
N·I·H
SEPA
25
YEARS
1991–2016
SCIED CONFERENCE 2016

NIH SciEd 2016

Held May 9–12 in Rockville, MD, NIH SciEd 2016 was the fifth NIH-wide conference for science education projects funded by the National Institutes of Health. The 74 projects represented at the conference were funded by the following programs:

- Science Education Partnership Award (SEPA), Office of Research Infrastructure Programs (ORIP), Division of Program Coordination, Planning and Strategic Initiatives (DPCPSI), Office of the Director
- Science Education Drug Abuse Partnership Award (SEDAPA), National Institute on Drug Abuse (NIDA)
- NIH Blueprint for Neuroscience Research Science Education Award
- Science Education Awards, National Institute of Allergy and Infectious Diseases (NIAID)
- National Institute of Neurological Disorders and Stroke (NINDS)

The 207 conference participants included 67 project PIs, 23 Co-PIs, 38 project managers, 26 project staff, 8 evaluators, 8 graduate students and post-doctoral fellows, 1 teacher, 25 other individuals, and 11 federal government employees, including NIH staff (ORIP/OD, NIGMS, NHGRI, NCI, Center for Scientific Review) and representatives from other federal agencies involved in science, technology, engineering and mathematics (STEM) education at the pre-kindergarten – grade 12 (P-12) levels. These agencies included The White House Office of Science and Technology Policy, US Department of Education (DoE), the National Science Foundation (NSF), and the National Aeronautics and Space Administration (NASA).

The theme of the conference was "SEPA at 25: Building the STEM Pipeline for a Diverse Biomedical Workforce." The conference celebrated the 25th anniversary of the SEPA program through a retrospective of highlights, delivered by L. Tony Beck, PhD, the SEPA Program Officer since 2001, as well as by a panel presentation and discussion with six PIs of SEPA projects that were funded in the first three years of the program. Sessions on building the STEM pipeline and broadening participation included keynote addresses by Jon Lorsch, PhD, director of NIH NIGMS, and by Wanda E. Ward, PhD, Assistant Director for Broadening Participation, The White House Office of Science and Technology Policy; plenary session roundtable discussions; and six breakout sessions.

A keynote address by Melissa M. Goldstein, JD, from The White House Office of Science and Technology Policy, focused on integrating ethics in science education. Breakout sessions addressed informal science education (3), engaging students and the public (11), teacher professional development (2), the Next Generation Science Standards (3), evaluation and research (6), and project administration (6). Each project presented a poster about their work. A reception featuring demonstrations of games, apps and technology-based educational materials provided another opportunity for participants to view the products of SEPA projects. Participants reported that they returned home energized by gaining new ideas for evaluation and other project components, learning about STEM education priorities at the national level, networking, and forming new collaborations.

NIH SciEd 2015 Conference Organizing Committee

Brenda Armstrong, MD, Duke University School of Medicine

Charles Carlson, AB, The Exploratorium

Laurie Fink, PhD, Science Museum of Minnesota

Maurice Godfrey, PhD, University of Nebraska Medical Center

Barbara Hug, PhD, University of Illinois

Diane Munzenmaier, PhD, Milwaukee School of Engineering

Carla Romney, DSc, Boston University School of Medicine

Rebecca Smith, PhD, University of California, San Francisco

Margaret Shain Stieben, MS, American Physiological Society

Louisa Stark, PhD, University of Utah

Tony Ward, PhD, University of Montana

Conference Support

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Conference Schedule

Monday, May 9

5:30–7:00	Conference Check-in and Networking Reception
	Poster Set-up

Tuesday, May 10

7:30–8:30	Late Conference Check-in and Poster Set-up
8:30–8:45	Welcome Louisa A. Stark, PhD Chair, NIH SciEd 2016 Conference Organizing Committee Chair, University of Utah
	Franziska B. Grieder, DVM, PhD Director, Office of Research Infrastructure Programs (ORIP), DPCPSI, OD, NIH
	Update on the SEPA Program L. Tony Beck, PhD, Director of OSE/SEPA, ORIP, DPCPSI, OD, NIH
8:45–9:15	SEPA – 25 Years of Serving the Diversity Pipeline L. Tony Beck, PhD, Director of OSE/SEPA, ORIP, DPCPSI, OD, NIH
9:15–10:15	Panel of early SEPA PIs Ann Chester, PhD, West Virginia University Carl Franzblau, PhD, Boston University Marsha Matyas, PhD, American Physiological Society Nancy Moreno, PhD, Baylor College of Medicine Rebecca Smith, PhD, University of California, San Francisco Martin Weiss, PhD, New York Hall of Science
10:15–11:45	Poster Session I Odd-numbered posters
11:45–1:15	Mentor-Mentee groups for newly-funded SEPA projects
1:15–2:15	Keynote Address: Integration of Ethics into Science Education Melissa M. Goldstein, JD, Office of Science and Technology Policy, Executive Office of the President, The White House
2:30–3:45	Concurrent Breakout Sessions
	Extending Teaching and Experiential Resources for SEPA: Envisioning a New role for Graduate and Professional Students to Re-think Career Paths Through SEPA Participation Wilson Room

Genetics, Genomics and Precision Medicine: Education, Outreach and Roles for SEPA Projects
Jackson Room

Serious STEM Games: Partnerships for Learning
Plaza Ballroom

Developing Your Science Education Program into a STEM Ecosystem in Your Community
Lincoln Room

Demystifying Science Assessment in SEPA Projects
Monroe Room

SEPA-INBRE Interactions: Developing a Pipeline of Future Biomedical Workforce
Truman Room

4:00–5:30 Poster Session II
Even-numbered posters

Wednesday, May 11

7:15–8:30 Breakfast
Meeting for all new SEPA PI's
L. Tony Beck, PhD, Director of OSE/SEPA, ORIP, DPCPSI, OD, NIH
Monroe Room

8:30–9:30 Keynote Address: NIGMS: Supporting the Training and Education of the Next Generation of Biomedical Scientists
Jon Lorsch, Ph.D., Director, National Institute of General Medical Sciences (NIGMS), NIH

9:45–10:45 Ways in which NIH SciEd Projects can Support Building a Diverse Biomedical Workforce

World Café methodology:

- 20-minute discussions at each of 3 tables
    - Go to a table with a different question at each time
    - Try to discuss with a different group of people each time
- Each of the 3 discussions at a particular table will discuss the same question
- Record your group's ideas on the large paper at that table, adding to the previous group's ideas

11:00–12:00 Keynote Address: Broadening Participation in STEM: Policy, Research and Practice
Wanda E. Ward, PhD, Assistant Director for Broadening Participation, White House Office of Science and Technology Policy

1:30–2:45	Concurrent Breakout Sessions Working with American Indian, Alaskan Native, and Pacific Islander Communities Wilson Room
	Early STEM Learning: From Birth to 3rd Grade Lincoln Room
	A Tale of Two Programs: Empowering Teachers Through Rigorous Professional Development Plaza Ballroom
	Strategies for Validating Evaluation Instruments Jackson Room
	Evaluating Outcomes in Informal Learning Environments Monroe Room
	Opportunities and Challenges in Crafting a Fundable Science Education Grant Program That You Want to Pursue Truman Room
3:00-4:15	Concurrent Breakout Sessions Strategies for Increasing Diversity in the NIH SciEd Workforce Truman Room
	The Evolving Field of Citizen Science in the SEPA Network Jackson Room
	Curiosity Video Productions and curiosityforall.org Lincoln Room
	Planning Effective Standards-Aligned Professional Development for K-12 Teachers Wilson Room
	Evaluation strategies that Support Longitudinal Tracking of Anonymous Participants Monroe Room
	Overview of National Science Foundation STEM Education Research Funding Plaza Ballroom
4:15–5:45	Networking Reception Demonstrations of Games, Apps and Technology-Based Educational Materials Dinner on your own

Thursday, May 12

8:30–9:45	Concurrent Breakout Sessions Diversity, Disadvantage, and the Biomedical Workforce of the Future Lincoln Room
	Why Are We the Way We Are? Supporting Middle School Students in Three-Dimensional Learning to Make Sense of Gene and Environment Interactions Wilson Room
	Exploring Common Themes in Type 2 Diabetes Education Truman Room
	Informing the Field: How to Use Existing Project Evaluations for Research Monroe Room
	SEPA Dissemination Strategies: Successes and Struggles Jackson Room
10:00–11:15	Concurrent Breakout Sessions Creating Culturally-Relevant STEM-H Enrichment Activities to Engage Rural Students and Community Lincoln Room
	Zika Virus, Correlation vs. Causation, NGSS and the Common Core: Leveraging the Popular Press to Teach Science Jackson Room
	Hexacago Health Academy: STEM Education and Game Design Monroe Room
	An Introduction to Survey Design Wilson Room
	Strategies for Initiating and Sustaining Partnerships in Community-Engaged Research Truman Room
11:15–11:45	Town Hall Discussion L. Tony Beck, PhD Director of OSE/SEPA, ORIP, DPCPSI, OD, NIH

Plenary Sessions
Tuesday, May 10, 2016, 8:45 AM – 9:15 AM

SEPA – 25 Years of Serving the Diversity Pipeline

Presenter: **L. Tony Beck, Ph.D.,** *Director of OSE/SEPA, ORIP, DPCPSI, OD, NIH*
Reporter: **Brenda Armstrong,** *Duke University School of Medicine*

Director Tony Beck provided an overview of the history and 25-year growth of SEPA as the primary NIH pre-college STEM program. SEPA has been charged with advancing science education in multiple settings. The program particularly has a focus on advancing diversity in the STEM pipeline, including down to the preschool and elementary levels. The SEPA program was initiated in 1991; the first projects were the New York Hall of Science National Traveling AIDS Exhibit and the Boston University CityLab. Through projects targeted to PK-12 students and their teachers it has had a significant impact on expanding the biomedical workforce for increased inclusion of under-represented, first-generation, and socio-economically disadvantaged students. In addition, SEPA health and medicine exhibits in science centers and museums have increased health literacy in families and the lay public. As of May 2016, 160 projects have been funded through the SEPA program; 35% of these have been led by PIs who have not had previous NIH funding. SEPA awards provide credibility for the work of these and all PIs, and often provide a foundation to leverage other funding support.

Dr. Beck reviewed SEPA's 25-year growth in numbers of grantees and diversity of grantee projects. He also discussed the multiple strategies that have been put in place to expand SEPA's collaborative impact across the NIH, including involvement in trans-NIH and trans-agency programs such as Citizen Science, trans-NIH/Pre-College STEM activities, DNA Day, Brain Awareness Week, and birth to grade 3 early STEM Learning. SEPA funding has also had an impact worldwide. For example, initial support in 1995 for Boston University's City Lab Mobile Bus has led to the development of other mobile labs, with more than 20 now around the world.

The SEPA program requires rigorous evaluation of all projects to assess their impact on the target audience(s). This includes randomized control or well-matched comparison studies for classroom-based projects. All projects are required to have a Logic Model that guides their evaluation design, and projects are strongly encouraged to have an independent Advisory Committee. In 2014, the SEPA program initiated a 2½ year Process Evaluation of the entire program.

Goals for the next 25 years include programs to replicate successful SEPA models, increasing IDeA state SEPA awards, increasing SEPA/INBRE/COBRE connections, enhancing partnerships with the Native American Research Centers for Health (NARCH) and Indian Health Service programs, increasing CTSA connections, cultivating the next generation of SEPA PIs, identifying and encouraging corporate funding to support/extend SEPA awards, and continued collaboration with STEM and informal science education (ISE) programs at other federal agencies.

SEPA Website *www.nihsepa.org*

Tuesday, May 10, 2016, 9:15 AM – 10:15 AM

Panel of Early PIs

Presenters: **Ann Chester, PhD,** *West Virginia University*
Carl Franzblau, PhD, *Boston University*
Marsha Matyas, PhD, *American Physiological Society*
Nancy Moreno, PhD, *Baylor College of Medicine*
Rebecca Smith, PhD, *University of California, San Francisco*
Martin Weiss, PhD, *New York Hall of Science*
Reporter: **Charles Carlson,** *Senior Scientist Emeritus, The Exploratorium*

This plenary session provided an opportunity for the larger community of new and old SEPA PIs and educators to interact first hand with some of the more established SEPA programs and their PIs. A diverse array of programs was presented, from traveling museum exhibitions with "adult materials" in children's environments, to developing programs for creating effective program evaluations, the very nuts and bolts of assessing program effectiveness, all the various parts of the SEPA pie.

The session leader, Laurie Fink, from the Science Museum of Minnesota, posed a series of four questions to the group of session participants Ann Chester (AC); Carl Franzblau (CF); Marsha Matyas (MM); Nancy Moreno (NM); Rebecca Smith (RS); and Martin Weiss (MW)). What are you most proud of? How has SEPA impacted your career and institution? How has SEPA funding leveraged other opportunities? What's your vision for SEPA 2041? There were lots of useful and insightful comments, and a book could follow.

This summary only scratches the surface.

All of the PIs were most proud of the impacts their programs have made in the lives of thousands of students. It typically starts by increasing the accessibility of biomedical science curricula through direct engagement in non-threatening environments (such as museums), or real hands-on laboratory-based activities with teacher support and engagement. AC's Health Sciences & Technology Academy (HISTA) has changed the academy trajectory of thousands of students in rural West Virginia, just as CF's innovative mobile City Science Lab has expanded science laboratory experiences around the country by taking the necessary laboratory resources directly to students and classrooms. Likewise, many of the PIs cited the fact that their programs had provided the opportunity for many NIH-funded biomedical researchers to engage with the students and the general public. Some of the PIs, most notably MM, function within the context of a larger scientific society with a reach well beyond a local campus or community, providing opportunities for teacher professional development at a national level.

Once a program gets started, it typically grows in scope and stature, garnering support from additional sources and serving as an example for other initiatives – copying is the finest form of flattery. NM's magnet school program shifted the local Houston school district approach to science and raised student performance. City Lab Science (CF), along with RS's Science Education Partnership and some extensively circulated museum exhibitions (like What About AIDS? (MW)), put the "fun" in science, and is now a more commonly accepted approach to bringing science out of the lab.

Clearly it can be argued that not everything is novel, nor every program successful, but overall it's apparent that NIH SEPAs have made a difference for many different kinds of audiences across the United States, and that NIH support has been instrumental in fostering the development of new biomedical educational programs and helping to leverage and enlist the support of other funding sources (RS, MW, CF, AC, MM, NM).

As might be expected from a group of PIs faced with continually figuring out how to sustain and grow an education program, there was a unanimous call for more funding and higher priority within the Federal Budget, along with a shift to a more sustaining method of funding within NIH, and shift to an R01-type award funding mechanism with a mix of R25 funding (RS, MW, CF, AC, NM, MM), along with a permanent study group to oversee the resources (CF).

Tuesday, May 10, 2016, 1:15 PM – 2:15 PM

Integration of Ethics Into Science Education

Presenter: **Melissa M. Goldstein, JD,** *Office of Science and Technology Policy, Executive Office of the President, The White House*

Reporter: **Maurice Godfrey,** *University of Nebraska Medical Center*

Ethical Principals are part of the President's goals in STEM. These principals are included in the Presidential Commission for Biomedical Issues. Thus, there is an overlap between STEM goals and bioethics from K-12 throughout life.

Ethical Principals are manifested by:

- Respect for persons
- Beneficence
- Non-maleficence
- Justice (distributive)
- Distributions of benefits and burdens across society

Ethical norms in regards to research on humans ask, "What am I supposed to do in a situation?"

Beneficence/Non-Maleficence

- IRB requires affirmative duties on researchers, not passive duty and not do what you wish.
- Good research design is harder to describe than bad research design.
- Research design must be done in a way to protect subjects.
- Competent researchers must be involved.
- Researchers must have the skills, training, know what they are doing, and know what to do if things go wrong.
- Risk/benefit must be favorable, i.e. risk is worth taking for the benefit.

Breakout Sessions
Tuesday, May 10, 2016, 2:30 PM – 3:45 PM

Extending Teaching and Experiential Resources for SEPA: Envisioning a New Role for Graduate and Professional Students to Re-Think Career Paths Through SEPA Participation

Presenter: **Brenda Armstrong,** *Duke University School of Medicine*
Reporter: **Brenda Armstrong,** *Duke University School of Medicine*

This session was designed to develop creative ways to engage graduate and professional students in SEPA programs as additional resources who represent a group of developing young scientists, particularly those who are representative of the targeted groups of students whom we hope to recruit toward career paths for engineering, science, and technology. They have emerged as a powerful additional reinforcement of success for SEPA participants. The session focused on:

- Why this is important
- The "How To's" to connect with graduate and professional students
- Requisite age-group participant training in SEPA-based awards
- Time commitment for graduate and professional students
- The "What Do I Get Out of This" for graduate and professional students

The session focused on how to reach under-served communities for both grad/professional students AND target participant audiences.

The major strategies include:

- Relentless recruiting from available grad students
- Financial incentives to departments for participation
- Convincing PIs for grad students that participation is aligned with a stated priority of the university, i.e. must have buy-in by the deans of graduate and professional schools that this IS part of the mission.
- Identifying examples of best practices among currently-funded SEPA awards and other examples
- Potential additional resources to support expansion of SEPA awards for this component
- Need help in identifying awards that encourage this component as a priority
- Reminder: This IS the long term goal of SEPA and other targeted initiatives
- Potential disadvantages for graduate students who might contemplate participating at this level:
- Additional time commitment
- Faculty mentors must be incentivized to support the additional commitment taken on by grad/professional students.
- Granting entities SHOULD incentivize this activity with additional grant support to those graduate/professional students and young faculty who are willing to participate.

Obstacles identified include:

- Negative attitudes about science and research among URM, first generation, socioeconomically disadvantaged students as early as pre-school, potentiated by the media.
- Altered priorities in the public school system
- Early and deep-seated inadequacies in problem-solving/reading skills/mathematical intelligence, lack of encouragement of curiosity, lack of exposure to the role of research across multiple disciplines.
- There is NO MONEY for anything other than superficial exposure in public schools, i.e. few field trips, missing or old or outdated equipment to encourage scientific inquiry.
- No teaching of the importance of statistical applications to ALL data as part of early education
- Lack of ADVOCATES
- NO buy-in by the deans of graduate and professional schools that this IS part of the mission
- Where is INDUSTRY?
- Unrealistic attitudes about science and scientific heroes
- Faculty in public schools have little extra time to write for grants for additional resources/no Saturday Academies to provide additional exposure.
- Negative social attitudes about research scientists and their careers in at-risk neighborhoods
- Intersection of adolescence and intelligence = negative impact on scientific research as a "cool" aspiration
- Educators do not see investment in FAMILIES AS WELL AS STUDENTS as co-partners in the development of ambition for science literacy and follow-through in career aspiration.

