



2018 NOYCE SUMMIT



TOWARDS A 2026 STEM EDUCATION — *Implications of Convergent Science for K-12 STEM Teacher Preparation in the Face of Changing Student Demographics*



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2018 Noyce Summit

Towards a 2026 STEM Education:
*Implications of Convergent Science for
K-12 STEM Teacher Preparation in the Face of Changing
Student Demographics*

July 16-18, 2018

Hyatt Regency on Capitol Hill

Co-hosted by

American Association for the Advancement of Science (AAAS)
Education and Human Resources Program (EHR)
and

National Science Foundation (NSF) Division of Undergraduate Education (DUE)



ADVANCING SCIENCE. SERVING SOCIETY

NSF Grant DUE-1548986

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ISBN 978-0-87168-770-8

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Program Book Cover Design: AAAS Marketing

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Workshops moderated by the following NSF Staff: <i>Kathleen Bergin, Karen Keene, Talitha Washington, Mark Pauley, R. Steven Turley, Tom Kim, Sandra Richardson, Andrea Nixon, Daphne Marshall, Michael Rook, and Ebony Horad</i>	

Towards a 2026 STEM Education: *Implications of Convergent Science for K-12 STEM Teacher Preparation in the Face of Changing Student Demographics*

The NSF **Ten Big Ideas for Future Science Investments** identifies a future STEM research agenda aimed at solving some of the most pressing societal problems. The research agenda includes:

- Understand the Rules of Life: Predicting Phenotype;
- Work at the Human-Technology Frontier: Shaping the Future;
- Windows on the Universe: The Era of Multi-Messenger Astrophysics;
- Navigating the New Arctic;
- Harnessing Data for 21st Century Science and Engineering; and
- The Quantum Leap: Leading the Next Quantum Revolution. (https://www.nsf.gov/about/congress/reports/nsf_big_ideas.pdf)

What is common to all of these research areas is a convergence of knowledge across multiple disciplines. The grand challenges of today -- protecting human health; understanding the food, energy, water nexus; exploring the universe at all scales -- will not be solved by one discipline alone. They require convergence: the merging of ideas, approaches and technologies from widely diverse fields of knowledge to stimulate innovation and discovery.

Recognizing the significant demographic shifts, the NSF **Ten Big Ideas for Future Science Investments** document leads with the idea of supporting collective problem solving to develop scalable ways to broaden STEM potential among traditionally underrepresented groups -- including women, Hispanics, African Americans, Native Americans, persons with disabilities, people from rural areas and people of low socioeconomic status.

Also, the **2014 NAS report, *Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond*** (<https://www.nap.edu/download/18722>) identified some goals for undergraduate student interdisciplinary learning, regardless of field, including:

- to develop in students the intellectual capacity to deal with real, complex problems;
- to build student confidence and willingness to approach problems from multiple perspectives;
- to build student ability to communicate with scientists from other disciplines;

- to develop student ability to make decisions in the face of uncertainty (reflective judgment); and
- to help students understand strengths and limitations of different disciplinary perspectives.

To this end the **2018 Noyce Summit** will begin to explore the ***Implications of Convergent Science for K-12 STEM Teacher Preparation***, including:

- How can STEM teacher preparation programs show the deeper connections among STEM fields within each course, including connections to societal challenges and the risk and benefits of science?
- What new courses or labs are needed to help prospective teachers to be prepared to make deeper connections across STEM fields in the K-12 classroom?
- What are the infrastructure changes needed to implement courses and labs that show the deeper connections across STEM fields within each course?
- What resources exist and are needed to facilitate course changes that show the deeper connections across STEM fields within each course?
- What experiences need to be provided to help teachers understand how to use culturally responsive connections to engage diverse learners?

National Science Foundation (NSF) Robert Noyce Teacher Scholarship Program

The **Robert Noyce Teacher Scholarship Program** seeks to encourage talented science, technology, engineering, and mathematics (STEM) majors and professionals to become K-12 STEM teachers. This program responds to the critical need for highly effective K-12 STEM teachers by recruiting and preparing talented undergraduate STEM majors and STEM professionals to pursue teaching careers in elementary and secondary schools, in high-need local educational agencies. The program seeks to encourage institutions of higher education to develop and sustain a culture where undergraduate STEM majors, especially those of the highest achievement and ability, are encouraged and supported when they express a desire to pursue K-12 STEM teaching careers.

The program was first authorized under the National Science Foundation Authorization Act of 2002 (P.L. 107-368). It was reauthorized in 2007 under the America COMPETES Act (P.L. 110-69) and the America COMPETES Reauthorization Act of 2010 (P.L. 111-358), and amended by the STEM Education Act of 2015 (P.L. 114-59). The Noyce program addresses the goal established by the President's Council of Advisors on Science and Technology, "of ensuring over the next decade the recruitment, preparation, and induction support of at least 100,000 new STEM middle and high school teachers who have strong majors in STEM fields and strong content-specific pedagogical preparation, by providing vigorous support for programs designed to produce such teachers." (PCAST, 2010).

By supporting the recruitment and preparation of strong STEM teachers who will teach in high-need local educational agencies, serving diverse student populations, the program supports the strategic objective (G1/O2) in the *NSF Strategic Plan for 2014-2018*: "Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities." The Noyce Program supports the role of NSF as central to discovering, studying, and promoting pathways for STEM teacher education through research and development.

The **Robert Noyce Teacher Scholarship Program** consists of four tracks: **Track 1** - The Robert Noyce Teacher Scholarships and Stipends Track (S&S), **Track 2** - The NSF Teaching Fellowships Track (TF), **Track 3** - The NSF Master Teaching Fellowships Track (MTF), and **Track 4** - Noyce Research Track. In addition, funds for **Capacity Building** awards, which may lead to the development of full proposals in Track 1: S&S, Track 2: TF, or Track 3: MTF, are also supported. Partnerships between four-year institutions and two-year institutions, providing pathways leading to STEM teacher certification, are particularly encouraged.

More information about the **Robert Noyce Teacher Scholarship Program** can be located online at http://nsf.gov/funding/pgm_summ.jsp?pims_id=5733&org=EHR&from=home.

American Association for the Advancement of Science (AAAS)

The **American Association for the Advancement of Science** is an international non-profit organization dedicated to advancing science around the world by serving as an educator, leader, spokesperson and professional association. In addition to organizing membership activities, AAAS publishes the journal *Science*, <http://www.sciencemag.org/>, as well as many scientific newsletters, books and reports, and spearheads programs that raise the bar of understanding for science worldwide.

AAAS was founded in 1848, and includes some 261 affiliated societies and academies of science, serving 10 million individuals. *Science* has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of one million. The non-profit AAAS is open to all and fulfills its mission to "advance science and serve society" through initiatives in science policy; international programs; science education; and more. For the latest research news, log onto EurekAlert!, <http://www.eurekalert.org/>, the premier science-news website, a service of AAAS.

Membership and Programs

Open to all, AAAS membership includes a subscription to *Science*. Four primary program areas fulfill the AAAS mission:

- Science and Policy
- International Activities
- Education and Human Resources
- Project 2061

AAAS Mission

AAAS seeks to "advance science, engineering, and innovation throughout the world for the benefit of all people." To fulfill this mission, the AAAS Board has set these broad goals:

- Enhance communication among scientists, engineers, and the public;
- Promote and defend the integrity of science and its use;
- Strengthen support for the science and technology enterprise;
- Provide a voice for science on societal issues;
- Promote the responsible use of science in public policy;
- Strengthen and diversify the science and technology workforce;
- Foster education in science and technology for everyone;
- Increase public engagement with science and technology; and
- Advance international cooperation in science.

Visit the AAAS website at <http://www.aaas.org/>.

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SMITHSONIAN MUSEUM MAP



MONDAY, JULY 16, 2018

2:00 pm - 4:00 pm **New Awardees Session with NSF Staff**
(Regency A)

3:00 pm - 9:00 pm **Registration**
(Regency Foyer Wall)

2:00 pm - 4:00 pm **New Awardees Session with NSF Staff**
(Regency A,B,C)

3:00 pm - 4:45 pm **Current Grantees Town Hall Meeting**
(Capitol A&B)

Led by NSF Noyce Program Directors

3:00 pm - 4:45 pm **Current and Former Scholars/Fellow Orientation | Meet and Greet**
(Concord/Lexington/Bunker Hill)

Led by NSF Noyce Program Directors

Facilitators:
Quincy Brown and Iris Wagstaff,
Program Directors, AAAS, EHR

3:00 pm - 6:30 pm **Poster Setup**
(Regency Foyer/Columbia Foyer/
Columbia A,B)

5:00 pm - 6:30 pm **Plenary Session 1**
(Regency A,B,C)

Moderator:
Shirley M. Malcom, *Director, Education and Human Resources Program, AAAS*

Opening and Welcome:
Sandra Richardson, *Program Director and Program Lead, Robert Noyce Teacher Scholarship Program, DUE, NSF*

Jim Lewis, *Acting Assistant Director, Education and Human Resources Directorate, NSF*

Speaker:
Cato T. Laurencin, *University Professor, UConn; Chief Executive Officer, Connecticut Institute for Clinical and Translational Science (CICATS); Director, Institute for Regenerative Engineering; Endowed Chair Professor, Department of*

Orthopedic Surgery, UConn Health Tenured Professor, School of Engineering

Announcements

6:30 pm - 8:00 pm **Poster Session 1 and Networking Reception**
(Regency Foyer/Columbia Foyer/
Columbia A,B)

TUESDAY, JULY 17, 2018

7:00 am - 6:00 pm **Registration**
(Regency Foyer Wall)

7:00 am - 2:00 pm **Poster Setup**
(Regency Foyer/Columbia Foyer/
Columbia A,B)

7:00 am - 7:45 am **Plenary Session 2 and Networking Breakfast**
(Regency A,B,C)

7:45 am - 9:15 am **Moderator:**
Shirley M. Malcom, *Director, Education and Human Resources Program, AAAS*

Gary Machlis, *University Professor of Environmental Sustainability, Clemson University and Former Science Advisor to the Director, National Park Service*

Announcements

9:30 am - 10:45 am **Concurrent Workshops Session 1**
(See handout for workshop room assignments.)

10:45 am - 11:00 am **Break**

11:00 am - 12:00 pm **Plenary Session 3: Voices from the Field**
(Regency A,B,C)

Moderator:
Sandra Richardson, *Program Director and Program Lead, Robert Noyce Teacher Scholarship Program, DUE, NSF*

AGENDA

	<p>Voices from the Field Panelists: Rachael Esh, <i>University of Wyoming</i> Arthur Funk, <i>American Museum of Natural History</i> Stephanie Molina, <i>California State University, San Bernardino</i> Luis Puga, <i>University of Texas, Arlington</i> Maisha Smith, <i>Lehman College, CUNY</i> Shirley Weng, <i>University of Virginia</i></p>	<p>WEDNESDAY, JULY 18, 2018</p>
		<p>7:00 am - 8:00 am Networking Session 2 and Continental Breakfast <i>(Regency A,B,C)</i></p>
		<p>8:00 am - 10:00 am Discussion Sessions: Exploring the 2018 Summit Theme <i>(See handout for room assignments)</i></p>
12:00 pm - 12:15 pm	Break	<p>10:00 am - 10:15 am Break</p>
12:15 pm - 1:45 pm	<p>Plenary Session 4 and Working Lunch <i>(Regency A,B,C)</i></p> <p>Moderator: Tom Kim, <i>Program Director, NSF DUE</i></p> <p>Speaker: Charles Fadel, <i>Founder, Center of Curriculum Redesign and Foundation Helvetica Education; Author 'Four-Dimensional Education,' and visiting scholar, Harvard Graduate School of Education</i></p>	<p>10:15 am - 11:15 am Concurrent Workshops Session 2 <i>(See handout for workshop room assignments.)</i></p> <p>11:15 am - 11:30 am Break</p> <p>11:30 am - 12:30 pm Closing Plenary Session 6: Synthesis from Discussion Groups and Plenary Sessions <i>(Regency A,B,C)</i></p> <p>Discussants: Shirley M. Malcom, <i>Director, Education and Human Resources Programs, AAAS</i></p> <p>Kathleen Bergin, <i>Program Director, Co-Lead Robert Noyce Teacher Scholarship Program, NSF</i></p>
1:45 pm - 2:00 pm	Break	<p>Evaluation</p>
2:00 pm - 3:30 pm	<p>Poster Session 2 <i>(Regency Foyer/Columbia Foyer/ Columbia A,B)</i></p>	<p>12:30 pm Summit Adjourns</p>
3:30 pm - 4:00 pm	Remove Posters Break	<p>12:30 pm Museum Tours for Scholars and Fellows <i>(Meet Tour Guides at the Regency Foyer Wall)</i></p>
4:00 pm - 5:00 pm	<p>Plenary Session 5 <i>(Regency A,B,C)</i></p> <p>Moderator: Andrea Nixon, <i>Program Director, NSF DUE</i></p> <p>Speaker: Rochelle Gutiérrez, <i>Professor of Curriculum and Instruction and Latina/Latino Studies, University of Illinois, Urbana-Champaign</i></p> <p>Announcements</p>	
5:00 pm	Dinner On Your Own	



Kathleen Bergin, *Program Director, Division of Undergraduate Education, Directorate for Education and Human Resources, NSF*

Kathleen Bergin is a Program Director in the Division of Undergraduate Education in the Directorate for Education and Human Resources at the National Science Foundation. She is a biologist by training, but an educator by passion. Bergin currently serves as the Lead Program Officer in the Robert Noyce Teacher Scholarship program and the Lead Program Officer in the Math and Science Partnerships/STEM-C: MSP Partnerships legacy program. She also serves as a Program Officer in the Improving Undergraduate STEM Education (IUSE: EHR) program, primarily related to teacher preparation and interdisciplinary studies.

Bergin manages a portfolio of awards in the programs listed above, as well as in the EHR Core Research (ECR) program, and in the Transforming Undergraduate Education in STEM (TUES) and the Laboratory Improvement (CCLI) programs, the latter two related to undergraduate biology, as well as the Innovation through Institutional Integration legacy program. She believes that all can learn mathematics and science at deep meaningful levels, and that it is the adults that need to work to discover the strategies that will engage, motivate, and provide access to the creativity and wonder that are inherent in these disciplines.

