Washington, Seattle

Beth Warren, TERC

Ann S. Rosebery, TERC

Elizabeth X. De Los Santos, Michigan State University

Christa Haverly, Michigan State University

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

#### *Teaching and Learning Outcomes*

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

**Presider:** Christine Lee, California State University East Bay

#### *Using the Complexity Paradigm to Help Students Construct Meaningful Links Among Biology Concepts*

Fadi B. El Hage, Universite Saint Joseph

Saouma B. Boujaoude, American University of Beirut

#### *Comparing Laboratory Instruction for Differently Tracked Groups of Students*

Patrick J. Enderle, Georgia State University

Anna M. Strimaitis, Florida State University

Jonathon Grooms, George Washington University

Victor D. Sampson, The University of Texas at Austin

Sherry A. Southerland, Florida State University

#### *High Performers in Science: The Relation Between Instructional Characteristics and Performance, Self-Concept, and Interest*

Stefanie Schmidtner, Technische Universitt M<sub>u</sub>nchen

Anja Schiepe-Tiska, Technische Universitt M<sub>u</sub>nchen

Tina Seidel, Technische Universitt M<sub>u</sub>nchen

Manfred Prenzel, Technische Universitt M<sub>u</sub>nchen

#### *Fostering Problem Solving Skills: A Training on Pictorial Literacy*

Julia Kobbe, University of Duisburg-Essen, Chemistry Education

Jenna Koenen, Humboldt-University Berlin

Stefan Rumann, University of Duisburg-Essen



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

### ***Self-Efficacy and Motivations***

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

**Presider:** Tonjua B. Freeman, University of Central Florida

### ***Relationships Among Taiwanese Undergraduates' Conceptions of, Approaches To, and Self-Efficacy Regarding Learning Earth Science***

Kuan-Ming Shen, National Sun Yat-sen University, Taiwan

Min-Hsien Lee, National Sun Yat-sen University, Taiwan

Chin-Chung Tsai, National Taiwan University of Science and Technology, Taiwan

Jyh-Chong Liang, National Taiwan University of Science and Technology, Taiwan

Yen-Yuan Chen, National Taiwan University, Taiwan

Guo-Li Chiou, National Taiwan University of Science and Technology, Taiwan

### ***A Comparison of Students' Motivation and Experiences in Face-To-Face and Virtual Laboratories in Introductory Biology***

Amber J. Reece, University of Central Florida

### ***Impacts of a Course-Based Undergraduate Research Experience on Novice Students' Attitudes and Motivation in Biology***

Jeffrey T. Olimpo, The University of Texas at El Paso

Ginger R. Fisher, University of Northern Colorado

### ***A Comparison of College Students' Character Development and Socioscientific Argumentation Based on their Orientations: Individualism-Collectivism***

Yeonjoo Ko, Ewha Womans University

Yunhee Choi, Soongmoon Middle School

Hyunju Lee, Ewha Womans University

## **Strand 7: Pre-service Science Teacher Education** ***Preservice Teachers' Scientific Writing, Literacy, and Language***

1:15pm - 2:45pm, Baltimore Salon B

**Presider:** Tonya D. Jeffery, Texas A&M University - Corpus Christi

### ***Uncovering Preservice Science Teachers' Tacit Reading Strategies***

Kirsten K. Mawyer, University of Hawaii

Heather J. Johnson, Vanderbilt University

### ***Pre-Service Educators' Digital Stories of Writing in Science***

Nancy P. Morabito, St. John's University

## ***A Study of Preservice Teachers' Use of Academic Language and Discourse in Science Teaching***

Sanghee Choi, University of North Georgia

## ***Creating a Model of Acceptance: Using Culturally Relevant Science and Mathematics at Family Learning Events***

Cherie McCollough, Texas A&M University-Corpus Christi

Olga Ramirez, University of Texas Rio Grande Valley

Zulmaris Diaz, University of Texas Rio Grande Valley

## **Strand 8: In-service Science Teacher Education** ***Issues About Earth Science in Teacher Education***

1:15pm - 2:45pm, Homeland

**Presider:** Greg Rushton, Stony Brook University

### ***Authentic Ocean Data as a Pathway to Meeting the Next Generation Science Standards***

Meghan E. Marrero, Mercy College

Raya-Jean Zaczek, NASA Endeavor STEM Teaching Certificate Program

### ***Examining Changes in Science Teachers' Conceptual Understanding About Earthquake Engineering***

Baki Cavlazoglu, Texas A&M University

Carol L. Stuessy, Texas A&M University

### ***Geoscience Teachers' Visual Representations of Plate Tectonic Boundaries: Development and Validation of a Scoring Rubric***

Dannah L. Schaffer, Minot State University

Lloyd H. Barrow, University of Missouri

### ***Semi-Quantitative Characterization of Science Teachers' Use of Three-Dimensional Instruction***

Deborah Herrington, Grand Valley State University

Senetta Bancroft, Grand Valley State University

## **Strand 10: Curriculum, Evaluation, and Assessment** ***Curriculum and Assessment Practices in P-16 Education***

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

**Presider:** Ann W. Wright, Canisius College

### ***Assessing, Operationalizing, Profiling Evolution Acceptance in College Students***

William L. Romine, Wright State University

Emily M. Walter, University of California: Fresno

Amber Todd, Wright State University

### ***Improving Science Teachers' Use of Data for Instructional Decisions***

Matthew Kloser, University of Notre Dame

Hilda Borko, Stanford University

Matthew Wilsey, University of Notre Dame's Center for STEM Education

Stephanie Rafanelli, Stanford University

### ***The Rubric for Scientific Writing: A Tool to Support Research, Assessment, and Instruction***

Katherine L. Wright, Texas A&M University

Tracey S. Hodges, The University of Southern Mississippi

Jennifer K. LeBlanc, Texas A&M University

### ***Capture of Interest and Motivation in Written Competency Tests with Context-Based Tasks***

Mariella Roesler, University of Kassel

Nicole Wellnitz, University of Kassel

Jürgen Mayer, University of Kassel

### ***Strand 10: Curriculum, Evaluation, and Assessment Symposium - Science Teachers as Science Education Researchers: Singapore School Teachers' Research Projects***

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

**Presider:** Gavin W. Fulmer, National Institute of Education, Singapore

#### **Presenters:**

Gavin W. Fulmer, National Institute of Education, Singapore

James Long, Punggol Green Primary School

Siew Ling Quek, Pioneer Junior College

Flavian B. Fernandez, Woodgrove Secondary School

Hooi Ling Chua, NUS High School of Mathematics and Science

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

1:15pm - 2:45pm, Pride of Baltimore

**Presider:** Zoe E. Buck Bracey, BSCS

### ***A Feminist Physics Framework: Deconstructed Physics and Students' Multiple Subjectivities***

Diane C. Jammula, Teachers College, Columbia University

### ***What We Talk When We Talk About Gender***

Devasmita Chakraverty, University of Virginia

Donna B. Jeffe, Washington University, St. Louis, Missouri.

Heather D. Wathington, University of Virginia

Robert H. Tai, University of Virginia

### ***Gendered Patterns of Future-Oriented Motivation to Learn Science Across 57 Countries***

Fatih C. Mercan, Bogazici University

### ***Intentionality or Unrealized Potential? Examining High School Girls' Perceived Efficacy and Potential Science Course Paths***

Jill V. Patterson, William Paterson University

Issam H. Abi-El-Mona, Rowan University

### ***Strand 13: History, Philosophy, and Sociology of Science Symposium - Nature of Science and the Next Generation Science Standards: Consideration, Critique and Conversation***

1:15pm - 2:45pm, Kent

**Presider:** Richard A. Duschl, Penn State University

#### **Presenters:**

Richard A. Duschl, Penn State University

Jonathan Francis Osborne, School of Education, Stanford University

William F. McComas, University of Arkansas

Valarie L. Akerson, Indiana University

David Stroupe, Michigan State University

### ***Strand 14: Environmental Education***

#### ***Administrative Sponsored Symposium - How Should We Treat Animals in Science Education?***

1:15pm - 2:45pm, Maryland Salon F

#### **Presenters:**

Stacey Britton, University of Mississippi

Sophia (Sun Kyung) Jeong, University of Georgia

Shahknoza Kayumova, University of Massachusetts

Andrew Kinslow, University of Missouri

Troy Sadler, University of Missouri

Dana Zeidler, University of Central Florida

Christopher Bentley, York University

Steve Alsop, York University

Teresa Shume, North Dakota State University

Michael Reiss, UCL Institute of Education, London, UK

Cassie Quigley, Clemson University

Kimberly Haverkos, Thomas More College

Rachel Gisewhite, University of Southern Mississippi

Deborah Tippins, University of Georgia

## Coffee Break

2:45pm – 3:15pm, Ballroom Foyer

## Concurrent Session #6

All strand poster sessions.

3:15pm – 5:15pm

## Poster Session A

3:15pm – 4:15pm, Maryland Ballroom A, B, C and D

### Strand 1: Science Learning, Understanding and Conceptual Change

#### Poster Session A

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

#### ***A1. Characterizing Students' Epistemic Considerations: An Automated Computational Approach for Embedded Assessment Responses***

Joshua Rosenberg, Michigan State University  
Christina Krist, Northwestern University

#### ***A3. Determining Curriculum Related Progress in Science Education among Gymnasium Students – A Longitudinal Study***

Regina Soobard, University of Tartu  
Miia Rannikmae, University of Tartu

#### ***A5. Development of an Empirically-Based Learning Performances Framework for 3Rd-Grade Students' Model-Based Explanations About Plant Processes***

Laura A. Zangori, University of Missouri-Columbia  
Cory T. Forbes, University of Nebraska-Lincoln

#### ***A7. Emotions during Reading of a Refutational Science Text***

Brian W. Miller, Towson University

#### ***A9. How Astronomers Investigate the Universe: Student Ideas About Astronomical Practices Before and After Instruction***

Chrysta Ghent, Pennsylvania State University  
Julia Plummer, Pennsylvania State University  
Timothy Gleason, Pennsylvania State University  
Christopher Palma, The Pennsylvania State University  
Yann Shiou Ong, The Pennsylvania State University

#### ***A11. Investigating Students' Pre-Instructional Ideas and Misconceptions About the Big Bang Theory***

Sarah Aretz, CERN  
Andreas Borowski, University of Potsdam  
Sascha Schmeling, CERN

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

#### Poster Session A

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

#### ***A13. The Affective Domain in Science Education***

Bette L. Grauer, Kansas State University  
Lawrence C. Scharmann, University of Nebraska-Lincoln

#### ***A15. Elementary School Students' Reasoning Skills: A Meta-Analysis***

Yurdagul Bogar, University of Tennessee

#### ***A17. Evaluating Science Educators' Perception of Students' Intrinsic Relevance as Key Component to Enhance Science Learning***

Tormi Kotkas, University of Tartu  
Miia Rannikmae, University of Tartu  
Jack B. Holbrook, University of Tartu

#### ***A19. Creating Learning Environment for Argumentation: Analysis of Fifth Grade Students' Writing in Argument-Based Inquiry Approach***

Sae Yeol Yoon, Delaware State University  
Brian M. Hand, University of Iowa

#### ***A21. The Effect of Students' Gestures on their Reasoning Skills Regarding Linear and Exponential Growth***

Sahar K. Alameh, University of Illinois and Urbana Champaign  
Nicholas Linares, University of Illinois and Urbana Champaign  
Nitasha Mathayas, University of Illinois Urbana Champaign  
Robb Lindgren, University of Illinois Urbana-Champaign

#### ***A23. Development of a Meaningful Chemistry Laboratory Guide Using Real-World Contexts***

Liliam A. Palomeque-Forero, Universidad Nacional de Colombia  
Luis A. Angarita-BaldeÚn, Universidad Nacional de Colombia

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

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

**A25. Children's Ideas About Fossils**

Lisa A. Borgerding, Kent State University

Sara P. Raven, Kent State University

**A27. Examining the Development of Elementary Teachers' Science Teacher Identities**

Sarah J. Carrier, North Carolina State University

Ashley N. Whitehead, North Carolina State University

Sarah C. Luginbuhl, North Carolina State University

Margareta M. Thomson, North Carolina State University

**A29. Exploring a Science Teacher's Views and Instruction on Reading Science Text**

Jing-Ru Wang, National Pingtung Teachers College

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

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

**A31. Pre-Service Teachers' Enactment of Topic Specific PCK Related to Chemical Equilibrium**

Marissa S. Rollnick, Wits University

Elizabeth Mavhunga, University of Witwatersrand

**A33. Identifying an Engineering Knowledge Base for Science Teachers: A Delphi Study**

Baki Cavlazoglu, Texas A&M University

Carol L. Stuessy, Texas A&M University

**A35. Middle School Science and Mathematics Teachers' Understanding of the Nature of Science: A Two-Year Study**

Sissy S. Wong, University of Houston

Irasema Ortega, University of Alaska-Anchorage

Eunjin Bang, Iowa State University

**A37. Opportunities for Science and Engineering Practices in Middle School Content: Comparing Curricula and Standards**

Daniel Z. Meyer, Illinois College

Bradley Perrin, Monmouth-Roseville High School

Leah Shumaker, Illinois College

Holly Crocher, Illinois College

**A39. Science Teachers Instructional Practices on the Way to Argumentation**

Yasemin Ozdem-Yilmaz, Gaziosmanpasa University

Jale Cakiroglu, Middle East Technical University

Hamide Ertepinar, Istanbul Aydin University

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

**Poster Session A**

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

**A41. A Snapshot of Science Teacher Perceptions of State, National and International Assessments**

Rhea L. G. Miles, East Carolina University

Anthony Thompson, East Carolina University

**A43. Assessing College Students' Misconceptions of Photosynthesis and Respiration in an Introductory Plant Science Course**

Cecilia Espinoza-Morales, Purdue University

Neil A. Knobloch, Purdue University

Kathryn E. Orvis, Purdue University

**A45. Assessing the Use of Small-Group, Active Engagement Exercises and Peer Evaluation in Introductory Biology Courses**

Marcia Shofner, University of Maryland

Gili Marbach-Ad, University of Maryland

**A47. Combining Lexical Analysis and Students Interviews to Gauge Students Understanding of Genetic Information Flow**

Alexandria L. Mazur, Michigan State University

Rosa A. Moscarella, Michigan State University

Mark Urban-Lurain, Michigan State University

John Merrill, Michigan State University

**A49. Comparative Analysis of Recognition of Scientists, Engineers, Teachers & Students About Problem Specification Elements**

Yohan Hwang, Kyungpook National University

Yune Bae Park, Kyungpook National Univ

Eunjeong Yun, Affiliation is Kyungpook National University

**A51. A Comparison of Learning Environments in Preservice Elementary Teachers' Science Self-Efficacy**

Christine M. Knaggs, Lourdes University

Toni A. Sondergeld, Drexel University



**A53. Developing Understanding of Pre-Service Teacher Exposure to Climate Literacy Content in Higher Education Science Courses**

Gili Marbach-Ad, University of Maryland

**A55. Effect of Science Teaching on Undergraduate Students' Science Self-Efficacy**

Nicholas Stroud, Massachusetts College of Liberal Arts  
 Leslie Rule, Massachusetts College of Liberal Arts  
 Jean Bacon, North Adams Public Schools  
 Christopher Himes, Massachusetts College of Liberal Arts  
 Molly Polk, Williams College  
 Lindley Wells, Williams College  
 Jennifer Swoap, Williams College

**A57. Energy Conservation in Biological Contexts: Intersection Between Scientific and Everyday Language Usage**

Vivien M. Chabalengula, University of Virginia  
 Frackson Mumba, University of Virginia

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

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

**A59. an Exploration of the Educational Museum as a Learning Space for In-Service Science Teachers**

Jinwoo Jeong, Korea National University of Education  
 Sophia (Sun Kyung) Jeong, University of Georgia  
 Eunjeong Kim, University of Georgia  
 Young Ae Kim, University of Georgia

**A61. Conceptualizing STEM Outreach in Rural Library Spaces**

Allison Antink-Meyer, Illinois State University  
 Ryan Brown, Illinois State University

**A63. Extension Faculty Lack Systematic Training in Outreach**

Kathryn A. Stofer, University of Florida  
 Teresa Wolfe, Oregon State University

**A65. Finding Scale: The Role of Research in Revising Program Design and Supporting Local Innovation**

Meghan P. Groome, New York Academy of Sciences  
 Johanna Duncan -Poitier, The State University of New York  
 Philip Ortiz, The State University of New York  
 Gaylen Moore, Gaylen Moore Program Evaluation Services  
 Gwendolyn Elphick, The State University of New York  
 Kristian Breton, The New York Academy of Sciences  
 Stephanie Wortel, The New York Academy of Sciences

**A67. Place or Practice? Negotiating the Boundary of Formal/Informal Science Learning in the Classroom**

Jennifer Adams, Booklyn College- CUNY

**A69. Using Case Studies to Develop Deep Understandings of Adolescent Youths' STEM Interest and Participation Pathways**

Nancy Staus, Oregon State University  
 Lynn D. Dierking, Oregon State University  
 Deborah L. Bailey, Oregon State University  
 Jennifer N. Wyld, Oregon State University  
 William R. Penue, University of Colorado  
 Julie Cafarella, University of Colorado Boulder  
 John H. Falk, Oregon State University

**A71. Using CHAT to Understand How Elements at STEM Outreach Stations Stimulate Student Engagement**

David Yale, University of California Santa Barbara  
 Jasmine Kyle McBeath, University of California, Santa Barbara  
 Walter Aminger, University of California, Santa Barbara

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**Strand 7: Pre-service Science Teacher Education  
 Poster Session A**

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

**A73. "I Don'T Want You to Feel Guilty, I Want You to do Something About It": Designing for Pre-Service Teacher Learning About Race, Science, and Teaching**

Manali J. Sheth, Iowa State University  
 Melissa Braaten, University of Wisconsin

**A75. Investigating Open-Mindedness Among Early Childhood Education Majors**

Nazan Bautista, Miami University  
 Thomas Misco, Miami University  
 Stephen Quaye, Miami University

**A77. Investigating Science Teacher Candidates' Assessment Practices Using EdTPA**

David Kimori, University of Minnesota  
 Barbara Billington, University of Minnesota  
 Gillian Roehrig, University of Minnesota

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

3:15pm – 4:15pm, Maryland Ballroom A, B, C, &amp; D

**A137. Implementing the NGSS: Results of a Statewide Professional Development Project**

David B. Vallett, University of Nevada Las Vegas

Hasan Deniz, University of Nevada

Kristoffer Carroll, Southern Nevada Regional Professional Development Program

Bret Sibley, Southern Nevada Regional Professional Development Program

Elif Adibelli, University of Nevada Las Vegas

**A139. Professional Learning Impact: Outcomes of PD Grounded in Reformed Science Teaching Practices and Educative Curricula**

Max L. Longhurst, Utah State University

Todd Campbell, University of Connecticut

Paul Wolf, Utah State University

**A141. Promoting Equity in Science Teaching through Transformative Professional Development in Rural Alabama**

Melody L Russell, Auburn University

M Goldston, University of Alabama

Mohammed Qazi, Tuskegee University

Shaik Jeelani, Tuskegee University

Christopher Parrish, Auburn University

Crystal Kaczor, University of Alabama-Tuscaloosa

Ruby Ellis, Auburn University

Laura Crowe, Auburn University

David Laurencio, Auburn University

**A143. Technology Teachers' Use in Inclusive Chemistry Classrooms and Factors that influence the Selection of such Technology**

Laura Ochs, University of Virginia

Frackson Mumba, University of Virginia

Vivien M. Chabalengula, University of Virginia

**A145. Varying Conceptualizations of STEM Education and the Implications for Professional Development**

Tamara Holmlund Nelson, Washington State University Vancouver

Kristin Lesseig, Washington State University Vancouver

David Slavit, Washington State University Vancouver

**Strand 9: Reflective Practice****Poster Session A**

3:15pm – 4:15pm, Maryland Ballroom A, B, C, &amp; D

**A79. A Scaffolded Approach to Planning Investigations in an Urban Science Classroom: An Action Research Study**

Anna K. Monteiro, Newark Public School

Rosiane Lesperance, Newark Public Schools

**A81. How do Science Graduate Students Benefit From Conducting Educational Research?**

Janet F. Stomberg, Illinois State University

Alicia T. O'Hare, Illinois State University

Rebekka Darner Gougis, Illinois State University

**A83. Implementing a Peer Mentoring Program in Preservice Science Teacher Education**

Lisa Neesemann, Teachers College Columbia University

Jessica Riccio, Teachers College, Columbia University

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

3:15pm – 4:15pm, Maryland Ballroom A, B, C, &amp; D

**A85. Assessing Changes in Relations Among Self-Evaluated Values, Cognition, and Engagement in Leisure Science Free-Choice Learning**

