About e-Exams
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Get the demo and user guides
http://transformingexams.com

Acknowledgement: Support for this project has been provided by the Australian Government Office for Learning and Teaching. The views expressed do not necessarily reflect the views of the Australian Government Office for Learning and Teaching or participating institutions.
What we are **not** specifically addressing here is off campus, online only, distance education, cross institutional students – there are some possible e-solutions to address these needs.
Why e-Exams?

Rationale: Concerns, drivers, possible solutions for e-Exams
A truly 'wicked' problem and a long road to get it right!


bit.ly/eexam-map
We are faced with a growing disconnect between the way high stakes testing is conducted using pen on paper exams and students’ everyday experiences of study and life.
Where we are going: Post-paper exams

We need greater pedagogical flexibility and more authentic assessments in the exam room. ... alignment!

Simulations, tools of the trade, virtual experiments...

'Windows' software via WINE. E.g. CAD / 3D modeling, Celestia.

Moodle quiz with media (auto marked).
Where we are now: Paper Equivalent

Question types used: short answer/essay, matching, construct a table, label a diagram/image (by filling a table). Manual marking.

Question 2. Match the following host-MGTA (see figure below).

Possible descriptions:
    a) Mauris id mi id orci interdum semper.
    b) Sed eu neque ut est dignissim fringilla.
    c) Vivamus in dolor euismod, luctus libero
    d) Mauris vehicula eros a viverra pellentesque
    e) Curabitur eu mi at nibh commodo varius
    f) Aenean eget orci porta, malesuada lorel

Please write or type the letter of the descriptions listed below.

<table>
<thead>
<tr>
<th>Term</th>
<th>1. Paxogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Sitabosis</td>
</tr>
<tr>
<td>3.</td>
<td>Fakesalism</td>
</tr>
</tbody>
</table>

Question 3. Samuel is 5 years old and attends racing cars 5 days per week. Eamon is 10 years old and rides a superbike around the same track. It is not a selected response item so some text will be expected.

In the table below, give two (2) examples of flippant fakasism relevant to his age range (4-6 years), and describe how Samuel and Eamon differ in their abilities to perform fakasism.

<table>
<thead>
<tr>
<th>Two different examples of flippant fakasism (one per row)</th>
<th>Describe Samuel’s abilities (age 5)</th>
<th>Describe Eamon’s abilities (age 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type here</td>
<td>Minimum heights set for both rows</td>
<td>More details about setting heights appear later in these examples.</td>
</tr>
</tbody>
</table>

Question 7: Some rationales for punishment are XEZT does this mean?

Please write / type your response inside the box below.

The student types their answer here. In this example a two row table. The response table row is created by dragging the box and a minimum height cell instead of successive carriage returns to set the box height, the next question will be less likely to be disrupted when students type their responses. The initial size of the box should indicate the desired length of the response. The box will automatically expand when it gets full.
e-Exam Trials Workflow

Set-up: prepare exam learning materials

1. Academic creates exam learning material
2. Create master USB (tested)
3. USBs duplicated per student

Pre-session: Student laptop setup & practice.

4. e-Exam system takes over laptop. Ubuntu Live USB. Libre Office.

Post session: retrieve responses and assessment

5. Collect USBs (responses)
6. Responses retrieved from USBs.
7. Collated e-responses sent to academic.

1. Students enter room.
2. Given USB.
4. Do exam.
5. Return USB.
First and Most Recent e-Exams

VETS2100 S2 2014

Used standard teaching rooms, sought rooms with tables and power sockets.

DENT4092 S1 2015

← VETS: hand-writers sat in rows. Attempted to separate typists and hand-writers where possible. DENT: typists at the back, → hand-writers at the front.
Data collected from students (opt-in S1 & S2 2014)

• Via pre-exam project online survey (UQ wide):

• Via pre-exam short survey (six courses – typists only - next).
  – Conducted at the pre-exam practice setup sessions.
  – Covered: student preliminary impressions, technical hardware compatibility.

• Via post-exam extended survey (six courses – all – later this session)
  – Conducted at the conclusion of the exam (in the room).
  – Covered: rationale, 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).
  – Further Dentistry and Criminology exams conducted April 2015.
Pre-exam Survey

Impressions of the e-exam system

Data collected from students (S1 & S2 2014) at pre-exam set-up/practice sessions.
### Trial Phase Attrition

#### Number of typists at each stage of the trial (Survey responses)

<table>
<thead>
<tr>
<th>Steps of trial</th>
<th>Yes will type</th>
<th>Maybe type</th>
<th>Total typists</th>
<th>Attrition</th>
<th>No (hand-write)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 EOI</td>
<td>201</td>
<td></td>
<td>201</td>
<td></td>
<td>361</td>
</tr>
<tr>
<td>2.1 Pre - before try</td>
<td>94</td>
<td>16</td>
<td>110</td>
<td>91</td>
<td>10</td>
</tr>
<tr>
<td>2.2 Pre - after try</td>
<td>86</td>
<td>15</td>
<td>101</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>4 Exam (after)</td>
<td>71</td>
<td></td>
<td>71</td>
<td>30</td>
<td>450</td>
</tr>
</tbody>
</table>

- Not all respondents completed every question.
- A number of students electing to hand-write did not fill in the EOI and the post-exam survey so are slightly under represented.
- Similarly not all attendees at the pre-exam set-up session returned a survey (~90%+ did).
Pre-exam Survey

Data collected from students (S1 & S2 2014) at pre-exam set-up/practice sessions.

