

**SENCER SUMMER INSTITUTE 2023
AUGUST 3-6**

**Session formats
Lightning Talks (LT)
Recorded Session (RS)**

**All Times are EASTERN DAYLIGHT TIME
All Sessions are in Zoom—registrants will receive zoom link**

Thursday, August 3

4:00 Opening Plenary- Welcome

Welcoming remarks from the Executive Director

4:30 Opening Keynote:



John L. Rudolph, Vilas Distinguished Achievement Professor of Science Education, University of Wisconsin-Madison

Rethinking Science Education for the Future

Few people question the importance of science education in American schooling. It's the key, after all, to economic growth, develops the ability to reason more effectively, and enables us to solve everyday problems. Good science teaching results in all these benefits and more—or so we think. But what if all this is simply wrong? What if the benefits we assume science education produces turn out to be an illusion, nothing more than wishful thinking? In this talk, Rudolph examines the reasons we've long given for teaching science and assesses how they hold up to what we know about what students really learn in science classrooms and what research tells us about how people actually interact with science in their daily lives. The results may be surprising. Instead of more and more rigorous traditional science education to fill the STEM pipeline, Rudolph challenges us to think outside the box of traditional instruction and makes the case for an expansive science education aimed instead at rebuilding trust between science and the public—something desperately needed in our current era of impending natural challenges and science denial.

John L. Rudolph's research focuses on the history of science education in American high schools. He also writes about issues related to the nature of science in the present-day school curriculum and on how the history, philosophy, and sociology of science have been used in science education research. He received his Ph.D. from the University of Wisconsin-Madison in curriculum and instruction and history of science. Prior to his current appointment, he spent a number of years teaching physics, chemistry, and biology in middle schools and high schools across Wisconsin. In addition to his position in C&I, he has affiliate appointments in the Department of Educational Policy Studies and the Robert and Jean Holtz Center for Science and Technology Studies. He is past editor-in-chief of the Wiley & Sons journal *Science Education* and National Academy of Education/Spencer Postdoctoral Fellow. His work has been funded by the National Science Foundation, the Spencer Foundation, and the Wisconsin Center for Education Research.

6:00 - Members Reception

Friday, August 4

1:00 Celebrating Achievements of Past Year

1:30--Session Block 1- The Wickedest Problems part 1: The Global Civic Challenge of Water

Presented by Bhawani Venkataraman and Davida Smyth with the NCSCE Water Fellows

Bhawani Venkataraman is Associate Professor of Chemistry at Eugene Lang College of Liberal Arts, The New School and a SENCER Scholar broadly supporting our work in water education and research. Her research is in the field of chemical education and science communication. Her new book *Paradox of Water*, explores the intersection of the scientific, social, and policy implications around access to safe drinking water.

Davida Smyth is Associate Professor of Biology at Texas A&M-San Antonio and the Deputy Director of SENCER. Davida's current research focuses on wastewater epidemiology to monitor for infectious disease. She is currently leading a funded initiative at NCSCE to extend economical and effective wastewater research to under-resourced communities in the global south.

The Work of the NCSCE WATER FELLOWS

Wastewater Surveillance in Uruguay (RP)

Florencia Cancela

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Department of Bacteriology and Virology, Faculty of Medicine, Montevideo-Uruguay

Overview of Wastewater surveillance of SARS-CoV-2 genomic populations on a country-wide scale through targeted sequencing. A cost-effective strategy for monitoring prevalence

2:30--Session Block 2- Wickedest Problems part 2: Climate Futures

Broadening Participation in Undergraduate Climate Education (LT)

Karl Haushalter, Lelia Hawkins, Gabriela Gamiz

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Harvey Mudd College

Lighting Talk

SENCER is partnering with the Hixon Center for Climate and Environment and the Harvey Mudd College Office of Civic and Community Engagement to present “Broadening Participation in Undergraduate Climate Education” on September 14-15. This conference will convene climate experts, teacher-scholars from other disciplines and community partners to discuss the future of climate education for undergraduates. The goal of the conference is to expand the number of faculty involved in climate education and for those already involved to deepen their understanding of and appreciation for the strengths that multiple perspectives bring to addressing the challenges of climate. A theme throughout the conference will be broadening participation in climate education on our campuses and in our communities. At the SENCER Summer Institute, the conference organizers will share an overview of the program and a preview of what attendees can expect.

Speculative Ecology: Teaching in the Chthulucene (LT)

Tobi Park

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Alec Armstrong

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Maryland Institute College of the Arts

We are now grappling with a new epoch, one which looms eerie and uncertain over all earthly lives. It brings both fears of environmental cataclysm and promises of ecological possibility. New life emerges as the old falls. We learn to adapt through disruption. We are able to cultivate and maintain global networks unlike any seen before. This future is profoundly urgent, socially dynamic, and ecologically electric. Are our educational approaches expansive enough to meet it? Speculative ecology is a creative mode of inquiry and research which explores alternative ecological futures. Going beyond traditional ecological sciences, it aims to challenge our assumptions and dominant socio-environmental tropes, drawing on the history and philosophy of science and melding scientific reasoning with personal expression. It fosters systems-based thinking, inspires creative and workable climate solutions, and encourages students to examine the perspectives which are included and excluded by mainstream social narratives.

