

## Bio-Link's Scale up of City College of San Francisco's Bridge to Biotech Program

---

### **Bio-Link's Scale-Up of the Bridge to Biotech Program Through the Synergy Collaboratory Project**

City College of San Francisco's (CCSF) Bridge to Biotech (B2B) program is a vocational program serving underprepared students who wish to continue their education in the Biotechnology field and pursue a career in life sciences research either in Biotechnology companies, or academic or government research labs.

The B2B primarily serves economically disadvantaged students: 82% of the students who enroll in the B2B are low-income or unemployed, most of them adults with prior work experience transitioning to the biotech field (64% are over 34 years old). Diversity is another key aspect of the B2B program, with 76% African American, Asian and Hispanic students.

The Synergy Collaboratory (a collaborative laboratory) for Research, Practice and Transformation is funded under a grant from the National Science Foundation Advanced Technological Education (NSF ATE) program through Bio-Link, a National ATE Center of Excellence for Biotechnology, and focuses on equipping ATE leaders and program participants to better realize the potential scale and impact of their centers and projects.

The Synergy Collaboratory builds on research on scale up and diffusion of innovation to create and grow a national network of expertise to help projects and centers realize potential scale and impact. As one of these 13 centers, Bio-Link chose City College of San Francisco's Bridge to Biotech as a project to be scaled up and disseminated to other potential colleges.

### **The Bridge to Biotech Program at City College of San Francisco**

Because of their open access model, community college Biotech programs often face the challenge of having to serve students with a wide range of levels in fundamental skills and core scientific concepts. In addition, as community colleges have a limited time to prepare students to be operational in the Biotech field, this situation often results in low retention rates for those under-prepared students, and as a result, in a lack of diversity in the student population in higher-level courses.

#### **INCREASING DIVERSITY, ACCESS AND SUCCESS IN BIOTECH PROGRAMS**

Under-prepared students in the Biotech courses are often referred to the appropriate developmental courses that will teach them the fundamental skills required to succeed in the "gatekeeper" courses – the science courses that are pre-requisites to all Biotech program certificates.

However, one of the unfortunate consequences of developmental programs at some community colleges is that they can delay the accrual of college credit by students. Many students depart college before completing degrees or certificates, or even before completing their developmental sequences.

The developmental education model implemented in the B2B program is different. B2B students receive college

**Bio-Link's Scale up of City College of San Francisco's Bridge to Biotech Program**

credit, and passing the B2B is a requirement for the Biotechnology Laboratory Assistant Certificate, the first of many Biotechnology certificates at City College of San Francisco (Figure 1).

The B2B program has a track record of high completion rates : on average between Spring 2006 and 2008, 82% of students who enrolled in the B2B completed the program, and 83% continued on to enroll in the College's classes and programs, including Biotechnology certificate and degree programs and an AS degree in Biotechnology.