Duke Experience:

- Initially altered priorities in the public school system AWAY from science education and mastery was a challenge.
- Early and deep-seated inadequacies in problem-solving/reading skills/mathematical intelligence, lack of encouragement of curiosity, lack of exposure to the role of research across multiple disciplines identified as part of grad students' talents to help with re-direction of student aptitude.
- Unrealistic attitudes about science and lack of knowledge of scientific heroes were identified as significant deterrents away from science interest and aptitude.
- Initial reluctance of some med school department chairs now replaced by strong support for pipeline program participation for younger students.
- Most graduate students able to manage time commitments for research development and completion with mentoring of students.
- Enthusiastic support of PhD students with BOOST project development and organization of Science Saturdays as additional exposure.
- Excellent progress in academic performance in STEM subjects since intervention by grad students by review of grades, honors, interest in advanced academic coursework, participation in science fairs/competition since intervention with grad/professional student mentor.

Participants:

Kelly LaRue The Jackson Laboratory

Berri Jacque Tufts Medical School

Alberto Guzman-Alvarez UC Davis

Alexandra Race City of Hope Beckman Research Institute

Marisa Bowers City of Hope Beckman Research Institute

Virginia Shepherd Vanderbilt University

Jennifer Ufnar Vanderbilt University

Rob Rockhold University of Mississippi Medical Center

Tiffany Nuessle Denver Museum of Nature and Science

Mary Jo Koroly University of Florida

Susan DeRiemer Meharry Medical College

Ashley Roseno East Carolina University

Elizabeth Kong Museum of Science, Boston

Isela Rodriguez-Bussey Georgia State University Bio-Bus Program

Douglass Coleman Building Opportunities and Duke Overtures in Science and Technology

Sara Hanks West Virginia University Health Science and Technology Academy

Genetics, Genomics, and Precision Medicine: Education, Outreach, and Roles for SEPA Projects

Facilitator: **Melissa M. Goldstein, JD,** *Office of Science & Technology Policy, The White House*
Louisa A. Stark, PhD, *Research Professor & Director, Genetic Science Learning Center, University of Utah*
Carla Easter, PhD, *Chief, Education & Community Involvement Branch, NHGRI, NIH, Partnership for Community Outreach and Engagement in Genomics*
Reporter: **Amy J. Hawkins,** *University of Utah*

Precision medicine (which includes genomic medicine) is receiving increased national attention as a result of President Obama's Precision Medicine Initiative (PMI) and the NIH's Precision Medicine Initiative Cohort program. As genomic medicine becomes more available, individuals will need an understanding of genetics and genomics in order to make informed decisions about healthcare for themselves and their families. This session consisted of brief presentations and discussions about efforts related to precision and genomic medicine education at the national level and by SEPA projects.

What follows is a list is of panel participants and a brief description and/or links to one of their relevant SEPA projects that support public genetic literacy in the PMI era.

Carla Easter, PhD, Chief, Education & Community Involvement Branch, NHGRI, NIH,

Partnership for Community Outreach and Engagement in Genomics

The Partnership for Community Outreach and Engagement in Genomics was established in 2014. The partnership brings together community liaisons and health advocates representing diverse populations to engage communities around genomic science, to inform and share perspectives about genomic research, and to impact the focus of research.

https://www.genome.gov/27563809/partnership-for-community-outreach-and-engagement-in-genomics/

"Your Genome & You" is an infographic that offers an introduction to the basics of genetics and genomics and how the science impacts our lives. It was designed by the National Human Genome Research Institute's Partnership for Community Outreach and Engagement in Genomics.

Jawed Alam, PhD, MBA, Ochsner Health System

BEST Science! - Bioscience Enrichment for Students and Teachers
Project website: *https://research.ochsner.org/p-12-science-education/best-science*

BEST Science! is a comprehensive program designed to provide "bioscience enrichment for students and teachers." BEST Science! is a partnership between Ochsner Clinic Foundation, Louisiana State University Health Sciences Center, and several local schools. The long-term objective of this partnership is to advance an interest in and understanding of biomedical research and health sciences by New Orleans

area high school students, particularly underrepresented minorities, with the ultimate goal of stimulating further education and vocation in these areas. BEST Science! provides a series of summer professional development workshops for biology teachers and then provides the necessary resources for them to deploy the curriculum in their classrooms during the academic year.

Shannon Carlin-Menter, PhD, State University of New York at Buffalo.

The Western New York Genetics in Research and Health Care Partnership is developing an ongoing partnership with disadvantaged schools across a 14-county region that serves as a pipeline for teacher and student recruitment, training, and mentorship in bioscience, with a particular focus on genetics. It is designed to support career paths for students in both scientific research and the health professions, emphasizing assistance to those from underrepresented and disadvantaged groups, as well as to familiarize teachers with basic bioinformatics concepts that they can introduce into their classrooms.

Toby Citrin, JD, University of Michigan

A New Genomic Framework for Schools and Communities & Education for Community Genomic Awareness
https://sph.umich.edu/genomics/education/k12.html

Education for Community Genomic Awareness allowed the Center for Public Health and Community Genomics at the University of Michigan School of Public Health (CPHCG) to expand its activities related to integrating information on genomics and public health into K-12 education. A new curriculum that addressed molecular genetics (single gene focus) and genomics (focus on human genome and its interaction with environment) was developed and enacted in five high schools in Detroit and three high schools in Flint.

From the high school curriculum project, CPHCG learned that high school students would gain from more understanding of basic concepts in the gene-environment interaction. Thus, a middle school curriculum was proposed and developed. Materials related to this curriculum, with a focus on gene-environment interaction and how it applies to students' everyday lives, can be found at:
http://create4stem.msu.edu/project/misepa/about

Victoria (Vicki) Coats, Oregon Museum of Science and Industry (OMSI)

http://omsi.edu/exhibitions/zoo-in-you/exhibition/

The Oregon Museum of Science and Industry, in partnership with the J. Craig Venter Institute (JCVI), developed Zoo in You: Exploring the Human Microbiome, a 2,000-square foot bilingual (English and Spanish) traveling exhibition for national tour to science centers, health museums, and other relevant venues. The exhibition's target audience is families and school groups with children in grades 4-12.

Marnie Gelbart, PhD, Personal Genetics Education Project, Harvard Medical School

https://pged.org/staff/

The Personal Genetics Education Project, based in the Department of Genetics at Harvard Medical School, seeks to shorten the time it takes for information about breakthroughs in genetics to reach the public. The Project group offers lesson plans on personalized medicine, which can be found here:
https://pged.org/lesson-plans/#PM

Dina Markowitz, PhD, University of Rochester

https://www.urmc.rochester.edu/life-sciences-learning-center.aspx

The goal of the Life Sciences Learning Center's Medicines and Me project is to increase adolescents' understanding of concepts essential for the safe use of medicines as well as to increase their awareness of the drug development and clinical trials processes. Like other University of Rochester Life Sciences Learning Center outreach programs, this field trip program for middle and high school students takes place at teaching laboratories at the University of Rochester Medical Center.

Nancy Moreno, PhD, Baylor College of Medicine

Gene U: Inquiry-Based Genomics Learning Experiences for Teachers and Students
http://www.bioedonline.org/lessons-and-more/resource-collections/gene-u-genetics-and-inheritance/

Baylor College of Medicine's Gene U project is creating and testing science and health curricular resources designed for middle and early high school teachers and students. Gene U covers the importance of family history in understanding disease risk, significance and genetic variability of the human microbiome, and other emerging areas of research. Gene U links to a wide variety of genetics/genomics-based resources for educators, including complete undergraduate courses (available for professional development contact hours), video and slide presentations, and related materials for use in the classroom.

Maureen Munn, PhD, Genome Sciences Education Outreach, University of Washington

Genes, the Environment, and Me (GEM) website:
https://gsoutreach.gs.washington.edu/programs/genes-the-environment-and-me-gem/

Genes, the Environment, and Me (GEM) works with school districts and communities in the Yakima Valley and throughout Washington State to develop a science education program focused on teaching about how genes and the environment interact to determine human traits, including disease conditions. Instructional materials on type 2 diabetes and "What Can We Learn From Worms?" can be found at:
https://gsoutreach.gs.washington.edu/instructional-materials/gem-type-2-diabetes/
https://gsoutreach.gs.washington.edu/instructional-materials/genes-the-environment-and-me/

Charles Wray, PhD, Director, Courses & Conferences, The Jackson Laboratory

https://www.jax.org/education-and-learning/course-and-conferences/staff#

The "Teaching the Genome Generation" project will provide high school teachers the content knowledge, teaching strategies, and resources needed to enhance student learning in genomics, bioinformatics and bioethics. Up to 48 teachers per year will participate in hands-on short courses that provide instruction in the molecular genetics of personalized medicine, use of bioinformatics tools, and discussion of the ethical, legal, and social issues (ELSI) surrounding genetics research. ELSI lesson plans and discussion frameworks are provided through partnership with the Personal Genetics Education Program within the Department of Genetics, Harvard Medical School.

Serious STEM Games: Partnerships for Learning

Facilitators: **Daniel Laughlin, PhD,** *NASA Learning Technologies, Assistant Research Scientist with the NASA Goddard Earth Science Technology and Research (GESTAR) center at Morgan State University*
Darrell Porcello, PhD, *Chief Technology Officer, Lawrence Hall of Science, University of California, Berkeley*
Carla Romney, DSc, *Director of Research, CityLab, Boston University*
Laurie Fink, PhD, *Director of Science Programs, Science Museum of Minnesota*

Reporter: **Charles Carlson,** *The Exploratorium*

Nine to ten game projects at various stages of development and were presented in an action packed hour and 15 minutes, with lots of contributions from the audience as well. The starting premise in this session was that games can be and are starting points for many learners of varying ages. They are interactive, and the field is changing with more games becoming independent of specific computer platforms and traditional delivery mechanisms such as a CD or DVD.

Beyond these agreed upon commonalities, specific rubrics varied immensely as best I could tell, and by the end, the definition I commonly associate with "game," that is, a contest or puzzle to be solved or won, had slipped from my grasp; I am no longer certain what a digital game is.

I would have found it useful to have working examples of the games themselves, or the opportunity to use them ahead of time, very helpful. This would have been difficult given the size and scope of the presentation. All in all, we barely touched the topic in the allotted time.

Digital games involve a computer. The games themselves are very diverse in style and intent, and some are more didactic than others. Ashlyn Sparrow described a sexual assault prevention game she is working on. I think they are taking a Simcity® approach with a match of the form and content. They're emphasizing that learning is fun. Paulette Jones is working on a project to familiarize students with lab protocols and techniques. Ralph Imondi, Coastal Marine Biolabs, is working on comparative genomics and meaningful interaction with real data.

Key points:

- Games take time to develop, but the games themselves might only be used for a short period of time.
- Games need to be fun.
- Games are not typically didactic.
- Game development includes evaluation and evaluator involvement.
- Games can reach large audiences (hundreds of thousands of individuals).
- Early involvement of the game designer is crucial.
- User motivation is crucial.
- Avatars can help to create an immersive environment.

I'm sure I've left much out. Games vary as much as gamers. There is no question that they're part of the educational fabric, but they seem more speculative than other forms of learning (but that's probably a feature of their recent history). They undoubtedly can affect a large group of learners, and are a component of education's future. Exactly what a STEM game is, I leave for you to decide.

Overall, it was clear this is no place for rank amateurs and de novo learning on the fly, as it might have been 15 years ago. The field is rapidly changing under the influence of iterative developments in gaming technologies and web development. I would have liked to have seen the inclusion of some completed game projects with some attention to common features that defined their successes and failures. All in all, it proved a useful session for making connections with others interested in games.

Participants:

Nicole Kowrach Museum of Science & Industry, Chicago
Darrell Porcello UC Berkeley Lawrence Hall of Science
Charles Carlson The Exploratorium
Ashlyn Sparrow University of Chicago
Andrij Holian University of Montana
Paulette Jones Meadowlark Science and Education
Valence Davillier Great Lakes Science Center
Margery Anderson Walter Reed Army Institute of Research
Dimitri Blondel Duke University Medical Center
Kristi Straus University of Washington
Patrice Saab University of Miami
Alana Johns Pacific Science Center
Ryan Perkins University of Utah
Tony Ward University of Montana
Jenny Williams University of Washington
John Pollock Duquesne University
Anne Westbrook Biological Sciences Curriculum Study
Laurie Fink Science Museum of Minnesota
Christi Buffington University of Montana
Carla Romney Boston University

Developing Your Science Education Program into a STEM Ecosystem in Your Community

Facilitator: **Katie Busch, EdS,** *the University of Alabama at Birmingham Center for Community Outreach Development (CHORD)*

Reporter: **Rachel Smilow,** *Children's National Health Systems*

Key points:

- STEM ecosystem
- Community engagement
- A strong partner
- Collaboration

Throughout the session, Ms. Busch mentioned the concept of strong partnerships and the importance of engaging your community. She noted the importance of knowing your audience and learning from those around you, which is why she took time during the session to go around to each table and engage with the audience in order to learn about what they are doing in the community. Coming from different organizations, we all shared similar audiences and found more similarities between our projects than differences.

Ms. Busch went on to discuss the program STREAM-X, which was created as a result of informal and formal educators wanting to create a safe space to discuss their problems and issues within their institutions. CORD began with a group of formal educators, school administrators, and parents, but by word of mouth the group started to grow, which is how STREAM-X was formed. Problems were solved through discussions, actions, and partnerships, and new collaborations were formed, building on the theory of an ecosystem and how the community can work together to find a solution for the common goal of educating children.

Ms. Busch mentioned that CORD also provides teachers with the confidence to teach science (which is not a strength for many K-5 teachers) by providing them with curriculum meetings and support through STREAM- X, whose community focus and mission are to provide education. One interesting point Ms. Busch brought up during her discussion was the importance of looking at all potential community partners (including hospitals and utility companies) to try and support the curriculum.

Participants:

Gwen Stovall University of Texas at Austin
Kira Hughes University of Hawaii
Mike Wyss University of Alabama Birmingham
Julie Yu The Exploratorium
Amy O'Doherty Museum of Science, Boston
Karen Peterman Karen Peterman Consulting Co.
Rachel Smilow Children's National Health Systems
Ty Martinez LSU Health Sciences Center Shreveport
Sue Kirk CRESST Virginia Commonwealth University
Renee Bayer Michigan State University
Susan Kane City of Hope
Alexandra Race City of Hope
Matt Fierman Tufts University
Rayelynn Connole Montana Tech
Eric Chudler University of Washington
Michelle Ventura Georgia State University/Bio-Bus
Susan Hershberger Miami University
Heather Kleiner Sci-Port Discovery Center
Naomi Delaloye University of Montana
Rebecca Houseman Seattle Children's Research Institute
Juan Ruiz University of Arizona
Gale Seilen Iowa State University
Kathryn Peters University of New Mexico Prevention Research Center

Demystifying Science Assessment in SEPA Projects

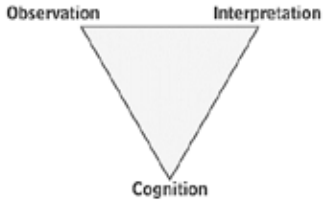
Presenters: Kristin Bass, PhD, *Rockman et al*
Linda Morell, PhD, *University of California, Berkeley*
Reporter: Joan Griswold, *University of Washington*

Informal Title: "Everything You Wanted to Know About Assessment But Were Afraid to Ask"

Recent publication: Bass, K. M., Drits-Esser, D. & Stark, L. A. (2016). A primer for developing measures of science content knowledge for small-scale research and instructional use. CBE-Life Sciences Education, 15(2), 1-14. *http://tinyurl.com/jozwmhp*

Kristin Bass defined a measure as a standardized quantifiable observation. Measurement in this context is a process of making quantifiable inferences about latent (unobservable) ideas using observable evidence.

The assessment triangle:



What you're measuring. (i.e. self-efficacy, content knowledge, etc.)

Assessment is a reversible, iterative process (not always linear; can jump back and forth).

Points 1 and 3 were highlighted.

- Construct identification – What specific goals and objectives should students be expected to achieve by the end of a curriculum unit, module, or program? Which are the priorities for the assessment? (What do we want to measure? What are the priorities?)
- Item selection, creation, and adaptation – What evidence shows the goal has been achieved?
- Scoring system creation – What levels of understanding would you expect to see within a goal or objective? How would you define complete and less complete levels? (How many points? What level of response is okay? Do raters agree?)
- Item review and validation – Do questions address the content? How do students perform? Revisions?

Linda Morell presented "Construct a Modeling Approach to Understand How Students Think":

- Construct map – Explanation of a theory of development or a learning trajectory. Identifying and defining the continuum from low knowledge to high knowledge. (For example, with students learning about density: ends of the continuum easiest to delineate, middle is more difficult.)
- Item design – The questions, performances, etc. asked of students that provide empirical evidence regarding the construct map. (How do students show what they know at each level of the construct? Provide items that will make student thinking visible.)

- Outcome space – A way of interpreting student responses and assigning them to a developmental level on the construct map; a valuing system for each item.
- Measurement model – e.g. Wright Map, which shows the item difficulties and student abilities for the content on the construct map.

We then participated in an activity in which we mapped student responses to a prompt about evaporation to a developmental level, first individually then in table groups. We found that people interpreted student responses very differently, and gave different reasons for placement on the construct map.

Participants:

Amanda Jones Seattle Children's Research Institute
Rebecca Carter Seattle Children's Research Institute
Christopher Burnett Baylor College of Medicine
Alana Newell Baylor College of Medicine
Deborah Peek-Brown Michigan State University
Barbara Hug University of Illinois
Tania Jarosewich Great Lakes Science Center
Tracey Meilander Great Lakes Science Center
Rebecca Smith University of California San Francisco
Karina Meiri CTSE Tufts University School of Medicine
Lisa Abrams Virginia Commonwealth University
Mike McKennan The Jackson Laboratory
Joe Polman University of Colorado Boulder
Dina Drits-Esser University of Utah
Theresa Freeman Thomas Jefferson University
Ben Koo University of California, San Francisco
Mary Kay Hickey Cornell University
Susan Rauchwerk Lesley University
Nicole Weber Lesley University
Joan Griswold University of Washington
Loran Parker DLRC, Purdue University
Patty McNamara Independent Evaluator
Kim Zeidler-Watters University of Kentucky
Marsha Matyas American Physiological Society
Katherine Richardson Bruna Iowa State University
Preeti Gupta American Museum of Natural History
Julia Skolnik Franklin Institute Science Museum
Shannon Weiss Oregon Museum of Science and Industry
Laura Tenenbaum Walter Reed Army Institute of Research
Don DeRosa Boston University City Lab
Melani Duffrin East Carolina University
Carol Boscom-Slack Center of Translational Science Education, Tufts University School of Medicine

SEPA-INBRE Interactions: Developing a Pipeline of Future Biomedical Workforce

Moderators: Krishan Arora, PhD, *Program Director, National Institute of General Medical Sciences, NIH*
Regina Sievert, PhD, *Professor of Science Education, Salish Kootenai College*
Reporter: Maggie Cearley, *University of Kansas Medical Center*

Background

SEPA has a 25-year history of funding a wide variety of innovative educational resources for PK-12 teachers and students in underserved communities. IDeA Networks of Biomedical Research Excellence (INBRE) provides research experiences, mentoring, and career development activities for undergraduate students from primarily undergraduate institutions, community colleges, and tribal colleges from the IDeA states, and serves as a pipeline to biomedical and health research careers. SEPA projects in turn provide student and teacher resources to support the pre-INBRE pipeline. Enhancing the SEPA-INBRE pipeline ultimately creates a system where SEPA programs can naturally feed into INBRE undergraduate programs, thereby creating a continuous pipeline from Pre-K through higher education.

