

# **E-examinations at the University of Tasmania**

**E-assessment case study**

**March 2010**



## Acknowledgement

This case study was produced for the Australian Flexible Learning Framework by Victor Callan from the University of Queensland. The author acknowledges the significant contribution from Dr Andrew Fluck, a lecturer at the Faculty of Education in the University of Tasmania, in preparing this case study. For further details, please contact Dr. Andrew Fluck: Phone: (03) 6324 3284 Email: Andrew.Fluck@utas.edu.au

The views expressed herein do not necessarily represent the views of the Commonwealth of Australia.

© Commonwealth of Australia 2010. Licenced under AShareNet Free For Education licence.

This work is copyright and licensed under the AShareNet Free For Education Licence (AShareNet–FfE Licence). The onus rests with you to ensure compliance with the AShareNet-FfE Licence and the following is merely a summary of the scope of the Licence.

You may use and copy any material covered by an AShareNet-FfE licence, for educational purposes only, and only within or for the services of your organisation.

Conditions for the licence can be found at <http://www.aesharenet.com.au/FfE2/>. Queries regarding the standard AShareNet-FfE Licence conditions should be directed to the AShareNet website at <http://www.aesharenet.com.au/help/support/>.

In addition to the standard AShareNet-FfE Licence conditions, the following special condition applies: The licence territory is limited to Australia and New Zealand.

Requests and inquiries concerning other reproduction and rights should be directed in the first instance to the Director, VET Technology Policy and Projects, Department of Education, Employment and Workplace Relations, GPO Box 9880, Canberra, ACT, 2601.

# Table of contents

Background .....	1
Introduction.....	1
The context of the eExaminations system.....	2
Preparing the eExamination.....	3
How students take an eExamination.....	4
eExamination experiences.....	4
Lessons learned .....	6
For more information.....	8

## Background

Assessment that is judged to be valid, reliable, fair and flexible is a pillar of the Australian vocational education and training (VET) system. The Australian Quality Training Framework 2007 (AQTF 2007)<sup>1</sup> is the set of standards which assures nationally consistent, high quality training and assessment services in VET.

The Australian Flexible Learning Framework ([Framework](http://flexiblelearning.net.au))<sup>2</sup> commissioned research to examine and promote a greater understanding of e-assessment and the AQTF 2007 among VET auditors and practitioners. This research involved 48 targeted interviews with respected auditors, quality managers and practitioners, to build a picture of the key issues around how practitioners are using e-assessment and the auditing of current e-learning assessment practices in public and private registered training organisations (RTOs). The final research report – *E-assessment and the AQTF: Bridging the divide between practitioners and auditors* – is available at: <http://flexiblelearning.net.au/research>

To support these findings, three case studies of e-learning assessment practices in the VET system were developed.

## Introduction

Dr Andrew Fluck is a lecturer at the University of Tasmania's (UTAS) Faculty of Education. The Faculty of Education has approximately 1,500 full time equivalent learners who are pre-service and in-service teachers undertaking Bachelor and post-graduate degrees.

Over time, the Faculty has gradually adopted online learning and video-conferencing so these technologies permeate its training. Over half the learners learn at a distance using these technologies. However, when it comes to assessing remote learners, there are two major concerns. Firstly, online and take-home assignments give very little guarantee of authorship. Secondly, tests can strongly influence course content.

Authenticating a candidate's identity is crucial to the reputation of the awarding institution. Historically, the Faculty of Education has relied upon assessments where authorship is asserted by learners through a signed statement. Some skills performances are demonstrated on professional performance (when learners are assessed by practicing teachers on-the-job in schools). However, the Faculty of Education is considering using examinations to increase the proportion of achievement scores guaranteed to be the learner's own work.

A related reason for supporting a change to e-examinations is the link between tertiary and secondary assessment methods. These are only loosely linked systems, yet it is likely methods used in one sector will be noticed and appropriately adopted in the other. Secondary sector assessments may be impeded from adopting e-assessment methods so long as tertiary systems rely heavily on high stakes written examinations. The informal scrutiny of pre-service teachers in schools substantiates this link with few instances of computer based assessments observed in classrooms.

---

<sup>1</sup> <http://www.training.com.au/aqtf2007/>

<sup>2</sup> The Framework is the national training system's e-learning strategy: <http://flexiblelearning.net.au>

## The context of the e-examinations system

As flexible e-learning becomes more pervasive, there is a growing need for educators to consider modes of assessment using e-learning tools. The increasing discrepancy between teaching through blended or online delivery with a learning management system (LMS), and assessing using pen and paper, is another reason to consider ways that candidates can verify their achievement while using computers. In his experience online, Dr Andrew Fluck believes that e-assessment is fraught with difficulties. Therefore he conducted a study that focused on an offline, computer based assessment system.