Bergin holds degrees from Georgia College at Milledgeville and Georgia State University. She was a classroom teacher of chemistry, physics, and biology for twelve years. She was a central office administrator for three years, during which time she implemented a totally hands-on middle grades mathematics and science program. She has been a State Science Coordinator, State Curriculum Director, and held positions at the University of Georgia and the Georgia Institute of Technology, where she retired as the Associate Director for the Center for Education Integrating Science, Mathematics and Computing (CEISMC) in the College of Sciences prior to returning (previously on-loan to NSF) to the National Science Foundation as a permanent employee in 2004.

It is the amalgam of these experiences that have brought Bergin to believe that it is the conceptual understandings, dispositions, and problem solving skills found in mathematics and science that serve as the basis for success for all individuals relative to personal economic sufficiency, civic responsibility, social justice, and joie de vivre. She believes that our youth should not be shackled by limiting adult perceptions of their potential, but rather adults should ensure that our youth own the mathematical and scientific knowledge and skills that will allow them to explore the post-secondary options of their choosing, in the near and long-term. It's about preparation, opportunity, and options for all.



Quincy Brown, *Program Director for STEM Education Research, AAAS*

Quincy Brown is a Program Director for STEM Education Research at the American Association for the Advancement of Science (AAAS). Her project portfolio includes the Robert Noyce Teacher Scholarship Program and investigating innovations in preservice STEM teacher education, investigating STEM mentoring practices, and supporting the AAAS Emerging Researchers National Conference. She was previously a Senior Policy Advisor in the White House Office of Science and Technology Policy. There her portfolio included Agricultural Entrepreneurship, STEM Education, and the My Brother's Keeper STEM+ Entrepreneurship initiatives. She was also an AAAS Science and Technology Policy Fellow at the National Science Foundation. She earned her PhD in Computer Science from Drexel University. She is a recipient of the Computing Community Consortium (CCC) CI Fellows Postdoctoral Research Fellowship award and was a National Science Foundation GK-12 and Bridge To the Doctorate Fellow.

Brown was also a Professor of Computer Science at Bowie State University. Her research interests included Mobile HCI, CS Education, and Broadening Participation in Computing. In 2011 she founded *Girls Who Will*, a summer program for middle and high school girls. Through her research she sought to identify methods of facilitating human interaction with advanced technologies to support learning. Her projects included exploring the ways in which young children use touch and gesture interactions with mobile devices, first responders' use of mobile devices during emergency evacuations, and modeling inquiry behaviors on mobile devices.



Charles Fadel, *Founder, Center of Curriculum Redesign and Foundation Helvetica Education; Author 'Four-Dimensional Education,' and Visiting Scholar, Harvard Graduate School of Education*

Charles Fadel is a global education thought leader and author, futurist and inventor; founder and chairman of the Center for Curriculum Redesign; visiting scholar at Harvard GSE; chair of the education committee at BIAC/OECD; co-author of *"Four-Dimensional Education"* (available in sixteen languages) and best-selling *"21st Century Skills"*; founder and president of the Fondation Helvetica Educatio (Geneva, Switzerland); senior fellow at The Conference Board. He has worked with education systems and institutions in more than thirty countries. He was

BIOGRAPHIES

formerly Global Education Lead at Cisco Systems, visiting scholar at MIT ESG, and angel investor with Beacon Angels. He holds a BSEE, an MBA, and seven patents.

Full Bio at: <http://curriculumredesign.org/about/team/#charles>



Yolanda S. George, Deputy Director, Education and Human Resources (EHR) Programs, AAAS

Yolanda Scott George is Deputy Director and Program Director, Education and Human Resources Programs, American Association for the Advancement of Science (AAAS). She has served as Director of Development, Association of Science-Technology Centers (ASTC), Washington, DC; Director, Professional Development Program, University of California, Berkeley; and as a research biologist at Lawrence Livermore Laboratory, Livermore, California involved in cancer research and cell cycle studies using flow cytometer and cell sorters.

George conducts evaluations, workshops and reviews for the National Institutes of Health and National Science Foundation (NSF), as well as for private foundation and public agencies, including the European Commission. She develops and coordinates conferences and workshops related to STEM undergraduate reform and recruitment and retention of minorities, women, and persons with disabilities in STEM. She works with UNIFEM, UNESCO, L'Oréal USA and Paris, and non-governmental organizations on gender, science, and technology initiatives related to college and university recruitment and retention and women leadership in STEM. She currently serves as principal investigator (PI) or co-PI on several NSF grants, including Vision and Change in Undergraduate Biology Education; National Science Education Digital Library (NSDL) Biological Sciences Pathways; Historically Black Colleges and Universities-Undergraduate Programs (HBCU-UP); Robert Noyce Teacher Scholarship Program; Transforming Undergraduate Education in STEM (TUES) and Virtual Faculty Workshop; and Women's International Research Collaborations at Minority Serving Institutions. In addition, George is the lead AAAS staff person for the L'Oréal USA Fellowships for Women in Science Program (postdoctoral fellowships) and the David and Lucile Packard Foundation HBCU Graduate Scholars Program (graduate school fellowships).

George serves on a number of boards or committees, including: Maria Mitchell Women in Science Awards Committee; McNeil/Lehrer Productions Online Science Reports Advisory Committee; Burroughs Wellcome Fund, Science Enrichment Program Grants, Advisory Board; The HistoryMakers, ScienceMakers, Advisory Board; and the National Advisory Board of The American Physical Society Physics Bridge Program. She has authored or coauthored

over 50 papers, pamphlets, and hands-on science manuals. She received her BS and MS from Xavier University of Louisiana and Atlanta University in Georgia, respectively.



Rochelle Gutiérrez, Professor of Curriculum and Instruction and Latina/Latino Studies, University of Illinois, Urbana-Champaign

Rochelle Gutiérrez is Professor of Curriculum and Instruction and Latina/Latino Studies at the University of Illinois, Urbana-Champaign, USA. Her research interrogates the unearned privilege that mathematics holds in society and the roles that race, class, language, and gender play in teaching and learning mathematics so as to open up a new possible relationship between living beings, mathematics, and the planet.

Her current research projects include: theorizing the roles of mathematics in relation to power, identity, the body, and authority in society; supporting mathematics teachers who engage their students in rigorous and creative mathematics and who are committed to social justice; and documenting moments of "Nepantla" and "creative insubordination" in the everyday practices of mathematics teachers. She has obtained a number of grants for her work, including from the Institute of Educational Sciences/American Educational Research Association, Spencer Foundation, and the National Science Foundation.

She has served as a member of the writing team for the Standards for Preparing Teachers of Mathematics produced by the Association of Mathematics Teacher Educators. On a Fulbright fellowship, she studied secondary mathematics teachers in Zacatecas, México, where she was able to document the different cultural practices and algorithms used in Mexican classrooms.

She has earned the Excellence in Research Award from the Association of Mathematics Teacher Educators for the work she has conducted and the theories on equity she has offered to the field. Pace University recognized her as a Distinguished Educator in the Pedagogy of Success in Urban Schools. And, TODOS Mathematics for All recently awarded her the Iris M. Carl Equity and Leadership Award.

Her work has been published in such journals as American Educational Research Journal, Mathematical Thinking and Learning, Journal for Research in Mathematics Education, Harvard Educational Review, Democracy and Education, Urban Review, and The Mathematics Teacher. Before and throughout graduate school, she taught middle and high school mathematics to adolescents in East San José, California. In her free time, she is

a board game geek, sews old clothing into new objects, teaches power yoga, and agitates for change with respect to local and global politics.

She earned her bachelor's degree from Stanford University and a Masters and PhD from the University of Chicago.



Cato T. Laurencin, *University Professor, UConn; Chief Executive Officer, Connecticut Institute for Clinical and Translational Science (CICATS); Director, Institute for Regenerative Engineering; Endowed Chair Professor, Department of Orthopedic Surgery, UConn Health Tenured Professor, School of Engineering*

Cato T. Laurencin is a University Professor at the University of Connecticut (the 8th to be designated in the institution's over 130 year history). He is the Albert and Wilda Van Dusen Distinguished Endowed Professor of Orthopaedic Surgery. He is Professor of Chemical and Biomolecular Engineering, Professor of Materials Science and Engineering, and Professor of Biomedical Engineering at UCONN. Laurencin is the Founder and Director of the Raymond and Beverly Sackler Endowed Center for Biomedical, Biological, Physical and Engineering Sciences at the University of Connecticut.

Laurencin earned his B.S.E. degree in Chemical Engineering from Princeton University and his M.D., *Magna Cum Laude* from the Harvard Medical School where he received the Robinson Award for Surgery. He earned his Ph.D. in Biochemical Engineering/ Biotechnology from the Massachusetts Institute of Technology where he was named a Hugh Hampton Young Fellow.

A practicing surgeon, Laurencin has been named to America's Top Doctors and America's Top Surgeons, and is a Fellow of the American Surgical Association, a Fellow of the American College of Surgeons, and a Fellow of the American Academy of Orthopaedic Surgeons. He is the recipient of the Nicolas Andry Award from the Association of Bone and Joint Surgeons.

Laurencin is a teacher, in courses at the graduate school, the medical school, the college of arts and sciences, and the engineering school at the University of Connecticut. He received the Distinguished Engineering Educator Award from the Engineer's Council in 2017.

In research, Laurencin is known internationally for his work in biomaterials, nanotechnology, stem cell science, drug delivery systems, and a new field he has pioneered, regenerative engineering. He has been funded by the National Institutes of Health, the National Science Foundation, and the Department of

Defense. Laurencin produced seminal studies in a number of areas of biomaterials. He and his colleagues were the first to develop nanofiber technologies for tissue regeneration. His group was the first to develop polymer-ceramic systems for bone regeneration. The American Institute of Chemical Engineers specifically cited this achievement in naming him one of the 100 Engineers of the Modern Era. His contributions to Biomaterials earned him the Founder's Award from the Society for Biomaterials.

Laurencin was honored at the White House where he received the Presidential Faculty Fellowship Award from President William Jefferson Clinton in recognition of his research work bridging medicine and engineering. Laurencin is the first individual to receive two Emerging Frontiers in Research and Innovation (EFRI) Awards from the National Science Foundation. In addition, Laurencin received the NIH Director's Pioneer Award, NIH's highest and most prestigious research award, for his new field of Regenerative Engineering.

Laurencin is dedicated to mentoring students, especially underrepresented minority engineers and scientists. He received the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring from President Barack Obama in ceremonies at the White House, the Elizabeth Hurlock Beckman Award for Mentoring, the Alvin H. Crawford Mentoring Award, and the American Association for the Advancement of Science's Mentor Award.

Laurencin has worked in addressing issues involving health disparities and diversity. He was Speaker of the House of Delegates of the National Medical Association, and the Founding Chair of the Board of Directors of the W. Montague Cobb/ National Medical Association Health Institute. He is the Founding Editor-in-Chief of *The Journal of Racial and Ethnic Health Disparities*, published by Springer Nature. He has received the Martin Luther King, Jr. Leadership Award from M.I.T. and the Diversity Award from the Biomedical Engineering Society in recognition of his efforts.

The W. Montague Cobb Institute and the National Medical Association established the Cato T. Laurencin Lifetime Research Achievement Award given at the opening ceremonies of the National Medical Association's Annual Meeting each year, while the Society for Biomaterials established The Cato T. Laurencin, M.D., Ph.D. Travel Fellowship Award given to underrepresented minority students pursuing biomaterials research. Laurencin is a faculty member affiliated with the Africana Studies Institute at UCONN and led a National Academy of Medicine Workshop entitled: An American Crisis: The Growing Absence of Black Men in Medicine and Science (<https://www.nap.edu/catalog/25130/an-american-crisis-the-growing-absence-of-black-men-in>).

Laurencin is a leader in the area of Convergence. He was a co-organizer of the National Academy of Sciences Workshop

entitled “Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond”. He is currently a member of the National Academies Committee on Convergence, Chaired by the Presidents of the National Academies.

Laurencin is an elected member of both the National Academy of Medicine, the National Academy of Engineering and AAAS. Internationally, he is an elected Fellow of the African Academy of Sciences, an elected Fellow of the India National Academy of Sciences, an elected Fellow of the Indian National Academy of Engineering and is a Fellow of The World Academy of Sciences. Laurencin is an Academician and elected Member (Foreign) of the Chinese Academy of Engineering and a recipient of the National Medal of Technology and Innovation in ceremonies at the White House. It is the highest honor bestowed in America for technological achievement.



William “Jim” Lewis, *Acting Assistant Director, Education and Human Resources Directorate, NSF*

W. James “Jim” Lewis is Aaron Douglas professor of mathematics and Director of the Center for Science, Mathematics, and Computer Education at the University of Nebraska-Lincoln (UNL). At UNL, Lewis

has served as President of the UNL Faculty Senate, President of the UNL chapter of AAUP, and chair of the Department of Mathematics (1988-2003). During the time he served as chair of his department, the department won the University-wide Department Teaching Award and an NSF Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. He has received many teaching awards including the University’s Outstanding Teaching and Instructional Creativity Award, membership in UNL’s Academy of Distinguished Teachers, and the Carnegie Foundation’s 2010 Nebraska Professor of the Year. He is also the recipient of the UNL Chancellor’s Commission on the Status of Women Award for his support of opportunities for women in the mathematical sciences and UNL’s Louise Pound-George Howard Distinguished Career Award. In 2015, Lewis was recognized by the Mathematical Association of America’s Gung and Hu Award for Distinguished Service and the American Mathematical Society’s Award for Impact on the Teaching and Learning of Mathematics.

Lewis has been PI or co-PI for several NSF grants including PI for two NSF Math Science Partnerships, the Math in the Middle Institute Partnership, and NebraskaMATH. He was chair of the Committee that produced the CBMS report, *The Mathematical Education of Teachers*, in 2001 and chair of the writing team for the follow-up publication, *The Mathematical Education of Teachers II*, in 2012. He was co-chair of the National Research Council committee that produced *Educating Teachers of Science,*

Mathematics and Technology: New Practices for the new Millennium. He was a member of the AMS Task Force that produced *Towards Excellence: Leading a Doctoral Mathematics Department in the 21st Century* as well as the author of the first four chapters of this book. He was also a member of the NRC Committee that produced *Preparing Teachers: Building Evidence for Sound Policy*. He is a past chair of the Conference Board of the Mathematical Sciences, the Mathematical Association of America’s Coordinating Council on Education and the American Mathematical Society’s Committee on Education. He received his Ph.D. in mathematics from Louisiana State University.

