The Association for Science Teacher Education

2020 International Conference
San Antonio, Texas

Photo credit: visitsanantonio.com, Al Rendon
At a Glance

**Wednesday, January 08**
- 5:00 pm—9:00 pm  Registration

**Thursday, January 09**
- 6:30 am—7:30 am  Fun Run/Walk
- 7:00 am—4:00 pm  Registration
- 7:00 am—8:30 am  Breakfast on Your Own
- 08:30 am—9:15 am  Poster Session
- 9:00 am—10:00 am  Coffee Break
- 9:30 am—10:15 am  Poster Session
- 10:30 am—11:30 am  Concurrent Session #1
- 11:30 am—1:00 pm  Lunch Break
- 11:30 am—1:00 pm  Graduate Student Business Lunch
- 1:00 pm—2:00 pm  Concurrent Session #2
- 2:15 pm—3:15 pm  Concurrent Session #3
- 3:15 pm—3:45 pm  Coffee Break
- 3:45 pm—4:45 pm  Concurrent Session #4
- 5:00 pm—6:00 pm  Regional Meetings
- 6:00 pm—8:00 pm  ASTE Social/Reception

**Friday, January 10**
- 7:00 am—4:00 pm  Registration
- 7:00 am—8:30 am  Breakfast on Your Own
- 8:30 am—9:30 am  Concurrent Session #5
- 9:45 am—10:45 am  Concurrent Session #6
- 10:45 am—11:00 am  Coffee Break
- 11:00 am—12:30 pm  Keynote: Ramy Mahmoud
- 12:30 pm—2:00 pm  Lunch Break
- 2:00 pm—3:00 pm  Concurrent Session #7
- 3:00 pm—4:00 pm  Coffee, Cookies, and Committees
- 4:15 pm—5:15 pm  Concurrent Session #8
- 6:30 pm—9:30 pm  WISE Dinner - Hard Rock Caf\tl

**Saturday, January 11**
- 6:00 am—7:30 am  Breakfast on Your Own
- 7:30 am—8:15 am  Forums
- 8:30 am—9:30 am  Concurrent Session #9
- 9:30 am—10:00 am  Coffee Break
- 10:00 am—11:00 am  Concurrent Session #10
- 11:15 am—12:15 pm  Concurrent Session #11
- 12:15 pm—1:45 pm  ASTE Awards and Business Luncheon
*Navarro & Sequin are across the street*
Welcome Message

27th International Conference of the ASTE

The Southwest Region of ASTE welcomes you to San Antonio. During your stay, we hope that you will visit the historical sites, dine on delicious Tex-Mex, BBQ, or other cuisine, enjoy the beautiful Riverwalk and the many other sights of San Antonio. As the seventh largest city in the United States, San Antonio has all the amenities of a large city, but the downtown area does not have a big city feel. We know that you will enjoy your stay and are happy that we can showcase our city and experience the hospitality of Texas, “The Friendship State.”

The Riverwalk is accessible from the lobby level of the Hyatt and includes a great assortment of bars, shops and restaurants or just a pleasant place to walk along the banks of the San Antonio River. Alamo Plaza houses one of the city’s five Spanish colonial missions, the Alamo, designated a UNESCO World Heritage Site. On Main Plaza, the San Fernando Cathedral houses the oldest, continuously functioning religious community since 1731. Markets fill the streets with local shops, eateries and public artwork for you to enjoy. There is so much for you to do just within a few steps of the Hyatt. We hope that in addition to the wonderful ASTE sessions, you enjoy everything that San Antonio has to offer while you are here.

Gil Naizer and Janice Meyer, 2020 ASTE Conference Co-Chairs on behalf of the Southwest Region

In order to control conference registration costs the number of meal functions that are included are limited. Meals included with full registration are:

Coffee Breaks daily
Thursday evening – reception
Saturday – luncheon

There are dozens of restaurants within a few blocks of the hotel offering a variety of options to fit any budget.

Check out things to do, places to eat, etc. on the visit San Antonio website: https://www.visitsanantonio.com/

Discounts from Show your Badge offers: http://meetings.visitsanantonio.com/Why-San-Antonio/Show-Us-Your-Badge

Riverwalk information, maps, etc: sanantonioriverwalk.com/ and thesanantonioriverwalk.com/
The famous holiday lights on the River Walk will remain on this year through the night of January 13th, 2020.

Sponsors

Gold Sponsors – $5000

Bronze Sponsors – $2500
Sponsors

Conference Exhibitors
Conference Program and Thread Coordinators and Reviewers

Scheduling the right presenters for the right rooms at the right times supports an energetic and enriching conference for everyone. The devil is in the details and conference program planning begins months in advance. The Program Coordinator works with the Professional Development Committee, Conference Chairs, Executive Director and Director of Electronic Services to manage the review of proposals, assist Thread Coordinators and reviewers, make recommendations about breakout sessions and coordinates breakouts with other conference activities. Thread coordinators communicate with reviewers during the review process, compile acceptance decisions, and suggest paper sets. Reviewers are the backbone of the process. Their insights and comments are the basis for decision-making and help authors improve their presentations.

Program Coordinator

Meredith L. McAllister

Thread Coordinators

College and University
Amanda Glaze
Leslie Bradbury

Policy and Reform
Catherine Koehler
Anita Benita

Curriculum, Pedagogy, and Assessment
Su Gao
Nate Carnes

History and Nature of Science
Allison Meyer
Brendan Callahan

Equity/Diversity
Ingrid Carter
Vanessa Dodo-Seriki

Educational Technology
Meredith McAllister
Josh Ellis

Preservice Science Teachers
Bridget Mulvey
Nazan Bautista
Demetrice Smith-Mutegi

Informal Science Education
Angelia (Angie) Reid-Griffin
Jenn Mesa

Science Teacher Professional Development
Tiffany Hill

STEM
Helen Meyer
Christina McDaniel

K-12 Student Learning
Angela Chapman
Melanie Reap

Ethnoscientific-Environmental Science Education
Bryan Nichols
Charlene Ellingson
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Selene Willis
Dawn Wiseman
Elana Worth
Yael Wyner
Pre-Program & Program Sessions

**Wed, January 08**

**Project WILD Facilitator Training**
*Michael Kamen, Southwestern University*

9:00 am - 5:00 pm at San Antonio Zoo

Texas Parks and Wildlife Department is offering a special Project WILD Facilitator Training. Project WILD Facilitators present Project WILD workshops and distribute this valuable resource to their students and to groups in their community. You will be put in touch with your local WILD sponsor about offering WILD in your state. Project WILD is the collaborative product of departments of natural resources and educators delivering current accurate science with best practices in pedagogy. Project WILD activities use wildlife and wildlife issues to build critical thinking skills from awareness to knowledge to responsible action. Kiki Corry (Texas Project WILD Coordinator) and Michael Kamen (Professor at Southwestern University) will lead the 8 hour workshop on January 8 at the San Antonio Zoo. The workshop is limited to 25 participants. There is a $50 fee for the workshop which includes all three of the Texas Project WILD Suite; Project WILD K-12, Aquatic WILD K-12; and Growing Up WILD Early Childhood. Please address any questions to Michael Kamen kamenm@southwestern.edu or Kiki Corry Kiki.Corry@tpwd.texas.gov. Additional information about Project WILD may be found at [https://www.fishwildlife.org/projectwild](https://www.fishwildlife.org/projectwild) Preregistration required [http://events.constantcontact.com/register/event?llr=t7fgmrfab&oeidk=a07egng](http://events.constantcontact.com/register/event?llr=t7fgmrfab&oeidk=a07egng7g0az9110d55c)

Format: Workshop

**Wed, January 08**

**Background and Development of STEM Teacher Persistence, Effectiveness, and Retention Studies Appropriate for the NSF Noyce Track 4 Program. Preregistration Is Required.**
*Gillian Roehrig, University of Minnesota*

12:00 pm - 5:00 pm in Live Oak

Format: Workshop

**Wed, January 08**

**ASTE Executive Board Meeting**

1:00 pm - 3:00 pm in Chula Vista Boardroom

**Wed, January 08**

**ASTE Board Meeting**

4:00 pm - 9:00 pm in Chula Vista Boardroom

**Wed, January 08**

**ASTE Office**

5:00 pm - 9:00 pm in Guadalupe
Wed, January 08
Registration
5:00 pm - 9:00 pm in Lobby

Wed, January 08
Presider Training [Video]
6:00 pm - 6:30 pm

Thu, January 09
Fun Run/walk
6:30 am - 7:30 am in Lobby

Thu, January 09
Breakfast on Your Own
7:00 am - 8:30 am

Thu, January 09
Equity Committee I
7:00 am - 7:50 am in Chula Vista Boardroom

Thu, January 09
ASTE Office
7:00 am - 5:00 pm in Guadalupe

Thu, January 09
History, Philosophy, and Nature of Science

Contemporary Science to Teach Nature of Science and Empower Learners: An Instructional Innovation

Bridget K. Mulvey, Kent State University-Main Campus
Jennifer C. Parrish, University of Northern Colorado; David M. Singer, Kent State University-Main Campus; Nicholas Santoro, Kent State University-Main Campus; Lucy Dyer, Kent State University-Main Campus; Kortney Cole, Kent State University-Main Campus; Raihan Chowdhury, Kent State University-Main Campus

8:30 am - 9:15 am in Regency Ballroom - Poster

We provide guidelines for using contemporary science research and related scientists as empowering ways to teach about nature of science concepts related to the human side of science.

Format: Individual Poster Presentation
STEM Education
Thu, January 09

Teacher Experience With Global Collaborative Science Education
Kirk Evans, Texas Tech University
Katherine Street Hoover, Texas Tech University
8:30 am - 9:15 am in Regency Ballroom - Poster

This poster presentation focuses on the experiences of eight teachers with global collaborative science projects. The qualitative researchers believe that global projects involving science are of particular interest as many new jobs will be in the STEM fields. They examined research from global and STEM education and will share their findings.

Format: Individual Poster Presentation

Educational Technology
Thu, January 09

Maximizing Observation, Analysis, Feedback and Reflection During Clinical Experiences Using an App-Based Tool That Facilitates a Team Approach
Craig Berg, U of Wisconsin-Milwaukee
Raymond Scolavino, UW-Milwaukee
8:30 am - 9:15 am in Regency Ballroom - Poster

This project is designed to improve teaching observations, analysis, and feedback, by using tool to collect both qualitative and quantitative data as a primary source for the feedback and evidence-based reflection and helps establish future quantitative targets for teaching, while facilitating collaboration between team members.

Format: Individual Poster Presentation

Preservice Science Teacher Preparation
Thu, January 09

Examining PSETs Planning Practices in Science
Elaine M Lucas-Evans, ASSET STEM Education
8:30 am - 9:15 am in Regency Ballroom - Poster

Planning is a crucial aspect of preparing for successful teaching. Preservice elementary teachers (PSETs) need to plan for teaching different subjects including science which requires a reasonable depth of content knowledge in this subject. This study explores the way in which seventy-two PSETs planned lesson sequences around a prescribed topic.

Format: Individual Poster Presentation
**Science Teacher Professional Development**
**Thu, January 09**

**Examination of Engineering Self-Efficacy Perceptual Changes in Elementary Teachers**

*Leiflyn Gamborg, Louisiana State University*
*Heather Lavender, Louisiana State University; Laurie Richard, Louisiana State University; Adronisha Frazier, Louisiana State University*

8:30 am - 9:15 am in Regency Ballroom - Poster

This mixed methods study sought to understand the changes in self-efficacy within practicing elementary teachers after participation in an engineer-design focused professional development (PD) workshop. The results from this study elaborate on the specific perceptual changes these teachers stated towards engineering-based curriculum integration.

*Format: Individual Poster Presentation*

**STEM Education**
**Thu, January 09**

**Knowing Your Coach’s Role: Navigating a Coaching Relationship at the Boundaries of STEM Integration**

*Justin R. McFadden, University of Louisville*

8:30 am - 9:15 am in Regency Ballroom - Poster

The current study examined how an elementary teacher interpreted the enactment of a STEM coach’s role. Additionally, the data presented reveal how strict adherence to a presupposed coaching stance (i.e. reflective) or role, can limit the fruitfulness of a teacher-coach relationship.

*Format: Individual Poster Presentation*

**Science Teacher Professional Development**
**Thu, January 09**

**Exploring How the Design of Professional Development Supports Geospatial Inquiry Implementation in the Classroom**

*Eric Nolan, Northern Arizona University*
*Brooke A Whitworth, University of Mississippi; Mark Manone, Northern Arizona University; Lori Rubino-Hare, Northern Arizona University; Nena Bloom, Northern Arizona University*

8:30 am - 9:15 am in Regency Ballroom - Poster

The purpose of the study was to identify how teacher workshops prepared teachers to implement geospatial inquiry lessons, provided them with geospatial technology skills, and prepared them to teach a lesson. Results provide a better understanding of factors influencing the design of scaling professional development.

*Format: Individual Poster Presentation*
Using Reflective Analysis to Explore Preservice Elementary Teachers’ Science Teaching Beliefs

Julie Mangano, Towson University
Deepika Menon, Towson University

8:30 am - 9:15 am in Regency Ballroom - Poster

This study investigates changes in preservice elementary teachers’ reflective practices within a science methods course. Participants’ written science autobiographies and reflections were assessed in terms of depth, and complexity of ideas. Field experiences provided appropriate contexts for developing preservice teachers’ reflective practices.

Creating a Summative Assessment to Measure Elementary Pre-Service Teachers’ Content Knowledge for Teaching About Matter and Its Interactions

Jamie N Mikeska, Educational Testing Service
Dante Cisterna, Educational Testing Service; Josie Melton, Western Washington University; Elizabeth Orlandi; Katherine Castellano, Educational Testing Service; Deborah Hanuscin, Western Washington University; Emily Borda, Western Washington University

8:30 am - 9:15 am in Regency Ballroom - Poster

We report on one research project’s assessment development efforts for creating a valid and reliable summative instrument to gauge the specialized, practice-based aspects of elementary pre-service teachers’ content knowledge for teaching (CKT) about matter and its interactions at the K-5 level.

Teacher Beliefs About Science Teaching and Learning in the Implementation of a Curriculum Reform in Pagaralam, Indonesia

Eka Lamar Syari, The University of Queensland
Patricia Morrell, The University of Queensland

8:30 am - 9:15 am in Regency Ballroom - Poster

This mixed-methods study examined connections between teacher beliefs and the implementation of reform-based national science curriculum in a rural town in Indonesia. Teachers’ beliefs and practices did not always match, and teachers’ did not always fully understand the reform practices. Contextual impediments to implementation were identified.
Encouraging Active Learning in University STEM Classrooms Using Peer Observation

Patricia D Morrell, University of Queensland
Eric Anctil, University of Portland; Heather Dillon, University of Portland; Carolyn James, University of Portland; Valerie Peterson, University of Portland; Tara Presholdt, University of Portland; Stephanie Salomone, University of Portland

8:30 am - 9:15 am in Regency Ballroom - Poster

Redesigning Education For Learning through Evidence and Collaborative Teaching (REFLECT) was designed to increase the use of highly effective, evidence-based active teaching methods in university STEM classrooms. This poster reports on the findings from the first year of this project.

Format: Individual Poster Presentation

Analysis of Concept Models: A Tool for Supporting Teachers’ in Working Through Science Concepts

Ryan S. Nixon, Brigham Young University
Benjamin K. Campbell, Longwood University

8:30 am - 9:15 am in Regency Ballroom - Poster

The concept model is a tool designed to support teachers in working through science concepts, thereby improving their subject matter knowledge, in preparation for instruction. Analysis of completed concept models provides implications for the design of tools for teachers and shows the promise of such tools in supporting teachers’ development.

Format: Individual Poster Presentation

Designing Physical Science Educative Curriculum Materials for Preservice Elementary Teachers to Impact Attitudes Toward Science

Brooke A Whitworth, University of Mississippi
Lauren Simpson, University of Mississippi; Whitney Jackson, University of Mississippi; Julie James, University of Mississippi; Alice Steimle, University of Mississippi

8:30 am - 9:15 am in Regency Ballroom - Poster

This mixed methods exploratory study examined how the development of physical science educative curriculum materials designed specifically for preservice elementary teachers impacted attitudes and interests in science. We begin to examine the design principles of educative curriculum materials for use in the higher education classroom.

Format: Individual Poster Presentation
**Preservice Science Teacher Preparation**  
*Thu, January 09*

**Increasing Self-Efficacy and Content Knowledge Through Embedded Community Engagement in 7-12 STEM Preservice Teachers**

*Cherie A McCollough, Texas A & M University-Corpus Christi, College of Science and Engineering*

*Faye Bruun, Texas A&M University-Corpus Christi, College of Education and Human Development; Carmen Tejeda-Delgado, Texas A&M University-Corpus Christi, College of Education and Human Development; Robin Johnson, Texas A&M University-Corpus Christi, College of Education and Human Development*

8:30 am - 9:15 am in Regency Ballroom - Poster

The NSF Noyce STEM INSPIRES (Infusing Social Programs in Residential Education Scholars) was funded to 1) increase STEM content knowledge in 7-12 preservice teachers, 2) increase self efficacy in teaching 7-12 STEM content and 3) incorporate a community-engaged teacher preparation program model at Texas A&M University – Corpus Christi.

*Format: Individual Poster Presentation*

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**Curriculum, Pedagogy, and Assessment**  
*Thu, January 09*

**Teacher Beliefs About Science Teaching and Learning in the Implementation of a Curriculum Reform in Pagaralam, Indonesia**

*Eka Lamar Syari, The University of Queensland*

*Patricia Morrell, The University of Queensland*

8:30 am - 9:15 am in Regency Ballroom - Poster

This mixed-methods study examined connections between teacher beliefs and the implementation of reform-based national science curriculum in a rural town in Indonesia. Teachers’ beliefs and practices did not always match, and teachers’ did not always fully understand the reform practices. Contextual impediments to implementation were identified.

*Format: Individual Poster Presentation*

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**Ethnoscience and Environmental Education**  
*Thu, January 09*

**Study on Improving Teachers Education for Sustainable Development**

*Bayarchimeg Baatar, Mongolian National University of Education*

*Punsalpaamuu Gaadan, Mongolian National University of Education*

8:30 am - 9:15 am in Regency Ballroom - Poster

Basing on observation made during environmental sciences lessons for elementary classes and careful study of the principles, requirements and standards of these lessons, we have conducted a self-assessment survey on complex capacity for the health and natural science lessons among parents, students and teachers.

*Format: Individual Poster Presentation*
Julie Luft, University of Georgia
Elana Worth, University of Georgia; Julia Przybyla-Kuchek, University of Georgia; Hatice Ozen, University of Georgia; Dorothy Y. White, University of Georgia; Paula Lemons, University of Georgia
8:30 am - 9:15 am in Regency Ballroom - Poster
This poster reports on the self-study of a secondary science teacher education program. Data were collected and analyzed pertaining to the number of teachers prepared, the perceptions of principals hiring teachers from the program, the perceptions of current/past graduates, and the program coursework. Data were used to reflect upon the program.
Format: Individual Poster Presentation

Initiating Argument-Based Inquiry Through a Nature of Science Encouraging Experience
Darrin Ellsworth, Xavier Catholic High School
Mark McDermott, University of Iowa
8:30 am - 9:15 am in Regency Ballroom - Poster
Many characteristics necessary in developing an effective immersive argument-based science learning environment have not been encountered or developed by students in previous science learning experiences. A writing-to-learn experience is described that initiates an immersive argument-based learning environment in a high school physics classroom.
Format: Individual Poster Presentation

Windows on an Inquiry Classroom: Full Video and Materials Record With Instructor, Student, and Prospective Teacher Reflection
Christopher F Bauer, University of New Hampshire
Julia Y.K. Chan, California State University Fullerton
8:30 am - 9:15 am in Regency Ballroom - Poster
A college course about heat and temperature was captured in entirety and is available as a pedagogic field laboratory. One can watch the instructor’s course design process, listen to pre-class plans and post-class debriefings, eavesdrop on teaching interns as they reflect on each class, and watch how students engage with the learning experience.
Format: Individual Poster Presentation
Growing Future Science Teachers in Maine

Emily Lesher, St. Joseph's College of Maine
Patricia Waters, St. Joseph's College of Maine

8:30 am - 9:15 am in Regency Ballroom - Poster

St. Joseph’s College was awarded an NSF grant called Growing Future Science Teachers in Maine to encourage talented STEM majors to become K-12 teachers. The project led to development of an online educational foundations course, research on undergraduate perceptions of teaching, and professional learning communities to support teachers.

Format: Individual Poster Presentation

Developing and Implementing an Instrument for Aligning Teacher Educators’ Science Content Course Curricula With Three-Dimensional Learning

Jeffrey D. Radloff, Purdue University
Brenda M. Capobianco, Purdue University; David Eichinger, Purdue University; Sanjay Rebello, Purdue University

8:30 am - 9:15 am in Regency Ballroom - Poster

This poster outlines the development and use of an approach to help university science instructors align preservice science teacher content course curricula with three-dimensional learning. Results reveal several uses of the approach and variance in the ways faculty addressed three-dimensional learning in their respective courses.

Format: Individual Poster Presentation

Inclusive Excellence Professional Development for Postsecondary Science Faculty Developing Course-Based Undergraduate Research Experiences

Rommel J. Miranda, Towson University
Laura Gough, Towson University; Matthew Hemm, Towson University; Trudymae Atuobi, Towson University

8:30 am - 9:15 am in Regency Ballroom - Poster

This HHMI-funded Inclusive Excellence PD Program presentation focuses on two main goals: 1) reform science laboratory courses to incorporate authentic research experiences via course-based undergraduate research experiences, and 2) provide professional development for postsecondary science faculty to promote effective inclusive teaching practices.

Format: Individual Poster Presentation
Using Informal Science Experiences to Engage Preservice Teachers in the Nature of Science

Cassandra Cartmill, Texas Christian University
Shelly C. Wu, Texas Christian University

8:30 am - 9:15 am in Regency Ballroom - Poster

The purpose of this preliminary study is to determine how an informal science setting can foster PSTs’ thinking about NOS. PSTs visited a meteorite gallery and wrote a post-reflection. Qualitative results demonstrate that four tenets of NOS emerged, drawing upon historical and current knowledge about meteorites.

Format: Individual Poster Presentation

Coffee and Conversations
9:00 am - 10:00 am in Regency Foyer

Using a ‘Model X’ Organism to Enhance Teaching and Learning in a Large Introductory Biology Lecture Course

Lisa M Paciulli, North Carolina State University
McKenzie D Nalley, North Carolina State University

9:30 am - 10:15 am in Regency Ballroom - Poster

Most students learn better when interacting with course material. Students chose a ‘pet species’ to correspond with lecture material. At the end of the semester, students demonstrated critical and creative thinking. This study aimed to increase student motivation, learning, and retention while also introducing creative approaches to teaching.

Format: Individual Poster Presentation

Progress Towards Determining the Status of Three-Dimensional Ability by Rural Science Educators.