Australian secondary schools are about to benefit from a major innovation. The Australian Government's Digital Education Revolution will provide a computer for every learner in years 9-12<sup>3</sup>. Universities therefore need to prepare for an influx of laptop-savvy learners from 2011 onwards. In addition, the National Broadband Network is being rolled out, starting in Tasmania. Educators are therefore preparing pre-service teachers for a new era in school education, where e-education becomes increasingly important. School teachers will need to be extremely aware of the potential and hazards of internet-based learning materials.

Before considering the way e-examinations have been developed at UTAS, it is worth looking at the background. Dr Andrew Fluck notes that online assessment is now commonplace in many Australian universities, but this is largely superficial for both formative and summative purposes. Online assessment is mostly used for quizzes, forums and digital assignment drop boxes. In many cases, online assessment is conducted using an institutional learning management system such as BlackBoard, WebCT, or an in-house product.

Online assessments offer several advantages for the institution and the learner. These include:

- time analysis of responses to the question level to better discriminate between candidates
- video in questions, particularly for scenarios in authentic assessment.
- adaptive testing, where the next question to be posed is determined by prior response(s)
- question banks and randomisation of questions and response orders to reduce cheating
- automated analysis of results from entire candidate cohorts
- immediate feedback can be given.

The delivery technology itself creates problems of inter-candidate interaction and is prone to technical malfunctions which can affect many learners simultaneously. Dr Andrew Fluck notes that, should the whole network fail, an examination scheduled for that time would need to be rescheduled. At this time, he has yet to explore the use of e-portfolios<sup>4</sup>, role plays and simulations, although these have been suggested as being powerful alternatives, and would be worthy of formal evaluation at another time.

---

<sup>3</sup>See <http://www.deewr.gov.au/Schooling/DigitalEducationRevolution>

<sup>4</sup> An *e-portfolio* is a learner-driven collection of digital objects demonstrating experiences, achievements and evidence of learning: <http://flexiblelearning.net.au/e-portfolios>

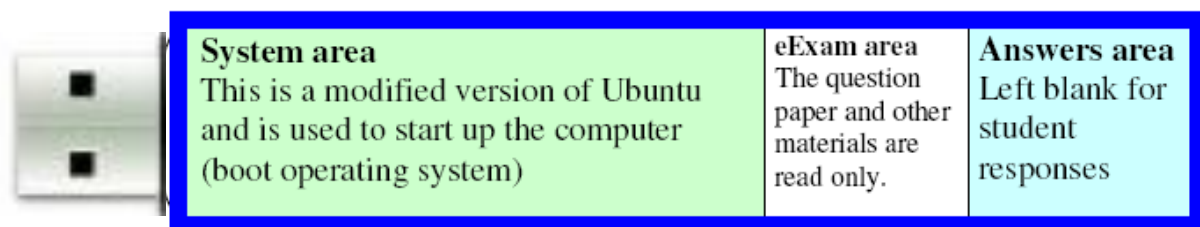
Dr Andrew Fluck acknowledges that conducting high stakes tests on a computer can cause serious logistical problems. For instance, few institutions have sufficient computers in a large enough space to have a majority of learners undertake an examination at the same time. He allows learners to bring their own, since about 85% have laptops registered on the UTAS wireless network. Then there is the problem of equity. Some computers are more modern and of greater power or capacity. To overcome this problem, his team provides everyone with the same operating system and application programs. There is also the same problem as for online assessment in that learners might collude with one another. To overcome this, his team provides an operating system which has had the networking drivers stripped out. They also provide surge suppressed mains electrical outlet sockets for any learners who require this.

## Preparing the e-examination

Dr Andrew Fluck and his team make use of Ubuntu (<http://www.ubuntu.com>). This is one of several Linux distributions which is available either for installation onto a computer or which can be run from a 'live CD'. The latter option allows a computer user to try the operating system without over-writing any existing installation on their machine. Ubuntu continues to be developed by a community initiative (sponsored by Canonical Ltd). The licence for Ubuntu and most of its associated software allows copies and derivative products to be distributed freely. Since 2007 his team have worked with different Ubuntu releases. This means the latest version works on PCs and Intel-based Macs, and also runs conveniently from a USB stick as well as CD-ROM.

Dr Andrew Fluck reports that it is important to know that switching on a computer normally causes it to load special software called an operating system from its internal hard disk drive. Almost all computers have a method by which this standard process can be diverted to a CD-ROM or USB stick. This is what the e-examination system requires every candidate to do. Therefore, during the e-examination, their computer is using the Ubuntu operating system instead of any software on the internal hard disk drive.

