UQ: BYOD for e-Exam Trial outcomes

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Get the demo and user guides
http://transformingexams.com

Acknowledgement
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Part 1: About e-Exams

Targeting...
• Supervised
• High stakes
• On campus
• Large scale

(credit: Dr Fluck UTAS)

What we are not specifically addressing here is off campus, online only, distance education, cross institutional students – there are some existing e-solutions to address these needs.
Rationale


Concerns, drivers, solutions for e-Exams (a 'wicked' problem!) – a clear need to take a whole of system approach – not just software!

bit.ly/eexam-map
Essentially...
We are faced with a growing disconnect between the way high stakes testing is conducted using pen on paper exams and students’ everyday experiences.
### Pertinent Features

| A 'Whole computer' environment (OS, LMS, applications...) on a stick. | Vastly expanded pedagogical scope over that of a browser window. |
| Typing student responses via Word processor, constructed via apps (human marked) or on-board learning management system quiz (computer marked). | Caters for introduction to advanced uses. Components added/removed to suit. Electronic collection facilitates analytics, item response analysis... |
| No live network required during exam, even for LMS questions. | Robust. Greater control. (network could be used for admin) |
| Student owned equipment used as host and left untouched. | An ethical approach to scalability (no invasive software to install) |
| Modular, open source code base and commodity 'off the shelf' components. | Leveraging popular and sustainable projects for better efficiency. Fully 'known' (no 'blackbox'). Available! |
| One version works on most Intel based laptops - Apple, 'windows', Linux, that have a USB port. | One software version can serve all. Streamlines development and maintenance. |
Current e-Exam System v5 Demo

Four-in-one demo system (desktop shown below)...

1. Word document based exams (paper equivalent / intro use S1 2014)
2. Word doc + multimedia + 3rd party software tools (more trials soon...)
3. LMS (Moodle) based exams (computer marked questions - TBA)
4. Remote (serves as a restricted gateway) to networked LMS.

Word doc exams

On-board LMs exams
UQ S1 2014 Trial: Paper equivalent exams

First stage: Paper 'equivalent' via on-board word processor. *This was used for Semester 1 2014 Trials.*

To start an e-Exam:
1. Student boots laptop with USB
2. Students type ID, name & click 'Start Exam' button
3. Student can now start typing

Note: Automated background processes...
The system copies Question file and renames it with the supplied ID.
File is opened ready for the student to start (cover page info to be automated soon too!)
UQ trials, Semester 1 2014: The aim was to explore the idea of BYOD e-exams, logistics, student impressions.

- Paper 'equivalent' exams (computer optional - students choose pen or keyboard.
- Mid term exams ~ 15% of grade.
- Question types used: essay, short answer, limited MCQs (type 'x' in a box), label a diagram/image (fill in a table; basic drawing features were available but not used by students). All manual marking – but at least it was typed text!
UQ S1 2014 Trial: Paper equivalent exams

Responding to questions in-line in the word processor (note – the system keeps a read-only backup of the questions!)

Type where indicated....

Simple drawing tools...

Label a diagram...

Type below the line (or in a box)

Draw in GIMP

Copy & Paste

Note: Drawing tool was available but not used.

Fill in table rows...

Or type ‘x’ for MCQs

Note: Drawing tool was available but not used.
The Current Process – how it works

Prep

Create master USB (tested)

Academic creates & submits exam script (plus associated files) USBs duplicated per student

Post Exam

Collated responses sent to academic. Responses retrieved from USBs.

Students pre-exam:
Practice/laptop testing/setup sessions.

1. Students enter room.
2. Given USB.
4. Do exam.
5. Return USB.

(credit: Dr Fluck UTAS)
Modular architecture so academics / institutions can choose the features and mode of operation that suit them... *For UQ trials we kept to the basic features!*

Current OLT project adds these features to v5 (not used in UQ trial):

- On-board LMS for computer marked question types (Moodle) [demo available]
- Improved answer reticulation/workflows [TBA – in progress]
UQ Trials S1 2014 - Four courses.

