BOARD # 402: NSF EDA-Eng Diversity Activities: *** Asset Driven Equitable Partnerships (ADEP) Workshops – Sharing What Works (WIP)

Dr. Kenneth A Connor, Rensselaer Polytechnic Institute

Kenneth Connor is Program Officer at the Inclusive Engineering Consortium (IEC), whose mission is to enable MSI ECE programs to produce more and better prepared graduates from groups that have been historically underrepresented in ECE careers. He is also an emeritus professor in the Department of Electrical, Computer, and Systems Engineering (ECSE) at Rensselaer Polytechnic Institute (RPI) where he taught courses on electromagnetics, electronics and instrumentation, plasma physics, electric power, and general engineering. His research involves plasma physics, electromagnetics, photonics, biomedical sensors, engineering education, diversity in the engineering workforce, and technology enhanced learning. He learned problem solving from his father (who ran a gray iron foundry), his mother (a nurse) and grandparents (dairy farmers). He has had the great good fortune to always work with amazing people, most recently the members and leadership of the IEC from HBCU, HSI, and TCU ECE programs and the faculty, staff and students of the Lighting Enabled Systems and Applications (LESA) ERC, where he was Education Director until his retirement in 2018. He was RPI ECSE Department Head from 2001 to 2008 and served on the board of the ECE Department Heads Association (ECEDHA) from 2003 to 2008. He is a Life Fellow of the IEEE.

Prof. Miguel Velez-Reyes, University of Texas at El Paso

Dr. Miguel Velez-Reyes is the George W. Edwards/El Paso Electric Distinguished Professor in Engineering and Chair of the Electrical and Computer Engineering Department at the University of Texas at El Paso (UTEP). He also holds a joint appointment with Pacific Northwest National Laborary (PNNL) as a Senior Scientist. Dr. Velez-Reyes is an accomplished educator, researcher and mentor. He is an experienced researcher in exploitation of remote sensing data for earth system science, defense and security, and space situational awareness. His research focuses on integrating physical, statistical, and machine-learning approaches for remote sensing signal analytics. His work is presented in over 180 publications in journals, book chapters, and conference proceedings, and has supervised over 60 post-doctoral, doctoral and master students. Dr. Velez-Reyes is a first generation in college student who received the BSEE degree from the University of Puerto Rico at Mayagüez (UPRM), in 1985, and the MSEE, the Electrical Eng. D., and the PhD degrees from the Massachusetts Institute of Technology (MIT) in 1988, 1988, and 1992 respectively. He chairs the SPIE Conference on Algorithms, Technologies and Applications for Multispectral and Hyperspectral Imaging. His technical achievements and service to the community have been recognized with the distinction of Fellow of SPIE (The International Society for Optics and Photonics) for his contributions to hyperspectral image processing, and Fellow of the Academy of Arts and Sciences of Puerto Rico. In 1997, he was one of 60 recipients from across the United States and its territories of the Presidential Early Career Award for Scientists and Engineers (PECASE) from the White House. He received the IEEE Walter Fee Outstanding Young Engineer Award in 1999. He is a board member of the Inclusive Engineering Consortium and an advocate to provide access to excellent education to students from underserved populations and foster social mobility of students from economically disadvantaged backgrounds. He is a life member of SHPE and SACNAS, and Senior Member of IEEE. He is also a member of AIAA, ASEE, and AGU.

Dr. John C. Kelly, North Carolina A&T State University

Dr. John C. Kelly, Jr. is chair and associate professor in the Department of Electrical and Computer Engineering at North Carolina A&T State University. He received his Ph.D. in Electrical Engineering from the University of Delaware. Dr. Kellyâ€™s researc

Dr. Pamela Leigh-Mack, Virginia State University

Dr. Pamela Leigh-Mack is Professor and Chair of the Department of Engineering at Virginia State University. She received the B.S. degree in Mathematics from Virginia Union University, B.S. and M.S. degrees in Electrical Engineering (EE) from Howard U

