Bridge to Biotech Lab Assistant Certificate Program

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Background. CCSF initially developed the Bridge to Biotechnology (B2B) program to create better access to biotechnology training opportunities for people who needed to strengthen their basic language and mathematics skills. Faculty observed that in the early stages of biotechnology degree and certificate implementation, several students dropped or failed introductory biotechnology and chemistry coursework due to a lack of foundational skills. As Program Coordinator James Lewis states, "Students want to get a job. No one is convinced that basic skills are what they need." B2B sought to develop a model that would help students build these skills and understand the value of these competencies to their goal of entering biotechnology employment. Over time, the College also recognized the need to assure employers of students' readiness when they were hiring program participants for internships and employment. Participation in B2B allows for the College to ensure a foundation of skill development before students enter the workplace.

Model Type: learning community

Description: basic skills math and English integrated with preparation for employment as a Biotech Lab Assistant and/or advanced biotech coursework

Target population: students placing at a 7-8th grade math and/or English level interested in pursuing employment in biotechnology

Requirements: participation in an orientation, assessment (strongly encouraged)

Type of Assessment: TABE test, college placement exam

Length: two semesters plus an optional 180-hour internship

Credit/Noncredit: credit

Program status: in progress since 2006

Program organization. B2B engages students in a two-semester model that includes 14 units of coursework and a 180-hour internship. See coursework outlined on next page. The program's first semester aims to help students learn essential laboratory skills while strengthening the basic math and language skills necessary for success in the workplace or more advanced biotechnology coursework. Students then practice this learning during the second semester through an internship placement in a biotechnology company. All coursework is credit-bearing and counts toward CCSF's Biotechnology certificate or A.S. degree. Student can take *Language Skills for Technicians or Practical Mathematics* for noncredit. Students in the program generally assess at the 7th – 8th grade level in math and language on the TABE test and the College's placement test. Students vary in age, ethnicity, and level of education but the vast majority share a specific interest in gaining employment in the biotechnology industry.

Semester 1	Semester 2
BTEC 10: Research Skills for Career Opportunities in the Biosciences (2 units)	BTEC 14B: Biotechnology Internship Experience (2)
ET 107: Language Skills for Technicians (3)	*Students also generally take additional 4 unit science courses (e.g. Introduction to the Science of Living Organisms or Advanced Medical Chemistry & Biotechnology)*
ET 108A: Practical Mathematics (3)	
BTEC 14A: Biotechnology Laboratory Techniques (2)	

Faculty roles and collaboration. B2B employs a team approach with six faculty actively engaged in program development and implementation, including a part-time program coordinator. This team has worked intensively over time to develop and refine curriculum through weekly meetings, curriculum exchange and syllabi alignment. *Language Skills for Technicians* instructor Rob Yung took the program's introductory biotechnology courses to understand the writing and speaking requirements found in biotech courses and the workplace. Similarly, *Practical Mathematics* instructor Rob Reed performed a needs assessment with the biotech and internship preparation instructors to identify the basic math skills required in these classes. B2B instructors all commented on the interdependence of their work and their inability to deliver their own course curriculum without the input of their program colleagues.

Key components of instruction. B2B is designed specifically to prepare individuals for both entry level employment in a biotech lab and the next level of science coursework required for Biotechnology degree or certificate completion. All basic skills development is linked back to the field of biotechnology. Program faculty emphasize two key program underpinnings designed to advance students' basic skills acquisition: an interdisciplinary approach that intentionally reinforces students' basic skills development across coursework and embedding all skill development in a meaningful context connected to students' educational and employment goals.

Program instructors time content delivery to emphasize the relationship of basic math and language skills to biotech coursework or internship acquisition. The *Practical Math* and *Language Skills* instructors Rob Reed and Rob Yung talk about employing a "just in time" mode of instruction. For example, *Biotech Lab Techniques* instructor Laurence Clement will notify Reed that students will begin preparing lab solutions in the coming weeks. Reed will then introduce students to ratios and proportions, concepts required for solution preparation, as that unit approaches. He starts with teaching math skills in the abstract and then moves quickly to biotechnology applications. He uses examples from the lab and problems that students feed back to him from internships. Students will practice the formulas necessary for mixing solutions, working with calculating a range of volumes and concentrations until they show mastery of the competencies and begin actual solution preparation in the lab.