Brady M. Jack, National Sun-yat Sen University

Hsiao-Ching She, National Chiao Tung University

Huann-shyang Lin, National Sun Yat-Sen University

**A87. Developing a Learning Progression and Assessment to Track Three-Dimensional Learning During an NGSS-Aligned High School Physical Science Curriculum**

Leonora Kaldaras, Michigan State University

Shawn Stevens, University of Michigan

Steven McGee, Northwestern University

Joseph S. Krajcik, Michigan State University

**A89. Does Knowledge and Situational Interest Support Personal Interest: A Health Education Study**

Michele Miller, Wright State University

William L. Romine, Wright State University

Amber Todd, Wright State University

Bill Folk, University of Missouri

***A91. How Students Develop an In-Depth Understanding of Neurobiology Concepts in a Three-Dimensional Virtual Learning Environment***

Sophia (Sun Kyung) Jeong, University of Georgia  
Georgia Hodges, University of Georgia  
Tugba E Toprak, Gazi University

***A93. Relationship Between Students' Collaborative Learning Attitudes and their Satisfaction with an Online Collaborative Case-Based Course***

Niva Wengrowicz, Technion  
William Swart, East Carolina University  
Kenneth MacLeod, East Carolina University  
Ravi Paul, East Carolina University  
Dov Dori, Technion  
Yehudit Judy Dori, MIT

***A95. The Nature of 'Nature' in Science Education***

Ajay Sharma, University of Georgia

***A97. Connecting the Imperatives of STEM, NGSS, Deep Learning and Assessment: A Conceptual Paper***

Eunjeong Kim, The University of Georgia  
J. Steve Oliver, The University of Georgia  
David F. Jackson, The University of Georgia

***A99. Exploring How a Collaborative Board Game Can Be Used as a Scientific Model within the Classroom***

Hillary Z. Lauren, University of Illinois at Urbana-Champaign  
Barbara Hug, University of Illinois at Urbana-Champaign

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

***Poster Session A***

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

***A101. Influence of Nollywood Film in Mother Tongue on Students' Learning Outcomes on Contemporary Environmental Concepts***

Michael A. Aho, Lagos State University  
Peter A. Okebukola, Lagos State University  
Isaac S Bankole, Lagos State University  
Foluso O Okebukola, Lagos State University  
Grace O. Oshun, Lagos State University

***A103. A Place for Race in Elementary Science Classrooms***

Stefanie L Marshall, Michigan State University  
Amal Ibourk, Michigan State University

***A105. Competing Conceptions of Knowing in Practice: Indigenous Teachers Teaching Western Science***

Paulina Grino, University of Arizona

***A107. Exploring the Cross-Disciplinary Collaborations Between Engineers and Educators at Engineering Research Centers***

Osman Aksit, NC State University  
Katherine Chesnutt, North Carolina State University  
M. Gail Jones, North Carolina State University  
Shelley Glimcher, North Carolina State University

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**Strand 12: Educational Technology**

***Poster Session A***

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

***A109. Students' and Teachers' Perceptions of Presence and Preferences for 3-Dimensional, Haptic-Enabled, Virtual Reality Science Instruction***

Rebecca Hite, North Carolina State University  
M. Gail Jones, North Carolina State University  
Gina Childers, North Carolina State University  
Katherine Chesnutt, North Carolina State University  
Elysa N. Corin, North Carolina State University  
Mariana Pereyra, North Carolina State University

***A111. The Development of a Computerized Interactive Teaching Assistant***

Cyrus Vandrevale, Purdue University  
Lynn A. Bryan, Purdue University  
Andrew Hirsch, Purdue University  
Hisao Nakanishi, Purdue University  
Laura Pyrak-Nolte, Purdue University

***A113. Tracing the Development of a Haptically-Enhanced Science Simulation for Matter and Intermolecular Forces***

James Minogue, North Carolina State University  
David Borland, RENCi, Renaissance Computing Institute, UNCCH  
Marc Russo, North Carolina State University  
Shengyen Chen, North Carolina State University  
Trevor Davis, North Carolina State University

***A115. A Computational Modeling of Student Cognitive Processes While Solving Critical Thinking Problems in Science***

Richard L. Lamb, Washington State University  
David B. Vallett, University of Nevada Las Vegas  
Tariq Akmal, Washington State University  
Maureen Schmitter-Edgecomb, Washington State University  
Reanne Cunningham, Washington State University

***A117. A Model of Remote Learning Environments: Factors Influencing Remote Microscopy Investigations***

Gina Childers, North Carolina State University  
M. Gail Jones, North Carolina State University



***A119. Collecting and Interpreting Highly Variable Real-World Data Using a Mobile Technology-Enabled Ecosystem Science Field Trip***

Cailean B. Cooke, WestEd

Amy M. Kamarainen, Harvard Graduate School of Education

Denise M. Bressler, Independent Consultant

Shari Jackson Metcalf, Harvard University

Tina Grotzer, Harvard University

Christopher Dede, Harvard Graduate School of Education

**Strand 13: History, Philosophy, and Sociology of Science  
Poster Session A**

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

***A121. Contextualization: How It Works on NOS Views and NOS Teaching of Pre-Service Science Teachers?***

Jale Cakiroglu, Middle East Technical University

Kader Bilican, Kirikkale University

Valarie L. Akerson, Indiana University

***A123. Toward Quantifying Responses to the Views of Nature of Science Questionnaire: Empirically Investigating Qualitative Coding***

Jeanne Brunner, University of Illinois at Urbana-Champaign

Ryan Summers, University of Illinois - Urbana/Champaign

John Y. Myers, University of Illinois at Urbana-Champaign

Fouad Abd-El-Khalick, University of Illinois at Urbana-Champaign

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

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

***A125. A Systems Mapping Approach to Community-Based Science Learning by Rural Learners***

Eleanor D. Abrams, University of New Hampshire

Sameer Honwad, University of New Hampshire

Erica Jablonski, University of New Hampshire

Michael J. Middleton, University of Massachusetts--Boston

Claes Thelemarck, University of New Hampshire

Ruth Varner, University of New Hampshire

Robert Eckert, University of New Hampshire

***A127. Development of CCE-RS – a Formative Model for Educational Partnership***

Michelle Molina, SmartStart Evaluation and Research

Erica Watson-Currie, SmartStart Evaluation and Research

Lauren Birney, Pace University

***A129. Education for Sustainability in Egypt: Participants' Perspectives***

Heba El-deghaidy, American University in Cairo

***A131. Learning at a Personal Level: A Middle School Agricultural Science Teacher's Enactment of Action Gardening***

Heather Rudolph, University of Northern Colorado

***A133. Phraseology, Science Learning and Secondary Marine Science Students' Global Warming and Climate Change Engagement***

Benjamin Herman, University of Missouri

Mark Newton, University of South Florida

**Strand 15: Policy  
Poster Session A**

3:15pm – 4:15pm, Maryland Ballroom A, B, C, & D

***A135. Defining and Measuring Leadership Content Knowledge (LCK) for Science Practices***

Rebecca Katsh-Singer, Boston College

Katherine L. McNeill, Boston College

Rebecca Lowenhaupt, Boston College

Kyle Fagan, Boston College

**Poster Session B  
4:15pm – 5:15pm, Maryland Ballroom A, B, C and D**

**Strand 1: Science Learning, Understanding and Conceptual Change**

***Poster Session B***

4:15pm – 5:15pm, Maryland Ballroom A, B, C, & D

***B2. MEL Diagrams: An Instructional Strategy That Promotes Scientific Thinking and Practice in Earth Science Students***

Shondricka Burrell, Temple University

Doug Lombardi, Temple University

Janelle M. Bailey, Temple University

***B4. Rasch Validation and Measurement of Students' Understanding of the Nature of Models: A New Computer-Based Questionnaire***

Silvia Wen-Yu Lee, National Changhua University of Education

***B6. Scientific Reasoning in Contextualised and De-Contextualised Cases***

Bashirah Ibrahim, The Ohio State University

Lin Ding, The Ohio State University

Katherine N. Mollohan, The Ohio State University

Andria Stammen, The Ohio State University

**B8. Spatial and Creative Development for STEM Education**

Jaclyn K. Murray, University of Georgia  
Barbara A. Crawford, University of Georgia

**B10. Supporting English Language Learners' Learning with Dynamic Visualizations: Generating Versus Reading Explanations**

Kristin D. Bedell, University of North Carolina, Chapel Hill  
Kihyun (Kelly) Ryoo, University of North Carolina, Chapel Hill  
Amanda Swearingen, University of North Carolina, Chapel Hill

**B12. Utilizing Cognitive Model Construction Strategies to Support Students' Participation in Kinesthetic Simulations**

Grant Williams, St. Thomas University  
Ryan Oulton, St. Thomas University  
Laura Taylor, St. Thomas University

**B14. Examining Middle School Learners' Scientific Explanations about Sea Level Rise**

J. R. McGinnis, University of Maryland  
Wayne Breslyn, Montgomery County Public Schools  
Emily Hestness, University of Maryland

**Strand 2: Science Learning: Contexts, Characteristics and Interactions****Poster Session B**

4:15pm – 5:15pm, Maryland Ballroom A, B, C, & D

**B16. Self-Positioning Within Laboratory Groups Resulting from Community College Faculty and Early Undergraduate Students Engaging in Authentic Scientific Research: Relationships to Participant Future Plans**

Stephen R. Burgin, University of Arkansas  
Daniel L. Dickerson, East Carolina University

**B18. Healthy Bodies, Healthy Minds, Healthy Learners: Growing Equity Environments to Foster Science Learning**

Bhaskar Upadhyay, University of Minnesota  
Nancy Albrecht, University of Minnesota

**B20. Strategies for Promoting Student Participation in Science Practices: A Teacher's Organization of Science Classroom Talk**

Deb Morrison, TREE Educational Services

**B22. Engaging in Groupwork in Science: Students' Views of the Causes of and Barriers to Equity**

Alexis Patterson, University of California, Davis

**B24. Leveraging Social Network Learning Platforms and Teacher Practice in Online Spaces to Engage Students in Science**

Vanessa B. Lujan, University of California, Berkeley  
Lynn U. Tran, University of California, Berkeley

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

4:15pm – 5:15pm, Maryland Ballroom A, B, C, & D

**B26. Pedagogical Differentiation: A Case Study of Classroom Orchestration**

Katherine Chesnutt, North Carolina State University  
Alonzo B. Alexander, North Carolina State University  
Eric N. Wiebe, North Carolina State University  
Courtney Behrle, North Carolina State University

**B28. Examining Early Childhood Teachers' Instruction of Scientific Explanations for Fostering Children's Explanations in Science**

Heidi L. Masters, University of Wisconsin - La Crosse  
Meredith A. Park Rogers, Indiana University  
Christina Cooper, Corban University  
Susan Hawkins, Indiana University

**B30. Examining Elementary Teachers' Existing Epistemological Beliefs in Science and Engineering**

Megan R. Lancaster, University of North Carolina at Greensboro

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

4:15pm – 5:15pm, Maryland Ballroom A, B, C, & D

**B32. The Implementation of Interdisciplinary Science Inquiry of Biology Teachers Compared to Physical Science Teachers**

Sarah A. Chudyk, State University of New York at Buffalo, SUNY  
Xiufeng Liu, State University of New York at Buffalo, SUNY  
Michelle R. Eades-Baird, State University of New York at Buffalo, SUNY  
Noemi Waight, State University of New York at Buffalo, SUNY  
Shao-Hui Chi, State University of New York at Buffalo, SUNY

**B34. The Learning Curve: High School Science Teachers Helping Students Make Sense of Data**

Lauren H. Swanson, Whittier College

**B36. High School Student Attitudes about Science and Career After Interactions with GK-12 Biology Graduate Students**

Kim Cleary Sadler, Middle Tennessee State University  
Rachel Lytle, Brentwood High School  
Anthony Farone, MTSU  
Ginger Rowell, MTSU  
Mary Farone, MTSU

**B38. Exploring How One Teacher's Perception of Science Pedagogy Aligns to the Enactment of Scientific Practices**

Kelly Mills, University of Maryland, College Park  
Diane Jass Ketelhut, University of Maryland, College Park

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

**Poster Session B**

4:15pm – 5:15pm, Maryland Ballroom A, B, C, & D

**B40. Examining Biology and Chemistry Students' Values for and Experiences with Various Skills and Teaching Methods.**

Gili Marbach-Ad, University of Maryland  
Carly H. Rietschel, University of Maryland  
Katerina Thompson, University of Maryland

**B42. Flipping the Large Lecture Physical Science Content Course for Preservice Teachers: Assessing the Success**

Stacy McCormack, Indiana University  
Meredith A. Park Rogers, Indiana University

**B44. General Chemistry Students' Understanding and Application of Acid-Base Ideas across Contexts: Acid-Base Neutralization and Conductimetry**

James M. Nyachwaya, North Dakota State University  
Shayla Evans, East Carolina State University

**B46. Instant Feedback and Automated Grading System in Collaborative Exams: More Learning in Weaker Teams**

Hyewon Jang, Harvard University

**B48. Measuring Professional Knowledge of Laboratory Assistants in Germany: Test Instrument Development and Validation in Biochemistry/Cell-Biology**

Devasmita Chakraverty, University of Virginia  
Stephan Gantner, Leibniz Institute for Science and Mathematics Education  
Jorg Grofhschedl, Leibniz Institute for Science and Mathematics Education  
Ute Harms, Leibniz Institute for Science and Mathematics Education (IPN)

**B50. Teachers of Science: A Comparison of the Beliefs and Practices of Secondary Pre-service Science Teachers and Science Graduate Teaching Assistants**

Patricia Simmons, North Carolina State University Raleigh  
David Haase, North Carolina State University  
Whitney Richardson, North Carolina State University

**B52. Undergraduate Science Majors (Interdisciplinary-) Metamodeling Knowledge Regarding the Integration of Physical Models in Understanding Biological Systems**

Shannon H. Sung, Spelman College  
Derrick Hylton, Spelman College

**B54. Undergraduate Students' Scientifically-Informed Decision-Making About Water-Based Socioscientific Issues**

Jaime L. Sabel, University of Nebraska-Lincoln  
Tina Vo, University of Nebraska-Lincoln  
Ashley R. Alred, University of Nebraska-Lincoln  
Jenny M. Dauer, University of Nebraska- Lincoln  
Cory T. Forbes, University of Nebraska-Lincoln

**B56. Using Primary Literature to Promote Science Literacy of Undergraduate Students in Cell Biology**

Hadiya A. Woodham, University of Maryland  
Gili Marbach-Ad, University of Maryland  
Katerina Thompson, University of Maryland

**B58. Validation of the Science Motivation Questionnaire II using Classical Test Theory and Rasch-andrich Model**

Hye Sun You, The University of Texas at Austin  
Kyungun Kim, The University of Texas at Austin  
Karynne A. Black, The University of Texas MD Anderson Cancer Center  
Kyung Woo Min, The University of Texas at Austin

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

4:15pm – 5:15pm, Maryland Ballroom A, B, C, &amp; D

**B58. Taking Science Home; Being an Informal Science Educator at Housing Authority Afterschool Program**

Mark T. Enfield, Elon University

Sara B Rosenthal, Elon University

**B60. Learning to Model as a Citizen Scientist: Adapting Experience to Scientific Practice**

Whitney E. Novak, Indiana University

Joey Huang, Indiana University

Cindy E. Hmelo-Silver, Center for Research on Learning and Technology

Rebecca Jordan, Rutgers University

Steven A. Gray, University of Massachusetts Boston

Alycia Crall, Virginia Polytechnic Institute and State University

Greg Newman, Colorado State University

**B62. Science, Humor, and Dialogue in an Online Gaming Space**

Logan M. Leslie, University of West Georgia

**B64. Student Perceptions of STEM and Attitudes Toward STEM Workshops at a Youth Organization**

Stephen T. Adams, California State University Long Beach

Paul Burns, California State University Long Beach

Elaine V. Bernal, California State University Long Beach

Lisa M. Martin-Hansen, California State University Long Beach

**B66. an Exploration of Racial and Ethnic Minority Participation in Science-based Hobbies**

Rebecca Hite, North Carolina State University

M. Gail Jones, North Carolina State University

Thomas andre, Iowa State University

Gina Childers, North Carolina State University

Elysa N. Corin, North Carolina State University

**B68. Citizen Scientists' and Science Hobbyists' Science Capital: Factors Influencing Development and Engagement for Lifelong Learning**

M. Gail Jones, North Carolina State University

Gina Childers, North Carolina State University

Thomas Andre, Iowa State University

Elysa N. Corin, North Carolina State University

Rebecca Hite, North Carolina State University

**B70. Impact of a Science Methods Course Combined with a Summer Camp on Pre-Service Teachers' Self-Efficacy**

Eulsun Seung, Indiana State University

Soonhye Park, North Carolina State University

**Strand 7: Pre-service Science Teacher Education****Poster Session B**

4:15pm – 5:15pm, Maryland Ballroom A, B, C, &amp; D

**B72. Learning to Teach Science by Integrating the Three Dimensions in NGSS**

Dongmei Zhang, The University of Georgia

Barbara A. Crawford, The University of Georgia

**B74. Recruiting and Retaining STEM Majors for Teacher Certification**

Marilyn M. Stephens, University of Alabama

Dennis Sunal, University of Alabama

Cynthia Szymanski Sunal, University of Alabama

James W. Harrell, University of Alabama

Jeremy Zerkowski, University of Alabama

Jim Gleason, University of Alabama

Sharon Vincent, Shelton State Community College

**B76. Understanding of Biotechnology Processes Among Pre-Service Science Teachers**

Jonathan Chitiyo, Southern Illinois University Carbondale

Vivien M. Chabalengula, University of Virginia

Frackson Mumba, University of Virginia

**B78. Validation of the Science Wrap-Up Observation Protocol [SWOP]**

Kirby Whittington, Florida State University

Shannon Gooden, Florida State University

Mary Beth Bowen

Anna M. Strimaitis, Florida State University

Sherry A. Southerland, Florida State University

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

4:15pm – 5:15pm, Maryland Ballroom A, B, C, &amp; D

**B134. Conflict, Connection and Retention for STEM Teachers in High Need Schools**

Amy Perfetti, Saint Joseph's University

Stacy Olitsky, Saint Joseph's University

**B136. Designing an Instrument to Measure Science Teachers' Appraisals and Emotional Responses when Facilitating Inquiry-based Instruction**

Daniel M. Alston, Clemson University

Jeff C. Marshall, Clemson University

Deborah Switzer, Clemson University



**B138. Exploring Alternate Route Science Teacher Development of Pedagogical Content Knowledge**

Kim Feltre, Rowan University

Issam H. Abi-El-Mona, Rowan University

**B140. From Professional Development to Teacher Practice: Project-based investigations of Local Watersheds**

Justin M LeVaughn, University of Kentucky

Rebecca McNall Krall, University of Kentucky

Bharath Kumar, University of Kentucky

Jennifer A. Wilhelm, University of Kentucky

Carol Hanley, University of Kentucky

**B142. High School, Community College, And University Faculty Perspectives on the Efficacy of Multi-Level Professional Development**

Caren A. Gough, Stony Brook University

Ross H. Nehm, SUNY Stony Brook

**Strand 9: Reflective Practice**

**Poster Session B**

4:15pm – 5:15pm, Maryland Ballroom A, B, C, & D

**B80. Looking Inside Classrooms: Formative Assessment Approaches in Science Classroom**

Hye-Eun Chu, Macquarie University

Kok Siang Tan, National Institute of Education Singapore

Rachel Ong, National Institute of Education Singapore

Eugene Lim, National Institute of Education, NTU Singapore

**B82. Understanding Enthusiasm in Teaching: A Self-Study of Teaching Science at the Undergraduate Level**

Brent Gilles, Indiana University

Gayle A. Buck, Indiana University

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

4:15pm – 5:15pm, Maryland Ballroom A, B, C, & D

**B84. How Does Written Feedback in Formative Assessment Enhance Students' Inquiry Skills**

Hilda Scheuermann, IPN Kiel

Mathias Ropohl, IPN Kiel

**B86. Manipulating 3D-Printed and Paper Models Enhances Student Understanding of Viral Replication**

Lisa Couper, WestEd

Jodi Davenport, WestEd

Matt Silberglitt, WestEd

Jacklyn Powers, WestEd

**B88. Rigorous Investigation of Relevant Issues: A Socio-scientific Issues Approach to support Three-Dimensional Science Learning**