This session describes a speculative ecology curricula that encourages environmentally, philosophically, and socially oriented thinking. We describe the key ideas animating our teaching and creative practices, share learning outcomes relevant from primary grades through undergraduate education, describe sample learning activities, and discuss plans to incorporate speculative ecology into undergraduate science courses at an art and design college and after-school creative writing programs for middle schoolers. We will also discuss difficulties in developing our work and pose questions to the SENCER community to further develop these ideas together.

The Role of Undergraduate Student Research in Community-based Resilience Planning: Introducing the CERENE model for Climate Resilience Hubs on O'ahu (RP)

Miku Lenentine

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Kapi'olani Community College CERENE (Center for Resilient Neighborhoods)

Robert Franco, Office for Institutional Effectiveness, Kapi'olani Community College.
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In this presentation we introduce an emerging model for addressing climate change through hyper-localized community-based resilience planning which puts students at the heart of the process. The Center for Resilient Neighborhoods (CERENE) is a community-based research and civic engagement center which supports community resilience, environmental sustainability, and climate change adaptation in partnership with community leaders and the City and County of Honolulu. At the heart of CERENE are student leaders who engage with community partners in resilience service learning and undergraduate student research through the Resilience Corps Leadership Award Program and the Transcending Barriers to Success in Economics Bridge Program (TBSE). These students represent the next generation of sustainability and resilience researchers, professionals, educators and neighborhood residents who can integrate sustainability and resilience competencies into their careers and local communities. Student leaders are invited to work as undergraduate research assistants, peer mentors and summer interns in support of islandwide resilience focused on food, energy, older age adults, health, and economic resilience in the context of emergency and non-emergency scenarios. Students gain applied research skills in community engagement, participatory urban planning, GIS, STEM, aina-based economics, social science and Indigenous research methodologies.

The CERENE model is community-based, place-based, equity-centered, culturally informed, and supports decolonizing and Indigenizing climate resilience curriculum and research. The TBSE program has a specific goal of graduating 100 women, Native Hawaiian, Pacific Islander and Filipino students with economics degrees to support a re-envisioned model for economic resilience and a network of community resilience hubs on O'ahu.

3:30 Session Block 3- Advancing Social Justice and Inclusion through STEM Learning Partnerships

Developing a Blueprint for Accelerating Change in Social Justice, Equity, Diversity and Inclusion in STEM Curricula (LT)

Pat Marsteller

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Emory University,

Participants in BioQUEST, SENCER and the ASCN (Accelerating Systemic Change Network) are developing a book, a collection of resources, and eventually a grant, to support and give examples of curricular ideas that use Social and Racial Justice issues for STEM curricula. The book will aim to provide change agents, faculty, and faculty development practitioners with resources to address social justice issues in STEM by providing advice and examples of successful practice. We hope people from all stem disciplines will come to discuss ideas for the book and particularly examples from all stem disciplines. The book will define terms, justify the need for change, and then proceed to practical knowledge for faculty including what self-reflection they need to do before embarking on this work, what they need to know and think about for their students, brief introductions to Universal Design for Learning, Principles of Inclusive Teaching and departmental and institutional supports and barriers. This initiative will bring together literature, advice on how to start with individual reflection and practice, identify multiple ways to engage students, multiple means of representing scientists and student learning, and provide ways of action and expression using UDL principles and other strategies that can promote equitable and inclusive outcomes and learning environments. We have also set up a collaborative group page on the BioQUEST/ QUBES hub. This home of a collaborative community is working on projects associated with social justice, equity, diversity and inclusion in STEM undergraduate programs. This site will have forums for discussion, collections of resources associated with Social Justice in STEM undergraduate curricula, including publications, curriculum descriptions, and chapters for the proposed book.

Centering racial equity in preservice science teacher education using critical speculative design in an undergraduate STEM course (RP)

Veronica Cassone McGowan, vmcgowan@uw.edu

Symone Gyles, sgyles@uw.edu; **Bryan White**, bdwhite@uw.edu; **Elizabeth Starks**, eestarks@uw.edu; **Amy Lambert**, lambea@uw.edu; **Rachel Scherr**, rescherr@uw.edu; **Charity Lovitt**, lovittc@uw.edu, **Carrie Tzou**, tzouct@uw.edu
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The natural sciences are increasingly recognizing the need to address social theories in the study of natural systems (Schell, et al, 2020; Graddy-Lovelace, 2017). Redlining, climate justice, and inequitable access to health care are the characteristics of science and science-related policies that are developed in a framework of institutionalized racism. Racial inequity is therefore a factor in the injustices done by science,

engineering, and technology, and we can no longer ignore the key role of sociopolitical contexts in the teaching, learning, and doing of science, and the preparation of pre- and in-service science teachers.

