Board 85: Work in Progress: Asset-Driven Equitable Partnerships (ADEP in Practice)

Dr. Kenneth A Connor, Inclusive Engineering Consortium & 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.

Dr. Mohamed F. Chouikha, Prairie View A&M University

Dr. Mohamed Chouikha is a professor and chair of the Department of Electrical and Computer Engineering at Howard University. He received his M.S. and Ph.D. in Electrical Engineering from the University of Coloradoâ€"Boulder. Dr. Chouikhaâ€™s research inte

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

Dr. John C. Kelly, Jr. is interim chair and associate professor in the Department of Electrical and Computer Engineering at North Carolina A and T State University. He received his Ph.D. in Electrical Engineering from the University of Delaware. Dr. Kelly's research includes engineering education and cyber-physical systems' security.

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

Dr. Stephen M Goodnick, Arizona State University
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). 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 is a leading researcher and educator in multi/hyperspectral remote sensing, and sensor and signal analytics for non-intrusive monitoring. His work is presented in over 160 publications in journals, book chapters, and conference proceedings, and has supervised over 55 post-doctoral, doctoral

and master students. Dr. Velez-Reyes has been principal investigator or co-principal investigator in grants and contracts totaling over $25M. 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. In addition to being ECE department chair, he is engaged in important leadership roles as UTEP Campus Coordinator for the NOAA Center for Earth Systems Science and Remote Sensing Technology led by City College of New York and was interim director of the UTEP Regional Cyber for Energy Security Center. He was a member of the faculty at the Electrical and Computer Engineering in the University of Puerto Rico at Mayaguez (UPRM) from 1992 to 2012. He was the Founding Director of the University of Puerto Rico at Mayaguez (UPRM) Institute for Research in Integrative Systems and Engineering (IRISE) and was Associate Director of the NSF Engineering Research Center for Subsurface Sensing and Imaging Systems (CenSSIS) led by Northeastern University. He was also UPRM campus coordinator for the Center for Power Electronic Systems (CPES) a NSF ERC led by Virginia Tech. He was director of the UPRM Tropical Center for Earth and Space Studies (TCESS), a NASA University Research Center, and Director of the UPRM Laboratory for Applied Remote Sensing and Image Processing (LARSIP). Dr. Velez-Reyes is a strong advocate on promoting access to excellent higher education to all students particularly those from socioeconomically disadvantage backgrounds and underrepresented populations. He is a board member of the Inclusive Engineering Consortium and is actively engaged in initiatives that promote diversity equity and inclusion in engineering education. He has held faculty research-internship positions with Air Force Research Laboratories, and NASA Goddard Space Flight Center. Furthermore, he is a member of the Eta Kappa Nu, Sigma Xi, Tau Beta Pi, and Phi Kappa Phi honor societies. He is a life member of SHPE and SACNAS, and Senior Member of IEEE. He is a member of ASEE, and AGU.

Michelle Klein, Electrical and Computer Engineering Dept. Heads Assoc.
Prof. Truong Nguyen, University of California, San Diego

Truong Nguyen is a Distinguished Professor at UCSD. His current research interests are video processing and machine learning algorithms with applications in health monitoring/diagnosis and 3D modeling. He received the IEEE Signal Processing Paper Award

Prof. Petru Andrei, Florida A&M University; Florida State University

Dr. Petru Andrei is Professor in the Department of Electrical and Computer Engineering at the Florida A&M University and Florida Stat University (FAMU-FSU) College of Engineering. He is the FSU campus education director for the NSF-ERC Future Renewable El

Prof. Shayla Sawyer
Dr. Esther T. Ososanya, University of the District of Columbia

Dr. Esther T. Ososanya is a professor of Electrical and Computer Engineering at the University of the District of Columbia. During her career, Dr. Ososanya has worked for private industry as a circuit development engineer. Her expertise is in the areas of VLSI ASIC design and Embedded Systems design.

David Zubia, University of Texas at El Paso
Milford Muskett

Asset Driven Equitable Partnerships – ADEP in Practice (WIP)

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 in 2021 that addressed Anti-Racism Practices in Engineering. Since that time, 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, there has been a focus on research because it is THE activity that is the most underdeveloped at most MSIs and the primary reason why groups from PWIs usually contact MSIs.

