

Washington, D.C.
June 17-19, 2024

NSF Report: TechConnect and the Community College Semiconductor Education Roundtable Discussion



June 2024

Author:

Justine Gluck (*The Fletcher School, Tufts University*)

Principal Investigators:

Jared Ashcroft (*The Micro Nano Technology Education Center*)

Dalia Yablon (*TechConnect*)

OSTP Roundtable Student Participants:

Kahneef Martin, City College of Philadelphia

Lillian Ngo, De Anza College

Samuel Avalos, Foothill College

Zahra Mohammadi, Foothill College

Cindy Pineda, Lonestar College

Thien Tran, Lonestar College

Amareesa Rivera, Hudson Valley College

Angelina Yan, Mercer Community College

Eric Li, Mercer Community College

James Greene, Mercer Community College

Ruben Melara, Mercer Community College

Adam Ashcroft, Pasadena City College

Alice Dong, Pasadena City College

Gabriela Deutsch, Pasadena City College

Gabriel Codina, Pasadena City College

Ishan Jha, Pasadena City College

Khanh Nguyen, Pasadena City College

Kiara Lewis, Pasadena City College

Kristal Hong, Pasadena City College

Megan Ashcroft, Pasadena City College

The authors would also like to thank the community college, university, government and industry participants who provided insight and feedback.

Micro Nano Technology Education Center is funded by the National Science Foundation under DUE ATE #2000281. 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

Executive Summary:

As part of MNT-EC's ongoing mission to perform broad outreach and community building within the semiconductor industry, MNT-EC facilitated funded participation in the TechConnect World Conference in Washington, D.C. from June 17-19, 2024 for a cohort of 151 students and faculty, representing 58 educational institutions and semiconductor industries across 21 states.

TechConnect World Conference bridges innovators and researchers across a variety of technological fields. Additionally, a cohort of 20 community college students visited the White House Office of Science and Technology Policy (OSTP) Executive Offices to share their stories with a panel of government representatives from five federal agencies. These experiences offered unprecedented networking opportunities, industry exposure, and professional development for attendees. The OSTP Roundtable offered a chance for federal programs, including CHIPS for America, to be shaped by community college student voices.

About the Micro Nano Technology Center (MNT-EC):

MNT-EC serves as a cornerstone for the National Science Foundation (NSF) Advanced Technological Education (ATE) program. MNT-EC aims to grow the micro/nano technology workforce community by facilitating partnerships between industry, universities, and community colleges. At present, MNT-EC engages a network of 64 community college partners to develop student support programs and industry engagement models. Since the passage of the CHIPS and Science Act in 2022, MNT-EC serves as a leading national organization championing the increased demand for semiconductor technicians and managing the obstacles to expanding the U.S.'s workforce development ecosystem.

TechConnect:

Advanced Technological International (ATI) hosted the 27th TechConnect World Innovation Conference and Expo. The conference gathered key speakers across industry and government to discuss innovations within the following sectors: nanotechnology, manufacturing, biotech, AI, materials, sustainability, energy, electronics, and business. Among the 3,000 attendees were 151 students, faculty, and semiconductor industry leaders funded by MNT-EC to engage with TechConnect offerings, including a dedicated student poster session, career panels, networking events, and a Student Leaders Conference, an opportunity for students to share best practices and network with like-minded group leaders. Students also joined several of TechConnect's 40+ technical symposiums, on topics like "Fuel Cell Developments" to "Advanced Manufacturing of Materials." In addition to the students funded by MNT-EC, ATI supported participation from local colleges and HBCUs, including Montgomery College and Northern Virginia Community College.

TechConnect CHIPS Workforce Development Sessions:

For the first time, TechConnect incorporated CHIPS Workforce Development Sessions into its programming. The inaugural CHIPS Workforce sessions aimed at raising student and educator awareness on the semiconductor industry, with consideration to the federal government's recent \$52 billion federal investment in the CHIPS and Science Act. In partnership with six major semiconductor companies—Intel, Micron, Texas Instruments, IBM, Wolfspeed, and Global Foundries—TechConnect also explored the sector's associated career opportunities.

To begin the program, TechConnect hosted a scientific overview session on the semiconductor industry. Following this tutorial, there were panels on registered apprenticeships, CHIPS research and development, and AR/ VR tools, along with career panels specific to community college students, undergraduates, and graduate students. Programming directly engaged students on how to leverage their skill sets for employment within the semiconductor industry and connected the 151 MNT-EC funded participants to session networking opportunities. CHIPS Workforce panels were also open to any interested TechConnect attendee and received a high turn-out.