In this presentation, we will share findings from an NSF-funded project to design a 2-quarter “science for elementary teachers” course, designed to take the place of science content courses typically required for entry into teacher certification programs. A team of educational researchers, STEM faculty, and community experts co-designed modules that integrate NGSS-aligned science and engineering concepts, racial equity, and contemporary scientific tools and practices in the context of examining the history of racist research practices within science itself. We ask, how can undergraduate science courses integrate issues of racial justice to support more just and equitable teaching of science across K-16 contexts? We will provide an overview of our course design and will share examples of how we used critical speculative design to engage students in using critical STEM practices such as data analysis and programming to think about more just futures in response to historic, powered decision making around topics such as climate change, redlining, and gender equity.

Senior Design Projects with Volunteers for Medical Engineering (RP)

Suzanne Keilson

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Loyola University Maryland

This talk is an introduction to the senior design course at Loyola University Maryland and the collaboration that has been developed with Volunteers for Medical Engineering (VME). VME is a forty year old non-profit organization that is part of Image Center Maryland. Each year VME coordinates a variety of client-focused projects that are taken up by individual student teams at a variety of secondary, community college and higher education institutions. This talk will present details of the organization and success of two projects that were completed by Loyola University Maryland student teams. The first project was to provide six saddle modifications that would allow communication devices (e.g. iPads) to be securely attached during therapeutic riding sessions with nonverbal children. The other project was to provide a an alternative communication mechanism for a nonverbal young adult with Autism who needs to briefly broadcast his needs in certain noisy and public situations. Both projects illustrate the ways in which true user-centered design can work to provided appropriate technology with positive social impact. Details of the two organizations, the partnership, and lessons learned for such successful collaborations will be presented.

A TIMEly CURE: A Multidisciplinary Approach to Advance Diversity, Equity and Inclusion of Underrepresented Minority Students in STEM Learning and Student Success (LT)

Fernando Nieto, nietof@oldwestbury.edu, SUNY Old Westbury, Science & Technology Entry Program(co-Director), **Hugh Fox**, Executive Director Community Action, Learning and Leadership (CALL) Program, foxh@oldwestbury.edu; **Duncan Quarless**, Professor, Department of Chemistry & Physics, SUNY Old Westbury,

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The number of minority students pursuing STEM degrees continues to decline nationwide. To promote broader student interest and persistence, the Science and Technology Entry Program (STEP) and Community Action, Learning and Leadership (CALL) Program at SUNY Old Westbury implemented a Panther Citizen Science project using equity-focused High-Impact Practices (HIP). The project model involves instruction that is Thematic, Inquiry-based, Mentor-supported and Enhanced (TIME) and features Course-embedded Undergraduate Research Experiences (CURE). This pedagogy supports courses in both high school and college curriculums, empowering students to develop their own research questions, with mentorship provided by faculty members, student peers, and community-based partners.

In partnership with Town of Hempstead Department of Conservation and Waterways, Nassau County Soil and Water Conservation District, and Brookhaven National Laboratory, college students from Suffolk County Community College, SUNY Old Westbury and Westbury High School are supporting the efforts to monitor the water quality of waterways in Nassau and Suffolk Counties. The multidisciplinary community of practice connects the humanities and STEM fields, providing an ethical context for sustainable practice, civic engagement and environmental justice. Students are provided community-based research opportunities as participatory global citizens of the democracy. The regional concerns regarding water quality have set the stage to identify and engage Environmental Justice Communities of Concern (EJCOC) across Long Island that include articulated project-based academic IHE partnerships between 2- and 4-year institutions as the next iteration for this citizen science project.

MSPY: Community Engagement Projects with Middle Schoolers (RP)

Cyndy Carlson carlsonc@merrimack.edu; **Anne Gatling** (gatlinga@merrimack.edu); **Katie Donell** (donellk@merrimack.edu); **Mary McHugh** (mchughm@merrimack.edu)
Merrimack College

Building on the success of the Lawrence Math and Science Project (LMSP), Merrimack STEM Pathways for Youths (MSPY) is a project-based, career focused after-school pilot program for 7th & 8th grade students. The pilot, which took place during the 22-23 academic year, included undergraduate students coaching middle school students to identify and complete community-engaged projects in their own neighborhoods. By inspiring, mentoring, and empowering young learners through scalable curriculum, career exploration, 180-degree mentorship, and assessment, MSPY sought to increase the number of Hispanic and low-income students succeeding in STEM disciplines in high school and beyond, address pandemic-related learning loss, and improve retention rates from middle school to high school.