MSIs need investment to increase their research capacity and, thus, expand opportunities for their students. People at PWIs must engage with their counterparts at MSIs so they will learn how to more effectively mentor, teach, and guide 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.

Since the original workshops in 2021, ADEP principles have been developed and applied through additional workshops 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. There have also been joint efforts with other non-profits working to achieve similar goals. 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, both virtually and in person, continue. There remain too many barriers to be overcome, but the ever-evolving ADEP approach is working.

Introduction

For the past several years, a community of ECE programs from Minority Serving Institutions (MSIs) has seen the need for a set of guidelines to improve the chances of success when they collaborate with strong Predominantly White Institutions (PWIs), especially those with Very High Research Activity (Carnegie R1). Based on a wide variety of experiences, including an exceptionally productive workshop series on Anti-Racism Practices in Engineering, a rubric was developed that offers a simple approach to applying such a set of guidelines. The rubric is found in the appendix, and its development and some additional discussion can be found in earlier papers [1]. This idea is likely to remain a Work in Progress for quite some time, especially because it attempts to address issues that have plagued societies for centuries.

Many other organizations have come to similar conclusions. In the last few years, the National Academies have issued some reports that address both reasons why groups from quite different universities should collaborate and how best to do so. Two reports are particularly important, one of which is being quite actively promoted in the present academic year. In the 2019 National Academic Press Report *Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce* [2], they discuss the critical role of MSIs in creating a diverse STEM workforce, both now and in the future (should their potential be fully tapped). In the 2023 report *Advancing Antiracism, Diversity, Equity, and Inclusion in STEMM Organizations: Beyond Broadening Participation* [3], they note "that minority-serving institutions (MSIs) can serve as examples of providing intentional and culturally responsive student and faculty support and recommends (Rec. 2-1) that predominantly White institutions (PWIs) seek sustainable partnerships with MSIs." The National Academies Board on Behavioral, Cognitive, and Sensory Sciences hosted a dissemination event on January 29-30, 2024, … to … "acknowledge new challenges to advancing ADEI in STEMM and provide space for focused discussions on the practical implementation of several key recommendations in the report. The event … include(d) sessions on strategies for forming partnerships with Minority Serving Institutions, responding to resistance to change, fostering inclusivity at the teams and organizational levels, and tracking gatekeeper decisions." In one of the first sessions, attendees heard "from individuals who have worked to establish sustainable partnerships between PWIs and MSIs." One of these partnerships involved IEC members and will be discussed below.

Since most of the core MSI members of IEC began actively collaborating more than a decade ago, they have worked together through partnerships with one another, PWIs, industry, government labs, other organizations, community colleges, etc. These partnerships succeeded when they were equitable with all voices being heard and all relevant assets identified and utilized. The model for such partnerships is what IEC calls ADEP – Asset Driven Equitable Partnerships. The principles of ADEP, while still being refined, have been found to provide a context in which it is possible to develop successful equitable partnerships and learn from existing partnerships. Key active examples of such partnerships are discussed below. Generally, they work well, but, at this time, the pathway to obtaining the resources necessary to achieve sustainable steady-state has been difficult to identify. It remains a major challenge to find a methodology that will enable people not directly involved in these partnerships (e.g. prospective partners, program officers and review panels) to understand these principles without necessarily having to engage in a long, labor-intensive process.

Active Partnerships in the Context of ADEP

There are several active partnerships that involve IEC member schools. Some are collaborations between one or more Core MSI members and one or more Affiliate PWI members. IEC is built around 21 Core MSI schools (HBCUs, HSIs, TCUs), but also includes a similar number of Affiliate PWI members, nearly all having very active research enterprises (Carnegie R1). There are also corporate and community college members. The latter is the newest member category and generally involves schools that participate in the IEC 2TO4 program [4]. Some IEC Core MSI members also have formal collaborative relationships with PWIs independent of IEC. IEC supports both types of partnerships to the extent requested by its members. There is one additional type of partnership – organization to organization. All partnerships can benefit from ADEP concepts. The following are examples of presently active partnerships.

