

Case-of-the-Week: connected, collaborative clinical chemistry

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Introduction

This project provides distance-learning tutorials for working scientists who are intending to sit for professional examinations. It utilises clinical case histories to direct learning and is delivered through the Internet using a variety of free, publicly licensed software tools. Students engage in self-directed learning through discussion forums and are supported by expert discussion to provide feedback and definitive resolution of the problems. These discussions are audio recordings (“podcasts”) of Voice Over Internet Protocol (VOIP) telephone calls. The project has now been running successfully for several months with a group of students studying for clinical biochemistry qualifications in Australia.

Software

Moodle¹ is a learning management software package for producing internet-based courses and web sites. It is available free under the GNU (Open Source) Public License. It allows the display and editing of web page content, together with the posting of files for download. The package includes features to host discussion forums and manages student enrolment, password access, the sending of email notifications and access log maintenance.

Skype² is free software providing peer-to-peer VOIP Internet telephony. Skype is the most popular of the computer-based packages with 100M registered users of the software claimed. SkypeOut is a paid feature, which allows Skype users to call non-computer-based landline or mobile telephones anywhere in the world. This service is available at very low cost, since the charge relates only to the link between the local exchange and the landline service.

Audacity³ is a free digital audio editor released under the GNU General Public License that is popular with the podcasting community. It allows cut and paste editing of sound files and includes effects tools for audio file manipulations eg normalisation. Using the LAME encoder, the exporting of MP3 files at a variety of bitrates is enabled.

Hardware

The recording setup utilises a small analogue sound mixer (Behringer Eurorack MX802A) and an AKG C1000S cardioid condenser microphone. The computer running the Skype software (Windows XP OS) is equipped with an M-Audio Audiophile 2496 soundcard. This setup provides high quality recording capability and sound files are saved to a second computer running Audacity. A Behringer Minicom Com800 compressor is used to limit the dynamic range and prevent sound clipping. The computer running the Skype application is connected to the Internet with an ADSL broadband internet connection at 1500/256kbps connection speed.

Weekly modules

Each week a diagnostic case history consisting of brief clinical notes and a set of laboratory results is submitted by one of the participating pathologists. This is uploaded into a topic module in the web-based content management system. A discussion forum is made available and a thread is started. An email to all participants is automatically generated to notify students of the updated material becoming available. Students review the case history and post comments in their own time. After an appropriate period to allow discussion, the submitting pathologist is interviewed by VOIP telephony, with a recording made of the conversation. During this discussion, student comments are reviewed and the correct diagnosis, interpretation and implications are provided. The recorded file is edited, converted to MP3 format and uploaded to the site for student access. Once again a forum posting ensures that students are emailed with notification of new content availability.

Project Progress

The project has been established with a group of students, many of whom are based in country areas. The relative isolation of these students in regional Victoria, along with the small size of many of the laboratories in which they work, restricts their access to educational opportunities such as workshops, seminars and peer group discussion within their own laboratories. Thus there is a particular requirement for these educational resources, which allow independent learning to take place anywhere and at any time.

The project has been received with enthusiasm. Generally there are several student comments forthcoming within a few days of each case being posted. The acuity of these indicates that students have given careful thought to the problems posed and may have conducted additional research before commenting. The expert's opinion contributes valuable insights and corrects any misconceptions from the students. Feedback has been very positive and supports the validity of this approach.

Discussion

E-learning is defined as, "teaching and learning that are delivered, supported, and enhanced through the use of digital technologies and media".⁴ The design of effective e-learning requires the incorporation of the principles of activity, scenario, feedback, delivery, context, and influence.⁴ There are numerous examples of distance learning

for medical education using the Internet.⁵⁻⁷ At this stage there is conflicting evidence as to the efficacy of e-learning compared to traditional methods,^{8, 9} although implementations vary making comparison difficult. The use and importance of case histories in teaching clinical biochemistry is well documented.¹⁰⁻¹²

This project ensures learner engagement through the use of the real-world context of the case history. Feedback is provided through student-to-student involvement in the forums and teacher-to-student feedback in the expert discussion. The learning mode embodies active principles in its use of forums prior to the provision of the problem solution. The discussion forums encourage cooperative learning.

The equipment requirements are modest consisting of readily available computer facilities and software. A variety of approaches to the hardware and software requirements of this project are possible. Thus there are several alternative VOIP software packages or the conventional telephone network could be used with traditional recording techniques. The hardware described here has been selected to provide high quality recording, but there are many lower quality, low cost alternatives. Similarly, many of these mixer functions can be achieved using alternative software solutions eg PowerGramo¹³. These may result in little perceptible reduction in final audio quality since the posted files are typically heavily compressed (trading-off quality against file size).

The use of VOIP telephony allows contact with a large number of professionals at extremely low cost, making available resources of expertise that are otherwise difficult to access. Together with the podcasting technique this provides an extremely efficient means of capturing and distributing information. Content creation for multimedia projects can be demanding in time and resources. As a result many projects are not sustainable after initial enthusiasm. The strength of the approach described here is due to the modest time requirement for weekly module generation. The use of publicly licensed software and low cost Internet technology ensures that project expenses other than instructor time are minimal.

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