Article



Volume 21 (2026), pp. 41-50
*American Journal of STEM Education: Issues and Perspectives*
eISSN 30.3-1190| Print ISSN: 3069-0072
Star Scholars Press
https://doi.org/10.32674/7k29aw23

# Preparing the STEM Workforce for the Global Semiconductor Industry: International Education, Economic Development, and National Security

Joshua S. McKeown, PhD
*State University of New York-Oswego and University at Albany (SUNY), USA*

**ABSTRACT**

*The global semiconductor industry has become central to economic competitiveness, technological innovation, and national security. As governments invest heavily in semiconductor manufacturing and supply chain resilience, higher education institutions play a critical role in preparing a globally competent STEM workforce. This study presents a case study of two public higher education institutions in New York State that developed international education initiatives to support workforce development in the emerging semiconductor ecosystem. Through partnerships with universities in key semiconductor regions, including South Korea and Taiwan, the program integrates STEM education, international learning, and industry engagement. Supported by funding aligned with the CHIPS and Science Act, the initiative expands global learning opportunities for diverse students while strengthening regional economic development and workforce readiness in critical technology sectors.*

**Keywords:** CHIPS and Science Act, IDEAS grant, semiconductors, STEM, South Korea, Taiwan

**Editors:** Dr. Cristina Alfaro, San Diego State University, USA | Dr. Krishna Bista, Morgan State University, USA

## INTRODUCTION

On October 27, 2022, then-U.S. President Joe Biden, Senate Majority Leader Chuck Schumer, and New York Governor Kathy Hochul visited Onondaga County New York to announce a $100 billion investment from Micron Technology, a U.S. semiconductor manufacturer. Central New York State is preparing to add 9,000 new Micron jobs and over 40,000 related jobs in the semiconductor fabs planned under the CHIPS and Science Act. On October 23, 2023, the Buffalo-Rochester-Syracuse region was named a federal tech hub called the "NY SMART I-Corridor Tech Hub," also under the CHIPS and Science Act, competing among 31 regions nationwide for $500 million in federal funding and potentially billions more in additional investment.

> "*Buffalo, Rochester and Syracuse are officially on the road to becoming America's semiconductor superhighway*,"
> NY Senator Chuck Schumer (October 23, 2023).

This emphasis on re-shoring manufacturing in critical technologies has bipartisan support in the United States. The administration of President Donald Trump has made trade policy and protecting American industries a central governing priority. The foreign policy of the United States, regardless of administration or party, has steadily been shifting towards greater protectionism and export controls, particularly towards China, Russia, and other states seen as rivals and adversaries, resulting in reciprocal tit-for-tat behavior. Seen in this context, then, the CHIPS and Science Act is evidence of a larger, global trade and economic security conflict in which certain key technologies, industries, and raw materials are increasingly under governmental influence if not outright control, even in fiercely free market countries like the United States. Concerns about disruptions in supply chains, outright cutoffs through export controls, and other restrictions or "chokepoints" are coming to define a new world in which economic coercion is more common than during the heydays of unfettered globalization (Farrell & Newman, 2025). It is in that context that the project featured in this article came to be.

## THE PROJECT: "GETTING READY FOR MICRON"

The State University of New York (SUNY) at Oswego in Oswego, NY is located 20 miles from the planned Micron facility. It is a diverse and rural serving master's regional public university founded in 1861 on the principles of accessibility in education with a global vision. Monroe Community College (MCC) located in Rochester, NY is a community college focused on workforce and economic development serving Western New York through local and global partnerships. SUNY Oswego and MCC came together as public institutions in upstate New York to bring more internationally focused career readiness to our students, workforce competitiveness to our communities, economic development to our region, international education to those less able to afford it, and greater access to the monumental opportunity provided by Micron and the related CHIPS and Science Act investments.

This article presents a case study of how, through strategic grant funding, nimble and focused execution, and taking advantage of existing institutional assets at home and abroad can lead to profound institutional change that directly impacts students. As institutions, we serve diverse and underrepresented students. We have public missions in what has been an economically struggling upstate NY region, but with an unprecedented opportunity to guide our students' talents and ambitions towards success in the global semiconductor industry.

