

Transforming Open Access College as a Path to Upward Mobility **CSUMB-Hartnell College - Innovation Award Strategy Narrative**

As stated in our application, we seek to increase the number of students earning computer science degrees, streamline the pathway from community college to university, and provide opportunities for underrepresented students in high-tech fields. To that end, we have developed a vision for the use of the Innovation Award funding. This vision has two primary aims: 1) the continued refinement and enhancement of the accelerated cohort program model to ensure its long term sustainability and cost-effectiveness; and 2) identifying components of the program that can be replicated and/or incorporated into existing programs, especially in STEM fields, thereby improving degree completion rates among a broader student base. These goals are directly aligned with the aims of the Innovation Awards.

1. Vision

*Develop a **proof-of-concept, replicable model** for a **cohort-based, accelerated computer science** degree program with **adaptive pathways, high quality curriculum, innovative teaching techniques, and integrated academic support**, to produce a **diverse** body of computer science graduates that can be **competitive** for opportunities in **industry and graduate programs**.*

This vision has been developed with the following principles in mind:

- Ensure the work done through this award has a positive impact on student outcomes beyond the period of the award.
- Go beyond using the number of graduates produced as the sole measuring stick for success, and also assess the quality of graduates through evaluation of internship, job, research opportunity, and graduate school placements.
- Continue to explore alternatives that disrupt status quo processes, procedures and practices of higher education.
- Develop rigorous metrics for evaluation using modern statistical tools and comparative testing of all activities to ensure meaningful and sustainable results.

The vision addresses:

1. **Administrative processes and practices** with an aim of developing a clear set of guidelines, best practices, and metrics that other institutions or programs can utilize to build similar programs
2. **Academic outcomes and quality** by implementing teaching techniques and academic support that go beyond traditional pedagogies
3. **Bringing diversity to a key engine of opportunity and growth in California - the field of computer science**

The next section enumerates a list of action items we will implement, test, and adapt to achieve this vision.

2. Actions

A. Complete the pilot phase of the existing project through the graduation of multiple cohorts until spring 2020

Research and preliminary results of our innovation indicate that assembling students into cohorts enables them to support one another throughout their higher education path. They struggle and succeed together, lifting one another up as they proceed. Thus, building cohort-based computer science programs is at the heart of the effort to increase retention, transfer and

graduation rates while maintaining high academic expectations and outcomes at Cal State Monterey Bay and Hartnell College. With the IA funding, we will:

- Build adaptive course sequence pathways between Hartnell College and Cal State Monterey Bay as well as additional pathways for first-time freshmen at CSUMB that allow for students to graduate in 3 years, 3.5 year or 4 years. Because students occasionally confront insurmountable obstacles, it is important that the pathways be adaptive so that students can join another cohort without losing ground. We wish to provide students the ability to transition from one pathway to another seamlessly based on their academic performance each semester.
- Develop a software system that supports administrative procedures for easy management of multiple cohorts, on-demand schedule planning, tracking and transitioning of students between cohorts. The system will be implemented at both institutions, thus supporting the creation of pathways in other disciplines as we expand the model (G, below).

These actions will require staff time, both the sustaining of the current team and adding new staff, as well as the development of a software system. Once the pathways and systems are fully developed, these functions will be institutionalized and sustained at Hartnell and CSUMB.

