

2014 Mid-Atlantic ASTE Regional Conference

Blowing Rock, NC

September 19th & 20th

Meg Blanchard, Leslie Bradbury & Lisa Gross

2014 MA-ASTE Conference Co-Chairs

This conference is sponsored by:

North Carolina State University, Department of STEM Education and College of
Education and

Appalachian State University, Reich College of Education

Conference Motto: Go Big or Go Home

Many thanks to Dr. Sherri Brown, Our Regional Director, for her incredible help with communications for MAASTE via email lists and for continual MAASTE website updates. Thanks to Rachel Wilson, our Treasurer for handling all of the registration deposits and refunds. And thanks to the Co-Chairs of 2013, Tina Cartwright, Deb Hemler, and Paula Magee for sharing their program information.

Thanks to Dr. Kathy Cabe Trundle of the Department of STEM Education and the NC State College of Education for supporting the printing of the program and providing some supplies. Thanks to Dr. Robin Groce, Acting Dean of the Reich College of Education and The James Foundation (Jan Stanley) at Appalachian State University for the lanyards, nametags and contributed supplies.

Thanks to Ruthie Nathan at Chetola Resort for her helpfulness throughout the planning process.

Thanks to all of our colleagues who responded in such timely manners to requests from the conference co-chairs.

Conference Overview

Thursday Evening

Registration 6:00-8:00 p.m. Outside Evergreen Room

Friday Morning

Evergreen Room

Breakfast 7:30-8:30 in Timberlake's Restaurant (*Bring your meal ticket)

Registration 8:00-8:30 Outside Evergreen Room

Friday 8:30-9:50 Session 1: Learning through Technology

Break 9:50-10:00

Friday 10:00-11:00 Session 2: College & High School Teaching and Learning

Friday 11:15-12:15 Session 3: Innovative Teaching and Projects

Lunch 12:15-1:00 Boxed Lunch is delivered to pick up (*Bring your meal ticket)

Friday Afternoon

Evergreen Room

Friday 1:00-2:20 Session 4: Teacher Response to Professional Development

Break 2:20-2:30

Friday 2:30-3:30 Session 5: Environmental Education

Break 3:30-3:40

Friday 3:40-5:00 Session 6: Elementary Student Learning & Informal Education

Friday Evening

Break 5:00-6:00 Hospitality Suite Condo will be open

6:00-7:00 **Poster Session 1** in App/Blue Ridge Room with light appetizers

Dinner 7:00-8:00 in Evergreen Room (*Bring your meal ticket)

8:00-9:00 **Poster Session 2** in App/Blue Ridge Room

Social 9:00 – 11:00 in the Hospitality Suite Condo (with The Box, beverages and light snacks)

Saturday Morning

Sessions in Evergreen Room

Breakfast 7:30-8:30 in Timberlake's Restaurant (*Bring your meal ticket)

Registration 8:00-8:30 a.m. Outside Evergreen Room

Saturday 8:30-9:50 Session 7: Preservice Teacher Preparation and Identity Development

Break: 9:50-10:00

Saturday 10:00-11:20 Session 8: STEM

11:20-11:30 Break

Saturday 11:30-12:30 Session 9: Student Learning and Identity Development

Saturday Afternoon

Lunch 12:30 – 1:30 in Timbers Room, Timberlake's Restaurant (*Bring your meal ticket)

1:30 – 3:00 Business Meeting

3:00 Gather for Optional Field Trips

Conference Detailed Schedule

Friday Morning

- Breakfast 7:30-8:30 in Timberlake's Restaurant (*Bring your meal ticket)
- Registration 8:00-8:30 Outside Evergreen Room
- Welcome 8:25 Conference Co-Chairs: Meg Blanchard, Leslie Bradbury & Lisa Gross

Friday 8:30-9:50 Session 1: Learning through Technology * Moderator: Eric Wiebe

- 8:30-8:50 Courtney Behrle, Ruth Sirkin, and Eric Wiebe*
A UDL Approach Using TTS in a Digital Science Notebook
- 8:50-9:10 Pamela Phillips and Margaret Blanchard
Does E-Education Benefit At-Risk High School Science Students?
- 9:10-9:30 William McConnell and Daniel Dickerson
The Impact of 3D Technologies on Engineering Design: A Comparative Case Study
- 9:30-9:50 James Rye and Melissa Luna
Integration of GigaPan in a Science Methods Course to Enrich Preservice Teachers Understandings about Garden-Based Learning and Its Connection to the Next Generation Science Standards

Break 9:50-10:00

Friday 10:00-11:00 Session 2: College & High School Teaching and Learning

* Moderator: Meg Blanchard

- 10:00-10:20 Stephen Biscotte
The Necessity of Teaching for Aesthetic Experience in Undergraduate General Education Science: Philosophy to Pedagogy
- 10:20-10:40 Katherine Mollohan and Lin Ding
How do students' views change with increased exposure to biology?
- 10:40-11:00 Diane Johnson and Margaret Blanchard*
What Factors Influence African American Males' Enrollment in Advanced Science Courses?

Break 11:00-11:15

Friday 11:15-12:15 Session 3: Innovative Teaching and Projects * Moderator: Tina Cartwright

- 11:15-11:35 Kerry Cresawn and Leisha Martin
Preparing Future K-8 Teachers for Culturally Relevant and Literacy-Integrated Science Teaching for English Language Learners

- 11:35-11:55 Rommel Miranda and Julie Damico
Changes in STEM Teachers' Beliefs about their Knowledge of, Experience with, and Comfort Level Planning and Implementing Inquiry-Based Instruction
- 11:55-12:15 Avia Huisman, Tina Cartwright*, and Katie McDilda
Participatory Learning: Taking High School Students on a TREK into Research

Friday Afternoon

Lunch 12:15- 1:00 Boxed Lunches are delivered to Evergreen Room (*bring your meal ticket)

Friday 1:00-2:20 Session 4: Teacher Response to Professional Development

* Moderator: Kristie Gutierrez

- 1:00-1:20 Chih-Che Tai
Reaching for Excellence in Grade 3-5 School Science- Lessons Learned from a THEC-ETSU STEM PD Project
- 1:20-1:40 Jennifer Maeng
A Randomized Controlled Trial Exploring the Effect of Professional Development on Elementary Science Teachers' Understanding and Classroom Implementation of Reform-based Science Instruction.
- 1:40-2:00 Amanda Gonczi, Jennifer Maeng, and Randy Bell
Computer Simulation Professional Development for Elementary Science Teachers: Attention to Teachers' Pedagogical Knowledge Cannot be Overlooked
- 2:00-2:20 Margaret Blanchard, Catherine LePrevost, Dell Tolin, and Kristie Gutierrez*
What's Tech Got to Do with It? Achievement Results of 2300 High Poverty Students Following Three Years of Technology-Infused Teacher PD

Break 2:20-2:30

Friday 2:30-3:30 Session 5: Environmental Education * Moderator: Barry Golden

- 2:30-2:50 Lisa Gross
In or out? Nonformal Activities of Today's Youth
- 2:50-3:10 Sarah Haines, Amy Trauth-Nare, Michelle Nappi, Alessandra Cascarano, and Kelisa Watkins
The Maryland Governor's Stream Initiative: Opportunities for Authentic and Locally Relevant Science Teaching & Learning
- 3:10-3:30 Karena Ruggiero and Barry Golden
A Comparative View of Environmental Literacy Planning in Tennessee and North Carolina

