

INSTITUTE FOR STEM EDUCATION, CAL STATE EAST BAY 2011-present

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Accomplishments, Yet to Come

In 2011, the Bayer USA Foundation awarded California State University, East Bay, a three-year grant totaling \$540,000 for the purpose of creating an Institute for Science, Technology, Engineering and Mathematics (STEM) Education, which would serve as a regional infrastructure to “prepare all graduates to preserve the San Francisco Bay Area’s global leadership in science research, manufacture, and investment.” That grant called for increasing recruitment of diverse students for careers in STEM industries and teaching; providing stronger training for present and future teachers, grades preK-12, in STEM subjects; and partnering with industry and educators to create seamless career pathways that include both rigorous academics and work experiences.

In the fall of 2011, the Institute for STEM Education began operation with the installation of Stephanie Couch, Ph.D., as the “Bayer Executive Director”. The mission of the Institute was articulated to focus on advancing STEM education in ways that build on existing strengths, are scalable to state and national levels, and are dedicated to continuous improvement. Specifically:

STEM Leadership: All four CSU East Bay colleges will, as never before, build common knowledge, develop coherent interdisciplinary strategies, and harness the campus’ many assets to develop new knowledge and innovations in strong STEM education.

Community Building and Collaboration: CSU East Bay and its partners in business, preK-16 education, and the community will work together and realize ongoing benefits as a result of their participation in the Institute’s initiatives.

New Educational Opportunities from Cradle to Career: With its partners CSU East Bay will ensure that the region’s students gain the knowledge, skills, and ways of thinking, knowing and being that are required for success in their chosen field.

Partnerships That Foster Success: The joint work of CSU East Bay and its partners will fuel economic development and result in new discoveries.

The irony of California’s standing, both as a world-class center of scientific innovation and as one of the lowest states in the nation for scientific achievement of students in its public schools, is much lamented. A regional institute founded with the mission of turning around this entrenched reality confronts the challenge of breaking down silos, securing public support and funding, knitting together best practices that have often functioned in isolation, delivering significant results immediately as it builds strategies to sustain results over time. Today, as Bayer

announces a second three-year grant of \$600,000, we present a summary of progress made and further work anticipated.

1. Consolidating Efforts, Building Effective Collaborations

Collaborating for stronger educational outcomes has built infrastructure and brought solid results in just a few years:

- Institute staff and partners built the Gateways “Cradle to Career” Initiative, focusing on STEM as a way to engage diverse learners and put them on the path to academic and career success.
 - For the first time, diverse partners—regional educators including grades preK-12 and both two- and four-year colleges, came together with informal science education programs, industries, and other stakeholders—to identify strategic areas for joint action.
 - A year-long study was undertaken to identify key levers for student success, and working groups were established based on potential for immediate and significant improvement in student outcomes. To date, working groups have been formed for preschool education, out of school time programs, high school to college/career transitions, and professional learning communities to implement new math and science standards.
 - *Preschool Success*: A pilot effort at a Harder Elementary preschool demonstrates the effectiveness of Gateways’ early numeracy efforts. In six short months in 2012-13:
 - The percentage of children scoring at grade level proficiency increased by at least 20% in every domain.
 - The largest gains were in the literacy and language development, cognition and MATH domains, with 40% increases in scores.
 - *After-School Promise*: Research shows that after-school programs can accelerate learning, and Gateways has helped secure funding to improve after-school STEM learning opportunities for more than 11,000 students across the region (emphasis in underserved communities).
- Cal State East Bay’s Colleges of Science and of Education and Allied Studies worked together in new ways to recruit and prepare current and future preK-12 teachers and to infuse STEM education into all disciplines.
 - *Teaching Teachers for Today’s Science Standards*: Newly designed Hands-On Science Teaching lab courses being launched in Fall 2014 will provide opportunities for undergraduates working toward a teaching credential to be taught and to teach science in ways that reflect the new K12 science standards (hands on, inquiry based, etc.). Area middle schools visiting CSUEB will be the live audience for teaching innovations, and successes will be scaled.