**Bridge to Biotech (B2B) Program at City College of San Francisco**

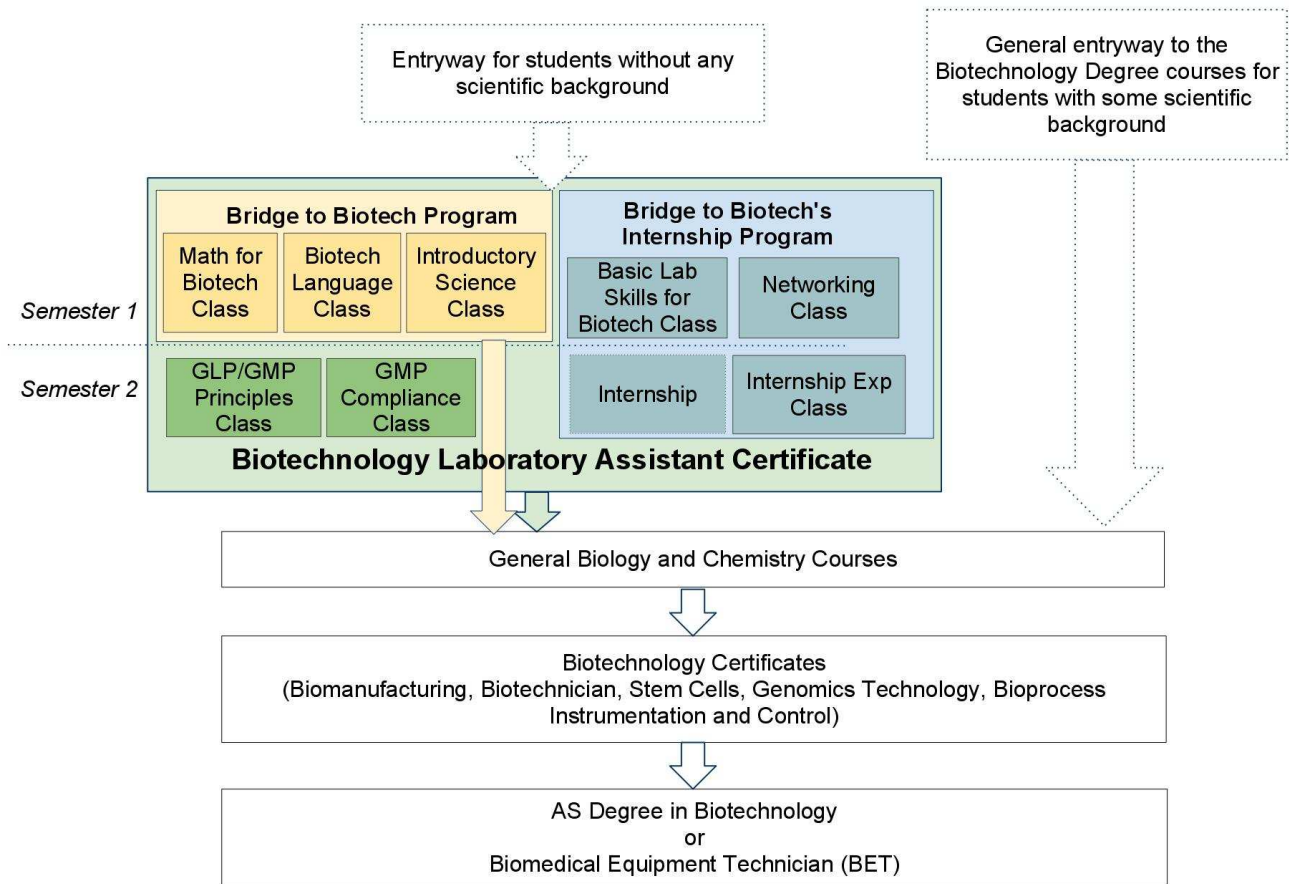


Figure 1: The Bridge to Biotech and the Bridge to Biotech's Internship program are the first steps to the Biotechnology Laboratory Assistant Certificate, which feeds into several Biotechnology Certificate Programs and an AS Degree in Biotechnology at City College of San Francisco.

**THE BRIDGE TO BIOTECH CURRICULUM**

***Integrated, contextualized curriculum***

The team of B2B instructors have worked intensively overtime to develop, refine and align their curricula, and to embed all skill development in a context connected to students' employment goals. In the B2B, students are required to complete 8 units of basic skills classes, including math, science, and language. Part of the success of the B2B program can be attributed to the integrated, contextualized curricula of the three

core classes of the B2B (math, science, language), as well as with the internship preparation class (laboratory skills).

Contextualization and linked courses has been shown to enhance student learning. The 2 foundational skills classes, math and language, are in taught in relation to Biotech content, and prepare students directly for their lectures and labs in the science class. Students are required to take the 3 courses as co-requisites, which allows them to see the relevancy of the skills learned in the math and language class, and significantly increases their level of engagement in all 3 courses.

### ***Learning communities***

The Bridge to Biotech is also a learning community, where students go through the 3 classes as cohorts. This allows for peer support, which usually arises organically as students form study groups. Bridge to Biotech alumni are also hired as lab aides in the Bridge science class, tutors in the math class, and outreach assistants for the overall program.

This learning community model also allows for better faculty support of at-risk students. By working closely together, and aligning their responses to challenging situations, the instructors can promptly address student issues in a consistent manner.