Currently, there are several successful SEPA-INBRE models that exemplify best practices in forming SEPA-INBRE partnerships. These models are also able to address the challenges faced in building a diverse pipeline of biomedical workforce. The following panelists shared their experiences with SEPA-INBRE collaborations.

Kelley Withy, MD, PhD, Hawai'i Area Health Education Center, University of Hawai'i at Manoa

Initially, SEPA-INBRE collaboration was challenging, as there was an impression, possibly originating from the grant design, that INBRE funds were "not allowed to be used for high school." However, Dr. Withy expressed the desire to integrate the two programs well: "Just because you're on an island doesn't mean you need to be isolated." As both SEPA and INBRE programs grew over time in a shared location, the programs were able to find common ground by using the SEPA project as a vehicle for the outreach activities mandated by all INBRE programs. Today there are a number of activities for teacher training, and there are over 300 students in the pipeline. The partnership has allowed shadowing experiences, mentorships, and career development.

Given that INBRE funding is larger and is considered to be the "big grant," the question becomes: how can we increase collaboration and utilize each other's resources? To answer this, the two programs got together every year to help develop mentor sessions. Recognizing that INBRE doesn't typically help with middle school students, the SEPA can transition to support them in all mentoring and shadowing opportunities. Ultimately, ideas stem from the SEPA grant, and resources and researchers stem from the INBRE grant.

Michele Shuster, PhD, New Mexico State University

New Mexico State's SEPA start was unique. Specifically, funding from the existing INBRE's public outreach efforts allowed the preliminary data to be collected, which was used to apply for SEPA funding. Therefore, the partnership was established from the outset of their SEPA program. This allows for enhanced collaboration, as exampled by the fact that SEPA researchers attend their partner INBRE conferences.

However, a fluid SEPA-INBRE pipeline does not currently exist because of the divergence in programmatic focus. That is, the SEPA funding is concentrated on training teachers as a conduit to impact students, and therefore has less of a direct link to join the student pipeline between secondary and postsecondary education. Additionally, the outreach efforts of the INBRE network are focused in one community, and do not have a broader focus on K-12 outreach. Lastly, one of the facets of INBRE is to support bioinformatics, which is naturally more detailed and intense and therefore does not naturally lend itself to collaboration at the K-12 level.

New Mexico's future plan is to allow INBRE to serve as a direct partner for classroom training instead of partnering with many institutions in the INBRE network to train graduate students. Specifically, they hope to take outreach skills to classrooms by using a "train the trainer" model, building on one another's knowledge base.

Ann Chester, PhD, West Virginia University

The goals of both the SEPA and INBRE partnership aligned to build the capacity of the community and to develop students who return to the communities they grew up in with new skills centered on what it takes to be a leader in the community. Near-peer mentorships between graduate and high school-level students help facilitate this community and leadership building. Dr. Chester expressed the goal of the West Virginia SEPA-INBRE partnership through a personal anecdote: "It can take a kid who doesn't think they have hope and form them into a supervisor or a leader in the community."

To make a seamless pipeline of SEPA-INBRE programs, West Virginia was left with the question: how do we combine recruitment of students for INBRE with the increase in students with SEPA experiences who wish to attend major R01 universities? Their solution: SEPA students who are a part of the West Virginia Health Science and Technology Academy (HSTA) program are allowed to attend.

To make the partnership between SEPA and INBRE work, the SEPA program decided to have one individual on INBRE payroll. This person helped with recruitment as well as coordinating judges for science fairs and public speakers at SEPA clubs. Additionally, funding was acquired to support tracking of students across the K-12 SEPA experiences into the postsecondary environment of INBRE.

Maurice Godfrey, PhD, University of Nebraska Medical Center

The Nebraska SEPA program centers on Creighton, tribal colleges (Little Priest Community College), and NE Medical Center. However, the INBRE program has different postsecondary partnerships than the SEPA program. To address this barrier, SEPA hopes to work with INBRE to pull students from a wider variety of programs and open up their recruitment. This would allow for a logical extension for SEPA students to continue their work at the postsecondary level.

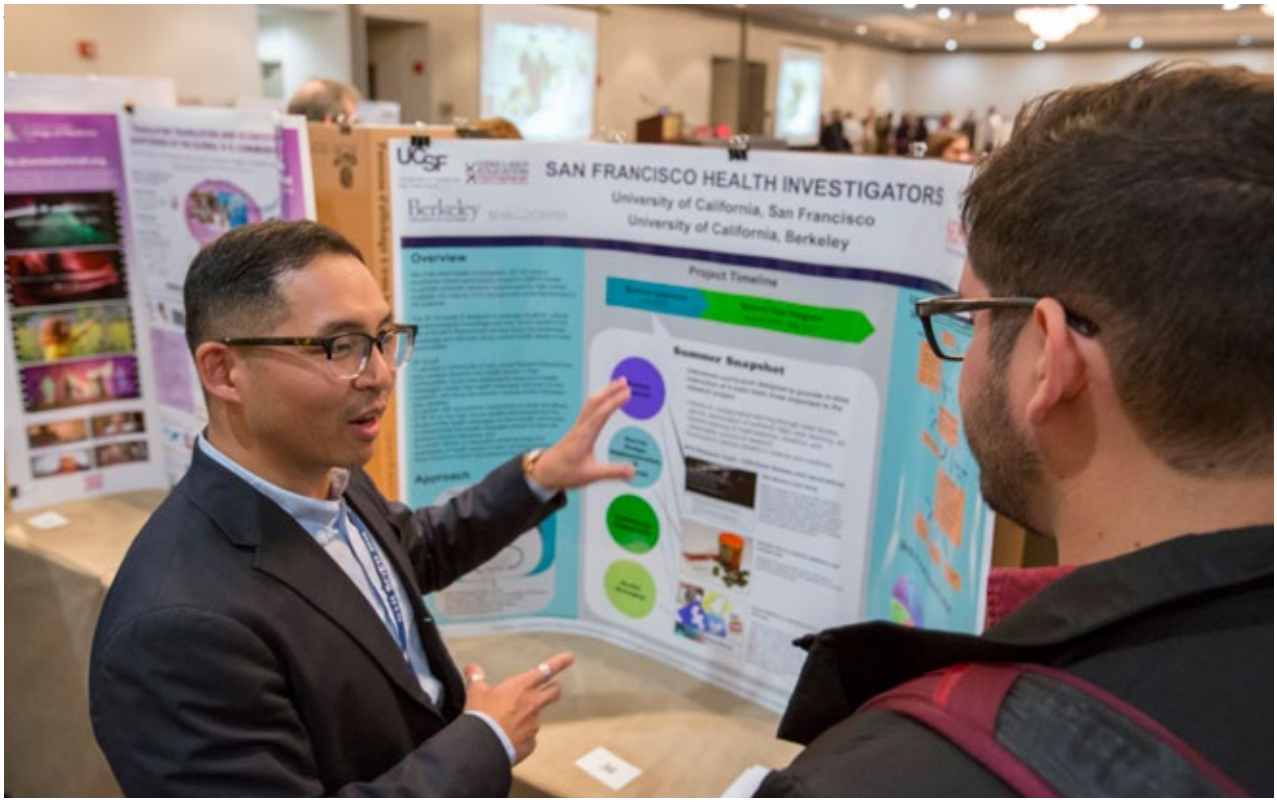
However, several challenges are present. In the native community, hospitals have become decertified and IHS issues constantly arise. Additionally, the pipeline is now focused on research, not clinical work. Also, there is a difficulty in getting students to come back to their original community. Lastly, aligning SEPA and INBRE partnerships is a very delicate matter.

Overall Barriers to Partnership and Proposed Solutions

SEPA and INBRE often have different geographical focuses. For example, they may focus recruitment and programming on rural or urban students, creating a mismatch between the two programs. Additionally, state boundaries can create funding restrictions; in areas like Kansas City, with both Kansas and Missouri students, SEPA funds that are tied to a particular state (or institution with state ties) limit the potential impact of the work. To address this, one should leverage the regional INBRE networks to expand on the possibilities of partnerships that cross the urban/rural divide as well as state boundaries.

The focus of INBRE is on biomedical students, but that is not always the case for SEPA projects. However, INBRE programs may consider diversifying their portfolio of principal investigators to include social science researchers or those focused on community-based research.

Bridging the gap between high school and college students is difficult. The gap between SEPA programs that work with pre-K and elementary students is even more challenging, and it is hard to generate longitudinal studies that track students across this age gap. Allowing for expansion of SEPA programs or additional programs funded in the same area (possibly through a supplement grant) may be able to bridge



Plenary Sessions
Wednesday, May 11, 2016, 8:30 - 9:30 AM

The National Institute of General Medical Sciences (NIGMS): Supporting the Training and Education of the Next Generation of Biomedical Scientists

Speaker: **Jon Lorsch, PhD,** *Director of NIGMS*
Reporter: **Amy J. Hawkins,** *University of Utah*

NIGMS has an annual budget of $2.5 billion, which supports basic research that increases understanding of biological processes and lays the foundation for advances in disease diagnosis, treatment, and prevention. NIGMS supports more than 3,000 investigators and 4,500 research grants—over 11% of the total number of research grants funded by NIH as a whole and approximately 26.3% of the NRSA trainees who receive assistance from NIH.

NIGMS is a leader in training programs, and its Division in Training, Workforce Development, and Diversity (TWD) particularly has a number of programs that are designed to enhance student training at various career stages that ultimately contribute towards development of an outstanding and diverse biomedical workforce. NIGMS supports training in 11 different basic biomedical research areas and the Medical Scientist Training Program (MSTP).

Recently, the NIGMS held a symposium on "Catalyzing the Modernization of Graduate Education." The videocast has over 500 views and can be viewed at *https://videocast.nih.gov/summary.asp?Live=18392&bhcp=1*. The twitter hashtag #ModernPhD associated with the videocast and topic is still used as of November 2016, and can be searched at *https://twitter.com/search?q=%23ModernPhD&src=typd*. Additionally, the NIGMS is also active on social media; their Twitter account can be viewed at *https://twitter.com/NIGMS* and their Facebook page at *https://www.facebook.com/nigms.nih.gov*.

Some of the themes that have emerged from this symposium include the idea that the output (including the kinds and amount of data and publications) of science has changed dramatically in the past two decades, but the structure and nature of graduate biomedical education has not. This speaks to a need for developing evidence-based education and curricula and evidence-based mentoring practices. Additionally, the scientific community and the popular press have recognized that "reproducibility" is a problem.

Since this presentation, on June 8, 2016, the NIGMS released a Request for Information (RFI) to obtain input from the broader community on how to catalyze the modernization of biomedical graduate education through NIGMS institutional predoctoral training grants program. Kenny Gibbs, a program officer in NIGMS' Training, Workforce Development and Diversity division, has written a report and a post on the NIGMS blog regarding the collected community perspectives on modernizing graduate education (*https://loop.nigms.nih.gov/2016/11/your-perspectives-catalyzing-the-modernization-of-biomedical-graduate-education/*).

Another funding mechanism the NIGMS uses to develop the talent pool of the entire United States, rather than just the students who happen to live in certain geographic areas, is the Institutional Development Award (IDeA) program (*https://www.nigms.nih.gov/Research/CRCB/IDeA/Pages/default.aspx*).

Established by Congressional mandate in 1993, the IDeA program's goal is to broaden the geographic distribution of NIH funding. The IDeA program supports research and institutional research infrastructure in states that have historically received low levels of support from NIH. A state's eligibility is determined by its aggregate level of NIH funding statewide. The current threshold of eligibility is less than $120 million per year averaged over a five-year period, currently from 2002 through 2006. The program is currently active in 23 States and Puerto Rico. These states have added challenges in developing a competitive research infrastructure. Many have only one medical school or no medical school at all. Alaska, Hawaii, and Puerto Rico have the added challenge of being physically separated from the continental U.S.

Wednesday, May 11, 2016, 9:45 AM – 10:15 AM

World Café Discussion on Building a Diverse Biomedical Workforce

Reporter: Diane Munzenmaier, *Center for BioMolecular Modeling*

Conference participants distributed themselves among the round tables in the plenary room. Each table discussed one of the following questions for 20 minutes. Participants then rotated twice to tables with different questions, discussing each for 20 minutes. The discussions related to each question are summarized below.

What are barriers to developing a diverse biomedical workplace in your community or state and how can they be addressed? What factors might inhibit or increase community/school participation in the SciEd project that seeks to build a diverse biomedical workforce?

Barriers discussed included: lack of learning culture and infrastructure in rural areas; transportation issues and family obligations; teacher turnover; lack of incentives for outreach by universities; mismatch between student and parent aspirations; lack of content foundation; lack of role models; lack of funds; safety/security; stereotypes; structural racism.

Solutions discussed included: provide the internet for all; incentivize university outreach; hire graduate students; include role models on SciEd teams; provide distance learning; teacher stipends; include parents; reach administrators; empower teachers to be able to integrate STEM; work together with other organizations already working with non-traditional audiences.

What are some concrete activities and strategies for engaging a non-traditional audience? How might your SciEd project's activities be adapted to engage a broader audience, e.g. younger or older, different populations, different settings or contexts?

Strategies and activities discussed included: work with families; work through libraries; train scientists to present to non-traditional audiences; travel to audiences; dual language materials; identify expertise in the community; tailor to what "non-traditional" means in your area; make programs fun; games/apps; promote attitude that science is for everyone; use ethical dilemmas; work through social media.

How do we (SciEd PIs, staff, and teachers) broaden participation and build a diverse biomedical workforce if we do not reflect the populations of the communities in which we work?

Strategies discussed included: widen recruitment; financial aid; URM/near-peer role models; target exclusively disadvantaged; broaden media/public engagement; travel to sites; use social media; program alumni return for motivation; salary support for teens; community maker fairs; homeschool community boards; generate the safety of a team; relevance to community churches; track with GiveGab; engage community; take-home materials; respect their situation; use appropriate language; build relatability into the program; find community leaders while writing grants; promote community-savvy individuals into your project; increase responsibility/autonomy of community partners; enhance sustainability of program;

cultural competence training; patience in building relationships, trust, ask what they need – don't tell them; overcome language barriers; implicit bias training; be culturally aware/sensitive; be flexible – relationships take time; be mentors more than just role models.

What are examples of best practices and lessons learned for broadening participation in the biomedical workforce?

Best practices and lessons discussed included: create participatory/hands-on activities; engage teachers/community leaders; provide authentic science experiences; create fun, a-ha moments; create opportunities, exposure, inspiration, and positive experiences that start from a young age; piggyback on other programs (Upward Bound); use culturally relevant role models; provide training for project staff; use a variety of mentors to build bridges; reach out to audiences that are not self-selecting and pay them during the summer; tap into wonder/curiosity through helping students ask questions that engage them; know that duration/frequency of the interaction matters; proactively go into communities where people are not expecting science experiences; change metaphor from "pipeline" to "watershed"; provide education/support for entire family; follow up on changes – ensure consistency in institutional policies and understanding of value of outreach within dept/institution; make science personal; offer endless career opportunities and build positive community perceptions; build ties with workforce; reward creativity, not memorization; understand the motivation of your audience and tap into it; create sustainable career paths; define "biomedical" through conversation; provide examples of biomedical career options; examine and address institutionalized and individual racism that hinders diversity; establish new educational models – innovation, creativity, outside-the-box thinking.

In what ways can our programs develop a co-curriculum for family engagement and support for STEM careers? In what ways can we link informal and formal STEM programs aimed at broadening participation and workplace development?

Ideas discussed included: getting students to see relevance and continuum of biomedical science internships; reaching into communities and families and gaining trust; providing role models with shared backgrounds and experiences; building a school culture of success (growth mindset); stress rigor in schools; consider sustainability of programs; understand audiences and ask for their input; use out-of-school time, science nights, Saturdays; relate STEM relevance to daily life; provide project-based learning and take-home activities; make family involvement integral; publish student projects on website; invite K-12 teachers to colleges and museums to raise awareness of their resources; expose families to games/apps; promote family discussion of medical history/lifestyle choices; provide incentives for family to participate (e.g. food, childcare for parents, extra-credit for students); seek family buy-in; identify necessary careers/degrees; link informal with formal (museum exhibits to school curriculum); create citizen science programs and career fairs; use students from formal programs as interns in informal (e.g. museum docents, etc.); integrate with extracurriculars/non-profits (Big Brothers/Sisters, Girls Inc., etc.); partner with TRIO or other programs; HOSA with CTE informal settings; use libraries and other community facilities that are accessible; co-develop activities rather than retrofitting; be mindful of standards that teachers are required to follow; build networks of learning HIVE/INBRE-like organizations to expand connectivity.

Wednesday, May 11, 2016, 11:00 AM – 12:00 PM

Broadening Participation in STEM: Policy, Research, and Practice

Presenter: **Wanda E. Ward, PhD,** *Assistant Director for Broadening Participation, White House Office of Science and Technology Policy*

Reporter: **Rebecca Smith,** *University of California, San Francisco*

Dr. Ward's keynote session served to update attendees on the White House's priorities and initiatives to broaden participation in STEM. She began with an overview of STEM talent development in the United States and what she termed the "Underrepresentation Challenge," shared the President's STEM education goals, then discussed a national response, "STEM for ALL," the importance of mentoring, and finally talked about the leadership role of the federal government to address the Underrepresentation Challenge. The session ended with a discussion of questions posed by NIH SciEd participants.

