Introducing a narrative of discovery to a course on advanced biological techniques: turning the classroom into a biotech start-up

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Abstract

Advanced techniques in biology and chemical biology, such as next-generation sequencing, super-resolution microscopy and multiple omics, have been transforming many areas of biomedical research, from disease diagnosis to drug discovery. There is a need for undergraduates majoring in chemistry and biomedical sciences to be familiar with the principles and applications of these techniques in order to enhance their employability in the R&D sector of technical industries. Furthermore, as biological techniques are rapidly evolving, they need to develop the ability of quickly incorporating new knowledge and ideas, as well as identifying the suitable techniques for a particular scientific question. At present, these techniques are taught, in the course “Biological Techniques and Instrumentation” (BCH4064), in a modular manner, i.e., individual techniques are taught in independent groups of lectures and practicals, with little attempt to connect these modules into a coherent narrative. As a result, many students envisage each technique as standalone concept without understanding how these techniques are used in combination to develop scientific solutions to real-life problems. This project proposes to transform this course, changing its original “technique-oriented” approach to a “problem-oriented” approach. Students will screen a collection of chemical compounds and nanomaterials, collected from Department of Chemistry, for antibacterial activity in a scenario that mimic the operation of a biotech start-up company for drug discovery and characterisation. The students will be coached to develop hypotheses based on their initial screening results and then design a series of experiments to test their hypotheses. This course provides a framework for the characterisation of the antibacterial mechanisms of the positive hits, resulting in a coherent body of data that will be presented in a scientific poster. We believe this pedagogy will increase students’ motivation to learn and their mastery of experimental design skills. The outcome of this course will likely generate original, patentable and publishable data and is compatible with the discovery-enriched curriculum of our University.