Camille T Stegman, Raggio Research Center for STEM Education
Catherine Pozarski-Connolly, Northwestern Regional Professional Development Program; David T. Crowther, University of Nevada, Reno

9:30 am - 10:15 am in Regency Ballroom - Poster

This presentation will introduce a Next Generation Science Standards (NGSS Lead States, 2013) survey instrument that gathers data about rural science educator command the three-dimensions found in the Framework for K-12 Science Education (NRC, 2012) and their use with the NGSS.

Format: Individual Poster Presentation
Re-Thinking Elementary Science Teacher Preparation ‘As Usual’: A Posthumanist Perspective

Maria F.G. Wallace, University of Southern Mississippi

9:30 am - 10:15 am in Regency Ballroom - Poster

Feminist posthuman theories (Braidotti, 2013) that focus on an intimate interrelatedness among all 'kinds' (human and nonhuman entities) is put to work. Highlighting components of a larger project, this research re-conceptualizes how science education researchers come to know and (re)produce elementary science teacher subjectivity and practice.

Format: Individual Poster Presentation

Exploring Active Teaching Practices to Better Support Preservice STEM Teachers: A Partnership Between STEM Discipline and STEM Teacher Preparation Faculty

M. Kate York, The University of Texas at Dallas

9:30 am - 10:15 am in Regency Ballroom - Poster

Active instructional practices expected of students in STEM teacher preparation are often at odds with more traditional instructional experiences in their undergrad content courses. This project partnered STEM discipline and teacher preparation faculty in the exploration of models/strategies to support active teaching and learning for both areas.

Format: Individual Poster Presentation

Diversifying the Geoscience Field: Promoting Awareness and Recruitment in a Science Club for Middle School Students

Casey Saup, The Ohio State University
Joanne Vakil, The Ohio State University

9:30 am - 10:15 am in Regency Ballroom - Poster

Perspectives from 2 PhD Candidates in Earth Sciences and STEM Education collaborate to assess a science club for diverse, economically disadvantaged middle school students. Preliminary findings suggest the need for enhanced representation of minority groups in the outreach activity as a means to maximize student engagement and potential recruitment.

Format: Individual Poster Presentation
Science Teacher Professional Development
Thu, January 09

Following Their Path: Identifying the Sustainability of Professional Development Focused Mobile Learning in the Science Classroom
Sunil Pokhrel, Clemson University
Cynthia Deaton, Clemson University

9:30 am - 10:15 am in Regency Ballroom - Poster

This presentation will explore the impact of an 18-month professional development experience, during, immediately after, and three years post experience. We will discuss the nature of the project, district support, and influence of professional development activities on the teachers’ instruction.

Format: Individual Poster Presentation

Science Teacher Professional Development
Thu, January 09

Institutional Constraints to General Reform-Based Science Teaching: Implications for Teacher Preparation and Professional Development
Chaztin Stigers, Texas A & M University
Alex Sobotka, Texas A&M University; Alister Olson, Texas A&M University; Michael P. Clough, Texas A&M University

9:30 am - 10:15 am in Regency Ballroom - Poster

Research has identified many obstacles to reforms-based science teaching. We summarize this research and present the recent experiences of three secondary science teachers from urban, suburban, and rural schools who sought to overcome such constraints. Strategies for science teacher preparation and professional development efforts are put forward.

Format: Individual Poster Presentation

STEM Education
Thu, January 09

Using the Stages of Concern Questionnaire to Understand Educators’ Perspectives During STEM Implementation
Benjamin B. Ewing, Oregon State University
Michael Giamellaro, Oregon State University – Cascades; Deborah R. Siegel, Institute for Learning Innovation

9:30 am - 10:15 am in Regency Ballroom - Poster

Implementation of K-12 project-based STEM is chronicled in a small school district from the perspectives of educators. The Stages of Concern Questionnaire (SoCQ) was used to gather perspectives of STEM implementation. Findings suggest educator perceptions were not influenced by time or grade level taught, though individual change was observed.

Format: Individual Poster Presentation
Conceptual Framework for Teacher Retention

Dorothy Holley, NCSU

9:30 am - 10:15 am in Regency Ballroom - Poster

A complex conceptual model explaining teachers’ persistence to remain in the profession. The overarching theoretical framework is Bandura’s (1986) Social Cognitive Theory. Factors impacting teachers’ persistence are personal, environmental, and behavioral.

Format: Individual Poster Presentation

Early Childhood Educators’ Declarative Knowledge of the Next Generation Science Standards

Susanna E. Hapgood, University of Toledo
Jeanna Heuring, University of Toledo; Grant Wilson, University of Toledo; Charlene Czerniak, University of Toledo

9:30 am - 10:15 am in Regency Ballroom - Poster

We share data regarding U.S. preK-3 grade teachers’ responses to a 10-item multiple-choice assessment regarding the NGSS three dimensions. Teachers had difficulty with items related to cross-cutting concepts and science and engineering practices and were more familiar with the purpose of engineering and identifying disciplinary core ideas.

Format: Individual Poster Presentation

Preparing STEM Master Teacher Fellows: Learning How to Plan for Integrative Instruction

Amanda M Gunning, Mercy College
Meghan E Marrero, Mercy College; Elena Nitecki, Mercy College; Latanya Brandon, Mercy College

9:30 am - 10:15 am in Regency Ballroom - Poster

Our research focuses on how to help teachers learn how to teach STEM in K-12 classrooms through a graduate-level course taken by in-service and pre-service teachers on STEM pedagogy.

Format: Individual Poster Presentation

Exploring 6th Grade Students' Experiences of STEM

Hye In F Hyun, University of California, Santa Barbara
Benny R Hiwatig, University of Minnesota, Twin Cities; Corbin P Rice, University of Minnesota, Twin Cities

9:30 am - 10:15 am in Regency Ballroom - Poster

The study aims to explore and describe how 6th grade middle school students experience STEM and how these experiences differ when the participants are grouped into whether they came from a STEM elementary school or not. This study may provide insights about student motivation, interest and attitude during STEM learning activities.

Format: Individual Poster Presentation
Identifying the Focus of Preservice Elementary Teachers' Philosophies and Reflections

*Cynthia Deaton, Clemson University*

*Khushbu Singh, Clemson University*

9:30 am - 10:15 am in Regency Ballroom - Poster

This presentation will explore the focus of elementary preservice teachers' science teaching philosophies and written reflections during their methods course. By exploring these, we will begin to understand their beliefs prior to student teaching and what role it may play during that experience.

Format: Individual Poster Presentation

Professional Development for Supporting K-12 Teachers on Computing and Computational Thinking

*Danielle J Malone, Washington State University*

*Judith Morrison, Washington State University; Jonah Firestone, Washington State University*

9:30 am - 10:15 am in Regency Ballroom - Poster

Computing and computational thinking (CT) are necessary skills for citizens today. A series of professional development (PD) offerings focused on computing and CT provided data to plan subsequent PD. We will outline the progression of our learning about teachers’ concerns and challenges about computing and CT and how this informed the PD offerings.

Format: Individual Poster Presentation

Perceptions of Teacher Leadership: The Influence of Organizational Structures on the Professional Identity of Urban STEM Teacher Leaders

*Anna E. Hutchinson, University of Cincinnati*

9:30 am - 10:15 am in Regency Ballroom - Poster

Professional identity is socially constructed while navigating within K-12 education systems. This qualitative case study, using York-Barr and Duke’s (2004) framework of teacher leadership practices, investigates how the development of professional identity of 17 urban STEM teacher leaders are shaped from embedded organizational structures.

Format: Individual Poster Presentation
From the Start: An Environmental-Focused Rural Elementary Charter School

Beth S. Klein, SUNY Cortland

9:30 am - 10:15 am in Regency Ballroom - Poster

This session will share the beginnings of a rural, agricultural and environmental focused STEM elementary charter school that uses Project-Based Learning (PBL) methods.

What Would You Do Next? Analysis of Elementary Preservice Teachers' Decisions to Elicit Student Thinking

Jeni R Davis, Salisbury University
Anne Estapa, University of Iowa

9:30 am - 10:15 am in Regency Ballroom - Poster

The purpose of this presentation is to report the decisions elementary preservice teachers made when engaged in a task designed around the teacher practice of eliciting student ideas.

Preservice Science Teachers’ Reflective Practice on a Peer Teaching Experience

Rosetta Ngugi, Towson University
Julie Mangano, Towson University; Deepika Menon, Towson University

9:30 am - 10:15 am in Regency Ballroom - Poster

The written reflections of 27 preservice teachers were analyzed after a microteaching experience. We found four categories representing the aspects of teaching emphasized. Findings have implications for teacher education programs for fostering preservice teachers as reflective practitioners.

Health and Wellness at La Escuelita: A Community-Driven Effort Toward Food and Environmental Justice

William Medina Jerez, University of Texas at El Paso
Victor del Hierro, University of Florida; Laura Gonzalez, University of Florida; Lucia Dura, University of Texas at El Paso; Valente Saens, New Mexico State University

9:30 am - 10:15 am in Regency Ballroom - Poster

A group of youth and their caretakers participate in weekly activities dealing with art, mapping, and collaborative cooking to interrogate notions of health, wellness, and environmental justice. The authors argue that food and environmental justice should center asset-based frameworks in reciprocal learning.
Politics at the Nexus of Science and Education
Angela Webb, James Madison University
9:30 am - 10:15 am in Regency Ballroom - Poster

Nowadays science and public education are under attack; yet, these disciplines are that the core of a science teacher’s work. The purpose of this study is to investigate teacher candidates’ consideration of the intersection of politics, science, and education via town hall meetings.

Format: Individual Poster Presentation

Urban STEM Education Successes in the Bronx: Moving Away From the Deficit Model
Judith Gouraige, Stony Brook University
9:30 am - 10:15 am in Regency Ballroom - Poster

In this case study, the deficit model is turned around by examining 4 successful Bronx high schools. The schools have a science, technology, engineering and math (STEM) focus and their characteristics are compared in terms of educational philosophy and practical operational decisions as a possible guide for urban STEM success.

Format: Individual Poster Presentation

Promoting the Assessment of Nature of Science Through an Assessment Literacy Model
Jose M. Pavez, University of Georgia
9:30 am - 10:15 am in Regency Ballroom - Poster

Today it is important for teachers to know how to assess NOS. The purpose is to provide recommendations to promote the assessment of NOS, using three different sources: assessment strategies, development of NOS assessment tools by researchers, and assessment literacy model. A second purpose is to adapt this model for the assessment of NOS.

Format: Individual Poster Presentation
Space Sciences Hands-on Activities & Practices for Middle School Classrooms Using NASA Education Resources

Soon Lee, Wichita State University
Daniel Bergman, Wichita State University; Greg Novacek, Wichita State University; Cathy Durano, Wichita State University; Hyonyong Lee, Kyungpook National University

9:30 am - 10:15 am in Regency Ballroom - Poster

The $S^2$HAP workshop is a practice-based training program for 15 middle school science teachers’ teaching space-science lessons using NASA education resources. The program has two phases: (1) a 3-day summer workshop to practice $S^2$HAP lessons, and (2) implementing the $S^2$HAP units in the classrooms with assistance from STEM success coaches.

Format: Individual Poster Presentation

Exploring Socio-Material Relations in Advanced Placement Biology Classrooms Through the Lens of New Materialism

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

9:30 am - 10:15 am in Regency Ballroom - Poster

This study is an ethnographically-informed qualitative study that aimed to explore how identity categories, particularly gender, played a role in the opportunities for learning made available to students. The purpose of this study was to describe the conditions under which the capacity of gender was actualized in high school science classrooms.

Format: Individual Poster Presentation

Content Knowledge for Teaching About Matter: Educative Curriculum Materials for Teacher Educators

Deborah L Hanuscin, Western Washington University
Jamie Mikeska, Educational Testing Service; Emily Borda, Western Washington University; Josie Melton, Western Washington University; Dante Cisterna, Educational Testing Service

9:45 am - 10:45 am in Chula Vista

Come learn more about materials developed to support teacher educators in developing preservice/inservice teachers' content knowledge for teaching (CKT) about the structure and properties of matter. You will learn more about the Work of Teaching Science framework, and be able to access our free resources for use in your classroom!

Format: Workshop

Helen Douglass, The University of Tulsa
Geeta Verma, University of Colorado Denver

10:30 am - 11:30 am in Blanco - Session A

There is a growing emphasis on STEM education in US public schools. Teachers may find themselves asked to teach STEM classes in traditionally informal spaces, such as a makerspace, in the formal school structure, thus finding themselves out-of-field. We investigate out-of-field teaching in makerspaces which intersects formal and informal learning.


Assessing STEM Identities in Intergenerational Informal STEM Programming

Laura S Rodriguez, University of Connecticut
Todd Campbell, University of Connecticut; John Volin, University of Connecticut; David Moss, University of Connecticut; Chester Arnold, University of Connecticut; Laura Cisneros, University of Connecticut; Cary Chadwick, University of Connecticut; David Dickson, University of Connecticut

10:30 am - 11:30 am in Blanco - Session B

Equity in informal science programs can be supported by empirically assessing STEM identity to determine program accessibility and effectiveness. We present results and implications from two years of empirical survey data used to describe STEM identities in an intergenerational project incorporating geospatial technology in conservation science.


Science Fiction Conventions as a Learning Space: Exploring Attendees Attitudes About Science

Kania Greer, Georgia Southern University
Donna Governor, University of North Georgia; Gina Childers, Texas Tech University

10:30 am - 11:30 am in Blanco - Session C

Science fiction conventions allow attendees to learn from professional scientists in low stakes free choice environments. Study participants indicated the science learned in these environments is relevant, meaningful, and interesting. Over 80% of respondents also indicated science fiction conventions were good places to learn science.

The Use of Robotics With Engineering Design: Early Childhood Conceptions of Engineers

**Kimberly H Lott**, Utah State University  
**Colby Tofel-Grehl**, Utah State University; **April Mitchell**, Utah State University

10:30 am - 11:30 am in Directors - Session A

This presentation will present the results of a study to assess early childhood perceptions of engineers before and after an engineering challenge using robotics to build cookie jar alarms.

*Format: Individual Paper Presentation*

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**NTLI**

10:30 am - 11:30 am in Frio

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**History, Philosophy, and Nature of Science**

**Addressing Interactions Between Science and Religion in Science Teacher Education**

**Joseph W Shane**, Shippensburg University  
**Lee Meadows**, University of Alabama-Birmingham; **Ron Hermann**, Towson University; **Ian Binns**, University of North Carolina-Charlotte

10:30 am - 11:30 am in Live Oak - Session A

This roundtable discussion will assist our fellow science teacher educators in preparing teachers to responsibly address science topics that frequently have religious implications for students and their associated communities. We will also present a recent NSTA Press publication.

*Format: Small Group Roundtables*

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**Educational Technology**

**Robotics Professional Development Project**

**Angelia Reid-Griffin**, UNCW/Watson College of Education  
**Jale Aldemir**, UNCW/Watson College of Education; **Amelia Moody**, UNCW/Watson College of Education; **Daisyane Barreto**, UNCW/Watson College of Education; **Carmen Sidbury**, UNCW/Watson College of Education

10:30 am - 11:30 am in Live Oak - Session C

Exploring how STEM teachers employed at the University's K-8 lab school engage in professional development with robotics to teach STEM concepts in mainstream as well as special education classrooms.

*Format: Small Group Roundtables*
Perspectives on the Role of Technology in Science Education
Joshua A Ellis, Florida International University
Jeanna Wieselmann, Southern Methodist University; Gillian Roehrig, University of Minnesota; Emily Dare, Florida International University; Gillian Roehrig, University of Minnesota; Emily Dare, Florida International University; Elizabeth Ring-Whalen, St. Catherine University

10:30 am - 11:30 am in Live Oak - Session D
This roundtable presentation will summarize technology initiatives across science, technology, engineering, and mathematics (STEM) education during the past 30 years to present perspectives on the role of technology in science education. Implications for science education researchers and practitioners will be discussed.
Format: Small Group Roundtables

The Influence of Teacher Beliefs on Teachers' PBL Enactments.
Christine R Lotter, University of South Carolina
Lark Widener, University of South Carolina

10:30 am - 11:30 am in Live Oak - Session E
This study investigated teachers’ range of project-based learning enactments nine months after a professional development program that included ultrasound technology. Case studies of three teachers’ enactments of their PBL units are presented with a focus on how their beliefs influenced their instructional choices and student learning.
Format: Small Group Roundtables

Importance of Science Fair Through the Lens of Highly Successful Science Fair Teachers
Christina L McDaniel, Bradley University
Ryan M Walker, Mississippi State University

10:30 am - 11:30 am in Llano - Session A
This study explored the concept of science inquiry through the lens of successful science fair teachers. Participants indicated science fair increased intrinsic value of science inquiry, supported STEM career choices, linked intrinsic and utility value with motivation and increased in academic aptitude with benefits far outweighing the costs.
Format: Individual Paper Presentation
A Science Education Reform Conundrum: Asking Teachers to Design Commons Assessments Used to Evaluate Their Own Effectiveness

Lisa N Pitot, UW-La Crosse
Meena Balgopal, Colorado State University

10:30 am - 11:30 am in Mesquite - Session A

Education policies have been enacted that rate a teachers’ effectiveness in part on their students’ performance on high stakes tests. Multiple methods were used to examine teacher perceptions related to science literacy, as well as their abilities to develop common assessments, which were intended to measure outcomes from opposing policies.

Format: Individual Paper Presentation  Presider: Daniel Carpenter

Teaching Evolution in Alabama

Carolanne Grogan, Texas Tech University
Rebecca Hite, Texas Tech University

10:30 am - 11:30 am in Mesquite - Session B

This study investigates evolution education in Alabama which recently adopted state science standards placing more emphasis on evolution. Mixed methods design was used to investigate high school biology teachers’ practices for teaching evolution, factors influencing their practices and changes to practices since the adoption of new state standards.

Format: Individual Paper Presentation  Presider: Daniel Carpenter

Graduate Student Workshop: Preparing for the Workforce

Shana Lee, Mississippi State University
Leiflyn Gamborg, Louisiana State University; Melanie Kinskey, University of South Florida

10:30 am - 11:30 am in Navarro

Graduate students will participate in roundtable discussions related to navigating the transition from graduate school to the workforce. Topics range from developing an effective CV to preparing for the campus visit. Established faculty members will lead the roundtables and offer their advice to participating graduate students.

Format: Workshop
How Does Field Experience Affect Teaching Self-Efficacy and Teacher Interest in Environmental Education?

Sarah Haines, Towson University
Chelsea McClure, Towson University

10:30 am - 11:30 am in Nueces - Session A

Our preservice teachers delivered programming focusing on watershed education for urban youth at the National Aquarium. Come learn how integrating field experiences that focus on local environmental issues into teacher preparation programs can promote better preservice teacher content and pedagogical knowledge, as well as higher self-efficacy.

Format: Individual Paper Presentation  Presider: Katie Green

Preservice Elementary Teachers’ Intensive Field Experience at a Science Summer Program: Effects on Self-Efficacy

Jacquelyn Duran, Teachers College, Columbia University
Alison Matthews, Teachers College, Columbia University; Allison Bookbinder, Teachers College, Columbia University; Min Jung Lee, Teachers College, Columbia University

10:30 am - 11:30 am in Nueces - Session B

Our study seeks to understand how experiences teaching at a hands-on, inquiry-based summer science program for elementary children shape preservice teachers’ beliefs about their ability to teach science. Self-efficacy was measured pre and post through the STEBI-B and researcher-developed surveys and interviews.

Format: Individual Paper Presentation  Presider: Katie Green

Effects of an Online Inquiry-Focused Science Methods Course on Elementary Pre-Service Teachers’ Self-Efficacy of Teaching Science

Daniel J Bergman, Wichita State University

10:30 am - 11:30 am in Nueces - Session C

A fully online science methods course (with home-based activities) was created as part of an elementary teacher licensure program for para-educators working full-time in schools. Pre-/post-surveys were collected to study participants’ science self-efficacy beliefs. Discussion will include findings and implications for both research and instruction.

Format: Individual Paper Presentation  Presider: Katie Green
Totally Charged! Examination of ELLs Science Writing Through Notebooks

Lisa A Gross, Appalachian State University  
Shanan Fitts, Appalachian State University

10:30 am - 11:30 am in Pecan - Session A

This presentation includes analyses of 16 fourth-grade students’ notebooks and their written explanations in a science unit on magnetism. The focus is on the writing of 3 English Language Learners. Findings revealed that most students were successful supporting claims with evidence, but struggled to represent their scientific reasoning in writing.

Explicitly Teaching Scientific Argumentation: Using Action Research to Study High School Science Readiness and Detracking

Ami LeFevre, Loyola University Chicago/Niles West High School

10:30 am - 11:30 am in Pecan - Session B

A professional learning community team of science and English teachers participated in a practical action research study to improve lessons relating to scientific argumentation practices. The goal of this study was to detrack academically challenged high school freshman science students through curriculum and instructional improvement.

Pedagogical Model and Strategies for Playful Learning in Science

Michael Kamen, Southwestern University  
Abigail Luna, Southwestern University; Sarah Buchanan, Southwestern University

10:30 am - 11:30 am in Pecan - Session C

Video recordings of 2nd grade block play stations were analyzed for playful learning in science. A pedagogic model of play was developed to support teachers planning and implementation for academic learning including science. The pedagogic playful learning model will be presented with strategies to promote playful science learning.
Teaching Science With Immersive Virtual Reality

Alec M. Bodzin, Lehigh University  
Jonah Firestone, Washington State University Tri-Cities; Richard Lamb, University at Buffalo; Robson Araujo Junior, Lehigh University

10:30 am - 11:30 am in Pecos - Session A

This Exploratory Session presents immersive VR science learning experiences that have been used with preservice teachers, inservice teachers, and their students. Implementation considerations when using immersive VR for science teaching and learning will be discussed.

Preservice Science Teacher Preparation

Policy of Practice-Based Teacher Education

Allyson Rogan-Klyve, Central Washington University  
Jennifer Sorensen, Seattle University; Matthew Miller, Western Washington University; Daniel Hanley, Western Washington University

10:30 am - 11:30 am in Seguin - Session A

This exploratory session will first outline the research landscape supporting practice-based teacher education (PBTE), then provide science teacher educators an interactive engagement in specific, implementable pedagogical strategies that increase pre-service teachers’ enactment of effective core practices in science education.

Lunch on Your Own

11:30 am - 1:00 pm

Graduate Student Lunch and Business Meeting

Shana Lee, Leiflyn Gamborg, Melanie Kinskey, Kathryn Green

11:30 am - 1:00 pm in Live Oak

The ASTE Graduate Student Forum (GSF) Lunch. Lunch will be served at a cost of $10.00. GSF business will include elections for leadership, etc.
What Do They See? Characterizing Prospective Science Teachers’ Noticing During Their Practicum

Lu Wang, University of Georgia
J. Steve Oliver, University of Georgia

1:00 pm - 2:00 pm in Blanco - Session A

This proposal investigated a group of prospective secondary science teachers’ noticing as they participated in a school-based practicum. Through a qualitative analysis, results show that prospective teachers’ development of noticing is idiosyncratic and that their noticing change is not a one directional or quick process.

