

Scholarship and mentoring

The key to recruiting minority students to STEM

- Modern society needs people with skills in Science, Technology, Engineering, and Mathematics – ‘STEM’ – more than ever.
- Industry’s demand for STEM graduates exceeds supply.
- Students from certain races and ethnicities, such as African Americans, Hispanics or Latinos, and American Indians or Alaska Natives, are fewer in STEM degree courses. They are referred to as underrepresented minorities (URM).
- Professor Jen-Mei Chang and Professor Gino Galvez of California State University, Long Beach, USA, have introduced a scholarship programme in STEM higher education that utilises mentoring to encourage talented, low-income URM students to study and make STEM their career.

A new scholarship programme at a university in the USA aims to encourage students from underrepresented minority (URM) communities to study ‘STEM’ subjects – Science, Technology, Engineering, and Mathematics – at degree level. Led by Professor Jen-Mei Chang and Professor Gino Galvez at California State University, Long Beach, the ongoing Mentored Excellence Toward Research and Industry Careers project, abbreviated as ‘METRIC’, focuses on the recruitment and retention of low-income and academically talented URM students. It is particularly aimed at students from African American, Hispanic, Asian, and Native American backgrounds.

METRIC is helping address two main problems. The first is that many more STEM graduates are needed to meet industry demands – in fact, a million more, according to the President’s Council of Advisors on Science and Technology in 2012. The second is that students from the URM communities are especially underrepresented in STEM degree courses, and many students who end up enrolling then fail to complete their degrees.

The statistics are telling. Data from the National Science Foundation in 2013 revealed that only 2% of students who studied mathematics came from African American backgrounds, and only 3% of students who studied science came from Hispanic backgrounds. Research at another university showed that 61% of STEM students from all backgrounds failed to graduate. These figures are even lower for URM students with only 11%–18% of students graduating.

High-impact programme

The METRIC programme adopts high-impact practices in STEM education and is based on three key strategies. The first and perhaps the most important one is that it provides financial support to help students access higher education in STEM, which enables them to dedicate more time on academic enrichment by engaging in research, professional networking, teambuilding, and attending regional and national events.

In addition to empowering students to apply to relevant opportunities, the programme also fosters team and community building by organising social events, such as mixers and retreats. Of the events conducted, the family and friends’ mixer during the December holiday allows people closely related to students to hear about their struggles and accomplishment – enabling them to be more supportive of the students’ pursuit of a rigorous STEM degree. These are aimed at giving students a sense of belongingness, while helping them develop their scientific identities and leadership skills.

Finally, METRIC provides faculty–student mentorship programmes through which faculty members guide students’ career pathways. For

example, mentors help students gain the skills they need to achieve their academic and professional goals by identifying research opportunities and helping students with résumé writing and job searches.

The three-tier recruitment process

Entry into METRIC is competitive and only a quarter of applicants are accepted into the programme. A three-tiered selection process is designed to be inclusive and progressive, and to act as a natural selection mechanism. A simplified first stage involves assessment of students’ eligibility by asking applicants to submit personal details and a reference from a STEM educator at their current or previous institution. The process is designed to take place in about five to ten minutes.

In the second stage, applicants complete a questionnaire about their interests and professional goals. This allows the programme committee to consider students’ motivation and fit, as well as their readiness for the programme, particularly its academic enrichment activities. The final stage encompasses a 20-minute online interview of the selected students, in which they are asked eight standard questions. Interviewers are looking for committed students with high academic potential, who are suitable for mentoring and have a mindset to persevere.