B. Develop new academic quality initiatives and scale existing initiatives

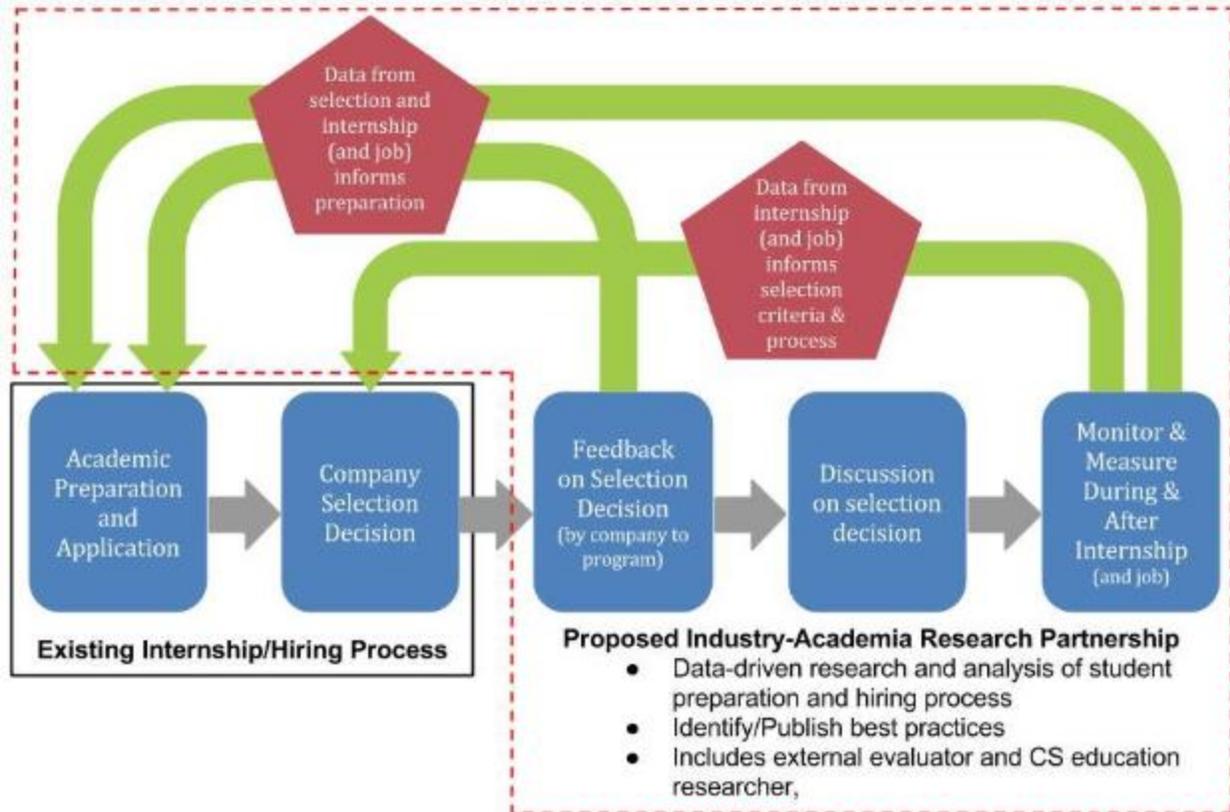
We will experiment with new pedagogical techniques for computer science education with the focus on preparing students who have little exposure to computer science in their K-12 education. The aim is to ensure that core computer science classes do not become filter classes that discourage traditionally underrepresented students from continuing to explore a career in computer science. The techniques to be explored include:

- Peer Instruction: <http://www.peerinstruction4cs.org/about/>
- Peer Led Team Learning: <http://www.pltlcs.org/>
- Integrating related courses to go beyond existing course boundaries
- Offering intensive courses taught by industry engineers for college credit
- Developing a computer science concept inventory to assess student learning and retaining of key computer science concepts

These actions will require support for faculty, staff and student assistants to develop, deliver and assess the initiatives. In addition, an assessment coordinator will be hired, in conjunction with the math department at CSUMB (the recipient of our second innovation award), to analyze the results of these techniques so that the successful components may be shared with other departments and other institutions.

C. Establish industry-academia feedback loop through internship and job placements to ensure competitiveness of graduates

We will establish partnerships with industry to exchange important and relevant feedback on student readiness and to utilize this feedback to inform the academic preparation of students. The diagram below offers a potential model for these partnerships by outlining an industry-academia feedback loop arranged around student internships. This kind of integrated partnership, which requires investment from both industry and academia, will result in concrete and specific feedback that can have a direct and immediate impact on both sides. We are already working with individual contacts at Facebook, Google, Salesforce, and Uber, and expect to expand this list moving forward.



As graduates join the workforce, they can provide additional mentoring to students in the pipeline, thus sustaining the path from K-16 to career. In the short term, award funds will support the coordination these internship opportunities and to assess data collected through these partnerships.