Format: Individual Paper Presentation  Presider: Mike Borowczak

Impact of Clinical Experience on Pre-Service Teacher Perceptions of Teaching Science and Math

Stephanie Fanselow, Western New Mexico University

1:00 pm - 2:00 pm in Blanco - Session B

Clinical experience is often an overlooked and untapped component of science teacher preparation. This study analyzed course-based assignments from a series of field experience courses to investigate the impact of clinical experience on pre-service science teachers at in one science and math teacher preparation program.

Format: Individual Paper Presentation  Presider: Mike Borowczak

Pilot Results of the Science Teaching Emotional Scales (Sci-TES)

Franklin S. Allaire, University of Houston-Downtown
Anne C. Frenzel, University of Munich; J. Patrick King, University of Houston-Downtown

1:00 pm - 2:00 pm in Blanco - Session C

Anecdotal and scholarly evidence suggests pre-service elementary teachers have strong negative emotions towards science. This may negatively impact the quality of their science instruction. This presentation shares the results in the development of the Science Teacher Emotions Scales to better understand emotions related to teaching science.

Format: Individual Paper Presentation  Presider: Mike Borowczak
Preparing to Observe Integrated STEM Education in K-12 Classrooms

Emily A Dare, Florida International University
Joshua A Ellis, Florida International University; Elizabeth A Ring-Whalen, St. Catherine University; Gillian H Roehrig, University of Minnesota

1:00 pm - 3:00 pm in Chula Vista

This workshop engages attendees from the science teacher education community about the development of our STEM Observation Protocol (STEM-OP) and provide them with an opportunity to learn to use the protocol by watching and scoring classroom video of integrated STEM lessons.

Format: Workshop

Elementary Science Centers as a Vehicle for Teaching Inquiry Methods to Preservice Science Teachers

Katie L Brkich, Georgia Southern University

1:00 pm - 2:00 pm in Directors - Session A

This session details the benefits of using field-based Science Centers as a pedagogy for developing teacher candidates' comfort with inquiry science methods from within a P-5 science classroom setting. Implications for science teacher education, development of school-university partnerships, and creation of scholarship opportunities are discussed.

Format: Individual Paper Presentation  Presider: Heidy Garcia-Moreno

The Content of and Practices in Elementary and Secondary Science Teaching Methods Classes

William F. McComas, University of Arkansas
Courtney Erickson, University of Arkansas; Stephen R. Burgin, University of Arkansas; Cathy Wissehr, University of Arkansas

1:00 pm - 2:00 pm in Directors - Session B

Preliminary discussion of results from an on-going national study of the content and practices in elementary and secondary preservice science methods classes and the programs that house them.

Format: Individual Paper Presentation  Presider: Heidy Garcia-Moreno
Extending a Hand: Learning to Work With Student Teachers
Rudolf V. Kraus, Rhode Island College
Lesley J. Shapiro, Rhode Island College

1:00 pm - 2:00 pm in Directors - Session C

Cooperating teachers play a key role in mentoring preservice teachers. Yet, the literature contains little about how cooperating teachers learn to mentor. This study examines first-time cooperating science teachers to identify how these cooperating professionals conceptualized and enacted their role during the student teaching semester.

Format: Individual Paper Presentation  Presider: Heidy Garcia-Moreno

Engaging Minoritized Students in STEM Pathways Using Aviation and Computer Modeling
Geeta Verma, University of Colorado Denver
Andrea Burrows, University of Wyoming; Jacqueline Leonard, University of Wyoming; Cara Djonko-Moore, Rhodes College

1:00 pm - 2:00 pm in Frio - Session A

This presentation shares details of a semester long after-school program in a Western state serving 80+ students and 4 teachers. The NSF funded program focused on STEM career explorations for underrepresented elementary-aged students through aviation and aerospace as the real-world connection to STEM applications.

Format: Individual Paper Presentation

Mario T Pickens, Georgia State University

1:00 pm - 2:00 pm in Frio - Session B

The "opportunity gap" in U.S. science education is a significant problem. Using CRT as a theoretical lens and analysis tool, this study seeks to examine the instructional and pedagogical practices of exemplary elementary African American teachers who teach science to African American students. Results from this study show that race does matter.

Format: Individual Paper Presentation
Elementary Teachers’ Portrayals of the Products and Processes of Engineering

*Jacob Pleasants*, Keene State College
*Joanne K Olson*, Texas A&M University; *Iliana De La Cruz*, Texas A&M University

1:00 pm - 2:00 pm in Llano - Session A

In this study, we used the Draw-An Engineer Test (DAET) to analyze changes in teachers’ conceptions of engineering over the course of a PD project. We present a novel method of analyzing teachers’ DAET responses and evidence of its validity. We present positive effects of the project as well as unexpected changes in teachers’ responses.

*Format: Individual Paper Presentation  Presider: Meredith Kier*

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Exploring Factors Related to the Connections Between Science and Engineering Instruction

*Kristina M Tank*, Iowa State University
*Jacob Pleasants*, Keene State College; *Joanne K Olson*, Texas A&M University

1:00 pm - 2:00 pm in Llano - Session B

Integrating science and engineering has many potential benefits, but also presents challenges for teachers. The present study employs a mixed methods multiple case study design to investigate factors related to elementary teachers’ incorporation of engineering into science instruction and the extent to which the teachers connected these two areas.

*Format: Individual Paper Presentation  Presider: Meredith Kier*

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A Reform Without Time: NGSS and Time for Sense-Making in Elementary Classrooms

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

1:00 pm - 2:00 pm in Llano - Session C

This study observed 129 science lessons across 43 school districts. Professional development had a positive impact on many lesson aspects, but time is a limiting factor for sense-making, which was poor for treatment and control groups. Lessons did not engage students in high-quality sense-making unless they had a minimum duration of time.

*Format: Individual Paper Presentation*
Building a New Road for MLL Equity in Science Education: Transforming Science Instruction in Classrooms and Schools.

David Crowther, University of Nevada-Reno
Rita MacDonald, University of Wisconsin-Madison

1:00 pm - 2:00 pm in Mesquite - Session A

This session will share the new NSTA / WIDA collaborative approach to teaching science to multilingual learners, working from a “language in use” perspective within the context of learning science. Participants will learn how to incorporate the new WIDA Language Practices into 3D inquiry-based science instruction.

Supporting Science Learning for English Language Students (ELs)

Judith Morrison, Washington State University
Yuliya Ardasheva, Washington State University; Sarah Newcomer, Washington State University; Lindsay Lightner, Washington State University; Gisela Ernst-Slavit, Washington State University; Kira Carbonneau, Washington State University; Stephen Morrison, Washington State University

1:00 pm - 2:00 pm in Mesquite - Session B

Through exploration of research-based practices used by two fourth-grade teachers to support English Learners’ (ELs) science learning, we provide insights into how these practices advance ELs’ science learning and language development. We also identify instances of practice when strategies may have been underutilized or hindered student learning.

Newcomer Meaning-Making Opportunities in High School Biology Classrooms

Julie C. Brown, University of Florida
Mark B. Pacheco, University of Florida

1:00 pm - 2:00 pm in Mesquite - Session C

This case study examines the ways two high school biology communities of practice afforded and constrained meaning-making opportunities for newcomer English language learners (ELLs). Meaning-making occurred when ELLs negotiated engagement with assistance of home language. Class activities encouraged resource-using, but often without scaffolding.
Supporting Teachers’ Understanding and Use of the NGSS Crosscutting Concepts to Strengthen Three-Dimensional Science Teaching and Learning

Jeffrey Nordine, Leibniz Institute for Science and Mathematics Education
Sarah Fick, University of Virginia

1:00 pm - 3:00 pm in Navarro

Many science teachers struggle to meaningfully incorporate the NGSS crosscutting concepts into their instruction. This workshop shares key outcomes of a recent summit focused on the crosscutting concepts and invites participants to discuss implications for various aspects of research and practice in science teacher education.

Format: Workshop

And Yet, They Persisted: Stories of Experienced Urban STEM Teachers

Helen Meyer, University of Cincinnati
Karen McGarry, University of Cincinnati

1:00 pm - 2:00 pm in Nueces - Session A

We share the stories of several urban STEM teachers, with between ten and thirty years’ experience, who chose to teach in urban secondary schools. We used a narrative inquiry design to develop individual stories, which we supported with additional qualitative data to highlight the common and divergent themes of the teachers’ stories.

Format: Individual Paper Presentation  Presider: Eva Nyutu

Elementary Science Teachers as Epistemic Agents in Responsive Professional Learning

Alison K Mercier, University of North Carolina at Greensboro

1:00 pm - 2:00 pm in Nueces - Session B

Teachers are often treated as “technicians” in professional learning. This case study illuminated how four teachers were positioned as epistemic agents – shaping the knowledge, practices, and learning in their professional learning; and speaks back to the traditional narratives of teachers’ roles in effective professional learning.

Format: Individual Paper Presentation  Presider: Eva Nyutu
**SEPs in RETs: Design and Development of an Observation Protocol**
*Kent J Crippen, University of Florida*
Gayle N Evans, University of Florida; Christine Garand Scherer, University of Florida; Courtney Spillman, University of Florida

1:00 pm - 2:00 pm in Nueces - Session C

Come learn about the design and refinement of an observation protocol for science & engineering practices employed to capture the activities of teachers in a NSF-funded Research Experience for Teachers (RET) site. Where previous RET studies have focused on self reported data, this protocol adds insight to program evaluation and research endeavors.

*Format: Individual Paper Presentation  Presider: Eva Nyutu*

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**The Impact of STEM Mentors in Technology-Driven Socio-Environmental Science Investigations**
*Kate Popejoy, Popejoy STEM LLC*
Alec Bodzin, Lehigh University; Thomas Hammond, Lehigh University; Joan Fu, Lehigh University; William Farina, Lehigh University

1:00 pm - 2:00 pm in Pecan - Session A

We have developed and implemented a geospatial curriculum to promote teachers’ professional growth with curriculum-linked PD to support the adoption of socio-environmental science investigations (SESI) in an urban high school, and also recruited mentors in STEM-related fields who use geospatial technologies in their jobs to work with students.

*Format: Individual Paper Presentation  Presider: Lauren Angelone*

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**Selected Teachers’ Perspectives of Technology Use in Outdoor Education**
*Sarah M Nuss, William & Mary*
Amelia Wildman, William & Mary

1:00 pm - 2:00 pm in Pecan - Session B

The crossroads of increasing technology use with decreasing time spent outdoors is a growing challenge for teachers. In a recent phenomenological study, nine in-service science teachers shared their insights of technology use outdoors, including affordances and constraints, and their technological pedagogical and content knowledge (TPACK).

*Format: Individual Paper Presentation  Presider: Lauren Angelone*
A Technology Enhanced STEAM Module for Early Childhood Preservice Teachers: Expanding Definitions and Building Confidence

Lauren Angelone, Xavier University

1:00 pm - 2:00 pm in Pecan - Session C

The design, implementation, and evaluation of a STEAM module utilizing 3D technology will be shared. The module was used with early childhood preservice teachers to understand and develop their conceptualizations of STEAM education.

Format: Individual Paper Presentation  Presider: Lauren Angelone

Efficacy of Correlated Science & Math PD Program

Sandra S. West, Texas State University
Sandra T. Browning, University of Houston-Clear Lake; Denise B. Kern, Texas State University

1:00 pm - 2:00 pm in Pecos - Session A

This study evaluated the CSM PD model in a program, Mix It Up, for grades 5-8 teacher teams and their principals. Initial results indicate teachers increased their content knowledge; adopted an integrated approach; perceived CSM as being effective for learning the content and language of the other discipline; reported using more integrated lessons.

Format: Themed Paper Set

Laboratory Schools to Support the Preparation of Preservice Science Teachers

Michael R.L. Odell, University of Texas at Tyler
Teresa J. Kennedy, University of Texas at Tyler

2:15 pm - 3:15 pm in Blanco - Session A

Finding high quality placement sites for preservice teachers to observe and practice inquiry-based pedagogies can be challenging. Preservice teachers need the opportunity to practice the teaching strategies in classrooms that engage student in inquiry. This paper describes the role of laboratory schools as an option to support preservice teachers.

Format: Individual Paper Presentation  Presider: Camille Stegman
Science Teacher Talk: Principals’ and Teachers’ Perceptions From the Field

Elana B. Worth, University of Georgia
Julia Przybyla-Kuchek, University of Georgia; Julie A. Luft, University of Georgia; Dorothy Y. White, University of Georgia; Paula Lemons, University of Georgia; Hatice Ozen Tasdemir, University of Georgia; Blake Whitt, University of Georgia

2:15 pm - 3:15 pm in Blanco - Session B

Equitable access to quality science teachers is of great concern in our nation. It is imperative that science teacher education programs reflect on their program structure to ensure future science teachers are well prepared to serve all populations of students. This presentation provides an example of one such reflective exercise.

Format: Individual Paper Presentation  Presider: Camille Stegman

Finding the Courage to Enact Inquiry Teaching: Investigating Wonder and the Leap From Teacher Educator Program to Practice.

Andrew Gilbert, George Mason University

2:15 pm - 3:15 pm in Blanco - Session C

This project highlights how engagement with wonder-infused pedagogy can positively impact pre-service and beginning teachers’ relationship with science and provides a platform for new teachers to enact inquiry approaches in their classrooms.

Format: Individual Paper Presentation  Presider: Camille Stegman

Evaluating Impact of an Online STEM Graduate Program

Mark McDermott, University of Iowa
Jessica Bowden, University of Iowa

2:15 pm - 3:15 pm in Directors - Session A

Online learning opportunities have significantly increased over the past several years. This presentation evaluates the impact of an online graduate program in STEM education. In particular, changes in student perceptions of integrated STEM learning as well as changes in level of interaction in an online environment are measured and discussed.

Format: Individual Paper Presentation  Presider: Felicia Leammukda
Mapping NGSS to College Curriculum: Physical Science DCIs to General Chemistry (I)

James M Nyachwaya, North Dakota State University
Krystal Grieger, North Dakota State University

2:15 pm - 3:15 pm in Directors - Session B

In this study, we looked at whether Disciplinary Core Ideas (and associated standards-NGSS) in high school physical science could potentially equip students with prior knowledge necessary for General Chemistry (I). We mapped DCIs to topics commonly taught in first semester General Chemistry.

Format: Individual Paper Presentation  Presider: Felicia Leammukda

Integrating Computer Science/Computational Thinking Into Science Curriculum Through Music

James Rutter, Haystack Mountain School of Craft
David A Slykhuis, University of Northern Colorado; Jennifer Parrish, University of Northern Colorado

2:15 pm - 3:15 pm in Directors - Session C

This presentation highlights an innovative digital arts STEM & CS/CT curriculum and related assessment.

Format: Individual Paper Presentation  Presider: Felicia Leammukda

The Work and Process of Graduate Student Preparation in Qualitative Research: Methods, Research, and Products

Felicia M Mensah, Teachers College at Columbia University
Alexis Riley, Teachers College at Columbia University; Andrea Horowitz, Teachers College at Columbia University; Leana Peltier, Teachers College at Columbia University; Jacqueline (Jacquie) Moore Hogan, Teachers College at Columbia University

2:15 pm - 3:15 pm in Frio - Session A

This session offers a new format for the conference. Four research papers that use different qualitative approaches are shared and outlines for teaching qualitative research methods are provided. Deliberate attention to graduate student preparation through mentoring and advisement as researchers begins with an engaging curriculum.

Paper #1: Joys and Traumas of Black Female Science Teachers: A Phenomenological Study, Alexis Riley

Paper #2 Using Grounded Theory to Understand the Development of a Social Justice Educator Identity, Andrea Horowitz


Paper #4 Practicing Qualitative Research Methods: Their First Rodeo, Felicia M. Mensah & Jacquie Horgan

Format: Themed Paper Set  Presider: Felicia Moore Mensah
A Duty of Care: Weaving Equity Throughout an Elementary Science Methods Course

Michelle Forsythe, Texas State University

2:15 pm - 3:15 pm in Live Oak - Session A

This syllabus session presents an overview of in-class activities and assignments designed to integrate explorations of equity, including linguistically sustaining and culturally responsive pedagogical practices, across an elementary science methods course.

Utilizing Lesson Study as an Instructional Strategy in an Elementary Science Methods Course

Sandra A Lampley, The University of Alabama in Huntsville

2:15 pm - 3:15 pm in Live Oak - Session B

This presentation is for science teacher educators who are looking for ways to bridge the gap between theory and practice. Participants will learn how to incorporate lesson study, a form of Japanese professional development, in their science methods coursework.

Syllabus Sharing: Elementary Science Content

Erin S Mistry, University of Florida

2:15 pm - 3:15 pm in Live Oak - Session C

In order to expose elementary pre-service teachers to inquiry-based science teaching and constructivist teaching practices, this elementary science content course was developed. Using Banilower et al's (2010) framework for effective science teaching, lesson plans, discussion prompts, assessment outcomes, and Canvas layout will be shared.
From Science to STEM: Introduction to STEM, Engineering Design Process, and Creativity Course Syllabus Part One of the STEM Certification Process

Elizabeth Stretch, University of Minnesota

2:15 pm - 3:15 pm in Live Oak - Session D

One step towards a unified STEM approach is creating coursework for educators, practitioners, and policy makers to have a foundational understanding of STEM pedagogy. This proposed course will explore issues that surround and define integration of STEM that allows participants to leave with efficacy towards STEM integration models and practices.

Format: Syllabus Sharing

Science Teacher Professional Development

Thu, January 09

Impact of a Science Endorsement Program on Content Knowledge and Curricular Decision-Making

Brendan E Callahan, Kennesaw State University
Michael Dias, Kennesaw State University; Anna M Arias, Kennesaw State University

2:15 pm - 3:15 pm in Llano - Session A

The Next Generation Science Standards places an emphasis on scientific processes. We discuss the results of a two year long professional development course that led to inservice elementary teachers receiving a science endorsement. We focus on content knowledge and curricular decision-making in implementing science and engineering practices.

Format: Individual Paper Presentation  Presider: Lenora Crabtree

Science Teacher Professional Development

Thu, January 09

Elementary Teachers Developing Perceptions of the Role of Representations in Teaching Science

Meredith Park Rogers, Indiana University - Bloomington
Celeste Nicholas, Indiana University – Bloomington; Joshua Danish, Indiana University – Bloomington; Alex Gerber, Indiana University – Bloomington; Jessica McClain, Indiana University – Bloomington; Andrea Phillips, Indiana University – Bloomington; Christina Stiso, Indiana University – Bloomington; Qiu Zhong, Indiana University - Bloomington

2:15 pm - 3:15 pm in Llano - Session B

In this presentation we share the findings from the first year of the design-based research PD project, in which we seek to learn how teachers’ perceptions about the use of representations in their science teaching develop over the course of one year. Changes in teachers perceptions of what representations are and their use are discussed.

Format: Individual Paper Presentation  Presider: Lenora Crabtree
**Science Teacher Professional Development**
**Thu, January 09**

**Engineering the Mindsets of Veteran Science and Mathematics Teachers Who Are Learning How to Integrate Design Into Standards-Driven Instruction**
*Meredith W Kier, William and Mary*
*Kelly G Leffel, William and Mary; Patrick G Hardner, Wiliam and Mary; Lauren A Grob, William and Mary; Adrian W Bruce, Howard University; Deena Khalil, Howard University*

2:15 pm - 3:15 pm in Llano - Session C

This study describes the experiences of middle school math and science teachers who learned how to integrate culturally relevant engineering design tasks into their lessons. Teachers scaffolded engineering for students with limited structural and economic support by interdisciplinary collaborations and building relationships with students.

*Format: Individual Paper Presentation  Presider: Lenora Crabtree*

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**Thu, January 09**

**The Integration of Disciplinary Literacy in an Elementary Science Methods Course: An Innovative Model for Strategic Collaborations Between Science Education and Literacy Faculty**
*Su Gao, Vassiliki ("Vicky") I Zygiouris-Coe, University of Central Florida; Rebeca A Grysko, University of Central Florida; Regina P McCurdy, University of Central Florida; Katherine Grady, BSCS Science Learning*

2:15 pm - 3:15 pm in Mesquite - Session A

This proposal examines the process of developing an innovative elementary science methods course model through collaboration between science education and literacy faculty. It includes implementation, results, and lessons learned. Results show the benefits of using disciplinary literacy to support preservice teachers’ preparation in science.

*Format: Individual Paper Presentation  Presider: Anne Gatling*

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**Preservice Science Teacher Preparation**
**Thu, January 09**

**(Program Pseudonym): A New Vision for Coherent Science Teacher Preparation**
*Betty Stennett, BSCS Science Learning*
*Connie Hvidsten, BSCS Science Learning; Abraham S Lo, BSCS Science Learning; David Slykhuis, University of Northern Colorado*

2:15 pm - 3:15 pm in Mesquite - Session B

Learn about an innovative research-based project to bring coherence to science teacher preparation from science content courses, to science education instruction, to practicum placements. We will present findings from Phase 1 of the project—creating a common vision and purpose among science faculty, education faculty, and cooperating teachers.

*Format: Individual Paper Presentation  Presider: Anne Gatling*
Supporting Interdisciplinary Teaching in a STEM Methods Course

John L Pecore, University of West Florida
Jill A Cochran, Berry University

2:15 pm - 3:15 pm in Mesquite - Session C

The science education community advocates for an interdisciplinary approach to STEM teaching and to solve future complex problems that will require an integration of STEM disciplines. This presentation provides a forum to discuss opportunities and challenges of a STEM methods course fostering interdisciplinary STEM teaching and learning.

Format: Individual Paper Presentation  Presider: Anne Gatling

An Exploratory Examination of High School Teachers’ and Students’ Perspectives and Experiences With a Novel Curriculum Integrating Earth Science and Chemistry

Kevin J Fleming, The George Washington University
Jonathon Grooms, The George Washington University; Alan Berkowitz, Cary Institute of Ecosystem Studies; Mary Ellen Wolfinger, The George Washington University; Bess Caplan, Cary Institute of Ecosystem Studies

2:15 pm - 3:15 pm in Nueces - Session A

This study examines teachers’ and students’ perspectives and experiences with a novel curriculum’s implementation, which identified synergies and tensions between teachers and students that can be utilized to further support implementation and teacher professional learning leading to sustainable reform in curriculum and instruction.

Format: Individual Paper Presentation  Presider: Mandy McCormick Smith

Helping Students Make Connections in Science Class: Lessons Learned From the TIMSS 1999 Video Study

Tiffany-Rose Sikorski, The George Washington University
Alexandra Straus

2:15 pm - 3:15 pm in Nueces - Session B

This session focuses on helping students make connections between ideas in science class. We show video examples of students noticing inconsistencies, suggesting relationships between ideas, and identifying gaps in explanations, and discuss what features of the lesson supported those efforts. The session is designed for teacher educators.

Format: Individual Paper Presentation  Presider: Mandy McCormick Smith
Engaging and Managing a Large Class With Active Learning Methods

*Kate Walker*, University of Arkansas
*Bill McComas*, University of Arkansas

2:15 pm - 3:15 pm in Nueces - Session C

Learn how qualitative research supports student perceptions of engagement and content retention through active learning techniques targeting the kinesthetic domain along with discussion, and problem-based learning. We will discuss how instructors and methods instructors can use such strategies for large group high school class instruction.