Intel Funded Program Connected Students and Faculty from Two IEC MSI Schools with Their Counterparts at an IEC Affiliate PWI School – Faculty from UCSD and IEC leadership developed a proposal to Intel to fund an Asset Driven Equitable Partnership to pilot a pathway to graduate studies for groups of 3 students from two different IEC Core members. Students were engaged in research at their home institution during the academic year and at UCSD in the summer. This program provided funding to support IEC Core MSI faculty release time and research expenses so that their student cohort could begin their research experience at their home institution. Faculty from UCSD and the student's home institution co-advised the students for the entire year of the project. This helped the students be prepared to make optimal use of their time at UCSD. In addition, faculty at the IEC Core MSI schools were able to build their local research activities and develop collaborations with UCSD faculty. Students were encouraged to attend graduate school and provided additional preparation by participating in an internship training experience at UCSD. The two IEC Core MSI schools participating were one HBCU FAMU and one HSI UTEP. Students were also encouraged to apply for internships at Intel after they complete their undergraduate studies.

Student feedback was very positive. "The summer research program was a great learning experience," said a student at FAMU, who conducted research in electrical engineering professor Kenji Nomura's lab at UCSD. "This program was my first time conducting research, and I am glad that I got to be part of such an interesting project." A second student said "I'd never done research before we joined the program." "Student participants got a semester of research experience under their belts at their home institution before coming to UCSD this summer. They'll continue that research when they return in the fall, with the goal of an internship at Intel next summer." The second student, who will graduate in 2024, said "this experience helped her solidify her post-graduation plans" [5].

Participating faculty appreciated both the immediate impact on their programs and future prospects. "'With this program, we are serious about building long-lasting multifaceted relationships that give electrical engineering faculty at minority-serving institutions both recognition and support for their critical efforts to inspire, train and educate – year after year – diverse cohorts of electrical engineering undergraduates who are prepared to go on to electrical engineering graduate programs, if they choose,' said Truong Nguyen, the electrical and computer engineering professor at the UCSD Jacobs School of Engineering who runs the program" [5].

Participating faculty from the two IEC Core MSI schools were asked to reflect on their experiences in this program by applying the ADEP Rubric (see Appendix for more details on the rubric).

Petru Andrei, from FAMU, had the following response. "I think this was a wonderful project. It has also increased the collaboration between the PIs/universities more than I expected.

"The 8 items in the rubric were clearly addressed during the project.

"For instance, in our first couple of meetings we identified the strengths that each of the PIs could bring to the project in multiple online presentations and Zoom meetings and we decided what each faculty was supposed to do throughout the project. We did it early enough, which was really great. A couple of things worth mentioning:

1. In the early spring, I asked the UCSD professors receiving the students from FAMU to send me their research publications about the research project in which the students would be involved. Then, during the entire spring semester I went over these articles with students multiple times; my students had to make oral presentations about each article, and we discussed in detail about what the authors have done - I've meet with the students about once a week. It was a bit hard in the beginning because the students did not understand the terminology related to semiconductor devices but, eventually, they had a good idea about what they would do at UCSD; they also learned a lot about semiconductor devices during the preparation phase. I also had to explain many things to about lithography, SRAM, noise margins, etc. but it was rewarding.
2. Since one of the students was going to work in the battery lab at UCSD, I trained her in advance on how to use the glove box and a cycler (to be able to charge/discharge batteries). In this way, the student was already trained about how to use the instruments before even going to UCSD.

"I've been involved in other collaborations before, but I think #1 above made a big difference. One thing that I would add to the rubric (or at least emphasize at number 2) is about how much effort the team put in the preparation of the students before the summer internship. Usually, we try to neglect this part.

"Truong Nguyen (like the other UCSD faculty) was also very responsive. I don't think I have waited for any reply from him for more than 2 hours. He was also very helpful with dealing with housing and admin work. After being involved in the FREEDM-ERC, I just cannot think about a better organization.

"On the more unsuccessful part, I should say it took a lot of time for UCSD & FAMU to do the paperwork for transferring the funds… Because the funding came late, the best students from FAMU committed to more secure industrial internships over the summer. In this way, I was left with only a few 'not so high-GPA' students from FAMU. The lesson that I learned here: we need to make offers to minority students in mid-fall; by December they have already accepted internships for the summer in the industry."

