

EXECUTIVE SUMMARY

In Year 2, Bakersfield College continues to achieve strong progress towards achieving goals and measurable outcomes for our project, “Turning a Gateway into a Pathway to STEM Degrees for Hispanic and Low-Income Students in the Southern San Joaquin Valley.” Our ongoing dialogue and action with collaborator, California State University, Bakersfield (CSUB), our four-year transfer partner, is making Baccalaureate STEM degrees a reality for our students. This is a tremendous service to our community with low educational attainment rates and high proportions of Hispanic, low-income and underprepared students. A number of areas are working synergistically to promote STEM success among our students and build institutional capacity: increasing faculty understanding of pedagogies of engagement; greater faculty involvement with students in a variety of settings; improved learning environments giving access and resources for student success; and dedicated, knowledgeable support services to help students from the start to the finish of their educational pathway.

We are committed to the success of this project because it means the success of our region and long-term national competitiveness in a global STEM economy. Student success supported by the STEM and Articulation Program will combat the San Joaquin Valley’s high rates of poverty, illiteracy and unemployment by producing more Bachelor’s degree holders who can fulfill workforce needs. Bakersfield (BC) serves approximately 19,000 students annually (53% Hispanic) and transfer partner CSUB educates 6500 undergraduates (43% Hispanic); we are the only institutions of higher education within a 100-mile radius making our mandate to serve our community crucial. However, both institutions have significant challenges to address among its students. BC’s and CSUB’s student bodies exemplify the national crisis in Hispanic students’ underpreparedness and underrepresentation in STEM degree programs. Our students are approximately 80% first-generation college students and 70% low-income and severely underprepared for college, bringing support services and best practices in pedagogy to the fore in our activities. These issues further underscore the imperative for continued successful collaboration between BC and CSUB.

We are very pleased to report that the collaborative has expended nearly all of the allocated budget towards achieving our goals and objectives, including all carryover from Year 1. In addition, Year 2 continues to achieve significant progress in all three project goal areas. Efforts go across all STEM disciplines with special attention to our highest-enrollment major, Engineering, which displays the greatest demonstrated need at all levels for educated workers among regional employers. Metrics focus on transfer rates and the pathways leading to them, including best practices in teaching and learning in STEM for underrepresented students, as well as intersegmental articulation efforts that will remove barriers for students now and in the future.

Our strongest emphasis has been on increasing STEM success and transfer among all students with attention towards the needs of low-income and minority students, and, eliminating the equity gap for Hispanic students. Promising results continue to be gained in classrooms and in

faculty development in Year 2. SMART math classrooms and hands-on lab equipment combined with problem-based learning known to bolster Hispanic student success are being used across STEM. Student qualitative feedback is very positive: “I never thought I would get to learn like this at a community college in my hometown. I feel like I can go anywhere now,” noted one Hispanic, female Biology major who successfully transferred to a four-year Biology program.

Data-driven understanding of the program remains a significant area of development. A research analyst joined the team mid-year. One of the most important areas she has been studying is our proportion of first-generation college students, at approximately 80% of our student body. She also has been developing the capabilities of understanding interventions of technology and pedagogy by working with faculty. The intersegmental system continues to be a goal we are pursuing.

Building a vibrant STEM program on campus and with industry partners and disseminating opportunities to diverse constituents is building greater STEM awareness. This includes speakers on STEM majors and careers, transfer success workshops, an email listserv communicating at least one email a week to all students and faculty. Students regularly request being added to the listserv when they meet with faculty, program staff and counselors, so we know that word of mouth among students is active. Press and media coverage continued to be strong, helping our community become aware of the educational opportunities available at the community college and four-year university together.

We look forward to continuing this positive work in Year 3.

Goal 1

Collaborative efforts between BC and partner CSUB continue to achieve substantial progress toward project goals and the HSI STEM and Articulation Program mission of increasing educational attainment among Hispanic and low-income students while building long-term institutional capacity.

The CSUB-STEM Transfer Specialist continues to serve students on the BC campus, advising STEM students on pathways to a B.S. degree and connecting them with CSUB support like financial aid. She also cross-enrolled students in STEM courses at CSUB, giving students a chance to take a course at the transfer destination, and avoid waiting another year for an available seat at BC whose classes are often full to capacity. These services are essential for our 80% first-generation college students usually unfamiliar with how to get correct information and prone to taking unnecessary classes in high-unit STEM majors which hurts their financial aid. Additional activities included a 2nd annual CSUB STEM Preview Day where BC STEM majors visited the CSUB STEM laboratories and received information on transfer financial aid, scholarships, and undergraduate research. Several “On-Site Admission” events from CSUB on the BC campus helped 228 students complete the transfer process early while still being enrolled at BC, in order to promote follow-through with transfer.