MONDAY JUNE 17

- 10:00 [CHIPS Workforce Development and Student Leaders Conference Internal Welcome and Networking \(SLC Participants Only\)](#)
- 10:30 [CHIPS Workforce Development Program: Tutorial on the Semiconductor Industry](#)
- 1:30 [CHIPS Workforce Development Program: Career Panel for Community College/Technical College Students and Educators](#)
- 2:30 [CHIPS Workforce Development Program: Career Panel for Four Year Undergraduates/Graduate Students and Educators](#)
- 3:30 [CHIPS Workforce Development Program: Registered Apprenticeships](#)

TUESDAY JUNE 18

- 9:00 [CHIPS R&D - SmartFab](#)
- 10:30 [CHIPS R&D - Metrology](#)
- 12:00 [CHIPS Workforce Development Program Career Awareness Fair \(12:00 - 6:00\)](#)
- 4:00 [CHIPS R&D - Posters](#)
- 4:00 [Student Leaders Poster Session](#)

WEDNESDAY JUNE 19

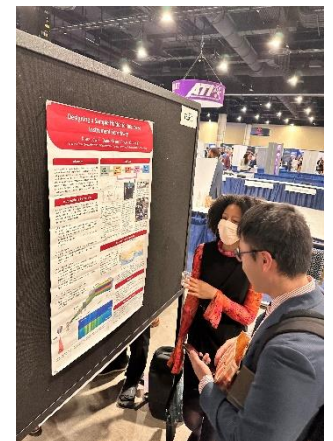
- 9:00 [XR for Semiconductor Workforce Development and Training](#)
- 11:00 [CHIPS Workforce Development Symposium and Student Leaders Conference Closing Remarks and Summary Discussion \(SLC Participants Only\)](#)



TechConnect Workforce Development Session attendees



TechConnect Student Poster Presentation



TechConnect World Reflections:

While for many years, TechConnect World has co-hosted a Student Leaders Conference together with the NextTech Student Network with ~20 participants from undergraduate and community colleges, the 2024 meeting provided a much more significant opportunity for these cohorts through the inaugural CHIPS Workforce program and associated travel funding. TechConnect World is a unique event to house such workforce development program within its greater innovation-based program that spans a large technology focus. There was clear cross-fertilization between the CHIPS WF program participants and the rest of the meeting, as the students participated in other technical sessions, the main exposition, and poster sessions. At the same time, attendees from TechConnect World also attended the CHIPS WF tutorials and panel discussions. With an innovation, applied research focus across multiple sectors including manufacturing, microelectronics, AI, and biotech, and a long track record of working with community college students, the 2024 TechConnect meeting success shows it is an ideal home for CHIPS and other ATE workforce development initiatives, especially for the community college audience that has been long neglected.



Community College Students Visiting the White House

Highlighting Community College Students in Nano/Microelectronics Roundtable:

The Highlighting Community College Students in Nano/Microelectronics Roundtable engaged 20 community college students from eight community colleges across the U.S. with 12 representatives from executive agencies: Department of Commerce, Department of Defense, Department of Labor, National Science Foundation (NSF), and the White House Office of Science and Technology Policy (OSTP). Dr. Kei Koizumi, Principal Deputy Director for Policy at OSTP, provided opening remarks and Dr. Branden Brough, Director of the National Nanotechnology Coordination Office chaired the roundtable.

The highlight was just sitting in the Indian Treaty Room with all these other bright-minded people. Getting to meet people face-to-face that are involved in all these different government agencies makes you feel like these positions are more obtainable. —Samuel Avalos, Foothill College

Each student shared personal stories, including their experiences seeking employment or education within the semiconductor industry. Following the roundtable, time was allotted for students to network with government representatives. Key themes discussed during the roundtable include:

- **Internships:** Multiple participants stated the need for paid internships, citing a desire for hands-on experiences in laboratories or industry environments. Students expressed concerns with finding internships, pointing to the challenges in seeking and applying for limited opportunities coming from the community college academic pipeline.
- **Apprenticeships:** Representatives from the Department of Labor and NSF highlighted opportunities for students to engage in registered apprenticeships and discussed their expansion.
- **Funding:** From a shortage of funding for on-campus tutoring programs to limited support for housing and living expenses, students highlighted community college funding needs. Participants pointed to the nexus between funding and experiential learning opportunities, like internships and research. A common theme was that community college students, faculty, and programs require more support from national initiatives, like CHIPS for America.