Andrew T. Kinslow, University of Missouri - Columbia

Troy D. Sadler, University of Missouri - Columbia

Patricia J. Friedrichsen, University of Missouri - Columbia

Kerri Graham, Rock Bridge High School, Columbia Missouri

**B90. Students' Development of NOS Understanding: Integrating a Historical Case Study with the Revising of Models**

Chandana Jasti, University of Illinois at Urbana-Champaign

Robert C. Wallon, University of Illinois at Urbana-Champaign

Barbara Hug, University of Illinois at Urbana-Champaign

**B92. The Importance of Random Assortment and Blinding in Qualitative Data Analysis**

Andrea M.-K. Bierema, Michigan State University

Rosa Moscarella, Michigan State University

Mark Urban-Lurain, Michigan State University

John Merrill, Michigan State University

Kevin C. Haudek, Michigan State University

**B94. Validation of an Instrument Measuring Student Complex Causal Assumptions**

Michael S. Tutwiler, Harvard Graduate School of Education

Meredith Thompson, Harvard University

Tina Grotzer, Harvard University

Shari Jackson Metcalf, Harvard University

Amy M. Kamarainen, Harvard Graduate School of Education

Christopher Dede, Harvard Graduate School of Education

**B96. Engineering Instruction in Inclusive STEM High Schools: A Cross-case Analysis**

Erin E. Peters-Burton, George Mason University

Todd Johnson, George Mason University

**B98. Validation of the Science Motivation Questionnaire II with 9th Grade Science Students**

Donna M. Shapiro, SUNY Stony Brook

**Strand 11: Cultural, Social, and Gender Issues****Poster Session B**

4:15pm – 5:15pm, Maryland Ballroom A, B, C, &amp; D

***B100. Qualitative Metasynthesis of the Intersectionality of Culturally Responsive and Reform-Based Science Education in K-12 Classrooms***

Michael Enah Kuo, University of Minnesota

Julie C. Brown, University of Minnesota

***B102. The Sociopolitical Turn in Science Education: A Call to Action***

Jean R. Aguilar-Valdez, Portland State University

Jesse Bazzul, OISE (Ontario Institute for Studies in Education)

Alexandra Schindel Dimick, University at Buffalo

Daniel Morales-Doyle, University of Illinois at Chicago

Nicole Snook, Changemaker High School

Regina Suriel, Valdosta State University

Sara E. Tolbert, University of Arizona

***B104. Voice of African American Women in STEM: How Did Social and Cultural Capital Impact Resiliency?***

Danielle Ferguson, Morgan State University

Catherine Martin-Dunlop, California State University - Long Beach

**Strand 12: Educational Technology****Poster Session B**

4:15pm – 5:15pm, Maryland Ballroom A, B, C, &amp; D

***B106. Examining Flexible Thinking and Resistance to Change According To Field of Study and Technology Expertise***

Miri Barak, Technion, Israel Institute of Technology

Ariella Levenberg, Technion - Israel Institute of Technology

***B108. Highly Interactive Cloud-Classroom (HIC) Embedded into Undergraduate Chemistry Course***

Kaushal Kumar Bhagat, National Taiwan Normal University

Chun-Yen Chang, National Taiwan Normal University

***B110. Like Us on Facebook: Students' Attitudes toward Learning Chemistry on Facebook Groups***

Shelley Rap, Weizmann Institute of Science

Ron Blonder, Weizmann Institute of Science

***B112. Mission HydroSci: Next Generation Science Learning Through Virtual Environments***

Troy Sadler, University of Missouri

James Laffey, University of Missouri

Sean Goggins, University of Missouri

***B114. Research on Blended Learning in K-12 Science Education: A Systematic Review***

Kent J. Crippen, University of Florida

Julie Bokor, University of Florida

Gayle N. Evans, University of Florida

***B116. On the Same Wavelength: Exploring Team Neurosynchrony during Technology-Enhanced Collaborative Learning***

Pavlo D. Antonenko, University of Florida

***B118. Pre-service Teachers' Understanding of Design Technology through Ecofriendly Birdhouse Design Challenge in a STEM Integrated Learning Context***

Young Ae Kim, University of Georgia

Deborah J. Tippins, University of Georgia

**Strand 13: History, Philosophy, and Sociology of Science**  
**Poster Session B**

4:15pm – 5:15pm, Maryland Ballroom A, B, C, &amp; D

***B120. Controversy Mapping for Studying Socioscientific Issues: Case Study of a Local Problem***

Naira C. Diaz Moreno, University of Almeria

Murut JimÉnez-Liso, University of Almería

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

4:15pm – 5:15pm, Maryland Ballroom A, B, C, &amp; D

***B122. Pre-Service Elementary School Teacher Learning of Common Ancestry Through Exploration of Local Tree Diversity***

Yael Wyner, City College of New York

Jennifer Doherty, University of Washington

***B124. Role of Renewable Energy and Environmental Political Policies in Introductory Undergraduate Science Education***

Rachel Yoho, Arizona State University

Binaben H. Vanmali, Arizona State University

***B126. Self-Determination Theory as a Lens for Promoting Scientific Identity and Retention: A Pilot Study***

Andrew L. McDevitt, Illinois State University

Rebekka Darner Gougis, Illinois State University

***B128. Technology-mediated Engagement with Nature: Design Guidelines for Self-guiding, Outdoor-based Mobile Learning Programs***

Lucy R. McClain, Penn State University

Heather Toomey Zimmerman, Penn State University

**B130. The Awareness of Middle School Students and Pre-service Teachers on Climate Change**

Hyoungbum Kim, Chungbuk National University  
Sophia (Sun Kyung) Jeong, University of Georgia

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

4:15pm – 5:15pm, Maryland Ballroom A, B, C, & D

**B132. Relationship of Teachers' Collaboration, Teaching Confidence, and Approaches with Student Science Performance**

Su Gao, University of Central Florida  
Jian Wang, Texas Tech University  
Dan Li, Iowa State University

**JRST Editorial Team Meeting / Dinner**

*Sponsored by Wiley-Blackwell (By invitation only)*

6:00pm-8:30pm, Watertable A and B

**Reception: *International Journal of Science and Mathematics Education***

*Sponsored by Springer (By invitation only)*

6:00pm – 7:30pm, Homeland

**Evening/Social Events****Membership and Elections Committee Sponsored Session****Graduate Student Forum**

The Graduate Student Forum aims to guide and encourage beginning researchers by discussing various problems that may arise, e.g. when completing the dissertation or searching for a position. Attendees of the forum are given the opportunity to question a panel of experienced colleagues on all matters of academic interest.

5:30pm – 7:00pm, Baltimore Salon A

**Presiders:**

Selena Bartels, Illinois Institute of Technology  
Judith Lederman, Illinois Institute of Technology

**Membership and Elections Committee Sponsored Session****Early Career and Junior Faculty Early Career Discussion**

This session is particularly designed for the early career, junior faculty who need support during the first years of their academic career. The focus will be a panel discussion with experienced faculty who can guide junior faculty through important issues that pertain to the tenure process and other issues. Discussion topics include, but are not limited to: publications, research in the new position, collaboration with different colleges within the university setting, teaching loads, the tenure and promotion process, etc.

We invite all junior faculty interested in this topic to join us.

5:30pm – 7:00pm, Maryland Salon A

**Presiders:**

Brooke Whitworth, Northern Arizona University  
Sonya Martin, Seoul National University  
Huihui Kanahale-Mossman, University of Hawaii at Hilo





**Saturday, April 16, 2016**



## Conference Registration

7:00am – 5:00pm, Maryland Foyer

## Concurrent Session #7

8:30am – 10:00pm

### Presidential Sponsored Session

***Where Should Science Education Be with Respect to the Conversations and Cultural Unrest in Our Academies and Schools?***

8:30am - 10:00am, Maryland Salon E

**Presider:** Mary M. Atwater, University of Georgia

#### **Presenters:**

Mary M. Atwater, University of Georgia

Malcolm B. Butler, University of Central Florida

Alejandro Martinez Gallard, Georgia Southern University

Leslie S. Jones, Valdosta State University

Peter Okebukola, Crawford University

Elizabeth Mavhunga, University of Witwatersrand

Silva Lizette Ramos de Robles, University of Guadalajara

### Strand 1: Science Learning, Understanding and Conceptual Change

***Understanding Students Explanations***

8:30am - 10:00am, Maryland Salon F

**Presider:** Mei-Hung Chiu, National Taiwan Normal University

***Assisting Students in Developing Useable Knowledge Structures by Building a Scientific Explanation Over Time***

Ann M. Novak, Greenhills School

***Evidence Construction: The Constructive Process of Collecting and Interpreting Scientific Evidence and Associated Learning Processes***

Lauren Barth-Cohen, University of Miami

Jonathan Shemwell, University of Maine

Daniel K. Capps, University of Maine

***Making Sense of Student Sense Making in Oral Presentations of Independent Research Projects***

Michele Koomen, Gustavus Adolphus College

Jonathan Andicoechea, University of Minnesota

Gillian Roehrig, University of Minnesota

Sarah Weaver, University of Minnesota

Narmin Ghalichi, University of Minnesota

***Thinking Frames Approach: Improving Conceptual Understanding in Thermal Physics Through Student-Generated Diagrams and Explanations***

Felicity McLure, Curtin University

Mihye Won, Curtin University

David F. Treagust, Curtin University

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

***Motivation, Self-Efficacy and STEM Achievement***

8:30am - 10:00am, Maryland Salon A

**Presider:** Zahra Hazari, Florida International University

***The Affective Side of Interactive Learning: Exploring a Drop in Students' Self-Efficacy***

Remy Dou, Florida International University

Eric Brewe, Florida International University

Justyna Zwolak, Florida International University

Geoff Potvin, Florida International University

Eric A. Williams, Florida International University

Laird Kramer, Florida International University

***Achievement and Self-Efficacy in Science: An Exploration of Student and Teacher Beliefs in Turkey***

Dekant Kiran, Middle East Technical University

Ellen L. Usher, University of Kentucky

***Taiwanese Adolescents' Motivational Beliefs and Science Achievement: Evidence of TIMSS 2011***

Cheng-Lung Wang, National Central University

Pey-Yan Liou, National Central University

***Effect of the Context-Based Physics Instruction on Achievement of Students with Different Motivation in Physics***

Haki Pesman, Firat University

***Who Becomes an Engineer? Students' Concepts about Engineers' Work and Its Relation to Career Aspirations***

Carolin Frank, Leibniz-Institut

Manuela Niethammer, University of Technology Dresden

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

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

**Presider:** Patrick S. Smith, Horizon Research, Inc.

***How Science Teachers Responded to Ebola: A National  
Study of Teacher Instructional Decision Making***

Patrick S. Smith, Horizon Research, Inc.

Keith Esch, Horizon Research Inc.

Joan Pasley, Horizon Research, Inc.

***Citizen Science Survey of Science Teachers in New  
England – Practices and Possibilities***

Maria R. Blewitt, University of Massachusetts Lowell

David Lustick, University of Massachusetts Lowell

***A Matter of Content: Investigating Biology Teachers’  
Understanding of Socioscientific Issues***

Jan Alexis Nielsen, University of Copenhagen

Sofie Tidemand, University of Copenhagen

***Exploring Science Teachers’ Content Knowledge and  
Positioning of Evolutionary Theory Through Classroom  
Discourse***

Margaret M. Lucero, Santa Clara University

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

***Laboratory Innovations***

8:30am - 10:00am, Maryland Salon B

**Presider:** Stephen B. Witzig, University of Massachusetts  
Dartmouth

***Wrapping-Up Laboratory Investigations in  
Undergraduate Biology Courses***

Kirby Whittington, Florida State University

Shannon Gooden, Florida State University

Sherry A. Southerland, Florida State University

***Team Learning in a Computer Science Flipped Classroom:  
Undergraduates’ Problem Solving, Conceptual, and  
Declared Knowledge***

Yehudit Judy Dori, MIT & Technion

Zehavit Kohen, Technion

Albert Meyer, MIT

***Investigating the Role of Reflexive Practices in a Science  
Laboratory Course***

Kristy L. Daniel, Texas State University

Chandrani Mishra, The University of Southern Mississippi

Kari L. Clase, Purdue University

***Students’ Expectations of Collaborative Learning: Case  
Studies From an Undergraduate Life Sciences Living-  
Learning Program***

Hannah Jardine, University of Maryland, College Park

Daniel M. Levin, University of Maryland, College Park

Byrn B. Quimby, University of Maryland, College Park

Todd J. Cooke, University of Maryland, College Park

**Strand 6: Science Learning in Informal Contexts  
*Related Paper Set - Understanding the Implementation  
and Outcomes of School and Regional Science Fairs***

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

**Presider:** Jacqueline DeLisi, Education Development Center, Inc

***Models of School-Based Science Fairs***

Abigail Jurist Levy, Education Development Center, Inc.

Janna Kook, Education Development Center, Inc

Erica T. Fields, Education Development Center, Inc.

Tracy McMahon, Education Development Center, Inc

Jacqueline DeLisi, Education Development Center, Inc

Marian Pasquale, Education Development Center Inc.

Leana Nordstrom,

***Relationship Between School Participation in Regional  
Science Fairs and Science Test Scores for That School***

Richard D. Lahti, Minnesota State University Moorhead

***Nature of Science Views Held by Science Fair Coaches  
and their Students***

Julie Angle, Oklahoma State University

***Assessing Practice of Science in High School Science Fair***

Frederick Grinnell, University of Texas

Simon Dalley, Southern Methodist University

Karen Sheperd

**Strand 7: Pre-service Science Teacher Education**  
***Preservice Elementary Teacher Learning and Identity Development***

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

**Presider:** Heidi Masters, University of Wisconsin - La Crosse

***A Longitudinal Study of Preservice Elementary Teacher Preparation in Science***

Chris Ohana, Western Washington University  
 Daniel Hanley, Western Washington University  
 Matthew Miller, Western Washington University

***Elementary Pre-Service Teachers' Preparedness for Next Generation Science Standards***

Diane Silva Pimentel, University of New Hampshire

***Change of Pre-Service Elementary Teachers' Attention and Pedagogical Reasoning Through Collaborative Video-Based Reflection***

Hye Gyoung Yoon, Chuncheon National University of Education  
 Youngjin Song, University of Northern Colorado

***Exploring Pre-Service Science Teachers' Conceptual Understanding of Particulate Nature of Matter Through Ordered Multiple Choice Assessments***

Mehmet Aydeniz, The University of Tennessee  
 Kader Bilican, Ataturk University  
 Zubeyde D. Kirbulut, Harran University

***Countering Microaggressions in the Science Methods Courses: Perspectives From Teacher Educators of Color***

Karthigeyan Subramaniam, University of North Texas  
 Sumreen Asim, University of North Texas  
 Eun Young Lee, University of North Texas  
 Kia Rideaux, University of North Texas

**Strand 8: In-service Science Teacher Education**  
***Related Paper Set - Online Video-Based Lesson Analysis Professional Development for High School Science Teachers***

8:30am - 10:00am, James

**Discussants:**

Kathleen Roth, Cal Poly Pomona Foundation

***Features, Affordances, and Challenges of an Online Professional Development Program for High School Science Teachers***

Betty Stennett, BSCS  
 Susan M. Kowalski, BSCS  
 Karen M. Askinas, BSCS  
 Mark Bloom, BSCS  
 Austin Lukondi, Colorado College  
 Pamela G. Van Scotter, BSCS

***Learning to Analyze Teaching Practice in an Online Course***

Karen M. Askinas, BSCS  
 Susan M. Kowalski, BSCS  
 Mark Bloom, BSCS  
 Betty Stennett, BSCS  
 Pamela G. Van Scotter, BSCS

***Enhancing Teacher Content Knowledge About Energy Concepts in an Online Course***

Mark Bloom, BSCS  
 Susan M. Kowalski, BSCS  
 Karen M. Askinas,  
 Betty Stennett, BSCS  
 Pamela G. Van Scotter, BSCS

***Examining the Effectiveness of Online Lesson Analysis PD for Enhancing Student Achievement on Energy Concepts***

Susan M. Kowalski, BSCS  
 Karen M. Askinas, BSCS  
 Mark Bloom, BSCS  
 Betty Stennett, BSCS  
 Pamela G. Van Scotter, BSCS  
 Kathleen J. Roth, Cal Poly Pomona Foundation



**Strand 10: Curriculum, Evaluation, and Assessment  
Related Paper Set - Assessing Science and Engineering  
in the Next Generation Science Standards**

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

***Many Facets of Validity Evidence***

Kerrie Douglas, Purdue University

Senay Purzer, Purdue University

***Developing a Construct-Based Assessment Using  
Think-Aloud Interviews: An Approach to Collaborative  
Assessment Design***

Jade Caines, University of New Hampshire

Lara Gengarelly, University of New Hampshire

Erik Froburg, University of New Hampshire

***The Development and Validation of an Engineering  
Assessment***

Jeremy Lingle, Georgia Institute of Technology

Meltem Alemdar, Georgia Institute of Technology

Stefanie A. Wind, University of Alabama

Roxanne A. Moore, Georgia Institute of Technology

Marion Usselman, Georgia Tech

***Assessing Informed Design Practices of High  
School Students***

Senay Purzer, Purdue University

Kerrie Douglas, Purdue University

Molly Goldstein, Purdue University

***Assessing Informed Design Strategies Using CAD Logs***

Jie Chao, Concord Consortium

Charles Xie, Concord Consortium

Saeid Nourian, Concord Consortium

Guanhua Chen, University of Miami

**Strand 10: Curriculum, Evaluation, and Assessment  
Related Paper Set - Developing a System of Assessment  
for Implementing NGSS in One State**

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

**Discussants:**

Alicia Alonzo, Michigan State University

Jonathan Osborne, School of Education, Stanford University

***The Challenges Posed by the Demands of NGSS and  
Possible Solutions***

Raymond Pecheone, Stanford University

Helen Quinn, Stanford University

Jonathan Francis Osborne, School of Education, Stanford University

Alicia C. Alonzo, Michigan State University

***What Assessments Exist and How Well do they Meet the  
Needs of NGSS***

Jill A. Wertheim, Stanford University

Alicia C. Alonzo, Michigan State University

***The Promise and Challenge of Eliciting and Measuring  
Evidence of Three-Dimensional Learning***

Nicole Holthuis,

Susan E. Schultz, Stanford University

Alicia C. Alonzo, Michigan State University

***Assessing Scientific Practices: Issues and Challenges  
Drawn From the Example of Argumentation***

J. Bryan Henderson, Arizona State University

Jonathan Francis Osborne, School of Education, Stanford University

Alicia C. Alonzo, Michigan State University

**Strand 11: Cultural, Social, and Gender Issues  
*Equity, Power, and Science Education***

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

**President:** Sara P. Raven, Kent State University

***Examining Issues in Critical Science Education:  
Does the Practice-Research Gap Still Exist?***

Catherine D. Bhatthana, Indiana University, Indianapolis

***Towards a Critical Theory of STEM Doctoral Completion  
and Attrition***

Senetta F. Bancroft, Grand Valley State University

***Representing Race and Ethnicity, STEM in Children's  
Television, and Healthcare: Potential and Setbacks***

Sheron Mark, University of Louisville

***Students Developing Agencies for Socio-Political  
Activism Through Critical Reflective Practices***

Majd Zouda, University of Toronto

Tomo Nishizawa

John Larry Bencze, University of Toronto

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# ESERA

ESERA 2017 Conference  
Dublin City University, Dublin, Ireland.  
21st - 25th August 2017  
[www.esera2017.org](http://www.esera2017.org)

You are invited to join us in Dublin for ESERA 2017 and contribute with your science education experiences. This conference will be jointly hosted by CASTeL at Dublin City University and EPI-STEM at the University of Limerick. Registration and call for papers opens November 2016.