David Zubia from UTEP, whose interaction with UCSD was a bit different from Petru Andrei's, had a similar response, but he directly addressed the rubric, point-by-point. Note that the following response has been condensed for clarity. Statements from the ADEP Rubric are *italicized.*

1. *Asset Identification: Each partner has clearly identified and shared their assets (tangible and intangible) with one another.* Rating: (High) "Duygu Kuzum and I met in 2022 and 2023 to discuss research projects. (Her) group provided devices for UTEP to test in an automated circuit builder that our group developed."
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*. Rating: (High) "3 UTEP students were hosted as UG interns in Duygu Kuzum's group during the 2023 summer session. The students learned how to measure devices fabricated in UCSD's cleanroom. I visited Duygu Kuzum in UCSD in the summer of 2023 to discuss the project. I took a semester course on semiconductor fabrication in May 2023 and supported the enrollment of the 3 UG students from UTEP."
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.* Rating: (Medium) "Communication was open on an as-needed basis."
4. *Specific Outcomes: Partners have mutually agreed upon specific, measurable outcomes that they are working towards.* Rating: (High) "The Partners agreed to incorporate the memory devices from Duygu Kuzum's group into the automated circuit builder being developed at UTEP."
5. *Communication: Communication is transparent, regular, and involves multiple channels to ensure all partners are informed and able to provide input.* Rating: (Medium) "The Partners are communicating on an as needed basis."
6. *Adaptability: Partners are willing to adapt and adjust their approach as needed, based on feedback, and changing circumstances.* Rating: (High) "The Partners have adapted to changing conditions."
7. *Responsiveness: Partners are responsive to any concerns or issues that arise, and work to address them in a timely and effective manner.* Rating: (High) "Various logistic issues have been resolved in a timely 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.* Rating: (High) "Commitments have been addressed."

Overall, in this limited pilot, the rubric seems to have done a good job of identifying key aspects of a successful project. Both collaborations benefitted from the availability of some research facilities and instrumentation at the home institutions of the student participants. Note that the leader on the UCSD side had many discussions about equitable partnerships with IEC leadership while developing ideas for the proposal that was submitted to Intel. He and others at UCSD now have a very clear understanding of ADEP and why it works. All participants found the experience to be very good and prepared and submitted a proposal to support a second student cohort. That proposal was not funded. Getting follow on funding to a first, quite successful project has been a challenge for these partnerships.

From Relationships to Partnerships to Equitable Partnerships – Virginia State University (a Core IEC HBCU) and Virginia Tech (an Affiliate IEC PWI) have collaborated with varying levels of success for several decades. A Sloan planning grant facilitated the development of an equitable partnership. Their holistic approach: Use an equitable partnership as the vehicle for creating the equitable pathway to graduate education with a focus in Quantum Information Science and Engineering (QISE). Historically, PWIs have not prioritized developing equitable, long-term partnerships with HBCUs. PWIs need to learn from HBCUs how to best develop mutually beneficial partnerships, which requires a change in mindset. They must share resources and development of faculty, students, and infrastructure, at each institution is required (e.g., joint faculty appointments, research centers, and courses). Systemic changes make for sustainable partnerships. The ingredients of this successful, equitable partnership include mutual respect and trust, frank and open discussions, educating stakeholders (changing the mindset), high visibility of PWI faculty/staff at the HBCU. It should not be primarily focused on students, as was the case in previous partnerships. Communication should involve listening and responding, not just hearing. The relationship should not be transactional, approached with a "savior" perspective, or with the assumption that the PWI will lead.

Many steps in the partnership have demonstrated success. PWI and HBCU faculty and students have engaged with one another. HBCU faculty have participated in a Quantum Workshop. HBCU students participate in summer QISE internships at the PWI. Faculty collaboration produced a major proposal, which, unfortunately, was not funded. Other smaller proposals, developed at the faculty workshop, have been funded. The PWI PI is taking a sabbatical at the HBCU, which will enable new infrastructure at the HBCU. The PWI participants have learned the many roles of HBCU faculty, how to be culturally competent, new effective ways of mentoring and developing students, and to appreciate the abundance of talent faculty and students at HBCUs. The new infrastructure at the HBCU includes a duplicate of the QISE Experimental Learning Lab at the PWI, a virtual laboratory version of the new course for remote access, and the beginnings of a new consortium of Quantum Experiential Learning.