Break 3:30-3:40

Friday 3:40-5:00 Session 6: Elementary Student Learning & Informal Science

* Moderator: Kathy Cabe Trundle

- 3:40-4:00 Jenay Sharp Leach
Teacher Conceptualizations and Practices of Discourse in Linguistically Diverse Elementary Science Classrooms
- 4:00-4:20 Mandy McCormick Smith, Mesut Sackes, and Kathy Cabe Trundle*
US and Turkish Preschoolers' Observational Knowledge of Day and Night Cycle
- 4:20-4:40 Leslie Bradbury and Rachel Wilson
Lessons Learned from an Emerging University Faculty-Classroom Teacher Community of Practice
- 4:40-5:00 Elysa Corin, Gail Jones, Tom Andre, Gina Childers, and Rebecca Hite
Eager to Teach: Perspectives from Astronomy and Birding Hobbyists

Friday Evening

- Break 5:00-6:00 Hospitality Suite Condo will be open
- 6:00-7:00** **Poster Session 1** in App/Blue Ridge Room with light appetizers
- 6:00-6:30 **Session A** *Moderator: Leslie Bradbury
1. Mathys Meyer & Darla French
The Use of High-Impact and Non-Cognitive Educational Practices in Building Classroom Communities in a Biology Course
 2. Tina Cartwright
GLOBE Learning Expeditions: International Environmental Science Conference in India and South Africa
 3. Jeffrey Carver and Robert Waterson
Integrating Science and Social Studies: A Look at a Shared Special Methods Experience
 4. Harrison Jones, Nicole Bryant, Rebecca Farrell, and Briana Biggs
An Outreach Program to Provide Pre-Service Teachers with Skills for and Confidence in Being Effective Science Teachers for English Language Learners
 5. James Sanders, Jared Smith, and Margaret Blanchard
Charting a Path to College: A Qualitative Study of 9th Grade Underrepresented Students in an Informal STEM Program
 6. William Thornburgh
Teaching with Technology
 7. Ross Toedte and Barry Golden
Teaching Climate Change Using Data Analysis and Argumentation
- 6:30-7:00 **Session B** *Moderator: Leslie Bradbury
8. Bharat Sampath Kumar
Teaching Chemical Equilibrium with Technology

9. Paula Magee and Jane Leeth

Using Non-Traditional Literature Circles in an Elementary Science Methods Course

10. Lana Minshew and Janice Anderson

Teacher Efficacy in a 1:1 Science Classroom: A Case Study

11. Brenda Brand, Chris Williams, and Jessica Stephenson

Engineering by Design: Innovation-based Manufacturing and Science Education

12. Robert Ceglie

Using NSTA's Learning Center to Promote Content Knowledge in a Pre-Service Elementary Methods Course

13. David Wimert

The Effect of Inquiry-Based Science on Middle School Students' Alternative Concepts Regarding of the Conservation of Mass

Dinner 7:00-8:00 in Evergreen Room (*bring your meal ticket)

Remarks from the Regional Director, Sherri Brown

8:00-9:00 **Poster Session 2** in App/Blue Ridge Room

8:00 – 8:30 **Session C** Moderator: Lisa Gross

14. Jenna Hickey and Cindy Ghent

Health Professions Majors Response to Introductory Biology Course

15. Corinne Jordan

Use of Student Created Smartphone Apps to Improve Understanding of Complex Human Anatomy and Physiology Concepts

16. Amy Trauth-Nare and Michelle Nappi

Teaching Science Outdoors: Characterizing the Influence of EE-Centered Methods and Practicum on Preservice Teachers' Attitudes and Ideas about the Environment

17. Ashley Murphy, Melissa Luna, and Malayna Bernstein

Classrooms, Hospital Beds, and Backyards: How Do These Scientific Experiences Relate to Elementary Teachers Practitioner Selves?

18. Rachel Wilson

Pre-service Elementary Teachers' Conception of their Connections within the Environment

19. George Glasson and Rojjana Klechaya

Place-based STEM Education in Southeast Asia

20. Tam'ra-Kay Francis, Mehmet Aydeniz, and Barry Golden

The Teachers We Forget: Professional Teacher Identity Development for STEM Graduate Teaching Assistants (GTAs)

8:30 – 9:00 **Session D** Moderator: Lisa Gross

21. Jessica Stephenson and George Glasson
Local Learning: A Study of Place-Based Science Education in Rural Appalachia

22. Jennifer Geib
Practical and Affective Impacts of Professional Development Targeting Science Teachers' PCK for Integrating Literacy in Their Classrooms: Strategy Use, Knowledge, and Dispositions Related to Literacy and the Common Core Standards

23. Stephanie Philipp and Ellen Yeziarski
Attending to Teacher Beliefs, Practice and Knowledge in Professional Development

24. Barry Golden and T.K. Francis
Who is Learning About Climate Change in American Schools?

25. Rita Hagevik
The Use of Mobile Technologies and ArcGIS online to Improve Preservice Science Teachers' Understanding of Visual Data

26. Ron Hermann
Secondary Science Methods Course Re-design

Social 9:00 – 11:00 in the Hospitality Suite Condo (with The Box, beverages & light snacks)

Saturday Morning

Breakfast 7:30 – 8:30 (*bring your meal ticket)

Registration 8:00 – 8:30 Outside Evergreen Room

Saturday 8:30-9:50 Session 7: Preservice Teacher Preparation and Identity Development

*Moderator: Leslie Bradbury

8:30-8:50 Pam Jett and Sherri Brown
Designing an Elementary Science Methods Course: A Self Study

8:50-9:10 Steven Wall
An Investigation into Elementary Pre-Service Teacher Identity

9:10-9:30 Eva Toth
Learning to Use Evidence from News Media: An Interdisciplinary Approach in Response to Current Standards

9:30-9:50 Stephen Burgin and Janeen Perry-Campbell
The Role of Elementary Field Placements in the Preparation of Secondary Science Teachers

Break: 9:50-10:00

Saturday 10:00-11:20 Session 8: STEM * Moderator: Gail Jones

- 10:00-10:20 Steve Oliver
A Brief History of Integrated Science Curricula: Looking Forward at STEM
- 10:20-10:40 Kimberly Haverkos
Engaging the Future through the Past: Using History to Teach STEM
- 10:40-11:00 Karen Irving, Anil Pradham, Sultana Nahar
Preparing STEM Faculty for Indian Universities: USA & India Collaboration Year 1
- 11:00-11:20 Rebecca Hite, Gail Jones*, Tom Andre, Gina Childers, and Elysa Corin
Female and Minority Under-Representation in Science Hobbies: Implications for Expansion of the STEM Pipeline

11:20-11:30 Break

Saturday 11:30-12:30 Session 9: Student Learning and Identity Development

* Moderator: Lisa Gross

- 11:30-11:50 Heidi Carlone
Being “Smart” and Being “Me”: Youths’ Identity Positioning in Field Ecology Versus School Science
- 11:50-12:10 Sam Wheeler
The Influence of a Video Analysis Project on High School AP Physics Students’ Interest and Perceived Learning
- 12:10-12:30 Charles Hutchison and Warren DiBiase
The New edTPA Standards and Science Methods Instruction

Saturday Afternoon

Lunch 12:30 – 1:30 (*bring your meal ticket)

1:30 – 3:00 Business Meeting

3:00 Gather for Optional Field Trips

Conference Abstracts by Author
(By First Author's Last Name)

B

Courtney Behrle, Ruth Sirkin, and Eric Wiebe

A UDL Approach Using TTS in a Digital Science Notebook

This project looked at elementary school students' use of the CyberPad, a digital science notebook incorporating Universal Design for Learning (UDL). Specifically, the use of text-to-speech (TTS) tools was reviewed across two physical science modules (Circuits and Magnetism). Use varied greatly based on the amount of new vocabulary, content in the lesson, and students' needs. Pre- and post-test score comparisons between the most frequent and least frequent users showed that even though the most frequent users scored lower on each test, they had learning gains matching those of the least frequent users, who scored higher on each test. The study demonstrates that the UDL tools were being utilized by students starting with lower content knowledge and, perhaps, helped support their learning. The findings provide guidance for future teachers, including that students do not always use the UDL tools to their best advantage and should be appropriately guided during instruction.

