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Rapid development of media-rich, interactive elearning

N. Watts*

Audio Visual Centre, Library Building, University College Dublin, Belfield, Dublin 4, Ireland

This paper describes how the UCD Audio Visual Centre developed tools to help the UCD School of Medicine and Medical Science to increase the quantity and improve the quality of its elearning materials. The Medical School wished to create pedagogically sound learning materials without converting the lecturers into elearning developers. In particular, there was an interest in making greater use of images and digital media, encouraging the students to reflect on their learning and in developing case studies on the diagnosis and treatment of disease. Any tool had to be suitable for use by medical lecturers with limited IT experience. Having evaluated the available software, a decision was made to develop a tool in-house. For reasons of portability, the tool was to tag content in XML and be SCORM conformant.

Keywords elearning; XML; SCORM; Flash; pedagogy; digital media; interactive; Blackboard

1. Background – eLearning in Medical School

The UCD Audio Visual Centre received funding from the Higher Education Authority (Ireland) to assist in the development of elearning in the UCD School of Medicine and Medical Science. Existing practice was surveyed by examining content in Blackboard, the institutional Virtual Learning Environment (VLE), and by interviewing lecturers [1]. Most of the content in the VLE was passive, consisting of announcements, lecture handouts and PowerPoint slides. Lecturers were aware of the limitations of these materials but mostly lacked the time and skills to produce more interactive content.

Typically, e-learning companies quote development ratios such as 276 hours to develop one hour of complex e-learning [2]. A media-rich, simulation would be an example of complex e-learning. While this figure is based on stand-alone courses for industry, similar development times apply to the development of complex, blended learning resources for use in education. Of those UCD lecturers who developed elearning materials, 64% spent an average of two hours or less per week on content development and maintenance.

Of the lecturers surveyed, 87.5% described themselves as competent or highly competent in Microsoft Office, but only 6.25% described themselves as competent or highly competent in authoring tools. Any new tool would have to be easy to use by those with reasonable MS Office skills but without specialised authoring skills.

Having completed their investigations, the AVC's role was to find a tool that would meet the lecturers' requirements for greater interactivity while being quick and easy to use.

* Corresponding author: e-mail: niall.watts@ucd.ie Tel. +353 1 716 7035

2. Selecting a tool – Build or Buy?

Good e-learning makes use of the many possibilities the computer offers for student interaction and engagement [2]. The most common method of interaction is to pose questions for the learner to answer [5]. Questions help to maintain the learner's attention, provide practice and self-assessment and encourage deeper learning [5]. Hudson [6] reported that medical students who used an interactive, computer-assisted learning (CAL) tutorial showed significant learning gains compared to non-CAL users. Therefore, the new tool had to be capable of generating a variety of question types, which could incorporate images and video. As academics have little time to spend designing or maintaining learning materials, it would have to support rapid content development and content reuse.

The first issue considered was whether to license a suitable tool or build it. Were there suitable commercial or open-source tools available? The advantages and disadvantages of each approach are summarised in Table 1 below.

Table 1: The Advantages and Disadvantages of Building and Buying Software.

	Advantages	Disadvantages
Build	Design exactly what is required Free from control by third parties No external costs	Needs large resources – time, money, people May not be as good as similar commercial products May be “reinventing the wheel”
Buy	May be able to obtain licence at reasonable price May meet all or most of requirements	May need to compromise on requirements Cost may be excessive Vulnerable due to third party control e.g. price increases

Two commercial and two open source tools were investigated. One open source tool seemed promising but was in the very early stages of development, while the other seemed to have been dropped by its developers. Of the two commercial products, one had insufficient features and the other was too costly to licence. Therefore, the decision was made to build a tool in-house.

3. XML with Text Editing

It was considered important to maximise the portability and potential reusability of any content created with the new tool. Therefore, the tool was to tag content in XML and be SCORM conformant. SCORM is a collection of standards and specifications for interoperability, accessibility and reusability of web-based learning content [3].

The screenshot shows a student interface for a question titled "Adaptive & Innate Immunity". The top right corner indicates "4 of 7". Below the title, it says "Free text with model answer including image".

The question text on the left reads: "If an infection is not eliminated by the innate immune system, the adaptive immune system comes into action. How do you think the adaptive immune system differs from the innate system? Type your answer into the box. Then click Done to compare it with the model answer." Below this is a text input field containing the word "recognition" and a "Done" button.

The right panel contains an image with the text: "The adaptive immune response can recognise antigens and can increase the intensity of its response on reinfection." The image is a diagram showing a cell with an orange antigen being recognized by a blue cell, which then produces antibodies (orange Y-shapes) that bind to the antigen.

