

# ENHANCING STUDENT LEARNING IN SCIENCE USING VIRTUAL LABORATORIES

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## Introduction and significance

Delivering an engaging and realistic laboratory experience for undergraduate biomedical and biological science students is difficult due to increasing class sizes, stringent health and safety requirements as well as costs, maintenance and availability of equipment and reagents. Flow cytometry is a core technology, widely used in research and diagnostic laboratories, but due to its complexity and cost, laboratory classes on the application of this technology are inadequate. Virtual laboratories provide students with the opportunity for lifelike, interactive, one-on-one learning that simulates real-laboratory experiences. There are no suitable flow cytometry simulations available in the education space and with the essential role that flow cytometry plays in the biomedical and biological sciences, as well as industrial research, this project addressed this need.

## Methodology

A virtual laboratory focused on flow cytometry was developed for undergraduate, honours and postgraduate research students. The simulation and tutorial were developed using the Smart Sparrow™ *Adaptive eLearning Platform*. The tutorial was designed to be adaptable to multiple audiences, with several platform datasets incorporated into the simulation to cover different scientific fields that use the technology.

## Results

The simulation developed (Figure 1) provides students with a personal experience with the interface very similar to the latest in flow cytometry technology. Students are in control of a wide range of experimental variables and instrument parameters, most of which are not usually available to them in laboratory classes. It is accessible online, and allows students to repeat lessons in their own time and to their own satisfaction. It was deployed in an undergraduate pathology class and to honours and postgraduate students receiving training in flow cytometry. Students reported that the lesson improved their understanding, their confidence in their technical skills and was targeted to their level of understanding. The average amount of time students spent in the lesson was 47 minutes with some returning for further revision.

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