Lewis is currently on leave from UNL and serving as the Acting Deputy Assistant Director for the Education and Human Resources Directorate at the National Science Foundation.



Gary E. Machlis, *University Professor of Environmental Sustainability at Clemson University and Former Science Advisor to the Director, National Park Service*

Gary E. Machlis is University Professor of Environmental Sustainability at Clemson University, and served as Science Advisor

to the Director, U.S. National Park Service (NPS) during both terms of the Obama administration. He was the first scientist appointed to this position within the NPS, and advises the director on a range of science policy issues and programs. Dr. Machlis also served as co-Leader of the U.S. Department of the Interior’s Strategic Sciences Group, which conducts scientific assessments during major environmental crises. He joined the Clemson faculty in 2013; he was on the faculty at the University of Idaho from 1979-2013.

Machlis received his bachelor's and master's degrees from the University of Washington in Seattle, and his Ph.D. in human ecology from Yale. He has written numerous books and scientific papers on issues of conservation, human ecology, and sustainability, including *The State of the World's Parks* (1985), the first systematic study of threats to protected areas around the world. His most recent books (co-authored) are *The Structure and Dynamics of Human Ecosystems* (2017), and *The Future of Conservation in America: A Chart for Rough Water* (2018). His research has been published in journals as varied as *Bioscience*, *Climatic Change*, *Conservation Biology*, *Society and Natural Resources*, and *Science*. Machlis served as a founding Deputy Editor for *Science Advances*, the online scientific journal in the *Science* family of journals.

He has been a leader in collaborative higher education, and serves as an advisor to the American Association for the Advancement of Science (AAAS) National Committee on Opportunities for Women and Minorities in Science. He was

instrumental in the development of the Cooperative Ecosystem Studies Units (CESU) Network, which includes 13 U.S. federal agencies and over 200 universities, and served as its National Coordinator from 1998-2006. For this work, Machlis was a recipient of the Department of the Interior's 2000 Conservation Service Award, one of the highest awards of the Department granted to private citizens.

Machlis is active in international conservation, and is a member of the IUCN's Commission on National Parks and Protected Areas. He worked in China in 1981 and again in 1986-87 and 2004 on the Giant Panda Project for the World Wildlife Fund, and has conducted research on conservation and sustainability issues in the Galápagos Islands, the national parks of Kenya, and in Eastern Europe. Most recently, he has helped advance environmental science and sustainability collaborations between the U.S. and Cuba. He helped establish and directed the National Parks Science Scholars Program, with over \$8 million in scholarships to students from Canada, the United States, Mexico, and the countries of Latin America.

As co-leader of the Strategic Sciences Group, Machlis led the Group's response and assessment related to the Deepwater Horizon oil spill and Hurricane Sandy. He also led the AAAS project to rebuild science capacity in Haiti after its devastating earthquake. His current research activities include science for parks, applying human ecology to sustainability issues, and the conduct of science during major environmental crises. In 2010, Machlis was elected as a Fellow of the American Association for the Advancement of Science.



Shirley M. Malcom, *Director of Education and Human Resources (EHR) Programs, AAAS*

Shirley M. Malcom, Director of Education and Human Resources (EHR) Programs at AAAS, has served as a program officer in the NSF Science Education Directorate; an assistant professor of biology, University of North Carolina, Wilmington; and a high school science teacher. Malcom received her PhD in Ecology from the Pennsylvania State University; Master's in Zoology from the University of California, Los Angeles; and Bachelor's with distinction in Zoology from the University of Washington. In addition, she holds 17 honorary degrees.

Malcom serves on several boards, including the Heinz Endowments, Public Agenda, Digital Promise, and the National Mathematics and Science Initiative. She serves as a trustee of Caltech and as a Regent of Morgan State University. In 2003, Malcom received the Public Welfare Medal of the National Academy of Sciences, the highest award given by the Academy. She was a member of the National Science Board, the

policymaking body of NSF, from 1994 to 1998, and of the President's Committee of Advisors on Science and Technology from 1994 to 2001.



Sandra Richardson, *Program Director and Program Lead, Robert Noyce Teacher Scholarship Program, DUE, NSF*

Sandra Richardson is a Program Director at the National Science Foundation (NSF) in the Division of Undergraduate Education, Directorate for Education and Human Resources and the Program Lead for the NSF Robert Noyce Teacher Scholarship Program. She earned a MS and PhD in Mathematics Education from Purdue University and a BS in Mathematics from Dillard University. Her research publications and scholarly interests have been motivated by the intersection of her personal, professional, and scholarly experiences as a student, teacher, research professor, and academic. Her scholarly and research interests include developing effective tools for mathematics curricula, advancing pedagogical content knowledge of mathematics teachers, studying minority and underrepresented students' mathematical thinking at all levels of school mathematics, and mathematics teacher education. She has been the principal investigator and co-principal investigator on numerous public, private, and federal grants, including funding efforts to study secondary mathematics teachers' mathematical knowledge for teaching, impacts of mathematics enrichment programs on students' STEM success, and effective means of preparing prospective and in-service mathematics teachers to teach English Language Learners. In addition to Richardson's research interests, she also has a passion for inspiring underrepresented students to pursue advanced degrees in STEM disciplines.

Richardson has served on numerous district, state, and national committees and advisory boards focusing on mathematics teacher education and increasing the representation of underrepresented students in STEM fields. She is a Mathematical Association of America Project NExT Fellow and an active member of Association of Mathematics Teacher Educators and Mathematical Association of America, among other professional societies. She has received numerous honors and awards, including a University Excellence in Teaching and Research Merit Award and the Texas State Teachers Association *Advisor of the Year Award* for her mentoring and outreach efforts and spent a summer preparing mathematics teachers in Cape Coast, Ghana.

In addition to managing a portfolio of awards in the Noyce program, Richardson also manages a portfolio of awards in the Improving Undergraduate STEM Education (IUSE), Transforming Undergraduate Education in STEM (TUES), and Laboratory Improvement (CCLI) programs.

BIOGRAPHIES



Iris R. Wagstaff, AAAS Program
Director, EHR, AAAS

Iris R. Wagstaff is a STEM Program Director in Education and Human Resources Programs at the American Association for the Advancement of Science (AAAS). She is a former 2015-2017 AAAS Science and Technology

Policy Fellow at the National Institute of Justice Office of Investigative and Forensic Sciences where she led an agency-wide strategic diversity and inclusion initiative. She is a native of Goldsboro, NC and has a BS and MS in Chemistry from UNC-Greensboro and NC A&T State Universities respectively.

She has over 20 years of STEM outreach and advocacy developing informal science programs, mentoring, resourcing parents, and working with K-12 science teachers to develop culturally relevant and engaging lessons with real-world applications. She has advocated for students at the K-20 levels and built strategic partnerships between industry, educators, and researchers. She worked as a research chemist at the Rohm and Haas Company (now Dow Chemical) for 15 years where she led project teams.

She obtained a PhD in STEM education research and policy analysis from NC State University in 2014 where she examined factors that predict science self-efficacy, science identity, and STEM career intent in a nationally representative sample of high school students. She is the founder of the SMART Scholars initiative for middle school girls that provide hands-on STEM outreach, role models, and parent resources in NC and the metropolitan Washington, DC area. She is a long-time member of the National Organization of Black Chemists and Chemical Engineers and serves on the National Executive Board.

She is also a long-time member of the American Chemical Society where she serves as Manager and STEM Education Chair of the Chemical Society of Washington. She has received several acknowledgements for her STEM outreach that include a 2016 nomination for the Presidential Award for Excellence in Science, Math, and Engineering Mentoring (PAESMEM), and the 2017 Women of Color in STEM Promotion of Education Award.

About the 2018 Noyce Summit Small Group Discussion Sessions

The **2018 Noyce Summit** small group discussion sessions will provide additional information for the AAAS Guide to Innovation in Science and Mathematics Preservice Teacher Education and Leadership Development. To this end discussions will begin to explore the summit theme, ***Towards a 2026 STEM Education: Implications of Convergent Science for K-12 STEM Teacher Preparation in the Face of Changing Demographics*** including:

- How can STEM teacher preparation programs show the deeper connections among STEM fields within each course, including connections to societal challenges and the risk and benefits of science?
- What new courses or labs or experiences are needed to help prospective teachers to be prepared to make deeper connections across STEM fields in the K-12 classroom?
- What are the infrastructure changes needed to implement courses and labs that show the deeper connections across STEM fields within each course?
- What resources exist and which are needed to facilitate course changes that show the deeper connections across STEM fields within each course?
- What experiences need to be provided to help teachers understand how to use culturally responsive connections to engage diverse learners?

Small Group Discussion Session Leaders

Nathan Alexander, *University of San Francisco/Morehouse College*

James Alvarez, *University of Texas at Arlington*

Jose Blackorby, *CAST Inc.*

Hilda Borko, *Stanford University*

Ann Cavallo, *University of Texas at Arlington*

Scott Dantley, *Dantley and Associates*

Dana Franz, *University of Mississippi*

Drew Gitomer, *Rutgers University Graduate School of Education*

Greg Hale, *University of Texas Arlington*

Michelle Head, *Kennesaw State University*

Billy Jackson, *University of Louisville*

Jihyun Kim, *Lehigh University*

Ramon Lopez, *University of Texas at Arlington*

James Matthews, *Siena College*

Camille McKayle, *University of the Virgin Islands*

Robert Megginson, *University of Michigan*

S. Justin Polizzi, *Kennesaw State University*

Bethany Rodgers, *Woodrow Wilson National Fellowship Foundation*

Donna Ross, *San Diego State University*

Ruthmae Sears, *University of South Florida*

Walter Secada, *University of Miami*

Hannah Sevia, *University of Massachusetts Boston*

Wendy Smith, *University of Nebraska*

Gay Stewart, *West Virginia University*

Marilyn E. Strutchens, *Auburn University*

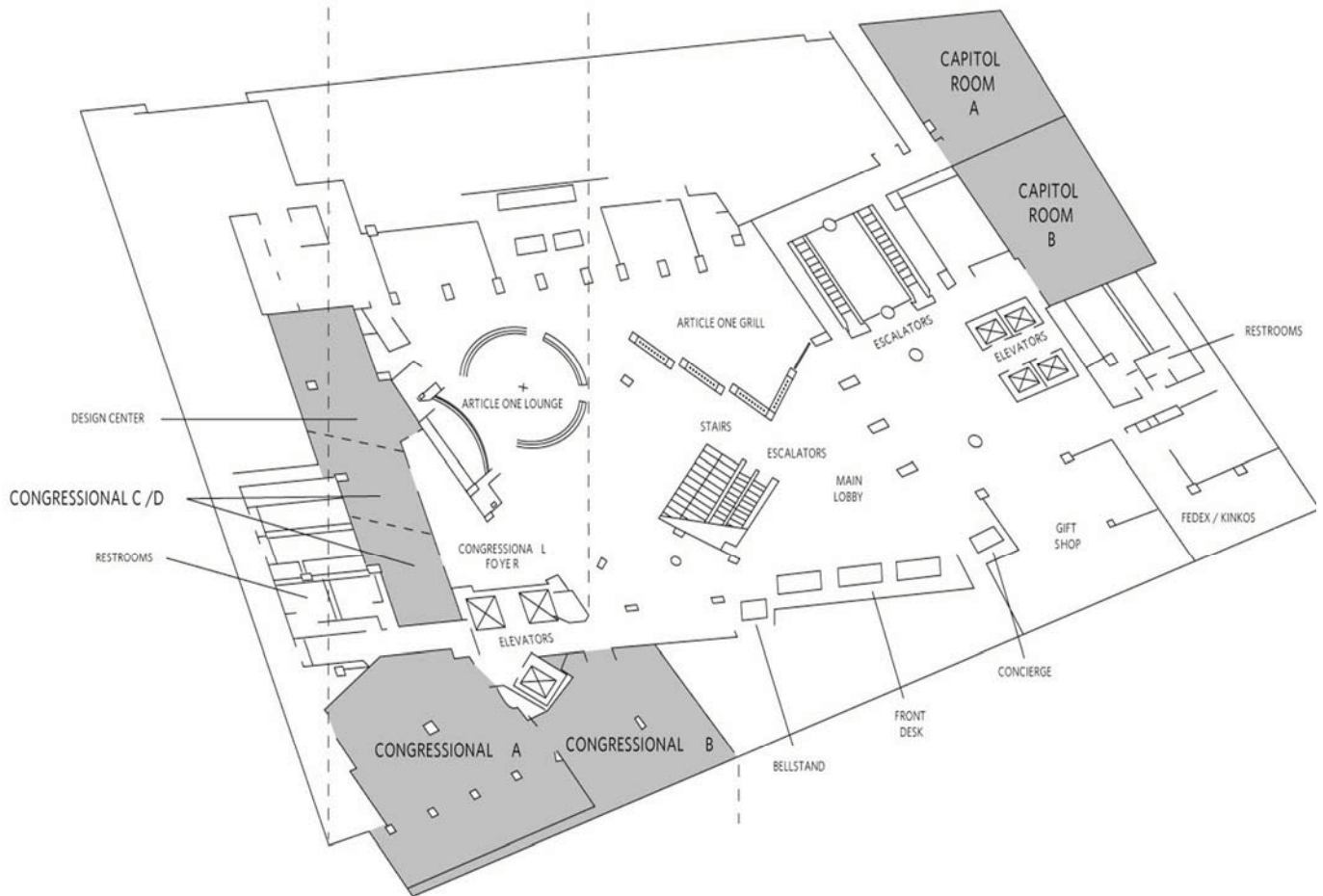
Sharon Vestal, *South Dakota State University*