However, as explained in this article, we also recognize that, as a region, we are not currently prepared for the enormity and complexity of the global semiconductor ecosystem, not in terms of workforce availability or readiness. It is economic development on a global scale that needs partnership and sophistication at a level we can aspire to. The project outlined in this article reflects this need and vision. We have sought to do our parts as international educators, in our lanes, but with a much broader goal now ahead of us.

It is especially noteworthy that, since January 2025, many federal funding mechanisms have been fraught and unpredictable. Many of our campus colleagues have been stymied and left wondering if grant programs previously committed to will be honored. It is important, then, that after a limited initial pause in grant funding assurance for this program, our project has been fully funded and enacted. The goals and purposes of it are aligned with consistent economic and national security policy and foreign policy goals of the United States regardless of presidential administration. We offer this program as a possible exemplar of the purposeful role international education can play at the intersection between national policy, funding, and higher education's traditional purposes.

## IDEAS GRANT

Since 2016, the United States Department of State has funded a prominent grant program designed for U.S. higher education institutions to develop capacity and expand international education program offerings. As of July 2024, 216 grants have been awarded to 205 institutions in 49 U.S. states and territories under the IDEAS program (*Increase and Diversify Education Abroad for U.S. Students*). This prestigious grant program also is designed to expand study abroad opportunities for American students in critical areas aligned with U.S. national security, economic prosperity, and other foreign policy goals (World Learning). For the first time, the 2024 round of the IDEAS grant competition prizeawarded top awards focused on the bipartisan CHIPS and Science Act, the law that provides billions in federal funding for domestic semiconductor research, development, manufacturing, and workforce development.

The CHIPS and Science Act was also designed to advance U.S. global leadership in critical technologies with the policy understanding that "U.S. leadership in new technologies - from artificial intelligence to biotechnology to computing - is critical to both our future economic competitiveness and our national security" particularly in countering China (White House Archives). With that backdrop of economic development and national security, the SUNY Oswego-led IDEAS grant proposal won a top award in 2024. The project, called "Getting Ready for Micron," harnessed our existing mission and applied it directly to the opportunities of the CHIPS and Science Act generally and the Micron investment particularly in service to the nation's industrial and foreign policy goals.

One of the grant's stipulations was that it identify specific U.S. foreign policy goals to which to align. The primary foreign policy goal for our project was *technology and innovation*, with the additional goal of *economic development and entrepreneurial potential* of our region. Combined with our consortium partner Monroe Community College, our proposal built on our existing institutional resources and capacities towards those that we lacked but recognized we needed. We had curricula and expert faculty in engineering, technology, optics, and computer science, for example, but not majors or specialties in the semiconductor industry with related experiential opportunities for students. We had excellent international relationships but had not strategized on using them to take advantage of and contribute to the global semiconductor ecosystem. By partnering with institutions abroad aligned with semiconductor leaders particularly in South Korea and Taiwan, which along with Japan and the U.S. make up the so-called "Fab 4" of allied semiconductor leaders (Reuters, 2023), we sought to contribute to our students' educational and career aspirations directly in line with our state and federal governments' goals, while expanding valuable people-to-people cultural exchange between important friends and allies.

**Institutional Needs**

SUNY Oswego and Monroe Community College (MCC), both public institutions in New York State serving diverse, first generation, and underrepresented students, sought through this project to bolster student preparation for the semiconductor industry. Specifically, the goal was to create relevant education abroad activity to South Korea and Taiwan to better prepare our graduates for this globally competitive industry. Neither institution had capacity in or sufficient preparation for education abroad in this specific academic and career area, and both institutions sought to diversify their education abroad populations. Taiwan and South Korea are semiconductor leaders, the opportunity to expose students and faculty to these locations and cultures would enhance graduates' preparation for Micron and other semiconductor-related career opportunities both directly and indirectly. Our belief is that our graduates who eventually will work in the semiconductor and related industries coming to the region will no doubt interact with co-workers, bosses, suppliers, and partners from these countries. We want them to be prepared culturally as well as technically.

SUNY Oswego and MCC were not without resources and assets. Existing resources included the Office of International Education and Programs at SUNY Oswego, and the Office of Global Education and International Services at MCC. These offices are organized around providing international education opportunities to the students they serve in support of the academic institutions of which they are a part. Academic resources include faculty expertise supporting majors in Electrical and Computer Engineering, Chemistry, Career & Technical Education, Computer Science, and Software Engineering at SUNY Oswego; and majors in Electronics, Optics, and Computer Technology at MCC. However, the size and scope of both the Micron investment and the larger goal of establishing the Buffalo-Rochester-Syracuse technology corridor as part of the CHIPS and Science Act highlighted capacity gaps in both international education and STEM programming directed towards this specific regional and national economic need.

