

A MODEL OF INVESTIGATIVE PROJECT WORK TO TEACH RESEARCH SKILLS TO STUDENTS STUDYING ADVANCED HUMAN PHYSIOLOGY AND LEAD THEM INTO A CULTURE OF PROFESSIONAL PRACTICE

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ABSTRACT

Leading biological and life-sciences experts recently put out a call to educators to action change in the way we deliver undergraduate biology education worldwide. Overall, the plea urged educators to engage students as active participants in the scientific process so they could be better prepared for the biology-related challenges of the 21st century (AAAS, 2011). Educators were urged to introduce learning activities designed to enhance core competencies in the sciences such as communication and collaboration, team participation, and visual, written, and oral scientific communication skills (AAAS, 2011). Furthermore, evidence suggests that undergraduate students exposed to authentic research experiences increase their interest in pursuing a graduate career in science (AAAS, 2011), and those students who may not decide to pursue graduate study have reported substantial gains in their understanding of research and the scientific process, laboratory skills, and their resilience (Lopatto, 2007). Designed from a constructivist approach, we introduced a model of investigative project work in human physiology into a final-year human biosciences capstone program designed for approximately 100 students. To encourage the utmost of authenticity, students were required to take on the role of a scientist in its entirety across a semester-long independent research project. Students self-selected their teams of 5-6 members, and each team was assigned a staff member who acted as an advisor for the project. This support system was adopted as it has been reported that students can become anxious in situations when teaching styles are excessively student-centred and lack structure, guidance, and support (Felder & Brent, 1996). Students decided on a research topic, read the relevant literature, and developed a research question and hypothesis. Students subsequently submitted a research proposal which comprised of the following: project overview (title, hypothesis, aim, experiment design, statistical analysis, and methods), ethical considerations, team member tasks, resources required, schedule for data collection, and information and consent forms. Advisors provided feedback on the proposal and made suggestions for fine-tuning the study where necessary. Data collection occurred over a 2-3 week period; all students were required to act as a participant for their own team and another team; advisors were present to assist students when required. After statistical analysis was completed teams worked together on preparing a team poster in the same format as for an annual meeting for The Physiological Society. Individually students worked on a 1200-1500 word journal article in the same format as for The Journal of Physiology, and an oral presentation in the same format as for an annual meeting for The Physiological Society. Effective communication is an essential skill for all scientists, and it is suggested that practicing the communication of science through a variety of formal and informal written, visual, and oral methods should be a standard part of undergraduate education (AAAS, 2011). Preliminary evidence indicates that the project promotes the development of scientific research skills, and as such, helps lead the students into a culture of professional practice. We believe that the model described could be adapted by academics across a range of science disciplines.

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