Audra Watson, *Woodrow Wilson National Fellowship Foundation*

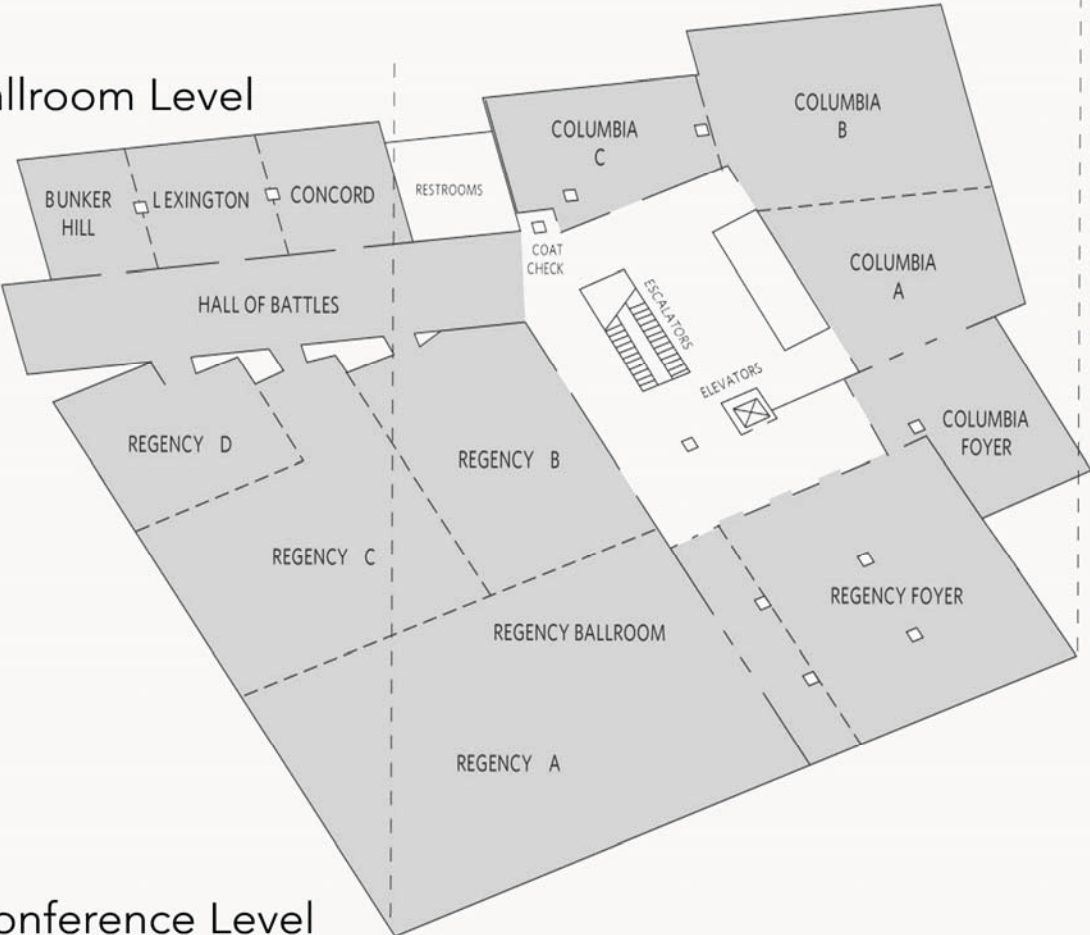
J Michael Wyss, *University of Alabama at Birmingham*

Peter Youngs, *University of Virginia*

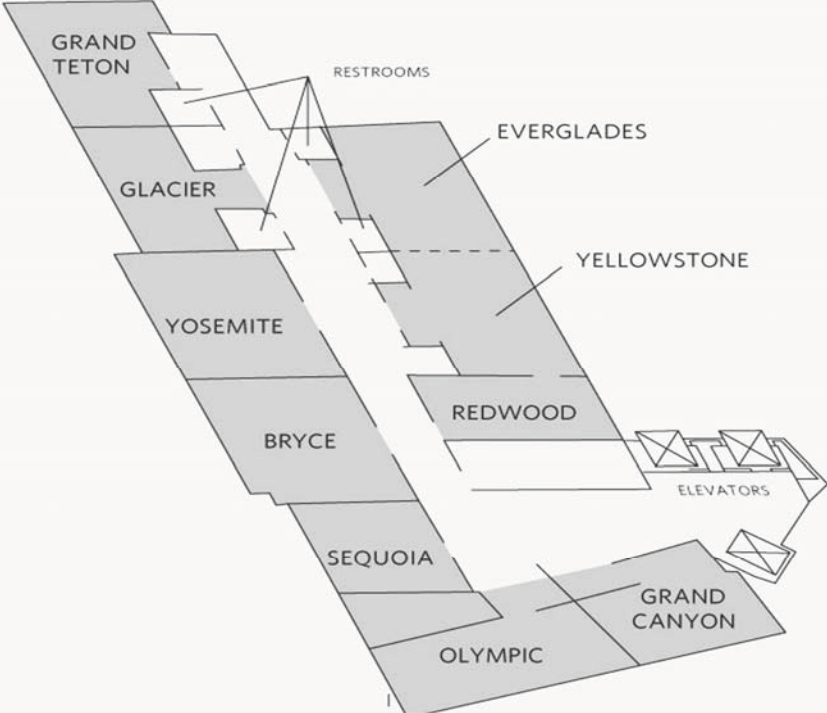
Lobby Level



Ballroom Level



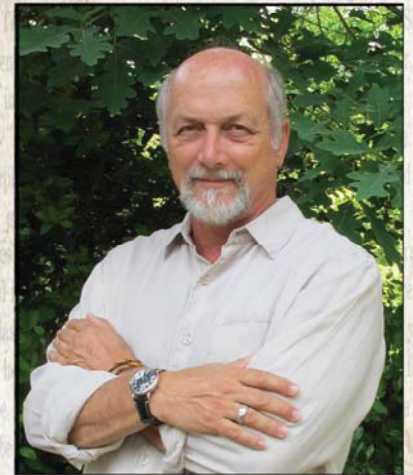
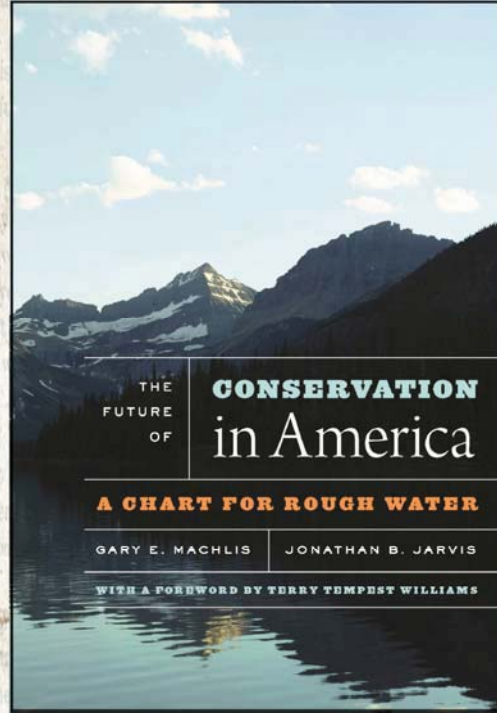
Conference Level



AUTHOR EVENT



The Future of Conservation in America



Join Busboys and Poets Books for a reading and signing with Dr. Gary Machlis for his new book, *The Future of Conservation in America: A Chart for Rough Water*. Written with Jon Jarvis, the eighteenth director of the National Park Service, this candid and caring book about conservation has been described by Pulitzer Prize-winning scientist E.O. Wilson as “a call to action written with authority and passion.”

BUSBOYS AND POETS
14th & V | LANGSTON ROOM
JULY 17, 2018 | 6:30-8:00pm

Session 1: Tuesday, July 17, 2018 9:30am - 10:45am

1.1 SUPERMOON! Literacy Infused STEAM

Length of Session: 75 minutes

Kevin Carr, Pacific University, kcarr@pacificu.edu, Co-Principal Investigator

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars

Topic: Teaching a Diverse Student Population

Participants will focus on ways STEAM teachers can provide students supported access to STEAM academic language. The specialized vocabulary, syntax, and discourse styles of STEAM represent a particularly significant barrier to students of color, future bilingual students (English Language Learners), and first-generation college students. Therefore, supporting access to STEAM academic language represents a leverage point teachers can use to improve the experience of students in the STEAM classroom. First, we will discuss how supporting STEAM language literacy will broaden pathways into STEAM education and careers for all students, and then we will practice tools and routines for infusing language support into STEAM curricula and instruction at the classroom level.

1.2 Supporting the Next Generation Science Standards (NGSS) with New Curriculum Materials

Length of Session: 75 minutes

Cari Herrmann Abell, AAAS Project 2061, cabell@aaas.org, Senior Research Associate
Jo Ellen Roseman, jroseman@aaas.org, AAAS Project 2061, Director

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, School and District Administrators
Topic: Resources for Teachers

Led by the AAAS Project 2061 development team, the workshop introduces participants to curriculum materials designed to support the Next Generation Science Standards (NGSS). The workshop focuses mainly on Toward High School Biology (published in 2017 by NSTA Press), a curriculum unit shown to improve 8th grade students' understanding of matter changes in chemical reactions and ability to use ideas about atom rearrangement and conservation during chemical reactions to explain phenomena involving the growth and repair of living organisms. The workshop will demonstrate how the unit tackles

some key problems, including persistent misconceptions many students have about matter changes. As participants try out sample activities and explore additional online teacher resources, they will see firsthand how the unit engages students in using science ideas and practices to make sense of phenomena, the essence of the vision of NGSS. The workshop concludes with a brief introduction to a high school unit that AAAS Project 2061 is currently developing and testing as a sequel to the 8th grade unit. The high school unit, Matter and Energy for Growth and Activity, builds on ideas about matter changes and introduces ideas about energy changes to help students explain how energy-releasing and energy-requiring chemical reactions are coupled to help living organisms move and grow.

1.3 A Rose by Another Name: Teaching Newly-Arrived English Learners

Length of Session: 75 minutes

Linda Houts-Smith, Minnesota State University Moorhead, Houtsli@mnstate.edu, Noyce Grant Co-PI, Associate Professor & Program Coordinator, Teaching ESL

Target Audience: Noyce Master Teachers, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars
Topic: Teaching a Diverse Student Population

Session attendees will find themselves in the shoes of a newly-arrived high school English learner as they experience a science or math lesson taught in a language they are unlikely to be familiar with. Post-experience debriefing and discussion will focus on instructional strategies teachers can use and learning strategies they can teach ELs to assist them in overcoming language barriers.

1.4 Enhancing Fellows' Professional Development Using an Innovative Self-Evaluation Approach

Length of Session: 75 minutes

Sarah Irvine-Belson, American University, sarah@american.edu, Executive Director, Institute for Innovation in Education School of Education, American University
Prof. Kathryn Newcomer, kathryn.newcomer@gmail.com, George Washington University, external evaluator
Prof. Steve Mumford, steven.mumford@gmail.com, University of New Orleans, external evaluator
Danielle Sodani, dgsodani@american.edu, Institute for Innovation in Education at American University, Program Administrator

Juliet Meltsner, jmeltsne@terpmail.umd.edu, Deal Middle School, Fellow

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars
Topic: Research and Evaluation

Noyce PIs and evaluators often face challenges evaluating the relationships between fellows' teaching practice in the field and impact on student outcomes, mainly because of the diverse STEM subjects taught by fellows and lack of consistent assessment strategies across many school systems. In addition, assessment of high stakes test scores rarely leads to information that allows for program improvement. To overcome these barriers and enhance fellows' capacity for self-reflection and development, the PIs and evaluators on this project elected to guide and coach fellows on reflecting on their evaluation of student outcomes. Through this process, we collaboratively developed templates and guidance for fellows' measurement and reporting of student growth, provided training and technical assistance to fellows as they prepared student outcome data, and guided fellows in reflecting on results to improve their practice and capacity for self-evaluation. The evaluators then aggregated fellows' student outcome reports to assess the program's overall impact, both on students' and fellows' development. This interactive workshop will walk attendees through the design and implementation of the fellow self-evaluation process from multiple perspectives: Noyce PIs, evaluators, and a fellow. We will discuss initial challenges that prompted the innovative approach, explain how we initiated and improved it over time, share supporting documents and sample reports, and reflect on strengths and shortcomings through different lenses. Beyond contributing to an external evaluation of the program, this student outcome assessment model enhanced fellows' capacity for self-reflection and ability to continuously improve their teaching practice beyond the fellowship.

1.5 Professional Noticing of Students' Scientific and Mathematical Ideas

Length of Session: 75 minutes

Lisa Lamb, San Diego State University, Lisa.Lamb@sdsu.edu, Mathematics Educator
Donna Ross, DLRoss@sdsu.edu, San Diego State University, Science Educator

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff
Topic: Resources for Teachers

Participants will explore a framework for examining students' scientific and mathematical ideas and then consider next steps on the basis of those ideas. Attendees will have an opportunity to attend to students' ideas, interpret those ideas, and decide how to respond on the basis of those ideas. The framework can be applied to written student work and to live, interactive discussions.

1.6 Statistics & Modeling in the Secondary Curriculum

Length of Session: 75 minutes

Sandra Madden, University of Massachusetts Amherst, smadden@umass.edu, PI - Supporting STEM Teaching and Learning through Communities (S2TLC)

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Non-Profit Organization Personnel, Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars
Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

The statistical preparation of teachers has never been more important as big data and data science are becoming ubiquitous. Unfortunately, most students encounter statistics in ways that do not promote their understanding of important statistical big ideas and instead focus on computational procedures. Statistical reasoning and sense-making tend to be nearly absent for many students. Building on research in statistics education, we've developed and implemented a blended-format course that has positively impacted learners' statistical understanding, use of powerful digital tools for exploring and doing statistics, and statistical knowledge for teaching. This session will introduce the course and some of its novel components and engage participants in an activity that is used to kick off the course and embody critical components for statistical reasoning. We will leave time for discussion and questions.