### ***Confidence-building curriculum***

One of the ways in which the B2B increases retention is by empowering students by providing them with the study skills to pursue a college education, especially through the language class. Students are also allowed time to progressively accommodate to the complexity of scientific concepts and the vastness of scientific knowledge through a gradual phase in of the science curriculum.

When students are polled at the beginning of the semester, 58% say they plan on enrolling in a certificate program. This number increases to 70% at the end of the first semester of the B2B.

The Bridge to Biotech was designed with the following semester in mind. The science curriculum was developed by the same faculty who developed the curriculum in some of the "gatekeeper" courses. These faculty members also teach both the Bridge science class and the gatekeeper courses. This allows for a smoother transition for students who would otherwise be overwhelmed by the difficulty of the materials, and intensity of the pace in these college courses.

## **THE BRIDGE TO BIOTECH'S INTERNSHIP PROGRAM**

The B2B internship component or *Bridge to Biotech's Internship program* is offered exclusively to B2B students and graduates. Like the B2B, it targets underprepared and economically disadvantaged adults who wish to work in the Biotechnology field while they pursue their education at City College of San Francisco.

The internship program seeks to:

- Match participants with internship positions in Bay Area academic, government and biotechnology research laboratories;
- Monitor intern performance and professionalism throughout the internship and support mentors with the internship training as needed;
- Provide personal and professional support to students to increase success rates;
- Help students grasp scientific and technical concepts during the internship, through in-class discussions and

**Bio-Link’s Scale up of City College of San Francisco’s Bridge to Biotech Program**

---

presentations;

- Provide students with networking opportunities, job search tools and assistance after the internship.

The program includes 2 courses during the Bridge semester, which are integrated with the Bridge curriculum, but are optional for Bridge students, and provide the basic laboratory skills used in bench-type internships, as well as the soft skills required to work efficiently in a laboratory environment and apply for positions in the field. The second semester includes a 180-hour lab assistant or lab technician-level internships in Bay Area laboratories. Between 2007 and 2009, approximately 50 students graduated from the Bridge to Biotech’s Internship Program alone, 40% of which were hired in research laboratories within a year after their internship. Some of the first interns who were hired as Lab Assistants after their internships - students who had no college degree or science background –have recently been promoted to Team Leader or to Staff Research Associate positions.

The majority of students who did not get hired in the field after completion of the program were not actively looking for work but decided to continue their education in the Biotechnology certificates as full-time students.

### Scaling-up the Bridge to Biotech

Since May 2010, our B2B Synergy Team has been working actively to plan for and implement the scale-up of the B2B program.

We expect scaling up the Bridge to Biotech process to require different phases of development and implementation (Table 1). We expect this process to evolve as we develop a better understanding of the challenges of achieving scale for our program.

Year 1 - 2010			Year 2 - 2011		
Mar-May	Jun-Sept	Oct-Dec	Jan-March	April-June	July-Dec
Start-up phase	Planning phase	Development phase	Implementation Phase 1	Implementation Phase 2	Implementation Phase 3
Identify team members and roles.	Apply Synergy tools to B2B project.	Refine scale-up process.	Identify first cohort of adopting colleges.	Begin working with first cohort of adopting colleges.	Develop tools to support our B2B Network.
Survey interest among potential adopters.	Create website and materials.	Develop “toolkit” (Best Practices) content.	Format existing and develop additional course materials for dissemination.	Begin disseminating course materials and “toolkit” content.	Launch of Bio-Link’s B2B Network.
Survey B2B faculty on distinctive elements of the B2B.	Identify initial collaborators and potential adopters.	Investigate dissemination methods.	Develop online content and platform for Web Toolkit.	B2B track at Summer Fellows to refine adoption plan for colleges.	Adopting colleges develop their B2B program.

Table 1: Project Plan for the B2B Scale-Up project through Bio-Link-Synergy project.

- ***Year 1 – Preparing to scale-up***

The 2010 has been a phase of development, leading progressively to the design of a scale-up process that would go beyond simple dissemination of materials. The Bi-Annual Synergy Conferences have allowed our team to envision ways of taking City College of San Francisco's experience in running the B2B, with its unique set of conditions, and extracting the universal elements of the program to allow easier adaptation and customization to other colleges sharing similar goals of increasing retention, completion and continuation of underprepared students into biotechnology, but with different set of limitations.