Stephen Biscotte

The Necessity of Teaching for Aesthetic Experience in Undergraduate General Education Science: Philosophy to Pedagogy

Students should have aesthetic experiences to be fully engaged in science learning at any level (Wickman, 2006). A General Education science instructor can foster opportunities for aesthetic educative learning experiences enabling student growth. Drawing on the work of John Dewey and expanding on others in the field, Uhrmacher (2009) identifies the characteristics of the aesthetic experience that include, but are not limited to: connections, active engagement, sensory experience, perceptivity, risk taking, and imagination. In this session, I argue that if instructors are not attending to these aesthetic characteristics, then students are not doing (learning) science and will therefore fail to meet any valuable outcomes identified for General Education science. Following a brief overview of the literature on aesthetic experience in science, I will lay out a research plan to gauge the current presence/level of teaching for aesthetic experience in undergraduate general education science at a large, research1 university.

Margaret Blanchard, Catherine LePrevost, Dell Tolin, and Kristie Gutierrez

What's Tech Got to Do with It? Achievement Results of 2300 High Poverty Students Following Three Years of Technology-Infused Teacher PD

This 3-year, mixed-methods study investigated the effects of science and mathematics teacher professional development (PD) on teacher factors (i.e. self-efficacy, technology familiarity, pedagogical discontentment) and student achievement in 2 middle schools in neighboring rural, low-income districts in a southeastern U.S. state. The 21 teachers experienced 2-3 years of inquiry-based, technology-infused PD. We collected state end-of-grade (EOG) mathematics (6th -8th grades) and science (8th grade) assessment data for a total of 2300 students. We found that there were significant increases in both the teachers' reform-based teaching beliefs and comfort using new technologies. Teachers' reflections indicate that their use of technologies was transformative and that students had positive affective responses to using the instructional tools. Students who had more project teachers earned significantly higher EOG assessments; this effect was significant for African American but not Caucasian students, with the most impressive gains for students with project teachers for all 3 years.

B

Leslie Bradbury and Rachel Wilson

Lessons Learned from an Emerging University Faculty-Classroom Teacher Community of Practice

This presentation will describe the initial efforts of two science educators and a second grade teacher to form a community of practice (COP) that would enable each of the stakeholders to learn from the expertise of the others. The COP developed as the participants planned and implemented a series of integrated lessons in a second grade classroom focused on the life cycle of ladybugs. Based on data that includes interviews, oral reflections, and student work, the presenters will share what each of the stakeholders has learned from the relationship and will outline some of the challenges that have arisen. Additionally, next steps for the COP will be discussed. Implications of this work for school-university partnerships and elementary science methods courses will be reviewed.

Brenda Brand, Chris Williams, and Jessica Stephenson

Engineering by Design: Innovation-Based Manufacturing and Science Education

There is a demonstrated need for advancing the United States' manufacturing presence in the global innovation economy. The primary goal of the Research Experiences for Teachers program in Innovation-based Manufacturing (RET:IBM) is to make significant steps towards improving the youth's perception of engineering and manufacturing by providing opportunities for teachers to engage in cutting-edge manufacturing research topics that are rich with contextual examples of STEM principles. Funded by the National Science Foundation, this five-week summer program partners middle and high school STEM teachers with Virginia Tech faculty to research topics in the area of advanced manufacturing. In addition to research, participants will engage in professional development activities that are geared toward helping the teachers to successfully translate their research experience into inquiry-based classroom modules. We will discuss teacher experiences and curriculum projects, lessons learned, and emerging data from the first two years of the program.

Stephen Burgin & Janeen Perry-Campbell

The Role of Elementary Field Placements in the Preparation of Secondary Science Teachers

The purpose of this project was to investigate the role of elementary field placements in an undergraduate freshman introductory course to STEM education for prospective secondary science teachers. We analyzed feedback forms completed by the mentor elementary teachers during observations of student teaching in order to identify the nature of the placements and how the preservice teachers performed in them. Additionally, we interviewed a subset of our students to explore their perceptions of the benefits of co-teaching science lessons in an upper elementary context as part of their teacher preparation program. Although the placement was at the elementary level, students expressed that they felt it was a great introduction to teaching science at the secondary level. Implications for secondary science teacher education programs are discussed including our own need to better prepare students both for these experiences and for constructive reflection on them.

C

Heidi Carlone

Being “Smart” and Being “Me”: Youths’ Identity Positioning in Field Ecology Versus School Science

The HERP Project (NSF ISE#1114558) has engaged 228 diverse high school youth in residential Herpetological Research Experiences (studies of reptiles and amphibians). Our research focuses on aspects of the HRE that nurture science-related identity work for youth who have spent little time outdoors and/or with wildlife. We found that power differentials between youth are minimized during the HRE; no one “type” of youth is considered smart. This is striking because historically, narrow meanings of “smartness” in school science disadvantage students from non-dominant backgrounds and serve as gatekeepers for attracting diverse youth to science. The impetus for this qualitative study was to understand unique affordances of the HRE compared with school science. We focused on youths’: (1) meanings of “smartness” and (2) self positioning (“being me”) in the HRE and school science. We found that the HRE facilitated broader meanings of “smartness” and more empowering

Tina Cartwright

GLOBE Learning Expeditions: International Environmental Science Conference in India and South Africa

Students, teachers and scientists gather from around the world to present their authentic research experiences and share their experiences with individuals from all around the world who have participated in The GLOBE Program. GLOBE has been around since the early 1990’s and was established through a collaboration between the State Department, NASA, and NSF. Every few years, participants come together at a GLE (GLOBE Learning Expedition). These GLE provide an excellent venue for GLOBE students from around the world to interact with scientists and with each other. In addition to student presentations, participants take part in field activities, student art displays and cultural events. This presentation will highlight two of the most recent GLE: Cape Town, South Africa in 2008 and Delhi, India in 2014.

Jeffrey Carver and Robert Waterson

Integrating Science and Social Studies: A Look at a Shared Special Methods Experience

This paper discusses the design and implementation of integrating science and social studies concepts in a way that allows teachers and students to further their understanding of the natural and social worlds in which they live by contextualizing the science and social studies content in real life occurrences. Specifically, the use of natural and manmade phenomena, such as Hurricane Katrina, the Haitian earthquake, and the earthquake and subsequent tsunami and nuclear disaster in Fukushima Japan as a context to examine the human-environment relationship from a holistic perspective is reviewed. This perspective on human-environment interaction fits naturally within all fields of science and the social studies fields of geography, economics and Government. It is through providing contextual relationships to the content we teach that our students come to know the content and begin to develop the ability to use that content in the context of democratic decision-making through science education.

C

Robert Ceglie

Using NSTA's Learning Center to Promote Content Knowledge in a Pre-Service Elementary Methods Course

Considerable attention has been placed on the quality of elementary teachers that are entering the profession. In particular, colleges of education have been under scrutiny to prepare teachers who are skilled in both pedagogy and content knowledge. Since content knowledge is often only reinforced in methods courses, it is becoming increasingly important for science methods faculty to find ways to support the review and acquisition of the requisite content. In the current study, NSTA's new online Learning Center was used as a way to review content knowledge for a course of pre-service methods teachers. In contrast to previous attempts to teach content within the course, six strategically chosen earth, space and life science units were assigned to be completed independently by the students. Post-test and student questionnaires were used to examine the effectiveness of using this method to support student learning. The feasibility of using the Learning Center to provide wider content support is discussed.