Prior to the roundtable, Dr. Brough accompanied the roundtable participants on a tour of the White House. Through these experiences, students gained first-hand insight into federal policymaking and engaged on new topics within microelectronics. Students also secured an unprecedented opportunity to share their insights on the community college ecosystem with high-level policymakers.

I really enjoyed the DC trip, it felt like my opinion was valuable. It felt like I had a voice and an opportunity to say something. They cared about my opinions and it felt like there was less of a barrier, like we had a platform, an invitation to share our thoughts and communicate as a community. —Kiara Lewis, Pasadena City College

MNT-EC Roundtable Reflections and Response:

While students are those most affected by education policy choices, they are rarely included within the process of education governance. This roundtable was an opportunity for meaningful conversations that incorporate student voices to address the unique needs of community college students. Future programs could encourage similar interactions in order to ensure that national initiatives, like CHIPS for America, are shaped by student experiences.

For example, it is important that community colleges become key stakeholders within CHIPS initiatives. Unfortunately, federal funding is historically limited and community colleges are often sidelined as partners in favor of four-year universities. Current CHIPS Act initiatives, such as the Department of Defense ME Commons program has zero community college faculty in leadership positions and in total, out of the nearly \$500 million yearly budget, less than \$500 K is sent to community colleges. In fact, the entire CHIPS Initiative currently has no community college PI's or Co-PI's, and only one faculty member on any of the NSTC, NIST, or NATCAST advisory boards.

The roundtable was my favorite experience, because it was something I did not expect to be doing. Getting to sit with decision-makers and speak on behalf of community colleges was something I was happy to do. The most surprising thing to me was meeting individuals who cared about community colleges. —Amareese Rivera, Pasadena City College



The Highlighting Community College Students in Nano/Microelectronics Roundtable

However, community colleges have many strengths—connectedness with the local region, diverse student bodies, and skill-specific training opportunities—that make them advantageous partners. This roundtable underscored these strengths and pointed to how community college faculty and students can support the CHIPS ecosystem.

The roundtable highlighted major areas of future investment for semiconductor workforce development. One key concern from students was limited internship opportunities. Agency representatives within roundtable conversations suggested registered apprenticeships as a primary solution to this challenge. While apprenticeships are useful pathways, estimates suggest that there are less than 400 apprenticeships nationwide for semiconductor training, the majority concentrated in upstate New York and Northern California. In fact, in the entire region spanning from Santa Barbara, Los Angeles, and San Diego there are no registered apprenticeships in semiconductor manufacturing. It is unclear how the current semiconductor education pipeline can support the 1,000's of jobs that are on the horizon once the new fabrication facilities are built and operational with minimal funding support. As more CHIPS Act programs are developed, especially related to workforce training, it is important that community colleges are in leadership positions. The NSF ATE program is an example of federal government support of community colleges but to successfully address domestic semiconductor technician needs, more support is necessary. In total, the federal government, through the NSF ATE program provides \$75 million to support every community college technical education program in the entire country. MNT-EC is a \$1.5 million a year Center that supports microelectronics, nanobiotechnology, quantum, materials, and many more community college MNT technician programs. It is unrealistic to believe that this amount of funding has a reasonable chance of successfully training a semiconductor technician workforce.

Student Participants:

Gabriela Deutsch, Pasadena City College
Gabriel Codina, Pasadena City College
Angelina Yan, Mercer Community College
Alice Dong, Pasadena City College
James Greene, Mercer Community College
Adam Ashcroft, Pasadena City College
Megan Ashcroft, Pasadena City College
Samuel Avalos, Foothill College
Khanh Nguyen, Pasadena City College
Ishan Jha, Pasadena City College
Lillian Ngo, De Anza College
Thien Tran, Lonesar College
Cindy Pineda, Lonestar College
Eric Li, Mercer Community College
Zahra Mohammadi, Foothill College
Ruben Melara, Mercer Community College
Amareesa Rivera, Hudson Valley College
Kahneef Martin, City College of Philadelphia
Kiara Lewis, Pasadena City College
Kristal Hong, Pasadena City College

Government Participants:

Department of Commerce

Eric Lin, Interim CHIPS Research and Development Program
Director, CHIPS for America
John Ratliff, Head of R&D Workforce Strategy, CHIPS for America

Department of Defense

Dev Shenoy, Principal Director for Microelectronics, Office of the
Under Secretary of Defense for Research and Engineering
Erin Gawron-Hyla, Workforce Development Technical Execution
Area Lead, Department of Defense Microelectronics Commons
Hayley Katz, Microelectronics Commons Workforce Development
Subject Matter Expert, Office of the Under Secretary of Defense for
Research and Engineering
Peggy Williams, Deputy Program Manager SCALE Workforce
Development Program, Naval Surface Center