For over 10 years, LMSP has provided after-school programming for middle school students one day per week through the school year. For MSPY, middle school students met with LMSP students for regular LMSP lessons once per week, and met after school

one additional day (total of 2 after school meetings each week). The students visited our college campus several times throughout the year for STEM activities led by faculty and college students, completed zoom calls for project support with faculty, and subsequently identified their own research question and/or community project to investigate further - such as how recycling might impact waste management at their school or how germs might spread from their school bathroom. At project conclusion, in May, the middle school students returned to campus to present research and results for their research questions and project outcomes.

4:30 Keynote: Jessica Wyndham, Associate Director, KPMG Banarra, Human Rights and Social Impact



Science Education as a Human and Civil Right: The Responsibility of Scientists

For over a decade Jessica Wyndham lead the Scientific Responsibility, Human Rights, and Law Program at the American Association for the Advancement of Science (AAAS), first as Associate Director, and then as Director. She is an internationally recognized expert on Human Rights Law and has written widely on the power and potential of the right to science for empowering individuals, strengthening communities, and improving the quality of life

Saturday, August 5

1:00-2:15 Session Block 4 – Re-claiming the Human Factor in STEM

Engineering for the Common Good: The Critical Role of Human Rights Education in Science and Technology (RP)

Kelly Bohrer

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University of Dayton

Recently, engineering for human rights has emerged as a field of study at leading universities in the United States. Among these leaders, the University of Dayton recently established a human right minor specifically designed for engineering students. This innovative program seeks to foster a new generation of students, scholars and policy

partners who together can draw on universal principles, tools, and institutional frameworks central to human rights to harness science and technology for tackling global, social, and environmental challenges. Using a human rights based approach more holistically and practically prepares students, faculty, and future engineering practitioners to not only respond to complex global challenges, but to also innovate in inclusive and interdisciplinary design. Human rights education builds on engineering code of ethics and offers international legal standards, new understandings of social structures as root causes in inequity, and systems of accountability providing concrete mechanisms for ensuring democratic practices. This developing field speaks to SENCER's commitment to the "integration of science with arts and the humanities" as well as the goal of "deploying science learning in the service of the long-term collective goals of democracy--including equity, justice, and community well-being." This presentation will explore the research, teaching, and industry opportunities that emerge in this space and aims to expand our community of learning and collaboration between science and human rights.

Using an Environmental Justice Case Study to Teach the Role of Science in Policy-making in a Science Ethics Course (LT)

Melissa Haswell

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Delta College

This environmental justice activity is a two-week module developed for use in a science ethics course that is taught using an anti-racist theoretical framework. The activity scaffolds the concepts of ethical research design, scientific integrity, and social/public policy-making roles of scientists. This specific module also emphasizes the ethical decision-making partnership between scientists, health care practitioners, and public health officials. Students are encouraged to think beyond stereotyped roles of a doctor or a bench scientist and develop an understanding of how they might potentially be involved in public policy where their scientific work is heavily scrutinized.

Purpose, Passion, Curiosity, Artistry and Creativity -- People NOT AI (LT)

Frank Wattenberg

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United States Military Academy (Emeritus)

Like many people, I have been astounded by the power of the latest product of the STEM disciplines - ChatGPT 4.0. But, like many earlier STEM products -- for example, nuclear fission and social media -- power without purpose is a haphazard, often dangerous, force multiplier. As scientists and science educators we need to work with our colleagues across the sciences, arts and humanities and with the artist/humanist within each of us to thoroughly change what and how we teach. We need to focus on the life of a scientist/artist/humanist bringing human purpose, passion, curiosity, artistry and creativity to bear on the existential problems we face -- to use the raw power of STEM wisely, to better our lives. COVID-19 highlighted our collective inability to make

decisions in a high-stakes environment where answers are not found in dusty books, where our knowledge is rapidly changing, where there are multiple, often conflicting, measures of success, loud stakeholders, and where, most importantly, our actions need to, and should be expected to, change as we learn more. The sciences inform our efforts but the real and absolutely essential imperative is living our lives as scientist-artist-humanists.

This session will focus on specific examples of units that can be used in our classes in which students live the life of a scientist/artist/humanist bouncing back-and-forth between theory and real world experimentation and observation using inexpensive readily available "equipment." We use ChatGPT for what it does best -- satirizing more traditional science

Incorporating Techniques from the Humanities to Encourage Engagement with Scientific Projects in a College-Level Summer Internship Program (LT)

Elizabeth Emery

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Montclair State University

Surveys administered during the Green Teams Summer Internship Program hosted by Montclair State University (NJ) reveal that STEM and non-STEM college students from diverse backgrounds report statistically significant gains in self-confidence and oral presentation skills after completing this ten-week paid internship. The program provides undergraduate students an opportunity to increase skills in STEM and prepare for careers by solving sustainability challenges for partners such as community groups, municipalities, and companies. In order to improve the communication skills so important in the workforce, the curriculum places nearly as much emphasis on the public presentation of student results as it does on their research, in part by building on the science communication curriculum developed by the ASBMB (American Society of Biochemistry and Molecular Biology). Weekly hour-long sessions facilitated by faculty members explicitly invite student reflection about the best ways of presenting findings to multiple audiences such as professional, scientific, and educational organizations, employers, family members, and social media outlets.