Elysa Corin, Gail Jones, Tom Andre, & Gina Childers

Eager to Teach: Perspectives from Astronomy and Birding Hobbyists

Science hobbyists, including amateur astronomers and birders, are members of the public who engage in self-directed, free-choice science learning and many have considerable expertise in their hobby area. Interviews were conducted with 58 amateur astronomers and 49 birders to collect information on the hobbyists' participation in their hobby. Most hobbyists in our sample engage in outreach and share their hobby interest with members of their community, including K-12 schools. This study describes the outreach engagement of hobbyists in our sample, and how they access universities and museums to support their hobby interest. Suggestions for how these institutions can better support this eager, yet largely untrained, group of educators will be discussed.

Kerry Cresawn

Preparing Future K-8 Teachers for Culturally Relevant and Literacy-Integrated Science Teaching for English Language Learners

In response to the rapidly growing ELL population in US schools, the unwelcoming attitudes towards ELLs reported by many teachers, and the inherently challenging nature of teaching science to ELLs, we gave 5 pre-service teachers a focused experience designing and implementing engaging science experiences for ELLs that are based on best practices in science education, and integrate both the ELLs' native culture and literacy objectives. Working with a literacy teacher and Biology specialist, the students reviewed the literature, developed relationships with the ELLs, designed the lessons and engaged a class of middle school ELLs in these experiences throughout the year. We will present the rationale for and design of the program, and pre/post survey results and interview transcripts demonstrating the positive impact of the program on the pre-service teachers' attitudes towards teaching science to ELLs and on the ELLs' interest in science and self-confidence in their abilities in science.

F

Tam'ra-Kay Francis, Mehmet Aydeniz, and Barry Golden

The Teachers We Forget: Professional Teacher Identity Development for STEM Graduate Teaching Assistants (GTAs)

Graduate teaching assistants are responsible for a significant fraction of undergraduate STEM instruction, yet they continue to be marginalized in science teacher education reform efforts. GTAs not only represent the future of academic instruction; they are major influences on students' developing science identities as well. The low attrition rates of intended undergraduate science majors cannot be addressed solely by the reform of introductory science courses thus the need to improve the quality of science instruction through professional development and teacher education. We attempt to operationalize the concept of a science teaching identity as a theoretical framework to provide direction for future research that will include GTAs in the science teacher education reform agenda; facilitate a change in undergraduate STEM instructional practices; clarify theoretical conceptions of teaching faculty identities in post-secondary science education and promote a rethinking of the recruitment and retention of STEM undergraduate majors including future science teachers.

G

Jennifer Geib

Practical and Affective Impacts of Professional Development Targeting Science Teachers' PCK for Integrating Literacy in Their Classrooms: Strategy Use, Knowledge, and Dispositions Related to Literacy and the Common Core Standards

An ever-increasing component of college and career success is the ability to interpret informational text and communicate meaning through writing, yet adult literacy achievement remains stagnate in the US. This session will share impacts of a PD program that provides teacher training in adolescent disciplinary literacy. We will share analyses of pre- and post- lessons developed by middle level science teachers (n = 29) showing gains in the frequency and variety of literacy strategies utilized. All teachers reported increased confidence in their ability to incorporate literacy strategies into science lessons and increased positive attitudes about the Common Core Standards for Literacy following the PD program. Collaboration time, developing a repertoire of new strategies to freshen stale lessons, and training in the use of iPad technology to achieve literacy goals were cited as the most useful components of the program. Participants' teaching experience prior to PD mediated resulting gains.

George Glasson and Rojjana Klechaya

Place-based STEM Education in Southeast Asia

The Association of Southeast Asian Nations (ASEAN) Roundtable Meeting, sponsored by the Institute for Promoting Science Teaching and Technology in Thailand, was attended by representatives from eleven countries in 2013. The meeting was designed to address the need to develop a Science-Technology-Engineering-Mathematics (STEM) workforce in ASEAN countries through world-class, quality STEM Education. This presentation provides a summary and analysis of the meeting, followed by an assessment of the status of STEM Education in the eleven countries. The presenters also discuss an example of a successful place-based STEM education professional development program in rural Thailand that prepared teachers to meet Thai National Curriculum standards through problem-based learning that connected to the local culture and community needs. Although preparing a scientifically literate workforce was considered important; many students in rural areas do not have access to technology and STEM resources or teachers prepared to teach STEM subjects.

G

Barry Golden & T. K. Francis*Who is Learning About Climate Change in American Schools?*

This study asks the questions “Are American K-12 students learning about climate change?” and “If so, in what contexts?” We report on our analysis of what climate change content is covered in state standards, as well as which of those standards are ensconced in courses required for graduation. In short, very few states, including those which have adopted the Next Generation Science Standards, currently have curricular graduation requirements which ensure that all of their students will encounter robust presentations of climate change, particularly in regard to anthropogenic elements of climate change, i.e., the extent to which current global warming is human-caused. We also discuss current trends regarding climate change education and potential steps needing to be taken by the science education community in K-12 and other avenues, regarding the pressing issues concerning climate change.

Amanda Gonczi, Jennifer Maeng, and Randy Bell*Computer Simulation Professional Development for Elementary Science Teachers: Attention to Teachers’ Pedagogical Knowledge Cannot be Overlooked*

This mixed methods study examined 65 elementary science teachers (grades 4-6) science education computer simulation (SECS) use prior to and following reforms-based professional development (PD). Results indicated a greater percentage (52%) of the participants utilized SECS following the PD compared with prior to the PD (17%). Furthermore, participants reported SECS use confidence increased following the PD. Interview and observation data indicated participants recognized SECS are useful in making abstract, microscopic, or macroscopic level phenomena visible to students. However, most participants did not explicitly recognize or take advantage of SECS affordances that might strengthen students’ scientific inquiry skills. Implications for SECS PD and improved elementary teacher use are discussed in light of these findings.

Lisa Gross*In or Out? Nonformal Activities of Today’s Youth*

This study describes the preliminary environmental worldviews and nonformal experiences of 5th grade students participating in four outdoor learning excursions during the 2010-2011 school year. Students responded to a survey that included 10 items from the New Ecological Paradigm (NEP) Scale for Children, validated by Manoli, Johnson and Dunlap (2007) and 28 items generated from the literature on environmental socialization (ES), an activity-based process described by Bixler and Morris (1998). NEP individual scores (unidimensional model) and three factor scores (multidimensional model) were calculated for each of the 52 students. The resulting scores were then examined in the context of participants’ reported nonformal experiences with nature. Environmental socialization items were utilized to catalogue types and frequencies of childhood activities identified by the participants. The resulting typologies have been used to illustrate how attitudes and interests can influence an individual’s participation in outdoor learning activities over time and in multiple nonformal settings.

H

Rita Hagevik

The Use of Mobile Technologies and ArcGIS online to Improve Preservice Science Teachers' Understanding of Visual Data

In May of 2014, Jack Dangermond, the president of ESRI, gave a 1 billion donation in mapping software to all k-12 schools in the United States by granting them free ArcGIS online organization accounts. This donation brings the possibility of the reality of visual data to all schools. But this opportunity will not become a reality unless teachers are prepared to use this powerful scientific tool. This presentation explores ways in which ArcGIS online and organization accounts can be used in preservice science teacher education courses to improve visual data literacy in these future teachers as well as in these preservice teachers' future students. A demonstration of how to collect your own data using the new collector app, how to set up and use ArcGIS online, and of the new connectED initiative by ESRI will be demonstrated in this presentation.

Sarah Haines, Amy Trauth-Naire, Michelle Nappi, Alessandra Cascara, and Kelisa Watkins

The Maryland Governor's Stream Initiative: Opportunities for Authentic and Locally Relevant Science Teaching & Learning

Stream investigation and restoration projects offer unique experiential opportunities to engage school students in outdoor learning experiences that are relevant to the communities that they live in. These experiences promote an understanding of watershed issues and establish positive attitudes and behaviors that benefit local watersheds. These experiences also provide a means for students to earn Service Learning hours and meet the state environmental literacy standards and learning outcomes, both of which are required for graduation in Maryland. In this presentation, we will highlight a pilot program in which Towson University preservice teachers partnered with classroom teachers to provide students in grades 3 and 4 Meaningful Watershed Educational Experiences (MWEEs) that met the mission of the Stream Initiative program and also met curriculum and learning goals for the school system.