Data collected from students:

• Via pre-exam short survey (*not shown here*).
  – Conducted at the pre-exam practice setup sessions.
  – Covered: technical compatibility, hardware spec lists, student preliminary impressions.

• Via post-exam extended survey (*main findings follow*)
  – Conducted at the conclusion of the exam (in the room).
  – Covered: student exam experience, reaction to exam session conditions, e-exam system impressions, exam writing strategies and production, general non-exam writing strategies.

Future analysis – production (words, language density, marks).
It is important to note:

- First ‘toe in the water’ trials.
- Participation was optional.
- Mid term exams worth an average 15% of course grade.

### Participation

<table>
<thead>
<tr>
<th>Course</th>
<th>Typed</th>
<th>Handwrote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinary technology: 90 min theory, mostly short answer</td>
<td>11</td>
<td>89</td>
</tr>
<tr>
<td>Criminology: 70 minutes. Single long essay response section (and a Multiple choice section done pen on OMR sheet)</td>
<td>17</td>
<td>67</td>
</tr>
<tr>
<td>Physiotherapy: 15 min (watch video and write) before OSCE</td>
<td>25</td>
<td>113</td>
</tr>
<tr>
<td>Animal Biology: 45 min mixed short answer and MCQ (type 'x')</td>
<td>5</td>
<td>115</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>58</strong></td>
<td><strong>345</strong></td>
</tr>
</tbody>
</table>

### Gender (Typers)

- Male: 21 (38%)
- Female: 34 (62%)

### Typers by cohort

- VETS: 19%
- CRIM: 29%
- PHTY: 43%
- ANIM: 9%

### Handwriters by cohort

- VETS: 32%
- CRIM: 14%
- PHTY: 31%
- ANIM: 23%
I felt the eExam system was easy to use
I felt the eExam system was reliable against technical failures
I felt the eExam system was secure against cheating
I liked the fact I could use my own computer
I would recommend the eExam system to others

Likert scale/rating: 1 = strongly disagree to 5 = strongly agree [N = 58]
Did typers think the exam suited the use of computers?

Those that typed the exam. All four cohorts combined (VETS, CRIM, PHTY & ANIM).
Likert Scale: 5 = Strongly Agree, 1 = Strongly Disagree
Boxplot whiskers are min and max.
An X denotes the mean 4.31 (value shown) and a small circle indicates the median. N = 58.

Largely that was a ‘yes’.

Those that typed the exam by cohort:
Overall my experience of this exam was positive
I ran out of time
I felt more stressed in this exam than I normally do in other exams
I went back and read over my responses before submitting
I could hear the sound of typing
> If you could hear typing, was the sound of typing distracting?

Likert scale: 5 = strongly agree, 1 = strongly disagree. Mean shown as × with figure and median shown as a circle o.

T-test to compare means (cross X and figures shown above) of typers and hand writers.

p  .166  .288  .582  .438  .000  .001
Hand writing in the exam

Breakdown by cohort

<table>
<thead>
<tr>
<th>Cohort</th>
<th>N</th>
<th>107</th>
<th>109</th>
<th>48</th>
<th>76</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHTY 15min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANIM 45min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRIM 70min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VETS 90min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discomfort from using a pen increased with exam duration (below).

Are some students over estimating the neatness of their hand writing?!

* Note 20% response rate by VETS for this item. All others near 100%
Most issues encountered were relatively minor
The bottom line is that all students were able to complete their exam in time.

**Scrolling** - relates to the ease/fluidity of moving up and down pages/screens. For example, two finger touchpad scrolling in the e-exam system was in the opposite direction to OSX but the same as in MS Windows. The size of the scroll bars may have also been an issue when targeting the cursor. (may also relate to the next item)

**Touchpad/mouse - the sensitivity/behaviour** of the software drivers and hardware. The interaction of the touchpad on their laptop and the software may not have been smooth. This may have resulted in erratic cursor movement or overly sensitive movements. No students chose to bring a mouse - all used the touchpad on their laptop.

**Boot up/start up** - relates to the initial boot process. For example, forgetting the 'one time boot' key, or forgetting the key press combination or on Apple laptops - holding down the power key rather than pressing and releasing it while holding down the ALT key to bring up the boot menu.