1.7 The Five Dimensions of Powerful Classrooms

Length of Session: 75 minutes

Behailu (aka Alu) Mammo, Hofstra University, matbzm@hofstra.edu, Principal Investigator

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Non-Profit Organization Personnel, Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District

Administrators, Undergraduate and/or Graduate Noyce Scholars
Topic: Resources for Teachers

In Alan Schoenfeld's Teaching for a Robust Understanding (TRU) framework, the five dimensions of powerful classrooms are characterized: the content; cognitive demand; equitable access to content; agency, ownership, and identity; and formative assessment. Hofstra Noyce program deliberately integrates these dimensions into all components of the program. In this workshop, we will discuss the framework and share how 'lesson study' and components of 'teacher noticing' can be applied to foster powerful learning environments. Preliminary findings help frame the questions workshop attendees will be invited to entertain. They include: (a) is there any teaching feature that is not represented by these dimensions? (b) what challenges do student teachers face in creating powerful classrooms in this context? (c) are there any opportunities and challenges unique to high-need classrooms in fostering these dimensions?

1.8 Creating Math Problem Solving Centers in High-Need School Classrooms

Length of Session: 75 minutes

Jim Matthews, Siena College, matthews@siena.edu, Professor
Emily Casey, ee05casey@gmail.co, Washington, D.C. Public Schools, Teacher and former Noyce Scholar

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars

Topic: Teaching a Diverse Student Population

Research and common sense indicate that students who are engaged in rich, meaningful mathematics programs learn more and perform at higher levels than students who are in narrow, test-prep focused programs. In this very interactive session, participants will learn about and discuss how to incorporate challenging, interesting mathematics into their programs. Mathematics classrooms should be problem-solving centers. Students should be provided with tasks that require them to do more than follow an algorithm. Problems may involve figuring something out, computing, modeling, proving, making an argument, finding examples, finding counter-examples, organizing, classifying and more. In all math classrooms, there should be problems of the day, of the week, and of the quarter. We will share how to successfully accomplish the goal of creating a problem-solving centered classroom.

In this session we will focus on posing, motivating, and implementing problems of the week. Workshop participants will work on some problems and see how a problem based

curriculum satisfies the most important learning standards in mathematics. By their nature, these activities heavily engage students in Common Core Standards for Mathematical Practice. Researchers (like Jo Boaler) have documented how programs that include this type of rich mathematics result in higher levels of performance.

1.9 Fostering Teacher Growth Beyond the Critical Years

Length of Session: 75 minutes

Sharon Vestal, South Dakota State University, sharon.vestal@sdstate.edu, PI
Matt Miller, matt.miller@sdstate.edu, South Dakota State University, Co-PI
Amanda Jensen, amanda.jensen@sdstate.ed, South Dakota State University, Graduate Research Assistant

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, Undergraduate and/or Graduate Noyce Scholars

Topic: Resources for Teachers

The first few years of a teacher's career marks the time when most will question their career choice. It is during these years when it is critical for teachers to gain the creative skill to successfully integrate new ideas and activities. In order to build confidence to evaluate new course materials, to choose what will work in their classroom, and to integrate activities into the curriculum, novice teachers need to experience this first-hand. These skills are not explicitly taught in most teacher preparation programs. Our Noyce program has been able to help our scholars and alumni by providing various resources through social media, email, an annual conference, and other educational opportunities. These resources have developed a professional learning community that has led to teacher resilience. In this workshop, we will share some interactive lessons we have used at our Noyce conference and other teacher workshops. We will discuss how these tasks help foster a teacher's innovative thinking, which is essential in the 21st century classroom. Today's middle and high school teachers have a big responsibility in preparing their students for a very different world. This world requires problem solving skills, critical thinking, and collaboration. We will introduce you to STEM activities that promote these abilities. You will walk away with concrete ideas for your classroom or your Noyce project.

The following workshops are 35-minute workshops, sharing the same breakout rooms during Session 1:

Session 1:10a: 9:30am - 10:05am

1.10a Noyce Scholarship Program for Mathematics Excellence for High School Students: STEM Pedagogical Focus

Length of Session: 35 minutes

Puneet Gill, Texas A&M International University, puneet.gill@tamui.edu, Co-PI on the Noyce Grant
Jacqueline Gonzalez, jacqueline_gonzalez@dusty.tamui.edu, Noyce Scholar
Stephanie Garcilazo, stephaniegarcilazo@dusty.tamui.edu, Noyce Scholar
Nelly Garcia, nellygarcia@dusty.tamui.edu, Noyce Scholar

Target Audience: Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, Undergraduate and/or Graduate Noyce Scholars

Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

Excellence in mathematics among high school students is a gateway for higher education pursuit in mathematics. Based on these relevant experiences, students choose a Mathematics degree major program when seeking programs in college and university. STEM education is also an exciting experience for 9th - 12th grade students that is offered by the teachers graduated from the Noyce Scholarship programs. Students may opt to concentrate in any of the related fields. The intent of the program is to support the efforts of our local community schools in motivating and encouraging today's youth to be successful in mathematics, so it is the hope of the Noyce program to not only help students improve their mathematical skills but also their attitudes toward mathematics. As aforementioned, STEM education creates a fun environment in the mathematically and pedagogically enriched classrooms. Through a continuous reflection process in the program, as evidenced by the pedagogy model developed by the TAMIU Noyce scholarship program, students hone skills in STEM understanding and are encouraged to apply knowledge in field-based placements. This presentation will highlight the extent of these interventions and the multi-faceted program that provides several features that have guaranteed nothing but success to date. Furthermore, as a byproduct of this endeavor, the gender disparity existing among the Hispanics pursuing Mathematics majors among educators has been duly addressed and was able to be narrowed.

Session 1:10b: 10:10am - 10:45am

1.10b Empowering Secondary STEM Teachers: Developing Culturally Responsive Practices

Length of Session: 35 minutes

Wanda Lastrapes, University of North Florida, w.lastrapes@unf.edu, PI, Project Director/Faculty Administrator

Target Audience: Non-Profit Organization Personnel, Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, Undergraduate and/or Graduate Noyce Scholars

Topic: Teaching a Diverse Student Population

Jacksonville Teacher Residency (JTR), a collaborative model, shifts the narrative from unprepared novice teachers to one of empowerment and resiliency. This joint initiative between Duval County Public Schools and the University of North Florida prepares STEM graduates and professionals while they are engaged in a rigorous urban teaching residency. They are partnered with veteran master teachers in high-need secondary schools. This presentation will outline the culturally responsive framework of this preparation program that equips Residents to function as effective, high-impact teachers and leaders in urban middle and high schools that are currently characterized by high teacher turnover and low student achievement. Because of its relationship to teacher efficacy, encouraging teachers' cultural competence is important for all teacher preparation programs and is especially salient to ensuring the retention of high-quality science educators in high-need schools. (Mosely et al, 2014). Urban professional development with alignment to course constructs is ongoing and provides a bridge between the Master of Arts in Teaching coursework and the apprenticeship experiences. This culturally responsive framework includes: 1) Multicultural/urban course with place-based field studies; 2) Monthly seminars to equip residents to work sensitively and effectively with students from a wide range of socioeconomic and cultural backgrounds in order to strengthen STEM achievement in high-need urban schools; and 3) Progress evaluations to assess Residents' progress toward attaining required state competencies. Audience participants will participate in relevant community-building activities and culturally responsive dialogue. The presenter will address and explore key issues raised during the Q & A session.

Session 1:11a: 9:30am - 10:05am

1.11a Methods for Supporting Teachers' Inquiry into Power and Privilege

Length of Session: 35 minutes

Tyrone Washington, Millersville University, tyrone.washington@millersville.edu, Co-PI
Erin Moss, erin.moss@millersville.edu, Millersville University, Associate Professor

Target Audience: Project PIs, Co-PIs, Other Faculty/Staff
Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

A major challenge of teacher education is preparing teachers to support learners that may be different from themselves in particular, students that have historically been disadvantaged and are underrepresented in higher-level mathematics courses. Power and privilege have a tremendous influence on interactions in an educational context, and they impact opportunities for student learning. In our workshop, we will talk about a course we designed to meet the needs of our recent Noyce graduates as they begin the induction phase of their mathematics teaching career. Participants will examine methods to foster teachers' developing understanding of the complex dynamics involved in interacting with others in a school setting. Through a mix of individual explorations and small- and large-group discussions, participants will discover how to have productive conversations about sometimes uncomfortable issues involving power and privilege. We will provide participants with resources for facilitating these conversations, including scholarly articles, video clips, and tasks. During this time, participants will have the opportunity to assess their own privilege, illustrate different aspects of their identity, and watch brief video clips from stand-up comics. As participants engage in and discuss implementation of these resources, we will all ask questions, share insights, and learn how to better facilitate conversations about teachers as 'gatekeepers' of mathematics.

Session 1:11b: 10:10am - 10:45am

1.11b The Powerful Professional Resume of a Noyce Scholar

Length of Session: 35 minutes

Dorene Huvaere, Lewis University, huvaerdo@lewisu.edu, PI
Pam Pritchard, pritchpa@lewisu.edu, Director of School Partnerships, Noyce Recruiter

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, Undergraduate and/or Graduate Noyce Scholars
Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

This session examines how the Noyce Scholars program is preparing STEM teacher candidates and enabling the scholars/teacher candidates to present powerful resumes to future employers. We identified the additional experiences and networking opportunities offered to each scholar, including: additional field experiences; seminars focused on understanding and using culturally responsive teaching, working with students of poverty and teaching with a social justice lens; working alongside professors in their content field as instructional assistants in undergraduate classrooms; workshops related to their content major or pedagogical practices; completing a summer internship in a public setting related to their field of study; and attending and presenting at professional conferences. We then compared Noyce and non-Noyce STEM teacher candidates teaching resumes. The data demonstrates the quality and breadth of experiences provided for Noyce scholars and how this translates into a powerful beginning teaching resume. It also illustrates the extent of research based practices and expanded network scholars have available. The COES project, in year two, has resulted in programmatic changes for secondary teacher candidates. COES promotes an awareness and ability to apply the principles of culturally responsive teaching; CRT is working its way into several courses required of all candidates. Noyce scholars are engaged in research and scholarship with professors in their content field and education; they attend multiple professional conferences. The expectation of attending a professional conference (national, state or regional) is now required of all secondary teacher education candidates and is being discussed as a requirement in other licensure areas.

Session 1:12a: 9:30am - 10:05am

1.12a Transforming Science Teaching in Elementary School: From Cookbook to Experimental Design

Length of Session: 35 minutes

Irina Lyublinskaya, College of Staten Island, irina.lyublinskaya@csi.cuny.edu, PI
Sharon Cameron, shea251@hotmail.com, P.S. 45, Noyce MTF
Lisa Thompson, nysweet85@yahoo.com, P.S. 78, Noyce MTF

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff

Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

The College of Staten Island Noyce Master Teaching Fellows (MTF) program includes 4-credit year-long course, Science Experiments Design for Elementary School, that was developed and taught to elementary school MTFs with the goal to prepare them to integrate science experiment design activities for their students. The underlying principle for the design of this course was that by developing a stronger foundational experience in science, participating MTFs will increase their success rate as teachers of science. Further, MTFs will begin to develop a higher-level understanding of teaching from the experimental and inquiry-based perspectives. Therefore, the central objective of the course was to emphasize the role of inquiry-based research in the laboratory learning experiences. This graduate course met for 2 hours every week for 30 weeks and was co-taught by one education and one science faculty members. The course followed a project-based approach for each of the following areas: life science, earth and space science, physical science, and interdisciplinary STEM. Within each area the experiences included inquiry-based open-ended science tasks for MTFs from the student's perspective followed by reflections on the experience from the teacher's perspective, followed by development and classroom implementation of experimental design tasks, and concluded with reflections on classroom implementation of designed activities. In this workshop we will share successes and challenges of the graduate course design and implementation. The workshop will include MTFs reflections on classroom implementation in high need elementary schools.

Session 1:12b: 10:10am - 10:45am

1.12b Learning Assistants: Bringing Active Learning into the Classroom

Length of Session: 35 minutes

Kari Hinkle, University of Montana,
kari.hinkle@umontana.edu, NSF Scholar
David Erickson, david.erickson@mso.umt.ed, PI

Target Audience: Higher Education Institution Administrators, Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars

Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

The University of Montana is using Learning Assistants to shift lecture classrooms to active learning classrooms. This is important because freshmen decide upon careers that interest them and STEM and STEM teaching careers are in high demand. Participants will discover strategies for increasing student learning and engagement and hear personal experiences and benefits from implementing active learning in science and mathematics classrooms. Activities will include open-ended questions, higher order questions, ConcepTest questions, and Plickers. Our hope is to transfer these strategies to the 7-12 classrooms of Noyce Scholars now teaching.

Session 1:13a: 9:30am - 10:05am

1.13a Developing and Supporting STEM Teacher Mentors

Length of Session: 35 minutes

Helen Meyer, University of Cincinnati, helen.meyer@uc.edu,
Associate Professor, Science Education

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators
Topic: Teacher Leadership

The purpose of this workshop session is to gather and exchange ideas for how different Noyce programs have developed and supported mentor teachers for pre-service and new (early career) STEM teachers. The University of Cincinnati's MTF program's is focused on supporting STEM teachers from their pre-service experiences to becoming expert STEM educators. The MTF program is working collaboratively with our urban district partner to develop resources that can be used to prepare and support mentor teachers. The program's MTFs are all highly qualified and experienced (10 years minimum) urban STEM teachers, and all have served as mentors to either pre-service or new STEM teachers. However, none remember receiving any specific training, resources or support to be a mentor to early career STEM teachers. The MTF program seeks to overcome this gap in professional preparation for STEM teachers. In this session, we will share the work we have done to date. This includes the strategies we used to understand the multiple perspectives of why we need to mentor new teachers, what this should include, and how it should be done. Once we understood the full expectations of mentor teachers, we are now working on what and how experienced teachers can be prepared and supported for this role. After sharing our work, we will open the session to all present to share how they prepare mentors, the resources they use to do so, and what

additional preparation and support they would like to see to continue to develop expert STEM mentor teachers.