This talk briefly describes the curriculum and different types of oral presentations produced by student participants while proposing that it is precisely the incorporation of elements such as character development, suspense, and connection to audiences--skills traditionally associated with the humanities and the arts--that makes the presentation of scientific concepts so helpful for students and audiences. Furthermore, using storytelling techniques to convey findings helps students better understand and articulate the ethical and social dimensions of the STEM projects in which they are engaged.

Two cultures? Using disciplinary parallels to build art-science-humanities initiativesn (RP)

Mary Nucci

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Rutgers University

C.P. Snow's concept of two cultures has been challenged in the literature many times since its publication in 1959. Unfortunately, these divisions still exist in many college and university mindsets. Over the last two years (and during Covid shut down), collaborations between science, art, and humanities departments in three different schools at Rutgers University have created a suite of courses and programs that function to connect the related goals of these fields for students in a range of majors. We started our discussions across three different schools at Rutgers with the mindset of difference--science was different than art, science was different from the humanities, and there was no easy way to connect. But what we found was that there were more equivalencies across these disciplines in terms of their desired outcomes especially when structured in terms of solving "wicked problems" that allowed us to demonstrate the value of collaboration that encouraged faculty to go beyond two cultures. The talk will focus on how we started, how we collaborated and where we are going with our collaborative programming and courses that encourage students to build their science knowledge through connecting with art and the humanities.

Developing the Mind of an Experimentalist (LT)**Arthur W. Bowman**

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This pedagogical approach aims to guide students in developing what might be called "the mind of an experimentalist." This approach aligns with how new scientific knowledge has been acquired for hundreds of thousands of years. Going back to the time before formal education was established, humans acquired knowledge of the natural world by authentic trial and error experiences, and unaided observations driven by efforts to survive. Motivation to obtain food and shelter, along with reproduction, was the primary impetus of what could be considered as primeval learning. Within the past 150 years, students' learning about the natural world has typically been teacher-centered and based upon the study of textbook information. This non-authentic approach to science instruction has resulted from the ease with which many people, especially in industrialized nations, have their food and shelter needs satisfied. By closely examining how historically-focuses trial-and-error experiences, modern laboratory experimentation, and natural-world-observations operate, an experimentally tending environment is created for students.

Science instruction presented by continually questioning how knowledge of the world is obtained, along with how experimentation extends existing knowledge, will encourage the asking deep questions as to how, why, when, and where scientific knowledge is obtained and verified. The asking of questions and research of protocols can foster students' developing "the mind of an experimentalist." This approach is suitable for teaching all Science, Technology, Engineering and Mathematics (STEM) disciplines, as

well as exploring ways that significant STEM-related societal problems can be identified, analyzed, and solved.

2:30 Session Block 5 - Knowledge and Skills that Support Civic Agency

Preparing Next Generation to Navigate through Misinformation (RP)

Debasmita Basu

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Eugene Lang College of Liberal Arts, The New School

In today's media landscape, visualizations are widely employed by magazines, newspapers, and television to simplify the presentation of complex information (Harper, 2004). Graphical representations of data effectively highlight essential numerical data that might otherwise go unnoticed or prove challenging to comprehend (Dur, 2012). However, alongside the increasing use of graphs in both print and digital media, misleading graphs are equally pervasive, leaving readers susceptible to false information. This prevalence poses a threat to democracy, particularly affecting individuals with limited educational opportunities and a lack of life experiences, who are more vulnerable to fake news and inaccurate graphs (De Keersmaecker & Roets, 2017). To address these concerns, it is crucial to introduce graphical literacy as a fundamental component of the educational curriculum, providing students with ample opportunities to engage with and interpret graphical data (Dur, 2012). Consequently, we conducted a study with middle school students to study their graphical comprehension when they encounter graphs published in public forums such as print and digital media and governmental websites. Particularly, we focused on students' ability to extract data from graphs (reading the data), identify relationships between variables presented in graphs (reading between the data), and make inferences about underlying structures of information displayed (reading beyond the data). In this presentation, I will briefly present the findings of our study and extend the insights gained from the current study to build strategies through course design to equip future generations with the ability to understand scientific information presented in graphical forms in public domains

Addressing Food Insecurity In Diverse, Local Communities (RP)

Christopher Stuetzle, Christopher Stuetzle, stuetzlec@merrimack.edu; **Cynthia Carlson**, Carlsonc@merrimack.edu; **Elaine Ward**, warde@merrimack.edu; **Eleanor Shonkoff**, shonkoffe@merrimack.edu; **Sandra Raponi**, raponis@merrimack.edu; **Claire Aki-Cobham**, akicobhamc@merrimack.edu; **Thavary Hay**, hayt@merrimack.edu
Merrimack College

