The Viral Outbreak iCase: realistic problem-solving in a virtual environment

A time for change

Laboratory-based practicals provide medical students with essential hands-on experience in problem solving, but where safety is a consideration they may not be an option or they invariably get reduced to a meaningless 'follow these instructions' that is not representative of real-world experimentation. This where technology comes into its own, as students can carry out realistic investigations in a virtual environment without risk of harm.

For some years the Dunn School of Pathology had been using an online practical class for students to explore different virological techniques as they investigated an imaginary outbreak of influenza. However, the software lacked visual appeal and, over time, became difficult to modify. More significantly, Dr Kenny Moore and his colleagues were finding that students tended to 'follow the recipe' without engaging fully with the context and purpose of what they were doing – in part because the practical was focused on information assimilation at the expense of intellectual stimulation. It was thus clear that change was needed to make the software more user-friendly, robust and challenging for learners. The team also wanted to make the resource open-source to benefit other institutions.

The redesigned online practical, The *Viral Outbreak* iCase*,* requires students to decide which experiments to perform in order to uncover a key piece of information about an imaginary outbreak of influenza in two fictitious primary schools. Importantly, there is no single 'right' answer to the problem.

Bringing the case to life through gamification, short videos and realistic data

The iCase team comprised members of the Dunn School of Pathology and the Medical Sciences Division Learning Technologies group. They began by updating the existing sections of the practical so that they addressed the teaching aims more effectively.
For example, at the start of the iCase a multiple-choice quiz (MCQ) tests the student's current knowledge. The original version of the MCQ required students to get all the answers correct, but did not tell them which of their responses were right or wrong. As a consequence, students became frustrated and disengaged from the remainder of the iCase. To remedy this, in the revised MCQ the students receive detailed feedback to each response, explaining why they are right or wrong, thereby reinforcing the knowledge learned.

Next, the team added two new sections. One of these asked students to think about sample collection and the impact their procedures might have on the sick children. The other included a more playful aspect, integrating two open-source teaching games.
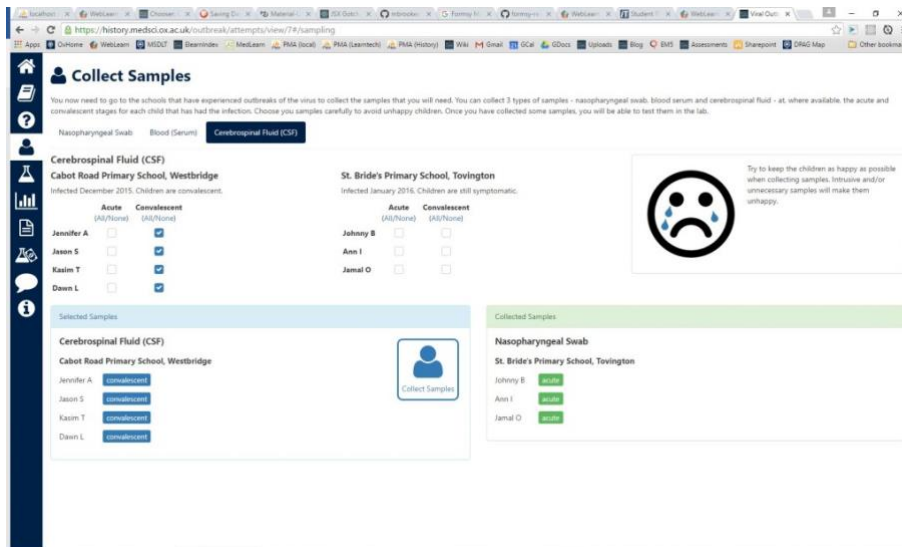
Figure 1 A screenshot of the redesigned iCase

A major objective of the iCase is to introduce students to a number of virological techniques, which they can then use in later sections. Previously, students learned about these techniques through reading a text online. In order to give the students a feel for how the techniques are carried out and what they can be used for, the team produced a series of short videos in which experts explain their respective techniques. The videos have since been made publicly accessible via the [Dunn School of Pathology's YouTube channel](#).
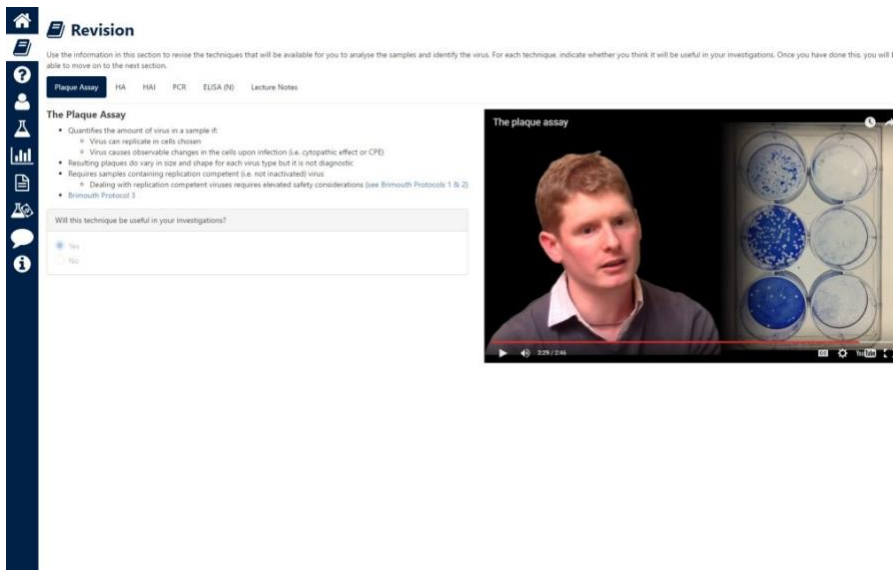