We increased the frequency our STEM Colloquia which present academic skills and transfer opportunities to students and faculty. We also added the “Pathways” series where STEM professionals discuss their educational path to real-world applications of STEM knowledge. 400+ students and faculty attended these presentations this year. 212 returned surveys displayed extremely positive feedback, such as students understanding the use of STEM skills in their everyday lives (92%), gaining useful information (Very useful: 65%), and feeling encouraged to pursue a STEM career (Probably or Definitely Encouraged to Pursue STEM or Apply Workshop to School/Life: 92%). While representation existed from all STEM majors, 46% of respondents were pursuing Engineering. As a result we may include even more Engineering-oriented content, or interdisciplinary topics. Our best-attended event (90 attendees) was NASA engineer and astronaut, Jose Hernandez, who discussed his experience as a first-generation college student. He grew up working in the agricultural fields of the Central Valley and was the first in his family to pursue higher education, mirroring the background of so many our BC students. His experiences were parallel to our students’, with traditional family structure that provided strength but could not give college guidance to him. In addition to keynoting at the Kern County Science Fair for two thousand Grades 4-12 students, he presented his story at Bakersfield College, and then held a special “up close and personal” discussion session in our MESA program which serves educationally and economically disadvantaged students with support for STEM success.

These activities produced strong progress for Performance Measures 1.1 and 1.4 in terms of numbers of STEM majors and transfer success. We are pleased to report that we have 1819 declared STEM majors, increasing our 2009 baseline of 1200 with equitable Hispanic student participation at just over 50%. Collaborative efforts and services with partner CSUB resulting in exceeding objectives; we transferred 136 students in Grant Year 2 over the baseline of 57 with equitable Hispanic students’ representation.

Across the STEM disciplines, faculty worked with technology, academic support mechanisms and pedagogies of engagement to improve student achievement and Hispanic success. 9 SMARTrooms in Math were mobilized mid-Year 2. Faculty found adopting the technology to be challenging and much support was needed. Now, professional development is being planned for Year 3 in response to faculty needs and the expressed desire to renew learned skills plus gain new ones. Developmental math courses were revamped, featuring newly aligned SLOs and a much higher level of intervention with students by faculty and Math Lab personnel. Examples included monitoring of students’ time on task and required in-person monthly assessments even with technology-centered courses. A new Moodle site was also created with weekly updates and interactive forums for questions and discussion. Results are being achieved already with an increase in success from the 2009 baseline of 44.1% to 51.5% in 2012-13. The Math Lab, which serves over 1000 students per semester, increased its hybrid developmental course success rates from 30.8% in 2009 to 46.0% in Year 2 of the grant. The Math Lab’s offering of Math 50, the first developmental course, where the most interventions to support students are taking place, dramatically increased its success rates by 21%. We are also pleased to report we are narrowing the equity gap for Hispanic students in developmental mathematics, supported by a 49.8% success rate among this ethnic identification, compared to 55.9% Caucasian students’ success. Therefore, we are achieving significant progress towards Performance Measure 1.2 thus far and

will continue work to build positive results. Plans for Year 3 and beyond include more “intrusive” intervening with students (predicting their questions even before they initiate asking for help); integrating transparent, user-friendly, Intermediate Learning Objectives that students can use to gauge their progress; and additional peer supplemental instruction. We will also mobilize two accelerations, one that addresses the lowest developmental levels (Math 50 and ACDV 78) and the other addressing Beginning and Intermediate Algebra (Math 60 and 70).

In the laboratory sciences, faculty collectively decided that while POGIL was too challenging to implement, especially with the high number of first-generation and underprepared students at BC, they observed that technology combined with problem-based learning is making strides with students. Chemistry 1A’s use of clickers and the NMR, and 1B’s use of Vernier instrumentation have the most traction with results of 67.0% and 87.3% success, respectively, and 78.2% and 92.4% retention for all students. Hispanics achieved 64.9% and 85.1% success in 1A, and 75.3% and 93.6% retention in 1B; the latter, in fact, exceeds Caucasian students retention. Student qualitative feedback is very positive: “I never thought I would get to learn like this at a community college in my hometown. I feel like I can go anywhere now,” noted one Hispanic, female Biology major. Notably, Biology will be using clickers in Year 3 modeled on Chemistry’s observations so far.