Dr. Barry J. Sullivan, Electrical & Computer Engineering Department Heads Assn

Barry J. Sullivan is Director of Program Development for the Inclusive Engineering Consortium. His 40-year career includes significant experience as a researcher, educator, and executive in industry, academia, and the non-profit sector. He has developed

Elizabeth Hibbler, Conference for Industry and Education Collaboration (CIEC)
Dr. Stephen M Goodnick, Arizona State University
Dr. Shiny Abraham, Seattle University

Shiny Abraham is an Assistant Professor of Electrical and Computer Engineering at Seattle University. She received the B.E. degree in Telecommunication Engineering from Visveswaraiah Technological University (VTU), India in 2007 and Ph.D. from Old Dominio

Michelle Klein, Electrical and Computer Engineering Dept. Heads Assoc. (ECEDHA)

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Abstract

The mission of the Inclusive Engineering Consortium (IEC) is to enable Minority Serving Institution (MSI) Electrical and Computer Engineering (ECE) programs to produce more and better prepared graduates from groups that have been historically underrepresented in ECE careers. IEC leadership hypothesizes that the key to achieving this goal is more fully engaging the students, staff and faculty at Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs) and Tribal Colleges and Universities (TCUs) in the broad ECE education and research enterprise by building partnerships with Predominantly White Institutions (PWIs), industry, government labs, etc. These partnerships must be equitable with all voices being heard and all relevant assets identified and utilized.

The equitable partnership concept came out of a series of IEC workshops that addressed Anti-Racism Practices in Engineering. Since then, IEC has been applying the ideas developed and collecting feedback, particularly on barriers to their effective use. Anti-Racism Practices in Engineering should apply to students, staff, and faculty in all activities in an ECE program. However, IEC has focused on research because it is THE activity that is the most underdeveloped at most MSIs and the primary reason why PWIs usually contact MSIs. The most exciting and potentially impactful effort involves co-development and co-delivery of courses in support of students on pathways to research careers.

MSIs need investment to increase their research capacity and, thus, expand opportunities for their students. Personnel at PWIs must engage with their counterparts at MSIs so they will learn how to more effectively mentor and teach students from MSIs. Both types of institutions must invest in each other to achieve maximum benefit from the diversity of ideas, cultures, resources, etc. found at such different institutions. Equitable partners must be able to identify and articulate their assets and understand the assets of other participants. Finally, partnerships only work if there is sufficient trust, which comes from knowledge of and engagement with one another. The model for such partnerships is what IEC calls ADEP – Asset Driven Equitable Partnerships.

ADEP principles have been developed and applied through additional workshops funded under this and other programs and developing partnerships. The partnerships take a variety of forms but generally involve either a small subset or all core IEC MSI members plus some PWIs, with occasional industry or national lab participation. Recently, partnerships have been developed between core IEC MSI members and their regional community colleges. There are also joint efforts with other non-profits and industry working to achieve similar outcomes. To guide these partnerships, the ADEP Rubric continues to be developed to identify what is helping or hindering the success of these collaborations. New proposals are being prepared and new programs begun. At the same time, the workshops that bring together as many IEC members as possible, virtually, in person, and hybrid continue. There remain many barriers to be overcome, but the ever-evolving ADEP approach is working through the active exchange of ideas in the pursuit of common goals.

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Introduction

Over the past several years, a community of ECE programs from Minority Serving Institutions (MSIs) has recognized the need for guidelines to enhance collaboration with strong Predominantly White Institutions (PWIs), particularly those classified as Very High Research Activity (Carnegie R1). Drawing on their experiences, including a productive workshop series on Anti-Racism Practices in Engineering, a simple rubric was developed to apply these guidelines. This rubric, detailed in the appendix and earlier papers [1], is a work in progress, addressing systemic issues that have persisted for centuries.