*Format: Individual Paper Presentation  Presider: Mandy McCormick Smith*

Meet the Innovations Editors

2:15 pm - 3:15 pm in Pecan

Guiding Lights: An Innovative Classroom Light System for Knowing When to Chase Aurora.

*Richard P Hechter*, University of Manitoba

2:15 pm - 3:15 pm in Pecos - Session A

“How do I know when to go outside to see the aurora?” This popular question inspired us to innovate a Wi-Fi based LED light system that flickers when auroral manifestation is probable. Come hear how we innovated the light system, and how it attracted people outside our class to drop in to inquire about the lights, curriculum, and the aurora!

*Format: Exploratory Session*

After Design Testing and Failure, Then What? Using Elementary Student Avatars to Practice Teaching a Post-Testing Engineering Argumentation Discussion

*Pamela S. Lottero-Perdue*, Towson University
*Jamie N. Mikeska*, ETS

2:45 pm - 4:45 pm in Seguin

Participants will consider how teachers can use a simulated classroom of student avatars to practice facilitating a post-testing engineering argumentation discussion. Session goals include discussion about how best to support teachers in engaging students in argumentation and in addressing design failure analysis and improvement during instruction.

*Format: Workshop*

Coffee Break

3:15 pm - 3:45 pm
Preservice Science Teacher Preparation
Thu, January 09

Knowledge and Practice for Teaching Scientific Explanations: From Physics for Educators to Science Methods
Heidi L. Masters, University of Wisconsin - La Crosse
Jennifer L. Docktor, University of Wisconsin - La Crosse

3:45 pm - 4:45 pm in Blanco - Session A

We explored prospective teachers’ abilities to construct scientific explanations and support children with this practice. Findings show those who receive explanation instruction in physics for educators along with their science methods course construct more accurate scientific explanations and provide children better support with this practice.

Format: Individual Paper Presentation  Presider: Helen Douglass

Preservice Science Teacher Preparation
Thu, January 09

Asking Questions: An Exploratory Study of Preservice Teachers’ Framing of Classroom Science Investigations
akarat tanak, Kasetsart University
Deborah Hanuscin, Western Washington University

3:45 pm - 4:45 pm in Blanco - Session B

We conducted an exploratory study of preservice teachers’ use of questions to frame investigations. We found few explanatory-type questions that could be used to drive an investigations or that model for students what makes a ‘good’ question to investigate. We argue that this contributes to the problem of ‘final form science’ or ‘data as answers.’

Format: Individual Paper Presentation  Presider: Helen Douglass

Science Teacher Professional Development
Thu, January 09

Impact of a Practiced-Based Professional Development on Secondary Science Teachers’ Use of Disciplinary Literacy Practices
Jeff D Thomas, Central Connecticut State University
Sally V Drew, Central Connecticut State University

3:45 pm - 4:45 pm in Directors - Session A

A design-based research project investigated the context/impact of a PD that introduced secondary science teachers to pedagogical shifts required for implementation and synergy among disciplinary literacy (DL) components of NGSS and CCSS-ELA. Teachers use of DL practices significantly improved—factors that influence this change will be shared.

Format: Individual Paper Presentation  Presider: James Nyachwaya
Implementing and Evaluating a Science and Literacy Instruction Model Designed to Support Academic Language Acquisition for English Leaners and Economically Disadvantaged Students.

Julie K. Jackson, Texas State University

3:45 pm - 4:45 pm in Directors - Session B

This study evaluated a science and literacy instructional model aimed at helping English learners and economically disadvantaged fifth grade students. Difference-in proportions tests determined if students showed gains on a high-stakes test. This study found statistically significant results with medium to large effect sizes at both campuses.

Cross-Disciplinary Faculty PLC to Support STEM PD

Amanda M Gunning, Mercy College
Elena Nitecki, Mercy College; Meghan E Marrero, Mercy College; Latanya Brandon, Mercy College; Brian Baldwin, Kean University

3:45 pm - 4:45 pm in Directors - Session C

Exploring faculty professional learning communities (PLC) made up of STEM and education faculty can be an avenue for developing rigorous STEM teacher education courses. In this study, faculty PLC meetings focused on improving a new course: Enhancing Mathematics with STEM for K-12 teachers of math and science.

3MT - Graduate Student Paper Competition

Shana Lee,
Leiflyn Gamborg, Melanie Kinskey, Kathryn Green

3:45 pm - 4:45 pm in Frio

The ASTE Graduate Student Forum is pleased to offer its third annual Three-Minute Thesis (3MT) competition at ASTE 2020. The 3MT competition has been held at universities worldwide and celebrates exciting research conducted by doctoral students. Ph.D. and Ed.D. students will concisely describe their dissertation work in three minutes and in one PowerPoint slide for a panel of judges. The winner will receive free registration to ASTE 2021. The GSF leadership team invites everyone at ASTE 2020 to witness this exciting event and help encourage graduate student involvement with ASTE.
Aqua(pH)onics: Development, Implementation, and Analysis of a STEM Curriculum Unit for High School Chemistry

Benny Mart R Hiwatig, University of Minnesota - Twin Cities
Khomson Keratithamkul, University of Minnesota - Twin Cities; Gillian H Roehrig, University of Minnesota - Twin Cities

3:45 pm - 4:45 pm in Live Oak - Session A

This seminal work is based on the need for an exemplar of STEM integration in high school education. A STEM curriculum unit for high school Chemistry was developed which features tabletop aquaponic farming as a real-world context to teach acid-base reactions, pH concept, and buffers to students.

Format: Small Group Roundtables

Middle School Science Teachers’ Experience With Computational Thinking in an RET

Stephanie B Philipp, University of Tennessee at Chattanooga
Olfa Nasraoui, University of Louisville; Jason Immekus, University of Louisville

3:45 pm - 4:45 pm in Live Oak - Session B

The experiences of two middle grades science teachers in a Research Experience for Teachers program focusing on Big Data and data science will be shared. Support for translating their research experience using the practice of mathematical and computational thinking resulted in teachers developing multi-dimensional curriculum materials.

Format: Small Group Roundtables

Climate Change and Population Control: Cross Disciplinary Curriculum Models for K-12 Education

Puneet S Gill, Texas A&M International University

3:45 pm - 4:45 pm in Live Oak – Session C

This presentation will argue change, especially in high fertility countries, can occur when comprehensive sex education and climate change education are taught as cross disciplinary curriculum models to create an actionable model for future population issues.

Format: Small Group Roundtables
Choosing Physics Teaching: Influencing Factors

Lauren Madden, The College of New Jersey
Susan Eriksson; Nathan Magee, The College of New Jersey; Desaree’ Vaughan, The College of New Jersey; Melissa Chesser, The College of New Jersey; Marissa Bellino, The College of New Jersey; AJ Richards, The College of New Jersey

3:45 pm - 4:45 pm in Llano - Session A

In response to the physics teacher shortage, this study seeks to understand reasons for choosing to teach physics using interviews with physics faculty and preservice physics teachers and a survey given to physics majors. The study provides multiple perspectives on choosing to teach physics and insights for physics teacher recruitment.

Format: Individual Paper Presentation  Presider: Lisa McDonald

Teacher Preparation and Teacher Communities of Practice

Michael E Beeth, University of Wisconsin Oshkosh
Rebecca Konz, University of Minnesota; Margaret Mohr-Schroeder, University of Kentucky; Samuel J Polizzi, Middle Tennessee State University; Gillian Roehrig, University of Minnesota; Gregory T Rushton, Middle Tennessee State University; Keith Sheppard, Stony Brook University; Brandon Ofem, University of Missouri – St. Louis

3:45 pm - 4:45 pm in Llano - Session B

This study investigated five National Science Foundation supported Noyce projects operating for a decade or more. Program features common to separate projects were interpreted through the lens of Communities of Practice. The benefits of incorporating Communities of Practice into mathematics and science teacher preparation programs are discussed.

Format: Individual Paper Presentation  Presider: Lisa McDonald

An Analysis of Research on Out-of-Field Teaching, With a Focus on Science Education

Harleen Singh, University of Georgia
Julie Luft, University of Georgia; Elana Worth, University of Georgia

3:45 pm - 4:45 pm in Llano - Session C

The review of literature on OOF teaching in science will help science teacher educators understand the phenomenon of OOF teaching, and its implications for science teacher education. It will help chart a course of research specific to OOF teaching in science education and help better prepare and support future science teachers at the K-12 level.

Format: Individual Paper Presentation  Presider: Lisa McDonald
**Preservice Science Teacher Preparation**  
**Thu, January 09**

**Evaluating Preservice Science Teachers Using a Faculty-Developed Observation Rubric**

*Julie Contino, Richard Gilder Graduate School/American Museum of Natural History*  
*Elaine V. Howes, Richard Gilder Graduate School/American Museum of Natural History; Natasha Cooke-Nieves, Richard Gilder Graduate School/American Museum of Natural History*

3:45 pm - 4:45 pm in Mesquite - Session A

Attendees will be introduced to a preservice science teaching observation rubric co-developed by MAT Program faculty and learn about the development process. They will watch video and use this rubric to evaluate a preservice teacher’s instruction. Additionally, best practices, future plans, and applications to home institutions will be discussed.

*Format: Exploratory Session*

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**Thu, January 09**

**Meet the JSTE Editors**

3:45 pm - 4:45 pm in Nueces

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**Equity and Diversity**  
**Thu, January 09**

**Designing for Critical Consciousness in Science Teacher Education**

*Lenora M. Crabtree, University of North Carolina Charlotte*

3:45 pm - 4:45 pm in Pecan - Session A

This presentation describes Design-Based Research and in-service science teacher education promoting critical consciousness. Findings reveal that exploring science content through critical pedagogies promotes critical consciousness development and science teaching for equity and social justice.

*Format: Individual Paper Presentation*  
*Presider: Jeanna Wieselmann*

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**Equity and Diversity**  
**Thu, January 09**

**“They Don’t Know How Much Work We Put Into Build These Kids!”: Counterstories of the Positional Identities of Black Science Teachers and Their Perceived Science Teaching Practices**

*Sonia M Howard, Georgia State University*  
*Natalie S. King, Georgia State University*

3:45 pm - 4:45 pm in Pecan - Session B

In this presentation, I discuss my research on how Black science teachers construct their positional identities, the implication of their constructions on how they perceived their work, and the larger implications of their constructions and perceptions to how Black science teachers are positioned in the canon of science teacher education research.

*Format: Individual Paper Presentation*  
*Presider: Jeanna Wieselmann*
The Impact of Induction on Aspects of Culturally Responsive Instruction

Zachary A Stepp, University of Florida
Julie C Brown, University of Florida

3:45 pm - 4:45 pm in Pecan - Session C

We report the impact of an induction course on science teachers’ culturally responsive instruction. Results show increases in practices including family collaborations, sociopolitical consciousness, and diverse perspective-taking. Offering students activity choices decreased. Classroom relationships and discourse-enhancing instruction were stable.

Format: Individual Paper Presentation  Presider: Jeanna Wieselmann

Understanding the Natures of Science, Technology, and Engineering: The Central Aim of STEM Education

Michael P. Clough, Texas A & M University

3:45 pm - 4:45 pm in Pecos - Session A

STEM education, as opposed to a mere STEM training, entails understanding the natures of the disciplines. Such understanding is crucial for informed decision-making regarding many personal and societal issues, but also for informed career choices. Rationales, strategies and resources for science teacher education efforts will be presented.

Format: Individual Paper Presentation  Presider: Natalie King

Community-Based Conceptual Framework for STEM Integration

Felicia Dawn Tibayan Leammukda, 1974
Gillian Roehrig, University of Minnesota

3:45 pm - 4:45 pm in Pecos - Session B

There has been an urgent call to improve K-12 STEM education. The study introduces a framework for STEM integration that works to foster STEM interest in a broader population of students and promotes STEM-literacy for all. This framework incorporates cultural relevance, inclusiveness, and community wealth building through community engagement.

Format: Individual Paper Presentation  Presider: Natalie King
“Beyond an Acronym, STEM Is...”: Perceptions of STEM and STEM Education

Shannon L Navy, Kent State University
Fatma Kaya, Kent State University; Brian Boone, Kent State University; Christine Brewster, Kent State University; Kelly Calvelage, Kent State University; Tanzimul Ferdous, Kent State University; Ebony Hood, Laura Sass, Kent State University; Maggie Zimmerman, Kent State University

3:45 pm - 4:45 pm in Pecos - Session C

STEM is at the forefront of many educational initiatives. However, little is known about perceptions of STEM. Therefore, this study investigated 164 preservice teachers’, inservice teachers’, administrators’, informal educators’, and STEM professionals’ perceptions of STEM, STEM education, STEM support, and STEM careers.

Format: Individual Paper Presentation  Presider: Natalie King

Thu, January 09

Break
4:45 pm - 5:00 pm

Thu, January 09

Regional Meetings
5:00 pm - 6:00 pm
Northwest - Blanco
International - Directors
Northeast - Frio
North Central - Live Oak
Mid-Atlantic - Llano
Southeast - Mesquite
Far West - Nueces
Southeast - Pecan
Southwest - Pecos

Thu, January 09

Social
6:00 pm - 8:00 pm in Regency Ballroom

Fri, January 10

Breakfast on Your Own
7:00 am - 8:30 am

Fri, January 10

Registration
7:00 am - 4:00 pm in Lobby
Challenges Experienced by Elementary Preservice Teachers While Facilitating Socioscientific Issues

Melanie E Kinskey, University of South Florida
Dana L Zeidler, University of South Florida

8:30 am - 9:30 am in Blanco - Session A

This study explores the challenges experienced by four elementary preservice teachers as they develop socioscientific issues lessons and facilitate those lessons to elementary students during their internship.

Format: Individual Paper Presentation  Presider: Mark Andrew Bloom

Pre-Service Teacher’s Challenges Perceiving and Successfully Implementing the Engage Phase of the 5E Inquiry Model

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

8:30 am - 9:30 am in Blanco - Session B

This qualitative research study investigates pre-service teachers understanding of the Engage phase of the 5E inquiry model. We used PSTs 5E inquiry-based lesson plans and peer teaching sessions as data sources. The results indicated that PSTs struggled planning an engage phase, asking good questions, and engaging the students through videos.

Format: Individual Paper Presentation  Presider: Mark Andrew Bloom

Elementary Pre-Service Teachers’ Use of the Crosscutting Concepts in Adapting Science Lessons

Carrie-Anne Sherwood, Southern Connecticut State University

8:30 am - 9:30 am in Blanco - Session C

This study contributes to a currently-inadequate body of research on the crosscutting concepts (CCCs) by examining the ways in which elementary pre-service teachers purposefully adapted curricular materials and used CCCs in their planning for “three-dimensional” instruction aligned with the vision of the NGSS.

Format: Individual Paper Presentation  Presider: Mark Andrew Bloom
3DLA: Three Dimensional Learning Architecture Instructional Planning Tool

Susanna Hapgood, University of Toledo
Grant Wilson, University of Toledo; Jeanna Heuring, University of Toledo; Charlene Czerniak, University of Toledo

8:30 am - 10:30 am in Chula Vista

Workshop participants use “Three Dimensional Learning Architecture” (3DLA) tools to unpack NGSS performance expectations and collaboratively plan 3D science and/or engineering experiences. Debriefing discussions focus on participants’ 3DLA experiences and ways to scaffold the use of 3DLA with teacher candidates and practicing educators.

Format: Workshop

The History of the Experiment and Its Implications for Science Teaching and Learning

Sarah J Reynolds, University of Indianapolis

8:30 am - 9:30 am in Directors - Session A

Drawing on my historical research into the development of laboratory-based science education in 19th-century United States, I will highlight some of the diverse approaches used and aspects debated by scientists and educators as they first incorporated inquiry and experimentation into formal science education and discuss the implications for today.

Format: Individual Paper Presentation  Presider: Bridget Mulvey

Nature of Science in a Special Education Context: Conceptions and Instructional Practices of Preservice Special Education Teachers

MilaRosa L Librea-Carden, Far Eastern University
Bridget K Mulvey, Kent State University; Lisa A Borgerding, Kent State University

8:30 am - 9:30 am in Directors - Session B

The study examined 18 preservice special education (SPED) teachers’ Nature of Science (NOS) conceptions, plans and implementations of NOS lessons. Findings suggest that SPED teachers consider NOS to be relevant to students with special needs given their unique ideas and different ways of thinking, therefore supporting their science instruction.

Format: Individual Paper Presentation  Presider: Bridget Mulvey
**History, Philosophy, and Nature of Science**

**Fri, January 10**

**Understanding of Evolution Laws and Approaches to Teaching Evolution Among K-12 Public School Teachers**

*Ronald S Hermann, Towson University*

*Ian C Binns, UNC-Charlotte; Lee Meadows, University of Alabama-Birmingham; Joseph W Shane, Shippensburg University*

8:30 am - 9:30 am in Directors - Session C

In this session we describe a study exploring K-12 public school teachers’ approaches to teaching evolution, views of evolution and creation, and knowledge of past legal cases. Findings include teachers’ understanding of evolution laws, views of evolution and religion, approaches to teaching evolution, and time devoted to teaching evolution.

_Format: Individual Paper Presentation  Presider: Bridget Mulvey_

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**Preservice Science Teacher Preparation**

**Fri, January 10**

**Preservice Elementary Teachers’ Science Teacher Self-Images: Influence of Science Learning and Teaching Experiences**

*Saiqa Azam, sazam@mun.ca*  
*Deepika Menon, Towson University*

8:30 am - 9:30 am in Frio - Session A

This mixed methods research investigated changes in preservice elementary teachers’ self-images during their participation in a science methods course. The findings indicated preservice teachers’ beliefs and self-images were linked to their personal histories and developed as they participated in a science methods course.

_Format: Individual Paper Presentation  Presider: Brenda Carpenter_

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**Preservice Science Teacher Preparation**

**Fri, January 10**

**Science Teacher Identity Survey: A Validation Study**

*Erin S Mistry, University of Florida*

8:30 am - 9:30 am in Frio - Session B

In science education, there is a need for a survey instrument to measure science teacher identity. In this presentation, the Science Teacher Identity Survey (STIS) development is addressed along with the results of the pilot study, which suggest the instrument may be a useful tool for science teacher identity research and teacher education.

_Format: Individual Paper Presentation  Presider: Brenda Carpenter_
Learning to Teach Science: Development of Two Preservice Teachers' Science Teaching Identity

Deepika Menon, Towson University
Saiqa Azam, Memorial University of Newfoundland

8:30 am - 9:30 am in Frio - Session C

This study utilizes a case-study research design to examine preservice teachers’ development of science teacher identity in light of formal K-12 science and informal experiences, and college science methods course and field experiences. The results of the study and implications for preservice teacher education will be discussed.

Format: Individual Paper Presentation  Presider: Brenda Carpenter

Cultivating Solutions for Science Teacher and Teacher Educator Preparation in a Developing Community of Practice

Jessica Riccio, Teachers College, Columbia University
Kristen Larson, Teachers College, Columbia University; Lisa Neesemann, Teachers College, Columbia University; Jennifer Passero, Teachers College, Columbia University; Cole Entress, Teachers College, Columbia University; Ava Javid, Teachers College, Columbia University

8:30 am - 9:30 am in Live Oak - Session A

In this session, we present the ways preservice student teachers are supported through embedded mentorship and scholarship in our preservice science education program. Our team will highlight novel ways to add value to traditional teacher education in the current climate of limited funding and increased focus on accountability.

Format: Small Group Roundtables

Maintaining Balance Between Pedagogy and Practice for Secondary Science and Mathematics Preservice Teacher Education

Kristen Apraiz, University of Florida
Gayle Evans, University of Florida

8:30 am - 9:30 am in Live Oak - Session B

Join us in a journey of program development & innovation seeking balance between pedagogy and practice through all phases of secondary science and math teacher preparation. We invite teacher educators to share results of engaging in cycles of reflection & revision around every aspect of our program, and to learn about what others are doing.

Format: Small Group Roundtables
Preservice Teacher Scripts and Counterscripts on Diversity

Seema Rivera, Clarkson University
Kathleen Kavanagh, Clarkson University; Jan DeWaters, Clarkson University; Benjamin Galluzzo, Clarkson University; Michael Ramsdell, Clarkson University

8:30 am - 9:30 am in Live Oak - Session C

Preservice teachers must address their biases, views, and attitudes about diversity so they understand how it is connected to social justice. The study is expected to support the idea that counter scripts developed in a third space can help preservice teachers challenge traditional scripts regarding diversity and social justice.

Format: Small Group Roundtables

Using Place-Based Learning to Engage Pre-Service Teachers in Teaching Beyond the Test

Robbie Higdon, James Madison University
Cindy Klevickis, James Madison University

8:30 am - 9:30 am in Live Oak - Session D

Many PK-6 science courses focus on covering content rather than developing student conceptual understanding. However, this approach can foster teaching science as merely imparting facts. Incorporating place-based learning in these PK-6 courses allows students to apply factual knowledge within a relevant context to promote conceptual understanding.

Format: Small Group Roundtables

Analyzing the Development of Science and Mathematics Teachers’ Maker-Centered Philosophy and Instructional Practices

Shelly R. Rodriguez, The University of Texas, Austin
Shaunna Smith, University of Hawai‘i – Manoa; Hannah Brooks, Corvian Community High School

8:30 am - 9:30 am in Llano - Session A

Making as an educational tool provides a way to learn through the creation of meaningful products. This study examines portfolios produced by 12 preservice and induction STEM teachers engaged in a maker-centered micro-credentialing program to explore how they take up and implement their maker philosophies in the secondary classroom setting.

Preparing Preservice Teachers to Teach Integrated STEM
Brandon T Aigner, Ohio State University
8:30 am - 9:30 am in Llano - Session B
This presentation outlines the development and outcomes associated with an integration-focused STEM elective course for preservice teachers, combining theoretical knowledge, foundational experiences, and guided practice. Results include a new framework designed to structure preservice teacher education towards the many meanings of integrated STEM.


STEM-Gineering Science Identity, Science Literacy, and Science Self-Efficacy of Elementary Pre-Service Teachers Through a University/School Immersion Partnership
Melisa (Lisa) Fowler, The University of Alabama
Elizabeth Wilson, The University of Alabama Kantrele King, The University of Alabama
8:30 am - 9:30 am in Llano - Session C
The model described in this presentation attempts to address the problem of the provision of quality field-experiences in elementary science for pre-service elementary teachers, through a school/community immersion program. STEM methodology was utilized in a community-based setting, and science identity and science self-efficacy were explored.

Format: Individual Paper Presentation

Addressing the Gap of Informal Science Field Experiences in Science Methods Courses
Christina L McDaniel, Bradley University
Colton Wilder, Bradley University; Courtney Baxter, Peoria Playhouse
8:30 am - 9:30 am in Mesquite - Session A
Providing quality experiences for preservice teachers continues to challenge teacher education programs. Preservice teachers in science education programs often lack in quality of experience with Informal Science Education. This research focused on addressing the gap in field experiences with Informal Science Education in science methods courses.