# ESERA DUBLIN 2017



### **Strand 12: Educational Technology Technology and Student Affective Dispositions**

8:30am - 10:00am, Baltimore Salon B

**Presider:** Elizabeth Ridgeway, Kodiak Island Borough School District

#### ***Augmented Reality in Class Reality: Raising Motivation and Changing Attitudes and Misconceptions.***

Aviva Klieger, Beit-Berl College

Hen Maayan, Beit-Berl College

Yossi Marciano, Beit-Berl College

Liat Shaked, Beit-Berl College

Shlomit Meyer, Beit-Berl College

#### ***Gaming Science: Student Responses to Virtual Agents and Science Tasks in an Educational Video Game***

Michael Radosta, University at Buffalo

#### ***The Impact of E-Education on at Risk High School Students' Science Achievement and Experiences***

Pamela P. Phillips, NCSU

Margaret R. Blanchard, NCSU

#### ***Social Engagement and Multilingual Aspects of Motivation to Learn in Massive Open Online Courses***

Miri Barak, Technion, Israel Institute of Technology

### **Strand 13: History, Philosophy, and Sociology of Science Nature of Science and Scientific Inquiry Understandings in K-12 Classrooms**

8:30am - 10:00am, Baltimore Salon A

**Presider:** Renee S. Schwartz, Georgia State University

#### ***Turkish Version of Students' Ideas About Nature of Science Questionnaire: A Validation Study***

Mustafa Cansiz, Artvin Coruh University

Nurcan Cansiz, Artvin Coruh University

Yasemin Tas, Ataturk University

Sundus Yerdelen, Kafkas University

#### ***Teaching Nature of Science and Scientific Inquiry to Diverse Early Primary Level Students***

Judith S. Lederman, Illinois Institute of Technology

Selina Bartels, Illinois Institute of Technology

Norman G. Lederman, Illinois Institute of Technology

#### ***STEAM and the 'Two Cultures': Developing Matured Views on the Nature of Science Through Drama***

Gary Weiser, Teachers College

Richard H. Novack, Teachers College

### ***Sparkling Elementary Students' Attention to Ethical Considerations Through Experiences with Engineering Design***

Theresa A. Hegedus, High Point University

Heidi B. Carlone, University of North Carolina at Greensboro

### **Strand 14: Environmental Education Partners in Environmental Education**

8:30am - 10:00am, Kent

**Presider:** Nicole Colston, Oklahoma State University

#### ***Using Drawings and Discussion to Learn About Young Children's Perspectives on Nature***

Lauren Madden, The College of New Jersey

Jennifer Liang, The College of New Jersey

#### ***Using Nature-Based Programming to Rethink Who Gets to do Science: Efforts to Increase Diverse Participation***

Benjamin L. Tupper, University of Michigan

#### ***Using Systems Theory to Define the Importance of Environmental Educator Communication with Formal Educators***

Patricia Patrick, Texas Tech University

Jillian Weinstein, Texas Tech University

#### ***Using the Environment as a Lens: Critical Environmental Agency During a Field Ecology Program***

Lacey D. Huffling, Georgia Southern University

### **Strand 15: Policy**

#### ***Symposium - Building Productive Partnerships Among Researchers and Practitioners: Lessons From Five RPPs in Science Education***

8:30am - 10:00am, Homeland

#### **Presenters:**

William R. Penuel, University of Colorado

Jessica J. Thompson, University of Washington

Jennifer Richards, University of Washington

Savitha Moorthy, SRI International

Andrew E. Krumm,

Philip L. Bell, University of Washington

Erin Marie Furtak, University of Colorado

Jason Buell, CU Boulder

Samuel Severance, University of Colorado Boulder

## Coffee Break

10:00am – 10:30am, Ballroom Foyer

## Committee Meetings

10:30am – 11:45am

### Outstanding Doctoral Research Award Committee Meeting

10:30am – 11:45am, Watertable Salon C

### Early Career Research Award Committee Meeting

10:30am – 11:45am, Pride of Baltimore

### Distinguished Contributions through Research Award Committee Meeting

10:30am – 11:45am, Gibson

### Equity and Ethics Committee Meeting

10:30am – 11:45am, Baltimore Salon A

### External Policy and Relations Committee Meeting

10:30am – 11:45am, Baltimore Salon B

### Research Committee Meeting

10:30am – 11:45am, Kent

### Membership and Election Committee Meeting

10:30am – 11:45am, Fells Point

### International Committee Meeting

10:30am – 11:45am, Federal Hill

### Program Committee Meeting

10:30am – 11:45am, Watertable Salon A

### Publications Advisory Committee Meeting

10:30am – 11:45am, Watertable Salon B

## Awards Luncheon

12:00pm – 2:00pm, Maryland Ballroom

## Concurrent Session #8

2:15pm – 3:45pm

### Membership and Election Committee

*Administrative Symposium - NARST Live: Co-Author Our Story, Meet Your Board, Get Involved!!!*

2:15pm - 3:45pm, Baltimore Salon B

#### Presiders:

Pauline W. U. Chinn, University of Hawaii at Manoa

Eileen R. Parsons, University of North Carolina at Chapel Hill

Valarie L. Akerson, Indiana University

### International Committee

*Administrative Sponsored Symposium - Promoting Cross-Culture Science Education Research*

2:15pm - 3:45pm, Watertable Salon C

**President:** Hsiao-Lin Tuan, NARST International Coordinator

#### Presenters:

Huann-Shyang Lin, National Sun Yat-Sen University

Larry D. Yore University of Victoria, Victoria, Canada

Zoubeida R. Dagher, University of Delaware, USA

Sibel Erduran, University of Limerick, Limerick, Ireland

Ebru Kaya, Bogazici University, Istanbul, Turkey

Saouma BouJaoude, American University of Beirut, Lebanon

Andrew Wild, Stanford University

Shelley Rap, Weizmann Institute of Science

Allyson Rogan-Klyve, Oregon State University

Dommonique Bulls University of North Carolina at Chapel Hill



## **Strand 1: Science Learning, Understanding and Conceptual Change**

### ***Student Beliefs Across Contexts***

2:15pm - 3:45pm, Watertable Salon B

**Presider:** Martina Nieswandt, University of Massachusetts, Amherst

### ***Developing General Metacognitive Knowledge Through Synthesis: Distracting Salient Features in Physics Problems***

Thanh K. Le, University of Maine

Jonathan T. Shemwell, University of Maine

MacKenzie R. Stetzer, University of Maine

### ***Effect of a Laboratory Instructional Model on Students' Epistemological Beliefs About Science***

Nizar El Mehtar, Lebanese University

Zalpha Ayoubi, Lebanese University

### ***Middle School Student Application of Evolutionary Change to Behavioral Change Scenarios***

Joshua Premo, Washington State University

andy Cavagnetto, Washington State University

Kenneth J. Kurtz, Binghamton University

### ***Upper Secondary Students' Self-Perceptions Towards their Actual Achievement in Science Education***

Miia Rannikmäe, University of Tartu

Regina Soobard, University of Tartu

Priit Reiska, Tallinn University

Aet Möllits, Tallinn University

Jack B. Holbrook, University of Tartu

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

### ***Science Teaching & Learning in Elementary School***

2:15pm - 3:45pm, Pride of Baltimore

**Presider:** Dave Hunsberger, Potomac Digitek

### ***The Influence of Teachers' Framing of Modeling on Elementary Students' Engagement in the Modeling Practice***

Li Ke, Michigan State University

Christina V. Schwarz, Michigan State University

### ***Exploring Links Between Elementary Students' Model-Based Explanations and Teachers' Knowledge and Practice with Scientific Models***

Laura Zangori, University of Missouri-Columbia

Tina Vo, University of Nebraska-Lincoln

Cory T. Forbes, University of Nebraska-Lincoln

Christina V. Schwarz, Michigan State University

### ***Unintended Learning in Primary School Practical Science Lessons***

Jisun Park, Seoul National University

Jinwoong Song, Seoul National University

Ian Abrahams, University of Lincoln

### ***Teaching Science in the Outdoors: Designing Outdoor Inquiry with Elementary School Teachers***

Kara Haas, Michigan State University

Irene S. Bayer, Michigan State University

Tali Tal, Technion

### ***Theorizing Relevance for Science Education***

Susan Kirch, New York University

Kara M. Naidoo, New York University

Ben Higgins, East Side Union High School District

## **Strand 3: Science Teaching--Primary School, (Grades preK-6): Characteristics and Strategies Issues in Early Childhood Science Education**

2:15pm - 3:45pm, Kent

**Presider:** Emily J.S. Kang, Adelphi University

### ***Centres of Care: A Guiding Principal in Primary Science Curriculum Enactment for Students From Low Socioeconomic and Refugee Backgrounds.***

Carolina Castano-Rodriguez, Australian Catholic University

Lyn Carter, Australian Catholic University

Jenny L. Martin, Australian Catholic University

### ***Less Use of Scientific Terminology in the Primary Science Classroom: A Means of Concept Development?***

Jon P. James, University of Bristol

### ***Making the Case for STEM in Early Childhood Education***

Christine D. Tippet, University of Ottawa

Todd Milford, University of Victoria

### ***Understanding Young Children'S Argumentation as Dialogical Relations***

Mijung Kim, University of Alberta

Wolff-Michael Roth, University of Victoria

**Strand 4: Science Teaching--Middle and High School,  
(Grades 5-12): Characteristics and Strategies  
*Perspectives on Science Teachers' Learning and Practice***

2:15pm - 3:45pm, Gibson

**Presider:** Ellen Barnett, University of Missouri

***Examining the Alignment Between Teachers' Classroom  
Instruction and the Next Generation Science Standards***

Jarod Kawasaki, University of California - Los Angeles

William A. Sandoval, University of California, Los Angeles

***Three Perspectives of High School Physics Teaching  
and Learning***

Dennis W Sunal, University of Alabama

Cynthia Szymanski Sunal, The University of Alabama

John Dantzler, University of Alabama at Birmingham

James W. Harrell, University of Alabama

Marilyn Stephens, University of Alabama

Tara Ray, University of Alabama- Tuscaloosa

Michelle Wooten, University of Alabama

Mohan Aggarwal, Alabama A&M University

***How Secondary Biology Teachers Characterized their  
Learning Within a Professional Learning Community  
Implementing NGSS***

Ellen M. Barnett, University of Missouri

Patricia J. Friedrichsen, University of Missouri-Columbia

***Professional Learning Experiences of Beginner  
Science Teachers***

Melanie A. Sadeck, Cape Peninsula University of Technology

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

2:15pm - 3:45pm, Fells Point

**Presider:** Kelly Riedinger, David Heil & Associates, Inc.

***Recruiting STEM Graduate Students for K-12 Education:  
Development of an Instrument for Identifying Candidates***

Stephanie B. Wortel, Stony Brook University

Angela M. Kelly, Stony Brook University

Meghan P. Groome, New York Academy of Sciences

Minsu Ha, Stony Brook University (SUNY)

***Investigating How the Intensity of the STEM Program  
Matters: A Comparative Study***

John C. Bedward, Buena Vista University

Margaret R. Blanchard, North Carolina State University

Steve McDonald, North Carolina State University

***Examination of Students' Attitudes Towards STEM and  
Interest in STEM Careers: A STEM Camp Example***

Niyazi Erdogan, Balikesir University

Ayşe T. Oner, Texas A&M University, Aggie STEM

Robert M. Capraro, Texas A&M University, Aggie STEM

Mary Margaret Capraro, Texas A&M University, Aggie STEM

***STEM Professionals' Perspectives on the Importance of  
Science Fair Participation and the Practices of Science***

Kathleen A. Fadigan, Pennsylvania State University

Penny L. Hammrich, Drexel University

**Strand 8: In-service Science Teacher Education  
*Professional Development for Science Teachers***

2:15pm - 3:45pm, Watertable Salon A

**Presider:** Gail Richmond, Michigan State University

***A Statewide Support Program for Beginning Secondary  
Science Teachers: Results From a Randomized-Controlled  
Trial Investigation***

Shannon L. Dubois, Valparaíso University

Jennifer L. Maeng, University of Virginia

Randy L. Bell, Oregon State University

***Immersive Clinical Professional Development (ICPD) as  
a Model for Supporting 21st Century Science Educators***

Brian J. Foley, California State University, Northridge

John M. Reveles, California State University, Northridge

Kelly Castillo, Fullerton School District

***Measuring In-Service Teacher Readiness to Engage  
in Professional Development: A Self-Regulated Learning  
Microanalysis***

Erin E. Peters-Burton, George Mason University

***Teachers' Disciplinary Engagement in an Online  
Professional Development Course***

Lama Jaber, Florida State University

Vesal Dini, Tufts University

David Hammer, Tufts University

Ethan Danahy, Tufts University

***Evaluation of a Continuing Professional Development Program  
About Nature of Science: Five Level Evaluation Model***

Eda Erdas, Kastamonu University

Serhat Irez, Marmara University

Nihal Dogan, Abant İzzet Baysal University

Yalcin Yalaki, Hacettepe University

Gultekin Cakmakci, Hacettepe University

Zekai Berk Altiner, Marmara University

Zeynep Neslihan Koylu, Marmara University



## Strand 9: Reflective Practice

### *Reflective Practice*

2:15pm - 3:45pm, James

**Presider:** Sonya N. Martin, Seoul National University

### *Axiology, the Subject and the Chair*

Wayne Melville, Lakehead University

Todd Campbell, University of Connecticut

Doug Jones, Lakehead District School Board

### *Critical Perspectives on Cogenerative Dialogue and Video Analysis on Science Teaching and Learning in the Elementary Classroom*

Sonya N. Martin, Seoul National University

Christina Siry, University of Luxembourg

Michele Gilbert-Dixon, Six Rivers Montessori, Arcata CA, USA

### *Integrating STEM into Leadership Curriculum*

Xiaoyang Gong, University of Maryland

Thomas E. Davis, University of Maryland

### *Planning Instruction by Implementing 5E Model into an Undergraduate Physics Laboratory: Action Research Study*

Ozden Sengul, Georgia State University

Renee S. Schwartz, Georgia State University

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

### *Symposium - Science Education in Complex Multilingual Contexts: Challenges and Insights From the Mediterranean and MENA (Middle East and North Africa) Regions*

2:15pm - 3:45pm, Baltimore Salon A

**Presider:** Sara Salloum, University of Balamand, Lebanon

#### **Presenters:**

Sara Salloum, University of Balamand, Lebanon

Saouma B. Boujaoude, American University of Beirut

Tamer G. Amin, American University of Beirut

Mariona Espinet, Universitat Autònoma de Barcelona, Spain

Charles Bonello, University of Malta

Diala Badreddine, American University of Beirut

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

### *Framing and Expanding Constructions of Scientific Knowledge*

2:15pm - 3:45pm, Federal Hill

**Presider:** Fouad Abd-El-Khalick, University of Illinois at Urbana-Champaign

### *A Wiser Goal for K-12 Science Education*

John Y. Myers, University of Illinois at Urbana-Champaign

Fouad Abd-El-Khalick, University of Illinois at Urbana-Champaign

### *Construction of Nature of Technology Conceptual Framework*

Hyunok Lee, Ewha Womans University, Republic of Korea

Dana L. Zeidler, University of South Florida

Hyunju Lee, Ewha Womans University

### *Transforming Teachers' Thinking About Engaging Students in Scientific Modeling in School Classrooms*

Barbara A. Crawford, The University of Georgia

## Strand 14: Environmental Education

### *Symposium - Urban Agriculture: An Untapped Context for STEM Learning*

2:15pm - 3:45pm, Homeland

**Presider:** Amie Patchen, Boston College

#### **Presenters:**

Dilafruz R. Williams, Portland State University

Sybil S. Kelley, Portland State University

Cary Sneider, Portland State University

Kerri LaCharite, Chatham University

Christopher D. Murakami, University of Missouri-Columbia

Heather Gillich, University of Missouri

Bruna Irene Grimberg, Montana State University

Fabian Menalled, Montana State University

Mike Barnett, Boston College

Amie Patchen, Boston College

## Concurrent Session #9

4:00pm – 5:30pm

### Strand 1: Science Learning, Understanding and Conceptual Change

#### *Related Paper Set - Learning Progressions for Global Carbon Cycling and Climate Change*

4:00pm - 5:30pm, Federal Hill

#### *Does Principle-Oriented Instruction Improve Student Performance in Novel Contexts?*

Charles W. Anderson, Michigan State University

Jennifer H. Doherty, University of Washington

Jinho Kim, University of California, Berkeley

Tian Xia, University of California, Berkeley

Karen Draney, University of California, Berkeley

#### *Refining an Inquiry-Based Learning Progression Framework That Describes Students' Approach to Scientific Practices and Uncertainty*

Emily E. Scott, Michigan State University

Jenny M. Dauer, University of Nebraska- Lincoln

Jennifer H. Doherty, University of Washington

Charles W. Anderson, Michigan State University

#### *A Learning Progression Framework for Students' Interpretation of Earth Systems Data*

Joyce M. Parker, Michigan State University

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

May Lee, Michigan State University

Charles W. Anderson, Michigan State University

#### *Exploring Connections Among Environmental Science Learning Progression Frameworks Addressing Diverse Scientific Practices*

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

Joyce M. Parker, Michigan State University

Charles W. Anderson, Michigan State University

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

#### *Related Paper Set - Creating Equitable Access for Underrepresented STEM Students: Professors' Inroads Toward University Changes*

4:00pm - 5:30pm, Maryland Salon F

**President:** Xiufeng Liu, State University of New York at Buffalo (SUNY)

#### *Where Are All the Female Engineers?: An Insider's View of Socialization and Power*

Jeanne W. Christman, Rochester Institute of Technology

Randy K. Yerrick, SUNY- UB

#### *Narrowing the Gap: One Project Lead the Way Director Asks, 'Are We Really Leading?'*

George H. Zion, Rochester Institute of Technology

Xiufeng Liu, State University of New York at Buffalo, SUNY

Jeanne W. Christman, Rochester Institute of Technology

George H. Zion, Rochester Institute of Technology

Annemarie Ross, RIT/NTID

Xiufeng Liu, State University of New York at Buffalo, SUNY

#### *Seeing What Others Hear: Regarding STEM Diversity, Writing, and Learning Chemistry*

Annemarie Ross, RIT/NTID

Randy K. Yerrick, SUNY- UB

#### *Learning to Engineer My Educational Experience*

Michael Eastman, Rochester Institute of Technology

Randy K. Yerrick, SUNY- UB

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

### ***Related Paper Set - Investigating Epistemic Agency: Creating Space for Students and Teachers to Actively Construct Scientific Knowledge***

4:00pm - 5:30pm, Baltimore Salon A

**Discussant:** David Hammer

### ***Epistemic Agency in the Science Classroom***

Aliza Stein, Northwestern University

### ***Developing a Culture of Caring to Support Epistemic Agency***

Christina Krist, Northwestern University

Michael J. Novak, Park View School and Northwestern University

### ***Negotiating Students Epistemic Agency and Epistemic Authority in Physics Discussions***

Enrique Suarez, University of Colorado, Boulder

### ***Shared Epistemic Goals and Patterns of Participation in a Teacher Learning Community***

Jason Buell, University of Colorado, Boulder

## **Strand 4: Science Teaching--Middle and High School, (Grades 5-12): Characteristics and Strategies Strategies for Professional Development**

4:00pm - 5:30pm, Watertable Salon B

**Presider:** Christopher A. Bogiages, Knowles Science Teaching Foundation

### ***Comparing Students' Talking in Lessons Using Different Instructional Approaches***

Lin Zhang, Providence College

### ***Content Knowledge Development When Teaching Out-of-Field: The First Five Years***

Ryan Nixon, Brigham Young University

Kathleen M. Hill, Pennsylvania State University

Julie A. Luft, University of Georgia

### ***Significant Events in the Development of Teachers' Topic Specific Professional Knowledge for Teaching Chemical Bonding***

Rene Toerien, University of Cape Town

Marissa S. Rollnick, Wits University

Annemarie Hattingh, University of Cape Town

## ***The Influence of Innovative, RRI Support Teaching Materials on Science Teachers' Practical Knowledge***

Drdane Bayram-Jacobs, Delft University of Technology

Ineke Henze-Rietveld, Delft University of Technology

## **Strand 4: Science Teaching--Middle and High School, (Grades 5-12): Characteristics and Strategies Socioscientific Issues in Science Education**