**Capacity Building Plan**

In order to build capacity to establish, expand, and broaden the type of impactful study abroad programming envisioned under the IDEAS grant, namely one that aligns with U.S. economic and foreign policy goals, we started by identifying the following questions: 1) Which students typically study abroad? 2) Which disciplines and destinations are typically represented in education abroad?

1. Associate's degree students typically comprise less than 2% of the U.S. study abroad population. Underrepresented students as counted by race/ethnicity, while growing in study abroad participation in recent years, still comprise a fraction of the U.S. study abroad population compared with the nearly 70% of participants who are white, according to the annual Open Doors Report analyzing both pre- and post-pandemic data (IIE, 2023). Underprivileged students (both urban and rural) are often unable to participate due to financial, social, and personal reasons. As institutions that serve these populations, which will be the workers hired into the emerging regional semiconductor industry, we recognize the need to build study abroad capacity such that all students, particularly in the STEM disciplines, can realistically participate.

2. Engineering and computer science / math students are underrepresented in study abroad, consistently comprising less than 10% of total U.S. study abroad students (IIE, 2023). Students in these disciplines have shown gains in their intercultural competence by studying abroad (Chedru & Delhoume, 2023) and graduates in these disciplines, including in vocational / technical areas of study, will be crucial to the emerging Central and Western New York semiconductor industry. Likewise, Taiwan and South Korea are low in popularity as destinations for U.S. study abroad students. Despite their political stability, safety, and welcoming posture towards Americans, together they account for less than 3% of U.S. education abroad participation (IIE, 2023). Both are in the top 5 countries globally for semiconductor production and (along with Japan) form the semiconductor alliance critical to U.S. national security and foreign policy goals (Hufbauer & Hogan, 2022).

The goal of the grant project in terms of capacity building included developing academic and cultural expertise on the part of faculty and staff of both institutions and building greater institutional connections through university level partnerships in South Korea and Taiwan. We plan to create faculty-led, short-term study abroad programs to those countries, make them accessible to students from both institutions, leverage existing international university partnerships, and build capacity for faculty expertise and staff advising. Believing that the expertise and confidence borne from their own direct experiences abroad during the grant will empower our faculty to design and lead students on their own faculty-led programs afterwards, we sought to identify, expand, and diversify student opportunities for overseas study and expand to Taiwan and Korea both STEM education experiences and faculty-led programming (traditionally done elsewhere, especially Western Europe). The role of faculty going forward is key to facilitating greater

enrollment because we know that quality, expert faculty mentoring (Niehaus et. al, 2018) has been proven to be an effective way to overcome barriers to participation.

Specifically, we used the grant to organize two faculty/staff delegation visits to South Korea and Taiwan designed to build knowledge of and personal contacts with counterparts there. With this personnel capacity building we can confidently undertake creating new faculty-led short-term programs focused on the semiconductor industry that will increase the number of undergraduate students who study abroad for academic credit in the near term. We know (Sadiki, 2022) that if designed well, even short-term programs abroad can improve students' employability and sense of career-readiness. Additional program expansion to include student research and internship placements are envisioned focused on the goal of providing career-ready training and international exposure for students entering the regional semiconductor industry.

**Project Activities**

Specifically, the IDEAS grant funding was used to organize delegation visits of faculty and staff from both institutions to South Korea and Taiwan. Building faculty/staff knowledge of and personal contacts with counterparts in those countries, sharing knowledge to benefit all partners, and contributing to U.S. foreign policy goals in those important and allied places are part of our purpose. As identified above, SUNY Oswego already had institutional exchange relationships with multiple universities in those countries, however they were underutilized with no specific activities focused on engineering, technology, or the semiconductor industry. The IDEAS funds led to major activities including selecting delegations of faculty from both institutions, appropriate cultural and travel logistical preparation, coordination with the partner universities abroad to design one-week visit schedules at a mutually convenient time, collaborations with academic and professional counterparts, and efforts to design follow-up student programs in the near term.