- *Building Diversity in our Science Teacher Pool:* Institute staff helped secure a four-year Noyce Scholars grant that will provide scholarships for 32 students from underrepresented backgrounds pursuing math teaching credentials. A research component aims to increase understanding of best practices for attracting, preparing, and supporting a diverse cadre of highly effective STEM teachers in urban schools.
- *Providing Basic Preparation for STEM Students:* Data analysis has demonstrated that too many entering CSU students struggle for success in STEM college/career pathways because of insufficient mastery of mathematics and English language arts. CSUEB has funded interdisciplinary faculty teams to research new approaches to helping these students, and is working to develop support programs for students in high school and lower grades.

2. Improving Teaching

Partnerships with school districts and community-based organizations throughout Alameda and Contra Costa County have generated several initiatives to improve teaching immediately:

- The Institute hosted a no-cost summer institute and has provided lab equipment and materials to maintain a network of high school biotech teachers throughout the East Bay (EBBENet).
- Initiated a new engineering education effort involving West Contra Costa USD teachers and CSUEB faculty/students.
- Initiated a new year-round middle school math and science professional learning community for teachers in Emeryville and elsewhere that will support the implementation of California’s new math and science standards.
- Secured funding to educate early childhood workers about the profound effects early numeracy development efforts can have on students’ future success. Conference to be held May 2, 2014.
- Co-hosted a “sold out” conference on STEM teaching and the arts for 290 area educators in February 2014.

3. Scaling Up STEM Career Pathway Models

The STEM Institute has been actively working to improve the reach and programmatic quality of various existing STEM college and career pathway. Much of this has consisted of strategic planning with several local school districts—Emeryville, Berkeley, San Francisco, Livermore, Dublin, and Pleasanton—with no full-scale programs yet in place. However, significant progress has been made as follows:

- *Career Impact Program:* For more than 20 years, Bayer has hosted an annual Career Awareness Day for about 70 students in the Biotech Partners program at Berkeley High and Oakland Tech, as part of its 30-year commitment to the City of Berkeley. Research

presented by Bayer Corporation in 2012 found that lack of peers is one of the biggest barriers for women and minorities pursuing careers in the sciences, and events like Career Day have proven to be transformative experiences that enable students to envision a specific career path in the sciences.

- In 2012, the Institute for STEM Education worked with Bayer to significantly scale up this one-day event. With U.S. Representative Barbara Lee delivering the keynote, nearly 100 students from three local high schools attended and toured ten local STEM workplaces, ranging from CalTrans to Bayer to the Stupid Fun Club.
- In 2014, more than 160 students are expected from six schools and will visit with working scientists from more than a dozen local companies. The event is being scaled up from one day to a year-round curriculum, offering site visits and personal meetings with leaders throughout the East Bay's Innovation Corridor. We are working to replicate the year-round Career Impact model with other school districts later in 2014.
- The University has secured funding for new Institute staff who will recruit and prepare CSUEB students to work both with STEM professionals and high school students as part of the year-round program. The new community and business engagement efforts will, commencing July 1, 2014, broaden valuable opportunities for college and high school students to learn from and be mentored by professionals in STEM fields. Research suggests that this will increase student interest, engagement, retention and graduation in STEM fields and disciplines.
- *Business Engagement:* An enormous regional challenge has been recruiting much broader business engagement in STEM education, along with rethinking the most cost-effective engagements to offer business. Demonstrable business engagement is a requirement for funding from the \$250 million state Career Pathways Trust (CPT) that will be dispersed this May, and many grant applicants are scrambling to meet this commitment.
 - The STEM Institute has strengthened business participation in the Gateways Initiative, which now includes representatives from Bayer, Cisco, Chevron, AT&T and others.
 - The Institute has participated actively in the I4C task force convened by Wareham Development and various other business-led conversations
 - The STEM Institute has played a key role in the Business Engagement Advisory Committee convened through the East Bay Economic Development Alliance. This committee is beginning to significantly rethink what we mean by “business engagement in education.” Rather than taking the traditional, relatively passive role of waiting to be contacted by educators to provide internships, classroom speakers, and the like, the Committee is carving out an assertive role for business in designing components of workforce development programs, developing ways to give students first-hand workplace experiences so that more employers can

participate, generally sharing with diverse array of businesses the value of their engagement.