Session 1:13b: 10:10am - 10:45am

1.13b Supporting Fellows' Identities and Skills as Teacher Leaders

Length of Session: 35 minutes

Stephanie Martin, University of Rochester, smartin@warner.rochester.edu, Director of Mathematics Education Outreach
 Kim Saccardi, kimsaccardi@gmail.co, Newark Central School District, Master Teaching Fellow
 Jennifer Davison, jdavison@genevacsd.or, Geneva Central School District, Master Teaching Fellow

Target Audience: Higher Education Institution Administrators, Non-Profit Organization Personnel, Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators
 Topic: Teacher Leadership

Supporting Master Teaching Fellows in their development as Teacher Leaders is a critical component of the University of Rochester Noyce MTF project. Our intent is to build long-term capacity for sustaining high quality math and science teaching through developing Fellows as Teacher Leaders. We know that supporting effective teachers into becoming effective leaders must be intentional and takes time. In order to do this, teachers must reflect on where they currently are and dare to dream of new possibilities. This involves developing identities as leaders and constructing a set of skills that are sufficient for them to become agents of change. We are currently wrapping up our third year working with 15 Fellows teaching in the Rochester City School District and 2 rural school districts (Newark and Geneva). Through a combination of graduate courses, seminar, and practicum work, our third year of the project involved positioning fellows as leaders through Content-focused coaching (West & Staub, 1998) as a means to transition from a focus on their own instructional practice to leadership development. In addition, fellows are beginning to try on roles as professional learning designers and facilitators for local audiences. In this workshop Master Teaching Fellows will share their stories as they shift from a focus on developing their own math and science instructional practices to expanding their spheres of influence outside of their classrooms. Participants will have opportunities to engage with each other and the presenters in order to connect ideas to their own contexts and projects.

Session 1:14a: 9:30am - 10:05am

1.14a Bolstering Preservice Teachers' STEM Literacy via a Summer Robotics Informal Learning Experience

Length of Session: 35 minutes

Margaret Mohr-Schroeder, University of Kentucky, m.mohr@uky.edu, Professor of STEM Education
 Craig Schroeder, dcraig.schroeder@gmail.com, Fayette County Public Schools, STEM Teacher - K12 Liaison
 Tyler Waters, tyler.waters@fayette.kyschools.us, Fayette County Public Schools, STEM Teacher, Former Noyce Fellow
 Katelyn Leroy, katelyn.leroy@jefferson.kyschools.us, Jefferson County Public Schools, STEM teacher, Former Noyce Fellow
 Brittney Hazel, brittneydenton02@gmail.com, Jefferson County Public Schools, STEM teacher, Former Noyce Fellow

Target Audience: Evaluators/Education Researchers, Non-Profit Organization Personnel, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars
 Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

Before many students enter the 8th grade, they conclude many of the STEM subjects are too challenging, boring, and/or uninteresting (PCAST, 2010). Research has shown that more exposure to a variety of STEM opportunities will have a long-term effect on individuals and the overall STEM education community (Wai, Lubinski, Benbow, & Steiger, 2010). The purpose of this session is to discuss how a teacher education program integrates informal learning experiences as a regular part of the program in order to increase prospective teachers' exposure to a variety of STEM learning experiences so they might integrate the opportunities into their own classrooms.

Session 1:14b: 10:10am - 10:45am

1.14b Developing Productive Partnerships with STEM Professionals in Your Classroom

Length of Session: 35 minutes

Betty Calinger, AAAS STEM Volunteers, bcalinge@aaas.org, Project Leader
 Robert Thomas, School District Leader and High School Volunteer
 Target Audience: Non-Profit Organization Personnel, Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars

Topic: Resources for Teachers

The AAAS STEM Volunteer Program (stemvolunteers.org) was launched in 2004 in response to an editorial in Science Magazine encouraging the scientific community to develop different and closer links with the general population. Founding members were also influenced by recent national reports that recommended improvements in curricula and development of teachers and described the value of partners in STEM fields to help students and teachers. Our STEM Volunteer Program currently has 200 STEM professionals assisting teachers in 10 school districts for the entire school year. We have discovered that volunteer programs provide a variety of opportunities for teachers and students:

- STEM volunteers give students and teachers the benefit of their hands-on expertise.
- STEM professionals provide busy teachers with the help that allows them to spend more time working one-on-one with students.
- Pairing educators in their classrooms with experienced scientists and engineers offers students the chance to engage in science practices as called for in the Next Generation Science Standards.

Teachers can receive a type of on-the-job professional development through their work with a STEM partner. It has been our experience that teachers often gain new comfort with STEM concepts and practices that last far beyond any program, leaving them able to deliver inquiry-based practices to students. Developing productive partnerships is not always easy, but we believe we have a system that works. Two volunteers and their teacher partners (middle and high school) will describe the steps to developing partnerships, the successes, the challenges and how they resolved them.

Session 1:15a: 9:30am - 10:05am

1.15a Meeting Noyce Scholars' Needs through Crowdsourced Professional Learning Communities

Length of Session: 35 minutes

Patrick McGuire, University of Colorado Colorado Springs, pmcguire@uccs.edu, Principal Investigator
Christopher Cruz, christopher.cruz@d11.or, Sabin Middle School, Science teacher

Target Audience: Noyce Master Teachers, Project PIs, Co-PIs, Other Faculty/Staff, Undergraduate and/or Graduate Noyce Scholars

Topic: Partnerships with High-Need Schools and Districts

What better way to meet your Noyce scholars' needs than to involve experienced in-service mentor teachers in the process? In this interactive workshop we will provide an overview of an innovative Professional Learning Community (PLC) framework involving three high-needs school districts and the University of Colorado Colorado Springs (UCCS). Over the past year we systematically designed and delivered ten unique 90-minute PLCs to support Noyce scholars' pedagogical content knowledge in STEM and develop dispositional skills necessary for success in high-needs teaching environments. Our PLCs were co-designed and facilitated by three in-service STEM teachers in conjunction with UCCS faculty. PLCs were held at the university and at high-needs partner school districts on a rotating basis. This provided Noyce scholars an opportunity to experience a variety of contexts and engage with in-service STEM teachers, staff, and administrators (when held at a partner school). In addition to providing an overview of the PLC model, we will discuss the benefits of 'crowdsourcing' and how this has resulted in increased collaboration between the university and school district stakeholders. We will share and model a sample PLC activity and provide all attendees with a link to the Google Drive infrastructure that includes all of the PLC content from our Noyce program. To conclude, we will discuss the advantages of this mutually beneficial PLC framework (for Noyce scholars, in-service mentors, and university faculty), associated challenges and limitations, and recommendations for other Noyce sites wishing to establish stronger partnerships with in-service educators or similar PLC frameworks.

Session 1:15b: 10:10am - 10:45am

1.15b Service Learning from the Perspective of Community Partners

Length of Session: 35 minutes

Joanne Caniglia, Kent State University, jcanigl1@kent.edu, Associate Professor

Target Audience: Non-Profit Organization Personnel

Topic: Partnerships with High-Need Schools and Districts

Reciprocity for community organizations is an essential feature of academic service-learning. This session will present research on how reciprocity is enacted with Noyce Scholars from the perspective of community partners and leaders. By interviewing 15 community and school personnel the study asked for their perspectives of service learning of Noyce Scholars. This qualitative study used constructivist grounded theory to gain insight into the experiences of community partners. Noyce Scholars from Kent State University are required to participate in monthly service-learning projects to

support their engagement with high need schools. Much research has appeared on the benefits of service learning from the student's view. Few research studies exist that examine the perspectives of community organizations. Campus Compact (2000) has published Benchmarks for Campus/Community Partnerships. The benchmark for building collaborative relationships is that the partnership is 'composed of interpersonal relationships based on trust and mutual respect' (Torres & Schaffer, 2000, p. 6). A semi-structured interview asked community partners to respond with their experiences with service learning. Three coding stages assisted the researchers in identifying themes, (open, axial, and selective.) Four themes emerged: (1) the need for longer commitments, (2) community partners embraced the Noyce Scholars' expertise and valued their content knowledge; (3) the community partners valued that Noyce PIs were onsite for each event; and (4) community partners welcomed Noyce Scholars and wanted to know how the course content interfaced with their organization. This session will encourage interaction from participants as they discuss Noyce projects that involve community partners. Participants will examine the challenges and benefits of projects involving community partners while they confirm themes and implications of the research.

Session 1:16a: 9:30am - 10:05am

1.16a Magnifying Our Impact: Integrating CRT Across a Secondary STEM Education Preparation Program

Length of Session: 35 minutes

Leah McAlister-Shields, University of Houston, lmcAlister@uh.edu, Academic Program Manager
 Paige Evans, pkevans@central.uh.ed, University of Houston, Clinical Professor
 Mariam Manual, mmanuel@Central.UH.ED, University of Houston, Clinical Professor

Target Audience: Higher Education Institution Administrators, Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, Undergraduate and/or Graduate Noyce Scholars

Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

This session will explore the instructional practice of culturally responsive teaching and provide a glimpse of the integration and evolution of the use of CRT in a Secondary STEM Educator Preparation Program. The planning and implementation process of the use of CRT across Secondary STEM education courses will be highlighted. Utilization of activities and course instructional resources will be provided to support Master

Teachers' implementation of CRT in their classrooms and programmatic strategies and considerations for program administrators, faculty, and staff regarding the implementation of CRT across programs will also be discussed.

Session 1:16b: 10:10am - 10:45am

1.16b Utilizing Inquiry-Based Learning in STEM Classrooms

Length of Session: 35 minutes

Paige Evans, University of Houston, pevans@uh.edu, PI and Clinical Professor

Donna Stokes, dwstokes@central.uh.edu, University of Houston, Associate Professor and Co-PI; Mariam Manuel, mmanuel@central.uh.edu, University of Houston; Leah McAlister-Shields, lymcalis@Central.UH.EDU, Academic Program Manager

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, Undergraduate and/or Graduate Noyce Scholars
 Topic: Resources for Teachers

In order to teach science effectively, teachers must possess a strong background in science content as well as understand effective methods of teaching such as inquiry-based learning that will cultivate conceptual development of science concepts with their students (*American Association for the Advancement of Science, 1993 National Academy of Sciences, 2007; National Research Council [NRC], 2000, 2005*).

Furthermore, it is imperative to use student-focused activities in high needs schools to engage all students in the learning process. As a result, the teachHOUSTON faculty at the University of Houston infused inquiry-based learning into their field-based courses to engage middle school and high school preservice teachers in interactive, teaching pedagogies for science. Additionally, they created physics courses for both middle and high school preservice teachers where content is taught as inquiry. Results indicate that participants had improved content knowledge and better insight of how to employ inquiry-based learning in the classroom. The benefits of including such courses in science teacher education programs are discussed. This session provides examples of inquiry-based activities that pre-service and in-service teachers can utilize in science classrooms. Additionally audience members will receive exemplary activities that were developed for the teachHOUSTON courses that are appropriate for middle school and high school classes.

Session 2: Wednesday, July 18, 2018 10:15am - 11:15am

2.1 Sense of Place: A Professional Development Series for STEM Teachers

Length of Session: 60 minutes

Meena Balgopal, Colorado State University,
meena.balgopal@colostate.edu, Associate Professor Biology;
Noyce Phase II PI
DeeDee Wright, deedee.wright@colostate.edu, Noyce
Coordinator

Target Audience: Noyce Master Teachers, Noyce Teaching
Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and
District Administrators, Undergraduate and/or Graduate Noyce
Scholars
Topic: Teaching a Diverse Student Population

In this interactive workshop, participants will learn about our
Noyce professional development (PD) series that integrates
various STEM issues to increase participation and relevance of
science to diverse populations of students. We will review how
we integrated 1) STEM content (bio-engineering, climate
change/phenology, environmental science, and watershed
science), 2) high-leverage teaching practices (purposeful
grouping, modeling practices, respectful relationships, and
connecting with community), and 3) social justice topics (girls/
women in STEM, rural/urban issues, democratizing science, and
economic inequities). Participants will not only learn about our
workshops and how we drew on local institutional expertise,
they will engage in activities designed for our Noyce Scholars
and Mentor Teachers. We will conclude the workshop by asking
participants to brainstorm topics that are relevant for their own
geographic (environmental, economic, and demographic)
contexts.

2.2 Get the Facts Out: Secondary Teaching Benefits Compared to Industry and University Teaching

Length of Session: 60 minutes

Kristine Callan, Colorado School of Mines, kcallan@mines.edu,
Teaching Faculty
Gay Stewart, gbstewart@mail.wvu.edu, West Virginia University,
Director
Wendy Adams, wkadams@mines.edu, Colorado School of
Mines, Research Faculty

Target Audience: Evaluators/Education Researchers, Higher
Education Institution Administrators, Non-Profit Organization

Personnel, Noyce Master Teachers, Project PIs, Co-PIs, Other
Faculty/Staff, School and District Administrators
Topic: Innovative Noyce Program Practices and Teacher
Preparation Models (Including new courses and degree
requirement and early field experiences)

If 45% of STEM majors nationally are interested in teaching, then
why do we have a teacher shortage? One hypothesis is that
potential teacher candidates are turned off by widespread
misperceptions about the teaching profession. In this interactive
workshop, participants will analyze data on secondary teachers'
compensation and benefits, and then compare this data with
that of university instructors and industry workers. Data on job
satisfaction for some of these careers will also be shared. This
activity will model an activity that we've engaged in with local
teachers, industry, and state representatives in Colorado.
Participants will then be ready to mine for similar types of data
in their own community. Lastly, we will ask participants to reflect
on what they found and how their views toward the secondary
teaching profession may have changed.

2.3 Developing an Online, Interactive Program to Prepare Math Teacher Leaders: Lessons Learned in Year 1

Length of Session: 60 minutes

Aimee Ellington, Virginia Commonwealth University,
ajellington@vcu.edu, Project PI
Joy Whitenack, jwwhitenack@vcu.edu, VCU, co-PI

Target Audience: Higher Education Institution Administrators,
Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-
PIs, Other Faculty/Staff, School and District Administrators
Topic: Teacher Leadership

In this session we will describe the lessons we have learned
during the first year of our NOYCE Track 3 project to develop an
online degree program to prepare K-8 teachers to serve as
mathematics teacher leaders. We will work through a sample
lesson from one of our highly interactive mathematics courses.
By working through a few of the mathematics activities we have
developed, session participants will have the opportunity to
explore several different software products that we have found
are useful for collaborative, online learning. These software
products allow our Master Teaching Fellows to share their
methods and strategies with each other as they work together
to develop a deep understanding of mathematical concepts. We
will also present the results we gathered from participant
feedback at the end of the first year of our project. A smart
device or laptop computer will be required to fully participate in
this session.