With the various interventions, the Project Team has observed the need for professional development and ongoing, responsive training to help methods improve and “stick.” In Year 2, we initiated “STEM Conversations,” a faculty professional development series with a forum format. Much like the direction we are moving towards with our students where passive lecture is minimized and active learning comes to the fore, STEM Conversations uses active techniques for faculty to develop shared solutions to difficult challenges. Two Conversations took place in Spring 2013, garnering extremely positive feedback from the approximately 20 faculty and STEM student services staff that attended each event. The first discussed best practices learned at the Academic Senate STEM Academy and how we might implement these at Bakersfield College; conversation threads focused on K16 alignment questions, a model STEM learning center patterned after American River College’s STEM Center, and interdisciplinary learning. Boosting low-income and underrepresented student success underlined each thread. Each of these topics then became action items whose development will continue in Year 3, including development of a STEM Center, articulation with K12 especially in mathematics, and a pilot interdisciplinary biology, writing, and multimedia bridge program that successfully took place in August 2013.

The second Conversation hosted two faculty from Cal Poly San Luis Obispo discussing institutional change—how can faculty be part of this process? What are the resilience skills needed when initiating a new idea and how do you weather the ups and downs of change processes? The collaborative discussion that took place edified the group as evidenced by survey responses. This thread was especially timely in our 2nd year of grant efforts, as several faculty were starting out piloting new pedagogies in their classrooms and experienced trepidation. A

positive benefit was also that faculty felt a sense of shared responsibility and camaraderie in their efforts ACROSS the STEM disciplines—it was useful in breaking down the artificial silos that come with faculty being part of different departments. The day also provided an unforeseen opportunity to discuss transfer support as well, given that the faculty from Cal Poly worked with cohorts of incoming students. Due to the success of Conversations in Year 2, we plan to hold more frequent events next year, hopefully 4 or 5 over the academic year.

Goal 2

Second-level articulation with our 4-year partner in all STEM disciplines is a key priority for the collaborative effort since it will remove barriers for students in the transfer process and produce more STEM baccalaureate earners. Ongoing BC-CSUB transfer activities give students knowledge and tools for transfer success and a sound academic foundation that will lead to undergraduate completion and professional pathways.

The SLO alignment process continues and is being spearheaded by a BC faculty member working with transfer partner CSUB in the remaining fields of Math, Chemistry and Physics. All disciplines met in Year 2 to review current alignment, remove barriers and develop student-centered solutions for transfer success. Associates in Science degrees for Transfer were added by Math, Physics and Geology; now Chemistry, Biology and Engineering are working on this issue. Engineering refined its curriculum even further, and continues to be a model for all our STEM disciplines as they improved their alignment with CIDs; approval needs to occur at the state level next.

The articulation dialogue also included student support professionals from both institutions, and the Transfer Mentors who presented their experiences and feedback working with BC students. Key needs identified in this collaborative process were the goals of cementing transfer support and increasing the availability of advanced subject academic support.

Transfer-prepared students still struggle academically when moving to the four-year university. Therefore, the STEM and MESA Transfer Counselor and team of near-peer Transfer Mentors (BC alumni now attending CSUB who made the successful transfer leap) began to engage in targeted professional development to enhance support. Additional mentors were hired as well to meet with students in various STEM disciplines. In Year 2, 117 students met with the Counselor for personalized educational plans and transfer advisement. The Transfer Mentor team also held workshops to address needs identified in student feedback surveys, such as lab report writing at the community college and at the 4-year university and how to use CSUMentor and Assist.org software to understand transfer requirements. To date, approximately 347 students are recorded in the database; 175 identify as Hispanic (50.4% Hispanic). This is evidence of the building culture of STEM advisement the STEM and Articulation program has been able to provide for BC students.

Interdisciplinary efforts developed successfully this year. A team of Biology and English faculty held the first biology filmmaking camp, used as a bridge program for the 13-14 year. 10 students participated and completed authentic learning inquiries at the Kern County Panorama Vista preserve, which they then made into multimedia presentations for students. Our largest BC major, Engineering, has made great strides including interdisciplinary engagement using hands-

on lab equipment. Rapid prototyping technology, giving professional skill-building, has enhanced the labs and is being developed in Year 3 to involve other STEM disciplines. We continue to promote these cross-disciplinary investigations of STEM using real-world settings.