None were road blocks in that all can be addressed though a combination of:
* use USB wired mice,
* more pre-exam practice by students to familiarise themselves with the software and processes,
* ensuring help/testing/set-up assistance is available to catch hardware incompatibilities before they get to the exam room (recommend mock exams too)
## Trial Technical Issues

### Issue log: 10 people of the 58 who typed reported ‘technical issues’ via the post-exam survey. Notes below supplemented by observation.

<table>
<thead>
<tr>
<th>Issue</th>
<th>N</th>
<th>Notes, Additional Observations, Suggested Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot up/start up</td>
<td>2</td>
<td>In reality most participants needed assistance/forgot boot key. <em>Familiarity: need to practice!</em></td>
</tr>
<tr>
<td>Entering my details</td>
<td>0</td>
<td>All good.</td>
</tr>
<tr>
<td>Using the software</td>
<td>0</td>
<td>Some did not know how to 'exit' gracefully (i.e. File save, file exit, shutdown). <em>Need to practice! Investigate an 'I’m finished' script/button.</em></td>
</tr>
<tr>
<td>Battery</td>
<td>0</td>
<td>Most plugged in. <em>Power needs to be available.</em></td>
</tr>
<tr>
<td>Saving files</td>
<td>0</td>
<td>All good. (noticed one student used ‘save as’ when save was ‘greyed out’)</td>
</tr>
<tr>
<td>Software crashed/computer froze</td>
<td>1*</td>
<td>2 mins into a 15 min exam. Continued on paper and given 2 mins extra time. Old 2009 white Macbook. <em>Better pre-exam testing should catch. Persistent logging to be implemented. Currently has 'recovery' autosave, a 'full' autosave to be investigated too.</em> <em>Recorded via observation.</em></td>
</tr>
<tr>
<td>Touchpad/mouse</td>
<td>7</td>
<td>Sensitivity reported by participants. <em>Some adjustments were made. USB mice highly recommended! Investigate drivers.</em></td>
</tr>
<tr>
<td>Scrolling</td>
<td>13</td>
<td>Two finger scrolling opposite to OSX. Small scroll bars. Sensitivity. <em>Familiarity: need to practice. Larger scroll bars. Investigate a user selectable option for touchpad/scroll behavior (and re-mapping of keyboard shortcuts)</em></td>
</tr>
</tbody>
</table>
## Student consideration of general exam conditions when using computer versus pen

<table>
<thead>
<tr>
<th>Typers</th>
<th>Hand-wrote*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Computer</td>
</tr>
<tr>
<td>I write more words when using</td>
<td></td>
</tr>
<tr>
<td>I write faster when using</td>
<td></td>
</tr>
<tr>
<td>I think more carefully before I start writing when using</td>
<td></td>
</tr>
<tr>
<td>I pause to think most when using</td>
<td></td>
</tr>
<tr>
<td>I write in a style that feels more normal when using</td>
<td></td>
</tr>
<tr>
<td>I try not to make changes unless they are really important when using</td>
<td></td>
</tr>
<tr>
<td>I change, move or correct words or phrases most when using</td>
<td></td>
</tr>
<tr>
<td>think the overall structure/argument of my responses is better when</td>
<td></td>
</tr>
<tr>
<td>I make more effective use of the time available when using</td>
<td></td>
</tr>
<tr>
<td>I go back and read over my responses before submitting most when</td>
<td></td>
</tr>
<tr>
<td>I feel more stressed when using</td>
<td></td>
</tr>
<tr>
<td>I am more likely to run out of time when using</td>
<td></td>
</tr>
<tr>
<td>Overall I feel I perform better in an exam when using</td>
<td></td>
</tr>
</tbody>
</table>