2.4 Lessons Learned in Organizing Robert Noyce Mathematics and Science Teacher Conferences

Length of Session: 60 minutes

William Hunter, Illinois State University, whunter@ilstu.edu, Director, Center for Mathematics, Science, & Technology
 Kim Nguyen, knguyen@iupui.edu, IUPUI, Professor
 Jessica Krim, jkrim@siue.edu, Southern Illinois University, Associate Professor
 Greg Phelan, gregory.phelan@cortland.edu, SUNY-Cortland, Professor
 Larry Horvath, lhorvath@sfsu.edu, San Francisco State University, Professor
 David Andrews, davidan@mail.fresnostate.edu, Fresno State University, Professor

Target Audience: Project PIs, Co-PIs, Other Faculty/Staff
 Topic: Project Management

In this interactive workshop, organizers from the Midwest, Northeast, Western, and Southeast Robert Noyce Mathematics and Science Teacher Conferences will be invited to describe how they organized their respective conferences and alliances between 2016 and 2021. They will describe the choices they made, successes achieved, and challenges they still face. This session will be of interest to current and potential proposers of Robert Noyce Regional Conferences.

2.5 Integrating Engineering Design in Mathematics and Science Instruction

Length of Session: 60 minutes

Mariam Manuel, University of Houston, mmanuel@uh.edu, Instructional Assistant Professor, Co-PI

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars
 Topic: Resources for Teachers

This session includes artifacts from a Fundamentals of Engineering Design course taught as part of the M.Ed. program in Curriculum & Instruction with an emphasis in STEM Education at the University of Houston that is part of the Noyce Track 3 Master Teacher Fellowship program. In this course, teachers explore their roles within the dynamic field of engineering education and how the engineering skills can support mathematics and science curriculum. Audience members will be provided with context of the nation's history of K-12 engineering education including arguments for and against content standards for K-12 engineering education and leveraging current

standards to improve engineering education experiences in secondary mathematics and science instruction. Engineering fundamentals and design methods will also be addressed through examples of engineering design challenges including invention, and reverse engineering and redesign modules. Audience members will participate in an engineering design activity and will be provided samples of engineering design projects in mathematics and science that are designed by previous teachers who completed the coursework.

2.6 Redesign of a Mathematics Course for Elementary Teachers: Developing Knowledge of Mathematics

Length of Session: 60 minutes

S. Asli Ozgun-Koca, Wayne State University, aokoca@wayne.edu, Co-PI
 Deborah Zopf, DZopf@hfcc.edu, Henry Ford College, Instructor
 Jennifer Lewis, jmlewis@wayne.edu, Wayne State University, PI
 Chris Nazelli, ac3361@wayne.edu, Wayne State University, Instructor

Target Audience: Higher Education Institution Administrators, Noyce Master Teachers, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators
 Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

As our pre-service teachers prepare to student teach, our goal is to have them learn the mathematics that underpins the mathematics they will teach as well as engage in mathematical practices in which mathematicians engage. In this session we will share our efforts to improve Mathematics for Elementary Teachers courses at two partnering institutions--a four-year Research 1 university and a local feeder community college--who collaborated in the design, implementation, and evaluation of these radical course revisions. After paring down the course content, activities were created that allowed students to experience/learn mathematics through authentic mathematical practices such as exploration and communication. Our teaching shifted to a more focused activity-based, student-centered design, integrating several high leverage practices (*Ball, Sleep, Boerst, & Bass, 2009*). For instance, eliciting student thinking, explaining and modeling content practices and strategies, appropriate usage of language and mathematical tools, and responding to each other's work became regular practices of the course. Students at the two institutions exchanged assignments, to provide authentic audiences for students' mathematical work and to strengthen the pipeline from community college to university. This session will include the presentation of artifacts from the redesigned courses including instructional packages and student journal responses. We will ask participants to

engage in an activity and model work done by our students. We will also share evidence of the effectiveness of the reformed course design from students at both institutions. Finally, we will ask for feedback on our work and recommendations to strengthen our project.

2.7 Network Retention in Noyce Communities of Practice

Length of Session: 60 minutes

Samuel Polizzi, Kennesaw State University, spolizzi@kennesaw.edu, Co-PI
Gregory Rushton, gregory.rushton@stonybrook.edu, Stony Brook University, PI
Brandon Ofem, ofemb@umsl.edu, University of Missouri-St. Louis, Co-PI
Margaret Schroeder, m.mohr@uky.edu, University of Kentucky, Co-PI
Gillian Roehrig, roehr013@umn.edu, University of Minnesota, Co-PI
Keith Sheppard, keith.sheppard@stonybrook.edu, Stony Brook University, Co-PI
Michael Beeth, beeth@uwosh.edu, University of Wisconsin Oshkosh, Co-PI

Target Audience: Evaluators/Education Researchers, Project PIs, Co-PIs, Other Faculty/Staff
Topic: Research and Evaluation

Empirical data on the outcomes and effectiveness of Noyce induction programs are needed to inform workforce policies. This Track 4 collaborative research effort aims to understand differences and similarities across five effective Noyce teacher induction programs. Induction programs are often viewed as a bridge between teacher preparation communities and in-service teacher communities, yet current methods to examine induction have not drawn upon the rich information present in Social Network Analysis (SNA). We are using SNA to understand how Noyce programs facilitate teacher communities of practice over time, and how those communities influence teacher identity, self-efficacy, and disposition toward remaining in the profession.

The overarching goals of the project are to understand the social mechanisms through which teachers become embedded in teaching communities, and how those communities impact retention in the teaching profession. To this end, we have assembled a team of researchers engaged in teacher preparation and induction with both Noyce scholarship recipients and non-Noyce teachers. The key research activities include investigating the support structures at each Noyce site, analyzing network maps of teacher communities of practice, and establishing interactions between teacher community structures and how teachers are positioned to remain in the profession. We

discuss SNA research design, which is gaining popularity in education research, and may be applicable to audience Noyce projects. We also describe the initial findings from our first longitudinal survey, including differences in science and math teacher networks related to teaching content and/or pedagogy, and correlations with retention dispositions.

2.8 UTeach Maker: A Micro-credentialing Program for Noyce Scholars

Length of Session: 60 minutes

Shelly Rodriguez, The University of Texas, rodriguez@uteach.utexas.edu, Clinical Associate Professor, UTeach Maker Director
Abdulkarim Bora, abora@mathhappens.org, The University of Texas, Noyce Scholar
Kyle Albernaz, kyle.albernaz@gmail.com, The University of Texas, Noyce Scholar

Target Audience: Noyce Master Teachers, Noyce Teaching Fellows, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars

Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

This session will provide an overview of an innovative micro-credentialing program, UTeach Maker, that supports pre-service STEM teachers in bringing maker centered learning into classrooms. Those in attendance will be provided with details of the initiative and can expect to learn from the successes and challenges emerging from the program's first years. The session will also provide information about the endorsement process which occurs through an open portfolio called a Maker Showcase. Participants will have the opportunity to engage with Noyce scholars who have been credentialed through this program, view elements of their Maker Showcase, and hear their perspectives on maker education. Participants will also leave the session with access to maker resources useful for supporting pre-service STEM teachers.

2.9 The Role of Online Induction Environments in Supporting Early-Career Teachers

Length of Session: 60 minutes

Gillian Roehrig, University of Minnesota, roehr013@umn.edu, Professor, PI
Joshua Ellis, ellisj@mtu.edu, Michigan Technological University, Assistant Professor, Co-PI

Target Audience: Higher Education Institution Administrators, Project PIs, Co-PIs, Other Faculty/Staff

Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

An online induction environment provides a unique ability to support Noyce scholars and early-career teachers regardless of their geographic location. This interactive session will engage attendees in a number of online activities that support our Noyce scholars' capacities for reflective practice, reformed teaching, and culturally responsive instruction. These include structured discussions and video case analysis, which are supported by the Venture/Vexation activity (*Johnston & Settlege, 2006*) and VideoAnt (*Hosack, 2010*), respectively. Attendees will participate in a Venture/Vexation activity during this session and analyze how this activity has been adapted and improved for an online learning environment. Attendees will also participate in an online video case analysis activity in this session, experiencing firsthand how these digital tools and techniques provide opportunities for teachers to describe, explain, and interpret video of classroom events. We will also host a discussion of other tools and techniques that attendees may be using to support their early-career teachers, with a consideration of the affordances and limitations of online approaches.

2.10 Moving Forward: Insights from Noyce Internship Programs

Length of Session: 60 minutes

Carolyn Viviano, Loyola Marymount University, cviviano@lmu.edu, Associate Professor Biology, Director Secondary Science Teacher Preparation

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Non-Profit Organization Personnel, Project PIs, Co-PIs, Other Faculty/Staff

Topic: Research and Evaluation

Each panel member will present the goals and results of their internship program and will share their experiences and insights with the audience. Attendees will have the opportunity to ask questions of panel members and make connections with others who are running similar programs. The aim is to gather data from established programs and to learn from each other in order to improve our programs moving forward.

The following workshops are 30-minute workshops, sharing the same breakout rooms during Session 2:

Session 2:11a: 10:15am - 10:45am

2.11a 2+2 Teacher Transfer Pipelines: A Study of Challenges and Opportunities in Texas

Length of Session: 30 minutes

Steven Fletcher, St. Edward's University, ssfletch@gmail.com, PI- Noyce Phase II, Associate Professor - Secondary Education
Wan Sin Lim, wansin.lim@utexas.edu, University of Texas at Austin, Associate Researcher

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Project PIs, Co-PIs, Other Faculty/Staff

Topic: Research and Evaluation

This session will address preliminary findings from an exploratory qualitative study that centered on examining constraints and pathways for a science and math teacher transfer pipeline from a large regional community college to a private catholic liberal arts university in an urban area in the Southern US. Previous efforts to recruit and retain community college transfer students into a Phase I Noyce scholarship directed by the same PI were hampered by a number of immediate and hidden factors. This study was developed to understand both hidden and apparent constraints to recruitment into the Noyce program and develop possible solutions to remedy this issue. Data was collected through semi-structured interviews, focus groups with students and other participants, surveys, and researcher memos from three workshops convened with local stakeholders from each institution during the Spring of 2018. There were multiple themes that emerged from data analysis. Themes included: A. Perceived cost of attending the private institution, B. Perception of the 4 yr. campus culture and student body, C. Communication and relationships between personnel at both institutions, D. Competition with other teacher preparation programs and avenues, E. Reputation and status of programs, and F. Waning interest in teaching as a career. The implications of this study showed the need to strengthen the collaboration between two institutions including: A. emphasis on relationship building between the key personnel (STEM faculty, advising specialist and transfer specialist) from both institutions, B. Better communication to demystify the perception of cost, culture and demographics of the 4-year institution and teaching as a career path. The session will include examples and implications of this work for the field in general.

Session 2:11b: 10:45am - 11:15am

2.11b Stories of 2 Developing Teacher Leaders: How Noyce Programs Can Develop Leadership Capacity

Length of Session: 30 minutes

Steven Fletcher, St. Edward's University,
stevenf@stedwards.edu, Dept Chair - Teacher Education,
Noyce Project PI
Erica Valdez, erica.valdez@svisd.ne, Del Valle ISD, Biology
Teacher
Tim Ornes, tornes@austindiscoveryschool.or, Austin Discovery
School, Science Teacher

Target Audience: Project PIs, Co-PIs, Other Faculty/Staff,
School and District Administrators, Undergraduate and/or
Graduate Noyce Scholars
Topic: Teacher Leadership

This workshop will share unique stories of personal and professional growth from two emerging teacher leaders from the St. Edward's University (SEU) Noyce Scholarship Program. Erica and Tim are currently teaching in the field and have recently found opportunities to expand their own vision as emerging leaders. Both have entered their third year in the classroom and are searching for the next step on the ladder in terms of career and personal development. In this session, Erica and Tim will describe their recent forays into developing as teacher leaders in their community. For example, Erica has seen the impact of state educational policy hurt the students in most need in her Biology classroom. She has therefore begun a serious inquiry into state education policy and plans to enroll in a master's degree to take on this issue in more depth. Tim has watched his students embrace outdoor science activities but finds his fellow teachers wary of taking students outside. He therefore designed and led a daylong workshop for teachers in his school to introduce them to the value of outdoor education. Both Erica and Tim have chosen authentic and individual ways to express their developing leadership and are poised to have impact on future generations of STEM students in the region. The project PI will provide an overview of the elements of the SEU Noyce program at the beginning of the session and will facilitate the question and answer discussion after the Scholars share their work.

Session 2:12a: 10:15am - 10:45am

2.12a Mini Internships to Expand the STEM Educator Pipeline

Length of Session: 30 minutes

Valorie Zonnefeld, Dordt College,
valorie.zonnefeld@dordt.edu, Principal Investigator
Ryan Zonnefeld, ryan.zonnefeld@dordt.edu, Dordt College, Co-
Principal Investigator

Target Audience: Project PIs, Co-PIs, Other Faculty/Staff
Topic: Recruitment, Retention, and Marketing Strategies

The nationwide shortage of STEM education majors has created a demand for secondary STEM teachers that exceeds the current number of graduates. Research shows that early teaching experiences are key for recruiting students into education (Rehmeyer, 2015, p. 50). To help alleviate the shortage of STEM educators, we implemented a Mini STEM Education (Mi STEM Ed) internship to give undergraduate students a taste of STEM education. The internship was open to any student who was not a double major in a STEM field and education. In turn, the primary targets for this internship were: (1) education majors who were not currently majoring in a STEM field and (2) STEM majors who were not currently majoring in education. Promotion of the program included signs, flyers, announcements on campus, and a two-minute program promotion in all introductory math and education courses by the project lead. To give students these early teaching experiences, the Mi STEM Ed internship required students to observe or assist for at least 7-hours in a grades 7-12 STEM classroom and write a one-page reflection on their experience. Upon completion, students received a \$100 stipend. We will share the success of this program in helping students explore STEM education as a career.