Format: Individual Paper Presentation  Presider: Brendan Callahan
Bridging Formal and Informal Place-Based SSI Learning Contexts: Promoting 4th Graders’ NOS and Environmental Views

Benjamin C Herman, University of Missouri
Sarah Poor, University of Missouri; Tanner Oertli, University of Missouri; Kristen Schulte, Missouri River Relief; Blake Romaker, University of Missouri

8:30 am - 9:30 am in Mesquite - Session B

This investigation explored how place-based instruction focused on Missouri River SSI bridged the gap between informal field trip and formal classroom educational contexts and impacted fourth graders’ NOS views and pro-environmental perspectives.

Format: Individual Paper Presentation  Presider: Brendan Callahan

Recruiting, Preparing, and Retaining STEM Teachers for Public Schools

Maria S. Rivera Maulucci, Barnard College, Columbia University
Lisa N. Edstrom, Barnard College, Columbia University; Adam Stefanile, Teachers College, Columbia University; Alanna Gibbons, Teachers College, Columbia University; Lisa McDonald, Teachers College, Columbia University; Shane E. Coleman, Teachers College, Columbia University

8:30 am - 9:30 am in Nueces - Session A

We explore recruiting, preparing, and retaining STEM teachers for high-need public schools. A key premise is that effective teacher preparation requires immersive teaching experiences with high-need public school students and specific attention to developing teachers’ sociocultural awareness and affirming attitudes towards students and families.

Format: Themed Paper Set

The Role of Caring in the Inclusion of Student Voice in High School Science Classrooms

Katie Laux
Allan Feldman

8:30 am - 9:30 am in Pecan - Session A

The purpose of this research was to explore the influence of caring for students on the importance high school science teachers place on the inclusion of student voice. Findings indicated that teachers who cared for their students were more willing to incorporate their students’ voices into the high school science classroom.

Format: Individual Paper Presentation  Presider: Jennifer Parrish
Tapping the Views of Middle School Teachers: Equitability and Culturally Relevant Science Teaching in an Era of Reforms in Science Education

Rose M. Pringle, University of Florida
Christine G. Lord, University of Florida

8:30 am - 9:30 am in Pecan - Session B

We examine teachers’ perspectives about diverse learners. Diverse students continue to be grossly underserved in science classrooms. The education system remains inequitable and some teachers’ beliefs about their students are hindrances to their conceptualization of the richness diverse learners can offer in the process of their science learning.

Format: Individual Paper Presentation  Presider: Jennifer Parrish

An Exploratory Session of Science-Specific Computational Thinking Skills

Leslie A. Suters, Tennessee Technological University
Andrea Henrie, Vanderbilt University

8:30 am - 9:30 am in Pecos - Session A

Current standards for science emphasize the importance of teaching all children computational thinking skills. These skills are important for preparing citizens that are STEM-literate and participation in a society that is rapidly changing with emerging technologies. Explore science-specific computational thinking strategies during this session.

Format: Exploratory Session

It's Still Debatable! Using Socioscientific Issues (SSI) in Elementary Science Methods and PD Courses to Promote K-5 Scientific Literacy

Sami Kahn, Princeton University

8:30 am - 10:30 am in Navarro

During this interactive workshop, participants will use real-world, scientifically-related societal issues, or Socioscientific Issues (SSI), as the context for advancing scientific literacy, moral development, social/discourse skills, and interdisciplinary content integration in diverse elementary classrooms through science teacher education.

Format: Workshop
Fri, January 10

Successful Grant Writing
Mary M Atwater, University of Georgia
Malcolm B. Butler, University of Central Florida; Rhea Miles, East Carolina University

8:30 am - 10:30 am in Seguin

ASTE members who are doctoral students near the end of their studies, assistant and associate professors, and informal science educators will desire to participate in this two-hour beginning and intermediate level grant-writing workshop. The workshop will focus on writing and submitting proposals to NSF, NIH, and private foundations.

Format: Workshop

Fri, January 10

Exhibitors

9:00 am - 5:00 pm in Regency Foyer

Fri, January 10

Break

9:30 am - 9:45 am

Fri, January 10

Science Teacher Professional Development

Elementary Teachers’ Mental Images of Engineers at Work
Rebekah Hammack, Montana State University
Toni Ivey, Oklahoma State University; Juliana Utley, Oklahoma State University

9:45 am - 10:45 am in Blanco - Session A

This research explores in-service elementary teachers’ mental images of the work of engineers and their use of mathematics and science. Data were collected at multiple time points before, during, and after a multiple day engineering-focused professional development.

Format: Individual Poster Presentation  Presider: Robbie Higdon

Student Learning P-12

Fri, January 10

The Effects on Students and Their Teacher of Authentic Research in Collaboration With a University Research Team on the Design and Use of Biosand Filters
Allan Feldman, University of South Florida
Jawaher A Alsultan, University of South Florida; Madison Rice, University of South Florida; Michelle Henderson, University of South Florida; Sarina Ergas, University of South Florida; Kebreab Ghebre michael, University of South Florida

9:45 am - 10:45 am in Blanco - Session B

This study examined a collaboration of a university team of researchers and a science teacher to engage Latino/a students in authentic science research on the design and use of biosand filters to clean water. The teacher and students learned how to engage in the practices of science, the need and use of the filters, and the science behind them.

Format: Individual Paper Presentation  Presider: Robbie Higdon
Investigating the Impact of the Use of Explicit Drawing Instruction in an Elementary Multimodal Science Unit: Year 1 vs. Year 2
Leslie U Bradbury, Appalachian State University
Rachel E. Wilson, Appalachian State University

9:45 am - 10:45 am in Directors - Session B

We focus on the results of a multi-year study of science learning within an elementary multimodal unit on plant structure and function. We will describe the impact of explicit instruction on the use of drawing as a mode of communication. There was a change in student learning based on drawing instruction and an additional modeling activity.

Format: Individual Paper Presentation  Presider: Michelle Forsythe

What We Know: Young Children and Scientific Curiosity
Morgan Stewart-Kim, 9:45 am - 10:45 am in Directors - Session C

With a lack of research on scientific curiosity in 5-7 year olds, this session will present the results and findings of a dissertation study. An overview of curiosity research, data, analysis, and themes of scientific curiosity will be presented and the session will conclude with main themes that emerged.

Format: Individual Paper Presentation  Presider: Michelle Forsythe

Innovative Signature Field Experiences for Pre-Service STEM Teachers
Melissa K Demetrikopoulos, Institute for Biomedical Philosophy
John L Pecore, University of West Florida; Jil A Cochran, Berry College; Natalie S King, Georgia State University; Brendan E Callahan, Kennesaw State University

9:45 am - 10:45 am in Frio - Session A

Science teacher education needs to expand opportunities for authentic field experiences. Unique field experiences for pre-service STEM teachers are designed to meet the needs of the larger communities that they serve. Attendees will obtain information about varied approaches to providing field experiences within specific educational contexts.

Format: Themed Paper Set
Preservice Elementary Science Teachers’ Shift From Learner to Teacher of Engineering Design-Based Science Teaching

Brenda Capobianco, Purdue University  
Jeffrey Radloff, Purdue University

9:45 am - 10:45 am in Live Oak - Session A

The goals of this presentation are two-fold: 1) to share an innovative approach to teaching science through engineering design in elementary science methods and 2) to illustrate how the teacher as learner framework justifies elementary preservice teachers’ construction of new knowledge of engineering and engineering design-based science teaching.

Format: Small Group Roundtables

Exploring BBC Micro:Bits As a Tool for Improving Elementary Pre-Service Teacher STEM Preparation and Science Teaching Self-Efficacy

Tammera Mittlestet, University of Nebraska-Lincoln  
Julie Thomas, University of Nebraska-Lincoln; Erin Ingram, University of Nebraska-Lincoln

9:45 am - 10:45 am in Live Oak - Session B

BBC Micro:bits helped researchers explore the malleability of elementary preservice science teachers (PSTs) science teaching self-efficacy. Phase I results pointed to novel advantages of the BBC Micro:bits tool and provided opportunity to consider the ways STEM integrated technologies might positively influence PST’s science efficacy beliefs.

Format: Small Group Roundtables

Schoolyard Pedagogy: Engaging Preservice Teachers in Outdoor Learning Experiences

Kelly Feille, University of Oklahoma  
Stephanie Hathcock, Oklahoma State University

9:45 am - 10:45 am in Live Oak - Session C

Schoolyard pedagogy involves learning experiences beyond the walls of the classroom. This roundtable will describe the schoolyard pedagogy framework of development through the lens of methods courses at two universities, which have been designed to showcase using a schoolyard as a venue for learning science for elementary preservice teachers.

Format: Small Group Roundtables
Preservice Science Teacher Preparation
Fri, January 10

Designing a Physical Science Course for Prospective Elementary Teachers Focused on Model-Based Inquiry
Jaclyn K Murray, Augusta University

9:45 am - 10:45 am in Live Oak - Session D

While some science teacher educators prioritize scientific modeling within pedagogy courses, the focus on other practices often takes precedence, resulting in little time for modeling or how to integrate it into instructional planning and practice. The purpose of this course is to focus on modeling in the context of a science content course.

Format: Small Group Roundtables

College and University Science Education
Fri, January 10

Outreach and Inreach: Multi-Pronged Science Education Efforts at the University of [Our State]
Ana Houseal,
Martha C Inouye, University of Wyoming; Bethann Garramon Merkle, University of Wyoming; Kate Welsh, University of Wyoming; Alan Buss, University of Wyoming; Dorothy Tuthill, University of Wyoming; Janel Seeley, University of Wyoming; Ashley Leonard, Wyoming Game and Fish

9:45 am - 10:45 am in Llano - Session A

The University of [our state] is the [main] land-grant and public 4-year higher education institution. Thus, it serves [a high % of] entities. Within science education, this includes communities, school districts, and university faculty and staff. This themed paper set focuses on innovative programs that seek to address these multifaceted needs.

Format: Themed Paper Set

Policy and Reform
Fri, January 10

Broadening Borders to Build Better Schools: Virtual Professional Learning Communities
Daniel Carpenter, Concordia University - Portland
Paul Munshower, McMurry University

9:45 am - 10:45 am in Mesquite - Session A

Virtual professional learning communities were provided to eliminate obstacles that keep educators from participating in job-embedded professional learning communities. Results from this investigation indicated that educators recognized virtual collaboration as valuable as face-to-face collaborations of a PLC.

Format: Individual Paper Presentation
One Elementary School's Environmental Education, Culture, and Community: A Portrait

Jennifer Kreps Frisch, University of Minnesota Duluth
Leslie Bucar, University of Minnesota Duluth

9:45 am - 10:45 am in Nueces - Session A

A school near the Great Lakes that was designated as an “environmental school” in the 1990’s lost its environmental focus, and we worked with teachers and students as they worked to reclaim that identity. Portraiture methodology was used to describe the journey of the school over a year, using both “insider” and “outsider” lenses to tell the story.


Physiological Examination of Allostasis, John Henryism and Chronic Stress in Historically Underrepresented Post-Secondary STEM Students.

Douglas L Hoston Jr., University at Buffalo
Richard L Lamb, East Carolina University

9:45 am - 10:45 am in Nueces - Session B

The purpose of this study is to examine John Henryism as a byproduct of allostasis within postsecondary STEM learning environments through cumulative stress. The researchers will administer a stress inventory survey against biological markers for noted physiological responses and examine outcomes with latent class profile analysis.


When Science and Religion Intersect: Using Cultural Intelligence to Break Down Barriers to Acceptance of Science by Religious Communities

Mark A Bloom, Dallas Baptist University
Ian C Binns, University of North Carolina, Charlotte; Doug Hayhoe, Tyndale University; Brian Webb, Houghton College

9:45 am - 10:45 am in Nueces - Session C

This presentation focuses on attempts to increase climate change acceptance among evangelical students at three private Christian universities. Significant and lasting gains were achieved. Attention will be given to the use of cultural intelligence to design critical pedagogies to reduce barriers to acceptance of science by religious communities.

Influencing Students’ Social and Moral Compassion Through Socioscientific Issues

Dana L. Zeidler, University of South Florida  
Ben Herman, University of Missouri; Melanie Kinskey, University of South Florida; Selene Willis, University of South Florida; Karrie Wickman, University of South Florida; Michael Mitchell, University of South Florida; Scott Applebaum, University of South Florida; Tara Nkrumah, Arizona State University

9:45 am - 10:45 am in Pecan - Session A

This study explores how students' epistemological reasoning related to social and moral compassion are revealed prior to, and after an academic year engaged in an SSI content-rich course advances a standardized rubric for the field that assesses three socioscientific orientations. Challenges to teacher SSI implementation are discussed.


Science for Social Responsibility: The Merger of Socioscientific Issues and Social Justice Curricula

Selene Y. Willis, University of South Florida

9:45 am - 10:45 am in Pecan - Session B

Using a critical pedagogy lens, this position paper's aim is to demonstrate the distinct yet similar goals of socioscientific issues and social justice education frameworks in order to promote a merger of the two concepts to support the goal of science education for social responsibility.


Exploring the Science Concepts, Scientific Data, and Meaning of Environmental Sustainability for the African American Gullah Geechee

Catherine L. Quinlan, Howard University

9:45 am - 10:45 am in Pecan - Session C

As climate change threatens the coastal regions the Gullah/Geechee people have been actively engaged in environmental, cultural, and economic sustainability. The African American Gullah/Geechee culture provides a context for understanding their contributions of African Americans, science, environmental sustainability, and climate change.

Gender Difference in Learning From Productive Failure

*Younkyeong Nam*, Pusan National University  
*Jimin Choi*, Pusan National University

9:45 am - 10:45 am in Pecos - Session A

This study presents how two types of evaluation methods (group competition and absolute criteria) affect students’ engineering problem solving skill and gender differences in improvement of engineering problem solving skill in both types of lesson units.

*Format: Individual Paper Presentation*  
*Presider: Donna Farland-Smith*

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Grit, Interest, Effort, and Achievement in Science of Eighth-Grade Students in Economically Developed and Developing Countries

*Elizabeth A Kirman*, Texas Tech University  
*Walter S Smith*, Texas Tech University; *Jian Wang*, Texas Tech University; *Christine A Royce*, National Science Teaching Association

9:45 am - 10:45 am in Pecos - Session B

This large-scale study examined the role of grit, interest, and effort on students’ science achievement in eighth-graders. Developing countries had higher grit, interest, and effort; developed countries had higher science achievement; grit and interest positively predicted science achievement, and effort inversely predicted science achievement.

*Format: Individual Paper Presentation*  
*Presider: Donna Farland-Smith*

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Creativity and Integrated STEM Experiences

*Elizabeth (Betsy) J.R. Stretch*, University of Minnesota  
*Gillian Roehrig*, University Of Minnesota

9:45 am - 10:45 am in Pecos - Session C

Creativity is a main component in 21st Century skills. Identifying how creativity is used in STEM and how students develop creativity is influential in building STEM education. Through a year-long study of middle school students, this study investigated ways integrated STEM experiences may help develop students’ creativity.

*Format: Individual Paper Presentation*  
*Presider: Donna Farland-Smith*

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Coffee Break

10:45 am - 11:00 am in Regency Foyer

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Plenary: Ramy Mahmou

11:00 am - 12:30 pm in Regency Ballroom
Fri, January 10
Lunch on Your Own
12:30 pm - 2:00 pm

Preservice Science Teacher Preparation
Fri, January 10
Secondary Science Preservice Teachers' Perceptions of Engineering: A Learner Analysis
Trina J Kilty, University of Wyoming
Andrea C Burrows, University of Wyoming

2:00 pm - 3:00 pm in Blanco - Session A
Three cohort years of secondary science preservice teachers answered if scenarios qualified as engineering and provided reasoning. Participants (n = 43) gained understanding with expanding perspectives from narrow views pre- to post-intervention. The authors recommend creating opportunities to challenge perceptions of engineering design practices.

Format: Individual Paper Presentation  Presider: Stephanie Fanselow

Preservice Science Teacher Preparation
Fri, January 10
Enhancing Elementary Preservice Teachers’ Engineering Efficacy and Engineering Implementation Through the 5E Inquiry Model
Suzanne M Nesmith, Baylor University

2:00 pm - 3:00 pm in Blanco - Session B
This study explored the impact of an engineering unit aligned with the 5E inquiry model and incorporated within an elementary science methods course on preservice teachers’ engineering efficacy and perceptions toward engineering. Findings provide implications for science methods courses and implementation of elementary engineering curricula.

Format: Individual Paper Presentation  Presider: Stephanie Fanselow

Preservice Science Teacher Preparation
Fri, January 10
Preservice Elementary Teacher Reflections on Teaching Engineering Design
Matthew P Perkins Coppola, Purdue University Fort Wayne

2:00 pm - 3:00 pm in Blanco - Session C
Over the course of 6 semesters, 121 undergraduate preservice elementary teachers at a metropolitan university designed and taught two-day mini-units on the engineering design process during their school-based field experiences. This qualitative study analyzes the structured reflections of these future teachers to provide insight into practice.

Format: Individual Paper Presentation  Presider: Stephanie Fanselow

Fri, January 10
Meet the CITE Editors
2:00 pm - 3:00 pm in Chula Vista
Elementary Integrated STEM Methods Approach

Selina I Bartels, Valparaiso University
Katherine Rupe, Illinois Institute of Technology; Judith Lederman, Illinois Institute of Technology

2:00 pm - 3:00 pm in Directors - Session A

This study looked at a collaboration between methods classes to teach STEM that was delivered to preservice students who were dually enrolled in elementary math and science methods courses. It was found that through this integrated methods approach preservice teachers were successful at planning and implementing elementary STEM lessons.

Format: Individual Paper Presentation  Presider: Christina McDaniel

Development of Elementary Teachers’ STEAM Planning Practices

Kristin L Cook, Bellarmine University
Sarah B Bush, University of Central Florida; Richard Cox, University of Central Florida; Dan Edelen, University of Central Florida

2:00 pm - 3:00 pm in Directors - Session B

This case study sought to understand elementary teachers’ planning of STEAM curriculum during a two-year ongoing professional development program. Analysis of 25 teachers’ planning documents is important in building our understanding of what constitutes sound design of STEAM inquiries.

Format: Individual Paper Presentation  Presider: Christina McDaniel

Design and Implementation of an Integrated STEM Program for PreK-6 Teachers: Skilled Graduates and Recruitment Dilemmas

Pamela S. Lottero-Perdue, Towson University
Sarah Haines, Towson University; Karen Cimino, Towson University; Rommel J. Miranda, Towson University

2:00 pm - 3:00 pm in Directors - Session C

We describe the design and subsequent re-designs of our blended post-baccalaureate certificate program for PreK-6 teachers in integrated STEM instructional leadership. We then share results from our program evaluation, as well as outcomes from program graduates. Finally, we address our most significant challenge: recruitment.

Format: Individual Paper Presentation  Presider: Christina McDaniel
Pilot Study: Teaching Elementary Science Methods Within a PDS Approach

*Dana Atwood-Blaine, University of Northern Iowa*

*Mason Kuhn, University of Northern Iowa*

2:00 pm - 3:00 pm in Frio - Session A

After the first semester of teaching integrated Elementary Science Methods and Classroom Management within a Professional Development School model, we present our program, our experience, and the results of preservice teachers’ pre/post science teaching self-efficacy scores on the STEBI-B.

*Format: Exploratory Session*

Models of Video Analysis Use Across Teacher Education Programs

*Michelle Forsythe, Texas State University*

*Anna Arias, Kennesaw State University; Brett Criswell, University of Kentucky; Joshua Ellis, Florida International University; Lawrence Escalada, University of Northern Iowa; Heather Johnson, Vanderbilt University; Donna Mahar, Empire State College; Amy Palmeri, Vanderbilt University; Margaret Parker, Illinois State University; Jessica Riccio, Teachers College, Columbia University*

2:00 pm - 3:00 pm in Live Oak - Session A

This session synthesizes the work of a collaborative of science teacher educators using a video analysis framework. An overview of the framework will be provided, and models of video analysis use across varied instructional contexts (e.g., elementary / secondary / methods / student teaching) will be presented using an interactive station format.

*Format: Exploratory Session*

Designing Professional Development to Facilitate Teachers’ Organizational Sensemaking Toward Effective Reform Implementation in Science

*Sara C Heredia, University of North Carolina at Greensboro*

*Carrie D Allen, University of North Texas*

2:00 pm - 3:00 pm in Llano - Session A

Recent reform efforts in science education have surfaced a need to better understand how to support implementation efforts. We provide a conceptual framework for supporting the implementation of science reform through the lens of organizational sensemaking that provides research and practical implications for professional development design.

*Format: Individual Paper Presentation  Presider: Selene Willis*
Design-Based Research to Improve NGSS Focused Professional Development

Byung-Yeol Park, University of Connecticut
Todd D Campbell, University of Connecticut; Ron Gray, Northern Arizona University; Miriah R Kelly, University of Connecticut; Chester Arnold, University of Connecticut; John C Volin, University of Connecticut; David M Moss, University of Connecticut

2:00 pm - 3:00 pm in Llano - Session B

Design-based research (DBR) recognizes the interconnected nature of designs and educational settings as contexts, while also taking a flexible stance on design as potentially ongoing in nature. This research draws on DBR to examine the interconnected nature of teacher PD anchored in curriculum and the implementation of that curriculum in classroom.

Format: Themed Paper Set  Presider: Selene Willis

Collaborative Design Capacity for Enactment: A Framework for Understanding STEM Pedagogical Design Capacity

Charlene Ellingson, Minnesota State University, Mankato
Gillian Roehrig, University of Minnesota

2:00 pm - 3:00 pm in Llano - Session C

This study investigated STEM Pedagogical Design Capacity (PDC). Analysis suggests teachers draw on three resources to grow their understanding of STEM curriculum and resulted in development of the Collaborative Design Capacity Enactment Framework (cDCE). The framework provides a useful lens for understanding the factors that contribute to STEM PDC.

Format: Individual Paper Presentation  Presider: Selene Willis

Teaching About Science-Religion Distinctions in the College Science Classroom

Lisa A Borgerding, Kent State University

2:00 pm - 3:00 pm in Mesquite - Session A

This study explores the topics that tend to evoke questions about science-religion distinctions and college science faculty’s approaches for addressing these questions.

Format: Individual Paper Presentation  Presider: Nazan Bautista
"Pleasantly Surprised": Navigating Cultural Borders While Learning About Evolution
Kathryn E Green, University of Georgia
2:00 pm - 3:00 pm in Mesquite - Session B
Students sometimes encounter complex cultural borders regarding how evolution is discussed at home and how science teachers approach it in the classroom. This research examines how students' understanding and acceptance of evolution is affected by an intervention designed to ease cultural border crossing.

An International Comparison on Climate Change Understanding - Does NGSS Make a Difference?
Tina Cartwright, Marshall University
Paula A Magee, Indiana University – Indianapolis; Deb Hemler, Fairmont State University
2:00 pm - 3:00 pm in Mesquite - Session C
This study examines students' climate change conceptual ideas over 8 years (middle school to high school) in a particular region of the US. These results are then compared to published student conceptions in the Northeastern US, UK and Australia.