4:00pm - 5:30pm, Kent

**Presider:** Niyazi Erdogan, Balikesir University

### ***Characteristics of Students' Socioscientific Issues: Peer Argumentations and their Impact on Students' Moral Sensitivity***

Eunhang Lee, University of South Florida

Dana L. Zeidler, University of South Florida

### ***Studies of Two Teachers Developing Argumentative Dialogues on a Socio-Scientific Issue in a Middle School***

Yaozhen Pan, Illinois Institute of Technology

Norman G. Lederman, Illinois Institute of Technology

### ***The Classroom Observation Protocol for Socioscientific Issue-Based Instruction: Development and Implementation of a New Instrument***

Mustafa S. Topcu, Yildiz Technical University

Sasithee Pitipornatapin, University of Missouri

Jaimie Foulk, University of Missouri

Troy Sadler, University of Missouri

### ***Development of a Socio-Scientific Issues-Based Instruction for Middle School Students***

Nejla Atabey, Milas National Education Directorate

Mustafa S. Topcu, Yildiz Technical University

Abdulkadir Genel, Mugla Sıtkı Koçman Üniversitesi

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

### ***Deeper Issues in Concepts and Assessment***

4:00pm - 5:30pm, James

**Presider:** David F. Treagust, Curtin University

### ***Student Performance Outcomes Related to Cognitive Levels of Formative Assessment Questioning and Its Associated Feedback***

Christina S. Melki, Corban University

Heidi Masters, University of Wisconsin - La Crosse

***Engineering Student's Perceptions of the Future:  
Transferability and Replication of Time Perspective  
Classifications***

Justin Major, University of Nevada, Reno  
Hank Boone, University of Nevada, Reno  
Marissa Tsugawa, University of Nevada, Reno  
Catherine McGough, Clemson University  
Lisa C. Benson, Clemson University  
Adam Kirn, University of Nevada, Reno

***Situated and Expert-Guided Discussion of Engineering  
Ethics in Student Teams***

Eun Ah Lee, University of Texas at Dallas  
Nicholas Gans, University of Texas at Dallas  
Magdalena G Grohman, University of Texas at Dallas  
Maarco Tacca, University of Texas at Dallas  
Matthew J. Brown, University of Texas at Dallas

***Synthesis Physics Problem Solving: Factors Influencing  
Concept Recognition and Application***

Bashirah Ibrahim, The Ohio State University  
Lin Ding, The Ohio State University

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

***Science Faculty Instructional Practices***

4:00pm - 5:30pm, Baltimore Salon B

**Presider:** Issam H. Abi-El-Mona, Rowan University

***A Model for STEM Faculty Professional  
Development: Lessons Learned***

Susan M Gomez Zwiep, CSU Long Beach

***Comparing Self-Report and Observational Data:  
An Investigation of Faculty Instructional Practices***

Emily M. Walter, California State University - Fresno  
Cody T. Williams, Western Michigan University  
Charles R. Henderson, Western Michigan University  
Andrea L. Beach, Western Michigan University  
Megan Grunert Kowalske, Western Michigan University

***Exploring the Constraints to Undergraduate STEM Instructors'  
Use of Research-Based Instructional Strategies***

Grant E. Gardner, Middle Tennessee State University  
Evelyn Brown, East Carolina University

***Institution-Based Instructional Improvement:  
Establishing Relational Expertise Through Disciplinary  
Unit Social Network Analysis***

Kathleen M. Quardokus Fisher, Oregon State University  
Ann Sitomer, Oregon State University  
Jana L. Bouwma-Gearhart, Oregon State University  
Milo Koretsky, Oregon State University

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

***Early Learners and Family Science***

4:00pm - 5:30pm, Watertable Salon A

**Presider:** Terence Patrick McClafferty, Charles Darwin University

***Head Start on Engineering: Supporting Engineering  
Interest Development in Early Childhood***

Scott Pattison, Institute for Learning Innovation; Oregon Museum  
of Science and Industry

***Engaging Preschool-Age Children in Multimodal  
Evidence-Based Explanations for Astronomy Phenomena  
During Museum Programs***

Julia Plummer, Pennsylvania State University  
Amy R. Ricketts, Pennsylvania State University

***Evaluating a Science Center's Impact on Family Learning  
and Science Literacy***

Terence Patrick McClafferty, Charles Darwin University  
Leonie J. Rennie, Curtin University

***Opportunities for Meaning-Making in Library-Based  
Science/Literacy Workshops***

Danielle Ford, University of Delaware  
Dale McCreedy, the Franklin Institute  
Julia Skolnik, the Franklin Institute  
Tara Cox, the Franklin Institute

**Strand 7: Pre-service Science Teacher Education**  
**Symposium - Teaching English Learners Through Science-  
 Language Integration: Linking a Conceptual Framework to  
 Secondary Teacher Preparation**

4:00pm - 5:30pm, Gibson

**President:** Trish L. Stoddart, University of California, Santa Cruz

**Presenters:**

Edward G. Lyon, Sonoma State University  
 Sara E. Tolbert, University of Arizona  
 Jorge Solis, University of Texas at San Antonio  
 Trish L. Stoddart, University of California, Santa Cruz  
 George C. Bunch, University of California, Santa Cruz  
 Barry Roth, University of Arizona  
 Ivan Salinas, University of Arizona  
 Corey Knox, University of Arizona  
 Joanne Couling, University of California, Santa Cruz  
 Malcom Butler, University of Central Florida

**Strand 7: Pre-service Science Teacher Education**  
**Preservice Teachers and Learning to Notice Student  
 Thinking and Science Practices**

4:00pm - 5:30pm, Fells Point

**President:** Elizabeth Wright, University of Washington

**Pre-Service Teachers' Lesson Reflections: Attending,  
 Analyzing, and Responding to Elementary Students'  
 Thinking for Engineering Design**

Elaine M. Silva Mangiante, Salve Regina University  
 Adam Moore, University of Rhode Island

**Examining Secondary Science Pre-Service Teachers'  
 Planning for High-Level Questioning in Lesson Planning**

Danielle K. Ross, Northern Arizona University

**Exploring Prospective Elementary Teachers' Engineering  
 Teaching Responsiveness Through a Video Case  
 Diagnosis Task**

Tejaswini S. Dalvi, University of Massachusetts Boston  
 Kristen B. Wendell, Tufts University

**Investigating Factors Shaping Agency and Resilience  
 of Science Teacher Candidates in High-Poverty Schools**

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

**Pre-Service Science Teachers' Efficacy in Using  
 Dialogical Argumentation for Teaching Integrated  
 Science-Indigenous Knowledge Lessons.**

Keith R. Langenhoven, University of the Western Cape  
 Meshach Mobolaji Ogunniyi, University of the Western Cape  
 Cynthia G. Fakudze, University of Cape Town

**Strand 7: Pre-service Science Teacher Education**  
**Related Paper Set - Preparing Novices for Ambitious  
 Instruction: A Look at Different Opportunities in  
 Learning Settings**

4:00pm - 5:30pm, Maryland Salon A

**"Macroteaching": Extending and Authenticating Peer  
 Teaching Opportunities**

Amelia Wenk Gotwals, Michigan State University  
 David Stroupe, Michigan State University

**Study 2: Planning for Elicitation of Students' Ideas:  
 A Lesson Study Approach**

Douglas B. Larkin, Montclair State University

**Designing Opportunities for Preservice Science Teachers  
 to Learn Formative Assessment**

Hosun Kang, University of California Irvine

**Approximations of Ambitious Practice in a Compressed  
 Science Teacher Program**

John Settlage, University of Connecticut  
 Elizabeth Raynor,

**Negotiating Tensions While Developing Ambitious  
 Science Teaching Practices**

Scott McDonald, Pennsylvania State University  
 Arzu Ozcelik, Penn State University

**Strand 8: In-service Science Teacher Education**  
**Related Paper Set - A Multi-Pronged Exploration of a  
 STEM Teacher Leadership Framework**

4:00pm - 5:30pm, Pride of Baltimore

**Tempering Our Understanding: Determining and  
 Increasing the Strength of a Framework for STEM Teacher  
 Leadership**

Brett Criswell, University of Kentucky  
 Greg Rushton, Stony Brook University



***Exploratory Analysis of Science Teacher Leaders' Communities of Practice Subject / Problem***

Samuel J. Polizzi, Kennesaw State University  
William Coyle,  
Greg Rushton, Stony Brook University

***Using EQUIP to Guide Reflective Conversations***

Donna J. Barrett, Metro RESA  
David Rosengrant, Kennesaw State University

***Tracking the Growth of Teacher Leaders Using the Multifactor Leadership Questionnaire (MLQ)***

Michelle L. Head, Kennesaw State University  
Amanda Edwards,  
Lyric Portwood, Kennesaw State University  
Greg Rushton, Stony Brook University

***Evaluation of a Noyce Program: Development of Teacher Leaders in STEM Education***

Meltem Alemdar, Georgia Institute of Technology  
Christopher Cappelli, Georgia Institute of Technology

***Strand 10: Curriculum, Evaluation, and Assessment Curriculum and Assessment in the NGSS Era***

4:00pm - 5:30pm, Maryland Salon B

**Presider:** Eva Erdosne Toth, West Virginia University

***Using an Allergy Curricular Unit to Address the Three NGSS Dimensions with Grades 2-3***

Christopher Burnett, Baylor College of Medicine  
Nancy Moreno, Baylor College of Medicine  
Alana Newell, Baylor College of Medicine

***Integrated Learning Progression Facilitated Instruction Advancing Synergetic Development of Energy Understanding and Scientific Explanation***

Yao Jianxin, Beijing Normal University  
Yuying Guo, Beijing Normal University  
Knut Neumann, Leibniz Institute for Science Education (IPN) Kiel

***Detect the Components of Scientific Modeling Competence***

Xiaoming Zhai, Department of Physics, Beijing Normal University  
Min Li, University of Washington  
Yuying Guo, Department of Physics, Beijing Normal University  
Dongsheng Dong, University of Washington

***Using Multiple Models to Support Students' Integrated Understandings About Water Systems***

Sarah J. Fick, Wake Forest University

***Strand 10: Curriculum, Evaluation, and Assessment Related Paper Set - Automated Analysis of Written Assessments in STEM: Methodological Issues***

4:00pm - 5:30pm, Maryland Salon E

**Presider:** Mark Urban-Lurain, Michigan State University

***The Development of Constructed Response Astronomy Assessment Items***

Matthew M. Steele, Michigan State University  
John Merrill, Michigan State University  
Kevin C. Haudek, Michigan State University  
Mark Urban-Lurain, Michigan State University

***Applying Automated Analysis to Develop a Cost-Effective Measure of Science Teacher Pedagogical Content Knowledge***

Molly Stuhlsatz, BSCS  
Christopher Wilson, BSCS  
Zoe E. Buck Bracey, BSCS  
Kevin C. Haudek, Michigan State University  
John Merrill, Michigan State University  
Mark Urban-Lurain, Michigan State University

***Automated Analysis Provides Insights on the Challenges to Understanding the Processes Underlying the Flow of Genetic Information***

Rosa Moscarella, Michigan State University  
Alexandria L. Mazur, Michigan State University  
Luanna B. Prevost, University of South Florida  
Matthew M. Steele, Michigan State University  
Karen Pelletreau, University of Maine  
Michelle K Smith, University of Maine  
Jennifer K Knight, University of Colorado - Boulder  
Kevin C. Haudek, Michigan State University  
Mark Urban-Lurain, Michigan State University  
John Merrill, Michigan State University

***Predicting the Accuracy of Computer Scoring of Text: Probabilistic, Multi-Model, and Semantic Similarity Approaches***

Minsu Ha, Stony Brook University, SUNY  
Ross H. Nehm, SUNY Stony Brook



**Strand 11: Cultural, Social, and Gender Issues*****Symposium - A Mini-Course on Race/Racism and Critical Race Theory for Application in Science Education Research***

4:00pm - 5:30pm, Watertable Salon C

**Presenters:**

Felicia Moore Mensah, Teachers College, Columbia University  
 Jomo W. Mutegi, Indiana University  
 Eileen C. Parsons, University of North Carolina at Chapel Hill  
 Leon Walls, University of Vermont  
 Konstantinos Alexakos, Brooklyn College-CUNY  
 Leah D. Pride, CUNY Graduate Center  
 Alejandro J. Gallard, Georgia Southern University

**Strand 13: History, Philosophy, and Sociology of Science*****Examinations of, and Supports For, Scientific and Pseudoscientific Explanations***

4:00pm - 5:30pm, Homeland

**Presider:** Shakhnoza Kayumova, University of Massachusetts-Dartmouth

***Aim, Working Status and Scientific Status of Crystal Healing as Pseudoscience From Middle School Students' Perspectives***

Duygu Metin, Abant Izzet Baysal University  
 Jale Cakiroglu, Middle East Technical University  
 Gulsen Leblebicioglu, Abant Izzet Baysal University

***Constructing Scientific Explanations: How Philosophically Informed Models Can Guide Instruction, Learning, and Assessment in NGSS***

Sahar K. Alameh, University of Illinois and Urbana Champaign  
 Fouad Abd-El-Khalick, University of Illinois at Urbana-Champaign  
 Jonathan Waskan, University of Illinois at Urbana-Champaign

***Educating Students for Science Policy: The Need for a Multidisciplinary Approach***

Peter S. Garik, Boston University

***The History of Nature of Science Representation in State Science Standards: A Systematic Assessment***

Ryan Summers, University of Illinois - Urbana/Champaign  
 John Maddux, University of Illinois at Urbana-Champaign  
 Robert Wallon, University of Illinois at Urbana-Champaign  
 Sahar K. Alameh, University of Illinois at Urbana Champaign  
 Jeanne Brunner, University of Illinois at Urbana-Champaign  
 John Y. Myers, University of Illinois at Urbana-Champaign  
 Aybuke Pabuccu, Abant Izzet Baysal University  
 Gulsum Akyol, Aksaray University  
 Christina Silliman, University of Illinois at Urbana-Champaign  
 Saadeddine Shehab, University of Illinois at Urbana-Champaign  
 Fouad Abd-El-Khalick, University of Illinois at Urbana-Champaign

**Evening/Social Events****Equity and Ethics Committee Sponsored Outing*****Equity Dinner, Maximum Attendance: 85***

6:30pm – 9:00pm, Off-Site

Spirit of Baltimore Dinner Cruise

Baltimore Inner Harbor

Boarding begins at 6:30pm

***Dinner, including tax and gratuity, is \$45.***

**Please note:** You must register for this event with your Advance Conference Registration. Tickets purchased for this event are not refundable.

**NOTE:** The Spirit of Baltimore will depart from the west wall of Baltimore's Inner Harbor. The distance from the Renaissance Baltimore Harborplace Hotel is about 3 blocks, mostly along the harbor. No transportation services will be provided.

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**Sunday, April 17, 2016**



## Conference Registration

7:00am – 12:00pm, Maryland Foyer

## Strand Meetings

### 7:00am – 8:15am

Informal meet and greet with strand coordinators. Ask questions and give your opinion about strand policies as well as the direction you would like to see the strand headed.

#### Strand 1: Science Learning, Understanding and Conceptual Change

Meeting—7:00am – 8:15am, Baltimore Salon A

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

Meeting—7:00am – 8:15am, Baltimore Salon B

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

Meeting—7:00am – 8:15am, Maryland Salon A

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

Meeting—7:00am – 8:15am, Maryland Salon E

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

Meeting—7:00am – 8:15am, Maryland Salon D

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

Meeting—7:00am – 8:15am, Maryland Salon F

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

Meeting—7:00am – 8:15am, Kent

#### Strand 8: In-service Science Teacher Education

Meeting—7:00am – 8:15am, Fells Point

#### Strand 9: Reflective Practice

Meeting—7:00am – 8:15am, Federal Hill

#### Strand 10: Curriculum, Evaluation, and Assessment

Meeting—7:00am – 8:15am, Watertable Salon A

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

Meeting—7:00am – 8:15am, Watertable Salon B

#### Strand 12: Educational Technology

Meeting—7:00am – 8:15am, Watertable Salon C

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

Meeting—7:00am – 8:15am, Pride of Baltimore

## Strand 14: Environmental Education

Meeting—7:00am – 8:15am, Gibson

## Strand 15: Policy

Meeting—7:00am – 8:15am, Guilford

## Concurrent Session #10

### 8:30am – 10:00am

#### Research Committee

*Sponsored Poster Symposium – Sandra K. Abell Institute for Doctoral Students*

8:30am - 10:00am, Maryland Salon E

#### President:

Joseph Polman, The University of Colorado, Boulder

Erin Marie Furtak, The University of Colorado, Boulder

*Exploring the Articulation of Scientific Practices of Modeling and Argumentation in a Sequence on Genetic Diseases*

Noa Ageitos, University of Santiago de Compostela

*Teachers Communicating with Informal Science Educators: Addressing the Need for a Collaborative Tool*

James Ammons, University of Georgia

*Integrating STEM: Online Teacher Professional Development*

Tasneem Anwar, University of Minnesota

*How a Community of Teachers Redesigned Curricula in Response to NGSS*

Ellen Barnett, University of Missouri

*Critical YPAR for Reimagining Urban Environmental Education*

Marissa Bellino, The Graduate Center, City University of New York

*Aligning Goals of Science Teacher Preparation to Enacted Teaching Practices*

Nellista Bes, Montclair State University

*Who Learns From Teacher Evaluation and Why?*

Chris Bradford, University of Wisconsin-Madison



***Culturally Relevant Science: Perspectives of African American Students Participating in an Informal Science Program***

Domonique Bulls, University of North Carolina at Chapel Hill

***Learning in the Science Classroom: A Phenomenological Study of Students' Instructional Experiences with Early Career Teachers***

Ben Campbell, University of Georgia

***Many Stories: Preservice Elementary Teachers' Identities as Teachers of Science and Students***

Martha Canipe, University of Arizona

***Coaching Teachers in the Design of Assessments to Support Students' Scientific Explanations***

Joanne Couling, University of California Santa Cruz

***Teachers' Sensemaking about Curriculum Materials across Settings***

Elizabeth X. de los Santos, Michigan State University

***Changes in Pre-Service Teachers' Understanding and Acceptance of a Model of Socioscientific Issues-based Teaching***

Jaimie Foulk, University of Missouri

***Constructive Alignment in a Large-Enrollment Undergraduate Biology Course Emphasizing Student-Centered Active Learning***

John Ivanovitch, Oregon State University

***How Classrooms Learn to Use Epistemic Considerations for Building Scientific Knowledge***

Christina (Stina) Krist, Northwestern University

***"Being a Good Person in a Bad System:" Agency, Structure, and Change for Sustainability***

Hannah Miller, Michigan State University

***Meanings of Evidence and its Uses: A 3-year Longitudinal Study in a Class of Kindergartners***

Sabela F. Monteiro, Universidade de Santiago de Compostela

***Examination of Persistence in Biology by Average Achieving Students***

Biscah Syombua Munyaka, University of Northern Colorado

***Understanding Positioning in a Teacher Learning Group***

Amy Ricketts, Penn State University

***The Effect of the Next Generation Science Standards on Teachers' Classroom Practice***

Allyson Rogan-Klyve, Oregon State University

***Teacher Perceived Practical Knowledge Development throughout a Research-Practice Partnership: An Intersectionality Perspective***

Tamara (TJ) Smolek, Michigan State University

***Enactment of Ambitious Instruction in an Undergraduate General Biology Laboratory Course for Nonscience Majors***

Anna Strimaitis, Florida State University

***Leveraging the Cultural Practices of Science for Making Classroom Discourse Accessible to Emerging Bilingual Students***

Enrique Suarez, University of Colorado at Boulder

***High School Science Teachers' Perceptions of how Others Think Science Should be Taught***

Andrew Wild, Stanford University

**Strand 1: Science Learning, Understanding and Conceptual Change**

***Learning Progressions and Student Understanding in Biology***

8:30am - 10:00am, Baltimore Salon A

**Presider:** Ravit Golan Duncan, Rutgers University

***Data Driven Refinements of a Genetics Learning Progression: Mapping an Understanding of Classical Genetics***

Moraima Castro-Faix, Rutgers University

Jason Rothman, Rutgers University

Rozaliya Seryapov, Rutgers University

Ravit Golan Duncan, Rutgers University

***How Is the Body's Systemic Nature Manifested Amongst High School Biology Students?***

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

Jaklin Tripto, Ben-Gurion University of the Negev Israel

Zohar Snapir, Ben-Gurion University of the Negev Israel

Miriam Amit, Ben-Gurion University of the Negev Israel

***The Effect of Students' Visual Reading Strategies on Understanding Representations in Biology***

Miriam Brandstetter, University of Duisburg Essen

Christine Florian, University of Duisburg Essen

Angela Sandmann, University of Duisburg Essen

***Using Alternative Instructional Sequences to Test a Learning Progression in Genetics***

Jinnie Choi, Rutgers University  
Ravit Golan Duncan, Rutgers University  
Moraima Castro-Faix, Rutgers University  
Veronica L. Cavera, Rutgers University