US STEM Talent Development: The Underrepresentation Challenge

This section began with a presentation of statistics from 2012 that detailed the underrepresentation of women and people of color both in completing STEM degrees and in the STEM workforce (both academic and non-academic). While there has been some progress made by women overall, there has been a profound lack of growth in representation in STEM fields by people of color. Dr. Ward discussed the critical importance of diversity of thought and the profound value it brings the scientific enterprise.

STEM Education – Presidential Goals

Dr. Ward presented additional details about the two presidential goals in STEM Education that were delineated in yesterday's keynote by Melissa Goldstein. Specifically, regarding the goal of graduating one million more STEM college graduates who reflect the demographics of the country by 2020, she stated:

1. To achieve this goal, we will need to increase the number of graduating STEM majors (currently 290,000 a year) by 100,000 a year.
2. That institutions of higher education in the U.S. are ill-prepared to deal with the demographic shift taking place in this country
3. That to achieve this goal we will need to both retain more STEM majors to graduation (currently 40% of declared STEM majors change their major before graduation) and increase interest in STEM among middle school students. The second STEM education goal is to train 100,000 more excellent STEM teachers for K-12 schools. Since this goal was announced, an additional 30,000 teachers have graduated from teacher preparation programs and there are commitments in place for this goal to be achieved.

STEM for ALL: The National Response

Dr. Ward discussed key tenets in a national effort to broaden participation in STEM. These included changing the way we teach at pre-college and university levels, expanding access to STEM courses (including in computer science), reducing bias in both STEM education and careers, working to improve the image of STEM in the media, and improving mentoring in STEM fields. Dr. Ward discussed the impact of both explicit and implicit bias at length, providing definitions of the two and explaining that they can occur both independently and interdependently. Dr. Ward shared that Congress had expressed concerns about bias in STEM in response to a Government Accountability Office report on Women in STEM (2015), which found that limitations in the way several federal agencies collect data on funding precluded the GAO from analyzing if there was gender bias in grantmaking. Note that no bias was found in funding and enforcement of Title IX at the NIH, NSF, or USDA. Two Federal agencies (HHS and DoD) were found to be noncompliant in Title IX reviews. She also discussed underrepresentation in the corporate sector. Dr. Ward discussed the importance of mentoring in addressing the Underrepresentation Challenge, in education from elementary through graduate school, as well as in the professional sector. She expressed that mentoring is particularly important during transition points in the career ladder and emphasized the role of mentors/sponsors in advocating for their mentees and helping them attain professional success. She concluded her talk with a discussion of the leadership role of the federal government in addressing bias. To these ends, she shared that an interagency task force has just written a report that identifies and makes policy recommendations to address bias through policy and practice. The recommendations will be made for government-wide use at the federal agency level and have bearing on federally-funded institutions of higher education.

Q & A:

1. What are the employment prospects for the one million additional STEM graduates in a climate where the bulk of job growth are in fields requiring associate's degrees or less education?
    - STEM fields are the primary driver of economic growth and STEM jobs remain unfilled. Technician-level education will also be critical in burgeoning growth fields.
2. How the initiatives mentioned including people with disabilities?
    - The NSF has had a program for persons with disabilities for many years, but that there is not nearly enough attention to this area. The nation at large has not addressed the importance of this untapped and underserved population.
3. Where is pre-kindergarten in these initiatives?
    - It is absolutely included and is an important aspect of presidential priorities, including intellectual stimulation, nutrition, etc.
4. What about attrition in the teaching workforce? Specifically, is there a mechanism in place to keep the 100,000 new teachers in the areas where they are needed most?
    - More needs to be done both in pre-service training and once teachers are in the field. Dr. Ward used the Noyce Fellows program as an example of a program that provides both rewards and infrastructure for teachers in the most underserved areas.

Breakout Sessions
Wednesday, May 11, 2016, 1:30 PM – 2:45 PM

Working with American Indian, Alaskan Native, and Pacific Islander Communities

Facilitator: **Maurice Godfrey, PhD,** *University of Nebraska Medical Center*
Panelists: **Regina Sievert, PhD,** *Salish Kootenai College*
Michelle Shuster, PhD, *New Mexico State University*
Amanda Jones, PhD, *Seattle Children's Research Institute*
Kelly Withy, MD, PhD, *University of Hawai'i at Manoa*
Reporter: **Kim Soper,** *University of Nebraska Medical Center*

Challenges include:

- Geographical isolation and distance
- Food deserts
- Insular and strong community ties
- Poor internet
- Homesickness for students who leave home

- Family responsibilities limit success in college
- Cultural trauma – history of being used as "minority element"
- Differences between native and Western science

Suggestions for partnering and pedagogy strategies:

- Advisory board of tribal members
- Collaborate on every step of plan
- Stress the benefits to the community
- Provide immersion experiences to educate new faculty and staff in cultural differences
- Utilize fine arts-based instruction
- Build strong relationships with students (of vital importance)
- Include families where at all possible
- Find a reliable liaison to community
- Trust and word-of-mouth advertising are important keys for support and building relationships

Participants:

Amber Vogel Morehead Planetarium and Science Center
Donna Cassidy-Hanley Cornell University
Karen Peterman Karen Peterman Consulting Co.
Kim Soper University of Nebraska
Sally Davis University of New Mexico
Heather Rauser Montana State University
Naomi Delalage University of Montana
Michele Shuster New Mexico State University
Amanda Jones Seattle Children's Research Institute
Regina Sievert Salish Kootenai College
Kelly Withy University of Hawaii
Tony Beck National Institutes of Health
Patrice Saab University of Miami

Early STEM Learning: From Birth to 3rd Grade

Facilitator: **Melissa Moritz,** *Deputy Director, U.S. Department of Education*
Panelists: **Barbara Baumstark, PhD,** *Georgia State University*
Georgia Hodges, PhD, *University of Georgia*
Loran Parker, PhD, *Discovery Learning Center, Purdue University*
Reporter: **Sharon Saddler,** *Michigan State University*

The format of the some of the more successful STEM programs developed for children from birth to third grade involves the process of modeling, with a focus on promoting and teaching skills related to curiosity and questioning. The goal is to get the preschoolers engaged in the learning process at the youngest age. The need for critical thinking skills is evident even at these early ages.

The concept of having a "growth mindset" is very important to the progress of the youngest learners. Growth mindset promotes the understanding that intelligence can be developed, and the focus is on improvement (instead of worrying how smart a child is). Studies have shown that with this change in focus, teachers work more closely together, parents are more supportive, and young learners are more enthusiastic. The tests administered by the team have shown that the children retain and implement skills with

greater proficiency the "second time around." Most success occurs when the skills are repeated often and presented as early as possible.

Assessments used for school-aged children are performance-based assessments developed by the teachers. For younger preschoolers, activities and observation are used to assess skills. Many skills are taught using media. One group has even developed an online application that has been successful for their young learners.

Early STEM Participants and Researchers:

Determining appropriate outcomes is not always easy. The science standards are identified by the project's principal investigator (PI) and teachers, and are connected to early reading skills. This means that those who are partnering will be able to contribute most effectively if the collaborations focus on the classroom through visitations to the actual classrooms. This means that bi-directional learning is essential. The teachers are the experts on their students' learning styles. They were equipped to help make adaptations that fit their own classroom environments. The use of outside resources is very important. Some of these resources include the Latin American Association (LAA), Headstart, partnering universities, local media, and non-profit organizations.

Hispanic Learners:

The core concepts are always repeated in Spanish while the children are in large group settings. When the children move to smaller groups, they are taught using their dominant language. The children are asked which language they prefer to use. Sometimes this was a challenge because the content would change during translation. The goal is to use words that are most familiar to them and possibly used in their homes.

It is important to empower parents to be directly involved in their children's educations, and to make learning environments culturally relevant. Plans are being made to have monthly workshops for parents. Lessons are provided for parents to complete the same skills and activities that are being presented to their children. This provides an important opportunity to connect the school with the home and encourage educational conversations at home.

Participants:

Melissa Montz U.S. Department of Education
Karin Chang University of Kansas
Michelle Ventura Georgia State University
Yukari Okamoto University of California, Santa Barbara
Laura Romo University of California, Santa Barbara
Bob Russel National Science Foundation
Jackie Shia Wheeling Jesuit University
Cathrine Sasek National Institute on Drug Abuse
Scott Rawls Temple University
Sharon Saddler Community-Based Organization Partners
Isela Rodriguez-Bussey Georgia State University
Victoria Coats Oregon Museum of Science and Industry
Kathy Hoppe University of Rochester
Rhea Miles East Carolina University
Diana Johns Pacific Science Center
Lorna Gitari-Mugambi Georgia State University
Michael Kennedy Northwestern University
Ann Chester West Virginia University
Linda Moreil University of California, Berkeley
David Petering University of Wisconsin–Milwaukee
Billy Roden Seattle Children's Research Institute
Marisa Bowers City of Hope Beckman Research Institute
Susan Kane City of Hope Beckman Research Institute
Marnie Gelbart Harvard Medical School
Rachel Smilow Children's National
Loretta Brady St. Anselm College

A Tale of Two Programs: Empowering Teachers Through Rigorous Professional Development

Reporter: Maggie Cearley, *University of Kansas Medical Center Milwaukee School of Engineering (MSOE), Center for Biomolecular Modeling (CBM)*

Tim Herman, Milwaukee School of Engineering

The MSOE CBM program Genes, Genomes, and Personalized Medicine provides a summer professional development course that utilizes hands-on materials, introducing teachers to the clinical use of next-generation genome sequencing to improve the lives of families living with previously undiagnosed disorders. The CBM program is unique to STEM teacher professional development because it provides an experience of science research without the physical lab experience. Innovative resources used by CBM teach the flow of genetic information from gene sequence to function/dysfunction in the context of real-life "molecular stories" that can be easily integrated into the classroom curriculum. Teachers receive these innovative materials during a one-week summer course where they are able to collaborate and package the materials to fit the unique needs of their classroom.

The strength of this approach to science teacher professional development lies in the diversity of the types of projects teachers can generate using the resources provided. Through evaluation of teachers as they implement CBM resources, teachers have used the materials as introductory units, end-of-the-year projects, and as thematic hooks throughout the year to introduce many different topics in biology. The MSOE CBM program has even created a category of the Science Olympiad, the Protein Modeling Event, to enhance utilization of their materials and to promote enhanced science learning across the country.

Ultimately, Tim Herman identified an overarching problem in science education today: teachers have students answer questions, but students had never thought ask those questions. By being able to visualize and contextualize protein models, and by supporting teachers to use CBM resources in an inquiry-based fashion, the CBM program sparks student interest in science and basic research.

Margaret Shain-Stieben, American Physiological Society (APS): Frontiers in Physiology

The APS program "Frontiers in Physiology" seeks to develop a model that effectively integrates inquiry, equity, and technology into middle school and high school science classrooms and into professional development programs. To do this, the program builds ongoing working relationships between research scientists and middle and high school teachers. Teachers leave the APS program with increased skills to develop, assess, and utilize web-based curricular inquiry. Thus far, APS has exposed 475 middle and high school teachers in 47 states to their programming.

By using numerous different internal and external evaluations and participant surveys, the Frontiers program has been able to change its course several times based upon the needs of its participants. Originally, the Frontiers program focused its professional development on five key areas:

1. Have teachers experience "Inquiry in Action."
2. Develop dynamic working relationships between teachers and researchers.

3. Support teaching pedagogy through a science teaching forum.
    4. Have teachers create a lesson as a final product of PD that incorporates lessons learned from their experience.
    5. Support teachers in dissemination by having them attend a national scientific meeting.

Recognizing a Changing Education Environment

The first major change to the Frontiers program came in 2000. At this time, standards-based teaching in the classroom became the norm, and teachers began to have less time and flexibility to create unique lessons in their classroom. Frontiers then pivoted to use a different "recipe" for their professional development, and implemented the use of Six Star Science for student-centered learning. This new framework emphasized:

1. Student-centered learning and inquiry
2. Addressing diversity in the classroom (i.e. culture, relevance, learning styles)
3. Integrating technology
4. Using authentic assessments for content, peer evaluation, and process skills
5. Incorporating accurate, timely content information into lessons
6. Reflecting on teaching and learning

This paradigm shift allowed teachers to infuse their original creativity with the changing reality of standards-based teaching. Moreover, rather than generating whole units, teachers left with a "cookbook lab" and the skills to transform future labs in their classroom.

Additionally, Frontiers added a new fellowship and programs to enhance and expand their professional development reach. They utilized master teachers as Teacher Mentors, who instructed and modeled during the summer science teaching forum, provided resources to expand the use of web based technology, and acted as sounding boards to provide feedback to teachers developing their cookbook lessons. Coupled together, they expanded the number of research hosts which allowed successful teachers to join the Physiologists-in-Residence Fellowship for a more in-depth summer lab experience. They created the Frontiers Alumni Network and Local Outreach Teams (LOTs) to further disseminate skills gained by Frontiers professional development. Specifically, LOTs helped create lessons and host workshops in their area, creating a "train the trainer" model to expand the Frontiers impact. Lastly, a PhUn Week (Physiology Understanding) was used to promote Physiology.

The second major adjustment by Frontiers came out of the need to save time and money. Additionally, some teachers were located in regions that did not have research labs available to partner with for their immersive lab experience. The program transitioned from live professional development to a completely online program using Blackboard. This virtual space served as a flipped classroom to build content knowledge. It maintained teacher collaboration through many group discussions, collaborative projects, and written reflections. Because professional development was online, Frontiers was able to handle a larger number of teachers and support more back and forth conversations. Evaluating the difference between the two models, APS measured a greater number of shared ideas, resources, and practices using its new online space.

Lessons Learned and Tips for Online Professional Development

Evaluation and feedback are key to improving professional development. Recognizing the challenges of engagement and discussion in a virtual environment, APS suggests that there should be greater instructor involvement to keep discussion going, similar to a live session, but spaced out over longer periods of time. One should also assign discussion leaders from each working group of teachers to increase participant accountability. Additionally, APS found that having professional development first online, one can use additional resources to identify which participants would be best suited to a more in-depth summer research lab experience.

When planning an online professional development platform, make sure to:

- Use a basic framework with a physical toolkit with a primary organizer for simplicity and efficiency in support and feedback.
- Build your course using links to save valuable time.
- Use rubrics and a curriculum outline whenever possible.
- Use a limited number of options and formats in Blackboard.
- Print ALL work before you shut the course down.
- Use video clips and other materials that build background knowledge to create a flipped classroom.
- Always have a human contact to support teachers, and clearly establish when this person will be available.

Strategies for Validating Evaluation Instruments

Facilitator: **Kristin Bass,** *Rockman Et Al*
Presenters: **Dina Drits-Esser, PhD,** *Genetic Science Learning Center, University of Utah*
Ralph Imondi, PhD, *Coastal Marine Biolabs*
Linda Santschi, PhD, *Coastal Marine Biolabs*
Reporter: **Alana Newell,** *Baylor College of Medicine*

- This are four parts in the general assessment process:
  - Construct identification
  - Item selection, creation, adaptation
  - Scoring system creation
  - Item review and validation
- Validity – are you measuring what you think you're measuring? How do you support your claims of validity?
- A test can be valid for one purpose, but not another. It's a characteristic of the test use (interpretation and context), NOT a characteristic of the instrument.
- What constitutes evidence?
- Content – does it accurately convey the domain? Are the levels within the ideas okay?
- Usually done with expert review (curriculum developers, teachers, etc.), this feedback looks at accuracy and coverage
- Response process – to what extent do the items elicit content?
- Understanding where comprehension issues lie
- Strategies – cognitive interviews (sit with individual students and talk through items), whole-group pilot (look at difficulty, other psychometrics)
- Internal structure – how do the items relate to one another?
- Relationships with other variables – how well do your items relate to other measures of the same construct?
- Consequences – what is the effect of test scores on positive or negative social outcomes?
- We looked at a test from Neurolab Project.
- This was a residential research experience for 11-12th grade students, spans many scientific areas, used collaborative activities.
- The test construct that we looked at was dimensions of collaboration (behavioral, emotional, intellectual).
- This was a self-report at the end of the program.
- We looked at different items for evidence of validity (content, response process) – discussed with small and large group.

Evaluating Outcomes in Informal Learning Environments

Presenters: Camellia Sanford, PhD, *Rockman et al*
Sasha Palmquist, PhD, *Palmquist & Associates*
Reporter: Ashley Roseno, *East Carolina University*

This session began with an informational presentation and ended with group discussions regarding personal goals. The initial presentation began with an overview of informal learning environments, types of evaluation (including front-end, formative, and summative), and outcomes.

1. The presenters discussed outcomes in detail, indicating they must be observable and measurable, should reflect benefits or expected change for participants, and could be categorized as short-term, intermediate, or long-term. Most importantly, the presenters stated that good outcomes should be clearly stated, have specific content, be realistic, measurable, and meaningful.
2. The presenters then moved on to discuss the importance of rigorous evaluation:
    - Rigor doesn't mean specific methods must be utilized.
    - "Don't put the cart before the horse." You should always determine your research questions before outlining your methods. This is essential to ensuring your methods are appropriate and will evaluate intended outcomes.
    - Creating a clear evaluation plan will allow you to avoid data overload and any surprises. You should also map out why the chosen methods are being utilized.
    - Evaluation questions should be evaluative, pertinent, reasonable, specific, and measurable.

The final portion of the session included a handout where individuals filled in a workshop and outlined three outcomes/questions and proposed appropriate methods to evaluate those outcomes. Individuals were encouraged to think about their learning outcomes broadly. Once everyone was given time to work through their outcomes, everyone convened in groups of two to discuss their ideas.

Participants:

Nicole Kowrah Museum of Science and Industry
Charles Carlson Exploratorium
Martin Weiss New York Hall of Science
Val Davillier Great Lakes Science Center
Patrick Ward Museum of Science and Industry
Laura Tenenbaum Walter Reed Army Institute of Research
Beth Tuck National Institutes of Health
Gale Seiler Iowa State University
Patty McNamara Independent Educator
Kim Obbink Montana State University
Katherine R Bruna Iowa State University
Julie Yu Exploratorium
Kelly LaRue The Jackson Laboratory
Toby Citrin University of Michigan
Renee Bayer Michigan State University
Tiffany Nuessle Denver Museum of Nature and Science

Opportunities and Challenges in Crafting a Fundable Science Education Grant Program That You Want to Pursue

Facilitator: **J. Michael Wyss, PhD,** *University of Alabama at Birmingham*
Panelists: **Jonathan A. Arias, PhD,** *Center for Scientific Review, NIH*
Dina G. Markowitz, PhD, *Life Sciences Learning Center, University of Rochester*
Nancy Moreno PhD, *Center for Educational Outreach, Baylor College of Medicine*
Reporter: **Michael Wyss, PhD,** *University of Alabama at Birmingham*

During this session, The facilitator and panelists discussed their top 12 questions related to writing successful grant applications.

