Advances in Biology Laboratory Education
Publication of the Association for Biology Laboratory Education
Volume 43, Abstract 22, 2023

Maximizing inquiry elements in a student project to investigate fibroblast growth factor signal transduction in NIH 3T3 cells

Aaron Coleman

University of California San Diego, 9500 Gilman Drive, La Jolla, CA, 92093, U.S.A.
(**abcoleman@ucsd.edu**)

Inquiry-based laboratory exercises are well established to better promote learning and science engagement in undergraduate students. However, implementing inquiry-based labs in upper-division biochemistry and molecular biology courses can pose daunting logistical challenges. CURE projects allow students to participate in novel research but are often at odds with integrating inquiry elements because they require students to follow a preestablished experimental design. Here we describe a project that incorporates inquiry and CURE elements to provide a research-like experience in a high-enrollment, upper-division biochemistry lab. Students investigate fibroblast growth factor (FGF) signaling in cultures of NIH 3T3 mouse fibroblasts and tackle some open questions about how alternate modes of signaling are achieved from FGF receptors. They begin with examining a dataset describing three distinct effects produced in NIH 3T3 cells by the addition of FGF-2 to the culture medium, and then must develop a hypothesis to explain how these effects are signaled. They go on to test their hypothesis by selecting conditions for a phospho-Erk/MAP kinase Western blot to measure signaling down the Ras-Erk pathway, and an ELISA experiment that measures signaling down the phospholipase C pathway. Workshop participants examined the dataset to form their own hypotheses and designed Western blot and ELISA experiments, and were then provided student data to interpret. We present this project as a model for creating student labs that address real-life research while still allowing students to have intellectual input to the direction of the experimentation. Ideas for new lab modules, as well as the expertise and technical support for developing them, can often be found by capitalizing on the research being conducted at an educator's home or neighboring institutions. By balancing CURE and inquiry elements, we can give students research-like experiences that maximize their engagement in the scientific process.

Keywords: signal transduction, biochemistry, CURE, inquiry-based learning

Mission, Review Process & Disclaimer

The Association for Biology Laboratory Education (ABLE) was founded in 1979 to promote information exchange among university and college educators actively concerned with teaching biology in a laboratory setting. The focus of ABLE is to improve the undergraduate biology laboratory experience by promoting the development and dissemination of interesting, innovative, and reliable laboratory exercises. For more information about ABLE, please visit http://www.ableweb.org/.

Papers published in *Advances in Biology Laboratory Education: Peer-Reviewed Publication of the Conference of the Association for Biology Laboratory Education* are evaluated and selected by a committee prior to presentation at the conference, peer-reviewed by participants at the conference, and edited by members of the ABLE Editorial Board.

Citing This Article

Aaron Coleman. 2022. Maximizing inquiry elements in a student project to investigate fibroblast growth factor signal transduction in NIH 3T3 cells. Abstract 22 In: Boone E and Thuecks S, eds. *Advances in biology laboratory education*. Volume 43. Publication of the 43rd Conference of the Association for Biology Laboratory Education (ABLE). https://doi.org/10.37590/able.v43.abs22