D. More efficiently identify and prepare students interested in computer science through K-12 outreach

In order to build a solid pipeline of better-prepared students by engaging students in the K-12 system, we will experiment with the following outreach ideas:

- Help build and offer a 2-course sequence of computer science classes in multiple high schools and middle schools in Monterey County. This will entail college/university faculty training high school teachers and pre-service teachers and helping partner schools obtain needed equipment.
- Develop an online student tracking system that integrates Khan Academy, EdX, Coursera and Udacity material and can be used to engage and educate students throughout the county.
- Develop and test various incentives, competitions, and rewards systems that [nudge](#) students through required math and computer science preparation. These rewards and incentives will be developed in collaboration with industry partners and local schools.
- CSUMB's second innovation grant to support mathematics education will also increase math preparation at regional schools, thus supporting this effort.

The award funds will support the program staff time and development resources needed to explore solutions for this objective.

E. Develop and implement disruptive innovations that go beyond traditional metrics of higher education outcomes like ‘seat time’ or ‘credit units’

Higher education traditionally measures progress through the numbers of hours spent in a class and the grade achieved in that class. Both to make accelerated pathways sustainable by adding flexibility and to challenge these traditional metrics, we plan to try the following approaches reevaluate graduation requirements:

- Develop competency-based assessment tools coupled with open resources that meet major and some general education requirements.
- Develop partnerships with industry to provide students with apprenticeship opportunities to earn graduation credit.
- Evaluate and compare performance of students, in internships and jobs, who met graduation requirements through different metrics.

Faculty and staff will work on this action with help from an assessment professional.

F. Institutionalize key program elements to better serve the broader computer science student base in a more cost effective manner

In order to support multiple cohorts, the policies, procedures, practices and information systems in both institutions will need to be adapted to accommodate and support the management of cohort pathways. Along with the institutionalization of administrative processes, key academic initiatives like required study time, cohort enrichment activities, and proven results from the new approaches outlined in actions A through E will need to be institutionalized. All of these efforts will be done with an eye towards also making these services beneficial to students who cannot commit to the cohort programs.

All efforts to institutionalize program elements must be informed by evaluation and demonstrate efficacy, cost savings, and academic value by addressing questions like:

- How can we sustain the high engagement and grit of students without dedicated scholarship support?
- How can we sustain high-touch academic support? Does cost savings from increased retention and graduation, and decreased units per graduate justify the cost of high-touch academic support?
- How can we integrate demand-based scheduling and other administrative practices into institutions?

The funding will support project faculty and staff time to work with existing academic departments on the institutionalization described above.

G. As various components of the model are proven successful, expand to additional community colleges and disciplines.

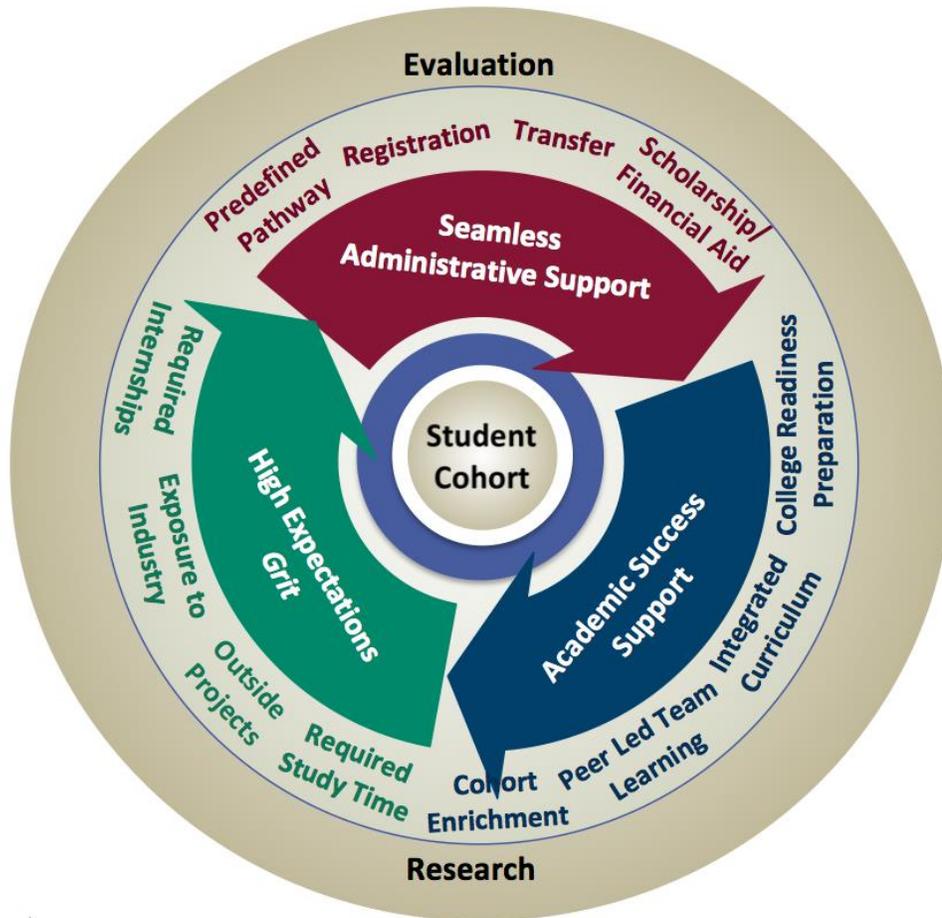
While purposes A through F aim to strengthen and institutionalize the implementation of the computer science cohort programs at Hartnell and Cal State Monterey Bay, purpose G aims to replicate the cohort-based program model with other institutions and other STEM disciplines.