Tips:

1. Identifying an original and compelling research area you wish to pursue
2. Being realistic in the proposed scope of work
3. Reviewing successful grant applications from others
4. Making the application easy for the reviewer to read
5. Writing the application for someone who is interested but not an expert in the area
6. Giving reviewers language they can use in their assessment of the application
7. Making assessment an important aspect in the application development
8. Using appendices wisely
9. Ensuring that the budget is justified appropriately
10. Making sure that letters from collaborators and participant organizations contain firm and meaningful commitments
11. Involving stakeholders (teachers, community personnel, parents, etc.) in planning and implementation
12. Getting input from K-12 education leaders so that you do not re-invent the wheel

A lively discussion ensued querying the panel on various aspects of grant submission and collaborations therein.

Participants:

Dina Markowitz University of Rochester
Kristi Straus University of Washington
Eric Chudler University of Washington
Ashlyn Sparrow University of Chicago
Robin L. Cooper University of Kentucky
Alex Turbyfield University of Georgia
Ella Greene-Moton University of Michigan
Patricia Slattum Virginia Commonwealth University
Matthew Finman Tufts University
Sue Kirk Virginia Commonwealth University
Ginger Cross Mississippi State University
Tony Ward University of Montana
Liz Kong Museum of Science Boston
Jenny Williamson University of Washington
Heather Kleiner Sci-Port Discovery Center Shreveport
Lisa Marriot Oregon Health and Science University

Joan Griswold University of Washington
Ken McMartin LSU Health Science Center Shreveport
Nicole Garneau Denver Museum of Nature and Science
Joe Polman University of Colorado
Susan Rauchwerk Lesley University
Theresa Freeman Thomas Jefferson University
Kathryn Peters University of New Mexico

Liz McMillan Sanford Research
Amy O'Doherty Museum of Science
Loretta Brady St. Anselm College
Louisa Stark University of Utah
Maria Isabel Leeder Frost Science Center
Danielle C. Alcena University of Rochester

Wednesday, May 11, 2016, 3:00 PM – 4:15 PM

Strategies for Increasing Diversity in the NIH SciEd Workforce

Facilitator: Susan A. Deriemer, PhD, *Meharry Medical College*
Reporter: Maggie Cearley, *University of Kansas Medical Center*

As members of the SciEd workforce, we are tasked with growing the next generation of scientists. But to plant the seeds necessary to grow our workforce, we must improve the soil, so-to-speak, in which students grow. We must look inward at ourselves first to address the foundational issue of diversity in the SciEd staff in order to address diversity in the workforce we are trying to create.

Define Diversity, Reflect and Identify Personal Barriers

The first step in increasing diversity in the NIH SciEd Workforce is to understand what diversity encompasses. Specifically, diversity goes beyond race and ethnicity, and should include disability, socio-economic status, environment (social-cultural, educational), rural/urban, background knowledge, skills, gender, gender identity, etc. Once this mosaic of diverse parameters is established, the next step is to understand how to track these targets. Is there a way to make visible the breadth of diversity?

The next step is to reflect on your own experiences with diversity and the barriers that exist. Through this reflection, SciEd professionals have uncovered barriers to entering jobs, including issues of tenure, maternity, and family obligations. Some individuals sensed a general lack of interest in giving back or investing in their own community, as well as the fact that many people seek to leave their original communities. Moreover, some individuals may self-select out of the type of work SciEd undertakes because of cultural differences between staff and themselves. On the other hand, positive experiences where flexibility was given, maternity needs were met, and relationships were built that instilled collaboration across differences and connections to the community all contributed to the promotion of creating and maintaining diverse SciEd work environments.

Identification of Best Practices

By outlining what diversity truly entails and identifying your experiences with it, you are then able to identify the best practices used in building diversity within the workplace. This process allowed SciEd professionals to outline the five best practices for increasing diversity:

1. Create ways for people to connect: Create a community that provides opportunities for networking, mentoring, and socializing. Additionally, you should demonstrate that people like themselves are not only finding success within the company but are willing to help them succeed as well.
2. Make diversity a part of your core values: Show that you care by promoting volunteerism among employees and providing sponsored initiatives to raise funds and awareness for different causes. Invest in diversity by offering internships and scholarships to people from underrepresented groups.
3. Look beyond compliance: Make sure you are not just filling quotas/complying with affirmative action. Actively build a workforce that's as diverse as those you serve. Reflect by asking yourself, is this recruitment sincere? Are you asking more of an individual so that you have your token member on your

diversity council? You can mitigate this by creating incentives for staying, such as creating a nurturing environment that values their contributions and differences. Be genuine in your approach, grow the staff that you have, and avoid negative thought processes such as "if I hire X then it takes it away from Y."

4. Identify new talent pools: Think outside the box to recruit new employees. Use recruitment tools that are used by those in the community, such as advertising in the federal work study program.
5. Address diversity in every aspect of talent management: Diversity and inclusion need to extend beyond HR and be considered in every phase of talent management: recruiting, professional development, leadership training, performance management, feedback/measurement, and workforce planning. Specifically, in the hiring process, you can also reflect on the knowledge, skills, and attitudes you are looking for in staff. Ask, how can minorities (across all spectrums of diversity) make themselves more competitive and demonstrate these qualities you are looking for? Are talented people being pre-screened out by specific questions or qualifications in our job description or hiring process?

Reflection and Identification of Barriers in the SciEd Community

So, what does it look like when we use this process to reflect the diversity of SciEd workforce itself? What can the SciEd community do to increase diversity? To answer this, it is helpful to take a closer look at the SEPA PAR. Doing so, you notice that the word "diversity" is only mentioned 13 times: once in the program objectives, once in reporting, and the rest of the instances are found in the section "Diversity Recruitment and Retention Plan." Reading the program objective itself highlights an emphasis on working in diverse communities, but has no emphasis on the diversity of the individuals creating and implementing interventions. That program objective states:

"SEPA supports diversity in the workforce by providing opportunities for students from underserved communities to consider careers in basic or clinical research, provides teachers with professional development in science content and teaching skills and improves community health literacy through its science centers and museum exhibits."

Notice that the mission of SEPA itself speaks to "opportunities for students from the underserved community to consider careers in basic or clinical research" – it does not, however, address the overall ability to integrate this same diversity in our SciEd workforce. Moreover, even if a statement of this nature was included, the presence or lack of a solid plan to address diversity is not given as much weight in determining the relevance and strength of a proposal.

Strategies to Increase SciEd Diversity – What Now?

SEPA Administrative Actions

First, we could start by explicitly asking for plans for increasing diversity in SEPA staff in the SEPA PAR. Then, with this new language, reviewers of applications can reweight the significance of this request, ensuring that considering diversity in the research team itself is a core part of the proposal and essential to their acceptance. One of the primary goals of SEPA should be to have a picture of diversity within our ranks. Think – if this meeting was open and attendance funded for all staff, would the demographics and diversity of attendees look different? We can have a space in the evaluation of the SEPA grant for PIs to

share best practices in diversity and inclusion, and build off one another's successes. We can even share these suggestions at the next SciEd program manager meeting to ensure action is taken to increase diversity!

We can close the gap between the students we serve and the researchers who serve them. One way to do this is to create a program akin to the already existing post bachelor's program for the medical field, where students can develop the knowledge and skills necessary for research in the SciEd community. Additionally, we could provide training grants for individuals to get their foot in the door and attract them to the research field. By focusing on trainees, we could grow the next generation of SEPA PIs. Administratively, programs that bridge this gap can be prioritized in future SEPA proposal reviews.

SEPA Partnerships

Even if the immediate core research team is fairly homogenous and/or not indicative of the community, the mindset and procedures used for reaching out to the community may be able to reflect the demographics of the people they serve. SEPA is, after all, a partnership award, and could therefore use partnerships to expand the diversity of the SciEd talent pool. For example:

- You can plan to use community-based participatory research (CBPR) techniques to equitably involve community members, organizational representatives, and researchers in all aspects of the research process, thereby sharing ownership and expanding the diversity of thought involved in the research process.
- You can define the role of a specific researcher to be a community liaison with the designated purpose of developing community partnerships, synergistically expanding the diversity of your network.
- You can partner for the recruitment process. To do so, you must first recognize your own implicit biases (i.e. leadership positions associated with males). Recognize that informal networks are segregated, and have a plan to reach beyond who you know. Seek out the people who have knowledge about underrepresented individuals' talents on your campus or in your community, and utilize them as a resource in your hiring process. These people may be counselors, social workers, or public health workers. It is through these connections and validations that we will be able to lower the barriers to entry for people who may not have otherwise entered the SciEd workforce.

You can train and retain diversity by teaming up with other departments that already have processes in place for increasing diversity. This shares and leverages best practices of others through partnerships. As this relationship grows (ideally as a part of a proposal's diversity plan and process evaluation), SEPA researchers can identify the nuance of differences of programs (dosage, context, time) to establish what works and how it can be replicated in future proposals with success.

Participants:

Maggie Cearly University of Kansas Medical Center
Toby Citrin University of Michigan School of Public Health
Isela Rodriguez-Bussey Georgia State University
Melani Duffrin East Carolina University
Patricia Slattum Virginia Commonwealth University

The Evolving Field of Citizen Science in the SEPA Network

Facilitators: **Tony Ward, PhD,** *University of Montana*
Jennifer Couch, PhD, *Chief, Structural Biology & Molecular Applications Branch, National Cancer Institute, NIH*
Panelists: **Rayelynn Connole,** *Montana Tech*
Katrina Theisz, MS, *National Cancer Institute, Coordinator of the NIH Citizen Science Working group*
Reporter: **Naomi Delaloye,** *University of Montana*

This session began with short presentations from each of the panelists, as well as from the facilitator. Below is a summary of key points and resources shared during each presentation.

Rayelynn Connole, Director of the Clark Fork Watershed Education Program (CFWEP) and BRIC (a SEPA program) in Butte, MT

- CFWEP engages 8,000 students a year and focuses on cleaning up the Clark Fork watershed in the Butte area (which became a superfund site due to tailings from mining).
- Large problems like the superfund site need a wide variety of people participating in the solutions. The program goal is to have informed, active, scientifically literate citizenry, including students and teachers, collecting watershed data.
- Why employ citizen science?
- To keep people informed
- Inspire care for the environment
- Help people participate in public decision-making
- Human health and well-being are intimately tied to ecosystem health

Katrina Theisz, from the NIH Citizen Science Working Group, a trans-NIH grassroots organization that started working with other federal agencies in 2013

- Useful resources:
- *www.citizenscience.gov*
- Biomedical Citizen Science Hub, an online collaboration space for biomedical citizen science resources and data: citscibio.org
- Key points:
- Citizen science complements traditional research, it does not replace it
- Citizen science in Biomedical research guiding principles:
- Biomedical research can benefit from the creativity and problem-solving skills of the public and from citizen-collected data and insights not obtainable through conventional approaches
- Biomedical research poses unique challenges for citizen science
- Citizens are eager and able to solve problems if given the right tools

- Patients and healthy individuals are motivated to collect and share personal health data
- These methods have the potential to complement existing research opportunities
- Model SEPA citizen science project: Barcode Long Island

Tony Ward, Clean Air and Healthy Homes Program (CAHHP) at the University of Montana

- CAHHP has students researching air pollutants (radon, CO, and particulate matter) in rural areas of Montana, Idaho, and Alaska.
- Future goals to have students doing personal monitoring, collecting, and uploading of data to be used by local agencies.

Following the individual presentations was a broader discussion involving the attendees of the session. Main discussions focused on how to get students collecting data that is up to data standards and to get it used, especially considering equipment limitations. This led to a discussion on how to ensure data is linked to meaningful questions and experiences and not just a systematic cataloging of data. Also, the definition of citizen science was discussed, which highlighted that in order for citizen science to be citizen science, it much lead to new, publishable knowledge. A member of the audience from the NSF gave the advice that programs should check sites and see what's already going on and contribute all together, rather than re-invent the wheel each time.

Participants:

Naomi Delaloye University of Montana
Nicole Garneau Denver Museum of Nature and Science
Mary Kay Hickey Cornell University
Joe Polman University of Colorado Boulder
Robin L. Cooper University of Kentucky
Patty McNamara Independent Evaluator
Tiffany Nuessle Denver Museum of Nature and Science
Camellia Sanford Rockman et. al
Marisa Pedulla Montana Tech
Carol Baslom-Slack Tufts Med
Ellen McCallie Natural Science Foundation
Christi Buffington University of Montana
Ralph Imondi Coastal Marine Biolabs
Donna Cassidy Hanley Cornell University
Lorna Gitari-Mugambi Georgia State University, Bio-Bus
Kira Hughes University of Hawaii
Susan Kane City of Hope Beckman Research Institute
Marisa Bowers City of Hope Beckman Research Institute
Alexandra Race City of Hope Beckman Research Institute
Janet Dubinsky University of Minnesota
Tony Beck National Institutes of Health
Sharon Pepenella Cold Spring Harbor Laboratory, DNA Learning Center
Susan Hershberger Center for Chemistry Education Miami University

Curiosity Video Productions and curiosityforall.org

Facilitator: Peter Crown, PhD, ***University of Arizona***
Presenter: Marlys Witte, MD, ***University of Arizona***
Reporter: Peter Crown, PhD, ***University of Arizona***

The topic of curiosity has become mainstream in the past year and has been the subject of numerous books and articles, e.g. "A Curious Mind," by Ian Grazer, and "Curious," by Ian Leslie. Participants shared what words came to mind when they heard the word "curious." While it can have negative connotations, as in "curiosity killed the cat" (a Google search of "curiosity" images produced lots of killed cat cartoons!), the Garden of Eden story, and Pandora's box, there was wide agreement that curiosity is a positive, driving force in learning and in research. As kids grow older, they lose the inclination to ask questions in class, perhaps because burdensome demands placed on teachers make it difficult to accommodate them. Medical students notoriously resist expressing their curiosity. They want to feel and appear that they know everything and prefer not to show their ignorance. One way of fostering curiosity is to reward students for asking questions, e.g. add points to their grades. The six-minute video "Curiosity For All" which shares how curiosity fuels scientific research, presented by top bio-medical researchers including a Nobel Laureate, was shown and made available for use by all at *http://curiosityforall.org/*

Participants:

Alex Turbyfield University of Goergia
Margery Anderson Walter Reed Army Institute of Research
Sharon Saddler Community-Based Organization Partners
Chuck Wood Wheeling Jesuit University
Jackie Shia Wheeling Jesuit University
Diana Johns Pacific Science Center
John Pollock Duquesne University
Loretta Brady St. Anselm College
Val Davillier Great Lakes Science Center
Yukari Okamoto University of California, Santa Barbara
Ben Koo University of California, San Francisco
Kelly Roden Seattle Children's Research Institute
Laura Romo University of California, Santa Barbara
Rob Rockford University of Mississippi Medical Center
Marnie Gelbart Personal Genetics Education Project, Harvard Medical Center
Beth Tuck National Institutes of Health
Heather Kleiner Sci-Port Discovery Center Shreveport
Barbara Baumstark Georgia State University
Renee Baylor Michigan State University

Planning Effective Standards-Aligned Professional Development for K-12 Teachers

Presenter: **Katie Busch, EdS,** *University of Alabama at Birmingham Center for Community Outreach Development*
Reporter: **Amy J. Hawkins, PhD,** *University of Utah*

While it's difficult to show that teacher professional development programs (PD) are effective in a long-term, meaningful way, the speaker shared planning strategies and an inexpensive, highly-rated classroom activity designed for inquiry-based learning.

Audience: The characteristics of adult learners (such as teachers) include being autonomous, self-directed, and knowing the goals of the learning ahead of time. They want information to have a practical application, and they want their own background to be valued – they understand themselves as less of a blank slate than younger learners. The level of audiences at the Birmingham Center for Community Outreach Development is quite variable: teachers of younger children often lack confidence in their science knowledge and are more interested in science connecting to other subjects in a comprehensive way. In contrast, high school teachers feel as if they need to express confidence in content and don't want to reveal any gaps in content knowledge. Middle school teachers might be the group that's most receptive toward PD—they are the audience that most often seeks help in how to structure inquiry into their lessons.

Recruiting: In building relationships, show new audiences examples of teachers/programs who have already participated and benefitted to build trust. Be absolutely upfront about what you need in the partnership from the beginning. Be cognizant of hidden costs – for example, that asking a district office to spend time compiling student test scores actually is a cost to the district in terms of labor. Find out what the protocol is for any given district: to collect data on PD, you might need permission from a principal or school district. Know test dates.

Workshop duration: Potentially schedule redundant sessions so half of the participants can come on one day, half the other day. Multiple-week or periodic training with follow-up is the only proven method by studies.

Incentives: This program's funding covers substitute teachers, but (as a stipulation of their district) can't pay teachers for PD unless it's over the summer, via electronics and/or other materials, or for PD or college credit. Even just having an hour to eat out is a privilege that lots of teachers don't have and appreciate.

Evaluation: Has anyone evaluated student content knowledge as a measure of teacher professional development? Teachers are really nervous about this because they are afraid that their administrators are going to get the results.

Good audience question: Is there a good self-sustaining model for PD? Answer: In some states there's line-item funding from the state legislature; others look to biotech industry to help promote a scientifically-literate workforce.

Portal to the Public: Excellent program to train scientists to speak to the public about their science in

informal settings. *http://popnet.pacificsciencecenter.org*

Blue Sphere exercise: Have students investigate the properties of sodium polyacrylate (an inexpensive product kept in the floral area of craft stores). Give each student one sphere for inquiry-based learning to discover everything about it: size, weight, volume, bends light. What do you think happens if you put it in water? Does it change color, float sink, absorb water, etc.? Students form hypotheses, manipulate conditions for the sphere, and then they aren't allowed to touch it for a day. Measure changes in water volume, etc. Using clear spheres, test if a sphere can absorb food coloring. It can, and then students can test if the food coloring can exit the sphere. Use this exercise as an introduction to concentration gradients. Can we get water to come back out of a sphere? Leave it in the sun. Can we get the water to come out of the sphere while it's still in water? Use this as an opportunity to learn about salt and those kinds of concentration gradients.

Evaluation Strategies that Support Longitudinal Tracking of Anonymous Participants

Presenters: **Amanda Jones,** *Seattle Children's Research Institute (SCRI)*
Lisa Marriott, *Oregon Health Sciences University (OHSU)*
Ann Chester, *West Virginia Health Sciences and Technology Academy (HSTA)*
Reporter: **Joan Griswold,** *University of Washington*

Amanda Jones, Seattle Children's Research Institute (SCRI)

Their SEPA project has created two units for the mobile lab, and two activities for families of students from ten target schools (all Title I eligible, with diverse student body). Family activities are Family Science Night and Family Field Trips to the research institute.

