CSU Monterey Bay’s HSI STEM & Articulation Program

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Undergraduate Research Opportunities Center

CSU Monterey Bay’s program under the U.S. Department of Education’s HSI STEM and Articulation grant capitalizes on CSUMB’s new and rapidly growing STEM majors and minors. Within the scope of the grant the university has launched a new B.S. degree in Marine Science, developed new minors in Chemistry and Statistics, fortified young majors in Biology and Computer Science, and restructured its Environmental Science, Technology & Policy B.S. degree.

Undergraduate research: The high impact practice of undergraduate research is a cornerstone of the program and is housed in CSUMB’s newly formed Undergraduate Research Opportunities Center (UROC). UROC’s mission is to build students’ educational ownership, intellectual vibrancy, and scholarly identity. UROC achieves this through mentored undergraduate research, rigorous, authentic, and calibrated scholarly activities, and intellectual, personal, and social capital. UROC began with a lean staff that was primarily grant funded and now has eight staff members, five of whom are funded by the university. The campus also provides a permanent office and classroom space in the university’s library, which is the student hub of campus. We have grown the matching endorsement element of our grant to $1.5 million with a $2 million goal by the end of the grant, and a $10 million ultimate goal.

Undergraduate Research Opportunities Center

UROC was launched in January 2009. In addition to housing the U.S. Department of Education’s HSI STEM and articulation grant, we are home to several of CSU Monterey Bay’s strong and growing undergraduate research-related initiatives. In collaboration with the Department of Education’s McNair Scholars program, the National Science Foundation’s Louis Stokes Alliance for Minority Participation (LSAMP), and other public and privately supported undergraduate research endeavors.

Fast Facts

• UROC has placed 420 students across 18 majors in funded research positions.
• 18 UROC’s (13 undergraduate, 3 graduate students) received fellowships from the National Science Foundation’s Graduate Research Fellowship Program (GRFP).
• 72 UROC’s are in graduate school programs including 25 in GRFP programs.
• Seventy-two percent (72%) of our UROC alumni in graduate programs are underrepresented in higher education, first-generation college students, or from low-income backgrounds.

UROC’s Mission

To build students’ educational ownership, intellectual vibrancy, and scholarly identity. UROC scholars and researchers participate in mentored undergraduate research and receive extensive training in reviewing literature, developing a research question, writing research proposals, presenting research results, developing professionalism, and preparing for graduate school. To further prepare for life beyond their undergraduate education, our students engage in professional experiences, including presenting their research at conferences and publishing their work in peer-reviewed journals. Additional UROC Workshops are offered throughout the year and are open to all students on campus.

UROC Scholars Program

• 3-year cohort model, paired with faculty and research mentors.
• Attend weekly research seminar courses and workshops.
• Intensive graduate school preparation and professional development support.
• 2-summer paid research experience, presentation of research results at national conferences and publication in peer-reviewed journals.

UROC Researchers

• Workshops on undergraduate school preparation and professional development.
• Paid summer research on campus or UROC partner organization, paired with research mentors.

Summer Research Experiences at CSUMB

• National Science Foundation Fellowships (NSF REU) at CSUMB

Faculty Mentors

Faculty mentors play a critical role in the undergraduate research experience. The student’s overall success in the research experience depends on an effective mentor-student relationship, as they provide the undergraduate researcher with guidance on research selection, and academic and personal success in faculty instruction time. The goal of this collaboration is to develop the undergraduate researcher’s confidence, research skills, and intellectual curiosity in order to succeed in their undergraduate and graduate career.

UROC mentors help students develop and execute research plans that pair students with researchers for advanced study, graduate school, and employment in their field. At minimum, projects last 8 weeks during the semester or 14 weeks during the academic year. We encourage our students to engage in the research programs, as the UROC scholars program work with a faculty mentor and additional research mentors for a two-year period.

Course Credit Policy, Reform, and Alignment

In year one of the project our curricular efforts focused on developing and enhancing individual student’s research experience. Students began to edge into and expose courses within the majors, ultimately creating 15 new courses and updating over 20 courses with hands-on, inquiry-based experiences. Now in year three we are seeing growth and innovation at the major, minor, and program levels. (select example)

• The Computer Science and Information Technology (CIST) program is aligning its curriculum with the Association for Computing Machinery’s (ACM), which is the principal professional organization for computing. This brings the major in alignment with current industry and national standards.
• Statistics faculty developed three much-needed courses for the new Statistics minor, as well as online statistics modules and a virtual textbook. Planning is underway to expand the Statistics minor offerings.
• At the program level, Faculty from the Division of Science and Environmental Policy (DSEP) collaborated on a mobile field lab to engage students in background and vegetation of a20% reduction in the woodchip bioreactor for pollutant removal. He also researched the development of undergraduate research experiences at the USDA Agricultural Research Service in Salinas with Dr. Carol Bill. The use of invasive field butchers, he grew up one block away from the USA facility where he now works.