Surpassed goals

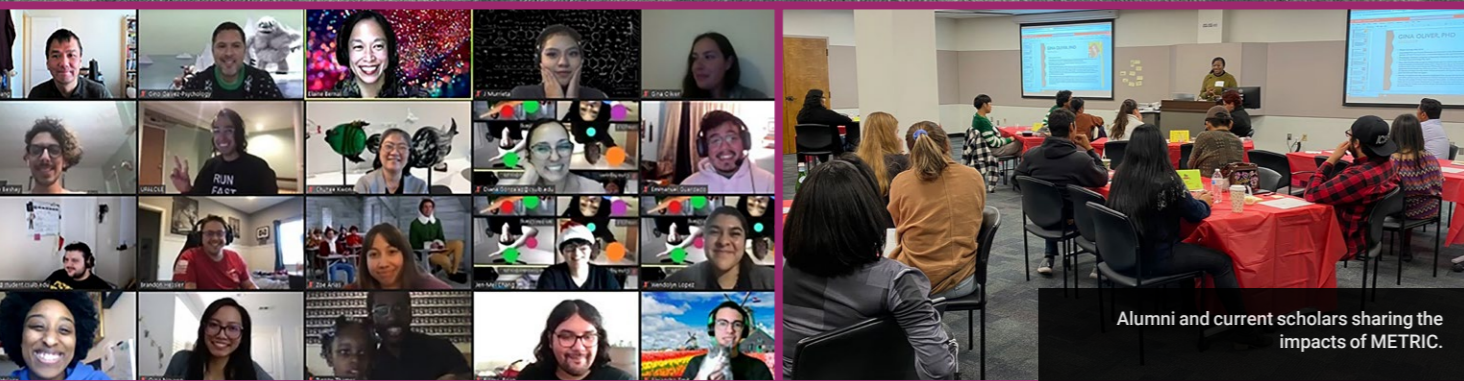
METRIC has already surpassed its goals and achieved impressive results in the recruitment and retention of low-income and academically talented underrepresented minority STEM students. In its first four years, 39 students have received financial and mentorship support. 95% of the students have completed their STEM bachelor’s degree or are on target to do so soon. During this time, only two students have left the university. 80% of those who graduated are either already pursuing or will go on to pursue their master’s or doctoral level research, or enter the industry, or do both.

The simplicity of the application process has resulted in a diverse and balanced applicant pool that reflects more closely with the demographics of the students in the university at large. Around 70% of those accepted in the programme’s first four years have been women. In the academic year 2022/23, out of the students recruited, two were from an Asian background, two from an African American background, one was American Indian or Alaska Native, four were white, four were Hispanic, and three identified as multi-racial.

Wide-ranging benefits

Student surveys also report METRIC’s success as a support programme for low-income college students in STEM subjects. More than two-thirds of those interviewed said that METRIC helped

METRIC focuses on the recruitment and retention of low-income and academically talented URM students.



to prepare them academically for their course, and that they now felt confident in their problem-solving, leadership, and collaboration skills. Students said the programme also helped them become more aware of the skills they needed to work at – with a third of the interviewees identifying study skills and work ethic, and half wanting to improve their time management.

For most students, financial support was the main benefit of being part of METRIC. However, students said that mentorship was very important in boosting their confidence, keeping them on track with their studies, and helping them develop a career pathway. They also cited the importance of feeling that they belonged to a learning community designed to help them overcome difficulties.

Providing opportunities

Currently in the final year of its funding by the National Science Foundation, METRIC's faculty-student mentorship programme in STEM higher education has provided students from underrepresented minority backgrounds with significant opportunities to make STEM their career. The final words go to a recent graduate, 'This programme helped me financially, which took a huge burden off my shoulders, allowing me to focus on my academic work. More importantly, it provided a community of mentors and peers that supported and facilitated my choice to pursue a PhD. Even during my PhD, my METRIC advisor provided me with perspective in challenging times. It inspired me to push forward and finish my degree.'

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Personal response

You are coming to the end of a five-year funding period for the METRIC programme. Will METRIC continue?

We have been recommended for a six-year 2.5-million-dollar Scholarship in STEM grant project titled, 'Mentored Excellence Toward Research and Industry Careers 2 (METRIC 2)' by the National Science Foundation (DUE-2322416). METRIC 2 will build from established best practices in previous two S-STEM projects and provide 288 semester-long scholarships of \$6,000 each to approximately 67 undergraduates in chemistry, computer engineering & computer science, geology, mathematics & statistics, and physics.