Assessment: Cohorts start in grade 4 with baseline assessment of content knowledge and interest in science and STEM careers (modified STAQ-R), and track outcomes through middle school. Assessment repeated in grades 5, 6, and 7.

Students use school's or SCRI's computers for pre/post assessments. Students use clickers for data collection on the bus and in the classroom. Clickers are numbered and color-coded to stations. Each color has an element name too. Students don't have to memorize the number.

Student Coding Sheet: Unites all student data. Teachers complete data sheets by adding 10-digit state ID number to student name and keep these until all activities are completed. Sheets are then sent to the evaluator. The 10-digit state ID number allows students to be tracked as long as they remain in the state.

Lisa Marriott, Oregon Health Sciences University (OHSU)

Let's Get Healthy is an education and research exhibit used in schools and public venues. Participants wear barcoded bracelets that link their anonymous data from each station, and automatically add it to the database at OHSU for use by schools, researchers, and communities. This allows for tailored feedback, automatic data entry, longitudinal follow-up, evaluation, and pre/post testing.

Assessment: A pre-survey given two weeks before the fair, and a post-survey given two weeks after, and a follow-up survey at the end of the year. The control group receives no fair but is put on the schedule for a future fair.

They have learned much through the iterative process of creating student ID numbers using numbers and letters, i.e. month of birth + first two letters of mother's name + last two digits of home phone number (trouble with twins/ triplets). Then used all of the above + birth order (if multiple) + student ID number from school (or can leave it blank). Using deterministic matching, got about 41% matched pre/post using five to nine variables. Tried probabilistic matching procedure (weighted variations), but that didn't work as well.

Now: They use a "Golden Ticket" that simply links wristband number to student ID number. They are now

able to track students through grade 12 if they stay in the state.

Wrist band – cost $0.75 each, bar code reader costs about $170 new, plus cost of sticker.

Ann Chester, West Virginia Health Sciences and Technology Academy (HSTA)

HSTA is a rural, statewide program that uses local volunteers and hired staff to oversee it. Students go grades 9-12. Tuition fee waiver if students are successful (covers 65-80% of tuition cost). Program focuses on both cognitive and non-cognitive factors.

Program/Assessment: At summer camp, students are screened for height, weight, BMI, HB1C, blood pressure, goals, community association, and given Quality of Life assessments. (Students assented/consented prior to camp). YOU are your first patient. After screening, students learn SMART goals and choose intervention. Set up in clustered, private Facebook social groups. Encouraged to post as much as possible about how they're doing. Students who returned had dropped BMI and increased good cholesterol.

Teachers report on which lessons they use, when kids were absent, how much exposure.

Control: Three entire schools complete just psycho-social metrics and provide school ID, but don't receive the intervention (but incentives to school are provided).

To follow students: In past, have used Facebook, Instagram, grandparents, friends, and schools to track students. Make tuition and fee waivers dependent on updated contact information. Lose very small number of kids over time (100/2200). Now they use bracelets with bar codes and state ID numbers to track students.

Many challenges associated with longitudinal projects, including tracking/finding students, database failures, use of paper-based data, staff turnover, data not backed up, computer death, missing entries.

Take home messages from session:

Use of state student ID numbers is key. Make sure to get IRB approval, and get school buy-in (ask principals) before approaching students/parents. Has a letter been prepared?

Evaluation: Importance of good evaluator. Can search for STEM evaluators through the ITEST Stellar site or the AEA STEM network. Dissemination and Implementation Research methods: Often used now for biomedical research (e.g. for cancer) but may be applied to SEPA projects assessing differences in attitudes and behavior.

Tools mentioned by presenters in this session:

"Remark" software for paper-based surveys (for Word docs). Upload to Remark, they PDF them and put data in the database directly from student paper sheet. $1200 software. Still need to do data entry for text fields.

Cam scanner – will it turn handwriting into text?

Beyond Twelve – program that connects state ID with college outcomes of kids.

Box.com – encrypted version of DropBox. The cost associated with it?

Recap and Qualtrix – Survey Monkey options

Google docs – forms

Linked In and Research Gate – good for finding program graduates in later years.

Participants:

Amanda Jones Seattle Children's Research Institute
Kristin Bass Rockman et al
Dina Drits-Esser University of Utah
Joan Griswold University of Washington
Laura Tenenbaum Walter Reed Army Institute of Research
Dimitri Blondel Duke University Medical Center
Liz McMillan Sanford Research
Anne Westbrook Biological Sciences Curriculum Study
Karen Peterman Karen Peterman Consulting Co.
Alana Newell Baylor College of Medicine
Douglass Coleman Duke Med BOOST!
Alexandra Valladares Duke Med BOOST!
Alberto Guzman-Alvarez University of California, Davis
Ashley Roseno East Carolina University
Preeti Gupta American Museum of Natural History
Mary Jo Koroly University of Florida
Maureen Munn University of Washington
Shannon Weiss Oregon Museum of Science and Industry
Marsha Matyas American Physiological Society
Ella Greene-Moton University of Michigan
Amber Vogel Morehead Planetarium and Science Center
Kathryn Peters University of New Mexico
Lisa Marriot Oregon Health Science University
Ann Chester West Virginia University

Overview of National Science Foundation STEM Education Research Funding

Presenter: Robert L. Russell, PhD, ***Program Officer, National Science Foundation***
Reporter: Charles Carlson, ***Senior Scientist Emeritus, Exploratorium***

Robert L. (Bob) Russell, a senior program officer at the National Science Foundation, provided an engaging presentation and narration through the process of applying for NSF informal education funding. Bob's presentation used a PowerPoint that will be online and available for reference and use. He started out by taking questions from the audience and continued them throughout his presentation. Here's a summary of his responses to some of the audience questions:

- NSF and NIH are both interested in promoting improved STEM education and have programmatic relevancies.
- NSF primarily focuses on basic research in the sciences and informal learning.
- NSF is interested in cyber learning and its uses in simulation development and other cutting edge learning experiments.
- NSF will fund biology education and biology as related to health, particularly if it is associated with implementing the Next Generation Science Standards (NGSS).

- There are six grant programs under the Directorate for Education and Human Resources (EHR). *https://www.nsf.gov/div/index.jsp?org=DRL*
- Call an NSF program officer for guidance as to which program might be most appropriate for your project.

How do grant applications fair in the current funding environment? About 10% get funded, 30% are triaged out of the evaluation review process, 20% get low ratings, and the remaining 40% go unfunded because of their non-competitive scores. Persistence and resubmission can and do result in some proposals getting funded. It is important to address the specific proposal deficiencies as noted by reviewers.

Some key points to address in drafting a proposal:

- Can the proposer do the proposed project?
- How will the team work together?
- Are there any relevant projects that provide evidence for the potential success of the proposed project?
- Make sure the most important aspects of the proposed project receive the most attention and space.
- An IRB will be required if funding looks likely (this is different than NIH requirements).
- Present a mechanism for the creation of project deliverables and a delivery method.
- Include an external review and evaluation plan.
- Senior staff is limited to two months of time per year.
- Indirect rates are calculated and negotiated, making them different from those of NIH.
- If you are planning to resubmit a proposal, talk to your program officer.

In review, there are many similarities between NSF and NIH funding for biology and bio-medical oriented programs. NSF takes a more basic biology orientation and includes funding outside of the areas of bio-medical science. If you're considering applying to NIH SEPA, it may be worthwhile to consider parallel track funding through NSF DRL, but be aware that the applications and requirements are not identical.

Participants:

Charles Carlson Exploratorium
Eric Chudler University of Washington
Nancy Moreno Baylor College of Medicine
Kim Zeidler-Watters University of Kentucky
Charles Wray The Jackson Laboratory
Linda Morell University of California, Berkeley
Amy O'Doherty Museum of Science
Elizabeth Kong Museum of Science Boston
Maria Isabel Leeder Frost Science Center
Kristi Straus University of Washington
Karina Meiri Tufts University
Kelley Withy University of Hawaii
Patrice Saab University of Miami
Heather Hanna Mississippi State University
Nicole Weber Lesley University
Ashlyn Sparrow University of Chicago
Karin Chang University of Kansas
Nicole Kowrach Museum of Science and Industry, Chicago
Lisa Abrams Virginia Commonwealth University
Matthew Fierman Tufts University
Patricia Ward Chicago Museum of Science and Industry
Scott Rawk Temple University
Dina Markowitz University of Rochester
Danielle Alcena University of Rochester

Rhea Miles East Carolina University

Diane Munzemaier Milwaukee School of Engineering

Susan Rauchwerk Lesley University

Heather Rausen Montana State University

Loran Parker Purdue University

Maria Isabel Leeder Frost Science

Tim Herman Milwaukee School of Engineering

Kim Soper University of Nebraska Medical Center

Maurice Godfrey University of Nebraska

Andrij Holian University Montana

Louisa Stark University of Utah

Jamie Bell Center for the Advancement of Informal Science Education

Breakout Sessions
Thursday, May 12, 2016, 8:30 AM – 9:45 AM

Diversity, Disadvantage, and the Biomedical Workforce of the Future

Facilitator: **Marlys Hearst Witte, PhD,** *University of Arizona*
Reporter: **Peter Crown, PhD,** *University of Arizona*

The nature of and connections between diversity and "disadvantage" in K-12 and higher education is at the forefront of national discussion and remedial efforts. This session began with the screening of the video "Diversity in the Biomedical Career Pipeline," which featured comments by diverse and disadvantaged student participants in the SEPA program at the University of Arizona College of Medicine. The ensuing discussion addressed the very definitions of disadvantage diversity, noting that the "life stories" one can tell about experiences can add a great deal of clarification and insight into the nature of being so categorized. The role played by faculty in recruitment is on the one hand key, but on the other hand can introduce a selection bias favoring students who already are high achievers. It was suggested that more than one person be involved in such selection situations.

Why Are We the Way We Are? Supporting Middle School Students in Three-Dimensional Learning to Make Sense of Gene and Environment Interactions

Presenters: **Deborah Peek-Brown, MA,** *CREATE for STEM Institute, Michigan State University*
Renee Bayer, MHSA, *CREATE for STEM Institute, Michigan State University*
Reporter: **Sharon Saddler,** *Michigan State University*

CREATE for STEM has created a new genomic framework for schools and communities. Aligning with the Next Generation Science Standards (NGSS), the curriculum allows students to engage in a three-dimensional learning process while using project-based science. Students learn how genetic and environmental factors affect their risk for diseases. In this case, the project focused on type 2 diabetes. The three-dimensional learning process is 1) organized around disciplinary core ideas (DCIs); 2) central to the role of science and engineering practices (SEPs); and 3) uses crosscutting concepts (CCCs). The video introducing the young case study patient with type 2 diabetes, Monique, and the opportunity to create a diagnostic board with "driving questions," allowed all participants to experience some of the learning technologies and "scaffolds" created for the actual students. The next steps lead to the creation of a scientific model. "Models explain or predict how and why phenomena happen."

The "driving questions" are examined through the use of the model activities that provide "authentic, situated inquiry to understand why the phenomena occur." In this case, the focus was on the genetic factors for diabetes found in the parents of Monique and examination of how these genetic factors affected their offspring. Next, environmental factors were investigated and added to the model. Use of learning technologies and other scaffolds are important to promote understanding of difficult concepts. A computer simulation of lab rats was used to analyze and interpret the data about how both genetic and environmental factors affect variations in health and, specifically, type 2 diabetes.

NGSS – Next Generation Science Standards and the three-dimensional learning process applied:

- Dimension 1 – Disciplinary Core Ideas
- Life Science 1 – Molecules to Organisms
- Life Science 3 – Heredity: Inheritance and Variation of Traits
- Life Science 4 – Biological Evolution: Unity and Diversity
- Dimension 2 – Crosscutting Concepts – Some ideas that cut across all science disciplines:
- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and models
- Stability and change
- Dimension 3 – Science and Engineering Practices – Multiple ways of knowing and doing used to study the natural and designed world:
- Asking questions
- Developing models
- Investigations
- Analyzing and interpreting data
- Developing explanations and solutions and arguing evidence
- Obtaining, evaluating, and communicating information

A curriculum has been developed for middle school students using the elements presented above. The students completed a model based on the "Monique" case study, with mentorship provided by graduate students and professionals in the field. Coordinated community and school activities were completed to provide formal and informal learning opportunities. Resource activities were also provided by partnering libraries and museums. Evaluations and dissemination were completed.

The correlation between genetic and environmental factors was successfully established by the students completing this project. It is also important to note that students learn scientific concepts best when they are engaged in practices tied to scientific ideas and when crosscutting concepts are used.

Participants:

Becky Carter Seattle Children's Research Institute

Melinda Gibbons University of Tennessee

Becky Fuller University of Illinois

Kelly LaRue The Jackson Laboratory

Bill Folk University of Missouri

James Blake Lincoln Public Schools

Kristi Straus University of Washington

Tim Herman Milwaukee School of Engineering

Linda Morell University of CA, Berkeley

Marisa Bowers City of Hope Beckman Research Institute

Christi Buffington University of Montana

Matthew Finman Tufts University

Susan Kane City of Hope Beckman Research Institute

Susan Hershberger Center for Chemistry Education Miami University

Exploring Common Themes in Type 2 Diabetes Education

Facilitators: **Joan Griswold, MIT,** *Genome Sciences Education Outreach, University of Washington*
Maureen Munn, PhD, *Director, Genome Sciences Education Outreach, University of Washington*
Reporter: **Amy J. Hawkins, PhD,** *University of Utah*

Using an Interview Design Process described in the Girls RISE (Raising Interest in Science and Engineering) network Facilitator Guide, breakout session facilitators divided the session participants into four groups and asked each group a question concerning diabetes content knowledge or raising awareness in patient groups.

1. What are two to three take-home messages you want your stakeholders to know/understand about type 2 diabetes?
2. How do you measure the success of your program?
3. What strategies do you use, or are you aware of, to build student self-efficacy around type 2 diabetes?
4. What are some of the common misconceptions surrounding type 2 diabetes?

Using a modified "musical chairs" format, each participant was interviewed in a brief one-on-one setting to contribute to each question individually. After each participant contributed to each question, participants looked for common themes and presented these back to the whole group.

Q1: Understanding Type 2 Diabetes Takeaways

- Teaching about Type 2 Diabetes through causes, interventions, prevention, and resources supporting these.
- Biological: nutrition aspects, genetic components
- Socioeconomic factors... and how they effect
- Behavior: physical activity, lifestyle changes/choices
- Evolving and informative research helps us determine what is best today, for whom, and in what context.
- Teaching needs to be individualized

Q2: How do you evaluate the success of your program?

- It's target dependent
- In a classroom: pre- and post-testing, is content understood?
- For health intervention: measures of self-efficacy, behavioral changes, follow-ups, and parental feedback
- In hospitals: interview patients with dieticians and nurses, study biomarkers
- Survey K-12 students: Where did they learn their information? Parents, a classroom, etc?

Q3: How do you promote self-efficacy?

- Building a knowledge base, putting it in the context of patients' lives
- Feedback and positive reinforcement:
  - Build on initial successes to create more
  - Emphasize that slips are informative opportunities, not absolute failures
  - Social support/feedback from multiple sources: parents, mentors, peer-to-peer
- Initial successes (and knowing yourself, because Type 2 Diabetes is so personalized) provide a sense of empowerment and control

Q4: What are some common misconceptions surrounding Type 2 Diabetes?

- If Type 2 Diabetes runs in your family, you will get it.
  - In reality, multiple factors influence whether or not a patient will develop Type 2 Diabetes: environment, stress, activity, socioeconomic factors, depression, the role of obesity
  - Education should focus on what Type 2 diabetes is, and what causes it. A myriad of factors allow patients to believe they have no control: leptin levels, slowing metabolism, thyroid issues, physical injury, and liver/pancreas function
  - "Got the sugar"
  - Patients don't understand the role of sugar in Type 2 Diabetes, or how they can be impacted by fruit/carbs
  - The role of food
  - What is the relationship between calories in, and calories out?
  - How to we consider the contributions to obesity and visceral adipose tissue?
  - Diabetes is only found in adults
  - Confusion between Type 2 and Type 1 Diabetes

Informing the Field: How to Use Existing Project Evaluations for Research

Pressenters: **Nancy Moreno, PhD,** *Associate Provost of Faculty Development and Institutional Research, and Senior Associate Director of the Center for Educational Outreach, Baylor College of Medicine*
Christopher Burnett, BA, *Lead Project Coordinator, Baylor College of Medicine*
Alana Newell, MEd, *Project Coordinator, Baylor College of Medicine*
Travis Kelleher, *Web Designer, Baylor College of Medicine*
Reporter: **Lisa Marriott,** *Oregon Health & Science University*

This session described the use of data for both evaluation and research. Evaluation is driven by goals and objectives, e.g. how well something works to inform stakeholders and guide improvements. Research is driven by questions and hypotheses, to generalize from a program or study in order to inform the field. Data can be used for both, but how you look at the data will be different. Formative and summative evaluation were discussed as data sources, including documentation on the data, with the context describing what will be learned. Goals are major aims; objectives should be measurable and specific. There are different types of objectives: operational (what you create and deliver, e.g. does involving classroom teachers improve impact?) or summative/impact (e.g. is a program having an effect? Pre/post testing to understand if the professional development will increase student knowledge). The session described the importance of designing for rigor: plan design in advance, random assignment of groups, sufficient sample size, valid and reliable instruments, meaningful comparisons (timelines, pre/post, comparison groups). It is also important to think about triangulation to help identify an issue or describe a result from multiple angles. When transforming evaluation into research, a person can change the question from "was the curriculum effective?" into "can appropriate curricula help students in this age group learn content assumed to be above the grade level?" Participants then broke into group discussions to plan their own evaluation vs. research questions.

Participants:

Becky Howsman Seattle Children's Research Institute
Tim Herman Milwaukee School of Engineering
Diane Munzewicia Milwaukee School of Engineering
Mary Kay Hickley Cornell University
Karen Peterman Karen Peterman Consulting Co.
Mark Hartman Tufts University
Don DeRosa Boston University
Ginger W. Cross Mississippi State University
Gale Seiler Iowa State University
Jawed Alam Ochsner Clinic Foundation
Margery Anderson Walter Reed Army Institute of Research
Laura Tenembaum Walter Reed Army Institute of Research
Travis Kelleher Baylor College of Medicine
Amy O'Doherty Museum of Science Boston
Chuck Wood Wheeling Jesuit University
Loran Parker Purdue University
Rebecca Smith University of California, San Francisco
Louisa Stark University of Utah
Shannon Weiss Oregon Museum of Science & Industry
Mary Jo Koroly University of Florida
Beth Tuck National Institutes of healthy
Danielle C Alcena University of Rochester
Mike McKenan The Jackson Laboratory
Michelle Ventura Georgia State University

SEPA Dissemination Strategies: Successes and Struggles

Presenters: **Barbara Hug, PhD,** *Clinical Associate Professor, University of Illinois Urbana Champagne*
Tania Jarosewich, PhD, *Evaluator, Censeo Group*
Reporter: **Barbara Hug,** *University of Illinois Urbana Champagne*

Three key goals of the SEPA dissemination strategies session were:

- Provide a mechanism by which the findings of a dissemination survey could be shared with the SEPA community.
- Allow SEPA PIs from projects with successful dissemination strategies to share.
- Create a space where an initial discussion of dissemination strategies could be shared between SEPA community members.