Innovative online summer writing support course using a combination of blogging, peer and instructor feedback while reducing faculty instruction time.

1. Realization of the project’s work has a significant effort on developing successful tutoring models through our Academic Skills Achievement Program (ASAP) and coordinating facilitators and reviewers for lower division scholars.
2. Following the results of these efforts, we needed to align and assess the program within the 3-year Doctoral Program at CSUMB.

Campus-wide STEM Curriculum Development

For Faculty

• Writing module development in core science courses.

Real-world STEM content on CSUMB’s shared writing criteria as a mechanism for responding to student writing.

For Students

• Use of calibrated peer review, a web-based tool that improves the quality of peer feedback, and the role of software in improving feedback.

International online summer writing support course using a combination of blogging, peer and instructor feedback while reducing faculty instruction time.

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For Future

• A Writing Fellows program that trains upper division scholars to serve as writing fellows.

Professional Communication Workshops and Classes focusing on:

• Conference presentations
• Published research papers
• Professional email
• Products for professional development
• C.V. / resume
• Cover letters

• Scholarships, fellowship and graduate school applications

Professional Writing Development and Support

STEM Transfer and Retention

The program is communicating best practices and program findings related to mentor preparation, student engagement, professional development, and articulation efforts.

Sharing Best Practices and Program Findings

The success of students in STEM is not the product of a single intervention but the result of a combination of multiple strategies. The following are examples of the strategies that have been employed at CSUMB.

Diverse Student Population, a37

The CSIST in-3 program, a 5-year Computer Science degree offered jointly by Point Reyes and CSUMB, has also contributed to the success of STEM transfer and retention.

For Faculty

• The CSIST in-3 program: real-world STEM content on CSUMB’s shared writing criteria as a mechanism for responding to student writing.

Future Directions and program staff

• Expand and share mentor training materials based on UROC workshops and best practices.

For Future

• Expand our peer-to-peer mentoring programs to target students in courses with high failure rates, increase engagement with research and scholarly

Engage students in the research dialog early in partnership with the First Year Seminar programs.

Partner with CSUMB’s nationally recognized Service Learning program to link Research and Service Learning experiences that bond, and outside the classroom.

The Undergraduate Research Opportunities Center has been able to institutionalize many of the program described here and they have yielded the hard work of UROC staff:

Bekah Bassett, Outreach Coordinator

Brigitte Clarkson, Ph.D., Curriculum Associate

Carla Freeman, Ph.D., Research Associate

Heather Haeger, Ph.D., Assessment and Educational Research Associate

Katelyn Gremillion, Writing and Professional Communication Coordinator

Bobby Quinonez, Administrative Support Coordinator

Student Achievements, Creating Practices with Impact

Student Achievements

UROC has been involved in a series of high stakes events throughout the nation as scholars. Each scholar undertaken two summer research experiences.

123 students have presented their work at conferences ranging from SACNAS, to the National Conference on Undergraduate Research (NCUR), the Emerging Researchers National (ERN) symposium and in disciplines as diverse as marine and environmental biology.

• This year, scholars to on humane research at SACNAS, the Mathematical Association of America (MAA), the annual Biomedical Research Conference for Minority Students (UBRCMS) and the Association for the Sciences of Limnology and Oceanography (ASLO).

Many scholars complete, and in some cases, publish research. Under the leadership of the NSF Graduate Research Fellowship Program (GRFP), the Barlow-Boldt Scholarship, the Eugene-Cole Fellowship and the CSU Presidio Program.

UROC students have published 20 articles in peer-reviewed journals.

Mentor Training

Each spring, along with our partners at the University of California, Santa Cruz (UCSC), we host a Mentor Training workshop for graduate students interested in helping their mentoring skills in academic teaching, advising, and undergraduate research. The workshop is offered to students at UCSC, CSUMB, West Los Angeles, Stetson, Hampton Institute Marine and the CSUMB Environment, Arts and Technology (EAT) Program.

Now in year three of the project, we have tested innovative ways to engage students in undergraduate research and writing-intensive experiences within the classroom. This project was implemented through our distributed model. Faculty mentor training and discussions of best practices are offered at CSUMB and Hartnell College.

Distributed Research Program

UROC has developed a suite of external partnerships for student research placement with institutions ranging from Moss Landing Marine Laboratories, Stanford’s Hopkins Marine Station, the Monterey Bay Aquarium Research Institute, the Monterey Bay National Marine Sanctuary, and the University of California, Michigan State University and the US Agricultural Research Station in Salinas.

Linking High Impact Programs

Throughout this project we have tested innovative ways to engage students in undergraduate research and writing-intensive experiences within the classroom. UROC scholars program processes throughout the distributed model. Faculty mentor training and discussions of best practices are offered at CSUMB and Hartnell College.

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