National Science Foundation

Celeste Carter, Division of Undergraduate Education, Lead
Program Director, Advanced Technological Education, National
Science Foundation
Sylvia Butterfield, Deputy Assistant Director, Directorate for
STEM Education, National Science Foundation

Department of Labor

Samantha Cooper-Morrison, Supervisory Program Analyst and
Industry Engagement Team Lead, Department of Labor
Wendy Slee, Program Analyst, Department of Labor

White House Office of Science and Technology Policy

Kei Koizumi, Principal Deputy Director for Policy
Dana Weinstein, Principal Assistant Director & Special Advisor for
CHIPS R&D, Industrial Innovation

National Nanotechnology Coordination Office

Branden Brough, Director of NNCO and Assistant Director for
Nanotechnology at OSTP
Quinn Spadola, Deputy Director of NNCO
Maria Fernanda Campa, Contract Staff of NNCO

Student Spotlight



**Kahneef Martin, City
College of Philadelphia**

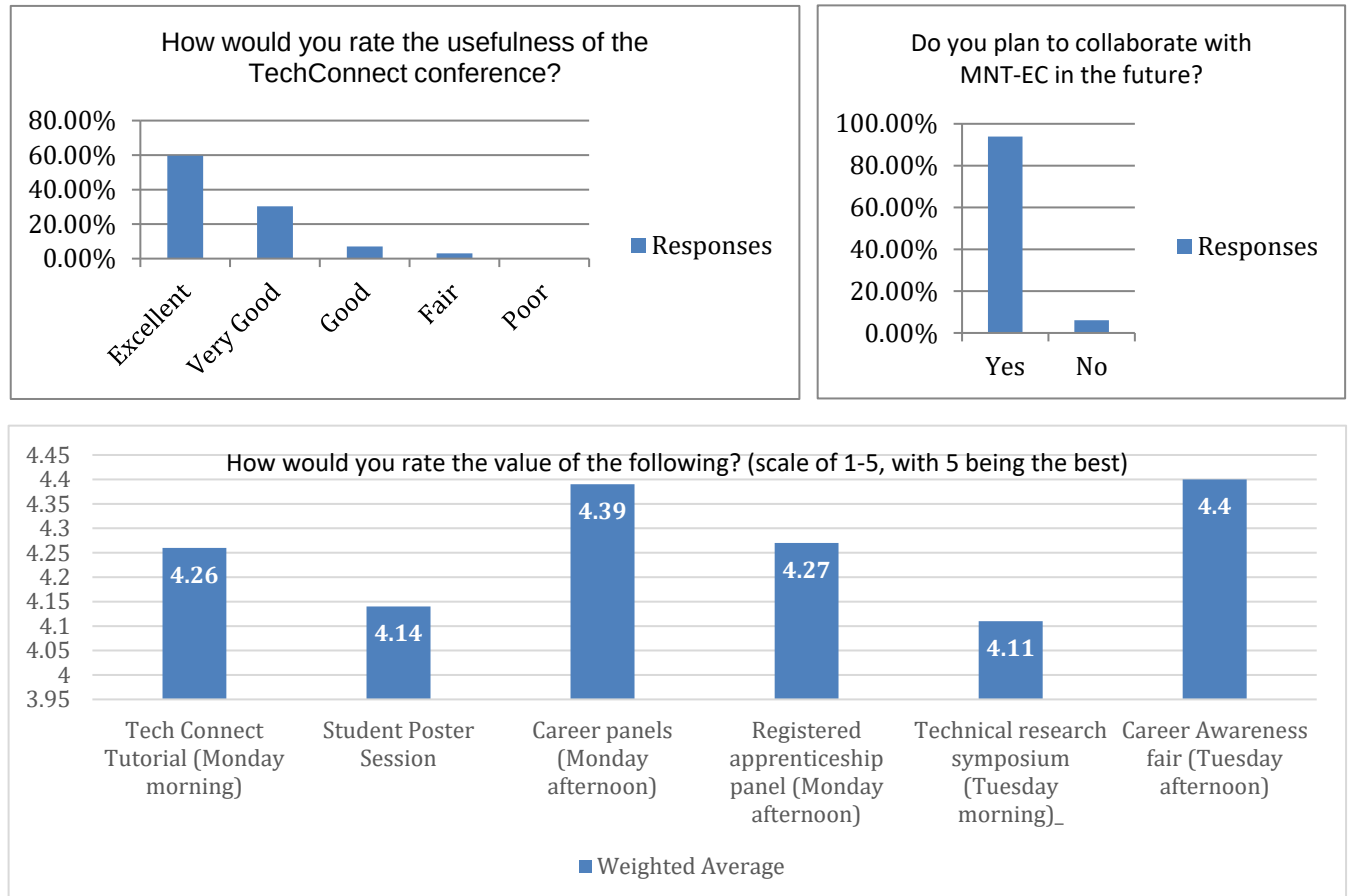
I was excited when I was invited to DC to have a meeting at the Executive Office and have my voice heard. A lot of officials actively working in government were present and it was cool to be able to speak to these government officials face to face. After the meeting, I had the opportunity to network, exchanging business cards and following up via email to stay in touch.