Rehmeyer, J. (2014). The role of the mathematics department in the mathematical preparation of teachers. Critical Issues in Mathematics Education, 10(March). Retrieved from <http://library.msri.org/cime/CIME-v10-wkshp-11-yr-2014.pdf>

Session 2:12b: 10:45am - 11:15am

2.12b Supporting STEM Teacher Retention: Monitoring, Mentoring, and Maintaining Teaching Identities

Length of Session: 30 minutes

Stacy Olitsky, Saint Joseph's University, solitsky@sju.edu,
Faculty

Target Audience: Evaluators/Education Researchers, Project
PIs, Co-PIs, Other Faculty/Staff, School and District
Administrators
Topic: Supporting New Teachers

This qualitative study explores the ways in which school policies, support from mentors and colleagues, and self-talk in

response to challenges impact the identity development and retention of STEM teachers in high-need schools. This four-year study follows the trajectories of twelve science and math teachers who received Noyce scholarships. Results indicate that the teachers who stayed in their positions were more likely to have relative autonomy in curriculum and classroom management, respect for the ways in which they were evaluated by supervisors, and access to mentors who supported planning and affirming self-talk. Teachers who left their positions were more likely to experience lack of autonomy in classroom decision-making, monitoring by administrators in ways that contradicted their beliefs, values, and professional identities, subject-matter teaching identities rather than student-centered teaching identities, weak connections to colleagues, and 'mulling over' self-talk. In addition, school policies that prioritized measurement of behavioral outcomes over relationships with students caused contradictions with teachers' efforts to implement culturally responsive approaches, contributing to job dissatisfaction. For the teachers who stayed, results show that that non-evaluative mentoring can provide the voices of supportive others and a sounding board for planning, which could counter the fractured reflexivity that can develop if teachers are left alone to face challenges. Implications of this study include the importance of work environments that facilitate the building of positive relationships, and professional development opportunities that support the self-talk that can help teachers generate internal solidarity in times of difficulty, thereby fostering strong professional identities and promoting retention.

Session 2:13a: 10:15am - 10:45am

2.13a Reflections from Noyce Scholars on their Route to STEM Teaching

Length of Session: 30 minutes

Jennifer Whitfield, Texas A&M University, jwhitfld@tamu.edu, Instructional Assistant Professor, aggieTEACH Director, Assistant Head Department of Mathematics
 Manjari Banerjee, mbanerjee@tamu.edu, Texas A&M University, Graduate Student
 Hersh Waxman, hwaxman@tamu.edu, Texas A&M University, Professor
 Tim Scott, t-scott@tamu.edu, Texas A&M University, Assistant Provost
 Mary Margaret Capraro, mmcapraro@tamu.edu, Texas A&M University, Professor

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators
 Topic: Research and Evaluation

When the supply of well-trained professionals does not meet demand, stakeholders oftentimes focus on incentive programs to increase supply. The federal government has a few initiatives that incentivize college students to become teachers. One of the most well-known scholarship programs for perspective mathematics and science teachers is The Robert Noyce Teacher Scholarship Program. This scholarship program encourages talented STEM students to pursue teaching careers in mathematics and science by providing institutions of higher education funding to recruit individuals with strong STEM backgrounds who might otherwise not have considered a career in K-12 teaching. Using scholarships as a mechanism for recruitment and retention of teachers in high-need fields requires further research. Thus, the researchers at Texas A&M University designed a three-year, longitudinal, quasi-experimental, mixed-methods study to help determine the perceived effects, influences, and impacts the Noyce scholarship had on its recipients. Across the three years of the study both quantitative and qualitative data were collected via surveys and interviews from 29 participants. The surveys were distributed to the participants each June from 2015 to 2017 and had a mix of ordinal, categorical, and open-ended questions. Results indicate that even though the Noyce Scholarship did not influence the scholars to choose teaching as a profession, or to teach in high-needs schools, it has contributed to their persistence in high-needs schools for the length of their obligation and in other personal, financial, and professional ways.

Session 2:13b: 10:45am - 11:15am

2.13b All Alone: A Study of Isolated Science Teachers in New York State

Length of Session: 30 minutes

Keith Sheppard, Stony Brook University, keith.sheppard@stonybrook.edu, Director of The Institute of STEM Education
 Linda Padwa, linda.padwa@stonybrook.edu, Stony Brook University, Project Faculty

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Non-Profit Organization Personnel, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators
 Topic: Research and Evaluation

This study explored the characteristics of all public-school chemistry teachers in New York State. Information about the teachers' qualifications and experience along with the characteristics of the schools in which they taught were collected from several independent, publicly available data sources and were compiled into a large database. Teacher

characteristics included: area(s) and type of teaching certification(s), professional age, and subjects taught. Information about the schools where these teachers taught included: locale, socioeconomic status (SES), and size of the student population. In addition, information was gathered regarding the number of students who took, passed, and/or achieved mastery on the state's standardized Regents Examination in Chemistry. This census of chemistry teachers revealed the unexpected finding that more than half of the secondary schools in New York State had chemistry teachers who were isolated, i.e., they were the only people who taught the subject in their schools. Isolated teachers were found in schools in every locale, SES category, and even in schools with large student populations, though chemistry teacher isolation was rare in suburban schools. When examining student performance on the state's standardized Regents Examination in light of chemistry teacher isolation, it was found that students of non-isolated teachers out-performed students of isolated teachers on almost every performance measure. The implications of these findings for science teacher preparation are discussed.

Session 2:14a: 10:15am - 10:45am

2.14a The Effective Feedback Loop: Item Writing From Noyce Program Dispositions, Values, and Expectations

Length of Session: 30 minutes

Brian G. Smith, Minnesota State University Moorhead,
brian.smith@mnstate.edu, Noyce Evaluator

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Non-Profit Organization Personnel, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators
Topic: Research and Evaluation

The session will begin with an overview of the principles employed at MSUM to evaluate and improve the program. Examples from our instruments will be presented as well as the values, expectations, and dispositions that they are derived from. The attendees will write individual evaluation items derived from their program's values, expectations, and dispositions. The session will focus on the characteristics of clear, focused, and insightful survey items.

Session 2:14b 10:45am - 11:15am

2.14b: Where the Pipeline Ends: Analyzing the Post-Graduation Outcomes of Two Urban UTeach Programs

Length of Session: 30 minutes

David Sparks, University of Texas at Arlington,
david.sparks@uta.edu, Assistant Professor of Curriculum and Instruction

Ann Cavallo, Associate Dean for Research and Co-Director-UTeach Arlington, cavallo@uta.edu

Target Audience: Evaluators/Education Researchers, Higher Education Institution Administrators, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators, Undergraduate and/or Graduate Noyce Scholars
Topic: Research and Evaluation

In conjunction with an institutional research seed grant, the experiences of recent graduates from the Cleveland State University (CSUteach) and University of Texas at Arlington (UTeach Arlington) science and mathematics teacher preparation programs were analyzed to see how they have adapted to become successful teachers in the science or mathematics classroom. The mixed methods study looked at key factors in students' transitions as they related to (1) demographic factors such as race, gender, and ethnicity (2) undergraduate or post-baccalaureate status, and (3) their involvement in the NSF Robert Noyce Scholarship program for mathematics and science teachers. The following question was the focus of this project: What are the similarities and differences in the way graduates in urban UTeach programs describe their ability to adapt to and become successful in the science or mathematics classroom after graduation? The session will discuss the unique needs of urban UTeach programs using a comparison and contrast of two UTeach replication sites with similar student demographics. Future research will analyze the similarities and differences among urban UTeach programs and the effect of the Robert Noyce Scholarship Program on student outcomes and success in the mathematics and science classroom. The final goal of this session is to solicit urban UTeach programs to join in the conversation and partner with UTeach Arlington and other urban UTeach universities to develop future NSF Track 4 Research grant proposals.

Session 2:15a: 10:15am - 10:45am

2.15a Effectiveness of Noyce Add-on Courses: Developing Collaborations for Research

Length of Session: 30 minutes

Paul Heideman, College of William and Mary,
pdheid@wm.edu, Professor of Biology; Noyce Program PI

Target Audience: Evaluators/Education Researchers, Non-Profit Organization Personnel, Project PIs, Co-PIs, Other Faculty/Staff
Topic: Research and Evaluation

Noyce add-on courses are intended to help students become better prepared to teach effectively in high need schools; publication of results from rigorous assessments of these courses could improve Noyce programs and STEM teacher preparation. How effective are these different courses? Do the courses repay their investment, if returns on investment are measured in more effective STEM teaching and/or greater STEM teacher retention in high need schools? If gains exist, how can the benefits be measured and reported? This workshop will bring together individuals interested in research to assess and publish on the effects and outcomes of Noyce Add-on courses. At least two types of courses will be considered: (A) practical experiences, often in high-need settings, to help students build their self-efficacy and understanding of effective teaching in high need schools, and (B) pedagogy-based courses on STEM teaching that provide evidence-based practical techniques and tips, including modeling of activities that can be transported directly into a classroom. Two one-credit courses, one in each of these categories, are required for all Noyce Scholars at the presenter's institution. This workshop will explore formal or informal collaborations among Noyce projects with the goal of collecting data toward rigorous, publishable assessment of the potential value of such courses. During this workshop, time will be divided between subgroup thinking and planning and whole-group discussion of ideas, with a final period to exchange information toward formal or informal collaboration.

Session 2:15b: 10:45am - 11:15am

2.15b Teacher Leadership (T-Lead): Investigating the Persistence and Trajectories of Noyce MTFs

Length of Session: 30 minutes

Gregory Rushton, Stony Brook University, gtrushton@gmail.com, Noyce PI
 Wendy Smith, wsmith5@unl.edu, University of Nebraska Lincoln, PI
 Jan Yow, jyow@sc.ed, University of South Carolina, PI
 Brett Criswell, brett.criswell@gmail.co, University of Kentucky, PI
 Christine Lotter, LOTTER@mailbox.sc.ed, University of South Carolina, Co-PI
 Target Audience: Evaluators/Education Researchers, Noyce Master Teachers, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators
 Topic: Teacher Leadership

For the past fifteen years, the Noyce program has sought to prepare more and more qualified STEM teachers for our nation's highest need classrooms. More recently, Track 4

projects have considered the persistence and effectiveness of Noyce participants by carrying out empirical studies intended to inform future efforts to recruit, prepare, and retain this essential population. In this presentation, we will share outcomes from existing and completed Master Teaching Fellows (MTF) projects that have led to a new collaborative research project across seven Noyce sites to determine how various leadership development models have influenced the career trajectories of 160 MTFs toward staying, moving, shifting or leaving high-need classrooms. Understanding the factors influencing MTFs to stay, move, shift or leave can inform supports and opportunities provided to TFs and Noyce Scholars to increase retention. We anticipate this session being relevant to PIs, evaluators, researchers, and K12 teacher leaders interested in our theoretical framework, research questions and design, and methodological approach to undertaking a mixed methods investigation of geographically and programmatically diverse settings.

Session 2:16a: 10:15am - 10:45am

2.16a Making a Difference with Alternative Certification Pathways

Length of Session: 30 minutes

Debra Poese, Montgomery College, debra.poese@montgomerycollege.edu, Director, Teacher Education Partnerships
 Karl Kovacs, ACET Program Resident Teacher, Montgomery County Public Schools, kfkovacs@gmail.com

Target Audience: Higher Education Institution Administrators, Project PIs, Co-PIs, Other Faculty/Staff, School and District Administrators

Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

How can career changers become successful and effective STEM teachers in a short time? Learn about the development and implementation of the Alternative Certification for Effective Teachers (ACET) program, one of the Maryland Approved Alternative Preparation Programs with a proven track record since 2006. Strategies for training and retaining candidates for this Maryland resident teacher program will be shared and attendees will discuss the potential for their own implementations. Additionally, this presentation will highlight the ACET program, a partnership program between Montgomery College and Montgomery County Public Schools. The characteristics that make this program highly effective in recruiting, training and retaining new teachers will be examined. The program has a nearly 90% retention rate and focuses on the high need content areas for Montgomery

County, Maryland, schools. Our selection criteria include increasing the participants' knowledge of adolescent culture before entering the program. The content included in the Teaching Institute has ensured a 100 percent passing rate for the Praxis Pedagogy exam, Principles of Learning and Teaching. We partner with our local school system in the selection of candidates and in support of candidates during their internship and resident teaching year to enhance their success and satisfaction with the work. Specific strategies will be discussed that have evolved over the last ten years. The selection criteria and design for instruction and internships for new teachers will be discussed allowing participants to analyze how these components could be utilized to develop or enhance a similar program at their own colleges.

to coordinate all this, however, there are many things that we learned from this experience that would inform and set examples for similar future collaborations. These learned lessons are gained through project directors' observations, reflections, and group discussions, as well as participating Noyce fellows' input through open-ended questions, written reflections, and focus groups. We would like to hear from others' experiences similar to this and start a discussion about what else can be done to increase the number of and improve such initiatives to provide more wonderful and educative experiences for our Noyce fellows.

Session 2:16b: 10:45am - 11:15am

2.16b Lessons Learned From a Unique Collaboration Opportunity Between Two Noyce Programs

Length of Session: 30 minutes

Adem Ekmekci, Rice University, ekmekci@rice.edu, Director of Research and Evaluation
Peter Sheppard, psheppard@louisiana.ed, University of Louisiana, Lafayette, Principal Investigator, The Louisiana Mathematics Masters in the Middle (LaM3), Project# 1240054

Target Audience: Evaluators/Education Researchers, Project PIs, Co-PIs, Other Faculty/Staff

Topic: Innovative Noyce Program Practices and Teacher Preparation Models (Including new courses and degree requirement and early field experiences)

We would like share some lessons learned from a unique collaboration opportunity between two Noyce programs in two different states. We will first give a brief overview of our two programs including overarching goals and where we are in our individual Noyce programs: The Louisiana Mathematics Masters in the Middle (LaM3) at University of Louisiana, Lafayette and Rice University School Mathematics Projects' (RUSMP) Master Teacher Fellows (RUMTF). In order to make learning opportunities richer for Noyce Master teachers, LaM3 teachers (eight middle and two high school) visited RUMTF teachers' (one middle and two high school) and their colleagues' (who are not part of RUMTF) classes for two days. The overarching goal of this collaboration opportunity was to have the two programs' teachers to connect with and learn from one another and share/exchange ideas about effective teaching strategies for a successful mathematics instruction. As a first time opportunity for such an unprecedented across-program exchange among two Noyce programs, everything went well logistically given how hard it is