At the bottom right of the interface are "Back" and "Next" buttons.

Figure 1: Student View of a Text Entry question. The top and bottom strip are standard. The left and right panels can include text, questions and range of media

To provide effective elearning, the tool included a number of question types including multiple choice, multiple answer and text entry. The content for these questions was tagged in XML and stored in a text file. This file was imported dynamically into a Flash player which presented the content. The AVC developed such a Flash player and a tagging scheme based on the work of Castillo et al [4]. This design allowed for a wide variety of layouts and media types but lacked a simple interface. Content could only be entered or updated using a text editor.

It was felt that text editing would be too demanding for the target audience. Developing an interface from scratch would be a major task in itself and beyond the resources of the AVC. Therefore, the AVC looked for a commercial product that would provide an interface for its templates. This tool was Flash Companion, which was also based on the ideas of Castillo et al [4].

4. Second Tool Flash Companion

Flash Companion was released by RapidIntake in 2005. It provides a form template as an interface for building questions such as multiple choice, multiple answer, drag and drop, fill in the blank etc. The form is written to an XML file, which is read by a Flash player. The XML files, any images or media used and the Flash player are integrated into a project. This project can be SCORM compliant.

Flash Companion is customisable. The AVC created some additional templates for Flash Companion that were originally developed for the first tool, for example, a two column multiple choice question, an open answer question with images or animations as part of the feedback. Email options were also added.

The online notebook is a significant feature as it can help to promote “reflection”. The concepts of reflection and reflective practice were originally developed from experiential learning theories. Boud [7] has described reflection as the processes where learners explore their experiences to gain a better understanding and appreciation of their learning. Reflection helps students to think and act like practitioners.

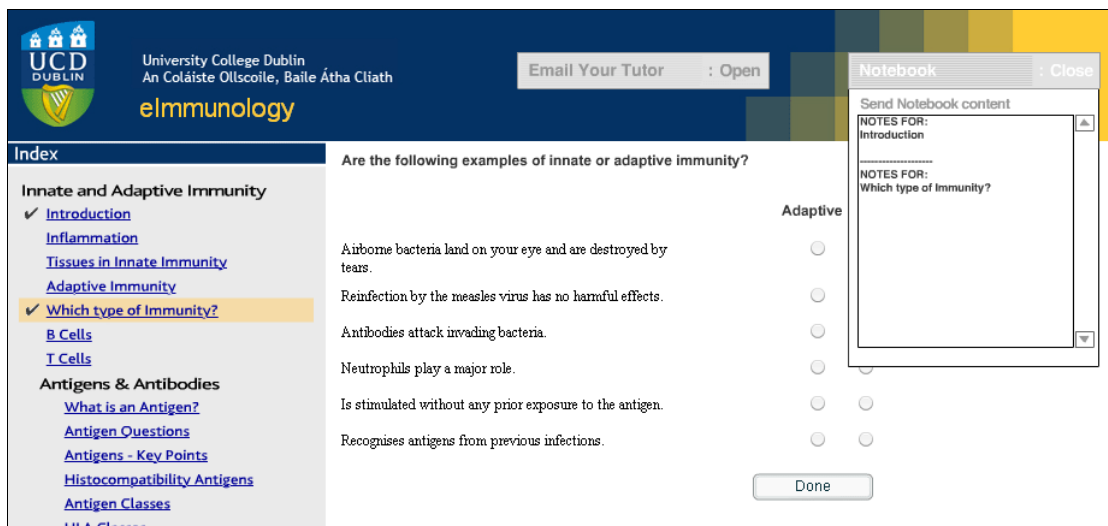


Figure 2: Student View of a Two Column Multiple Choice question with the notebook open. The top strip has been adapted to the university branding; left panel contains the navigation while the right panel contains text, questions and media elements.

As teaching materials are created in templates, they can easily be updated and republished. SCORM compliance means that Flash Companion projects can be shared with others and integrated in other VLEs.

5. Results and Conclusions

The AVC and the School of Medicine and Medical Science have developed online learning materials in Immunology and Respiratory Pathology to evaluate Flash Companion and the AVC templates. It was found to be easy to use and to enable the rapid creation of online content. The evaluation projects were presented to the School of Medicine and Medical Science in February 2006 where they were well received. The presentation generated interest among academic staff, who were interested in using Flash Companion to develop their own materials.

The AVC designed and ran two training courses on Flash Companion and the AVC templates for UCD staff. Half a day is spent on Flash Companion and half a day on designing learning materials for the online environment. Authoring using technology is now easy – the challenge is in the pedagogical design and usability of the materials. Our other challenge is to increase the number of lecturers developing interactive teaching materials for Blackboard and the web.

6. Further Information

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