* Note - Many of those that hand-wrote their exam had no prior experience of using a computer for an exam so the results presented here are largely speculative on their part. However, it is reasonable to assume that they drew on their general use of computers.
Writing strategies under non-exam conditions – general writing habits
Responses by Typers (left) and Hand writers (right)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Typers</th>
<th>Hand writers</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think carefully before I start writing when using my computer</td>
<td>40%</td>
<td>87%</td>
</tr>
<tr>
<td>I think carefully before I start writing when using pen and paper</td>
<td>49%</td>
<td>87%</td>
</tr>
<tr>
<td>I take notes in lectures using my computer</td>
<td>52%</td>
<td>68%</td>
</tr>
<tr>
<td>I take notes in lectures using pen &amp; paper</td>
<td>61%</td>
<td>52%</td>
</tr>
<tr>
<td>I make quick, rough notes before writing essays/reports properly using my computer</td>
<td>50%</td>
<td>75%</td>
</tr>
<tr>
<td>I make quick, rough notes before writing essays/reports properly using pen and paper</td>
<td>61%</td>
<td>61%</td>
</tr>
<tr>
<td>I make a detailed plan before writing essays/reports properly using my computer</td>
<td>57%</td>
<td>50%</td>
</tr>
<tr>
<td>I make a detailed plan before writing essays/reports properly using pen and paper</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>I just start writing (there is no plan!) when using my computer</td>
<td>30%</td>
<td>28%</td>
</tr>
<tr>
<td>I just start writing (there is no plan!) when using pen and paper</td>
<td>30%</td>
<td>28%</td>
</tr>
<tr>
<td>I make lots of notes using pen &amp; paper</td>
<td>70%</td>
<td>77%</td>
</tr>
<tr>
<td>I tend to go back and re-read and revise my writing quite a lot</td>
<td>83%</td>
<td>83%</td>
</tr>
<tr>
<td>I prepare most of my assignments using a computer</td>
<td>89%</td>
<td>89%</td>
</tr>
</tbody>
</table>
Part 3: Next phase. Post-paper exams with multimedia

UQ 2015? TBA: Post-paper exams via word processor (used at UTAS)
Include links to on-board media, PDFs and other software tools.
The next phase: can include software tools

Simulations, tools, virtual experiments, serious games... Business, history, language/communication, science labs...


Including 'Windows' software; CAD / 3D modeling, Celestia via WINE

Ref: Dr Fluck, UTAS
Computer marked question types via on-board LMS (new to v5) with Integrated multimedia – high def video is possible!

Trials TBA!
The Future: LMS Question Types

Computer marked question types (Moodle)

Standard [already in the demo]:
• Calculated (Wildcards and datasets, calculated MCQ)
• Matching
• Embedded Answers (Cloze Test / Gap Fill – text with multiple choice, short answers and numerical answers)
• Short Answer (sentences)
• Numerical
• True/False
• [Short essay - with response template - human marked]

Custom types:
• Algebra, Multinumerical, Spreadsheet,
• Chemistry Molecular editor questions,
• Music (key signature, scales, intervals)
• Hot spots, drag and drop (labels, text, images),
• Set splitting,
• Missing words, Gapfill,
• Regular expression…

Marking: delayed, Certainty-Based Marking... manual override.
Proposal for offline Virtual OSCE, practicals etc. Technology is already working 'online'.

Set up Quiz in the LMS. Results are stored in the in grade book.

A set of scripts for Moodle and VW that acts as a bridge.

Student undertakes assessment in the virtual world

Data flows as if the student was doing the activity in the LMS

Online (Second Life) examples see http://www.transformingassessment.com/secondlife.php
Remote connection to networked LMS

Computer marked question types via institutional LMS
Needs network. Provides a restricted gateway – e.g. demo can *only* connect to UQ Blackboard (IP address) and no other server. New to v5.
Trials TBA – dependant upon reliable/robust network connections!
More information....
Demo set-up Guide,
Student Practice and User Guide
http://transformingexams.com

Demo videos start-up, use and recovery examples.
'Wintel' (Dell) http://bit.ly/eexam-demo-vid-d
Contact: m.hillier[at]uq.edu.au
Session Feedback & Expression of Interest

bit.ly/EN-feedback

Cite this resource:

[Blended session held 20 Aug 05:00AM GMT / 3 to 4 PM local time]