Goal of survey: to determine how SEPAs disseminate their work.

Melani Duffrin: Strategies for Academic Publishing

Shared strategies for academic publishing. Need to be mindful regarding developing a plan for publishing of articles. Throughout the life of a SEPA project, different papers can be written. Early on: look to publish on development. Later in the project: look to publish on findings from both evaluation and research studies.

Often will find that education journals want both qualitative and quantitative data; think about the types of data early on in the development of the evaluation and research questions of the project.

A wide range of journals to publish in: professional teacher journals, science education and science journals. Each journal will have its own timeline to publication—often these times will vary greatly. Look through different journals to determine the structure of the article and to see if your ideas will fit into the type of journal article published in each journal.

Kim Soper: eBooks As a Way of Dissemination

The eBook came out of work being done on different role model posters and the integration of technology in the schools. Teachers were interested in having an interactive type of "poster" that could be used on interactive smartboards and/or tablets. Many different types of platforms available on which to develop the eBook. Kim talked about how their eBooks were developed on the Google platform. Reasons for choosing this platform: interactive, accessible to anyone, easy to update, possible to add video. Dissemination was made possible through the State Department of Education (highlighting the importance of networking and using connections). During the session, there was a discussion about different ways to disseminate eBooks (PDF, interactive PDFs, and other formats—need to be aware of bandwidth issues and accessibility of software).

John Pollock: App Development and Dissemination

Throughout John's talk, a key point was the importance of partners—one can't be an expert in everything. John strongly recommended partnering with an expert, as his experience has been that it is better to find someone who knows the details of what you need and is able to execute it professionally.

It is key to have a mechanism to advertise and get the app that you are developing out there for others to notice it and use it. John recounted the story of how one of his apps was noticed by someone at Apple, resulting in having it put on the "New and Noteworthy" list. Once it was listed in this part of the App Store, it went to 70,000 downloads per day, eventually just shy of 650,000 downloads. Then after few months, the app was switched from free to a paid app, and the download frequency went down.

However, unless one can get Apple to promote it for you, you need a separate mechanism to let people know it is there. Be creative and plan ahead. Possible way to advertise: take to NSTA or other educational/science conferences and have a QR code that people can easily access. Stay away from long web address—too difficult for people to remember. Similarly, the name of the app matters and you will want to make certain no one else has the name.

Ideas on how to find a professional to help you with the development of your app:

Can go colleges/schools of art, education, computer science, etc. and there will probably be faculty who are creating apps and may have a grad student who can do it for you. Can also go to companies or established groups who know how to create the apps already. During the session, there was a discussion about the pros and cons of each model. Whatever the working model is, you need to work with a developer who is forward thinking. The developer needs to be thinking about how to update the app and everyone should recognize that you will need to do updates within the five-year grant period (and this will cost additional money). John felt that apps being produced today that will be finished by next year will be used by teachers in two years. It is Important to recognize that people will not be using the web the same way in the future and that one will need apps and eBooks.

It is important to recognize that different universities handle IP differently.

Karina Meiri: Website

Initially, the Great Disease website was built as a way to get materials to teachers so they could download it. There was both a teacher and a student website; each site has its own set of materials, important for the audience. Access to teachers is password protected, while the general student site is not. Currently the website is a WordPress page they have worked to expand in collaboration with the university IT department. It's important to know the strengths and weaknesses of the website creation tool that you are using.

Curriculum materials are posted to the website, as are videos of how to do certain parts of the lessons. Curriculum materials have been made into eBooks, iBooks, etc. However, the project found out that teachers wanted to print the student textbooks and had to attend to creating simple PDFs as well.

Dissemination of materials: Projects are working with supply companies to create kits for sale that teachers can purchase. Currently, groups are working with Carolina, New England Biolabs, and BioRad.

However, not all groups had the same experience working with the companies. A brief discussion ensued of nondisclosure agreements and the issues they create.

At the end of the session, a brief discussion was had about using an online classroom management system and how successful this approach has been. People talked about still looking for a best practices system—individual SEPA projects don't have the time, expertise, or money to create such a system.

Teachers do not use the discussion forum on Canvas, these other guys find. An issue that several groups discussed was how to create a strong online community of learners.

Other people's advice:

- The need for videos and how to's
- YouTube channels are very good
- Silk – distance learning website, one way of disseminating materials
- Go do district-level conferences
- Offer free PD in districts
- Going to the top of the school district worked for some, others talked about the importance of talking with teachers (probably want to do a combination)
- Think beyond science teachers: health and PE teachers are their audiences
- Find a strong professional organization
- Statewide is good, nationwide can be overwhelming

Participants:

Melani Duffrin East Carolina University
Jan Dubinsky University of Minnesota
Elizabeth Kong Museum of Science Boston
Sue Kirk Virginia Commonwealth University
Ella Greene-Moton University of Michigan
Patty McNamara Independent Educator
Tiffany Nuessle Denver Museum of Nature and Science
Kim Soper University of Nebraska Medical Center
Liz McMillan Sanford Research
Sally Davis University of New Mexico
Rachel Smilow Children's National Health System
Sharon Pepenella Cold Spring Harbor Laboratory's
Charles Wray Jackson Laboratory
Donna Cassidy-Hanley Cornell University
Marnie Gelbart Harvard Medical School
Martin Weis New York Hall of Science
Berri Jacque Tufts University
Erin Hardin University of Tennessee
Jackie Shia Wheeling Jesuit University
Amanda Jones Seattle Children's Research Institute
Robin L. Cooper University of Kentucky
Ken McMartin LSU Health Sciences Center Shreveport
Laura Romo University of California, Santa Barbara
Yukari Okamoto University of California, Santa Barbara
John Pollock Duquesne University
Loretta Brady St. Anselm College
Julie Yu Exploratorium
Katherine R. Bruna Iowa State University

Thursday, May 12, 2016, 10:00 AM – 11:15 AM

Creating Culturally-Relevant STEM-H Enrichment Activities to Engage Rural Students and Communities

Presenters: **Sally Davis, PhD,** *Director & Professor, The Prevention Research Center at the University of New Mexico*
Kathryn Peters, *MCRP, MA, Program Specialist, The Prevention Research Center at the University of New Mexico*
Reporter: **Rachel Smilow,** *Children's National Health Systems*

Key Points:

- Engage under-resourced communities
- Understand your audience
- Promote science and health education through the world around you

This session dealt with the Hispanic and Native American populations in Cuba, New Mexico. This rural town is a one to two hour drive from the main city of Albuquerque and has a mostly Native American population. Ms. Peters went through some of the programs that CRP offers the students and stressed that these programs center on the students using their environment to learn about science and health. "Hike with the Principal" is a question-driven program that has markers with information about geography and plants in the area. Like many of their other programs, this program takes into consideration the audience, and those implementing it adapt certain aspects of the program for all students to participate. For example, it must be decided whether activities should be on Native American land or government land. During this discussion, Ms. Peters and Dr. Davis brought up the issue of dealing with biases and how they can cause difficulties in teaching not just STEM but other subjects as well to a certain audience. This led to a conversation on the importance of role models in the STEM field. Ms. Peters mentioned a few members of their staff who were of both Navajo and Hispanic descent who grew up in the community. Naturally this led to a discussion on the importance of role models in the biomedical field, which has a small percentage of underrepresented minorities. Seeing role models especially in this field is crucial because many students, especially men, do not go to college in this area, but instead join the military or attend college for a few years before having to leave or drop out due to the fact they must work to support their families' farms.

One challenge Ms. Peters and Dr. Davis stated was distance and the participation of children and families in some of the special events the program offers. Many of the events are part of the annual city fair or other annual events, which can bring in either small or large crowds depending how far the families live or if they already have a reason to come into town. In this vein, both presenters mentioned that offering food at events is key to getting a crowd to attend.

Participants:

Sally Davis University of New Mexico
Debra Yourick Walter Reed Army Institute of Research
Patricia Slattum Virginia Commonwealth University
Kristi Straus University of Washington
Charles Wray Jackson Laboratory
Maurice Godfrey University Nebraska Medical Center
Kim Zeidler-Watters University of Kentucky
Robin Cooper University of Kentucky

Melani Duffrin East Carolina University
Maureen Munn University of Washington
Regina Sievert Salish Kootenai College
Rob Rockhold University of Mississippi Medical Center
Kim Soper University of Nebraska Medical Center
Isela Rodriguez-Bussey Georgia State University
Robin Cooper University of Kentucky
Kim Walters University of Kentucky

Zika Virus, Correlation vs. Causation, NGSS, and the Common Core: Leveraging the Popular Press to Teach Science

Facilitators: **Rebecca Smith, PhD,** *Co-Director, UCSF Science & Health Education Partnership*
Barbara Hug, PhD, *Clinical Associate Professor, University of Illinois at Urbana-Champagne*
Laurie Fink, PhD, *Director of Science Programs, Science Museum of Minnesota*
Reporter: **Amy J. Hawkins, PhD,** *University of Utah*

This work was funded by a SEPA grant on infectious diseases, and it was a coincidence that in 2015 the Zika virus emerged as a concerning infectious disease in the popular press. Participants in this breakout session were divided into three groups to read different articles about the Zika outbreak from reputable sources in the popular press (e.g. The New York Times). After breakout groups answered a series of questions, the discussions were summarized as a larger group in an effort to isolate larger themes about how the popular press covers disease outbreaks. Even in reputable news sources, articles contradicted themselves, using phrases like "the virus causes" in the first sentence, then later in the article describing a possible association. These discrepancies can be used to ask students to think critically about correlation and causation–in this case, about the relationship between Zika and microcephaly. An "us versus them" dichotomy repeatedly appears in the Zika coverage, here depicting the Brazilian researchers and public health officials opposing western biomedical researchers, or, more broadly, people internal to the situation versus people outside the situation. Another theme emerged that echoed media coverage of the HIV epidemic in the 1980s: focusing on the lifestyle of the victim rather than the biology of the virus. The chronological progression of articles and the public conversation can show students that reporting and attempting to understand the Zika outbreak is an example of how science works: it's an accumulation of evidence. It was also emphasized that in matters concerning public health policies, we often need to act on our best guess.

An Introduction to Survey Design

Presenters: **Dina Drits-Esser, PhD,** *Senior Researcher, University of Utah*
Kristin Bass, PhD, *Senior Researcher, Rockman et al*
Reporter: **Dina Drits-Esser, PhD,** *University of Utah*

The focus of the session was to introduce participants to the basics of survey design.

Definitions of construct, items/indicators, and scale were discussed.

Presentation and in-depth discussion of six basic steps of survey design:

1. Determine what it is you want to measure – define a construct; create a blueprint to help adequately represent the content domain of interest
2. Generate an item pool – identify existing scales; for each item consider its purpose; generate more items than you will need
3. Determine the format for measurement/optimize scale length – respondent effects; extreme response such as leniency or severity; midpoint response such as central tendency, satisficing, social desirability (For Likert scales, need to consider: should you label anchors or all options? Should you have an odd (include a midpoint) or even number of responses? How many response options is ideal? What percent of time do you think corresponds with "frequently"?)
4. Determine survey order/instructions (instructions, rapport, fatigue)
5. Have initial pool reviewed by experts (sample; think alouds, focus groups, open-ended questions)
6. Pilot the items (sample size; give survey under actual circumstances)
7. Evaluate the items (frequency of responses; reliability and factor analysis of item scores; relationship to other survey scores)

After discussing step 1, participants worked in groups to construct a concept map (blueprint) of a construct that is relevant to their projects.

After discussing step 3, participants worked in groups to generate a small item pool relevant to their projects.

Participants and discussants engaged in additional relevant conversations throughout, just as length of scales, etc.

Handouts included additional resources for survey development.

Strategies for Initiating and Sustaining Partnerships in Community-Engaged Research

Presenters: **Lisa Jacobs, MSW,** *Mixed Methods Research Lab Manager, University of Pennsylvania*
Britt Dahlberg, PhD, *Director, Center for Applied History & Chemical Heritage Foundation*
Reporter: **Ashley Roseno,** *East Carolina University*

This session began with the presenter asking for introductions from each participant. Throughout the session, the presenter gave an overview of the program she worked with, called REACH Ambler (Resources for Education and Action for Community Health in Ambler). The program explores the history, environmental health, and community identity of Ambler, Pennsylvania through a partnership between the University of Pennsylvania's School of Medicine and the Chemical Heritage Foundation (CHF).

1. The presenter first discussed the history of Amber, PA:
    - From the 1880s until the mid-20th century, asbestos production was the cornerstone of this community. The town was actually built around the factory.
    - In 1986, one of the factory waste-dump sites was added to the EPA's NPL, with clean up not completed until 1993.
    - Another site was added in 2009 with clean up still ongoing.
    - The University of Pennsylvania became involved through the Center for Excellence in Environmental Toxicology (CEET).
    - They wanted to determine the effects of asbestos on community identity and better educate the community about it.
    - Products included a booklet, website, films, oral histories, play, and short animated film.
2. The presenter emphasized the importance of building relationships with community members using the model below:

    STOP > LOOK > LISTEN > REPEAT

    - Regular meetings with the community to keep them involved in the process is essential.
    - Develop stakeholder group (e.g. local newspaper, news outlets, etc.).
    - Facilitate brainstorming sessions and provide opportunities for community members to share expertise and experiences.
3. Pain Points to this type of project:
    - You only know who you know – you will not be able to reach everyone and obtain all the information
    - Neutrality – people talk and say what they want, so bias will be present
    - You must keep partners/participants engaged throughout the process by making them feel important and needed.

4. The final portion of the session included a discussion between two to three people and the presenter. Points made included:
    - Parental involvement is key
    - Consent forms can be challenging when working in schools (solutions: use school website, host a family fun night)
    - Engage churches to spread the word
    - Utilize outlets to keep partners involved, including social media

Participants:

Ashley Roseno East Carolina University
Ella Greene-Moton University of Michigan, Ann Arbor
Maggie Cearley University of Kansas Medical Center
Toby Citrin University of Michigan
Regina Sievert Salish Kootenai College
Ty Martinez LSU Health Sciences Center - Shreveport

Plenary Session
Thursday, May 12, 2016, 11:15 AM - 11:45 AM

Town Hall Discussion

Reporter: Tony Ward, ***University of Montana***

Information was provided by Tony Beck on the following items:

- 21 of 22 newly-awarded SEPA PIs were attendance at the conference.
- For those who have stories of how SEPA has impacted them over the last 25 years, please email write-ups to Tony B.
- If you publish manuscripts with SEPA funding, make sure you register the publication through PMCID.
- Tony B. is interested in a five year strategic plan called "SEPA Logic Model." Please send ideas to Tony if you have suggestions.
- SEPA is interested in regional consortium projects in the future.
- There are two new initiatives from the White House of interest to SEPA projects. This includes the Precision Medicine/Health Literacy initiative, and the Early Education initiatives focused on Grade 3 and lower.
- Please continue with SEPA mentor/mentee interactions.
- If you have extra SEPA posters, please leave them with Tony B. so he can use them.
- Please send electronic files of the posters to Tony B. if you are interested.
- One future activity could be to link project progress reports to the individual projects on the SEPA website.
- Please use the available teacher professional development supplements that are available through SEPA (bioethics, dental health, etc.).
- Please CC Tony B. when discussing project budget issues with NIH.
- The new SEPA funding and gaming FOAs should be published in the next year.
- There could be a Request for Information (FOI) released to gather information on future SEPA directions.