A Systematic Review of Indigenous Perspectives in Science and Math Education in Canada: Implications for Teacher Education
Dawn Wiseman, Bishop's University
Lisa Lunney Borden, St. Francis Xavier University; Florence Glanfield, University of Alberta
2:00 pm - 3:00 pm in Nueces - Session A
This paper presents the results of a systematic review focused on the ways in which Indigenous ways of knowing, being, and doing have been taken up in science and mathematics teaching and learning, in K-12 and teacher education, in Canada.
Challenges, Opportunities, and Successes in Developing a Lens for Issues of Equity and Diversity in Preservice Science Teacher Preparation

Kristen V Larson, Teachers College, Columbia University

2:00 pm - 3:00 pm in Nueces - Session B

This presentation looks at the challenges preservice teachers face during fieldwork observations, coursework, and reflections around issues of diversity and equity. This talk will contribute to the conversation around preparing teachers for recognizing and challenging issues of race and equity while navigating their fieldwork placements.

Function of the University Mentor Supervisor in Promoting Social Equity Awareness, Advocacy, and Activism With Secondary Science Preservice Teacher Interns

Stephanie Arthur, University of South Florida
Allan Feldman, University of South Florida

2:00 pm - 3:00 pm in Nueces - Session C

This study focuses on the efforts of the university mentor supervisor to embed awareness for social equity identity and promote activism for social justice with secondary science preservice teacher interns enrolled in a Masters of Arts in Teaching program during the coaching, mentoring, and supervising process of the final clinical internship.

Integrating Knowledge of Curriculum in a Content Course to Influence Curricular Role Identity and Science Teaching Self-Efficacy of Preservice Elementary Teachers

McCormack-Hootman Stacy, University of Indianapolis
Meredith Park Rogers, Indiana University

2:00 pm - 3:00 pm in Pecan - Session A

Studying the use of two curriculum tasks designed for a Physical Science class for elementary education majors, results show increased curricular role identity, improved science teaching self-efficacy, an apparent co-evolution of these two constructs, and a particular order of completion of the tasks to best develop these PSTs beginning PCK.
Expressions of Personal Epistemologies in Pre-Service Educators’ Scientific Discourse

Anne Gatling, Merrimack College
Katelyn Kurkul, Merrimack College

2:00 pm - 3:00 pm in Pecan - Session B

For this exploratory study, we explored pre-service teachers’ personal epistemologies and how they influence discourse patterns with students when exploring novel scientific concepts. Thus, for these analyses, we focused solely on student responses to teachers’ initial questions and the teacher follow up to these responses.

Format: Individual Paper Presentation  Presider: Karl Jung

Using Teacher Theorizing to Drive the Action Research Process With Pre-Service Teachers

Brian P Zoellner, University of North Florida
Jeffrey Cornett, University of North Florida; Julia Mayeshiba, Duval County Public Schools

2:00 pm - 3:00 pm in Pecan - Session C

In our presentation, we will show how we use science pre-service teacher beliefs, or personal practical theories, to encourage pre-service teachers to actively develop their professional identity to foster more authentic reflection to create more relevant and personal action research projects.

Format: Individual Paper Presentation  Presider: Karl Jung

Determining the Impact of the Correlated Science and Math PD Model on Teacher Leadership

Ruby A. Hernandez, North East ISD
Sandra S. West, Texas State University; Emily J. Summers, Texas State University; Sandra T. Browning, University of Houston - Clear Lake

2:00 pm - 3:00 pm in Pecos - Session A

The purpose of the study was to determine the impact of the MIX PD on teacher leadership growth using a mixed-methods approach which allowed an understanding of if and how teacher leadership growth occurred. Teachers reported the MIX program enabled them to progress in stages of leadership.

Format: Themed Paper Set
Fri, January 10
Committee Meetings
3:00 pm - 4:00 pm
Awards Committee - Blanco
Elections Committee - Directors
Membership/Participation Committee - Live Oak
Communications Committee - Llano
Conference Planning Committee - Mesquite
Publications Committee - Nueces
Professional Development Committee - Pecos

Fri, January 10
Coffee and Conversations
3:00 pm - 4:00 pm in Regency Foyer

Fri, January 10
Break
4:00 pm - 4:15 pm

History, Philosophy, and Nature of Science
Fri, January 10
Exploring Connections Between Science Teachers’ Views of Nature of Science and PCK for Argumentation
Renee Schwartz, Georgia State University
Patrick Enderle, Georgia State University; Robert Bennett, Georgia State University; Emily Turner, Georgia State University

4:15 pm - 5:15 pm in Blanco - Session A
Through multiple case studies, we explore how teachers understand and make connections between nature of science and PCK for argumentation. Results suggest some initial relationships, as well as potential contextual influences, on how teachers think about NOS and argumentation.

Format: Individual Paper Presentation
Influence of Situated Research Experience on Teaching Nature of Science

Doug Ball, Utah State University
Colby Tofel-Grehl, Utah State University; Brenda Bennett, Utah State University; Max Longhurst, Utah State University; Alison C. Webb, Utah State University; Andrew M. Durso, Utah State University; Susannah S. French, Utah State University

4:15 pm - 5:15 pm in Blanco - Session B

Can the nature of science (NOS) be taught in apprenticeship-like authentic research? This study investigates the NOS learning outcomes of pre-service teachers and their students after teachers were immersed in a semester-long research experience. Findings reveal challenges to the effectiveness and reliability of learning NOS in this format.

Format: Individual Paper Presentation

Beyond Experiments: Considering the Range of Investigative and Data-Collection Methods in Science

Sandra S. West, Texas State University
Susan Schwinning, Texas State University; Alexis D. Denn, Southwest High School

4:15 pm - 5:15 pm in Blanco - Session C

A limited view of scientific practices is prevalent in classrooms, commercial materials, online resources and implied by the requirements in many science competitions. A more complete picture a detailed overview of all scientific methodology in a useful tool we call the “Modes of Scientific Inquiry” (MSI) flowchart with examples and practice.

Format: Individual Paper Presentation

Strategies to Publish More for Busy Professors

Timothy F Slater, University of Wyoming

4:15 pm - 6:00 pm in Chula Vista

If your career goal is do a better job of writing peer-reviewed articles, writing conference abstracts, or creating winning grant proposals, you need time-tested, action-oriented, get-it-done, productivity strategies to create dedicated time to think and write.

Format: Workshop
Lessons Learned From a Climate Change Unit as a Vehicle for “Authentic Science Inquiry”

Paula A Magee, Indiana University - Indianapolis

4:15 pm - 5:15 pm in Directors - Session A

This study used climate change as an elementary field experience topic for instruction and teaching. Preservice teacher work and PST written science units were used to assess the efficacy of this instructional approach and to develop recommendations for future semesters.


Examining the Aspects of Nature of Science in Elementary Pre-Service Teachers’ Past Science Experiences

Jessica L Chen, Teachers College, Columbia University
Allison K Bookbinder, Teachers College, Columbia University; Felicia M Mensah, Teachers College, Columbia University; Katherine Cruz-Deiter, University of Central Florida; Tonjua B Freeman, University of Central Florida; Malcolm B Butler, University of Central Florida; Denise Mahfood, Teachers College, Columbia University

4:15 pm - 5:15 pm in Directors - Session B

This study investigated the ways that aspects of nature of science were reflected in pre-service teachers’ K-12 science experiences through reflective Science Timelines across two university settings. The findings shed light on the nuances and diversity of science experiences elementary PSTs had themselves.


Pre-Service Teachers Images of Informal Settings as Places of Science Instruction

Supreeya Muimongko, Udon Thani Rajabhat University
Karthigeyan Subramaniam, University of North Texas

4:15 pm - 5:15 pm in Directors - Session C

The study investigated prospective teachers’ images of science instruction in informal settings and was guided by the following research question “What are prospective teachers’ images of science instruction in informal settings?” Constructs from the literature on place-based education provided one such lens to look at the phenomenon under study.

Informal Science Education
Fri, January 10

Measuring Engagement With Informal Science Education: A Mixed Methods Case Study of Student Engagement With a Weekend Science Program
Brenda Carpenter, Texas Tech University

4:15 pm - 5:15 pm in Live Oak

This mixed methods case study investigated participant engagement with an informal weekend science program in a rural mid-Atlantic community by exploring engagement through the theoretical framework of flow theory, self-determination theory, and Informal Science Education.

Format: Individual Paper Presentation

College and University Science Education
Fri, January 10

Comparing Statistical Reliabilities of Instrument Administrations in Intro Chem Courses
Mandy McCormick Smith, The Ohio State University
Jonathan Breiner, University of Cincinnati

4:15 pm - 5:15 pm in Llano - Session A

This session presents findings from five psychometric tests evaluating reliability and the discriminatory power of an English language instrument of the NSSDI. This session discusses evolution of the English version of the instrument, results of online versus pen/paper admin, and how results influence UG classroom instruction.

Format: Individual Paper Presentation  Presider: Stephanie Hathcock

College and University Science Education
Fri, January 10

Assessing Elementary Teachers’ Conceptions of Matter: Best Practices That Promote Increased Conceptual Understanding
Brenda L. Bennett, Utah State University
Max L. Longhurst, Utah State University; Colby Tofel-Grehl, Utah State University; Kimberly Lott, Utah State University

4:15 pm - 5:15 pm in Llano - Session B

This presentation discusses an investigation of elementary teachers’ basic knowledge of matter before and after a STEM endorsement course. Findings suggest that targeted professional learning that utilizes formative assessment coupled with reflective journaling may be effective in augmenting content understanding while promoting conceptual change.

Format: Individual Paper Presentation  Presider: Stephanie Hathcock
Analyzing Science Laboratory Perceptions Between Science Educators and Students

William E Hansen, University of Iowa

4:15 pm - 5:15 pm in Llano - Session C

Laboratory is a traditional practice in science education with copious research supporting the effectiveness of laboratory in both secondary and undergraduate education. Currently, there has been little work in measuring and comparing the perceptions of laboratory between students and teachers. This study seeks to rectify this lack of literature.

Format: Individual Paper Presentation  Presider: Stephanie Hathcock

Meet the ASTE Editors

4:15 pm - 5:15 pm in Mesquite

Engaging in Scientific Practices: An Ethnographic Case Study of a Pre-Service Teacher’s Undergraduate Research Experience

Kara E Baldwin, Illinois State University
Rebekka Damer, Illinois State University

4:15 pm - 5:15 pm in Nueces - Session A

This presentation describes an ethnographic case study of an undergraduate research experience (URE) program for pre-service teachers. Through the lens of communities of practice, the presentation will describe the participant, setting and emergent themes, providing insight into student perceptions of UREs and student's NGSS practice understanding.

Format: Individual Paper Presentation

Benefits and Challenges to Using Leadership Tasks to Develop Teacher Leaders

Amanda Gonczi, Michigan Technological University
Kedmon Hungwe, Michigan Technological University; Jacqueline Huntoon, Michigan Technological University

4:15 pm - 5:15 pm in Pecan - Session A

This study investigated the extent a twelve week-long course, delivered remotely, could support 12 teachers’ perceived knowledge and skill development associated with targeted teacher leadership standards through Leadership Tasks.

Format: Individual Paper Presentation  Presider: Gayle Evans
Elementary Teachers' First Year as Teachers: Negotiating Science Instruction and Discourse

Sarah J Carrier, NC State University
James Minogue, NC State University; Aimee B Fraulo, NC State University

4:15 pm - 5:15 pm in Pecan - Session B

This research documents beginning elementary teachers’ science planning and enactment of instruction and discourse focusing on two teachers during their first year of teaching. We present analysis of semi-structured interviews and video recorded observations using EQUIP for video analysis.

Format: Individual Paper Presentation  Presider: Gayle Evans

Case Study: Generating Persuasive Arguments Through a Series of Evidence Represented in Concrete Forms

Tugba Keser Solak, Trakya University

4:15 pm - 5:15 pm in Pecos - Session A

This study investigates how high school students generate persuasive and convincing arguments through a series of evidence represented in concrete forms on a computer simulation when justifying their claims for the behavior of gases represented on their drawings.

Format: Individual Paper Presentation  Presider: Elizabeth Stretch

Exploring Coherence Across a Multi-Level Networked Improvement Community Focused on the Implementation of the Next Generation Science Standards

Jonathan L. Hall, University of Connecticut
Todd Campbell, University of Connecticut; Lisa Lundgren, University of Connecticut

4:15 pm - 5:15 pm in Pecos - Session B

This design-based research study explored the struggle for coherence among a Network Improvement Community (NIC) in designing materials to implement the Next Generation Science Standards. The foci, opportunities, and challenges of the NIC and important elements of collaborative spaces such as trust are explored.

Format: Individual Paper Presentation  Presider: Elizabeth Stretch
MRET Badges: Using Micro Certifications to Scaffold an Engineering Laboratory Research Experience for Elementary Teachers

Gayle N. Evans, University of Florida
Kent J. Crippen, University of Florida

4:15 pm - 5:15 pm in Pecos - Session C

Join us to learn about our development and use of a micro-certification framework based on NGSS science & engineering practices, [Program Name] Badges, to scaffold a research experience for elementary teachers embedded in engineering research laboratories and aid in the translation of these experiences into classroom STEM teaching.

Format: Individual Paper Presentation  Presider: Elizabeth Stretch

JSTE Editorial Meeting and Reception: By Invitation Only
5:30 pm - 6:30 pm in Live Oak

WISE Dinner: Ticket Required
6:30 pm - 9:30 pm at Hard Rock Café

Breakfast on Your Own
6:00 am - 7:30 am

Forum Meetings
7:30 am - 8:15 am
Small Colleges and Programs - Blanco
Policy and Government Relations - Directors
Graduate Student - Frio
Scientist/Science Educators Collaborations - Live Oak
Technology - Llano
Inclusive Education - Mesquite
Women in Science Education - Nueces
Seniors as Resources for Science Education - Pecan
Environmental Education - Pecos

Break
8:15 am - 8:30 am
The Persistence of Related and Unrelated Concepts in Pre-Service Teachers’ Conceptual Understanding of Average Speed
Karthigeyan Subramaniam, University of North Texas
Pamela Harrell, University of North Texas; Chris Long, University of North Texas; Nazia Khan, University of North Texas

8:30 am - 9:30 am in Blanco - Session A

This presentation reports on pre-service teachers’ conceptual understanding of average speed. This understanding was explored through written responses to questions that required pre-service teachers’ to define, identify associated concepts, and describe how they plan to teach and explain average speed to their future students.

Format: Individual Paper Presentation  Presider: Jeni Davis

Science Focused Coaching Conversations: Lessons From Four Preservice Elementary Teachers
Karl G Jung, University of South Florida

8:30 am - 9:30 am in Blanco - Session B

The NGSS calls for a focus on the three dimensions of learning and preservice teachers must be supported in developing an understanding of how to implement these in their classrooms. This presentation explores instructional coaching partnerships as one means to support this development in preservice elementary teachers.

Format: Individual Paper Presentation  Presider: Jeni Davis

Fostering Transformative Experiences and Evolutionary Understanding in Introductory Biology for Pre-Service Teachers
Rachel A. Sparks, Illinois State University
Rebekka Damer, Illinois State University

8:30 am - 9:30 am in Blanco - Session C

Elementary educators are expected to teach evolutionary ideas as early as 3rd grade yet receive little evolution instruction. This presentation details a research study regarding the efficacy of an introductory biology course designed to improve evolutionary understanding and science teaching skills in pre-service elementary teachers.

Format: Individual Paper Presentation  Presider: Jeni Davis
**Sat, January 11**

**How Can the National Science Teaching Association Support Teacher Candidates and Professors?**

*William Veal, College of Charleston*  
*Michael Odell, The University of Texas at Tyler; Ollie Bogdon, Missouri Western State University; Ray Scolavino, University of Wisconsin Milwaukee*

8:30 am - 10:30 am in Chula Vista

The National Science Teaching Association’s mission is to promote excellence and innovation in science teaching and learning for all. Presenters will share how they use NSTA’s online learning community to increase students’ ability to become lifelong learners and how NSTA resources and experiences can help in implementing the NSTA/ASTE 2020 Science Standards for Teacher Preparation. Bring your laptop computer.

*Format: Workshop*

**Sat, January 11**

**Equity Committee II**

8:30 am - 9:30 am in Chula Vista Boardroom

**Student Learning P-12**

**Sat, January 11**

**Secondary Student’s Engagement and Attitudes Towards Mathematical Problem Solving Across Hierarchical Course-Levels Within Secondary Physics Education.**

*Charles Fidler, Franklin Public Schools/Physics Educator*

8:30 am - 9:30 am in Directors - Session A

Mathematical problem solving is central to secondary physics education programs. This research examines participant (n=123) attitudes towards mathematical problem solving and finds statistically significant results across a hierarchy of courses within a secondary physics education program. Implications for physics teacher preparation are explored.

*Format: Individual Paper Presentation  Presider: Angela Chapman*

**Student Learning P-12**

**Sat, January 11**

**A Three-Tiered-Transformative-Classroom (TTTC) Model for Middle School Science**

*Alton G. DeClaire, USF*  
*Barbra Spector, USF*

8:30 am - 9:30 am in Directors - Session B

A qualitative evaluation of a Three-Tiered-Transformative-Classroom (TTTC) model implemented in a low level 8th grade science classroom reveals consistence with NGSS, features of the TTTC, its evolution from initiation, through implementation, continuous improvement, impact on both students and the teacher, and implications for teacher education.

*Format: Individual Paper Presentation  Presider: Angela Chapman*
High School Student Learning of Academic Vocabulary in Science and Math

Angela M Chapman, University of Texas Rio Grande Valley
Anthony Bailey, University of Texas Rio Grande Valley

8:30 am - 9:30 am in Directors - Session C

This study investigated high school student learning of academic vocabulary when instruction was embedded with multiple vocabulary strategies (MVS) in algebra, anatomy and physiology, or biology. Students, including native Spanish speakers, who received MVS outperformed students who did not.

Equity and Diversity

Preservice Teachers Using the UDL Framework to Plan Accessible 3D Science

Jennifer C Mesa, University of West Florida

8:30 am - 9:30 am in Frio - Session A

This study examined preservice teachers' use of the Universal Design for Learning (UDL) framework in an elementary science methods course. Patterns in how preservice teachers addressed learner diversity and reduced learning barriers in three-dimensional science were analyzed.

Science in Silence: How Educators of the Deaf and Hard-of-Hearing Teach Science

Sara Raven, Texas A & M University
Gretchen Whitman, University of Wisconsin-River Falls

8:30 am - 9:30 am in Frio - Session B

This case study focuses on the experiences working with Deaf and Hard-of-Hearing (DHH) students in science. Data consisted of interviews with and observations of teachers. Findings include teachers’ limited understandings of the NOS and inquiry-based pedagogy, as well as support for students focused on vocabulary, rather than hands-on engagement.
The Transformative Nature of a Comprehensive National Science Foundation Supported STEM Education Initiative in the Elementary Classroom

Carolyn Parker, American University

8:30 am - 9:30 am in Frio - Session C

I describe how a comprehensive National Science Foundation supported comprehensive education initiative helped support two teachers to transform the way they enacted science and engineering instruction in an high-poverty elementary classroom.

Format: Individual Paper Presentation  Presider: Jennifer Mesa

Evolution Education and the Rise of the Creationist Movement in Brazil: A Book Preview

Alandeom W. Oliveira, State University of New York at Albany
Kristin L. Cook, Bellarmine University; Hesley Machado Silva, Centro Universitario de Formiga; Pedro Teixeira, Pontificia Universidade Catolica do Rio de Janeiro; Maria Elise de Brzezinski Prestes, University of Sao Paulo; Nelio Bizzo, University of Sao Paulo; Giuliano Reis, University of Ottawa

8:30 am - 10:30 am in Live Oak - Session A

In this session, we preview an upcoming book that examines how societal forces such as religion, media, and politics have shaped Brazil’s educational landscape and impacted evolution education. The book editors and chapter authors will provide accounts of evolution curricula and instruction, teacher preparation programs, and educational policies.

Format: Themed Paper Set

Ins and Outs of Digestion for Middle School Students via 5-E Model

Mohammed A Qazi, Tuskegee University
Shaik Jeelani, Tuskegee University; Ruth Liddell, Alabama State University; Shirley Scarbrough, Alabama State University; Carol Banks, Tuskegee University

8:30 am - 9:30 am in Llano - Session A

This module emphasizes hands-on, inquiry-based activities designed to create a model of the human digestive system and determine the correct placement of various organs. Students use the model to compare mechanical and chemical digestion.

Format: Exploratory Session
Conference Professional Development Increases Science Teacher Empowerment

**Dr. Susan M. Stehling, UH-Victoria**  
**Dr. Teresa LeSage-Clements, UH-Victoria; Dr. Barba A. Patton, UH-Victoria**

8:30 am - 9:30 am in Mesquite - Session A

This presentation gives teachers the evidence to support their science teacher conference professional development. Novice science teachers need their voices heard and administrators and fellow teachers need to listen. Novice teachers who are empowered with specific content knowledge are more effective and confident teachers.

*Format: Individual Paper Presentation*

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Parallel Processes: Mirroring the Unit Design Process in Professional Development to Build Teacher Experience and Increase Transference

**Martha C Inouye, University of Wyoming**  
**Ana Houseal, University of Wyoming**

8:30 am - 9:30 am in Mesquite - Session B

Three-dimensional instruction departs from many teachers’ classroom practices and personal experiences. We present how modeling parallel structures in PD provides meaningful opportunity to equip teachers’ facilitation of student learning with personal experience and empathy and to embrace an iterative structure that informs meaningful learning.

*Format: Individual Paper Presentation*

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An Examination of Preservice Teachers’ Classroom Practice Regarding Nature of Science in a Mixed-Reality Simulated Classroom

**Noushin Nouri, University of Texas RGV**  
**Leila Molaei, Ministry of education Iran; Juan Lazo, University of Texas RGV**

8:30 am - 9:30 am in Nueces - Session A

Teachers knowledge of nature of science is sometimes not going to transfer into the classroom. In this proposal, a mixed reality simulation called TeachLive is used to simulate a classroom for three preservice teachers (PSTs) who first attended an intense, 15 hours workshop. Their knowledge challenged in a simulated classroom.

*Format: Individual Paper Presentation*
The Development of Iranian In-Service Physics Teachers’ Understanding of Nature of Science (NOS) Within a Competency-Based NOS Course

Maryam Saberi, Shiraz university
Noushin Nouri, University of Texas RGV; Mehdi Mohammadi, Shiraz University; Mansour Vesali, Shahid Rajaee Teacher Training University

8:30 am - 9:30 am in Nueces - Session B

We examined the effect of a competency-based nature of science course on inservice teachers’ understanding of NOS and including it in their lesson plans. NOS competencies are extracted previously from 51 articles with qualitative meta-synthesis. Positive impact of the course in understanding NOS and writing NOS embedded lesson plans is supported.