Kimberly Haverkos

Engaging the Future Through the Past: Using History to Teach Integrated STEM

Historical locations offer informal educational opportunities to school groups tied to the history of the space. Historical spaces, however, are ripe with possibility for the STEM field. By beginning with historical spaces, learners have a context to explore questions about both history and science/STEM issues to develop a deeper understanding of current social, cultural, and environmental issues. As we look to prepare 21st century teachers in the field of STEM, I suggest that we look to the past as our beginning point. This study will explore pre-service teachers' ideas around the use of historical locations as a starting point for STEM education. Learners will be given pre- and post-surveys on attitudes towards STEM and integrated STEM teaching and historical field trips. In addition, learners will keep a multi-semester journal around their experiences at different historical locations and the STEM education ideas and learning that they develop out of those experiences.

H

Ron Hermann

Secondary Science Methods Course Re-design

Due to a diverse class population, the secondary science methods course at TU must be redesigned. The course will address UTeach students as well as MAT, informal environmental education and special education majors. Some students will arrive well versed in science education and for others this will be their first, and only science education course. As such, the course will be re-designed to address this diverse mixture. The instructor envisions a course with in-class meetings of all students every other week. The instructor envisions each a virtual meeting the weeks the class does not physically meet with differentiated instruction for different student populations. This may include self-directed instruction, virtual meetings, recorded teaching activities, etc. The purpose of this presentation is to describe the challenges of this model and call upon the expertise of MA-ASTE members to provide ideas, insights, course activities, and delivery methods.

T

Jenna Hickey and Cindy Ghent

Health Professions Majors Response to Introductory Biology Course

The purpose of this study is to elucidate student responses to a rigorous introductory biology course for non-major health professions. This is a required course for moving on to anatomy and physiology, and therefore demands a solid understanding of basic biology concepts. Excelling in the course is also imperative for admission into competitive majors like nursing. Four students were interviewed individually near the beginning of the semester, and three students were interviewed in a group setting near the conclusion of the semester. Interviews were recorded and transcribed. Preliminary analysis indicates an appreciation for teacher strategies, specifically the use of diagrams and study questions for exam preparation. There was also an overwhelming desire for connectivity of concepts throughout the lectures and the course itself. Data analysis is ongoing for this project.

T

Rebecca Hite, Gail Jones, Tom Andre, Gina Childers, and Elysa Corin

Female and Minority Under-Representation in Science Hobbies: Implications for Expansion of the STEM Pipeline

Women and minorities have been historically underrepresented in science fields, despite changes in policy and targeted outreach, disparities persist in the STEM workforce. Current research explores the formation of STEM identities and efficacy in under-represented of groups, however, little research is conducted in the non-formal sector(s) of STEM development, such as the obtaining, maintaining and growth of science hobbies. Through seven qualitative interviews from self-identified under-represented individuals (e.g. racial, ethnic and gender) in a science hobby (Astronomy), descriptive stories of hobby development are explored. Trends regarding women and minority differential participation in science hobbies are based upon correlations between interviewees' experiences in various phases of hobby growth (e.g. introduction, induction, and developing expertise) as well as contemporary challenges with minority exposure to and persistence in STEM fields. This information may prove useful in guiding next steps regarding policy and research regarding under-representation of women and minorities in STEM careers.

H

Avia Huisman, Tina Cartwright, and Katie McDilda

Participatory Learning: Taking High School Students on a TREK into Research

TREK (Teacher Research Experience for the advancement of Knowledge) is a summer research experience at 3 universities in WV (Marshall University, West Virginia University, and West Virginia State University) for in-service and pre-service high school science teachers along with high school students. During a six week period over the summer, program participants design and implement scientific research. Interviews with participants as they progress through the program give insight into how their ideas of science and science research evolve as they gain a deeper understanding of what scientific research actually entails. In a follow-up survey, high school student participants reported that the TREK experience was positive, would recommend it to others, and felt it informed their decision to pursue science as a career. This presentation will focus on the experiences of the high school students from the Marshall University and West Virginia State University programs at three time periods: at the beginning and end of the summer program and at least 1 year after their summer experience.

Charles Hutchison and Warren DiBiase

The New edTPA Standards and Science Methods Instruction

edTPA is a new instructional standard currently under consideration in 34 states and the District of Columbia as a means of ensuring that graduates using this program would reflect a better teaching capability. Being under consideration for adoption in North Carolina institutions, this paper discusses the issues that arose from the implementation edTPA standards in two pilot courses taught by two instructors. Both instructors found that edTPA standards had some merits because it made students more reflective of their instructional decisions; on the other hand, the standards created significant logistical issues for both students and instructors, because it exacted significant amounts of time for implementation leading to frustrations on the part of some students. Partly because of the need to grade its video inclusion, class sizes may need to be limited so as to ensure high quality for the program.

I

Karen Irving, Anil Pradham, and Sultana Nahar

Preparing STEM Faculty for Indian Universities: USA & India Collaboration Year 1

The Obama-Singh 21st Century Knowledge Initiative project at Ohio State University and Aligarh Muslim University (AMU) aims to produce world class STEM faculty for higher education institutions in India and to promote research collaborations. The project intends to encourage mutual understanding, facilitate educational reform, innovation and economic development and to promote academic cooperation.

The project goal is to prepare world-class STEM faculty who can teach well and engage in STEM research for positions in Indian universities. The project consists of a two year Master in Education degree program for post-candidacy Fellows who are completing their doctoral studies in a STEM field at AMU. Through a joint agreement, the Fellows (selected after a rigorous and competitive process) enroll in the MED program at OSU. Fellows are partnered with a STEM research advisor at OSU to continue and expand their research studies during the project as well as an education advisor.

J

Pam Jett and Sherri Brown

Designing an Elementary Science Methods Course: A Self Study

Designing an elementary science methods course begs the question, where do you start? There are certainly well established science curricula in textbooks, and perusal of university websites will quickly reveal scope and sequence of similar courses. With the desire to be responsive to our students' needs, a simple 24-question true/false test, designed by Stein & Goetz (2008), has been used to collect data from pre-service teacher candidates about their basic science knowledge. These responses have revealed interesting patterns over the past 7 years and clearly indicate that our students have distinct deficits across the sciences. We have used this information to provide justification for the design of the science curriculum we teach in our elementary science methods course. In our presentation we will share both qualitative and quantitative data and how those data has been the foundation and inspiration for designing specific course work in response to identified knowledge deficits.

Diane Johnson and Margaret Blanchard

What Factors Influence African American Males' Enrollment in Advanced Science Courses?

Minority males are greatly underrepresented in advanced science courses. This qualitative case study investigates twelve African American males enrolled in advanced science courses in an urban, predominantly African American high poverty high school (84%). Guided by expectancy-value theory of achievement motivation, weekly classroom observations, in-depth interviews, and the students' creation of presentations for younger science students were analyzed regarding the relative costs and benefits of taking these courses, social influences, future goals, self-concept, and science identity. Most of these males (83%) have career intentions in science, are incredibly future oriented in their goals, and identify with science. Students downplay the costs of their choices and are strongly supported by family and teachers. Students relate their traits (curiosity, intelligence, critical thinking skills, interests in science, ability to solve problems, and enjoying the hands on nature of science) as shared characteristics that related to being a scientist and identify with science careers.