The importance of such collaborations is echoed in recent National Academies reports. The 2019 report *Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce* [2] highlights MSIs' critical role in diversifying the STEM workforce. The 2023 report *Advancing Antiracism, Diversity, Equity, and Inclusion in STEMM Organizations: Beyond Broadening Participation* [3] underscores the need for sustainable partnerships between MSIs and PWIs, recommending PWIs draw inspiration from MSIs' culturally responsive practices. A January 2024 dissemination event by the National Academies discussed practical implementation of these recommendations, featuring sessions on fostering inclusivity, forming MSI-PWI partnerships, and addressing resistance to change.

IEC core MSI members, who began collaborating over a decade ago, have partnered with PWIs, industry, government labs, and community colleges. These partnerships thrive when equitable, with all voices heard and assets fully utilized. This approach aligns with IEC's model of Asset-Driven Equitable Partnerships (ADEP), which provides a framework for successful collaboration. While ADEP principles are still evolving, they have proven effective in fostering equitable partnerships. However, a significant challenge remains: identifying sustainable funding pathways and developing methodologies to help prospective partners, program officers, and reviewers understand these principles without requiring extensive engagement.

Key examples of these partnerships are discussed below, highlighting successes and ongoing challenges in building sustainable, equitable collaborations. IEC member institutions are engaged in a variety of multi-organizational partnerships. The organization began with 13 HBCU ECE programs, who worked together to develop and implement a new pedagogy for learning the most fundamental of ECE courses – Electric Circuits. Based on the use of personal instrumentation, this collaboration also went on to address other electronics rich courses, courses that introduced ECE to first year students, and senior design. [4] All 13 programs worked closely together, guided by colleagues from two HBCUs and a PWI. Two or more faculty at each institution formed a team for local implementation, and all teams met regularly online and roughly annually in person to learn from one another, share what worked and what did not, and generally develop a network of collaborators who produced a remarkable level of change at all 13 schools. Overall group members had a great deal in common with similar communities served, similar sizes institutions and departments, similar resource levels, etc.

Since IEC was founded in 2019, the number of core MSI schools involved has grown by adding HSIs and TCUs. The HSIs are a small subset of universities with that designation. They have

demographics like HBCUs. That is, they are easily majority Hispanic, with percentages as large as 90%. They do differ from HBCUs. They are generally much larger and are located in a city or general area that is also highly Hispanic. Some have achieved R1 status and regularly graduate a large number of PhDs. No HBCU has R1 status, although some are working on it. What all these core schools share is a long-term and very strong commitment to the education of the community they serve. They also share larger than average teaching and advising responsibilities.

In addition to adding other MSIs, IEC now has nearly as many PWI affiliate members as core MSI members. It also has several corporate members. Collaborations are being formed and sustained involving all types of members, which now include community colleges largely through the DoDSTEM funded program to facilitate transfer from 2-Year to 4-Year Engineering Studies. [5] New collaborations are being developed through IEC's partner Foundation, which helps the same communities as IEC through industry partnerships. Finally, there are many other excellent organizations working to accomplish similar goals. IEC is also working together with these organizations, which vary greatly in size, resources, agility, and general focus, but essentially all are engaged in some aspect of broadening participation in engineering.

New and Developing Equitable Partnerships

Much of the present development of equitable partnerships is built around the DoDSTEM funded 2to4 program, in which over 50 undergraduate students are supported with stipends and scholarships at a similar number of institutions, both 2-Year and 4-Year. Faculty led projects are also being funded to support these and other transfer students. These activities include:

Outreach and Networking Workshop All supported 2to4 Scholars have been organized into teams of 3-6, each with both an academic and industry mentor, to develop and deliver hands-on outreach activities at community colleges.

Partnerships Involving 2-Year and 4-Year Faculty To build more productive relationships between faculty at both 2-Year and 4-Year schools, IEC is piloting faculty-developed ideas to bring students from their community college to at least one of their choices for a 4-Year school where they will complete their BS degree program.