Posters

Posters are listed alphabetically by Institution within the following topic areas:

- Informal Science Education
- Student Science Enrichment
- Authentic Research Experiences for Students and Teachers
- Teacher Professional Development
- Early STEM
- Rural STEM
- Curriculum Development

Informal Science Education

Poster	Project Name/ Poster Title	Institution	PI(s)/Poster Authors	Funder
1	Biodiversity and Human Health	American Museum of Natural History	Preeti Gupta, Rob DeSalle	SEPA
2	Developing Skills in Health Literacy	BSCS	Anne Westbrook	SEPA
3	Partnership in Neuroscience Educations	Duquesne University	John Pollock	SEPA
4	DNA Runs in the Family: Promoting Genetic Literacy	Georgia State University	Barbara R. Baumstark	SEPA
5	MedLab: Using Patient Simulation for Student Exploration of Community Health Issues	Museum of Science and Industry, Chicago	Rabiah Mayas, Patricia Ward	SEPA
6	A New Genomic Framework for Schools and Communities	Michigan State University & University of Michigan	Joseph Krajcik, Toby Citrin	SEPA
7	Hispanic Role Models in Health Careers	National Association of Hispanic Nurses	Angie Millan	SEPA
8	Zoo in You: Exploring the Human Microbiome	Oregon Museum of Science and Industry (OMSI)	Victoria Coats	SEPA
9	Out of the Lab and Into the Spotlight	Pacific Science Center	Diana Johns	SEPA
10	PlayPads: Mobile Educational Health Science Activities for Children in Hospitals	Lawrence Hall of Science, University of California, Berkeley	Darrell Porcello, Sherry Hsi	SEPA
11	Discover Health/Descubre la Salud: A Colorado Community Engagement Project	University of Colorado, Denver	Jennifer Hellier	SEPA
12	Hawaii Science Career Inspiration (HiSCI) Program	University of Hawaii John A. Burns School of Medicine	Kelley Withy, Rachel Boulay	SEPA

13	Girls Realizing Options through OpenSim Virtual Experiences (GROOVE)	University of Miami, Patricia and Phillip Frost Museum of Science	Patrice Saab, Judy Brown	SEPA
14	Weighing the Evidence: Making Informed Healthcare Decisions	Science Museum of Minnesota	Laurie Fink	SEPA
15	Biology of Human	University of Nebraska	Judy Diamond, Julia McQuillan, Charles Wood	SEPA
16	REACH Ambler	University of Pennsylvania & Chemical Heritage Foundation	Frances Barg, Jody Roberts	SEPA

Student Science Enrichment

Poster	Project Name/ Poster Title	Institution	PI(s)/Poster Authors	Funder
17	CityLab and Urban Squash: A New SEPA Model	Boston University and Fordham University	Carl Franzblau, Donald DeRosa, Carla Romnye	SEPA, NIAID, Blueprint for Neuroscience
18	Duke Med Activated A+	Duke University	Brenda E. Armstrong	SEPA
19	Transmission: Astonishing Tales of Human-Animal Diseases	New York Hall of Science	Martin Weiss	SEPA
20	Engaging Families to Enhance Science Learning and Interest in STEM Careers	Seattle Children's Research Institute	Amanda L. Jones	SEPA
21	Building Bridges/Accelerating Access: Health Science Education in Native American Communities	University of Nebraska Medical Center	Maurice Godfrey	SEPA
22	Sowing the Seeds of Neuroscience	University of Washington	Eric H. Chudler	SEPA
23	Sowing the Seeds of Neuroscience	University of Washington	Eric H. Chudler	Blueprint for Neuroscience
24	Biology-Environmental Health Science Nexus: Inquiry, Content and Communication	University of Wisconsin Milwaukee	David Petering	SEPA
25	In-classroom Biology Internships for Students & Teachers in Underserved Schools	Walter Reed Army Institute of Research	Debra Yourick	SEPA
26	Pandem-Sim	Wheeling Jesuit University	Charles Wood	SEPA

Poster	Project Name/ Poster Title	Institution	PI(s)/Poster Authors	Funder
27	San Gabriel Valley SEPA Collaborative	City of Hope Beckman Research Institute	Susan Kane	SEPA
28	NeuroLab	Coastal Marine Biolabs Integrative Biosciences Institute	Ralph Imondi, Linda Santschi	SEPA
29	Barcode Long Island: Exploring Biodiversity in a Unique Urban Landscape	Cold Spring Harbor Laboratory's DNA Learning Center	David Micklos	SEPA
30	Rex: Bringing Real Experiments about Substance Abuse to High School Students	Duke University Medical Center	Rochelle D. Schwartz-Bloom	SEPA, SEDAPA
31	BioMedTech STEM: Students Translating and exploring Medicine	Great Lakes Science Center & Cleveland CTSA	Valence Davillier, Sarah MacLeish	SEPA
32	BIOSTART: Research Intensive Internship and Education Experience for High School Students	LSU Health Sciences Center-Shreveport	Kenneth McMartin	SEPA
33	Bringing Research Into the Classroom (BRIC)	Montana Tech	Marisa Pedulla	SEPA
34	Let's Get Healthy!: (CHIDR Chatter: Community Health Interactive Data Resource)	Oregon Health & Science University	Lisa Marriott	SEPA
35	Western New York Genetics in Research and Health Care Partnership	State University of New York at Buffalo	Stephen T. Koury, Shannon M. Carlin-Menter	SEPA, NSAID
36	San Francisco Health Investigators	UC San Francisco	Rebecca Smith, Katherine Nielsen	SEPA
37	Translating Translation And Scientific Questioning In The Global K12 Community	University of Arizona College of Medicine	Marlys Witte, Francisco Garcia	SEPA, NIAID, NINDS
38	Training rural/underserved youth to understand and pursue scientific careers	University of Montana	Andrij Holian, Tony Ward	SEPA
39	Transforming STEM Learning in Urban Settings Using the SSMV Model	Vanderbilt University	Virginia Shepherd, Jennifer Ufnar	SEPA
40	Teaching to Learn: WV-HSTA students take CBPR to their community	West Virginia University	Ann Chester	SEPA
41	Planarians on Sweeteners: Addictive-like Effects of Sucrose, Splenda and Equal	Temple University	Scott Rawls	SEPA, SEDAPA
42	Anxious Planarians: Benzodiazepine Inhibits Anxiety Produced by Cocaine or Ethanol Withdrawal	Temple University	Scott Rawls	SEPA, SEDAPA

43	Science Education Against Drug Abuse Partnership (SEADAP)	East Carolina University	Scott Rawls, Rhea Miles, Kathleen Mooney, Sara Ward	SEPA, SEADAP

Teacher Professional Development

Poster	Project Name/ Poster Title	Institution	PI(s)/Poster Authors	Funder
44	Frontiers in Physiology Communities of Practice	American Physiology Communities of Practice	Marsha Lakes Matyas	SEPA
45	Exploratorium Digital Teaching Box: A Professional Development Tool	Exploratorium	Kristina Yu, Julie Yu, Hilleary Osheroff	SEPA
46	Neuroscience in your World: A Partnership for Neuroscience Education Across the K-12 Spectrum	The Franklin Institute	Jayatri Das	Blueprint for Neuroscience
47	Young Scientist, Ambitious Teachers Improving Health in an Urban Ecosystem	Iowa State University & University of Wisconsin, Madison	Katherine Richardson Bruna Gale Seiler, Lyric Bartholomay	SEPA
48	Teaching the Genome Generation	The Jackson Laboratory	Charles Wray, Gareth Howell	SEPA
49	Turning K-12 Environmental STEM Education InSciEd Out	Mayo Clinic	Joanna Yang, Christopher Pierret	SEPA
50	Teachers FIRST	Milwaukee School of Engineering	Tim Herman	SEPA, SEDAPA
51	STC: Science Tools in the Classroom	New Mexico State University	Michele Shuster	SEPA
52	Science Club Summer Camp (SC2): Training Teachers and Youth in Authentic STEM Practice	Northwestern University	Michael Kennedy	SEPA
53	BEST Science!	Ochsner clinic Foundation & LSU Health Sciences Center	Jawed Alam, Paula Gregory	SEPA
54	The Great Diseases: Biomedical Science in the High School classroom	Tufts University School of Medicine	Karina Meiri, Berri Jacque	SEPA
55	Modeling for Fidelity: Mentored Dissemination of a Novel Infectious Disease Curriculum	Tufts University School of Medicine	Karina Meiri, Berri Jacque	NIAID
56	Science Education Enabling Careers: GeoTeach	University of Alabama at Birmingham	Mike Wyss	

57	Biomedical Explorations: Bench to Bedside	University of Florida	Mary Jo Koroly	SEPA
58	T-SCORE: Teachers and Students for Community Oriented Research and Education	University of Kansas Medical Center, University of Kansas	Ana Paula Cupertino, Karin Chang	SEPA
59	Science Teaching Excites Medical Interest (STEMI)	University of Mississippi Medical Center	Rob Rockhold, Donna Sullivan	SEPA
60	CRESST - Clinical Research Education for Secondary Students and Teachers	Virginia Commonwealth University	Lisa Abrams	SEPA

Early STEM

Poster	Project Name/ Poster Title	Institution	PI(s)/Poster Authors	Funder
61	Partnerships to Promote Healthy Lifestyles for Children and Communities	Mississippi State University	Ginger W. Cross	SEPA
62	This Is How We "Role": Inspiring Future Researchers through Veterinary Medicine	Purdue University	Sandra San Miguel	SEPA
63	Integrating Germ Transmission Concepts into Science: The “Think Biology” Preschool Curriculum	UCSB	Laura F. Romo, Yukari Okamoto	SEPA
64	Preliminary Findings Related to the Impact of the “Think Biology” Curriculum on Latino Preschoolers’ Understanding of Germ Transmission	UCSB	Laura F. Romo, Yukari Okamoto	SEPA
65	Preliminary Findings Related to the Impact of the “Food for Thought” Curriculum on Latino Preschoolers’ Understanding of Nutrition	UCSB	Laura F. Romo, Yukari Okamoto	SEPA
66	Stimulating Young Scientists to Engage, Motivate, and Synthesize	University of Georgia	Georgia W. Hodges	SEPA

Rural STEM

Poster	Project Name/ Poster Title	Institution	PI(s)/Poster Authors	Funder
67	The Science Around Us	University of New Mexico	Sally Davis, Shiraz Mishra	SEPA
68	PIPES: Possibilities in Postsecondary Education and Science	University of Tennessee	Melinda M. Gibbons, Erin Hardin	SEPA

Curriculum Development

Poster	Project Name/ Poster Title	Institution	PI(s)/Poster Authors	Funder
69	Innovative Curricula: Genetics, Neuroscience and Infectious Diseases	Baylor College of Medicine	Nancy Moreno	SEPA, Blueprint for Neuroscience, NIAID
70	Sharing ASSETs: Expanding Science Opportunities in K-12 Classrooms	Cornell University	Theodore Clark	SEPA
71	ARC: Building Awareness, Respect, and Confidence through Genetics	Harvard Medical School, Sanford Research	Marnie Gelbart, Ting Wu, Elizabeth McMillan	SEPA
72	Bioinformatics Inquiry through Sequencing (BioSeq)	Tufts University	David R. Walt, Donna K. Slonim	SEPA
73	How Sure Are You? Science, Biostatistics and Cancer Education	UC Davis	Marco Molinaro	SEPA
74	Project NEURON	University of Illinois	Barbara Hug	SEPA
75	The Science of Healthful Living	University of North Carolina at Greensboro	Catherine D. Ennis	SEPA
76	Medicines and Me: Understanding and Using Medicines Safely	University of Rochester	Dina Markowitz	SEPA
77	Genes, the Environment, and Me (GEM)	University of Washington	Maureen Munn, Helene Starks	SEPA
78	Inside Your Body: Web-Based Curricula for Secondary Science	University of Utah	Louisa Stark, Kevin Pompei	SEPA

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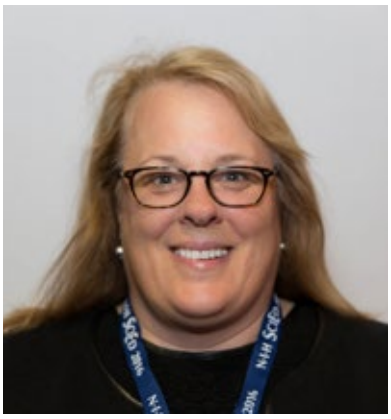

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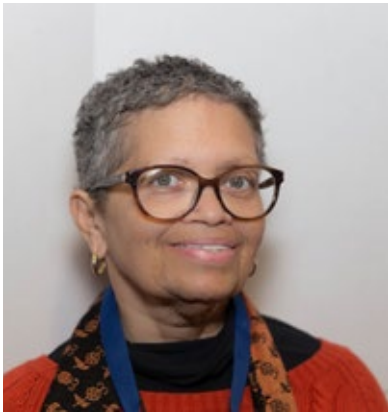

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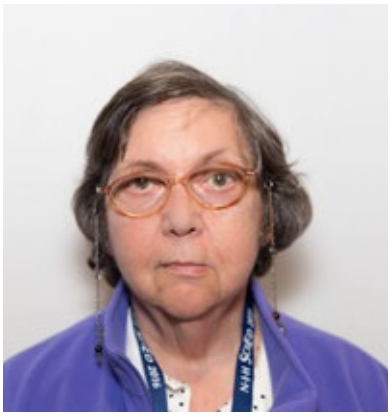

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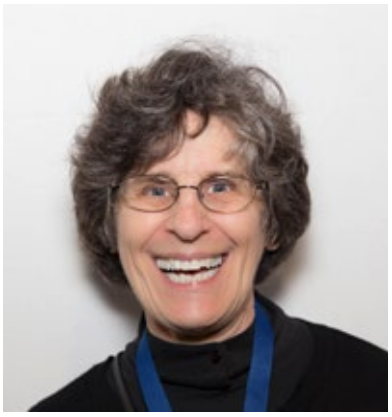

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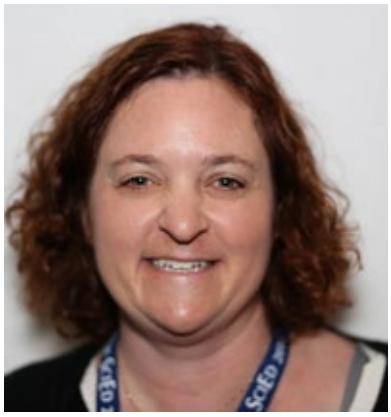

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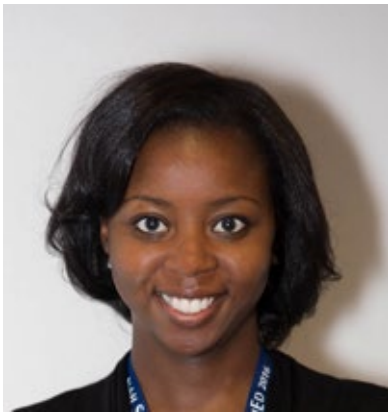

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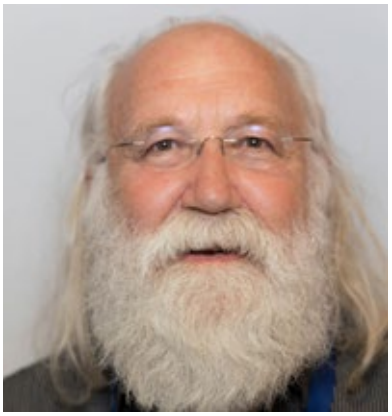

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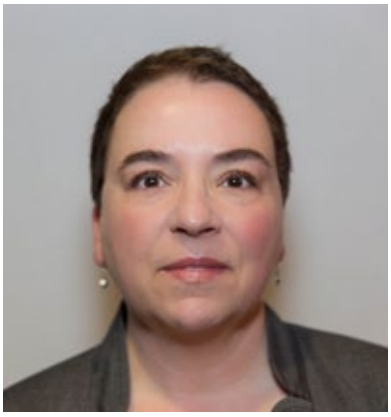

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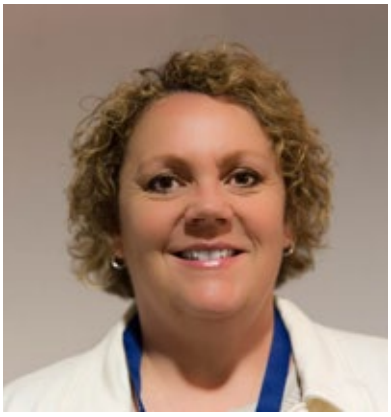

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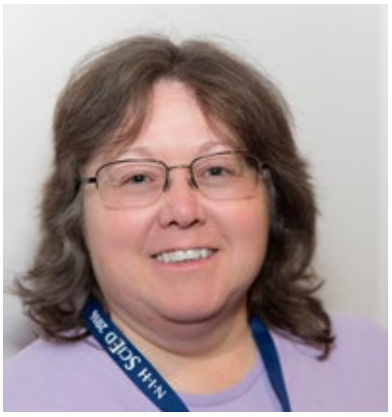

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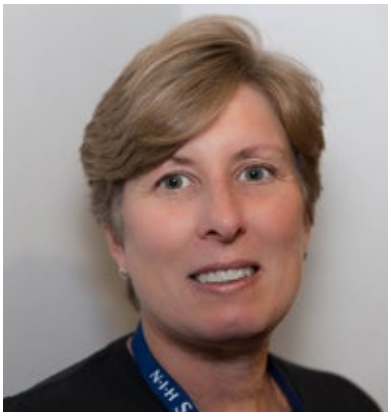

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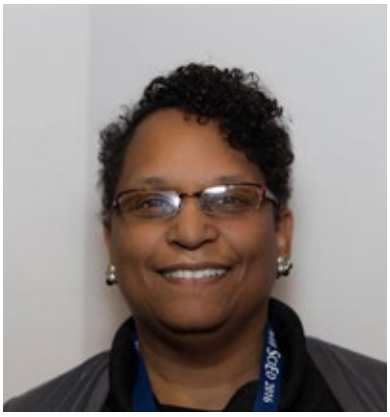

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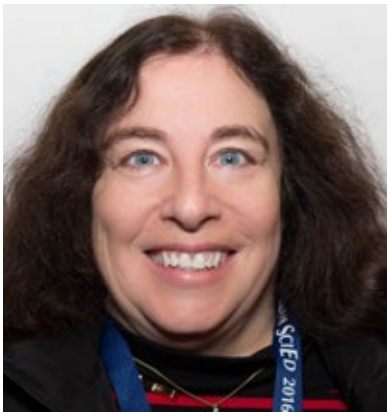

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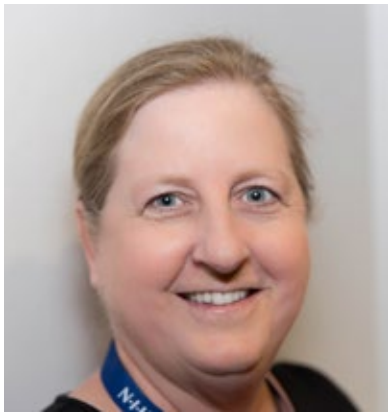

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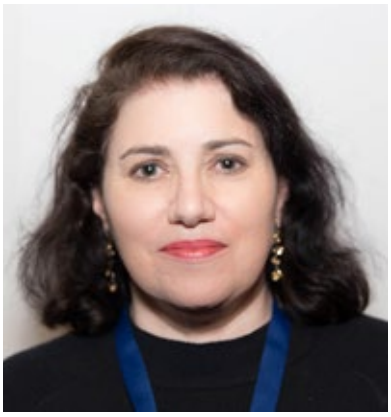

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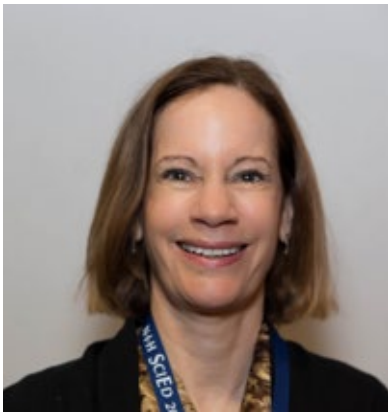

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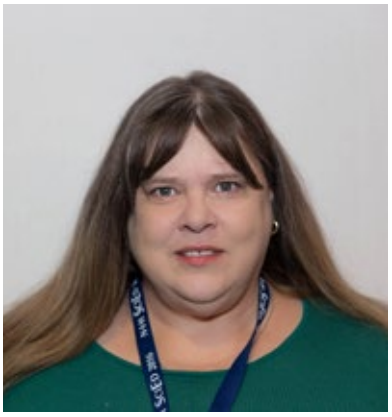

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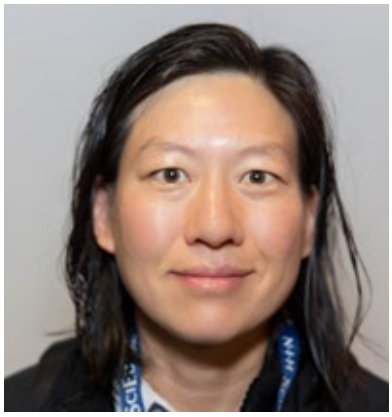

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