Harrison Jones, Nicole Bryant, Rebecca Farrell, and Briana Biggs

An Outreach Program to Provide Pre-Service Teachers with Skills for and Confidence in Being Effective Science Teachers for English Language Learners

The technical vocabulary of science and contexts that are often based on US culture contribute to the fact that science education for ELLs remains one of the more intimidating challenges for new teachers. JMU's pre-service teachers graduate with experience working with ELLs and foundations for science education; however, they lack focused opportunities to understand and practice enhancing science lessons to better engage ELLs. To address this, 5 pre-service teachers worked with a biologist and a literacy specialist to design science experiences for middle school ELLs that were hands-on/minds-on, and integrated culture and literacy objectives. The students involved in this program will present the 3 lessons ("culture, language, and science of volcanoes", "geography, language and anatomy of frogs" and "thinking like a scientist") along with pre/post survey results demonstrating the positive impact of the program on both the ELLs and on their own attitudes.

J

Corinne Jordan

Use of Student Created Smartphone Apps to Improve Understanding of Complex Human Anatomy and Physiology Concepts

Today's college students are technology driven and research has indicated possible benefits of educational Smartphone applications (apps) as an effective teaching strategy to promote student interest, motivation and content understanding. A pilot study was conducted in a college undergraduate human anatomy and physiology classroom whereby students were taught the osmoregulation of the kidney. Students were required to answer related case study questions. In groups of two, students were given an assignment of answering case study questions in the form of creating their own Smartphone app using the website, www.ibuildapp.com. Initial results indicated average scores of 89% using an evaluation rubric. Students were receptive to the assignment and enjoyed using their creativity to create the app. In the future, a research study will be conducted to evaluate the potential implication/s of student designed apps on promoting memory retention and critical thinking skills of complex biological concepts.

K

Bharat Sampath Kumar

Teaching Chemical Equilibrium with Technology

Chemistry concepts are abstract and difficult to learn, particularly at the microscopic level. Chemical equilibrium is a topic that presents many conceptual difficulties for students. Effective use of technology can make abstract concepts accessible and apparent to students, and can support explorations of natural phenomena. This paper will present a review of the research on common conceptual difficulties secondary students and teachers experience with chemical equilibrium, and review current instructional tools and technologies for teaching chemical equilibrium. The paper will conclude with a discussion on partnering visual simulations with low-tech instructional methods to improve student learning of chemical equilibrium.

L

Jenay Sharp Leach

Preparing STEM Faculty for Indian Universities: USA & India Collaboration Year 1

The Obama-Singh 21st Century Knowledge Initiative project at Ohio State University and Aligarh Muslim University (AMU) aims to produce world class STEM faculty for higher education institutions in India and to promote research collaborations. The project intends to encourage mutual understanding, facilitate educational reform, innovation and economic development and to promote academic cooperation.

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Jennifer Maeng

A Randomized Controlled Trial Exploring the Effect of Professional Development on Elementary Science Teachers' Understanding and Classroom Implementation of Reform-Based Science Instruction

This investigation characterized changes in teachers' understanding and classroom implementation of problem-based learning, nature of science, and inquiry following participation in a state-wide professional development. The PD was assessed through a randomized controlled trial (RCT) design. Treatment teachers (n=199) attended a summer institute with academic year follow-up and coaching; control teachers (n=143) received no PD. Data included pre-/post-/year-end Perceptions surveys, post-summer institute/year-end interviews, Pedagogical Content Knowledge surveys, and classroom observations. Data were analyzed using systematic data analysis and inferential statistics. Results indicated the majority of teachers expressed either partially or fully aligned understandings of PBL, inquiry, and NOS instruction following the PD. Further analysis of classroom observations and PCK surveys indicated the PD facilitated teachers' implementation of PBL, inquiry, and NOS into their classroom instruction. The results of this study have the potential to inform PD supporting educators' implementation of reforms-based science practices by in-service elementary science teachers.

Paula Magee and Jane Leeth

Using Non-Traditional Literature Circles in an Elementary Science Methods Course

In this session we will discuss the use of non-traditional literature circles (LC) in an elementary science methods course. For this project we used non-fiction adult level texts that connected to critical science issues (mental illness, industrialization of food and racism/ethics in scientific research). After using traditional LC roles (e.g., summarizer, word wizard, investigator, and illustrator) we developed non-traditional roles (e.g., soundtrack, cultural X-ray, zentangles, and graffiti board) that tapped into underutilized visual and auditory modes of learning. These modes offered PSTs new ways to express and share their understanding of the texts. We used these strategies, not as a replacement for hands-on science investigations, but as an additional layer of learning - a reminder of the importance of connecting science to social and critical issues.

Mandy McCormick Smith, Mesut Sackes, and Kathy Cabe Trundle

US and Turkish Preschoolers' Observational Knowledge of Day and Night Cycle

This cross-cultural study describes young children's (ages 48-60 months) observational knowledge of day and night cycles, which is foundational in the development of mental models. The purpose was to compare U.S. and Turkish children's knowledge to identify similarities predicted by framework theory. Fifty-six children, (27 U.S. and 29 Turkish), participated in the study. Semi-structured interviews were individually conducted, digitally recorded, transcribed and analyzed using the constant comparative method.

The results demonstrate that preschoolers from two cultures are able to make comparable informal observations of the sky, and their observational knowledge includes many similarities as predicted by framework theory (Vosniadou & Brewer, 1992; Vosniadou, Vamvakoussi, & Skopeliti, 2008).

Mathys Meyer & Darla French

The Use of High-Impact and Non-Cognitive Educational Practices In Building Class Room Communities in a Biology Course

We intentionally implemented both high-impact educational practices (common intellectual experiences, intensive writing, learning communities, research, service and community learning, and a capstone project) and non-cognitive variables (positive self-concept, realistic self-appraisal, long term goals, strong support system, leadership experience, community service, and acquired knowledge) in a team-taught special topics course in restoration ecology. We wanted to assess if these practices 1) could be scaled down to smaller classes, 2) could transform the learning experience, and 3) if it is useful in building community and cohort. We believe this turned out to be the case, and the course was a transformative experience for both faculty involved. Here we share some of the qualitative and quantitative data gleaned from our course.

William McConnell and Daniel Dickerson

The Impact of 3D Technologies on Engineering Design: A Comparative Case Study

The newly developed Next Generation Science Standards call for a new and invigorated focus on engineering design in the classroom. With most states adopting these national standards one challenge for teacher educators is to seek effective and innovative means to integrate engineering practices in the science classroom to provide training for pre-service and in-service teachers. In this study nine collaborative groups comprised of a total of thirty- three students used computer assisted drawing software (TinkerCad) to design a 3D model demonstrating the connection between animals' physical adaptations to their environment. With these 3D technologies, we found students encountered both affordances and constraints to the design process as compared to simple paper designs. Implications of our work include the possible use of pre-created design features as scaffolds to enhance student designs, and the importance of providing students ample time to explore important tools within the software preceding teacher-directed student challenges.

Lana Minshew and Janice Anderson

Teacher Efficacy in a 1:1 Science Classroom: A Case Study

One-to-One technology initiatives have become prevalent among school districts as a way to achieve student development of twenty-first century skills. Technology integration, specifically mobile one-to-one technology, into the classroom offers many benefits to student learning. Such as enhancing peer interaction and group work, facilitate knowledge sharing, and distribute knowledge and expertise among the learning community. When teachers lack the knowledge of how to use technology, their attempts to integrate technology successfully are often limited. Internal barriers are much more personal, more deeply ingrained, and may require a pedagogical change in the individual over time in order to over-come the barrier. These reasons make over-coming internal barriers much more difficult than external barriers such as technology availability, technical support, and technical infrastructure. Using a TPACK framework, this research project examines the classroom practice of a middle grade science teacher integration in a 1:1 initiative in the science classroom.