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

***Related Paper Set - Epistemic Framing and Agency in Modeling Classrooms***

8:30am - 10:00am, Maryland Salon B

**Discussants:**

Brian Reiser, Northwestern University

***"Models of" Versus "Models For": Implications for Designing Lessons to Support Students' Epistemic Agency***

Julia Gouvea, Tufts University  
Cynthia Passmore, University of California-Davis  
Brian J. Reiser, Northwestern University

***Successes and Challenges in Promoting Student Sense Making in Modeling Classrooms***

Chris D. Griesemer, University of California Davis  
Abraham S. Lo, University of California, Davis  
Candice R. Guy, University of California, Davis  
Emily Harris, University of California, Davis  
Cynthia Passmore, University of California-Davis

***Examining the Effect of Teacher Responsiveness to Student Ideas on Student Modeling in a MBI Unit***

Ron Gray, Northern Arizona University  
Allyson M. Rogan-Klyve, Central Washington University

***Redirection and Other Methodological Conceptions in a Modeling Based Learning (MBL) Environment***

Todd Campbell, University of Connecticut

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

***Related Paper Set - Examining Elementary School Students' Interactions with Engineering Design and the Factors Affecting their Learning***

8:30am - 10:00am, Maryland Salon F

**Discussant:** Michael Falk, Johns Hopkins University

***Characterizing Elementary School Students' Science Conceptual Understandings Through Engineering Design as a Context for Learning***

Brenda M. Capobianco, Purdue University  
Hongji Gui, Purdue University

***Assessing Elementary Students Transfer Science and Engineering Practices in the Context of Engineering Design***

Todd Kelley, Purdue University  
Euisuk Sung, Purdue University

***Understanding Out-of-School-Time Elementary Students' Conceptions of the Engineering Design Process***

Catherine Kruchten, The John Hopkins University  
Carolyn A. Parker, The John Hopkins University  
Audrey Moshfeghian, Johns Hopkins University

***Enhanced Interest and Attitudes Towards Engineering After Two Years of a Community Focused STEM Partnership***

Carolyn A. Parker, The John Hopkins University  
Erica L. Smith, Johns Hopkins University  
David E. McKinney, the Johns Hopkins University

**Strand 4: Science Teaching--Middle and High School, (Grades 5-12): Characteristics and Strategies  
*New Approaches to Science Instruction***

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

**President:** Billy McClune, Queen's University

***Science Teaching: Integrating Indigenous Knowledge into the Science Curriculum an Interdisciplinary Approach to Academic Success***

Willard S. Gilbert, Northern Arizona University

***Comparative Case Study: Whole-Class Discussion Strategies for Using Dynamic and Static Images of Scientific Models***

Norman T. Price, UMASS Amherst/ SRRI  
John J. Clement, University of Massachusetts

***Equipping Young People to Engage with Media Driven Science Experiences: Beyond Science Knowledge to Science Literacy and Discerning Consumers of News.***

Billy McClune, Queen's University

***Beginning Science Teachers' Communications with Families***

Nena E. Bloom, Northern Arizona University  
Shadow W.J. Armfield, Northern Arizona University

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

***Instructional Practices - Chemistry***

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

**Presider:** Yehudit Judy Dori, MIT

***Project-Based Learning in General Chemistry for Engineers: An Initial Pilot Study***

Kent J. Crippen, University of Florida

Maria Korolov, University of Florida

Treavor Boyer, University of Florida

Chang-Yu Wu, University of Florida

Trisha de Torres, University of Florida

Philip Brucat, University of Florida

***Mathematization as One Core Problem of Solving Chemistry Questions***

Lennart Kimpel, University of Duisburg-Essen, Chemistry Education

Elke Sumfleth, Universitaet Duisburg-Essen

***Perceived Impacts of a Research Experience for Undergraduate Chemistry Majors***

Adriana R. Lunsford, Texas A&M University

***The Influence of Interdisciplinary Laboratories on Undergraduate Biology and Chemistry Students' Nature of Science Understanding***

Margery Gardner, Syracuse University

John W. Tillotson, Syracuse University

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

***Agents of Change***

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

**Presider:** Eleanor W. Close, Texas State University

***Developing Physics Identity and Competence Through Participation in a "Learning Assistant" Community of Practice***

Eleanor W. Close, Texas State University

Jessica Conn, Texas State University

Hunter G. Close, Texas State University

***Factors Related to Student Choice of Academic Major and Persistence in STEM***

Adam V. Maltese, Indiana University

Eunju Jung, Indiana University

***Do Teaching Assistants Matter? Assessment of Teaching Assistants Impact on Student Outcomes in a General Chemistry Laboratory***

Lindsay B. Wheeler, University of Virginia

Jennifer Maeng, University of Virginia

Jennifer Chiu, University of Virginia

Randy L. Bell, Oregon State University

***Impacting STEM Performance: Undergraduate Teaching Assistants as a Fulcrum for Elevating Instructional Practices***

Stephanie B. Philipp, University of Louisville

Melissa L. Shirley

Thomas R. Tretter, University of Louisville

Christine V. Rich, University of Louisville

***What do Graduate Teaching Assistants Understand About Teaching Organic Chemistry?***

Bette Davidowitz, University of Cape Town

Marissa S. Rollnick, Wits University

Marietjie Potgieter, University of Pretoria

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

***Scholarship of Teaching***

8:30am - 10:00am, Kent

**Presider:** Eva Erdosne Toth, West Virginia University

***How Participatory Action Research Supports a College Science Instructor's Science Teacher Assessment Literacy***

Morgan L. Presley, Drury University

***Instructors' Perspectives on Inter-Disciplinary Health Sciences Co-Teaching in Higher Education***

Arpana Dhar, Curtin University

David F. Treagust, Curtin University

Georgina M. Fyfe, Curtin University

***Reciprocal Learning in Science Professional Development: Faculty Shift their Practice***

Caron Inouye, California State University, East Bay

Kathryn N. Hayes, California State University, East Bay

Christine Lee, California State University East Bay

Jeff Seitz, California State University, East Bay

Dawn O'Connor, California State University, East Bay

Rachelle DiStefano, Cal State University East Bay

***University Engineering Instructors' Perceptions of their Need for Professional Development***

David F. Treagust, Curtin University

Caroline Selepe, Tshwane University of Technology

A.L. Chandrasegaran, Curtin University

## **Strand 6: Science Learning in Informal Contexts** ***Informal Science with K-12 Schools and Teachers***

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

**President:** Jennifer Dewitt, King's College London

### ***Mismatch of Goals and Assessments: Analysis of Zoo and Aquarium Provided Teacher Professional Development***

Joy Kubarek, PEER Associates

Judith Lederman, Illinois Institute of Technology

### ***Pregnant Pauses: Science Museums, Schools and a Controversial Exhibition***

Erminia G. Pedretti, University of Toronto

Ana Maria Navas Iannini, University of Toronto

### ***How to Assess Learning School Visits? Personal Meaning Maps as a Tool for Assessing Learning***

Claudia Faria, Institute of Education of The University of Lisbon

### ***Exploring the Sky: Investigating Discourse Dynamics in an Atmospheric Science Educational Outreach Program***

Kathryn J. Boyd, Colorado State University

Meena M. Balgopal, Colorado State University

Thomas Birner, Colorado State University

## **Strand 7: Pre-service Science Teacher Education** ***Symposium - A Design Charrette to Explore Models for Engaging Science Preservice Teachers in Engineering***

8:30am - 10:00am, James

**President:** Christine Schnittka, Auburn University

### **Presenters:**

R. Charles Dershimer, University of Michigan

Carolin Frank, Leibniz Institute for Science and Mathematics Education

Frackson Mumba, University of Virginia

Jennie Chiu, University of Virginia

Alonzo B. Alexander, North Carolina State University

Timothy A. Goodale, North Carolina State University

Christine Schnittka, Auburn University

## **Strand 8: In-service Science Teacher Education** ***Teacher Perspectives and PCK***

8:30am - 10:00am, Homeland

**President:** Mary K. Nyaema, University of Iowa

### ***AP Science Redesign: Teachers' Perspectives on their Schools' AP Culture and Implications for Student Success***

Abigail Jurist Levy, Education Development Center, Inc.

Ayana M. McCoy, University of Massachusetts Boston

Kim M. Frumin, Harvard University

Arthur Eisenkraft, University of Massachusetts Boston

Christopher Dede, Harvard Graduate School of Education

Barry J. Fishman, University of Michigan

Christian Fischer, University of Michigan

Frances Lawrenz, University of Minnesota

Yueming Jia, Education Development Center, Inc.

### ***Effects of an ISEP Professional Development on Teachers' PCK and Students' Understanding of Science***

Yang Yang, University at Buffalo

Xiufeng Liu, State University of New York at Buffalo (SUNY)

Michelle R. Eades-Baird, State University of New York at Buffalo (SUNY)

### ***Examining Physics Teachers' Technological Pedagogical Content Knowledge After a Professional Development Program: Multiple Case Study***

Merve Senturk, Gazi University

Meltem Irmak, Gazi University

Jale Ercan, Gazi University

Duygu Yilmaz, Gazi University

Mehmet F. Tasar, Gazi University

### ***Investigating In-Service Science Teachers' Orientations and Practices Toward Developing Socioscientific Issues Based Instruction***

Stephen B. Witzig, University of Massachusetts Dartmouth

### ***The Pedagogical Content Knowledge of Pollution Held by Secondary Chemistry Teachers in Country A***

Farah Shamaa, American University of Beirut

Saouma B. Boujaoude, American University of Beirut



**Strand 10: Curriculum, Evaluation, and Assessment**  
***Symposium - Building Responsible NGSS-Aligned Curriculum and Assessments in an Era of Accountability***

8:30am - 10:00am, Baltimore Salon B

**Presider:** Suzanne M. Wilson, University of Connecticut

**Presenters:**

Barbara Nagle, University of California-Berkeley  
 James B. Short, American Museum of Natural History  
 Suzanne M. Wilson, University of Connecticut  
 Anna MacPherson, American Museum of Natural History  
 John Howarth, University of California-Berkeley  
 Maia Willcox, University of California-Berkeley  
 Bianca Montrosse-Moorhead, University of Connecticut  
 Kristen Juskiewicz, University of Connecticut  
 Katherine L. McNeill, Boston College  
 Jamie N. Mikeska, ETS

**Strand 10: Curriculum, Evaluation, and Assessment**  
***Related Paper Set - Challenges and Solutions to Assessing Three-Dimensional Science Proficiency***

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

***Using Learning Performances to Design Three-Dimensional Assessments of Science Proficiency***

Kevin W. McElhaney, SRI International  
 Brian D. Gane, University of Illinois at Chicago  
 James W. Pellegrino, University of Illinois at Chicago  
 Christopher J. Harris, SRI International  
 Lou DiBello, Learning Sciences Research Institute-UIC  
 Joseph S. Krajcik, Michigan State University

***Connecting and Assessing Mathematics-Related Science Practices, Crosscutting Concepts and Disciplinary Core Ideas Using Learning Progressions***

Malcolm Bauer, Educational Testing Service  
 Hui Jin, Educational Testing Service  
 Lei Liu, Educational Testing Service

***Developing Assessment for Scientific Argumentation***

Jonathan Francis Osborne, School of Education, Stanford University

***Multidimensional Assessment in Simscientists***

Edys S. Quellmalz, WestEd  
 Barbara C. Buckley, WestEd  
 Matt Silbergliitt, WestEd

**Strand 11: Cultural, Social, and Gender Issues**  
***Culturally Congruent Approaches to Science Education***

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

**Presider:** Irasema Ortega, University of Alaska-Anchorage

***Supplemental and Optional Take-Home Projects for Culturally and Linguistically Diverse Learners: Formal and the Informal***

Geeta Verma, University of Colorado Denver  
 Helen Douglass, University of Colorado Denver  
 Brandy Bourdeaux, University of Colorado Denver

***Making Connections: Finding Success in the Gray Zone of a Collaborative, Cross-Cultural Making Project***

Lauren Causey, Science Museum of Minnesota  
 Marjorie Bullitt Bequette, Science Museum of Minnesota  
 Gina N. Svarovsky, University of Notre Dame

***Exploring the Impact of Culturo-Techno-Contextual Approach (CTCA) in Tackling Under-Achievement in Difficult Concepts in Biology***

Khadijat Ige, Lagos State University, Lagos, Nigeria  
 Peter A. Okebukola, Lagos State University, Nigeria  
 Temitope Anuoluwapo, Lagos State University, Nigeria  
 Rebecca Oyeyemi, Lagos State University, Nigeria  
 Adetola Olusesi, Lagos State University, Nigeria  
 Khadeejat Ige, Lagos State University, Nigeria  
 Olatunde Owolabi, Lagos State University, Nigeria  
 Foluso Okebukola, Lagos State University, Nigeria  
 Sunday Banjoko, Lagos State University, Nigeria  
 Grace O. Oshun, Lagos State University, Nigeria

***Rethinking Pedagogy in Urban Spaces: Implementing Hip-Hop Pedagogy in the Urban Science Classroom***

Edmund S. Adjapong, Teachers College, Columbia University  
 Christopher Emdin, Teachers College Columbia University  
 Ian P. Levy, Teachers College, Columbia University

**Strand 14: Environmental Education*****Symposium - International Symposium on Culture, Language, Practices, and Place in STEM Education: Indigenous and Place-Based Approaches***

8:30am - 10:00am, Maryland Salon A

**Presenters:**

Pauline W. U. Chinn, University of Hawaii - Manoa  
 Steven C. Semken, Arizona State University  
 Huihui Kanahale-Mossman, University of Hawaii Hilo  
 Geoffrey Bruce, Arizona State University  
 Chiung-Fen Yen, Providence University, Taichung, Taiwan  
 Hsuan-Fang Hung, Providence University, Taichung, Taiwan  
 David Zandvliet, Simon Fraser University  
 George Glasson, Virginia Tech  
 Sharon Nelson-Barber, WestEd  
 Rojana Klechaya, Srinakharinwirot University, Bangkok, Thailand

**Concurrent Session #11****10:15am – 11:45am****Equity and Ethics Committee*****Administrative Sponsored Symposium - Jhumki Basu Scholars Symposium - Equity and Justice: Perspectives From Emerging Scholars***

10:15am - 11:45am, Maryland Salon F

**Presenters:**

Nam-Hwa Kang, Korea National University of Education  
 Deb Morrison, TREE Educational Services  
 Senetta Bancroft, Grand Valley State University  
 Joy Barnes-Johnson  
 Thea Charles  
 Geraldine Cochran  
 Annabel D'Souza  
 Khadija Fouad  
 Maleka Gramling  
 Sheron Mark  
 Kirsten Mawyer  
 Karen Rose  
 Kihyun (Kelly) Ryoo  
 Somnath Sinha  
 Sara Tolbert, University of Arizona  
 Shari Watkins

**Strand 1: Science Learning, Understanding and Conceptual Change*****Instructional Trajectories and Learning Across Levels***

10:15am - 11:45am, Homeland

**Presider:** Shannon H. Sung, Spelman College***Comparing Elementary and Junior High School Students' Conceptual Understanding and Analogical Modeling Competence of Electricity***

Jing-Wen Lin, National Dong Hwa University  
 Meng-Fei Cheng, National Changhua University of Education  
 Ruan-Ching Yu, National Dong Hwa University  
 Weishen Wu, Da-Yeh University

***Distinguishing Emergent and Sequential Processes by Learning Emergent Second-Order Features***

Dongchen Xu, Arizona State University  
 Na Li, Arizona State University  
 Joshua R. Adams, Arizona State University  
 Michelene T.H. Chi, Arizona State University

***Elementary, Middle and High School Students' Scientific Reasoning Skills: A Content Analysis From 1980 to 2015***

Yurdagul Bogar, University of Tennessee  
 Jale Cakiroglu, Middle East Technical University

***Following and Breaking Conventions for Scales on Graphs: From Middle School Students to University Professors***

Cesar Delgado, University of Texas at Austin  
 Margaret M. Lucero, Santa Clara University



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

### ***Socio-Scientific Issues and Outdoor Learning***

10:15am - 11:45am, Maryland Salon E

**Presider:** Stephen C. Scogin, Hope College

### ***Analysis of a Middle School, Problem-Based Outdoor Learning Science Program***

Stephen C. Scogin, Hope College

Chris Kruger, Hope College

Regan Jekkals, Hope College

### ***Exploring Students' Quality of Argumentation About Local Socio-Scientific Issues in Different Learning Contexts***

Esra Capkinoglu, Abant Izzet Baysal University

Serkan Yilmaz, Hacettepe University

Gulsen Leblebicioglu, Abant Izzet Baysal University

### ***Negotiations Among Students, Scientists, and Teachers in a School-Based Citizen Science Partnership***

Emily Harris, University of California, Davis

Heidi Ballard, University of California Davis

Cynthia Carter Ching, University of California Davis

### ***Trouts and High-Rises: Exploring Student and Teacher Experiences with a STEM Integrated PBL***

Marissa C. Owens, University of Nevada, Las Vegas

Abeera P. Rehmat, University of Nevada, Las Vegas

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

### ***Symposium - Why Matter Matters in Science Education: Implications for Practice***

10:15am - 11:45am, Maryland Salon B

#### **Presenters:**

Catherine E. Milne, New York University

Kathryn Scantlebury, University of Delaware

Anita Hussenius, Uppsala University

Anna T. Danielsson, Uppsala University

Annica Gullberg, University of Gvle

Katherin Otrel-Cass, Aalborg University, Denmark

Bronwen M. Cowie, University of Waikato/WMIER

David S. Heywood, Manchester Metropolitan University

Shirley A. Simon, University College London

Paul Davies, Institute of Education, University of London

## **Strand 3: Science Teaching--Primary School, (Grades preK-6): Characteristics and Strategies Impacts of Teacher Knowledge on Elementary Science Classrooms**

10:15am - 11:45am, Watertable Salon A

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

### ***Comparing the Preparedness and Instructional Quality of Traditional and Science Specialist Elementary Teachers***

Joseph A. Brobst, Western Washington University

Tammy Q. Tasker, Western Washington University

Kimberly A. Markworth, Western Washington University

### ***Developing and Testing a Method for Collecting and Synthesizing Pedagogical Content Knowledge***

Courtney Nelson Plumley, Horizon Research, Inc.

Patrick S. Smith, Horizon Research, Inc.

Keith Esch, Horizon Research Inc.