This purpose will be achieved by following two major steps:

- Developing a centralized dissemination portal, a website, that provides structured information for other institutions and disciplines on how to implement a cohort-based, accelerated undergraduate program. This documentation will include ways to develop such programs across institutions or within single institution. As a preliminary step to this end, an abstract describing this innovation was presented at the CSU HSI STEM meeting on April 8th. We will also disseminate successful aspects of the program through conference and publication venues.
- Supporting duplication of successful cohort programs by providing incentives based on demonstrable results from other institutions and/or disciplines.

3. Summary

The vision, purposes, ideas, and new initiatives proposed in this narrative aim to build individual stages of an end-to-end pipeline that engages a broad and diverse group of students in computer science, prepares them for college, supports them through college to graduate in no more than four years, and connects them with internships, jobs and graduate school. Cohort-based programs are a means to clear administrative barriers, provide integrated, targeted academic support, build supportive learning communities, and challenge students with high expectations and applied learning experiences, while continuously adapting to student performance, industry feedback, and rigorous assessment practices.



Efficient implementation of cohort-based programs also requires the development of new information systems that recognize and serve cohort requirements within the institutions. The aim is to integrate the model represented in the picture above within existing institutional practices along with improving services to all students.

Our vision will enable us to fulfill CSUMB's commitment to increasing numbers of STEM degrees, continue to ease and thus increase transfer between Hartnell College and CSUMB, and ensure that more students complete these degrees in four years or less.

Please remit funds to *CSUMB* and send to the address below:
Bonnie D. Irwin

Provost and VPAA
California State University, Monterey Bay
100 Campus Center
Seaside, CA 93955

831-582-4401
birwin@csumb.edu



CALIFORNIA STATE UNIVERSITY
Monterey Bay
OFFICE OF THE PRESIDENT

100 Campus Center
Seaside, CA 93955-8001
831-582-3532
Fax 831-582-3540
csumb.edu

April 8, 2015

Selection Committee
Awards of Innovation in Higher Education
California Department of Finance
915 L St.
Sacramento, CA 95814

Dear Selection Committee Members:

California State University, Monterey Bay, appreciates that our efforts in innovation have been recognized. We are excited to expand our efforts to serve the people of California with these funds by shortening time to baccalaureate degrees and increasing the number of degrees awarded.

I have reviewed the CSIT-in-3 spending proposal and find it to be ambitious and appropriately directed toward enhancing the current innovation and disseminating the best practices to other programs and pathways from our community college partners. The project will enable us to meet an industry need for a more diverse labor force in Silicon Valley and beyond. What we learn from this innovation will enable us to make further innovation in STEM innovation in the future.

Sincerely,

Eduardo M. Ochoa, Ph.D.
President