Rommel Miranda and Julie Damico

Changes in STEM Teachers' Beliefs about their Knowledge of, Experience with, and Comfort Level Planning and Implementing Inquiry-Based Instruction

This study investigates the extent to which STEM teachers' beliefs about their knowledge of, experience with, and comfort level planning and implementing inquiry-based instruction change following participation in a large mid-Atlantic university's Research Experiences for Teachers (RET) and Professional Learning Community (PLC) program. Supported with NASA funding, fourteen middle school and thirty-eight high school STEM teachers participated in this study. An implication of the study's findings suggest that RET-PLC programs may help to transform teachers' beliefs about how to plan an inquiry-based learning experience, and their understanding of, and ability to implement inquiry-based instructional strategies. Another implication is that having STEM teachers experience an authentic research learning environment and participating in PLC meetings that focus on translating research experiences to inquiry-based lessons in their classroom might facilitate changes in their beliefs about the practices of science. Differences between middle and high school teachers' beliefs, as well as differences and across STEM disciplines will be presented. Suggestions to guide the design of future RET-PLC professional development models will also be discussed.

Katherine Mollohan and Lin Ding

How do Students' Views Change with Increased Exposure to Biology? Student Epistemologies in an Intermediate Level Biology Course

While attitudes and beliefs have been extensively studied across scientific disciplines, such investigations are generally conducted with introductory-level students. This mixed methods study extends previous research on student epistemological beliefs into a mid-level course for biology majors, to determine if these students have different views about the subject than do those in introductory courses. Both the qualitative and quantitative results support the available literature with upper level students, namely that they do not exhibit the same negative shifts in attitudes and beliefs as those in introductory courses. Surveys (n=102) indicated that students did not become novice-like in their epistemologies over the course of the semester, and qualitative interviews (n=15) revealed several factors that students themselves believe are related to their improved epistemologies and understanding, including experience in college, exposure to the material, and involvement in undergraduate research.

Ashley Murphy, Melissa Luna, and Malayna Bernstein

Classrooms, Hospital Beds, and Backyards: How Do These Scientific Experiences Relate to Elementary Teachers Practitioner Selves?

Researchers note that achieving the fundamental changes called for by current reforms in science education requires new learning on the part of teachers. This literature focuses primarily on the pedagogical and content knowledge teachers lack. However, this study focuses not on the resources teachers lack, but rather on the meaningful experiences with science teachers have had throughout their lives, experiences that can be leveraged for teacher learning and drawn on during instruction. The aim of this qualitative study was to better understand how elementary teachers' science practice has been shaped by exploring retrospective accounts of teachers' science life stories. The preliminary findings presented in this poster characterize the relationship between teachers' retrospective narrative and current narrative of practice. This research in progress gives us insight into different ways we can support teachers in their science teaching practice by better understanding the untapped resources teachers' bring with them into the classroom.

O

Steve Oliver

A Brief History of Integrated Science Curricula: Looking Forward at STEM

Some scholars in science education suggest that STEM education has become the overall goal of our field usurping scientific literacy. In its role as an alternative to scientific literacy, STEM has adopted a meaning that refers to curricula with an emphasis on student learning outcomes based in an integrated knowledge of science, technology, engineering and mathematics. This idea of integrated science curricula has a very long history in science education dating as far back as the beginning of the 20th century. And yet this historical record is not well known nor is it one of success. Rather grand goals have served to stimulate grand projects which do not survive to fruition. One of the most notable is the NSTA project of the late 1980s and early 1990s called *Scope, Sequence and Coordination*. This presentation will examine a procession of efforts across the 20th century to create integrated science curricula.

P

Stephanie Philipp and Ellen Yeziarski

Attending to Teacher Beliefs, Practice and Knowledge in Professional Development

Teachers participating in the first year of Target Inquiry-Miami University, a 2.5 year professional development program for experienced chemistry teachers, were interviewed at the beginning of the program. Keys and Bryan (2001) strongly recommended attending to teacher beliefs, practice, and knowledge during professional development in order to support teacher conceptual change. Interviews revealed that teachers believed that inquiry-based teaching could help their students learn more effectively, knew that they did not possess the skills to enact inquiry-based instruction successfully, and used verification labs in practice to engage their students in learning chemistry content and process skills. Interview excerpts and observational protocol scores will be shared to depict teachers' beliefs, knowledge and practice after a summer-long chemistry research experience but before engaging in education research literature and developing inquiry-based curricular materials.

Pamela Phillips and Margaret Blanchard

Does E-Education Benefit At-Risk High School Science Students?

It is estimated that at-risk students make up 30% of all U.S. students in public schools. At-risk students are defined as ones who will likely not graduate, have poor school attendance and low socio-economic status. The study explored the use of an e-education science program, e-2020® with a population of at-risk youth in a summer school setting in a rural county in the Southeastern United States. Exit interviews and survey results indicate an increase in self-efficacy. Specifically science self-efficacy increased by significantly when students utilized the science e2020® program. The amount of time spent on the program (engagement) correlated positively with the final exam scores. The differences in pretest scores and posttest scores were statistically significant. It is anticipated that the results of this study will add to the research base and offer suggestions to the advocates of at-risk youth. Academic data, surveys and interviews were collected throughout the study.

R

Karena Ruggiero and Barry Golden

A Comparative View of Environmental Literacy Planning in Tennessee and North Carolina

The research presented will provide a comparative look at the Environmental Literacy Plan's (ELPs) of Tennessee and North Carolina through the lens of a decision matrix in order to determine the major points of difference between both state's plans, as well as explore the role of each state's political and socio-economic status in the development and implementation of environmental education. The study is intended to be a pilot study prior to the start of a full fifty state Environmental Literacy Plan comprehensive comparison. The presentation will focus of the decision matrix created to compare state's ELP in terms of political status, curriculum, professional development, amongst other criteria.

James Rye and Melissa Luna

Integration of GigaPan in a Science Methods Course to Enrich Preservice Teachers Understandings about Garden-Based Learning and Its Connection to the Next Generation Science Standards

GigaPan and associated components (stitching software, website) enable “producers” to harness robotics and digital technologies to generate and post panorama images. “Consumers” of the images can rove, zoom, photograph portions, and post comments. Educators can develop web-based projects that harness existing GigaPan images (gigapan.com) and/or those that they have produced to provide science instruction at any grade level. We developed and provided to preservice elementary teachers (PST) an online learning experience to model the potential of GigaPan in providing science instruction—in this case through a garden-based learning context. Related goals of the experience were to enhance PST understandings of garden-based learning and connections to the Next Generation Science Standards (NGSS). The experience required PST to investigate specific aspects of images taken over time of an elementary school garden and initiate/continue on-line conversations with their classmates. Post-experience reflections were sought to reveal their insights, wonderings, and ideas for instructional applications.

S

James Sanders, Jared Williams, and Margaret Blanchard

Charting a Path to College: A Qualitative Study of 9th Grade Underrepresented Students in an Informal STEM Program

Research is unclear on how and why students benefit from informal STEM programs. In this qualitative study, we analyzed interview data from 37 rural, high poverty, predominantly African American 9th grade students using factors of the expectancy-value theory of achievement motivation. Students were enrolled in an intensive, informal STEM program for 1-4 years. We asked: What motivates the students to attend the program? How are students describing the path to possible careers? and, How clear are students’ college identities? We found that students’ social needs and family supports were the key motivators, and that students described paths to college that included their skills and interests, hard work in school, taking appropriate classes, and having strong support from the program. There was a broad range of identification with STEM careers, and students who did not have clear career goals had a difficult time articulating STEM pathways.