Similarly, Rob Yung works on students' written and oral communications skills necessary for success in the biotech and internship preparation curriculum. For example, *Research Skills for Career Opportunities in the Biosciences* instructor Zimmerman found that students struggle to write conclusions in their laboratory notebook that communicate what they have proven in their lab experiments. Yung then worked with

Zimmerman to develop a related unit for students. He now practices writing conclusions with students, discusses the criteria for a strong conclusion through use of examples and has students make an analysis of their own writing based on these criteria.

Lewis notes the impact of linking the basic skills instruction with biotechnology preparation. "No one class is working alone. The echoing between courses is persuasive to students because the reason [for skill development] is almost self evident. They're using the math to prepare a solution in the lab or they're preparing a resume for a job opportunity or they're developing a lab skill that they'll have to talk about in an interview. The reinforcement [across classes] is convincing to students."

When talking about how the practice of contextualizing basic skills instruction differs from his traditional delivery of the content, Reed mentions a deeper level of investigation about the math students would really need to know for success in the workplace or continued biotech training. He notes the challenge of finding a relevant text and the time he has developing other instructional materials. He also talks about efforts to reinforce workplace readiness skills in the *Practical Math* course, emphasizing students' ability to communicate and work in teams. He engages students in extensive group work and peer mentoring. He notes the benefits to both student and instructor: "Students need to have interaction with each other for the math to really sink in…and I don't have to stand up and say what to do a million times." He also talks about how much more his students seem to enjoy math. "If it's purely academic, students lose interest. Students get turned on and like math after being in a contextual environment. They can see how it relates."

Impact on/outcomes for students. When asked how his approach to contextualizing a basic skill such as writing a conclusion or teaching presentations differs from his traditional classroom practice, Yung states that it does not vary that much. However, he notes the power of context that is meaningful, real and interesting to students. "I use the same strategies in my ESL classes…but in the bridge program, you happen to have a real context, one that is interesting to students, motivating and inspirational because they want a job. Here the context, versus the content, is motivational. In many cases, it's rare for students to see any immediate, pragmatic value of the math or language [in their learning]. Here, we're making the relevance really apparent."

Yung notes the challenges of creating a context that is meaningful to all students in a traditional classroom. He believes that because basic skills instruction happens in a context they care about, B2B students try harder. He talks about working with students on summarizing—a skill both his B2B and his traditional ESL students struggle to master. He observed that more B2B students take him up on the offer to revise summary assignments and really push themselves to improve their competence with the skill.

Reed echoes the impact of an authentic context. He says, "Students get more invested in taking on the discomfort of learning…The context helps create persistence because they're getting something out of the process. Adult learners have survived one way or another with limited education or basic skills and connecting the learning with something pragmatic helps them tap into their ability to learn the content. There's a definite increase in their self esteem."

B2B faculty see not only an increase in motivation and self esteem but increased success for B2B students in subsequent science courses. B2B completers experience a 90% successful completion rate versus a much

lower rate of 45% for those who have not participated. Eighty-five percent of B2B students continue into the College's Biotechnology certificate/degree program. They self-report an increased interest in pursuing additional education based on pre- and post-program surveys and proper preparedness for other courses.

Challenges and supports. When talking about challenges to their particular contextualized basic skills practice, B2B faculty talk about the significance of instructor willingness to learn outside their own discipline. Reed and Yung say they had to learn a great deal of science to make their coursework relevant. They note the importance of attending classes in the topic area other than your own to support authentic contextualization.

They also remark on struggling through a few semesters before the curriculum gelled and they felt like they could effectively teach it to their students. As they developed their curriculum, B2B faculty engaged in peer review with colleagues from both CCSF and other institutions. The College has provided the infrastructure for this kind of collaboration, with the ESL and Transitional Studies departments allocating instructors Yung and Reed to work on the program's development with the Engineering Department—the organizational home to all of the College's biotechnology certificates and degrees. They held regular weekly meetings to discuss curriculum alignment at the onset and now maintain regular check-ins to address both general coordination and areas for refinement.

B2B also benefits from a part-time faculty coordinator who supports curriculum development, student outreach and recruitment and relationship development with external partners and funders. An initial grant from the National Science Foundation followed by additional funding from the Bay Area Workforce Funders Collaborative and San Francisco Mayor's Office of Economic and Workforce Development have all supported ongoing curriculum and professional development, program coordination and replication. The College continues to work toward full institutionalization of the program.

Ultimately, B2B faculty say employing a model like theirs requires motivated instructors who are willing to take a "leap of faith." As Reed notes, "the leap of faith is worthwhile. Experientially, I can see how something [I teach] being reinforced by another instructor is helpful." Yung seconds this sentiment, stating "Together we have created something a lot better than working on our own."