FARLABS: ENHANCING STUDENT ENGAGEMENT VIA REMOTE LABORATORIES

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INTRODUCTION

Engagement in practical experiments has long been considered central to science education (Hofstein & Mamlok-Naaman, 2007). However, due to the high costs required, the implementation and maintenance of quality laboratory equipment is out of reach for many schools, in particular those in remote or low socioeconomic environments. The lack of engaging activities has been identified as contributing to the declining enrolment of Australian students in science subjects for Years 11-12 (Goodrum, Druhan, & Abbs, 2012).

One possible solution to this problem is the use of remote access laboratories to complement science education. As the facilities at one centralised laboratory hub can be disseminated widely via the internet, this strategy has the potential to enhance student engagement at a national level while requiring minimal resources. Recent work indicates that remote laboratories can be highly beneficial in secondary school teaching (Lowe, Newcombe, & Stumpers, 2012).

APPROACH

FARLabs (Freely Accessible Remote Laboratories) has been designed to provide engaging, yet cost-effective, practical experiments to a large population of secondary schools across the country.

An online platform has been set up (**www.FARLabs.edu.au**) which allows high school students to control and interact with scientific equipment housed at three major Australian universities. Five remote experiments are currently available and they cover three key themes in physics and chemistry (Nuclear, Environment and Structure). Access is completely free for Australian high schools and can be achieved using standard web browsers. For example, students from anywhere in Australia can conduct experiments with radioactive materials by controlling robotic equipment whilst viewing live video feedback (see Figure 1).

The FARLabs program has been designed in direct consultation with active high school teachers and all content is aligned with the relevant Australian state and national curriculums. Moreover, the modular nature of the system, allows it to be easily expanded as further pieces of scientific equipment become available.

Figure 1: Screenshot (annotated) of the FARLabs 'Turntable' experiment. A live video feed displays the sources, absorbers and the Geiger counter (top left). When the student selects a new source and absorber, the turntables rotate to position them below the counter. The live data feed displays count rate versus time and is updated on a second by second basis.

RESULTS AND DISCUSSION

To date over 220 schools and 340 teachers have registered for the FARLabs program (Figure 2). These teachers have booked and run well over 1000 individual experiments. The registered schools are spread across 5 States, with many schools in isolated, rural environments, hundreds of kilometres from the nearest university. The remote-experiments are also being implemented in a number of tertiary level physics courses.

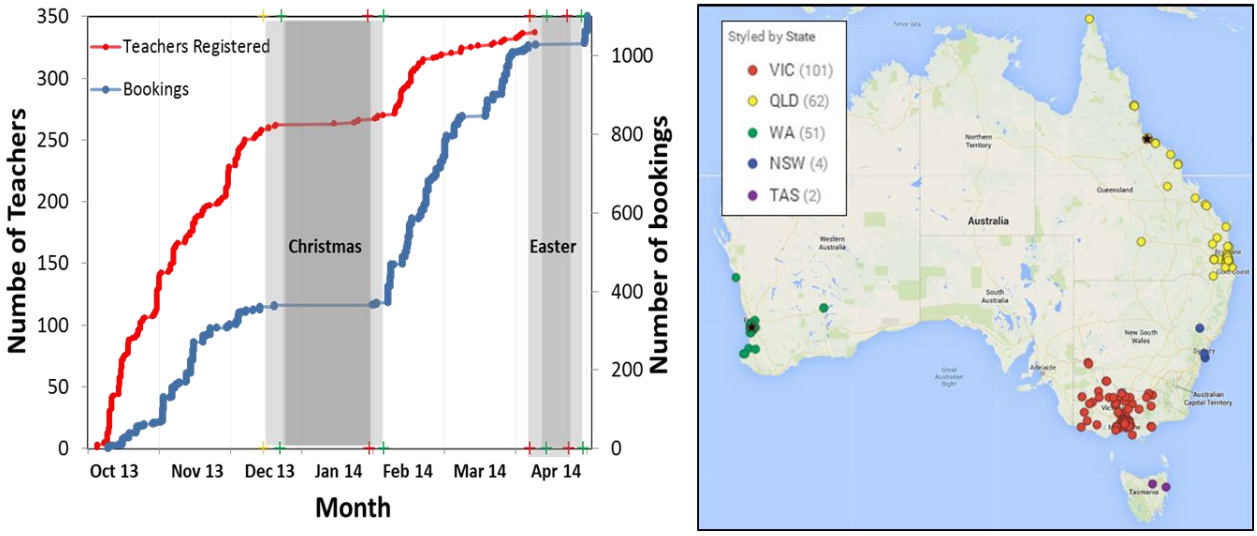

Figure 2: [Left] The growth in utility of the FARLabs platform since going live in October 2013. Over 340 teachers are currently registered users, and over 1100 experiments have been run in classrooms. [Right] The distribution of over 220 FARLabs registered high schools across Australia.

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