S

Jessica Stephenson and George Glasson

Local Learning: A Study of Place-Based Science Education in Rural Appalachia

The purpose of this presentation is to outline the foundational literature and preliminary results of place-based science education at the Alleghany Mountain Classroom (AMC), a summer environmental education enrichment program in rural Western Virginia in its 30th year of instruction. Using inquiry in place-based education, teachers at the AMC guided students through critical examinations of local environmental issues that lead to discussions of global consequences. Teacher instruction created the possibility for understanding a critical pedagogy of place for rural students, extending their focus from the local community to that of global citizens. The over-arching question remains: What does a place-based environmental education program, designed to use scientific inquiry, look like in rural Appalachia? This presentation describes the curriculum and history of the AMC, and investigates both teacher and student experiences at the AMC, to better understand their local environmental studies in the context of global environmental issues.

T

Chih-Che Tai

Reaching for Excellence in Grade 3-5 School Science- Lessons Learned from a THEC-ETSU STEM PD Project

This professional development project seeks to enable elementary teachers to reach for excellence in elementary school science through Inquiry-, Standards-, Problem- and Technology-based (ISPT-based) learning environments. The project provided a total of 102 hours of ISPT-based PD by sponsoring five Saturday workshops, one summer institute and three school visits. It intended to build up two instructional infrastructures under the ETSU Northeast TN Innovation STEM Hub: (1) A Bank of Human Resource: creating a cadre of skillful science lead teachers; (2) A Virtual Instructional Network: building up a web-based instructional resource network.

Various summative and formative assessment instruments were used to evaluate the effectiveness of the project, including: Teachers' Content/Pedagogy Surveys, Classroom Observations, Content Assessments, Tennessee Value-Added Assessment System (TVAAS) Reports and Students' TCAP Achievement Tests. Overall, this program demonstrated statistically significant growth in all measured areas, including teacher quality, teacher opinions, preparedness, content knowledge as well as teachers' TVASS reports and students' TCAP results.

William Thornburgh

Teaching with Technology

First year science teachers face many challenges, including how to effectively use technology as an integral part of their instruction. This study documents how students in an alternative certification program incorporated technology into their instruction during their first year of teaching and explores how they envision incorporating technology into their instruction after taking a technology course. Students completed a pre-course self-assessment about technology and a post-course reflection on what they learned and future plans for technology use. The preliminary results show growth in knowledge, attitude shifts, and an increase in willingness to implement more technology to improve teaching.

T

Ross Toedte and Barry Golden

Teaching Climate Change Using Data Analysis and Argumentation

This session features a pilot project intended to gauge student learning about climate change through data analysis of real scientific data. We present a unit in which students will develop evidence-supported claims and personalized knowledge about climate change through individual and group work. Students, (either middle school or high school level) will analyze data from professional climate researchers. In groups, students will have specific and complementary roles that foster inclusion and equity in science education, modeling components of scientific teams. A key theme of this project is to immerse students in scientific modeling, using the context of climate change models. Students will analyze graphic data, identifying trends, constructing scientific arguments and communicating those arguments to their peers. These skills are common in STEM fields and are emphasized in the Common Core as well.

T

Eva Toth

Learning to Use Evidence from News Media: An Interdisciplinary Approach in Response to Current Standards

The purpose of this study was to assess the effectiveness of an instructional method to prepare non-science major, elementary teacher candidates for their citizen education roles. The method asked candidates to read media reports and develop a well-reasoned argument about the use of novel technologies in the context of dire human need. The results indicated that teacher candidates had a positive value perspective about the use of novel technologies and they explained their values with rational, emotional and intuitive reasons. Candidates recognized that stakeholders in recovery after a natural disaster had various conflicts of interests for using technology tools. Teacher candidates' interpretations of these stakeholder-interests were based on their readings as well as personal values. Candidates' arguments employed different types of evidence including research data, historical trends personal world-views. The findings suggest the need for further instruction about the use of varied types of evidence to better prepare teacher candidates for their future responsibilities.

T

Amy Trauth-Nare and Michelle Nappi

Teaching Science Outdoors: Characterizing the Influence of EE-Centered Methods and Practicum on Preservice Teachers' Attitudes and Ideas about the Environment

This study characterized preservice elementary teachers' mental models of the environment and clarified how a methods course focused on environmental education influenced their mental models. Participants included 15 undergraduate elementary education majors, comprised of 13 females and two males. Data sources, which included PSTs' responses to course writing prompts and reflections on teaching, were analyzed using thematic analysis through the lens of Louv's construct of nature deficit disorder. Findings indicated that the majority of PSTs believed they had extensive personal experience with nature (i.e., they were not nature deficient), yet when charged with the task of teaching elementary students outdoors, many were reluctant and anxious. To counter their hesitation, we focused the content of our methods course and practicum mentorship on environmental education. Thematic analysis revealed which aspects of the methods course and practicum were perceived as most effective for preparing PSTs for teaching about the environment.

W

Steven Wall

An Investigation into Elementary Pre-Service Teacher Identity

Recognizing the important dialectic that occurs between contextual variables associated with science teaching and the practices utilized by those preparing for careers as teachers, a study was conducted to understand more about PST identities and perceptions of teaching science at the elementary grade level. Given the complexity of learning environments and the complex identity-based interactions generated within them, a research question emerged: “*What is learned about PST identities as they navigate opportunities that afford them development as elementary science teachers?*”

Initial findings indicate two distinct influences. First are PST beliefs centered on perceptions of their roles and their students. Second are PST perceptions of structural components of the profession, such as the use of published curriculum, classroom environment and science content. Analysis of these findings indicates PSTs value content learning that is participatory and student-centered. These values occur even though PSTs recognize that student misconceptions are common.

Sam Wheeler

The Influence of a Video Analysis Project on High School AP Physics Students’ Interest and Perceived Learning

This study examines the impact of video analysis-based open inquiry projects on student attitudes and interest toward physics and student perceptions of learning physics. Seventy-three high school physics students, working in small groups, created their own videos of physical phenomena dealing with aerospace or aerodynamics which they analyzed using Logger Pro software. Each group then presented their findings and analysis to the class for review. Student interest and attitudes toward physics and learning through their individually-designed inquiry projects were measured through an online survey and post project interviews. Twenty-seven students responded to the survey and eleven students volunteered to be interviewed. The respondents reported that this type of project made them more interested in doing physics and seventy percent of respondents indicated that they learned more than they did in more traditional guided inquiry lab activities. Ninety-six percent of those responding felt that creativity was important while doing physics.

Rachel Wilson

Pre-service Elementary Teachers’ Conception of their Connections within the Environment

In an era of increasing urgency surrounding environmental issues, citizens need to be able to evaluate how decisions they make in their daily life are dependent upon and consequential to the quality of the environment. Within an environmental literacy course for preservice elementary teachers (PSETs), the instructor uses the UNESCO (2010) definition of environment, encompassing four dimensions (natural, social, economic, political) as a framework for asking PSETs to consider how lifestyle choices are intertwined with environmental issues. How does such a personal focus on the connections between lifestyle and the environment influence PSET understandings of what the term “environment” encompasses? How does such a personal focus on the connections between lifestyle and the environment influence PSET understandings of what and how actions/choices are connecting them with environment? Pre- and post-course data from sixty-one PSETs from three semesters of the environmental literacy course are analyzed to explore these research questions.

W

David Wimert

The Effect of Inquiry-Based Science on Middle School Students' Alternative Concepts Regarding of the Conservation of Mass

Many middle school students have alternative science conceptions. The purpose of this study was to engage students in a 5 E inquiry-based unit of study about the conservation of mass that would allow them to express and modify their conceptions compared to students engaged in commonplace science instruction. A mixed methods design was used in this study of two 8th grade classes of science students from a small rural school in southeastern North Carolina. Results showed that 18 students in the treatment group revised their ideas, while 13 students in the commonplace group maintained the same conceptions. This study showed that when students were able to discuss, collect data, argue evidence and compare their ideas, they were able to change their original ideas.

NOTES

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