From this thought process was born the idea of developing a Program Toolkit, which would describe the essential elements of the Bridge to Biotech, such as contextualized learning, faculty teams, learning communities, student cohorts. When possible, a correlation will be established between the implementation of these tools and the program outcomes (retention, completion, continuation).

- ***Year 2 – First cohort of adopters***

**Phase 1: Identification of participants (January to March)**

The second year of our project will begin with the identification of new potential adopters.

Our conversations with past adopters have indicated the necessity of establishing the appropriate criteria to select these adopters and of determining the extent to which the adaptation of B2B compromises the chances of success.

Our team will be sending out surveys to interested colleges to establish their objectives and to make sure this program would serve them well.

**Phase 2: Dissemination of materials (April to June)**

Once selected, the adopters will have access to the course materials and lesson plans for the 3 core Bridge classes: math, science and language. For this first cohort, we will not include aspects of the program that relate to the internship program.

The second step, to take place in May, will be to disseminate our "Program Toolkit", which describes and illustrates the essential elements of the program, such as contextualized learning, faculty teams, learning communities, student cohorts. This will allow colleges who already have a Bridge or who are planning to build their own version of the Bridge to start thinking about how they can incorporate these elements into their program to increase retention, completion and continuation.

In June, the future B2B team (faculty and program staff) from each adopting college will be invited to participate in a B2B-track at Bio-Link's Summer Fellows Forum (from June 6<sup>th</sup> to June 10<sup>th</sup>, 2011 in Berkeley, CA).

The seminar will include:

- tutorials on incorporating contextualized teaching to an existing or new curriculum,
- tutorials on creating learning communities,
- presentations on other essential elements of the toolkit
- support to develop a program plan tailored to the college's needs and limitations
- discussions with CCSF B2B instructors on curriculum content
- discussions with other Bridge adopters in the cohort

- training on online tools used for sharing information with the B2B network

### **Phase 3: Network capacity building (July to December)**

In the third phase, which will take place from July to December, adopters will begin working with each other, using online tools to allow exchange of best practices among members of the B2B adopters network. Our team will also follow each college's progress in developing and then launching their Bridge.

Throughout this process, the Bio-Link team plans to collect information on challenges faced by community colleges as they try to adopt an existing program as well as best practices, and to integrate the lessons learned back into Bio-Link's scale-up process.

- ***Plan for Year 3***

In Year 3 (2012) of the program, based on the demand from colleges, we hope to launch materials for the Internship portion of the Bridge.

In Year 3, our goal is to strengthen Bio-Link's network of B2B adopters, and to create a community of practice, where experienced B2B adopters will provide advice to new adopters, will discuss challenges and best practices and will document their experience using online collaborative tools.

We are hoping to use the best practices gathered from the colleges in the B2B network to create a feedback loop into the B2B program. City College of San Francisco could act as a pilot campus to test new curriculum and program elements in its own B2B model before offering new materials to its network of B2B adopters.

## **Impacts**

We hope that the scale-up of the B2B will have several long-term impacts for ATE centers and students, including:

- Increasing number of biotech & STEM graduates into the workforce in regions with B2B programs
- Increasing access to the biotechnology field for underprepared and economically disadvantaged adults
- Using contextualized, integrated teaching and student-led components as a model for other STEM programs
- Developing a feedback loop to improve existing B2B models, including the CCSF B2B
- Using data collected from the B2B scale-up experience for ATE Centers to drive scale up of successful programs

---

### **Contact:**

**Laurence Clement**  
**Bio-Link Synergy Project Leader**  
Adjunct Biotechnology Faculty,  
Bridge's Internship Program  
City College of San Francisco  
[lclement@ccsf.edu](mailto:lclement@ccsf.edu)

**Elaine Johnson**  
**Bio-Link Director**  
**Bio-Link Synergy Project PI**  
[ejohnson@biolink.ucsf.edu](mailto:ejohnson@biolink.ucsf.edu)

**John Carrese**  
**Bio-Link Synergy Project**  
**Innovation Coach**  
Director, San Francisco Bay  
Center of Excellence  
[jcarrese@ccsf.edu](mailto:jcarrese@ccsf.edu)