BC also put a year-long Organic Chemistry sequence onto the roster for Year 3. This gap has urgently needed to be filled for our students pursuing baccalaureate science degrees, especially those transferring to the University of California system. The course will use the technologies installed in the Chemistry lab acquired due to the auspices of the STEM and Articulation grant, and will continue to foster authentic learning experiences for students.

Goal 3

Data-driven understanding of the program remains a significant area of development. A research analyst joined the team mid-year. One of the most important areas she has been studying is our high proportion of first-generation college students, at approximately 80% of our student body. She also has been developing the capabilities of understanding interventions of technology and pedagogy by working with faculty. The intersegmental system with CSUB continues to be a goal we are pursuing. The BC portion of the database has been mobilized; the intersegmental portion is under development.

The database of students receiving STEM counseling services has grown to 347 (50% Hispanic) and allows us to track students by ethnicity and gender. Educational milestones are tracked using a progress rating as well, as these indicators can predict STEM completion and suggest triage. The milestones include completing an educational plan with the Counselor, major declaration, math progress, full-time student status and number of units completed.

Data development through the HSI STEM and Articulation project has shed light on the efficacy of interventions in boosting student success. As described in the Goal 1 narrative, we have seen progress on increasing success in developmental mathematics using student intervention strategies. In other data development, the Project Team analyzed students in three areas, based on the level of structure of student support and intervention. In Year 2, we examined student GPAs and enrollment status in the 1) MESA program—a highly structured program with required activities, prescribed interventions, and corrective action taken by students; 2) the STEM majors population with optional but still structured activities, services and support which are very well-communicated and highly available; and 3) the general BC student population with the least structured and least promoted activities. Notably, MESA, the most highly structured program with required interventions and student actions produced 51% of students with a 3.0 GPA or above; next were the STEM students where 37.9% had a 3.0 or greater, and lastly, the general student population, with the least amount of structure and interventions produced only 29.8% of students with a 3.0 or higher. Furthermore, more MESA (75%) and STEM students (57%) are enrolled full-time compared to 22% of general population students—a key ingredient in students completing STEM degrees. This reveals that student achievement and enrollment

status can be strongly and positively shaped by institutional intervention and student support services. We plan to pursue this data-driven understanding further in Years 3 through 5.

Supplemental instruction was expanded considerably at the end of this project year across the campus with the STEM Assistant program as a model. Greater standardization of methods and implementation occurred, with ongoing training for SI leaders a key piece. There is also additional attention to data collection of this effort to continuously improve this program which we know provides much-needed academic support to the variety of STEM disciplines. This data will be available in Year 3 for our next Annual Performance Report.

Data will also be collected in an upcoming STEM Center (based on the American River College model) where students can receive supplemental instruction, transfer mentor and advising services, tutoring and engage in quiet study. The Center will be a hub for success skill-building with workshops that are created and led by faculty and catered to STEM student needs. Faculty and counselors will donate hours to increase faculty-student interaction—this has been shown in CCSSE results to be an area of need at commuter colleges, including BC. Our plan is for students to be tracked using a swipe card system called Accu Track, planned for implementation in Year 3 and 4, to help us understand which services are most useful for students and their impact on student achievement. Ideally, we should be able to cross reference educational milestones in our database, such as the completion of the Student Educational Plan (SEP) and GPA, with the usage of support services like SI or Transfer Mentors.

The need for all engaged in improving STEM teaching and learning to understand metrics is emerging at our institution. Within the STEM areas, there is limited access and understanding of data among the faculty at large; knowledge is mostly concentrated among those at the chair level engaging in college administrative roles not just teaching. Thus, we aim to illuminate the understanding of data and disseminate our findings in STEM in upcoming project years. This has already begun in terms of disseminating project activities in a monthly STEM Highlights newsletter; however, greater attention specifically to data's role in shaping teaching and learning is needed. This commitment is shared institution-wide where two professors from STEM are participating in a campus data initiative related to the California Community College's Student Success Scorecard. We anticipate also holding a STEM Conversation regarding STEM data and interventions in Year 3.

Using data to make decisions regarding program progress and the success of interventions is crucial to achieving performance measures and effectively shaping how institutional capacity is built. Summative and formative evaluations, based on quantitative and qualitative feedback, are important elements in the project team's mission. Substantial progress has been made towards both performance measures comprising Goal 3.