Specifically, METRIC 2 will take a holistic and responsive approach to address student needs and issues exacerbated by the COVID-19 pandemic. METRIC 2 will establish an institutional pathway to connect students with basic needs and mental wellness training, identify, and create a collection of online modules to improve students' mental resilience to everyday challenges, confidence, and efficacy, and increase students' sense of belonging with frequent social events and skills development training.

METRIC's results are impressive. What plans do you have to open the process to other study areas and/or other universities?

Although STEM departments at CSULB have increased efforts to enrol URM students to reflect the diversity of the surrounding communities in urban Los Angeles and Orange counties, nearly all participating departments in METRIC are still enrolling URM students at a rate below the most recent university URM percentages. Seeing the tremendous rise in demand for data science majors, our first step in expansion is to involve the Computer Science and Computer Engineering Department in the next Scholarship in STEM (S-STEM) project.

Programme leadership will continue to look for creative ways to remove barriers in degree attainment and identify activities that are most effective at supporting skills-development, confidence-building, and barriers-removal for the participants through annual evaluations. The knowledge generated from the focused research can help STEM and possibly non-STEM educators design activities adapted to the needs of their students at critical transitions in their educational career. Moreover, we hope to share the online modules created by the METRIC 2 scholars with other STEM faculty at CSULB.

Faculty mentors will work with their STEM colleagues to create a learning environment that fosters inclusive and positive mentorship.

Campus programmes (eg, basic needs, counseling, and psychological services) that collaborate directly with us to support scholars will gain information about how to better support low-income STEM students.

We will publish the results of our studies in related journals and present our findings at regional and national conferences (eg, S-STEM PI Symposium). Locally, we plan to participate in dissemination activities (eg, meetings, webinars, panels) at CSULB and engage with the Chancellor's Office STEM-NET programme which promotes best practices and innovative educational ideas across the CSU university system.

The programme is about helping students to overcome barriers – what barriers did you face in directing it?

The most challenging aspect of directing METRIC has been finding time to meet and maintaining communication with faculty mentors and scholars. Most faculty mentors and scholars want more time to meet and build connections; however, finding common times that work for everyone has always been extremely difficult on a commuter campus. To mitigate this issue, we have started hosting more events by organising less-structured social meetups. Sending out mark-your-calendar requests well before the events has also been very beneficial in boosting event attendance.

In METRIC, we rely on students to work directly with their discipline mentors to identify areas of development and enrichment. It takes a certain amount of trust and confidence for scholars to discuss their personal life and professional plans with their faculty mentors, and there could be a myriad of reasons for scholars to not maintain a timely and open communication with their mentors. For example, scholars might shut down from their mentor completely because they are ashamed of what is happening in their personal life. They might refuse to seek help from any campus resources because they are afraid of being labelled as 'not fit' for STEM. Scholars might not schedule regular meetings with their mentors because they have decided for themselves that their questions and concerns are not worthy; and scholars might choose not to follow through with their mentor's recommendations because of lack of time or trust in the recommendations. Since we can't force students to share everything with us, we would refer students to appropriate campus resources when they experience stress or distress.

Details



Jen-Mei Chang



Gino Galvez

Funding

- National Science Foundation DUE-90966039 (S-STEM: PSMS)
- National Science Foundation DUE-1833753 (S-STEM: METRIC)

Bio

Jen-Mei Chang is a professor of mathematics at California State University, Long Beach. She is also co-author of the book, *The Power of Mathematics Workbook with Notes*.

Gino Galvez is an associate professor of psychology and director of the Center for Evaluation and Educational Effectiveness at California State University, Long Beach.

Further reading

- Chang JM, Kwon, C, Stevens, L, Buonora, P, (2016) Strategies to recruit and retain students in physical sciences and mathematics on a diverse college campus, *Journal of College Science Teaching*, 45(3), 10018903.
- LearnMathAtYourPace (2022). METRIC 2022 Fall Welcome at Camp Fire Long Beach. 4th September. YouTube. [Online Video]. Available from: www.youtube.com/watch?v=QnZcX5W_YZE&t=64s. [Accessed 4th August 2023]