### ***Influence of Pedagogical Content Knowledge (PCK) on Sustainable Implementation of an Argument-Based Inquiry Approach***

Jee Kyung Suh, University of Iowa

Soonhye Park, North Carolina State University

### ***The Investigation of Effective Strategies for Developing Creative Science Thinking***

Kuay-Keng Yang, National Sun Yat-Sen University

Ling Lee, National Sun Yat-Sen University

Zuway-R Hong, National Sun Yat-Sen University

Huann-Shyang Lin, National Sun Yat-Sen University

### ***Using Elementary Teacher Life Science Subject Matter Knowledge to Inform Professional Development***

David E. McKinney, Johns Hopkins University

Erica L. Smith, Johns Hopkins University

Carolyn A. Parker, The John Hopkins University

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

10:15am - 11:45am, Kent

**Presider:** Rhea L. G. Miles, East Carolina University

***Engineering Integrated Science (EIS) for Reforming Technical High School Science Curriculum in South Korea***

Seoung-Hey Paik, Korea National University of Education  
 Younkyeong Nam, the College at Brockport - State University of New York

***Lessons From Four Middle School Science Teachers' Implementation of Integrated STEM Units***

Nii A. Tackie, University of Minnesota  
 Sousada Chidhachack, University of Minnesota  
 Gillian Roehrig, University of Minnesota  
 Tamara J. Moore, Purdue University

***Urban Science Teachers' Implementation of Common Core State Standards for ELA within the Context of Interdisciplinary Science Inquiry***

Michelle R. Eades-Baird, State University of New York at Buffalo (SUNY)  
 Xiufeng Liu, State University of New York at Buffalo (SUNY)

***An Urban High School Biology Teacher's Initial Experience Implementing Scientific Argumentation***

Brent Gilles, Indiana University  
 Gayle A. Buck, Indiana University

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

***Science Education for Social Change***

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

**Presider:** Loran C. Parker, Purdue University

***Colleagues as Change Agents for Undergraduate Education Reform***

Tessa C. Andrews, University of Georgia  
 Evan P. Conaway, University of California-Irvine  
 Jun Zhao, University of Georgia  
 Erin Dolan, University of Texas at Austin

***Making the World a Better Place by Educating the Public with Equity, Justice, and Respect***

Eva Erdosne Toth, West Virginia University  
 Paula Witt-Enderby, Duguesne University  
 Michelle Nowacki

***Studying Organizational Change and Learning: Rigorous Attention to Complex Systems Via a Multi-theoretical Research Model***

Jana L. Bouwma-Gearhart, Oregon State University  
 Ann Sitomer, Oregon State University  
 Kathleen M. Quardokus Fisher, Oregon State University  
 John D. Ivanovitch, Oregon State University  
 Christina Smith, Oregon State University  
 Milo Koretsky, Oregon State University  
 David Little, Oregon State University

***Undergraduate Research Experience and Changes in Career Ambitions for Underrepresented Students in STEM***

Anthony Carpi, John Jay College  
 Darcy M. Ronan, Research Foundation, City University of New York

**Strand 6: Science Learning in Informal Contexts**  
***Informal Science Online and Games***

10:15am - 11:45am, Gibson

**Presider:** Lucy R. McClain, Penn State University

***High School Students and Critical Reading of Inaccurate Science Claims on the Internet***

Anita S. Tseng, Stanford University

***Building Systems From Scratch: An Exploratory Study of Student Learning About Climate Change***

Gillian Puttick, TERC  
 Eli Tucker-Raymond, TERC

***Social Media Messaging and Engagement with Paleontology in an Online Community of Practice***

Lisa M. Lundgren, University of Florida  
 Kent J. Crippen, University of Florida  
 Bruce J. MacFadden, Florida Museum of Natural History  
 University of Florida  
 Shari Ellis, Florida Museum of Natural History University of Florida  
 Betty A. Dunckel, Florida Museum of Natural History University of Florida  
 Eleanor E. Gardner, Florida Museum of Natural History

***Science in the Media: Analyzing Depictions of Science Content in ESPN's SportsScience?***

Joel R. Drake, Utah State University  
 Victor Lee, Utah State University

**Strand 8: In-service Science Teacher Education**  
***Support and Collaboration Among Teachers and Stakeholders***  
 10:15am - 11:45am, Maryland Salon A  
**Presider:** Jonathan Francis Osborne, Stanford University

***Practitioner Inquiry into Professional Development Centered on STEM, Access and Equity, and Distributed Leadership***  
 Liesl Chatman, Science Museum of Minnesota  
 Amy Grack Nelson, Science Museum of Minnesota

***A Foundational Study of the District Science Coordinators Role in Supporting Science Instruction***  
 Brooke A. Whitworth, Northern Arizona University  
 Jennifer Maeng, University of Virginia  
 Lindsay B. Wheeler, University of Virginia  
 Jennifer Chiu, University of Virginia

***Collaboration Among Science Teachers in Qatar***  
 Saed Sabah, Qatar University, Qatar

***Developing Elementary Teachers' Capability to Support Reading for Learning in Science***  
 Jonathan Francis Osborne, Stanford University  
 Brian M. Donovan, Stanford University  
 Michelle Friend, Stanford University  
 Alexis Patterson, Stanford University  
 Diego X. Roman, Southern Methodist University

***What Influences Science Teachers' Ability to Lead Within and Beyond the Classroom?***  
 Rachel Ruggirello, Washington University in St. Louis

**Strand 10: Curriculum, Evaluation, and Assessment**  
***Teachers and Students***  
 10:15am - 11:45am, Watertable Salon B  
**Presider:** Dan Carpenter, TX Tech Education College

***The Teacher's Voice in Education Policy: Responses to National Curriculum and Assessment Reforms in Sweden***  
 Jim Ryder, University of Leeds  
 Malena Lidar, Uppsala University  
 Eva Lundqvist, Department of Education  
 Leif Ostman, Uppsala University

***STEAM-ESL Professional Development for Elementary Teachers: Mediation Through the Language and Inquiry Science Tool***  
 Irasema Ortega, University of Alaska-Anchorage  
 Sissy S. Wong, University of Houston

***Data Literacy: Assessing Student Understanding of Variability in Data***  
 Bill Zoellick, Schoodic Institute  
 Molly Schaufli, University of Maine  
 Marcella Flubacher, Schoodic Institute at Acadia National Park  
 Ryan Weatherbee, University of Maine  
 Hannah Webber, Schoodic Institute at Acadia National Park

***Investigating Formative Assessment Classroom Practices in Science***  
 Hye-Eun Chu, Macquarie University  
 Kok Siang Tan, National Institute of Education Singapore  
 Rachel Ong, National Institute of Education Singapore  
 Eugene Lim, National Institute of Education, NTU Singapore

**Strand 11: Cultural, Social, and Gender Issues**  
***Related Paper Set - Queering Perspectives on the Production and Regulation of Difference in STEM Education***  
 10:15am - 11:45am, Federal Hill  
**Presider:** Will Letts, Charles Sturt University  
**Discussants:**  
 Steve Fifield, the Franklin Institute Science Museum

***Grit, Gumption, and Virtuous Bodies: Constructions of Promise in American Engineering Students***  
 Amy Slaton, Drexel University  
 Will Letts, Charles Sturt University  
 Steve Fifield, the Franklin Institute Science Museum

***Wonder as a Pathway to Emotion, Inspiration and Possibility in Science Classrooms***  
 Andrew Gilbert, George Mason University  
 Emily Gray, RMIT

***What Does Queer Theory Have to do with Teaching Science in Elementary Schools?***  
 Kristin L. Gunckel, University of Arizona

***Children, Nomads, Queers: Desire and Surprises in a Wiggly World***  
 Sheri Leafgren, Miami University  
 Scott Sander, Miami University

**Strand 11: Cultural, Social, and Gender Issues*****Administrative Sponsored Symposium - A Critical Examination of Social, Cultural, and Gender Research in Science Education***

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

**Presenters:**

Angela Chapman, University of Texas Rio Grande Valley

Michelle A. Fleming, Wright State University

Leon Walls, University of Vermont

Ariana Garza, University of Texas Rio Grande Valley

Laura Hinojosa, University of Texas Rio Grande Valley

Mayra Hernandez, University of Texas Rio Grande Valley

Edgar Palomino, University of Texas Rio Grande Valley

Felicia Rodriguez, University of Texas Rio Grande Valley

Carolina Zarinana, University of Texas Rio Grande Valley

Eva Rojas, University of Texas Rio Grande Valley

Colleen Q. Saxen, Wright State University

**Strand 12: Educational Technology*****Argumentation, Literacy, and Dialogue***

10:15am - 11:45am, Baltimore Salon A

**President:** Shirly Avargil, Bar Ilan University***Utilizing Mixed Methods to Better Understand Knowledge Organization with Multiple Representations for Socioscientific Argumentation***

Bahadır Namdar, Recep Tayyip Erdogan University

***Using Social Media to Make Computer Modeling Accessible and Improve Dialogue in an Online Course***

Morgan B. Yarker, Yarker Consulting

Michel d.S. Mesquita, Uni Research Climate Bjerknes Centre for Climate Research

***Using an Interactive Simulation to Promote High School Students' Scientific Argumentation***

Tugba Keser Solak, Trakya University

***AgLIT (Agricultural Literacy Through Innovative Technology): A STEM Integrated, Project-Based, Upper-Elementary Agricultural Literacy Curriculum Module***

Farah L. Vallera, Lehigh University

Alec M. Bodzin, Lehigh University

**Strand 15: Policy*****Policy, District-Level Professional Development, and Leadership***

10:15am - 11:45am, Baltimore Salon B

**President:** Gavin W. Fulmer, National Institute of Education***Are We So Different? a Study of Teacher and Administrator Perceptions of Science Education***

Ashley Chiu, Museum of Science and Industry, Chicago

Aaron Price, Museum of Science and Industry, Chicago

Elsie Ovrhim, Museum of Science and Industry

***Examining the Relationship Between Generic and Subject-Specific Observational Measures of Secondary Science Teaching Effectiveness***

Jamie N. Mikeska, ETS

Tamara Shattuck, Michigan State University

Leslie Stickler, ETS

Yi Qi, ETS

Steven Holtzman, ETS

***The Impact of a High School Science Professional Development Program on Achievement: A Retrospective Quasi-Experiment***

Jody Bintz, BSCS

Molly Stuhlsatz, BSCS

Joseph A. Taylor, ABT Associates

***NGSS and Scientific Argumentation: District Leaders' Beliefs and PCK***

Rebecca Katsh-Singer, Boston College

Katherine L. McNeill, Boston College

## Lunch—On Your Own

### 12:00pm – 1:00pm

## Concurrent Session #12

### 1:00pm – 2:30pm

#### **Workshop - Publications Advisory Committee** ***The “Guest Doctoral Student Reviewers” Initiative: Realizing the Professional Development Potential of the Journal of Research in Science Teaching***

1:00pm - 2:30pm, Baltimore Salon A

#### **Presenters:**

Fouad Abd-El-Khalick, University of Illinois, Urbana-Champaign  
Dana Zeidler, University of South Florida

#### **Strand 1: Science Learning, Understanding and Conceptual Change** ***Supporting Growth in Student Understanding of Science Content***

1:00pm - 2:30pm, Baltimore Salon B

**Presider:** Mandy M. Smith, Capital University

#### ***College Students’ Ideas About Antibiotics as an Application of Evolution***

Lisa A. Borgerding, Kent State University  
Vanessa A. Klein, Montclair State University  
Lucy Kulbago, Kent State University

#### ***Middle School Students’ Materialistic Views of Sound Concept***

Eshach Haim, Ben Gurion University of the Negev, Israel  
Tzu-Chiang Lin, National Taiwan University of Science  
and Technology  
Chin-Chung Tsai, National Taiwan University of Science  
and Technology  
Guo-Li Chiou, National Taiwan University of Science and Technology

#### ***Student Ideas in Middle School Science: Attending to Partial Understandings Regarding Science Phenomena***

Christine S. Lee, California State University East Bay  
Kathryn N. Hayes, California State University, East Bay  
Dawn O’Connor, California State University, East Bay  
Anna M. Newman, University of Texas Brownsville  
Jeff Seitz, California State University, East Bay  
Rachelle DiStefano, Cal State University East Bay

#### ***Teaching Complex Systems Components with an Agent-Based Participatory Simulation***

Christopher Rates, University of Virginia  
Bridget K. Mulvey, Kent State University  
Jennifer Chiu, University of Virginia

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

#### ***Related Paper Set - How Spatial Factors Relate to Earth- Space Conceptual Learning and Understanding***

1:00pm - 2:30pm, Maryland Salon A

#### ***Teachers Conceptions and Spatial Sense About the Earth, Moon, Sun System***

Jennifer A. Wilhelm, University of Kentucky  
Merryn Cole, University of Kentucky  
Ronald Wilhelm, University of Kentucky

#### ***Journaling to Show In-Service Teachers’ Spatial Reasoning of Lunar Phases***

Merryn Cole, University of Kentucky  
Jennifer A. Wilhelm, University of Kentucky

#### ***The Relationship of Spatial Ability, Earth Science Conceptual Understanding, Content Exam Success, and Completion of University Science Content Courses***

Alice (Jill) Black, Southwest Missouri State University

#### ***The Role of Spatial Perspective-Taking in Understanding Celestial Motion***

Corinne Bower, The Pennsylvania State University

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

#### ***The Construction and Use of Modeling Within Science***

1:00pm - 2:30pm, Maryland Salon F

**Presider:** Noemi Waight, University at Buffalo

#### ***Bridging Students’ Views on Models and the Use of Representations in Science: An Empirical Study***

Kyungwoon Seo, University of Iowa  
Brian M. Hand, University of Iowa



***Investigating the “Collabrified” Use of an App to Engage 6th Grade Students in Co-Constructing Models***

Carrie-Anne Sherwood, University of Michigan

***Shift in Students’ Epistemological Framing and Network of Epistemological Resources During Small Group Modeling***

Soo-Yean Shim, University of Washington

Heui-Baik Kim, Seoul National University

***Labs Versus Models: Physical and Computational Experiences in Learning About Complex Systems in Chemistry***

Sharona T. Levy, University of Haifa

Sigal Samon, University of Haifa

***Examining the Relationship Between Physical Models and Students’ Science Practices***

Alison R. Miller, Bowdoin College

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***Strand 3: Science Teaching--Primary School, (Grades preK-6): Characteristics and Strategies Instructional Strategies in Elementary Science***

1:00pm - 2:30pm, Pride of Baltimore

**Presider:** Cory T. Forbes, University of Nebraska-Lincoln

***Examining Student Thinking Through Learner-Generated Drawings***

Dongsheng Dong, University of Washington

Min Li, University of Washington

Xiaoming Zhai, BNU

Siwei Chen, University of Washington

***Learning to Support Students’ Model-Based Learning About the Water Cycle: A Three-Year Longitudinal Case Study of Two 3rd-Grade Teachers***

Tina Vo, University of Nebraska-Lincoln

Cory T. Forbes, University of Nebraska-Lincoln

Laura Zangori, University of Missouri-Columbia

Christina V. Schwarz, Michigan State University

***STEM Integration Using a Problem-Based Learning Approach: Measuring Students’ Content Knowledge and Critical Thinking Skills***

Abeera P. Rehmat, University of Nevada, Las Vegas

***Student Notebooks as a Tool for Identifying Evidence of Engineering Learning in Elementary Classrooms***

Kristina Maruyama Tank, Iowa State University

Tamara J. Moore, Purdue University

Bhaskar Upadhyay, University of Minnesota

***Teaching the Water Cycle with a Systems Thinking Approach***

Tammy D. Lee, East Carolina University

M. Gail Jones, North Carolina State University

Katherine Chesnutt, North Carolina State University

Bonnie B. Glass, East Carolina University

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***Strand 4: Science Teaching--Middle and High School, (Grades 5-12): Characteristics and Strategies Pedagogical Implications on Student Learning***

1:00pm - 2:30pm, Maryland Salon E

**Presider:** David F. Jackson, The University of Georgia

***Exploring Middle School Students’ Embodied Conceptions of Thermal Conduction and Its Implications for Instruction***

Nitasha Mathayas, University of Illinois Urbana Champaign

Robb Lindgren, University of Illinois Urbana-Champaign

David E. Brown, University of Illinois

***Students’ Ideas About Ecosystems and their Implications for Teaching***

Hayat Hokayem, Texas Christian University

***Developing Explanatory Gestures for the Seasons: Two Students’ Approaches***

Nathan Kimball, Concord Consortium

Robb Lindgren, University of Illinois Urbana-Champaign

***Episodic Memories and the Longitudinal Impact of High School Physics on Female Students’ Physics Identity***

Jianlan Wang, Florida International University

Zahra Hazari, Florida International University

Cheryl Cass, North Carolina State University

Robynne M. Lock, Texas A&M University



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

***Visual & Spatial Reasoning in Understanding Science***

1:00pm - 2:30pm, James

**Presider:** Stanley M. Lo, University of California, San Diego

***Fostering Spatial Skills in Chemistry***

Deborah L. Carlisle, UMass Amherst

***The Value of Multiple Visual Representations for Student Learning of Quantum Concepts in General Chemistry***

Emily C. Allen, Boston University

Peter S. Garik, Boston University

Binyomin Abrams, Boston University

Dan Dill, Boston University

***"Seeing Data": Eye Tracking Students' and Scientists' Practices in Reading and Interpreting Graphs***

Joseph A. Harsh, James Madison University

Christina Myers, James Madison University

Caylin Murray, James Madison University

Molly Campillo, Harrisonburg High School/Massanutten Regional Governor's School

***Design by Introductory Engineering Students and the Role of Spatial Knowledge and Functional Creativity***

Jaclyn K. Murray, University of Georgia

Barbara A. Crawford, University of Georgia

**Strand 7: Pre-service Science Teacher Education  
*Cultural and Equity Perspectives to Teacher Preparation (1)***

1:00pm - 2:30pm, Watertable Salon C

**Presider:** Felicia Moore Mensah, Teachers College, Columbia University

***Student Diversity in the Science Classroom: (Re)-Introducing a Dimension of Topic-Specific Science Pedagogical Content Knowledge***

Saiqa Azam, Memorial University of Newfoundland

Bonnie L. Shapiro, University of Calgary

***Teacher Candidates' Perceptions About Student Diversity and Teaching Science on Equity***

Eun Young Lee, University of North Texas

Karthigeyan Subramaniam, University of North Texas

Dina Castro, University of North Texas

Pamela Harrell, University of North Texas

***Teaching Science in Inclusive Classrooms: Preservice Science Teachers' Knowledge and Views About Inclusive Education***

Nurcan Cansiz, Artvin Coruh University

Mustafa Cansiz, Artvin Coruh University

***Why Science Teacher Education Needs Disability Studies: A Comprehensive Research Analysis***

Phillip A. Boda, Columbia University: Teacher's College

**Strand 7: Pre-service Science Teacher Education  
*Preservice Science Teachers' Pedagogical Content Knowledge***

1:00pm - 2:30pm, Kent

**Presider:** Nidaa Makki, The University of Akron

***Teachers' Understandings and Perceptions in an Engineering Design Course for Educators***

Nidaa Makki, The University of Akron

Karen Plaster, The University of Akron

Edward Evans, The University of Akron

***Topic Specific Pedagogical Content Knowledge from the Perspective of Chemistry Pre-Service Teachers***

Elizabeth Mavhunga, Wits University

Marissa S. Rollnick, Wits University

***Using Explicit Approach to Develop Pre-Service Teachers' Knowledge Base for Teaching Chemical Bonding***

Mpunki E. Nakedi, University of Witwatersrand

Elaosi Vhurumuku, UNiversity of Witwatersrand

***The Encyclopedia and the Newborn Deer: Monitoring Student Teachers' PCK Development Addressing Separate PCK Elements and Psychological Filters and Amplifiers***

Erik Barendsen, Radboud University & Open University of the Netherlands

Ineke Henze-Rietveld, Delft University of Technology

***Analysis of Pre-Service Science Teachers' TPACK in their Creation of an Adventure Learning Environment***

Joshua A. Ellis, Michigan Technological University

Emily A. Dare, Michigan Technological University

Gillian H. Roehrig, University of Minnesota

**Strand 8: In-service Science Teacher Education**  
**Symposium - Models, Strategies, and Research on PD for Science Educators: Responding to the Framework and NGSS**  
 1:00pm - 2:30pm, Maryland Salon B

**Presenters:**

Sarah Michaels, Clark University  
 Brian J. Reiser, Northwestern University  
 Jean Moon, Tidemark Institute  
 Deanna E. Bailey, Vermont Science Initiative  
 Renee Affolter, UMass Amherst  
 William R. Penuel, University of Colorado  
 Samuel Severance, University of Colorado Boulder  
 Eve Manz, University of Colorado Boulder  
 Heather Leary, Brigham Young University-Idaho  
 Suzanne M. Wilson, University of Connecticut

**Strand 10: Curriculum, Evaluation, and Assessment**  
**Related Paper Set - Supporting Student and Teacher Learning of Genetics Across Grade Levels Through a Technology Based Curriculum**

1:00pm - 2:30pm, Watertable Salon A

**Presiders:**

Kevin W. McElhaney, SRI International  
 Michelle Williams

**Learning About Genetics in an Elementary Classroom**  
 Amal Ibourk, Michigan State University  
 Michelle Williams

**Analysis of Middle School Students' Knowledge Integration About Trait Expression During a Technology-Based Science Inquiry Investigation**  
 Erika D. Tate, bluknowledge LLC  
 Mingyu Feng, Center for Technology in Learning SRI International  
 Kevin W. McElhaney, SRI International

**Designing Inquiry-Based Investigations for High School Genetics: Insights From Researcher-Practitioner Collaborations**  
 Stefanie Marshall, Michigan State University  
 Christina Restrepo Nazar, Michigan State University  
 Kevin W. McElhaney, SRI International

**3-D PD for 3-D Science Learning: Designing Professional Learning Opportunities for Middle School Science Teachers**  
 Tamara J. Smolek, Michigan State University  
 Erika D. Tate, Bluknowledge LLC

**Strand 10: Curriculum, Evaluation, and Assessment**  
**Teaching and Assessing Science and Engineering Practices**  
 1:00pm - 2:30pm, Fells Point  
**Presider:** Jamie N. Mikeska, ETS

**Diagnosing Students' Understanding of Models and Modeling**  
 Sarah Gogolin, Freie Universitaet Berlin  
 Dirk Krueger, Freie Universitaet Berlin

**Assessing Experimental Skills in the Large-Scale: A Simulation-Based Test Instrument**  
 Knut Neumann, Leibniz Institute for Science Education, IPN Kiel  
 Martin Dickmann, University of Duisburg-Essen  
 Bodo Eickhorst, University of Bremen  
 Horst Schecker, University of Bremen  
 Heike Theyssen, University of Duisburg-Essen

**Towards Engagement with the Science and Engineering Practices for All Students**  
 Joan D. Pasley, Horizon Research, Inc.  
 Peggy J. Trygstad, Horizon Research, Inc.  
 Eric R. Banilower, Horizon Research, Inc.