Figure 2 Experts explain virological techniques in a series of videos

A key decision that students have to make in the iCase is which experiments to perform in order to uncover a key piece of information. To encourage them to fully engage with each of the techniques, the iCase includes a set of simulated data that students have to process for themselves. This has the advantage of being more visually appealing and more representative of real-life experiments.
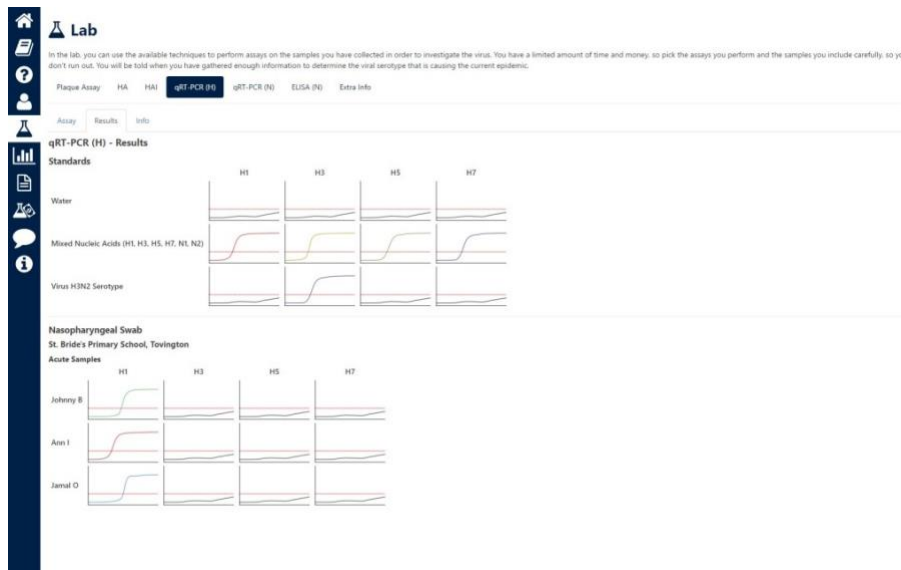
Figure 3 Students are presented with raw data to interpret

A promising antidote to previous issues

The team was pleased to observe that students' reports (the assessed part of the iCase) were generally of higher quality and demonstrated greater understanding of the key learning outcomes than in previous years. In the past, a small number of students had been asked to rewrite their reports to address major flaws, but in the year that the new iCase was trialled not one rewrite was required. As in previous years, drop-in sessions were provided, where demonstrators were available to assist the students in working through the iCase and writing their report. The demonstrators found that students arrived at drop-in sessions with a better understanding of what was required; indeed, a number had already completed the entire practical class over the preceding vacation without need of assistance. This indicated an improved workflow and suggested that students found the course easy to use.

In a feedback survey, 94% of students reported that they found the iCase interesting and 87% found it enjoyable. Many of the students also preferred it to the practicals they had been used to, despite finding it more difficult and demanding. In response to other survey questions, 69% of students said that they would like more practicals in this format, and 51% agreed that the iCase would change the way they thought about problems on the rest of the course.

Useful pointers

Dr Kenny Moore offers the following advice for developing online problem-based learning resources:

- Try to develop a clear vision and plan for the structure and flow of your exercise before turning it into an online learning package.
- Keep the learning outcomes at the front of your mind: don't get caught up in the scenario and the urge to make things absolutely true to life.
- Keep videos short and focused on the key points that you are trying to get across.

Further information

- If you don't have access to video-recording software, you can use the University's Replay lecture capture software for the purpose. See the [Replay web pages](#).

- The IT Learning Centre in IT Services runs courses on planning, producing, filming and editing short videos.
- The Educational Media Unit in IT Services provides digital video production and editing services (chargeable).

Runner-up, OxTALENT 2016 award for innovative teaching. The text in this case study has been adapted from Kenny Moore's entry for the OxTALENT competition.