Note that both partnerships were equitable and that the participants understood everyone's assets. These relationships work well because they are based on a very significant investment of time and personal passion. The participants have learned to trust and respect one another, because of these investments. It is not yet clear how best to make the case for success to program officers and review panels who have not benefitted from a corresponding mutual investment. It takes time to make substantive changes.

Future Semiconductor (FuSe) Collaboration for the Development and Delivery of New Learning Experiences to Address Technology Changes and Workforce Development in the Semiconductor Industry – IEC is part of a consortium of primarily PWIs (RPI, Notre Dame, and Cornell) that was funded in the first NSF FuSe round. Its role is to collaborate, as an equal partner, with project researchers in the mutual development and delivery of new courses, workshops, outreach activities, etc. to attract MSI students to the semiconductor industry and to provide the education they need to succeed. Most HBCU ECE programs do not presently provide the variety and level of courses their students need to make the choice of a semiconductor career realistic. A workshop, with participation from most IEC Core MSI members, some affiliate

members, industry, and government labs will take place at the March ECEDHA meeting in Tucson this year. The goal of the workshop is to jumpstart the work of several collaborative design teams charged to develop and test pilot ideas for semiconductor education. This effort is being guided by ADEP principles and, given the present low number of HBCU and TCU graduates working in the semiconductor industry, should result in a major impact on the size of the US workforce. The key idea is co-development and co-delivery of all educational materials, with the responsible teams working together equitably and sustainably. The workshop will be a true working workshop, making full use of the GAPA process developed at Olin University [6]. Pilots are expected to be completed during Fall 2024.

Other Partnerships that Involve IEC Core MSI Members and PWIs – In addition to partnerships that directly involve IEC, several Core MSI members have signed formal agreements with PWIs, either alone or with other MSI partners, to mutually invest in one another and develop a long-term working relationship. IEC core member faculty are keeping the overall IEC community informed regarding how well these relationships are working so that everyone can benefit from lessons learned and new partners can be added, when appropriate. IEC is particularly interested in recent partnerships that are growing as ADEP principles are refined.

The first such partnership involves Michigan Tech and IEC Core MSI member UDC, who have "signed a … memorandum of understanding (MOU) focused on the values of diversity, equity, inclusion and sense of belonging" [7]. The MOU's scope includes student exchanges and graduate study articulations, faculty collaborations and visiting professorships, and Joint funding proposals and philanthropy. The second involves an alliance of several IEC Core MSI members (UDC, VSU, PVAMU, AAMU, Tuskegee), plus Central State University (CSU) and Binghampton University (BU) [8]. Esther Ososanya, an ECE professor from UDC reports that the latter alliance was established "following the 'Emerging Technology & Broadening Participation Summit hosted at BU on June 4-7, 2023. The purpose of the alliance was to have participating universities pooling resources, knowledge, and expertise, to co-develop STEM education and research initiatives focusing on emerging technologies and cutting-edge research: artificial intelligence and machine learning, data science, smart energy, future manufacturing, cybersecurity, material science, microelectronics, cyberphysical systems and IOTs, and biomedical engineering. The partnership will involve bilateral visiting and faculty sabbatical appointments, and paid summer research opportunities for students. Equally important, the partnership will support the participating HBCUs in their pursuit of a higher Carnegie classification, and using BU's model, create a training program to improve HBCUs offices of sponsored research, by taking a close look at Watson's impressive Institute for Systems Excellence (WISE), which conducts innovative research for government and industry, and remarkably generates 40% of BU's annual budget.

"The Summit which was sponsored by the Thurgood Marshall College Fund (TMCF), was initiated and directed by Dr. N. Joyce Payne, TMCF Founder/Sr. International Affairs & STEM Advisor to the President, based on the premise that "having esteemed academics working together, will stimulate intellectual growth, foster innovation, and contribute to the academic enrichment of partner universities, while laying the foundation for a more diverse and inclusive enterprise in STEM. Recent ongoing collaborations efforts within the newERA cohort, includes the monthly BU Watson College webinar series, 'The Federal Funding Landscape,' with

presentations from DoE, NIH, DoD, 'Increasing Research Impact and Expanding Collaboration Networks' seminars, the individual invited campus visits, by BU Watson College Faculty and the dean of the Watson College and vice versa. Upcoming events in the plans are the 2nd Annual Summit for June of 2024 (at BU)."