**Secondary Teachers Current Use of Four Science Practices While Teaching Genetics and Biological Evolution**  
 Dina Driks-Esser, University of Utah  
 Nicola C Barber, University of Utah  
 Louisa A. Stark, University of Utah

**Strand 11: Cultural, Social, and Gender Issues**  
**Cultural Competence and Science Curricula**  
 1:00pm - 2:30pm, Watertable Salon B  
**Presider:** Jacqueline Theresa McDonnough, Virginia Commonwealth University

**Biology Teachers, the Teaching of Biological Evolution and Secularism in Three Latin American Countries**  
 Hesley M. Silva, University Center of Formiga  
 Eduardo F. Mortimer, Universidade Federal de Minas Gerais

**Opportunities to Learn Science: A Case Study of Science Classrooms in Successful-Diverse Texas High Schools**  
 Jennifer K. LeBlanc, Texas A&M University  
 Carol L. Stuessy, Texas A&M University  
 Kaitlin K. Stone

**The Educational Debt: Biology Textbooks Can Increase Prejudice and Misunderstandings of Biological Variation Amongst Adolescents**  
 Brian M. Donovan, Stanford University

***The Travelling Story of Traditional Ecological Knowledge: Its Origin and Current Conceptualizations in Science Education***

Eun-Ji A. Kim, McGill University

***Human Bodies in Primary Education: Difference in Focus***

Carolina R. Souza, Federal University of Sao Carlos

Mauricio Pietrocola, University of Sao Paulo

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**Strand 13: History, Philosophy, and Sociology of Science  
*Classroom Teachers' Perspectives on Nature of Science and Scientific Inquiry***

1:00pm - 2:30pm, Federal Hill

**Presider:** Hasan Deniz, University of Nevada

***Developing Knowledge and Pedagogical Practices for the Nature of Scientific Inquiry: Results From a 13-Month Preservice Program***

Renee S. Schwartz, Georgia State University

***Hong Kong In-Service Science Teachers' Views on the Values of Teaching Nature of Science***

Zhi Hong Wan, The Hong Kong Institute of Education

Siu Ling Wong, The University of Hong Kong

***The Link Between Continuing Professional Development Program and Teachers' Nature of Science Views***

Nihal Dogan, Abant Izzet Baysal University

Eda Erdas, Kastamonu University

Serhat Irez, Marmara University

William W. Cobern, Western Michigan University

Yalcin Yalaki, Hacettepe University

Gultekin Cakmakci, Hacettepe University

Zekai Berk Altiner, Marmara University

***Visualizing Change of Teacher's Accurate Understanding and Misconceptions Regarding Scientific Inquiry and Nature of Science***

Yue Li, Miami University

Sarah B. Woodruff, Miami University

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**Strand 14: Environmental Education**

***Climate Change***

1:00pm - 2:30pm, Homeland

**Presider:** Keith R. Langenhoven, University of the Western Cape

***Examining Teacher Candidates' Moral and Ethical Perspectives on Climate Change***

Emily Hestness, University of Maryland

J. Randy McGinnis, University of Maryland

Wayne Breslyn, Montgomery County Public Schools

***Elementary Teachers and Climate Change: Examining Teacher Knowledge in a Science Professional Development Program***

Andrew J. Keck, George Mason University

Kristofer Pachla, George Mason University

Amanda Luh, George Mason University

David E. Long, George Mason University

***Student Argumentation About Climate Change***

Barry Golden, University of Tennessee

***Teaching Climate Change Through Pbl: Successes and Failures at a Multi-Site Professional Development Institute***

Danielle M. Kittrell, George Mason University

Susan Poland, George Mason University

Amanda Luh, George Mason University

David E. Long, George Mason University

***Who Is Learning About Climate Change in Us Schools? Not Many!***

Barry Golden, University of Tennessee

## Concurrent Session #13

2:45pm – 4:15pm

### Strand 1: Science Learning, Understanding and Conceptual Change

#### *Reasoning and Cognitive Development in Upper Secondary Students*

2:45pm - 4:15pm, Maryland Salon B

**Presider:** Abigail C. Perkins, Texas A&M University

#### *Classifying Grade Ten Students' Positions Regarding the Existence of Sodium Chloride Crystal*

Sulaiman M. Al-Balushi, Sultan Qaboos University

#### *Eliciting Students' Discipline-Specific Epistemic Knowledge: A Value-Focused Approach*

Hiroki Oura, University of Tokyo

#### *Emergent Student Conceptions of Geologic Time and their Implications for Embodied Learning*

Jason Morphew, University of Illinois

Robb Lindgren, University of Illinois Urbana-Champaign

David E. Brown, University of Illinois

#### *What Matters? Exploring the Development of Inquiry and Scientific Reasoning Skills in High School Chemistry*

Raghda M. Daftedar, Teacher's College, Columbia University

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

#### *Diverse Strategies for Studying and Improving STEM Learning*

2:45pm - 4:15pm, Baltimore Salon A

**Presider:** Hillary Z. Lauren, University of Illinois at Urbana-Champaign

#### *Converging Learning Performance and Neuroimaging Measures to Examine Team Function During Collaborative Problem Solving*

Pavlo D. Antonenko, University of Florida

Robert Davis, University of Florida

Mehmet Celepkolu, University of Florida

Jiahui Wang, University of Florida

Christine Davis, University of Florida

Nancy Ruzyski, University of Florida

#### *Using the Eye Tracking Method to Reveal Students' Cognitive Conflicts*

Chia Hui Cheng, National Taiwan Normal University

Fang-Ying Yang, National Taiwan Normal University

#### *The Impact of the Design and Use of Multiple Models on Seventh Graders' Spatial Abilities.*

William J. McConnell, Old Dominion University

Daniel L. Dickerson, East Carolina University

Stephen R. Burgin, University of Arkansas

#### *School Leadership and STEM Enactment in a High Needs Secondary School in Belize*

Noemi Waight, University at Buffalo

Stephen Jacobson, University at Buffalo

Lorenda Chisolm, University at Buffalo

#### *Literature Review of Students' Metacognition and Metacognitive Strategies in Science Education*

Rea Lavi, Technion - Israel Institute of Technology

Shirly Avargil, Bar Ilan University

Yehudit Judy Dori, MIT; Technion - Israel Institute of Technology

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

#### *Exploring Novel Instructional Approaches*

2:45pm - 4:15pm, Homeland

**Presider:** Daniel M. Alston, Clemson University

#### *A Comparison of Three Teacher-Created Project-Based Investigations on Local Watersheds: Successes and Limitations*

Rebecca McNall Krall, University of Kentucky

Justin M LeVaughn, University of Kentucky

Bharath Kumar, University of Kentucky

#### *Exploring Science Teachers' Practices About Formative Assessment*

Dante Cisterna, Pontifical Catholic University of Chile

Amelia Wenk Gotwals, Michigan State University

#### *Productive Framing for Making Effective Transitions on Learning Progressions: A Video Study*

Hui Jin, Educational Testing Service

Michele Johnson, University of California, Santa Barbara

Charles W. Anderson, Michigan State University

#### *Classroom Patterns That Characterize the Different Levels of Inquiry-Based Instruction*

Daniel M. Alston, Clemson University

Jeff C. Marshall, Clemson University

Julie B Smart, Clemson University



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

### ***Teacher Preparation and Science Education***

2:45pm - 4:15pm, Pride of Baltimore

**Presider:** David Osmond, University of North Georgia

### ***Pre-Service Science Teachers' Misconceptions About Density and Buoyancy***

Sinem Demirci, Middle East Technical University

Mehmet Sen, Middle East Technical University

### ***Written Argumentation in an Undergraduate Physics Class for Future Elementary Teachers***

Carina M. Rebello, Purdue University

### ***On the Relation Between Pre-Service Teachers' Physics and Mathematics Content Knowledge***

Irene Neumann, Leibniz-Institute (IPN), Kiel

Anke M. Lindmeier, Leibniz-Institute (IPN), Kiel

Knut Neumann, Leibniz-Institute (IPN), Kiel

Aiso Heinze, Leibniz-Institute (IPN), Kiel

### ***Interaction Between Science Teaching Orientation and PCK Components***

Betul Demirdogen, Bulent Ecevit University

## **Strand 6: Science Learning in Informal Contexts Interests and Attitudes in Out of School Time Science**

2:45pm - 4:15pm, James

**Presider:** Jennifer A. Gatz, Stony Brook University

### ***Middle School Girls' Science Motivation and Performance: Cognitive Effects of an Out-of-School-Time Program***

Jennifer A. Gatz, Stony Brook University

Angela M. Kelly, Stony Brook University

### ***Impacts of Students' Interaction with Indigenous Craftsmen on their Attitude and Interest in Physics Related Careers***

Irene U. Osisioma, California State University, Dominguez Hills

Peter A. Okebukola, Lagos State University, Lagos-Nigeria

Hakeem Akintoye, Lagos State University, Lagos-Nigeria

Solomon O. Aregbede, Lagos State University, Lagos-Nigeria

Yinka Orulebaja, Lagos State University, Lagos-Nigeria

Grace Njoku, Lagos State University, Lagos-Nigeria

### ***"Anchor Points" to Define Youth Scientific Literacy for Informal Education Programs***

Martin H. Smith, University of California, Davis

Steven Worker, University of California

Emily Schoenfelder, University of California

Kelly Brian, University of California

Andrea Ambrose, University of California

Lynn Schmitt-McQuitty, University of California

### ***Characteristics, Influencing Factors, and Development of Members of Ten STEM Hobby Groups: A Comparison Study***

Elysa N. Corin, North Carolina State University

M. Gail Jones, North Carolina State University

Thomas andre, Iowa State University

Gina M. Childers, North Carolina State University

## **Strand 7: Pre-service Science Teacher Education Preservice Teachers? Learning About Pedagogical Routines and Assessments**

2:45pm - 4:15pm, Fells Point

**Presider:** Grant Williams, St. Thomas University

### ***Influencing Pre-Service Science Teachers' Beliefs About Model-Based Whole-Class Discussions***

Grant Williams, St. Thomas University

John J. Clement, University of Massachusetts

### ***Longitudinal Study of Preservice Teachers' Use of Learning Processes in an Integrated Course***

Peter Cormas, California University of Pennsylvania

Samantha Middlemiss, California University of Pennsylvania

### ***Pre-Service Teacher Planning for Academic Language During Elementary Science Instruction***

Karl G. Jung, University of Minnesota

Julie C. Brown, University of Minnesota

### ***Tracking the Development of Assessment Literacy: Preservice Science Teacher Trajectories***

Frances Edwards, University of Waikato

**Strand 8: In-service Science Teacher Education**  
***Science Teachers' Use of Inquiry Strategy and their Beliefs About Scientific Inquiry***

2:45pm - 4:15pm, Maryland Salon F

**President:** Franz X. Bogner, University of Bayreuth

***European-Wide Large-Scale Study of Inquiry-Based Professional Development in Science Education***

Franz X. Bogner, University of Bayreuth

Sofoklis Sotiriou, R&D Department Ellinogermaniki Agogi, Pallini/Athens

Rodger W. Bybee, Biological Science Curriculum Study

***Science Teachers' Cultural Beliefs and Views of Scientists and Scientific Inquiry: A Call for Scientist-Science Teacher Partnerships to Promote Inquiry-Based Learning***

Nasser Mansour, University of Exeter

***Teacher Professional Development Using Iterative Inquiry-Based Chemistry Activities***

Mitchell Bruce, University of Maine

Clint Eaton, University of Maine

Somnath Sinha, University of Maine

Laura Millay, University of Maine

Alice Bruce, University of Maine

***Examining Science Teachers' Changes in Implementing an Argument-Based Inquiry Approach: Year 1 Results***

Soonhye Park, North Carolina State University

Jee Kyung Suh, University of Iowa

Ye Jun Bae, University of Iowa

Brian M. Hand, University of Iowa

**Strand 8: In-service Science Teacher Education**  
***Teachers' Understandings of and Responses to NGSS***

2:45pm - 4:15pm, Federal Hill

**President:** Loran C. Parker, Purdue University

***Developing Rubrics That Support Teachers' Understanding of NGSS Practices: An Approach Grounded in Improvement Science***

Rachelle DiStefano, California State University, East Bay

Corinne H. Lardy, California State University, East Bay

Christine Lee, California State University, East Bay

Michele Korb, California State University, East Bay

Danika LeDuc, California State University, East Bay

Michelle Sinapuelas, California State University, East Bay

***Documenting, Characterizing, and Understanding Science Teacher Growth and Learning in the Context of NGSS***

Arash Jamshidi, University of California, Davis

Laura Schafer, University of California, Davis

Cynthia Passmore, University of California-Davis

***Examining Knowledge Pathways Teachers Leverage: Designing and Facilitating Professional Development Around NGSS Practice-Based Instruction***

Laura a Shafer, University of California Davis

Arash Jamshidi, University of California, Davis

Cynthia Passmore, University of California-Davis

***Perceptions of Expertise of Urban Elementary Teachers in Response to the Next Generation of Science***

Erica L. Smith, Johns Hopkins University

Carolyn A. Parker, The John Hopkins University

David E. McKinney, Johns Hopkins University School of Education

Charlie Mitchell, the Johns Hopkins University

**Strand 10: Curriculum, Evaluation, and Assessment**  
***Issues of Diversity, Equity, and Access in Curriculum and Assessment***

2:45pm - 4:15pm, Baltimore Salon B

**President:** Michael S. Tutwiler, Harvard Graduate School of Education

***Equity in Science Education for Students with Significant Cognitive Disabilities Through Alternate Content Standards***

Lori andersen, University of Kansas

Sue Bechard, University of Kansas

Katherine Anne Merriweather, University of Kansas

***Opportunities-To-Learn at School: Profiles of Students Reaching High Timss Science Benchmark***

Melinda Whitford, SUNY - Buffalo

***Differential Performance of English Learners on Science Assessments: The Role of Cognitive Complexity***

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

Cari F. Herrmann Abell, AAAS/Project 2061

Sarah Glassman, AAAS/Project 2061

***Research-Based Transformation From Teaching to KNOW - to Learning to THINK for Equity and Justice***

Uri Zoller, Haifa University - Oranim

***Reinserting Play and Playfulness into Formal Science Learning***

Harouna Ba, SciPlay, New York Hall of Science

Amanda P. Jaksha, SciPlay, New York Hall of Science



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

### *Language and Culture in Science Education:*

#### *National and International Contexts*

2:45pm - 4:15pm, Watertable Salon C

**Presider:** Shakhnoza Kayumova, University of Massachusetts-Dartmouth

#### *“Do You Know Hwangsa?” an Examination of Korean-English Bilinguals’ Translanguaging in an Afterschool Science Program*

Minjung Ryu, Purdue University

#### *Teaching NOS Within a Cross-Cultural Learning Community with Karen Elementary Students*

Susan G. Harper, University of Georgia

#### *Explicating the Ubuntu Worldview into Science Education: A Project Experience*

Meshach Mobolaji Ogunniyi, University of the Western Cape

#### *English as Default Language of Instruction in Primary Grades: Repercussions in Indian Science Classroom*

Vanashri J. Nargund-Joshi, New Jersey City University  
Nazan Bautista, Miami University

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

### *Symposium - Critical Perspectives on Science Education: Examples From Practice*

2:45pm - 4:15pm, Kent

**Presider:** Deb Morrison, TREE Educational Services

#### **Presenters:**

Deb Morrison, TREE Educational Services  
Enrique Lopez, University of Colorado, Boulder  
Jean R. Aguilar-Valdez, Portland State University  
Alexandra Schindel Dimick, University at Buffalo  
Sara E. Tolbert, University of Arizona  
Daniel Morales-Doyle, University of Illinois at Chicago  
Deb Morrison, TREE Educational Services

## Strand 12: Educational Technology

### *Online and Mobile Tools*

2:45pm - 4:15pm, Maryland Salon A

**Presider:** Frackson Mumba, University of Virginia

#### *Connecting Complex Human Body Systems During Model-Based Investigations*

Barbara C. Buckley, WestEd  
Daniel Brenner, WestEd  
Andrew A. Grillo-Hill, WestEd  
George Deboer, AAAS  
Kim Luttgen, WestEd

#### *Results of a Randomized Trial to Test the Effectiveness of Online Units to Teach Science*

Fatima Terrazas Arellanes, University of Oregon  
Lisa a Strycker, University of Oregon  
Emily Walden, University of Oregon  
Alejandro J. Gallard, Georgia Southern University

#### *Impact of Mobile Technology Based Physics Curriculum on Preservice Elementary Teachers’ Technology Self-Efficacy*

Meera Chandrasekhar, University of Missouri, Columbia MO  
Deepika Menon, Towson University, Towson, MD  
Troy Sadler, University of Missouri, Columbia Mo  
Dorina Kosztin, University of Missouri, Columbia MO

#### *Not Just Kittens: Design Guidelines for Youtube Science Videos for the General Public*

David L. Fortus, Weizmann Institute of Science  
Yossi Elran, Davidson Institute of Science Education  
Avi Saig, Davidson Institute of Science Education  
Shulamit K, Davidson Institute of Science Education  
Hanna Edelman, Davidson Institute of Science Education

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

### *Perspectives on Socioscientific Issues and Instruction*

2:45pm - 4:15pm, Maryland Salon E

**Presider:** Sarah Halwany, Ontario Institute for Studies in Education (OISE)

#### *A Conceptual Analysis of Perspective Taking in Support of Socioscientific Reasoning*

Sami Kahn, University of South Florida  
Dana L. Zeidler, University of South Florida

#### *Case Studies of Secondary School Science Teachers Designing Technology Rich SSI-Based Instruction*

Engin Karahan, Eskisehir Osmangazi University  
Gillian Roehrig, University of Minnesota

***Using Actor Network Theory to Critically Teach About  
Socio-Scientific Issues: A Multi-Layered Pedagogy***

Sarah Halwany, Ontario Institute for Studies in Education (OISE)

Majd Zouda, University of Toronto

Chantal Pouliot, Université Laval

John Lawrence Bencze, University of Toronto

***The Development of an Instrument for Assessing  
Pedagogical Content Knowledge for Socioscientific  
Knowledge (PCK-SSI)***

Cigdem Han Tosunoglu, Marmara University

Norman G. Lederman, Illinois Institute of Technology

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## Evening Events

**NARST Executive Board Meeting #3**

5:00pm – 10:00pm, Watertable A and B

In an effort to reduce paper consumption and promote environmental awareness, NARST has decided to exclude Abstracts from this year's paper program. You may find all Abstracts posted in the online program on the NARST website at [www.narst.org](http://www.narst.org). We hope that you will have a positive NARST Annual International Conference experience while supporting our sustainable practices.

# Abstracts



When a presentation has greater than 5 authors, only the first 5 authors are indexed in accordance with the Publication Manual of the American Psychological Association (6th Edition).

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