## Transformation of a biotechnology laboratory to introduce critical components of authentic research

## S. Bohlson, M.Cuerpo, and C. Hong

School of Biological Sciences, University of California Irvine, Irvine, CA 92697 (bohlsons@uci.edu; )

Authentic engagement in research provides students with skills in scientific inquiry and experimental design that are not easily obtained through traditional pre-developed laboratories. The goal of this work was to transform a twenty-week traditional laboratory experience for first year MS students in a biotechnology program into an authentic research experience. The original goal of this biotechnology teaching laboratory offered to first year MS students was to provide experiential learning opportunities in foundational biotechnology techniques in order to prepare students to enter research labs in their second year in the program. This goal was previously met with pre-designed laboratories that focused on molecular cloning, protein expression and purification, and cell culture. In the re-design, the curriculum focused on a new publication involving a signal transduction cascade in leukemia stem cell self-renewal. In the first ten weeks of the course, students critically evaluated the publication. They developed methods presentations to introduce modern techniques in biotechnology, they identified gaps in knowledge in the newly proposed molecular mechanism, and they designed experiments to address those gaps in the form of an NIH-style research proposal. Simultaneously, the students engaged in wet labs in molecular cloning to generate protein expression constructs required to address their research questions. In the second ten weeks of the course, the students conducted their proposed experiments using protein purification and cell culture techniques. During this quarter they presented their lab results weekly and developed a final poster presentation to showcase their final work. Students were exposed to multiple learning modalities including individual and group work, knowledge-based quizzes, experimental design, data analysis, and presentation. In the future, we would like to determine (1) if students are acquiring experience that facilitates their entry into research labs and (2) if faculty mentors perceive these students as well prepared when they enter the research space.

Keywords: biotechnology, signal transduction, stem cells, molecular mechanisms

## 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**

Bohlson S, Cuerpo M, and Hong C. 2023. Transformation of a Biotechnology Laboratory to Introduce Critical Components of Authentic Research. Abstract 42 In: Boone E and Thuecks S, eds. *Advances in biology laboratory education*. Volume 43. Publication of the 43nd Conference of the Association for Biology Laboratory Education (ABLE). https://doi.org/10.37590/able.v43.abs42

Compilation © 2023 by the Association for Biology Laboratory Education, ISSN 2769-1810. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the copyright owner. ABLE strongly encourages individuals to use the exercises in this volume in their teaching program. If this exercise is used solely at one's own institution with no intent for profit, it is excluded from the preceding copyright restriction, unless otherwise noted on the copyright notice of the individual chapter in this volume. Proper credit to this publication must be included in your laboratory outline for each use; a sample citation is given above.