The Food Justice Research and Action Cluster (FJRAC) at Merrimack College addresses the difficult challenge of food equity and food access in diverse, local communities surrounding the college. The problem of food insecurity has been prevalent for years, but it has become worse since the Covid-19 pandemic. Following Merrimack College's investments to support community engagement and community

engaged research, FJRAC was formalized. FJRAC has advanced work on food insecurity in several ways, such as raising awareness (e.g., Food Justice Symposium); funding community engaged undergraduate research (e.g., the Comer study, and identifying and mapping food insecurity metrics based on market prices and food access); student events (e.g., planting event at the Giving Garden, which is near the College and donates food to local pantries); and cultivating relationships with respective community partners that help combat food insecurity within their community (e.g., collaboration on the Merrimack Valley Food Systems Resiliency Partnership and “Mack Gives Back”). This presentation will discuss the ways in which the cluster: (a) supports local communities in working together and sharing resources, (b) educates undergraduate students about food justice, (c) directly addresses food insecurity through the provision of food (e.g., service-learning course requirements) and (d) seeks long-term solutions through community engaged research incorporating undergraduate students.

Planting the Seeds for Community Engagement through Media Arts (RP)

Patricia Amaral (Buskirk) pbuskirk@hawaii.edu, University of Hawai‘i at Mānoa, School of Communication and Information.

Media Arts is a developing interdisciplinary field of study that combines art, media technology, and communication. Media Arts at its best integrates artistic practice and community engagement with research, critical analysis, and communication about today’s contested and urgent capacious issues through creative and expressive use of various media forms. The Media Arts field has a tremendous potential to communicate across disciplines, institutions of higher education, and communities. As a creative Media Arts curriculum developer and instructor, the presenter will use Media Arts technology and principles in a brief recorded presentation to share examples of how applied designed media communication principles and skills can strengthen the students’ knowledge, community engagement, and specialization – not seldomly leading to fulfilling jobs.

Through the overall curriculum and specific assignments integrating Public Service Announcements (PSA’s) for non-profit organizations and community causes, students are encouraged to utilize their creative digital media knowledge and skills to create short-form media that are communicating pressing social and civic issues that make a difference in their own lives and in the society overall. This presentation will share specific media assignments and approaches designed to enhance critical thinking and strengthen the understanding of the need to care for humans and the environment in these times of crisis for democracy, environment, and human compassion. It will include short-form examples of student productions incorporating these values in areas of environmental impacts and social services.

Community-Engaged Undergraduate Research via Interdisciplinary Collaboration (LT)

Klm Pearson

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S. Monisha Pulimood, Diane Bates, The College of New Jersey

We will present best practices and preliminary outcomes from the campus-wide implementation of a model for boosting undergraduate STEM literacy and civic engagement via interdisciplinary teaching and research collaboration. Students were engaged in research-related activities in two ways. First, students in STEM and non-STEM classes were paired to develop and implement action research projects in collaboration with a community partner to address a community-identified problem. Second, undergraduate student researchers conducted qualitative research on the experiences of students and community partners while computer science and interactive media students built and tested models for computing frameworks leveraging concepts from human computation, collective intelligence, and open collaboration to enable CAB model adopters to find interdisciplinary courses and project ideas of interest, and to become motivated to participate in the dissemination and sustainability of hosted projects. Results indicate that both STEM and non-STEM students indicate that their scientific skills and knowledge increase over the course of a semester in which they participate in a CAB project. In the course of implementing the model, we learned a lot about the kinds of institutional supports needed to facilitate these kinds of interdisciplinary efforts. This research has been supported by a grant from the National Science Foundation (Award #1914869)

3:30 Session Block 6 – Advancing Equity and Access in STEM

STEM Education in the Associate in Arts Program at the University of Delaware: Accessible, Equitable, and Impactful (LT)

Robin Kucharczyk

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University of Delaware

The University of Delaware's Associate in Arts Program (AAP) brings educational equity and access to students across the state. Each of its three campuses provides a route to a UD A.A. degree, after which students can transition to the Newark campus to complete their baccalaureate degree. This opportunity is facilitated by the state's SEED tuition scholarship program for Delaware high school graduates, and the program enrolls a student body that is more racially and socioeconomically diverse than that in Newark. As part of their degree curriculum, AAP students complete ten credits of Natural Sciences and Mathematics courses.