- STEM Institute was integral voice in three regional CPT grants
- Supported 2013 webinar to EBEDA members with internship toolkit to recruit more businesses into providing paid summer internships.

4. Changing the Conversation about Science Education

When Bayer awarded the first \$540,000 in 2011, it was with the intention to create “a new dawn in science education for California schools.” Achieving this vision requires collective action by many people, especially those in the policy making and philanthropic communities. Evidence of the new conversations and ways of working that are emerging in the region include:

- State Superintendent of Public Instruction Tom Torlakson presented the Next Generation Science Standards during an event with educators and other stakeholders held at Bayer in February, 2013. As a result of education and advocacy efforts by the STEM Institute and others, \$1 billion was subsequently allocated by the state from unanticipated tax revenue to help prepare California teachers to implement the rigorous new math and science standards and to cover instructional materials and technology costs.
- Policy makers across the state have called on the Institute to provide testimony and data in legislative hearings regarding ‘what works’ in STEM education. An elected leader from Germany, a nonprofit from Israel, and Stanford’s Social Innovations group requested briefings on the Gateways network model.
- Building on the Bayer start-up grant, the STEM Institute has raised \$1.9 million in additional funding as validation of the concept that a strong regional network, bound together by a backbone organization focused on uniting all stakeholders toward common goals, can make relatively fast progress toward transforming California from one of the nation’s worst states for science education into one of its best.
- The value of the STEM Institute from the perspective of local educators is demonstrated by its inclusion in local applications for Career Pathways Trust funding. One application notes, “CSUEB will help us leverage STEM education and work based learning assets in the region through its Gateways East Bay STEM Network.” Another reads, “Key to the implementation of the strategies described above will be a regional professional development framework and delivery system overseen by the DGI Professional Development Lead, the Gateways East Bay STEM Network... Gateways, a project of CSUEB and an affiliate of the California STEM Learning Network, is a system of support to increase students’ access to high quality STEM learning opportunities from cradle to career. Gateways currently convenes a STEM Professional Learning Communities Action Group that develops the skills of teachers through direct learning opportunities.”

5. Expansion of Direct STEM Learning Opportunities For Students

In addition to events noted above, the Institute has contributed to the expansion of STEM learning opportunities for students in the following ways:

- Hosted STEM oriented workshops for middle and high school students from first generation, African American, Latino, Asian and Pacific Islander backgrounds. Approximately, 1,303 students participated in this event in 2013 from local high schools and middle schools.
- The Institute recruited entities to participate in the Bay Area Science Festival at CSUEB and hosted several activity booths of its own. Approximately, 7,000 future scientists and their families attended this event.
- In concert with the Bay Area Science Festival, the Institute hosted a coffee with Congressman Swalwell aimed at getting girls/women engaged in or interested in learning more about STEM.
- The Institute was asked by Congressman Swalwell to lend support to students for their participation in a STEM Apps challenge. The event was held at CSUEB. Five students from area high schools were in attendance (Dublin and Moreau Catholic).
- The Institute supported the second annual Brain Bee competition for area high school students interested in neurobiology.

In sum, the last three years have indeed seen impressive, profound improvements coming from the Institute for STEM Education. Improvements have come on the ground and in state arenas of strategic planning and policy making; for targeted audiences of underrepresented students and for two- and four-year educators who have never before worked together. We have seen improved training for preschool teachers and better metrics from their students—which promise to arm these students with the tools they need to succeed all the way through college to careers. This work at present remains fragile, too dependent on a few compelling leaders—but it has begun. In the next three years, we look forward to stronger collaborations, broader results, and expansion of the shared commitment it takes to advance STEM education so that all California students are prepared to succeed in our rapidly evolving world.