Format: Individual Paper Presentation

Merging Perspectives and Changing Conceptions: Preservice Teachers’ Developing Conceptions of Lunar Phases Through Formative Assessments

Stephanie Hathcock, Oklahoma State University
Drew Gossen, Oklahoma State University; Toni Ivey, Oklahoma State University

8:30 am - 9:30 am in Pecan - Session A

This study examined changes in elementary preservice teachers’ conceptual understanding of lunar phases. Using formative assessment throughout the unit, PSTs’ gradual knowledge acquisition process was examined and analyzed. Findings indicate that there are key concepts required to attain full understanding of lunar phases.

Format: Individual Paper Presentation  Presider: Helen Meyer

Teachers’ Professional Learning During Collaborative Development of NGSS-Adapted Middle School Science Curriculum

Latanya T Brandon, Mercy College
Amanda Gunning, Mercy College; Meghan Marrero, Mercy College; Alex Servello, Yonkers Public School District

8:30 am - 9:30 am in Pecan - Session B

NYS Science Learning Standards (2016) outlines goals for science teaching and learning that includes an integration of science and engineering practices, disciplinary core ideas, and crosscutting concepts (NRC, 2012). Using data from a Math Science Partnership Program, we examine professional learning during collaborative development of curriculum.

Format: Individual Paper Presentation  Presider: Helen Meyer
From Private Conception to Professional Practice: A Cross-Case Analysis of Elementary Teachers’ Scientific Misconceptions and How They Play Out in Classroom Instruction.

Colby Tofel-Grehl, Utah State University
Brenda Bennett, Utah State University; Melia Balls, Utah State University; Doug Ball, Utah State University; Kimberly Lott, Utah State University; Max Longhurst, Utah State University

8:30 am - 9:30 am in Pecan - Session C

This paper seeks to explicate some of the misconceptions held by elementary teachers and explore the ways those misconceptions make their way into classroom instruction. Using an exploratory cross case analytic approach, we investigate the down-stream effects on student science learning opportunities of teacher misconceptions.

Format: Individual Paper Presentation  Presider: Helen Meyer

The Need of Translanguaging to Prepare Science Bilingual Teachers

Yohanis De La Fuente, Texas Christian University

8:30 am - 9:30 am in Pecos - Session A

This case study examines the perspective that two preservice bilingual teachers have about their readiness for teaching language and science content. Besides, this study provides evidence of the necessity of using translanguaging pedagogies to attain better science content knowledge of future bilingual teachers.

Format: Individual Paper Presentation  Presider: Lu Wang

Perfecting a Vision for Improving Preservice Teachers’ Lesson Planning Competencies

Nate Carnes, University of South Carolina

8:30 am - 9:30 am in Pecos - Session B

This presentation chronicles an innovation created and implemented to support secondary preservice teachers in meeting lesson planning competencies via an active learning experience but has implications that cross all grade levels and science content areas.

Format: Individual Paper Presentation  Presider: Lu Wang
Impact of Engagement With the ASSIST Approach on Pre-Service Elementary Teachers

Mark McDermott, University of Iowa
Will Hansen, University of Iowa; Cathryn Carney, University of Iowa; Chenchen Deng, University of Iowa; Yejun Bae, University of Iowa; Mason Kuhn, University of Northern Iowa

8:30 am - 9:30 am in Pecos - Session C

Pre-service students struggle in coming to understand teaching approaches inconsistent with how they experienced science education as learners. Changes in pre-service elementary teachers views on argument-based instruction and epistemic orientations will be explored in the context of a course utilizing an immersive argument-based framework.

Format: Individual Paper Presentation  Presider: Lu Wang

Coffee Break
9:30 am - 10:00 am in Regency Foyer

Lesson Study for Preparing Preservice Elementary Teachers for Science PBL and Working With Language Minority Children

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

10:00 am - 11:00 am in Blanco - Session A

Lesson Study was used to develop preservice teacher understanding and skills of Problem-Based Enhanced Language Learning (PBELL). This model combines PBL, language-based theories of learning, and methods of working with students developing abilities in the language of instruction. The study used a retrospective survey and PST interviews.

Format: Individual Paper Presentation  Presider: Richard Hechter

Expressing, Exploring, and Developing Beliefs About High-Need STEM Classrooms Through Collaborative Action Research

Frederick B Bradley, University of South Florida
Allan Feldman, University of South Florida

10:00 am - 11:00 am in Blanco - Session B

The 2018 Noyce Community of Practice was a collaborative action research-based instructional intervention centered on a journal club, that allowed scholars to express, explore and develop multiple areas of beliefs relevant to the impact of identity, home-life, and sociocultural-interactions in high-need middle and secondary STEM classrooms.

Format: Individual Paper Presentation  Presider: Richard Hechter
**Preservice Science Teacher Preparation**  
**Sat, January 11**

**An Elementary Education Program Using Practitioner Action Research to Help New Teachers Understand and Implement Inquiry Learning.**  
*Bryan H Nichols, Florida Atlantic University*  
*Lori Dassa, University of Florida*

10:00 am - 11:00 am in Blanco - Session C

This talk will describe new undergraduate elementary honors programs that blend coursework and training in practitioner action research with science skills and improved understanding of scientific inquiry. Interviews and projects from the pilot suggest the additional work was challenging but empowering for a talented subset of preservice teachers.

*Format: Individual Paper Presentation  Presider: Richard Hechter*

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**NSTA/ASTE 2020 Science Teacher Preparation Standards: Moving Forward and Recognition Options**  
*Paul Adams,*  
*William Veal*

10:00 am - 11:00 am in Directors - Session A

NSTA/ASTE’s 2020 Science Teacher Preparation Standards are available for all science teacher preparation programs to use in program development and evaluation. During the session we will share how these can be used to prepare for program reviews through accrediting agencies. We will also discuss and gather interest in a program recognition program being jointly considered by NSTA and ASTE.

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**Equity and Diversity**  
**Sat, January 11**

**Cases in Science Teaching and Learning: Exploring Its Complexities, Promise, and Dilemmas**  
*Deborah J. Tippins, University of Georgia*  
*Sophia (Sun Kyung) Jeong, University of Georgia; Lynn Bryan, Purdue University*

10:00 am - 11:00 am in Frio - Session A

This exploratory session will introduce participants to innovative uses of case-based pedagogies in science teacher preparation. During this session, participants will engage in discussion around the use of case-based pedagogies, effective case writing strategies and formats, and brainstorm potential case dilemmas situated in personal experience.

*Format: Exploratory Session*
Integrating Computer Science Into K-12 Science - It’s Not Programming, It’s Problem-Solving

Mike Borowczak, University of Wyoming
Andrea C Burrows, University of Wyoming

10:00 am - 11:00 am in Llano - Session A

A 16-day professional development (PD) introduced 22+ K-12 teachers to methods of integrating computer science (CS) concepts into their existing curricula. This work looks at the impact of this PD on STEM teachers' CS self-efficacy, perceptions, and in-class utilization.

Format: Individual Paper Presentation

Teachers’ Professional Growth Through Co-Design and Implementation of Computational Thinking (CT) Integrated Biology Units

Amanda Peel, Northwestern University
Sugat Dabholkar, Northwestern University; Gabriella Anton, Northwestern University; Mike Horn, Northwestern University; Uri Wilensky, Northwestern University

10:00 am - 11:00 am in Llano - Session B

Integrating computational thinking (CT) in science will better reflect STEM disciplines and may deepen science learning. We have worked with high school teachers to co-design and implement CT integrated biology units. This paper is an analysis of teachers’ roles in co-design, roles in classrooms during implementations, and perceptions of outcomes.

Format: Individual Paper Presentation

Dialogic Feedback as a Predictor of Student Achievement on Critical Thinking Assessment.

Mason Kuhn, University of Northern Iowa
Marine Pepanyan, University of Northern Iowa

10:00 am - 11:00 am in Llano - Session C

The purpose of this paper is to examine the relationship between teachers’ use of dialogic feedback and students’ outcomes on a critical thinking exam. Furthermore, we analyzed the different types of dialogic feedback and if any codes correlated with student achievement on a modified version of the Illinois Critical Thinking Test.

Format: Individual Paper Presentation
Equity and Diversity
Sat, January 11

Addressing Social Justice in the Science Methods Classroom: Engaging Preservice Teachers in Uncomfortable Discussions

Nazan U Bautista, Miami University
Katherine E Batchelor, Miami University

10:00 am - 11:00 am in Nueces - Session A

We will share a critical literacy infused engineering design lesson we developed to engage preservice early childhood education teachers in meaningful discussions about social justice and equity issues in classrooms. Audience will be encouraged to brainstorm ways to meaningfully address social justice concepts in science teacher education courses.

Format: Exploratory Session

Educational Technology
Sat, January 11

E-Books to Support Preservice Science Teacher Development

Patricia Waters, St. Joseph's College of Maine

10:00 am - 11:00 am in Pecan - Session A

This study used mixed methods to understand the role of e-books in developing preservice science teachers’ digital literacy (DL) and technological, pedagogical, and content knowledge (TPACK). Results from this study highlight the need for Educational Technology to become an intentional part of teacher preparation programs.

Format: Individual Paper Presentation  Presider: Brooke Whitworth

Educational Technology
Sat, January 11

Examining Elementary Teachers’ Technology Integration Beliefs and Practices Across STEM Curricula in 1:1 Schools

Angelina Constantine, University of Minnesota
Paula Rozowa, University of Minnesota; Alaina Szostkowski, Great River School; Joshua Ellis, Florida International University; Gillian Roehrig, University of Minnesota

10:00 am - 11:00 am in Pecan - Session B

Technology’s role in STEM education is ambiguous at best. This multiple-case study uses both the TPACK framework and the PIC-RAT framework to explore the technology use of six elementary teachers during two STEM units. We seek to uncover a clearer understanding of the “T” in STEM by examining the relationship between their beliefs and practices.

Format: Individual Paper Presentation  Presider: Brooke Whitworth
Integrating Computational Thinking Into Middle School Science Through Co-Designed Storylines

Quentin Biddy, University of Colorado
Alexandra Gendreau Chakarov, University of Colorado; Jennifer Jacobs, University of Colorado; Tamera Sumner, University of Colorado; Mimi Recker, Utah State University; William Penuel, University of Colorado

10:00 am - 11:00 am in Pecan - Session C

We describe a professional development model that supports teachers to integrate computational thinking (CT) and computer science principles into middle school science and STEM classes. The model includes the collaborative design of storylines or curricular units aligned with the NGSS that utilize programmable sensors.

Format: Individual Paper Presentation  Presider: Brooke Whitworth

Deepening Teacher Understanding and Implementation of Disciplinary Core Ideas Instruction Through Pictorial Representations.

Max L. Longhurst, Utah State University
Kimberly H. Lott, Utah State University; Brenda Bennett, Utah State University; April Mitchell, Utah State University

10:00 am - 11:00 am in Pecos - Session A

This presentation will address the instructional practice of using pictorial representations to introduce and deepen pre-service teacher understanding of the Disciplinary Core Ideas from A Framework for K-12 Science Education. A model of instruction will be shared in connection to a procedural method to analyze pictorial representations.

Format: Individual Paper Presentation  Presider: Leiflyn Gamborg

Nonmajors’ Engagement in Science Practices in NGSS-aligned Science Course

Ellen Barnett, Trinity University

10:00 am - 11:00 am in Pecos - Session B

This session presents a case study of how 233 nonmajors enrolled in science courses originally designed for future PK-8 teachers engaged in NGSS science practices while planning and carrying out investigations. Finding provide research and practical implications for science teacher educators and science faculty who prepare future teachers.

Format: Individual Paper Presentation  Presider: Leiflyn Gamborg
Virtual Science Mentoring: Undergraduate Biology Majors' Guidance of Elementary and Middle School Students’ Science Research Project

Madelon J McCall, Baylor University
Marty Harvill, Baylor University; Michael E Moore, University of Nebraska-Lincoln; Tracey Sulak, Baylor University; Alex Tolar, Texas Christian University

10:00 am - 11:00 am in Pecos - Session C

This presentation addresses how undergraduate biology majors promoted science literacy through virtual mentoring and teaching of scientific knowledge and research processes to elementary and middle school students, providing them the opportunity to participate in scientific research resulting in a final research project and poster presentation.

Format: Individual Paper Presentation  Presider: Leiflyn Gamborg

Break

11:00 am - 11:15 am

Methods of Scientific Investigation: Vitruvian Man Corrected

Alexis Denn, Southwest High School

11:15 am - 12:15 pm in Blanco - Session A

For decades national and state science education standards have fought against the tide of language pushing the idea of a single scientific method used by all scientists. This misconception can be addressed with a modified Vitruvian Man lesson which gives students a hands on experience with three different methods of scientific investigation.

Format: Individual Paper Presentation  Presider: Sara Heredia

Evolution Education in Iran: Shattering Myths About Teaching Evolution in an Islamic Country

Mahsa Kazempour, Penn State - Berks Campus
Aidin Amirshokoohi, DeSales University

11:15 am - 12:15 pm in Blanco - Session B

This presentation will focus on the K-12 teaching of evolution in Iran. The aim of the presentation is to shed light on: (a) the views of nature of science projected in the science education standards, (b) the depiction and description of the evolutionary concepts in the K-12 science content, and (c) possible contributing factors.

Format: Individual Paper Presentation  Presider: Sara Heredia
Facilitating the Development of Pre-Service Science Teachers' Assessment Literacy in a Science Methods Course

Laura C Eicher, Clemson University
Michelle Cook, Clemson University

11:15 am - 12:15 pm in Directors - Session A

The assessment literacy of five pre-service science teachers was examined to determine how embedded assessment instruction in a science methods course influenced the development of science assessment literacy. Based on our findings, we suggest pedagogies for methods instructors to implement to facilitate the development of assessment literacy.

Format: Individual Paper Presentation  Presider: Charles Fidler

Learning Theory Into Practice: A Three-Year Study of Pre-Service Teachers' Use of Learning Theory in the Science Classroom

Jennifer F Oramous, University of Arkansas
Stephen Burgin, University of Arkansas

11:15 am - 12:15 pm in Directors - Session B

The results from a three-year study with preservice secondary science teachers (PST) and their use of learning theory (LT) in the classroom will be shared. Using observations and student artifacts, we explored the use and types of LT used in our PSTs during their spring internship. Suggestions for improvement in PST use of LT will be included.

Format: Individual Paper Presentation  Presider: Charles Fidler

Meeting the Challenges of the edTPA by Developing Candidates Understanding and Implementation of the NGSS Science & Engineering Practices

Matt Reynolds, North Carolina State University
Soonhye Park, North Carolina State University; K. C. Busch, North Carolina State University; Gary W. Wright III, North Carolina State University

11:15 am - 12:15 pm in Directors - Session C

This study investigated how a revised edTPA/NGSS-aligned science methods course impacted preservice teachers’ performance on the edTPA. Scores and evidence of PCK from the cohort which took the NGSS-aligned course (N = 6) were analyzed and compared to the edTPA performance of the previous three cohorts of preservice science teachers (N = 33).

Format: Individual Paper Presentation  Presider: Charles Fidler
**Ethnoscience and Environmental Education**  
**Sat, January 11**

**Garden-Based Education for Engagement of Underrepresented Youth in STEM**

*Rita Hagevik*, *The University of North Carolina at Pembroke*  
*Kathy Cabe Trundle*, *Utah State University*

11:15 am - 12:15 pm in Frio - Session A

In this study we build upon previous empirical studies on gardening-based learning specifically with a focus on underrepresented youth and science identity. We found that a garden-based program with 115 youth participants (84% minority) on a University campus did have a positive impact on youth engagement in STEM and on youth science identity.

*Format: Individual Paper Presentation*

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**Sat, January 11**

**A Planning Framework for Developing Sense of Place in Outdoor Learning Environments**

*Matthew J Benus*, *Dunes Learning Center*  
*Jory K Mathews*, *River Forest Middle School*

11:15 am - 12:15 pm in Frio - Session B

A curriculum planning framework to help foster “sense of place”/ “place attachment” is introduced. The framework is derived from published research studies. It includes developing three foundational experiences: Social Context of Place, Activities and Experiences in Place, and Actions to Maintain/Refine Place.

*Format: Individual Paper Presentation*

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**Science Teacher Professional Development**  
**Sat, January 11**

**Secondary Science Teachers’ Self-Efficacy Beliefs and Implementation of Inquiry**

*Fatma Kaya*, *Kent State University*  
*Lisa A Borgerding*, *Kent State University*; *Tanzimul Ferdous*, *Kent State University*

11:15 am - 12:15 pm in Llano - Session A

An explanatory mixed methods design was used to understand secondary science teachers’ self-efficacy beliefs and implementation of inquiry to provide information for improvement of science education in a Midwestern U.S. state.

*Format: Individual Paper Presentation*  Presider: Max L. Longhurst
Factors Contributed to Impacts on Instructional Practice: A Comparison of 2 STEM Professors for a Reflective Teaching Program

Stephanie P Toro, Universidad de los Andes

11:15 am - 12:15 pm in Llano - Session B

The Reflective Teaching Program for Science, Engineering, and Math Professors is a ten month program that engages professors in a community of practice (CoP) that includes workshops, meetings, and peer feedback. Here we compare the growth of two professors related to motivation, self-regulation learning skills, and participation with the CoP.

Format: Individual Paper Presentation  Presider: Max L. Longhurst

NSTA's Position Statement on the Teaching of Climate Science: a Topical Tool for Science Teacher Education

Eric Pyle, James Madison University

11:15 am - 12:15 pm in Mesquite - Session A

There can be little doubt that the impacts of climate change on society represent a generational “wicked problem,” the solutions to which may be elusive without a scientifically literate population. A pivot point to this literacy is a body of teachers of science well-prepared to address the content that supports climate science and prepared to deal with the external pressures that are often placed upon teachers. In response to this need, NSTA assembled a team of science teachers, scientists, teacher educators, and Informal Science Education specialists, to develop a position statement that represents the best thinking on how to support teachers of science in their delivery of evidence-based instruction of climate science and climate change. Released in September 2018, the position statement is designed to speak not just to science teachers, but also useful advice to school administrators, state-level policy makers, and to all those who would support quality teaching of climate science in general and climate change in particular. The general response to the position statement has been muted but supportive. But given the broad nature of climate change, several members of the committee extended the position statement through a supplemental document, with specific implications for science teacher preparation and professional development. Briefly, the domains addressed are (a) the nature of science and scientific decision-making, (b) controversy and personal beliefs, (c) the nature of deep-seated beliefs, (d) the time needed for learning, and (e) responses to climate change (Pyle, Niepold, Haas, Wysession, and Manning, 2018). In this presentation, the NSTA position statement will be described, but the role of the supplemental document in supporting K-12 science teacher education will also be discussed.
Novice Elementary and Secondary Teachers’ Technology and Engineering-Enhanced Science Instruction
Jennifer L. Maeng, University of Virginia
Amanda L. Gonczi, Michigan Technological University

11:15 am - 12:15 pm in Nueces - Session A

This study investigated the extent to which and ways novice teachers of grades 4-12 integrated technology, with specific attention to engineering-focused lessons. Results indicate a need to support teachers’ meaningful technology use within engineering projects and a need to help teachers of higher grades include more engineering in instruction.

Format: Individual Paper Presentation  Presider: Mason Kuhn

Microteaching Science With the HyperDuino System: A Potential Pathway to Improving Elementary Teachers’ Self-Efficacy and Growth Mindset for Using Educational Technology
Jennifer C. Parrish, University of Northern Colorado
Bridget K. Mulvey, Kent State University

11:15 am - 12:15 pm in Nueces - Session B

This study explored changes in elementary preservice teachers’ self-efficacy and mindset after teaching a 20-minute physical science microteaching lesson using a HyperDuino computing platform. Findings indicated the HyperDuino provided an accessible entry-point for elementary preservice teachers apprehensive about using Educational Technology.

Format: Individual Paper Presentation  Presider: Mason Kuhn

Supporting Students in Small Group Engineering Activities: An Exploration of Teacher Moves
Jeanna R. Wieselmann, Southern Methodist University
Emily A. Dare, Florida International University; Elizabeth A. Ring-Whalen, St. Catherine University; Gillian H. Roehrig, University of Minnesota

11:15 am - 12:15 pm in Nueces - Session C

Small group engineering design activities pose challenges to students because of their open-ended nature. This study explores the role of the teacher in supporting students by addressing the research question: What moves do teachers of students aged 10-12 years make to support students’ participation in small group engineering activities?

Format: Individual Paper Presentation  Presider: Mason Kuhn
Measurement of Virtual Reality Based Science Teacher Preparation Simulations

Richard Lamb, East Carolina University
Elisabeth Etopio, University at Buffalo

11:15 am - 12:15 pm in Pecan - Session A

The purpose of this study is to compare VR based preservice science teacher clinical teaching environments with real-life teaching environments to understand how this tool may support preservice science teacher education. VR environments assist with the transfer of theory to practice.

Format: Individual Paper Presentation  Presider: Brad Lanier

Integrating Funds of Knowledge With Flipped Classrooms for English Language Learners

Heidy M Garcia-Moreno, University of Texas Rio Grande Valley
Angela M Chapman, University of Texas Rio Grande Valley

11:15 am - 12:15 pm in Pecan - Session B

This paper examines the literature on the integration of flipped classrooms and funds of knowledge in science education. The authors share classroom experiences with Hispanic students whose native language is Spanish and make a case for the need to explore flipped classrooms integrated with FOK for ELL students.

Format: Individual Paper Presentation  Presider: Brad Lanier

Experiences of Teacher Certification Testing: Bias, Resistance, and Practical Solutions

Marcelle A Siegel, University of Missouri
Shannon M. Burcks, University of Missouri; Adele Du, University of Missouri; Patrick Bowey, University of Missouri; Dante Cisterna, Independent; Nilay Muslu, Muğla Sıtıkı Koçman Üniversitesi; Christopher D. Murakami, Chatham University; Suleyman Cite, Kastamonu University

11:15 am - 12:15 pm in Pecan - Session C

Preparing teachers to understand and resist pressures from high-stakes testing is a critical undertaking for programs. This study examines the impact of a certification test. Key findings were ethical considerations; pre-service teacher unmet needs; resistance and coping. We will discuss support for science teachers related to testing pressures.

Format: Individual Paper Presentation  Presider: Brad Lanier
Preservice Science Teacher Preparation
Sat, January 11

No Grades in a Science/Technology/Society Interaction (STS) Course: Will Students Learn?
Barbara S. Spector, University of South Florida
11:15 am - 12:15 pm in Pecos - Session A

This emergent design qualitative evaluation of an STS course in an Honors College in which students were guaranteed an A grade from the beginning of the semester reveals 14 out of 16 students were outstandingly productive. The professor’s and the students’ reflections are reported as well as implications for science teacher education.


Preservice Science Teacher Preparation
Sat, January 11

Validating a 3E Rubric Assessing Pre-Service Science Teachers’ Practical Knowledge of Inquiry Teaching
Jianlan Wang, Texas Tech University
Stacey Sneed, Texas Tech University; Yuanhua Wang, Texas Tech University
11:15 am - 12:15 pm in Pecos - Session B

Inquiry teaching is a critical objective in science teacher preparation. Yet, there is lack of a preservice-teacher-friendly rubric that can serve as the practical guideline for their implementation of inquiry teaching. We will introduce a rubric adapted from the 5E model, provide examples of its use, and discuss its validity and reliability.


