

Inquiry-Based Cell Culture Course Improves Student Conceptual and Practical Understanding of Biomedical Research

Greg J. Eaton¹, Alison Krufka, Mark Dittmar, and Cristina Iftode

¹Rowan University, Department of Biological Sciences, 201 Mullica Hill Rd., Science Hall 201K, Glassboro NJ 08028 USA

(eatong@rowan.edu)

To develop strong scientific thinking abilities in the context of cell biology experimentation, we have developed a laboratory-intensive undergraduate cell culture course for acquisition of a broad technical skill set along with inquiry skills necessary to conduct scientific research. The course engages in three student-driven inquiry modules. Module 1: Cell Proliferation introduces students to cellular proliferation and builds the foundational skills necessary to conduct more advanced cell culturing manipulations. Students learn how cells respond to environmental conditions including cell density, nutrient availability, and cell-substratum interactions. In Module 2: Cell Viability, students design and execute experiments to test influences on cell survival by assaying cell viability. In Module 3: Cell Differentiation, students investigate the multilineage differentiation capability (chondrogenic, osteogenic, adipogenic) of human mesenchymal stem cells derived from adipose tissue (AD-MSCs). This comparative analysis provokes the students to further explore the distinct requirements for various differentiation pathways and the existence of cell-specific biological signatures. To assess the students' growth, we administered pre- and post-course surveys and conducted the Experimental Design Ability Test (EDAT). Our analyses show a positive effect on the students' understanding of biomedical research, confidence in designing and conducting experiments, and confidence in presenting their conclusions from those experiments.

Keywords: cell culture, inquiry-based

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