Raziq Yaqub, an ECE professor from AAMU is also enthusiastic about the alliance. He says that "our collaboration with BU has proven to be a valuable partnership, particularly in the areas of Advanced Manufacturing, Smart Energy, AI, and Cybersecurity. In our recent meeting, we discussed expanding the alliance to include faculty exchange and joint proposal development, reflecting our commitment to fostering interdisciplinary collaborations for an enriched academic experience… The impact of this alliance is gaining recognition on campus, prompting us to take steps to further enhance its visibility. I'm pleased to inform you that BU Faculty, along with the Dean of Electrical Engineering and Computer Science, are planning a visit to AAMU … signifying the growing engagement."

Partnerships with Other Organizations – The final type of active partnership involves IEC and the 50K Coalition. These two organizations, which share an interest in the successful transition of students from 2-year to 4-year schools in pursuit of a BS in EE or CpE, are sponsoring the T3 Series which introduces thought leaders whose work is focused on this transition to both of our constituencies. There is more information in [9]. The two organizations also regularly actively participate in one another's workshops.

Conclusion

The principles of Asset Driven Equitable Partnerships (ADEP), while still being refined, provide a context in which it is possible to develop successful equitable partnerships and learn from existing partnerships. It remains a major challenge to find a methodology that will enable people not directly involved in these partnerships to understand these principles without necessarily having to engage in a long, labor-intensive process. What looks like a key to expanding the acceptance and use of this approach is a semi-quantitative method for determining the value of the assets each partner brings to the collaboration. Some ideas from engineering design look promising and will be reported on at future conferences. The Inclusive Engineering Consortium will continue to explore a variety of partnerships (programs, workshops, seminar series, etc.), facilitate the pursuit of grants and other resources, and continuously develop the ADEP rubric and other guidance leading to successful Asset Driven Equitable Partnerships.

This material is based upon work supported by the National Science Foundation under Grants Nos. 2338936, 2317076, and 2328906. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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*. Each category can be given a score, then total scores can be added to come up with a numerical characterization of equity. Such an assessment can then be utilized to monitor improvements in a partnership.

It's important to note that this is not a definitive and exhaustive list; it is a good starting point and can be modified to suit the specific needs and context of the partnership. (Note that the rubric was constructed with the assistance of ChatGPT. We include this information when we share the rubric as an incentive for potential collaborators to improve it.)

References

[1] Connor, K. A., & Goodnick, S. M., & Klein, M., & Sullivan, B. J., & Kelly, J. C., & Leigh-Mack, P., & Abraham, S., & Janowiak, J., & Alvarado, S., & Andrei, P., & Scales, W. A., & Wilson, T., & Lagunas, Y. (2023, June), Board 78: ADEP: Asset-Driven Equitable Partnerships (WIP) Paper presented at 2023 ASEE Annual Conference & Exposition, Baltimore , Maryland. 10.18260/1-2—42939

[2] National Academies of Sciences, Engineering, and Medicine. 2019. Minority Serving Institutions: America's Underutilized Resource for Strengthening the STEM Workforce, Washington, DC: The National Academies Press. Doi: https://doi.org/10.17226/25257

[3] National Academies of Sciences, Engineering, and Medicine. 2023. Advancing Antiracism, Diversity, Equity, and Inclusion in STEMM Organizations: Beyond Broadening Participation. Washington, DC: The National Academies Press. https://doi.org/10.17226/26803

[4] See the paper on 'The 2TO4 Project: Facilitated Transition from 2-Year to 4-Year Electrical and Computer Engineering Studies' in this conference.

[5] https://jacobsschool.ucsd.edu/news/release/3678?id=3678

[6] J. D. Stolk and R. Martello, "Reimagining and Empowering the Design of Projects: A Project-Based Learning Goals Framework," *2018 IEEE Frontiers in Education Conference (FIE)*, San Jose, CA, USA, 2018, pp. 1-9, doi: 10.1109/FIE.2018.8658981.

[7] https://www.mtu.edu/news/2023/02/partnering-to-advance-diversity-equity-and-inclusion-mtu-university-of-the-district-of-columbia-pursue-new-mou.html

[8] https://www.binghamton.edu/news/story/4323/binghamton-university-and-six-hbcus-forge-new-educational-and-research-alliance

[9] https://www.iec.org/Programs/T3-Series