I teach both terms of introductory chemistry and a course, Snack Science, on the science of food and cooking. All three of these courses have advanced STEM learning, each in its own unique way. In CHEM103 I advocated for equity in instructional time for my section and now have a peer-led workshop session attached to the course. This course also utilizes graded student reflections. CHEM104 was taught in a hybrid format this past term so that students on the Georgetown campus would have access to the course and could complete the two-term sequence before transitioning to Newark. Snack Science covers basic biology, chemistry, and physics, as well as the structure and function of food biomolecules, but students also engage with the unexpected:

genetics/genetic engineering, equity and inclusion in the food industry, climate science, and food security.

Online Science Course Development: Increasing Affordability and Accessibility (RP)

Dorothy Salinas

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County College of Morris

This presentation will address techniques to increase the accessibility and affordability of online science courses. These techniques remove barriers to student success and promote diversity by eliminating geographic limitations, supporting disabled students, and promoting enrollment of students from varying socioeconomic status. Examples of techniques to lower course cost include the selection of Open Educational Resources (OER), development of an OER virtual microscope, and the elimination of a laboratory kit through the development of hands-on experiments utilizing common household items.

Larger than themselves: A latent content analysis of students' success stories journals toward civic identity (LT)

John Osias Jacaban

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Philippine Science High School - Ilocos Region Campus

Engagement in a community project as an academic endeavor can develop civic identity. This study uses latent content analysis to examine the concept of civic identity that emerged from the 16 success stories journals of Grade 12 students in the Philippine Science High School - Ilocos Region Campus based on Bengtsson's (2016) four-step-process data procedure. Notably, this study portrayed a drawing-from-the-well relationship between three themes. Being Committed embodies the goals of the community project that deepens students' willingness to improve the quality of life of the people. The second theme, Being Adaptive, remarks on the flexibility and capability of the students to manage their time and resources. The role played by these themes is essential in the manifestation of Being Responsible, for making the project successful and beneficial for the people. With this study, teachers can develop an effective community project toolkit and provide a meaningful civic engagement and leadership experience to their students. This study contributes to understanding the critical role of civic engagement in enhancing civic identity, which is essential for building a strong civil society, and the need for creating effective civic education programs to promote active citizenship. Moreover, the study can inform decision-making in supporting students in developing their civic engagement and leadership skills.

4:00 Session Block 7- STEM Participation: Lessons from Indigenous Serving Institutions

Engagement Pedagogies in Support of Democracy (LT)

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University of Hawai'i at Mānoa, College of Social Sciences

High-impact practices such as service learning, internships, and undergraduate research have strong potentials for building civic capacity through connecting disciplinary content in academic fields with the context of lived experiences for self and others. Through inquiry and action inside and outside of traditional educational settings, this can create opportunities for expanding competencies, knowledge, understanding, and responsibility. The presenter will share thoughts, experiences, and examples of transformative education in Hawai'i higher education, developed over almost three decades of research and of practice in civic engagement. Recent inspiring and collaborative research and practice in SENCER-related initiatives such as the "Transcending Barriers to Success" and the IKE Alliance (Indigenous Knowledges, Encouragements, Engagements, and Experiences) have contributed greatly to this work, as has an ongoing, joint, research project focused on the potential of engaged pedagogies in strengthening civic-mindedness and a culture of democracy. This latter research builds on surveys and focus-group discussions with students and is performed in collaboration with Dr. Ingrid Geier from Salzburg University of Teacher Education, Austria.

It is essential for the 21st century that we "learn to live together" locally and globally in the sense described by Delors in his "fourth pillar" of education almost 30 years ago. But to learn to live together, we must know how to create partnerships for community and educational improvement. We need to be able to create learning experiences for students to develop positive attitudes, and we need to hone in on the competencies needed today.

The IKE Alliance**Amy Shachter and the IKE Leadership Team**

The Indigenous Knowledges, Engagements, and Experiences (IKE) Alliance addresses STEM participation challenges for Native American, Alaska Native, Native Hawaiian, and Native Pacific Islander (NAAN-NHPI) students. The IKE Alliance is a collective of Native and Non-Native individuals associated with organizations (including colleges, universities, tribal governments) committed to 1) increase NAAN-NHPI student representation in STEM that reflects the population of the Nation; 2) achieve systemic change by Indigenizing STEM education in IKE Alliance institutions; and 3) establish and expand a sustainable IKE Alliance for transformation beyond year five. Our four-strand approach includes a *Sense of Belonging*, a *Sense of Place*, a *Sense of Responsibility and Reciprocity*, and a *Sense of Becoming* that is deeply rooted in local community relationships motivated by respect for culture, history, values, and community knowledge. Our approach has five objectives: 1) take full advantage of both Indigenous and Western knowledge systems to tackle grand challenges; 2) weave Indigenous science, culture, and community into best practices in STEM education; 3) support STEM NAAN-NHPI student leadership through the IKE Alliance Student Corps; 4) create a collective infrastructure to support an Indigenized Networked Communities

model; 5) Develop innovative and culturally appropriate assessment instruments. We invite you participation as we listen and learn.

