

A Contract Research Organization as a Model for Engaged Learning in STEM

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ABSTRACT

The Biotechnology Program at Salt Lake Community College operates a technician training program that is based on a contract research organization. The program, called InnovaBio, operates alongside of the regular academic program to provide training opportunities to biotechnology interns while at the same time offering research services to local bioscience companies. InnovaBio interns are drawn from partnering high school biotechnology programs as well as Salt Lake Community College programs. The value of their internship experience is the opportunity to work on challenging, credible, research projects that add value to their training as well as the local economy. InnovaBio research is conducted at the Salt Lake Community College Biotechnology Program labs under the guidance of professional research scientists.

Keywords: STEM, Conference Proceedings, science, training.

INTRODUCTION

STEM learning is dependent on a core of knowledge that encompasses a wide variety of fields including life sciences, chemistry, physics, and mathematics. This knowledge is typically learned in a traditional lecture environment with supporting laboratory experiences. However, the practical application of this knowledge in an employment context is dependent on experiences in which the material is used to problem-solve, design experiments, and measure outcomes. In many STEM training programs, these experiences are developed through a research internship in which students obtain real-world experience to augment their academic preparation. However, effective internship experiences are dependent on finding appropriate host sites, such as academic and corporate research labs, that provide rigor and structure while at the same time giving the student latitude to explore and grow. Unfortunately, the needs of the interns are often at odds with the need for productivity in the host site. As a result, high quality research internships are difficult to find in many areas. While biotechnology has found its way into many regions of the country, there are very few large biotech clusters that high schools and community colleges can easily draw upon to augment their training programs with real-world experience. This was the problem faced by Salt Lake Community College's (SLCC) Biotechnology program. The solution that SLCC has developed is to work within the college to develop an in-house contract research organization to provide contract research services, equipment, space, and a pool of highly trained students. Called InnovaBio, the project was the first contract research organization training program founded with funding from the Advanced Technological Education (ATE) program at the National Science Foundation (Carrese, 2012; Lindburg, 2009). Since its inception, the InnovaBio program has developed innovative relationships with a variety of life science companies. The contract mechanism developed by SLCC allows InnovaBio to provide partnering companies with access to fully equipped wet labs,

a cell culture facility, and a cohort of students to do the work. Students have the experience of doing real science, in a real lab, being supervised by real scientists. InnovaBio's recipe for success is a true balance between educating students and meeting the needs of biotechnology firms as customers.

Developing A Contracted Project

InnovaBio provides three full-time staff scientists (Ph.D and Masters level) to train interns, help design experiments, manage the work, and supervise the creation of a final research report. While some companies are initially slow to recognize the value inherent in this opportunity, careful outreach can overcome this. Using the "cluttered basement" model to illustrate the concept helps. In this model, InnovaBio approaches companies asking them about the "basement" projects that have never gotten out of the box. Once companies begin to explore this idea, they realize that there are always an accumulation of projects for which there is never enough time or resources to pursue. Playing in this space allows InnovaBio and its students to avoid many of the high-risk pitfalls inherent in flagship projects and still add value to its corporate clients. Generally, the budget attached to these projects is designed to cover the costs of consumables and general lab supplies while InnovaBio provides the personnel and supervision. The contract document developed by SLCC on behalf of InnovaBio includes provisions for protecting the intellectual property of clients, experimental outcomes, projected timelines, risk management, and cost estimates. Students conduct research and take part in the final report and presentation to contracting companies. Examples of contracts include identifying and quantitating active compounds in herbals, purifying recombinant proteins for lab diagnostic test kits, conducting genotyping experiments, and cloning and expressing genes. One of the key aspects of the SLCC InnovaBio contract is that it is "IP-free." The program does not make any claims on anything it produces or discovers. This is very important to drive home with partner companies. The message that SLCC wants learning experiences for students rather than intellectual property is important and is an attention getter for potential clients. On the other hand, InnovaBio does not protect proprietary information so companies must carefully decide what is appropriate for the InnovaBio program. Finally, it is important to note that personal connections have been a key ingredient in bringing industry collaborators on board. While the goal of the contracted project is to provide a quality research outcome, the real focus should be on developing top-notch employees that support the local STEM-based industry. The InnovaBio program has the unique challenge of inspiring confidence in the contracting company that the work can get done, while at the same time setting the expectation that it is primarily an educational opportunity. While it may take longer than a for-profit CRO would to get data, InnovaBio will have a report for the client at the end of the day. However, the true value proposition is that students become highly productive on InnovaBio time rather than on company time.

Key Outcomes

To date, InnovaBio has served approximately 600 hundreds students in various capacities. Interns come from one of four sources: high school programs that have partnerships with SLCC for dual enrollment in biotechnology courses, Utah Valley University which is a transfer institution for SLCC, SLCC biotechnology students, and volunteers that are not students but

want experience. In addition to laboratory skills, students develop the sought after “soft skills” that are in demand. These include oral and written communication, teamwork, time management, reliability, and accountability. Communication skills emerge as a result of group presentations and written reports. Teamwork is essential since the intern pool is so diverse. With an open entry/open exit operational model, students must be in constant contact with team members to ensure continuity of work. Reliability and accountability are developed through a clock in mechanism that tracks student attendance and through assessment meetings. Finally, InnovaBio enjoys nearly a very high placement rate into jobs for its college interns.

REFERENCES

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AUTHOR’S INFORMATION

Dr. Caldwell earned his Ph.D from Texas A&M University in Biochemistry. He subsequently conducted post-doctoral research at the NIH. He has worked as a scientist at Myriad Genetics and Science and Technology Corporation. Craig left the private sector for SLCC to implement the InnovaBio program. He is currently the chair of the Biotechnology Department at SLCC where he works closely with industry, other science departments in the college, and many partners in high school biotechnology programs.