In early versions of the system, the assessor was required to choose whether candidates would be able to use, or not use, facilities like the internet, sound, and so on. Over time, his team have eliminated these options, focusing on an environment which is as secure as possible. The assessor just has to place the examination materials (questions, videos and other resources) onto a special partition on the USB drive (see internal arrangements in the figure below).



**Figure 1: Internal partitioning of e-examination USB stick**

The version of Ubuntu used for the UTAS e-examination system was modified so that no one could access the hard drive of the computer they were using. Also, Ubuntu does not change the contents of the drive. Learners can carry on after the examination using the very same program they were using before (for instance, Windows can go to sleep, and restore the session after the examination).

There is a security feature as well. A unique picture image is placed on the desktop when the system boots up. Examination supervisors just check this image is visible. If there is no image, there is no examination!

## How students take an e-examination

Six to eight weeks prior to the e-examination, learners were given a free practice CD. This was entirely legal, because the operating system licence allows it. They were shown how to use the e-examination system during a practice tutorial to ensure they could operate the software. During the tutorial, learners were taught the basics of the Ubuntu operating system, the use of OpenOffice Writer for word processing and shown how to create drawings using The Gimp software.

The examination procedure involved putting the CD/USB into a computer, then switching it on. The computer then began to operate using the Ubuntu-Linux operating system from the CD. An examination folder appeared on the desktop. The examination questions within the folder had been prepared with Microsoft Word, so learners just double clicked on the test document to open it with OpenOffice Writer.

The first instruction in the rubric told the learner to immediately re-save the file to the USB stick with a filename using their UTAS identity number. Learners then completed the answers to each question, saving at appropriate intervals (using good computer procedures such as before making a major change or after every 300 words or so of text input). When finished, they saved the document and closed all application(s), without switching off the computer or logging out. In the event of equipment failure, learners were to report this quietly to the test supervisor. They could restart using another computer or a paper version of the test would then be made available.

Access to the internet or any other digital resources was not allowed. In early laboratory-based pilots digitally facilitated collusion was prevented in three ways:

- Networking was disabled in the CD based operating system by omitting the interface modules and drivers from the operating system compilation.
- Networking cables were withdrawn from the wall sockets in each computer laboratory. This was quick and easy to do, and visually monitored.
- The gateway for the sub-net containing the laboratories was disabled by UTAS's IT technicians for the duration of the examination.

These three methods were used simultaneously. Each of them alone should have been sufficient to prevent network access. Dr Andrew Fluck and his team were therefore confident candidates would be individually responsible for their submissions. They could have gone further to prevent collusion based upon observation of neighbour's work by installing privacy screen filters. These comprise very thin vertical bars which reduce the oblique viewing angle for a computer screen, but were not used because of the cost and our seating arrangement which minimised observation opportunities.

## E-examination experiences

The UTAS e-examination system has now been used for over three years, with increasing sophistication. In 2007 the e-examinations consisted of a single document containing questions with spaces under each for learner responses. They had two computer 'lockups', but both candidates had been able to resume after a restart, losing none of their

work.

In designing the 2008 e-examination, UTAS realised that learners might inadvertently edit the questions, so prepared these as a separate PDF file. About 10% of learners were permitted to undertake the e-examination using their own laptops, with the remainder using institutional lab computers. The teaching team included a stimulus scenario video and PowerPoint learner work samples. Inadequate testing on the variety of computers failed to reveal the video playback did not silence internal computer speakers on some models despite using headphones, which disturbed other candidates.

Additionally, an early version of Open Office crashed when a PowerPoint file was closed – which was disarming for learners who were new to e-examinations! These factors accounted for many of the technical difficulties reported. Nearly one third of the learners who reported other technical difficulties included the comment ‘the system was slow to respond’. This is an effect of using a ‘live’ CD operating system since commands must be loaded from the optical media, and led to the development of the variation used in 2009 entirely based on a USB drive. Other specific reports of technical difficulties included:

- *I could not remember how to create a diagram.*
- *Spelling issues – I kept touching the wrong keys.*
- *AutoCorrect changed my words.*

Third year university students who took an e-examination responded to an evaluation survey with comments such as:

- *This was great! I can type much faster than I can write and no hand cramps!! ☺*
- *I believe that this testing way was better than hand writing for the reasons such as I am able to type faster than handwrite and your hands didn't cramp up.*
- *I think it is better on cXXXX paper as yXX you can writer faster. [Alterations in handwriting].*

In recent surveys, eighty-two percent of the learners had used the practice CD before coming to the examination, and 61% said that, on balance, it was better to have formal tests conducted using computers instead of handwriting on paper. They found the noise of computer keyboards in the confined laboratories distracting during the e-examination.