With this capacity building and preparation, already two new faculty-led short-term programs focused on those countries and on the semiconductor industry have been started, with more in development. These will increase the number U.S. students in those destinations. Additional program activities envisioned include student research and internship placements, COIL (Collaborative Online International Learning) courses, clean room visits, and other joint projects focused on the goal of providing career-ready training and exposure for students entering the regional semiconductor industry.

It is important to note also that affinity for popular culture (e.g., music and entertainment from South Korea, boba / "bubble" tea and famous night life from Taiwan, etc.) is strong with today's university students and is being used appropriately to promote the new programs. To address financial challenges, collaboration with relevant offices at both institutions to provide targeted information sharing and guidance on how financial aid can apply to study abroad, accurate financial understanding of the costs involved, as well as specific financial supports including waiving program deposits and institutional grant support to cover student flights will help. In order to address language and cultural issues, we included native language speakers and cultural facilitators as part of the delegations, and to prepare students, we plan to include basic language preparation in Mandarin and

Korean utilizing existing campus resources designed for engineering and technology specifically for the semiconductor industry.

## ALIGNMENT WITH NATIONAL SECURITY AND FOREIGN POLICY

Academic professionals in the United States are not alone in recognizing that federally appropriated funds and projects have been delayed, reduced, and eliminated this year. We cannot change this on our own. Rather, we can seek to understand the causes and prepare for the reactions that they entail. In this project, we seek to build programming in line with long-term U.S. economic and foreign policy goals that students can take advantage of in the near term. We have been willing and engaged participants, facilitating relationship-building and knowledge sharing among faculty and staff through these mutual experiences. Professional contacts and industry-specific knowledge have developed during the delegation visits, followed up by new study abroad programs designed, developed, and led by the faculty involved and guided by the expanded capacity of institutional staff. The uniqueness of the ensuing programs will be to prepare engineering and technology students, especially from community college and rural-serving institutions, for careers in the global semiconductor industry planned for Central and Western New York.

This project has been successful through focused academic experiences abroad, interaction with faculty and student counterparts, and visits to leading firms in those countries. Immersion into this global and friendly semiconductor ecosystem will expose future students to the industries and leading companies within them. This, combined with ongoing joint academic projects after they return, will prepare them for careers with Micron and related industries in the emerging Central and Western New York semiconductor hub which will continue to interact regularly with these important semiconductor manufacturing countries. As examples, Micron is a U.S. firm that operates a chip fab in Taiwan; Korea's Samsung operates a fab in Texas; Taiwan Semiconductor Manufacturing Company is building a new fab in Arizona, and so on.

### Primary Foreign Policy Goal: Technology and Innovation

Among the stated goals of the 2022 CHIPS and Science Act is innovative technology, namely to boost American semiconductor research, development, and production, ensuring U.S. leadership in this vital sector. So far, the Taiwanese and South Korean university partners have been eager to expand our partnerships from existing traditional exchange relationships towards this new focus on semiconductors. Institutional partnerships such as these can facilitate people-to-people exchange with strategic countries which is vital to U.S. national interests. This project will contribute to potential research collaborations between faculty, as well as student preparation for careers in the global semiconductor industry. The U.S., Taiwan, and South Korea are, along with Japan, referred to as the "Fab 4" in recognition of both our shared interests in and leadership of the semiconductor industry, but also our mutual interests, friendly relationships, and both formal and informal alliances.

**Additional Foreign Policy Goal: Economic Development and Entrepreneurship**

Additionally, our proposal included economic development and entrepreneurial goals to strengthening supply chains and production in the semiconductor industryboosting, to boost the U.S. economy and countering potential global rivals. Both SUNY Oswego and Monroe Community College anticipate a surge in demand for trained workers for careers in STEM, technical, and vocational fields, and the IDEAS grant program will contribute to the global competitiveness of both institutions, to the strength of the regional economy of Central and Western New York, and to the new regional semiconductor industry in service to national goals and objectives.