Co-Development and Co-Teaching at 2-Year and 4-Year Schools Possibly unique to ECE, there is one course that is critical for student success – Electric Circuits. An exciting new project is being piloted by the IEC 2to4 Project that brings together faculty from two of its larger core partners along with faculty from the local community college that sends the most students for their BS degree in Electrical or Computer Engineering. They are co-developing and collaborating on the delivery of Circuits courses at all four institutions. The project is built around a new online homework system developed at an IEC HBCU. In the Fall 2024 term, 131 total students were enrolled in these classes, 28 of whom were at community colleges.

Exporting Models for Transfer from Local Community College to 4-Year Institution The 2to4 Project is built on a node architecture where each core MSI 4-year school, along with its key local community colleges, forms one of 20 nodes in the IEC community.

The Keysight 2to4 Scholars Program is an initiative designed to support engineering students transitioning from Santa Rosa Junior College (SRJC), to the University of California, Davis (UC Davis), with a focus on underrepresented and first-generation college students. It provides scholarships of up to $10,000 per student to cover tuition, along with student participation in the IEF Pathways program, which offers mentorship, workshops, and internship support. The initial version of this program begins in Winter 2025 with the goal of offering scholarships in Fall 2025. This Keysight funded scholarship program is a model for other companies to emulate and has the potential to provide a sustainable pathway for continued support of community college students who wish to pursue ECE careers.

Building Productive Long-Term Relationships Between MSI and PWI ECE Programs The Chips and Science Act has offered some outstanding opportunities for building up the educational infrastructure to support the US Semiconductor Industry. IEC partnered with three PWIs to obtain first round FuSe funding to explore advanced ideas in interconnects. Part of this funding supported an ideation workshop at which IEC core MSI and affiliate PWI members developed new pedagogical approaches for semiconductor education. The outcomes of this workshop formed the basis for an NSF INCLUDES proposal to develop and pilot focused training to enable MSI students to obtain internships and ultimately their first job at major semiconductor manufacturers.

Working with Other Organizations to Promote Opportunities for MSI Students – Next Steps Much of higher ed is focused on local optimization. Each institution works to make itself the best it can be rather than focusing on benefiting the community as a whole. IEC takes a different viewpoint where at least some of the resources at each institution are pooled and faculty, staff and students work together to make sure every single student who should be pursuing an ECE or any other engineering degree in the sub-discipline of their personal passions, can do so. An ECE student at a school without a decent semiconductor fab facility should still be able to obtain the education necessary for a career making semiconductor devices.

Conclusion

Equitable partnerships have shown that they can help build productive relationships between quite different institutions, involving students, staff and faculty along with practicing engineers from industry. The principles of ADEP work. People listen to one another. They develop ideas together. The build relationships that can last for many years. Some of the authors of this paper have been collaborating for decades.

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Appendix: Asset Driven Equitable Partnerships (ADEP) Equity Rubric

This rubric has been developed by IEC to determine the level of equity in a partnership:

1. Asset Identification: Each partner has clearly identified and shared their assets (tangible and intangible) with one another.
2. Investment: Partners are actively investing in one another, not just through the sharing of resources but also by committing time and energy to building the partnership.
3. Inclusivity: All voices are heard and considered in decision-making, and there are mechanisms in place to ensure that marginalized voices are particularly amplified.
4. Specific Outcomes: Partners have mutually agreed upon specific, measurable outcomes that they are working towards.
5. Communication: Communication is transparent, regular, and involves multiple channels to ensure all partners are informed and able to provide input.
6. Adaptability: Partners are willing to adapt and adjust their approach as needed, based on feedback, and changing circumstances.
7. Responsiveness: Partners are responsive to any concerns or issues that arise, and work to address them in a timely and effective manner.
8. Accountability: Partners hold themselves accountable for their actions and commitments, and work to address any issues that arise in a timely and effective manner.

This rubric can be used to evaluate the equity of a partnership by assessing whether the partnership is built on *mutual respect, transparent communication, and a willingness to invest in each other's success*. This is not a definitive and exhaustive list; it is a Work in Progress and can be modified to suit the specific needs and context of the partnership.

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