By 2009, a second version of the e-examination system had been developed by OpenTechnology Solutions in Hobart. This suited a wide variety of computers and would even run on Macintosh computers using Intel processors (more recent models). UTAS deployed it on CD-ROM (a cost-effective option) or on USB sticks (for ease of use and fast performance) in the induction and examination phases. Ninety percent of learners brought their own laptop into the university gymnasium and were provided with surge-suppressed mains power outlets. The remainder were provided with institutional laptops. This meant a room was chosen with ample wall points and learners seated near these. Most used the mains power points, but a handful operated during the two hour e-examination just using batteries. Every learner was given a USB stick sporting a special logo, and many booted from this, giving faster responsiveness and performance than when using an internal hard drive.



**Figure 2: Example of the special USB sticks for the e-examination**

The question paper was also the response file, and questions were presented as images in a read-only file to prevent editing or deletion. Most ancillary materials were provided in portable document format (PDF). A single student had his laptop overheat, which would have been mitigated if he had saved his work to the USB stick. Everyone returned their USB stick with answers saved on it, and these were quickly downloaded for on-screen marking. Dr Andrew Fluck and his teaching team report that it was quite noticeable that the laptop keyboards were much quieter than the institutional desktop ones, and the large space eliminated the harsh noise of clacking echoes. In fact the atmosphere during the examination was just like that of any other purposeful individual activity.



**Figure 3: Typical learner netbook running the e-examination system**

## Lessons learned

The system used in this study had a number of useful attributes. The open source operating system on a live CD (and subsequently converted to bootable partitioned USB drives) provided a holistic examination environment which learners could use to practise personal skills at home without copyright infringement.

It also allowed e-examinations to be supervised without specialist IT skills by displaying a unique desktop background image for security. E-examinations can be easily constructed for a range of software environments, with candidates working on isolated workstations or 'open book' contexts with full internet connectivity.

The use of the e-examination system allows candidates to use their personal laptop without gaining advantage because local disk access can be blocked. Future developments will focus on facilitating the automated reproduction of e-examination master USBs and collection of completed scripts. Although the cost of USB drives is higher than the 50 cents per CD, they can be re-used many times. Instructions for both

these techniques and the open source 'Reconstructor for exams' software are available at <http://www.eExaminations.org> (it is released under a Creative Commons Attribution-Noncommercial-Share Alike 2.5 Australia License).

The e-examination system has several important advantages:

- portability – it can be set up using almost any available computers (PCs and Intel-based Apple Macs)
- equity – it is accessible to a wide range of learners
- familiarity – learners can have the opportunity to practice essential skills in this environment, because the basic system is free of restrictive copyrights
- technical capacity – it does not limit learners' creativity or expression
- archival – the environment produces material which will be accessible in future years
- inviolate – learners cannot alter the environment to gain an unfair advantage.

When assessment moves onto a computer, other possibilities also emerge. These include: full colour pictures of animals and plants in biology examinations; video-based scenarios in politics, law or business studies; interactive simulations in science and spreadsheet models in economics.

The idea of assessment becomes more exciting with e-examinations. Possibilities include:

- Ancient Civilisations - answers are typed into four answer booklet documents.
- Biology - lavishly coloured photographs are included for students to comment on.
- Chemistry - answers are placed into text form boxes on a single examination paper file.
- Music - sound recordings can be played through headphones and commented upon in the typed answer paper.
- Sport - learners observe sporting incident videos and respond orally using a microphone.
- Health - an interactive simulation is provided, and learners answer questions based upon deep understanding verified by the settings achieved on the simulator.
- Information Technology and Systems – use of a wiki for recording learner responses.

Other universities have been adopting the system. Phoenix University in the USA is modifying it to suit local circumstances. Edith Cowan University in Western Australia and Queensland University of Technology have expressed interest in trialling the system which is also being explored by the Faculties of Business (for Economics examinations) and Medicine (for Surgical Pathology tests) at UTAS.

At this stage the USB sticks have to be individually programmed. There are USB duplicators available, but a bitlevel copier is required to reproduce the three partitions on each one. Dr Andrew Fluck reports that a next step will be to acquire a duplicator which creates 118 USBs in five minutes for re-use daily over the weeks of the examination period.

## For more information

### **Benchmarking and Research**

Annie Fergusson

Phone: (08) 8348 4071

Email: [Annie.Fergusson@sa.gov.au](mailto:Annie.Fergusson@sa.gov.au)

Website: [flexiblelearning.net.au/research](http://flexiblelearning.net.au/research)

### **Australian Flexible Learning Framework**

Phone: (07) 3307 4700

Email: [enquiries@flexiblelearning.net.au](mailto:enquiries@flexiblelearning.net.au)

Website: [flexiblelearning.net.au](http://flexiblelearning.net.au)