Science Teacher Professional Development
Sat, January 11

Impact of a Teacher Induction Model: Noyce at VCU
Elizabeth W Edmondson, Virginia Commonwealth University
11:15 am - 12:15 pm in Pecos - Session C

The use of a two year induction model supports our Noyce Scholars in their first years of teaching. The induction model engages the Scholars in two protocols, a problem-solving and success protocol, at each meeting. Novice Teachers attend at high rates and remain in the profession at above average rates.


Sat, January 11

ASTE Awards and Business Luncheon
12:15 pm - 1:45 pm in Regency Ballroom
Presiders

Mark Andrew Bloom  
Lauren Angelone  
Ellan Barnett  
Nazan Bautista  
Mike Borowczak  
Stephen Burgin  
Brendan Callahan  
Daniel Carpenter  
Brenda Carpenter  
Lenora Crabtree  
Jeni Davis  
Yohanis De La Fuente  
Helen Douglass  
Gayle Evans  
Stephanie Fanselow  
Donna Farland-Smith  
Charles Fidler  
Michelle Forsythe  

Leiflyn Gamborg  
Heidy Garcia-Moreno  
Anne Gatling  
Katie Green  
Carolanne Grogan  
Stephanie Hathcock  
Richard Hechter  
Sara Heredia  
Robbie Higdon  
Karl Jung  
Meredith Kier  
Natalie King  
Mason Kuhn  
Max L. Longhurst  
Sandra Lampley  
Brad Lanier  
Felicia Leammukda  
Mandy McCormick Smith  
Christina McDaniel  
Lisa McDonald  
Jennifer Mesa  
Helen Meyer  
Felicia Moore Mensah  
Bridget Mulvey  
James Nyachwaya  
Eva Nyutu  
Jennifer Parrish  
Stephanie Philipp  
Franklin S. Allaire  
Camille Stegman  
Elizabeth Stretch  
Lu Wang  
Angela Webb  
Brooke Whitworth  
Jeanna Wieselmann  
Selene Willis

Past Presidents

1932-34  S. Ralph Powers  
1935-36  John C. Johnson  
1936-38  W. L. Kikenberry  
1938-40  E. Laurence Palmer  
1940-41  Earl R. Glenn  
1941-45  Anna M. Gemmill  
1946-47  Victor L. Crowell  
1947-48  Ellis Haworth  
1948-49  H. Emmett Brown  
1949-50  John Read  
1950-51  George Haup  
1951-52  Robert Cooper  
1952-53  Rose Lammel  
1953-54  G. P. Cahoon  
1954-55  Ned Bryan  
1955-56  John Wells  
1956-57  Robert Wickware  
1957-58  June Lewis  
1958-59  George Zimmer  
1959-60  Harold Tannenbaum  
1960-61  Herbert Schwartz  
1961-62  Fletcher Watson  
1962-63  Willard Jacobson  
1963-64  R. Will Burnett  
1964-65  Herbert Smith  
1965-66  Ralph Leifer  
1966-67  Edward Victor  
1967-68  Sylvan Mickelson  
1968-69  Stephen Winter  
1969-70  Eugene Lee  
1970-71  John Montean  
1971-72  Paul Westmeyer  
1972-73  Ronald D. Anderson  
1973-74  Robert E. Yager  
1974-75  David P. Butts  
1975-76  Jacob Blankenship  
1976-77  Patricia Blosser  
1977-78  David H. Ost  
1978-79  John Schaff  
1979-80  Ertle Thompson  
1980-81  Hans Anderson  
1981-82  Jerry C. Horn  
1982-83  James P. Barufaldi  
1983-84  Ron W. Cleminson  
1984-85  Thomas P. Evans  
1985-86  Marvin Druger  
1986-87  Robert K. James  
1987-88  Joyce Swartney  
1988-89  William C. Ritz  
1989-90  Floyd Mattheis  
1990-91  Gwendolyn Henderson  
1991-92  Roger Olstad  
1992-93  Catherine G. Yeotis  
1993-94  Peter A. Rubba  
1994-95  Norman Lederman  
1995-96  Jim Ellis  
1996-97  Paul Kuerbis  
1997-98  Bill Baird  
1998-99  Larry Flick  
1999-2000  John Staver
Past Award Winners

Outstanding Science Educator of the Year (Award I)

- 1973 Gerald Krockover, Purdue University
- 1974 No Award Given
- 1975 Vincent Lunetta, University of Iowa
- 1976 No Award Given
- 1977 No Award Given
- 1978 Harold Jaus, University of Illinois-Chicago
- 1979 Roger W. Bybee, BSCS
- 1980 Anton Lawson, Arizona State University
- 1983 William R. Capie, University of Georgia
- 1985 James Dudley Herron, Purdue University
- 1986 Charles R. Coble, East Carolina University
- 1987 John Penick, University of Iowa
- 1988 James Barufaldi, University of Texas
- 1989 Lawrence F. Lowery, University of California
- 1990 William C. Kyle, Jr., Purdue University
- 1991 Barry Fraser, Curtin University of Technology, Australia
- 1993 Cherl Mason, San Diego State University
- 1994 Patricia Simmons, University of Georgia
- 1995 J. Preston Prather, University of Virginia
- 1996 Sandra Abell, Purdue University
- 1997 Bonnie Shapiro, University of Calgary
- 1998 William F. McComas, University of Southern California
- 1999 Patricia Simpson, St. Cloud State University
- 2000 Wolf-Michael Roth, University of Victoria
- 2001 John Settlage, Cleveland State University
- 2002 No Award Given
- 2003 (10+ yrs): Ronald Bonnstetter, University of Nebraska; (<10 yrs): Michael Clough, Iowa State University
- 2004 No Award Given
- 2005 (10+ yrs): Larry Yore, University of Victoria, Canada (<10 yrs): Joanne Olson, Iowa State University
- 2006 (10+ yrs): Penny J. Gilmer, Florida State University (<10 yrs): John W. Tillotson, Syracuse University
- 2007 (10+ yrs): James A. Shymansky, University of Missouri-St. Louis (<10 yrs): G. Nathan Carnes, University of South Carolina
- 2008 (10+ yrs): Kathryn Scantlebury, University of Delaware (<10 yrs): Kathy Cabe Trundle, The Ohio State University
• 2009 (10+ yrs): Deborah Tippins, *University of Georgia* (<10 yrs): Catherine Milne, *New York University*
• 2010 (10+ yrs): Julie A. Luft, *Arizona State University* (<10 yrs): Randy L. Bell, *University of Virginia*
• 2011 (10+ yrs): Julie Gess-Newsome, *Northern Arizona University*
• 2012 (<10 yrs): Rebecca Schneider, *University of Toledo*
• 2013 (10+ yrs): Lynn Bryan, *Purdue University* (<10 yrs): Carla Johnson, *University of Cincinnati*
• 2014 Alec Bodzin, Lehigh University (10+ yrs)
• 2015 Gail Jones, North Carolina State Univ. (10+ yrs); Deborah Hanuscin, Univ. of Missouri (<10 yrs)
• 2016 Rose Pringle, University of Florida (10+ yrs); Erin Peters-Burton, George Mason University (<10 years)
• 2017 Felicia Moore Mensah, Columbia University, (10+ yrs)
• 2018 Ron Hermann, Towson University (<10yrs)
• 2019 Lisa Martin-Hansen, California State University, Long Beach (10+yrs); Jerrid Kruse, Drake University (<10yrs)
• 2020 Colby Tofel-Grehl, Utah State University (<10 yrs); Gillian Roehrig, University of Minnesota (>10yrs)

**Outstanding Mentor (Award II)**

• 1997 John Penick, *University of Iowa*
• 1998 Hans Anderson, *Indiana University*
• 1999 Norman Lederman, *Oregon State University*
• 2000 Robert K. James, *Texas A & M University*
• 2001 Robert E. Yager, *University of Iowa*
• 2002 Walter S. Smith, *Ball State University*
• 2003 Larry Enochs, *Oregon State University*
• 2004 Catherine Yeotis, *Wichita State University*
• 2005 Sandra Abell, *University of Missouri-Columbia*
• 2006 Tom Koballa, University of Georgia
• 2007 Kenneth Tobin, *Graduate Center of the City University of New York*
• 2008 Dana Zeidler, *University of South Florida*
• 2009 Lloyd Barrow, *University of Missouri, Columbia*
• 2010 Kathryn Scantlebury, *University of Delaware*
• 2011 Gerry Saunders, *Unity College*
• 2012 Alec Bodzin, *Lehigh University*
• 2013 Julie Luft, *University of Georgia*
• 2014 Gillian Roehrig, *University of Minnesota*
• 2015 Pat Obenauf, *West Virginia University*
• 2016 Randy Bell, *Oregon State University*
• 2017 Kent Crippen, *University of Florida*
• 2018 William McComas, *University of Arkansas*
• 2019 Deborah Hanuscin, *Western Washington University*
• 2020 Michael P. Clough, *Texas A&M University*

**Emeritus Awards/Outstanding Longtime Service to ASTE (Award III)**

• N. Eldred Bingham, *University of Florida*
• Milton O. Pella, *University of Wisconsin*
• Pinchas Tamir, *Hebrew University*
• Clarence Boeck, *University of Minnesota*
• Fletcher Watson, *Harvard University*
• Marvin Druger, *Syracuse University*
• R. Will Burnett, *University of Illinois*
• Fred Fox, Oregon State University
• Nasrine Adibe, Dowling College
• Gerald Craig, Teachers College Columbia University
• Herbert Smith, Colorado State University
• Roger Olstad, University of Washington
• Alfred De Vito, Purdue University
• Hans Anderson, Indiana University
• Paul DeHart Hurd, Stanford University
• Robert W. Howe, Ohio State University
• Ronald K. Atwood, Univ. of Kentucky
• Dorothy Gabel, Indiana University
• Addison Lee, University of Texas
• Willard Jacobson, Teachers College Columbia University
• Donald W. McCurdy, University of Nebraska-Lincoln
• Ralph Lefler, Purdue University
• Harold Tannenbaum, Hunter College
• Steven Winter, Tufts University
• William C. Ritz, California State University, Long Beach
• Edward Victor, Northwestern University
• Stanley Helgeson, Ohio State University
• Floyd E. Mattheis, East Carolina University
• Kenneth J. Appleton, Central Queensland University
• William E. Baird, Auburn University
• Michael Cohen, Indiana University-Purdue University
• Vincent Lunetta, Pennsylvania State University
• Gerald Craig, Teachers College Columbia University
• Herbert Smith, Colorado State University
• Roger Olstad, University of Washington
• Dana Zeidler, University of South Florida
• Jon Pedersen, University of Nebraska-Lincoln
• Kevin Finson, Bradley University
• Molly Weinburgh, Texas Christian University
• Malcolm Butler, University of Central Florida

Innovations in Teaching Science Teachers (Award IV)

• 1990 A Reflective Approach to Science Methods Courses for Preservice Elementary Teachers, Dorothy Rosenthal, California State University-Long Beach
• 1991 Enhancing Science and Mathematics Teaching, Kenneth Tobin, Nancy Davis, Kenneth Shaw, and Elizabeth Jakubowski, Florida State University
• 1992 The Learning Cycle as a Model for the Design of Science Teacher Preservice and Inservice Education, Peter Rubba, Pennsylvania State University
• 1993 Reconstructing Science Teacher Education Within Communities of Learners, Deborah Tippins, University of Georgia, Sharon Nichols, Florida State University, and Kenneth Tobin, Florida State University
• 1994 No Award Given
• 1995 Science for Early Adolescence Teachers (Science FEAT): A Program for Research and Learning, Samuel Spiegel, Angelo Collins, and Penny J. Gilmer, Florida State University
• 1996 An Innovative Model for Collaboration Reform in Elementary School Science Teaching, M. Gail Shroyer, Emmett Wright, and Linda Ramey-Gassett, Kansas State University
• 1997 Reconceptualizing the Elementary Science Methods Course Using Reflective Orientation, Sandra Abell and Lynn Bryan, Purdue University
• 1998 What Science Education Standards Say: Implications for Teacher Education, Penny Hammrich, Temple University
• 1999 No Award Given
• 2000 Professional Development Programs for Elementary Science Teachers: An Analysis of Teacher Self-Efficacy Beliefs and The Professional Development Model, Tracy J. Posnanski, University of Wisconsin-Milwaukee

• 2001 Empowering Teachers as Researchers and Inquirers, Anne M. (Amy) Cox-Petersen, California State University, Fullerton

• 2002 Being There and Not Being “There:” The Experience of Teaching an Elementary Science Education Course on the Internet, Janice Koch and Michael Barriere, Hofstra University

• 2003 Using a Card-sorting Task to Elicit and Clarify Science Teaching Orientations, Patricia Friedrichsen, University of Missouri-Columbia and Thomas Dana, Pennsylvania University

• 2004 An Inquiry-based Laboratory Lesson to Construct an Understanding of Earth’s Seasons, Paul Ashcraft, Clarion University and Susan Courson, Clarion University

• 2005 No Award given

• 2006 No Award given

• 2007 Using Historical Non-fiction and Literature Circles to Develop Elementary Teachers’ Nature of Science Understanding, Sharon E. Nichols, The University of Alabama & William Straits, California State University Long Beach

• 2008 A Case Study of Fifth Grade Teachers’ Changes in Methodology During a Two-Year Timeframe, Anita Martin and Brian Hand, University of Iowa

• 2009 Flexibly adaptive professional development in support of teaching science with geospatial technology, Nancy M. Trautmann, Cornell University & James G. MaKinster Hobart & William Smith Colleges

• 2010 Learning to Teach Science Through Collaboration: Coteaching and Cogenerative Dialogue in Elementary Science Methods Courses, Christina Siry, University of Luxembourg, Nicole Lowell, Elizabeth Zawatski, Manhattanville College

• 2011 Exploring Multiple Outcomes: Using Cogenerative Dialogues and Coteaching in a Middle School Science Classroom, Nicole K. Grimes, The Graduate Center, The City University of New York What about those left behind? A template for developing quality science lessons for English language learners, Susan Gomez-Zwiep and William J. Straits, California State University, Long Beach

• 2012 Descriptive Inquiry in the Throes of Learning to Teach: Can Prospective Teachers Learn to Teach and Study their Teaching Closely? Michele Koomen and Jamie Mitchell, Gustavus Adolphus College

• 2013 No Award Given

• 2014 Connecting to Our Community: Utilizing Photovoice as a Pedagogical Tool to Connect College Students to Science, Kristin Cook, Bellarmine University & Cassie Quigley, Clemson University

• 2015, If You Can’t Say Something Nice: A Design-Based Research Approach Investigating the Social Interactions of New Science and Math Teachers Using a Video Annotation Tool, Joshua Ellis, Tasneem Anwar, Justin McFadden, & Gillian Roehrig from the University of Minnesota STEM Education Center

• 2016, The Use of Journal Clubs in Science Teacher Education. Dr. Karen A. Tallman, Springfield College and Dr. Allan Feldman, University of South Florida

• 2017, Teachers’ classroom practices 2-5 years after having completed an intensive secondary science teacher education program. Michael Clough, Iowa State University; Joanne Olson, Iowa State University

• 2018, Collaborating to teach elementary science methods in the field with K-6 classroom teachers: Benefits for in-service and pre-service teachers. Matthew Vick, University of Wisconsin, Whitewater; Patricia Falk Mukwonago Area School District

• 2019, A Curriculum-linked Professional Development Approach to Support Teachers’ Adoption of Socio-Environmental Science Investigation Alec Bodzin, Lehigh University; Thomas Hammond, Lehigh University; Kate Popejoy, Popejoy STEM LLC; William Farina, Lehigh University, David Anastasia, Breena Holland, James Carrigan, Scott Rutzmoser, Dork Sahagian

• 2020, CyberSecurity and Technology: How do they Fit into a Science Classroom? Andrea C. Burrows and Mike Borowczak, University of Wyoming.

Implications of Research for Educational Practice (Award V)
<table>
<thead>
<tr>
<th>Year</th>
<th>Title</th>
<th>Authors</th>
</tr>
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<tbody>
<tr>
<td>1978</td>
<td>Teacher Behavior Does Make a Difference in Hands-On Science Classrooms</td>
<td>James A. Shymansky, University of Iowa, and John E. Penick, University of Iowa</td>
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<td>1981</td>
<td>Wait-time and Learning in Science</td>
<td>Kenneth Tobin, Western Australia Institute of Technology and William Capie, University of Georgia</td>
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<td>1983</td>
<td>The Disadvantaged Majority: Science Education for Women</td>
<td>Jane Butler Kahle, Purdue University</td>
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<td>1984</td>
<td>Training Science Teachers to Use Better Teaching Strategies</td>
<td>Russell H. Yeany and Michael J. Padilla, University of Georgia</td>
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<td>1985</td>
<td>Using Research to Improve Science Teaching Practice</td>
<td>Kenneth Tobin, Western Australian Institute of Technology</td>
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<td>1986</td>
<td>Active Technology for Higher Cognitive Level Learning in Science</td>
<td>Kenneth Tobin, William Capie, and Antonio Bettencourt, University of Georgia</td>
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<td>1987</td>
<td>Training Teachers to Teach Effectively in the Laboratory</td>
<td>Pinchas Tamir, The Hebrew University</td>
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<td>1988</td>
<td>What Can Be Learned From Investigations of Exemplary Teaching Practice</td>
<td>Kenneth Tobin, Florida State University</td>
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<td>1990</td>
<td>Helping Students Learn How to Learn: A View from a Teacher-Researcher</td>
<td>Joe Novak, Cornell University</td>
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<td>1992</td>
<td>Teacher Development in Microcomputer Usage in K-12 Science</td>
<td>James D. Ellis, BSCS</td>
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<td>1993</td>
<td>Understanding and Assessing Hands-On Science</td>
<td>Lawrence Flick, Washington State University</td>
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<td>1994</td>
<td>Teaching Evolution: Designing Successful Instruction</td>
<td>Lawrence Scharmann, Kansas State University</td>
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<td>1995</td>
<td>Using Visits to Interactive Science and Technology Centers, Museums, Aquaria and Zoos to Promote Learning in Science</td>
<td>Leonie Rennie and Terrence McClafferty</td>
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<tr>
<td>1996</td>
<td>General Biology: Creating a Positive Learning Environment for Elementary Education Majors</td>
<td>Larry Scharmann and Ann Stanheim-Smith, Kansas State University</td>
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<td>1997</td>
<td>Empowering Science Teachers: A Model for Professional Development</td>
<td>Ann Howe, University of North Carolina at Raleigh and Harriet Stubbs, North Carolina State University</td>
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<tr>
<td>1999</td>
<td>A Dynamical Systems Based Model of Conceptual Change</td>
<td>Andrew Hurford, Haskell Indian Nations University</td>
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<td>2000</td>
<td>Teachers and Technology: A Case Study From an Implementation Project</td>
<td>Myra Halpin and Ann Howe, North Carolina School of Science and Mathematics, and North Carolina State University</td>
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<tr>
<td>2002</td>
<td>What Knowledge is of Most Worth for Lateral Entry Secondary Science Teachers?</td>
<td>William R. Veal, University of North Carolina at Chapel Hill</td>
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<tr>
<td>2003</td>
<td>Teacher Student Con-Construction in Middle School Life Science</td>
<td>Maria Nunez-Oviedo, University of Massachusetts-Amherst, Mary Ann Rea-Ramirez, Hampshire College, John Clement and Mary Jane Else, both of, University of Massachusetts-Amherst</td>
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<td>2004</td>
<td>'I Be Bangin'! Understanding How Urban African American Youth Can Sustain Agency Across Social Field</td>
<td>Rowhea Elmesky, Washington University in St. Louis</td>
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<tr>
<td>2005</td>
<td>Culturalized Science Instruction: Exploring Its Influence upon Black and White Students’ Achievement</td>
<td>Eileen Parsons, North Carolina State University</td>
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<td>2006</td>
<td>No Award given</td>
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<td>2007</td>
<td>Narrative of Community: Visualizing Culturally Relevant Science Pedagogy Through the Identities of Black Middle School Teachers</td>
<td>M. Jenice Goldston and Sharon E. Nichols, The University of Alabama</td>
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<td></td>
<td>Co-Winner: Paper 2 – Expanding the Ways in Which Urban Students Participate in Science</td>
<td></td>
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</tbody>
</table>
Past winners of the John C. Park National Technology Leadership Initiative Fellowship

Park, J. C. (2003). *Now that we have new technology tools, what is being built?* Association for the Education of Teachers in Science (AETS), St. Louis MO. (North Carolina State University)


*Educational Technology use during secondary science student teaching: Three case studies.* Association for the Education of Teachers in Science (AETS), Nashville TN. (The Ohio State University, University of Virginia)

Koballa, T., Upson, L., Minchew, C., Parlo, A., & Inyega, J. (2005). *Using technology to support evidence-based science teaching and mentoring.* Association for the Education of Teachers of Science (ASTE), Colorado Springs, CO. (University of Georgia)


Schneider, R. M. (2007). *Examining the instructional design of a technology enhanced course for new mentor teachers.* Association of Science Teacher Education, Clearwater Beach, FL. (University of Toledo)


Hagevik, R., & Stinger-Barnes, P. (2011). *The effects of geospatial informational technologies on preservice science teachers’ technological pedagogical content knowledge.* Association for Science Teacher Education, Minneapolis, MN (The University of Tennessee, Carson-Newman University)

Young, T., Farnsworth, B., Grabe, C., & Guy, M. (2012). *Exploring new technology tools to enhance astronomy teaching & learning in grades 3-8 classrooms: Year one implementation.* Association for Science Teacher Education, Clearwater Beach FL. (University of North Dakota)


*CyberSecurity and Technology: How do they Fit into a Science Classroom?* (2019). Andrea C. Burrows and Mike Borowczak, University of Wyoming.
The Conference Committee invites you to journey to Utah and join us at the 2021 ASTE conference in Salt Lake City. Pre-conference adventures begin on January 13th, and the conference continues until January 16th. Numerous hiking trails and ski slopes are accessible within a short drive from Salt Lake. Hotel rooms at the conference rate will be available from January 11th through January 18th so that you may fully explore all the many wonders Utah has to offer.

Recent Honors:

Top Ski Resorts: Snowbird and Alta  (Forbes)
#1 US Hiking City: Salt Lake City  (National Geographic)
#1 Mountain Town: Park City  (Travel + Leisure)
#2 Friendliest US City: Salt Lake City  (Travel + Leisure)

Utah hosts the Utah Jazz, Utah Grizzlies, REAL Salt Lake, 6 National Parks, and 7 National Monuments. And for patrons of the arts, Salt Lake offers nationally recognized professional companies: Ballet West, Salt Lake Symphony, Utah Opera Company, Pioneer Theater Company, and the Utah Festival Opera and Musical Theatre Company.

We look forward to hosting you at higher elevations!

Kathy Cabe Trundle, Conference Chair