Black and brown students in the STEM field are considered underrepresented groups. When we attended this meeting, I saw the diversity within our group. It was great to observe who showed up, spoke, and contributed their insights during the meeting.

I stepped into the Executive Office, ready to make a difference. I not only wanted to advocate for underrepresented groups within the STEM field but also for support at community colleges across the country. More than 50% of underrepresented students begin their college education at community colleges. I truly believe we achieved something great that day.

Student Feedback:

Following TechConnect, 99 participants answered a survey on the event, an 87% response rate. Among survey questions, students ranked the usefulness of conference programming, discussed the connections that they made at the event, and highlighted conference learnings.



TechConnect offered invaluable exposure to the conference experience, with one student sharing that “this was my first conference, I learned how to conduct myself.” Students were excited to gain the skills that come from attending a large event, with one student reflecting that attending their first networking session at TechConnect gave them a “better grasp on networking.” Several students remarked that this experience made them excited to pursue other conference opportunities, including returning to TechConnect next year.

Connections:

TechConnect offered unprecedented networking opportunities to students. Student poster sessions produced meetings with academics and industry representatives, while career panels and social events spurred conversations among peers and professionals. One student commented that “I’ve made many valuable contacts in the short 2.5 days during the conference that would have otherwise taken me months or perhaps not have even been possible to make.” Liam Colleton, a recent community college transfer to Columbia University, shared that his connections made at TechConnect produced an offer for contract work with a semiconductor startup in New York.

Industry Knowledge:

TechConnect broadened students' industry knowledge, including introducing participants to new career opportunities. One student shared that they "learned that semiconductors are vital even in a biological setting," relating their TechConnect sessions on semiconductors to their biology major. Another student commented that "the inclusion of the CHIPS sessions within the broader TechConnect conference was very rewarding. I was able to connect with speakers and learn about a variety of topics that, although outside of my direct field of interest, were illuminating and thought provoking." TechConnect engaged students on topics adjacent to their primary fields and exposed different career paths, as well as technological trends and innovations.

Communication Skills:

TechConnect helped students strengthen critical communication skills. The student poster sessions offered opportunities for public speaking and the career fairs added space to exchange ideas. One student highlighted that "I gained essential skills such as effective communication, time management, and perseverance through participating in presentations and workshops." Other students shared anecdotes on connecting with peers and building confidence through conversations with industry leaders.

Representation:

TechConnect provided a space for underrepresented students to connect with mentors. For community college participants, TechConnect was an invaluable opportunity to meet experts with similar educational journeys. One student shared that "meeting some of the people there was very inspiring, as many of them started off as community college students." Other students found themselves empowered by connecting with likeminded peers from across the country. One participant reflected, "talking with other students and hearing their experiences really helped with my confidence in the clean room." A community college student at Pasadena Community College, also reflected on the diversity at TechConnect. She noted that "I never expected to see as many Black people as a part of TechConnect as I did, which made me so happy since STEM is not a prominent subject in black schools or communities. This experience made me feel like I could do more with myself." As part of its goal of fostering representation in STEM, TechConnect, through ATI also sponsored attendance for local students attending community colleges and HBCUs.

Next Steps:

After the success of this year's TechConnect, MNT-EC will seek grant funding to support student and faculty attendance at TechConnect over the next three years. MNT-EC hopes to work with other ATE Centers to offer TechConnect attendance to students studying different disciplines, like biotechnology, alongside students focused on MNT-EC disciplines. MNT-EC's goal is to increase TechConnect funding from 150 participants to 300 participants per year, with 250 of those participants being representatives from community colleges. In preparation for next year's conference, MNT-EC aims to expand its TechConnect partnerships, connecting with organizations like the Semiconductor Research Corporation (SRC), The Society of Manufacturing Engineers (SME), and SEMI, an industry association for semiconductor companies.