## PROJECT SUSTAINABILITY

SUNY Oswego's Office of International Education and Programs is the campus department responsible for education abroad. It manages partner relationships and active programs around the world on an ongoing basis. It is well-staffed, experienced, and has the ability to sustainably continue the program post-grant. We have interested and engaged faculty program leaders, some of whom already have developed new programs as a result of their visits for this project. Financially, to support this program's sustainability SUNY Oswego has committed to awarding one of its existing scholarship funds to participating students on these new programs in the amount of $1,500, the approximate cost of round-trip airfare. As an institution, SUNY Oswego has long made education abroad an institutional priority, however the challenge and opportunity presented by the Micron investment under the CHIPS and Science Act are unprecedented and so must be our response. Our project is tied directly to the regional economic opportunity that Micron and the broader Central and Western New York tech hub represent. By articulating this ambitious international program plan we are enhancing our reputation for excellence both in international education and the specific technical disciplines supported by the project. Finally, we will be expanding our faculty and staff expertise and potential collaborative relationships abroad in a way that is more sustainable with grant funds.

MCC has identified in its most recent strategic plan the focus on workforce development both regionally and globally, addressing equity gaps to increase access to improve academic and professional outcomes, strengthening partnerships in the community and globally, and to serve as a leader in workforce and economic development for the region. MCC recently appointed a Dean of Applied Sciences and Technologies as its academic programs have expanded and interest from students increased. As a key partner of the IDEAS grant project, it will support efforts to globalize the curriculum by offering options for COIL, faculty-led programs, and global internships. Additionally, MCC and SUNY Oswego faculty and staff collaboration will lead to increased opportunities for effective transfer enrollment in the region's vital engineering and STEM fields.

It should be noted that as part of our goal of developing this into a sustainable, ongoing project, at SUNY Oswego our work is strongly supported from the offices of the President, Provost, and Research and Sponsored Programs as well as the key academic departments involved. At MCC, this project is supported through the offices of the Vice

President of Diversity, Equity, and Belonging, Provost and Vice President of Student Affairs, and relevant academic program departments. That form of leadership support and collegial buy-in has been essential to this successful project's enaction and sustainability not only for SUNY Oswego as the administering campus but for MCC as well as partner in the project's success.

## REFERENCES


Chedru, M., & Delhoume, C. (2023). How does studying abroad affect engineering students' intercultural competence: A longitudinal case study. *European Journal of Engineering Education, 48,* 375-390. DOI: 10.1080/03043797.2023.2171853

Farrell, H., & Newman, A., (2025). The weaponized world economy: Surviving the new age of economic coercion. *Foreign Affairs*, *104*, 8-23.

Hufbauer, G.C., & Hogan, N., (2022). Major semiconductor producing countries rely on each other for different types of chips. *Peterson Institute for International Economics* (October 31, 2022). https://www.piie.com/research/piie-charts/major-semiconductor-producing-countries-rely-each-other-different-types-chips

IIE - Institute of International Education (August 25, 2025). *Open Doors*. https://www.iie.org/publications/open-doors-report-on-international-educational-exchange/

Niehaus, E., Reading, J., Nelson, M.J., Wegener, A., & Arthur, A. (2018). Faculty engagement in cultural mentoring as instructors of short-term and semester study abroad programs. *Frontiers: The Interdisciplinary Journal of Study Abroad, 30.* DOI: 10.36366/frontiers.v30i2.413

Reuters (February 25, 2023). https://www.reuters.com/technology/taiwan-says-fab-4-chip-group-held-first-senior-officials-meeting-2023-02-25/

Sadiki, H. (2022). Internationalization and employability: Assessing the effects of study abroad programs on participants' employability. *Journal of Learning and Educational Policy, 2.* DOI: 10.55529/jlep.23.18.32

White House Archives (August 9, 2022). Fact sheet: CHIPS and Science Act will lower costs, create jobs, strengthen supply chains, and counter China. https://bidenwhitehouse.archives.gov/briefing-room/statements-releases/2022/08/09/fact-sheet-chips-and-science-act-will-lower-costs-create-jobs-strengthen-supply-chains-and-counter-china/

World Learning (August 25, 2025). IDEAS Program. https://www.studyabroadcapacitybuilding.org/about


---

**Bio**


**JOSHUA S. MCKEOWN,** PhD, is the Senior International Officer / Associate Provost for International Education & Programs at the State University of New York (SUNY) at Oswego and International Education Leadership Fellow at the University at Albany (SUNY). He teaches in the Global & International Studies program at SUNY Oswego and in the International Education Leadership graduate program at UAlbany. His main research

interests include the impact of international education activity on students and scholars, global higher education issues, and the intersection of international education and global politics. Email: joshua.mckeown@oswego.edu