One of the benefits of the Alliance is that we have supported each other as we work to make progress toward these goals at our various institutions. Multilevel institutional partners (University of Hawai'i (UH), Humboldt State University (HSU), University of Arkansas (UA)), George Mason University (GMU), University of North Carolina, Asheville (UNCA), Texas Woman's University (TWU), and Santa Clara University (SCU). Today, we have a few Alliance members with us.

Sunday, August 6

1:00 Workshop

Building Community, Organizing for Change: The Importance of Systems Thinking

Presented by Don Greer of Greer Black Company, Albert Linderman, PhD, of Sagis Corporation and Jonathan Bucki of the Dendros Group.

Using their broad experience in supporting non-profit organizations in achieving durable, systemic, change, the professionals of the Dendros Group have guided the National Center's strategic planning and leadership development since 2011. They have supported our efforts to build mission-driven, values-centered leadership and planning efforts aligned with the goals and ideals of our educational "community of transformation."

In this most challenging and volatile time for educational institutions, this presentation will explore emerging strategies and models that illuminate the critical role of systems thinking in managing and achieving durable and lasting change using the example of a Collective Impact initiative in Rapid City, South Dakota. The team will consider how models can be an important tool for learning, challenging assumptions and identifying high-leverage variables in the systems we hope to impact.

2:30 Session Block – 8 Cross National Conversation on STEM Education, Social Justice, and Democracy

Geraldine Mooney Simmie, Professor of Education (STEM Education)

Director EPI•STEM National Centre of STEM Education, School of Education, Faculty of Education and Health Sciences, University of Limerick and

Sara Tolbert, Associate Professor of Science and Environmental Education, University of Canterbury, SENCER Diplomat

3:30 Session Block 9

GIS Analysis of Redlining on Urban Forest Composition in Syracuse, NY (LT)

Christopher Badurek

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State University of New York at Cortland

What impact does the history of redlining have on forest composition in neighborhoods of cities in upstate New York State? The practice of redlining, or discriminatory lending practices, as evidenced by the 1930's era Homeowners Owners Loan Corporation (HOLC) maps is well known to have affected neighborhood property values. The web GIS tools from the Mapping Inequality: Redlining in New Deal America project are integrated with urban forestry data sources here to examine potential linkages between the legacy of 'redlined' properties and their forest composition. The Mapping Inequality data are scanned images of the HOLC maps, downloadable GIS data files, and in web GIS data format (e.g., GeoJSON) for direct placement into web GIS applications. Spatial analysis of current property values and percent tree canopy cover for nine neighborhoods was conducted: five neighborhoods classified as Red (undesirable) and four neighborhoods classified as Green (highest quality) in the City of Syracuse. Results indicate a substantial difference in tree canopy cover as well as in corresponding property value. Why is tree canopy cover an important aspect of measuring equality in the urban environment? According to Murphy (2022), tree canopy cover is a reliable indicator of inequalities in property values, home ownership rates, and in racial segregation in the City of Rochester. In addition, disparities in tree canopy cover also include relationships to differences in public health outcomes and resilience to climate change.

From the Liberal Art of Science to the Liberating Art of Science (LT)

Gordon Uno

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This is a short introduction to a new model of scientific literacy that is student-centered, holistic, and focuses on the preparation of all students to engage with science and science related issues and problems in their personal, professional, or civic lives, regardless of their academic major or future career.

4:00 Closing Keynote

Cathy Manduca



Education for a Sustainable and Just Society - Linking Values, Equity, Science and Action

Science and Civic Engagement is a corner stone of education for a sustainable and just society. This talk will reflect on the foundational values and principles of NCSCE are

how they are tied to the broader goals of STEM education and of higher education. Viewed in this context what do we learn about our own practices and our role in contributing to the larger goal of higher education for a sustainable and just society.

Dr. Cathy Manduca founded the Science Education Resource Center (SERC) at Carleton College in 2001 and served as Director until 2020. SERC supports communities of educators in improving education through peer learning and creation of on-line resources. This work included a strong emphasis on Earth education and its relationship to societal issues. Dr. Manduca's scholarship focuses on understanding faculty learning and strategies for improving teaching practice. She has also written about the nature of geoscience expertise and the scope and purpose of geoscience education. Currently her interests include community-scale educational ecosystems and the role of education in creating a sustainable, just communities and society.

Dr. Manduca was the Executive Director of the National Association of Geoscience Teachers from 2007 to 2019. She served on the Board on Science Education for the National Academies of Science, Engineering, and Medicine, as well as in the elected leadership for the American Geophysical Union and AAAS Education Section. She is a fellow of the AAAS, the American Geophysical Union, and the Geological Society of America, and past recipient of the American Geophysical Union's award for Excellence in Earth and Space Education. She received her B.A. in Geology from Williams College and Ph.D. in Geology from the California Institute of Technology

5:00 *Presentation of the Wm. E. Bennett Awards for Civically Engaged Science Education*