Before trying e-exam

<table>
<thead>
<tr>
<th>Count</th>
<th>Prior to tying the e-Exam System with my laptop I intended to type my exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Yes</td>
</tr>
<tr>
<td>20</td>
<td>Maybe</td>
</tr>
<tr>
<td>0</td>
<td>No</td>
</tr>
</tbody>
</table>

After trying e-exam

<table>
<thead>
<tr>
<th>Count</th>
<th>After trying the e-Exam System with my laptop I am going to type my exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Yes</td>
</tr>
<tr>
<td>20</td>
<td>Maybe</td>
</tr>
<tr>
<td>10</td>
<td>No</td>
</tr>
</tbody>
</table>

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Pre-exam Survey

Open text comments – concerns and praise

- Fear of technical failure/crash
- Remember procedure/use difficulties
- Scrolling/touchpad use
- Power/battery
- Fear of data loss
- Drawing/diagram difficulty
- Fear of computer damage
- Newness/unfamiliarity
- Security
- Panic
- Eye strain
- Fail the exam
- Rules/contingency
- General positive/praise
- Good ease to use
- Convenient
- Fence sitting

That my computer may freeze or not work properly.
Random technological malfunction.

Simply a different format of exam. Remembering this for the exam.

Am I allowed to use a mouse? Will it affect the system? Scrolling opposite.

Would it save my answers properly.

Availability of power. Battery run out.

Doing something wrong and panicking

Good concept. Provides an alternative to written exams. Easy to navigate.

Fairly sure I'll use the laptop but just need to think about it a little more.
So… we had a pool of loan laptops.
Upgrade to next version of OS will help too.
UQ e-Exam Trials 2014

Data collected from students (opt-in S1 & S2 2014)

• Via pre-exam project online survey (UQ wide):

• Via pre-exam short survey (six courses – typists only).
  – Conducted at the pre-exam practice setup sessions.
  – Covered: student preliminary impressions, technical hardware compatibility.

• Via post-exam extended survey (six courses – all students – next)
  – Conducted at the conclusion of the exam (in the room).
  – Covered: rationale, 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).
  – Further Dentistry and Criminology exams conducted April 2015.
### Participation across the six 2014 courses in the trials

<table>
<thead>
<tr>
<th>Course</th>
<th>Type</th>
<th>Typed</th>
<th>Handwrote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Biology (ANIM)</td>
<td>45 min mixed short answer and MCQ (type ‘x’)</td>
<td>5</td>
<td>109</td>
</tr>
<tr>
<td>Zoology (BIOL)</td>
<td>50 min short answer (Multiple choice section done pen on OMR sheet)</td>
<td>10</td>
<td>81</td>
</tr>
<tr>
<td>Criminology (CRIM)</td>
<td>70 minutes. Single long essay response section (and a Multiple choice section done pen on OMR sheet)</td>
<td>17</td>
<td>50</td>
</tr>
<tr>
<td>Occupational Therapy (OCTY)</td>
<td>100 min mixed short answer and MCQ (type ‘x’)</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>Physiotherapy (PHTY)</td>
<td>15 min (watch video and write) before OSCE</td>
<td>25</td>
<td>108</td>
</tr>
<tr>
<td>Veterinary technology (VETS)</td>
<td>90 min theory, mostly short answer</td>
<td>11</td>
<td>78</td>
</tr>
</tbody>
</table>

**Gender**

<table>
<thead>
<tr>
<th>Typists</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>40%</td>
<td>60%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hand writers</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>139</td>
<td>38%</td>
<td>62%</td>
</tr>
</tbody>
</table>

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

Detailed case descriptions available:
http://transformingexams.com/uq_trials/UQ_e-exam_cases_s1_and_s2_2014.pdf
Reasons for typing the exam

More time because of good typing skills
Poor hand writing skills, legibility for examiners
Editing potential
I think best when I type
Don’t get writer’s cramp
Saves paper
Prefer a screen

(added 30 October 2014)
It is cleaner, I make lots of mistakes when I'm writing and it usually ends in lots of scribbles everywhere.

I have terrible handwriting. Felt bad about it.

Quicker typing and the ability to edit or completely delete my answer without compromising on space.

You can write as much as you otherwise would but don't get a sore hand when typing.

I could get info down faster and examiner could read it.

Typing is more natural for me. I think best when I am typing.
Reasons for handwriting the exam

(added 30 October 2014)

- Computer issues/Fear of technology failure
- Prefer handwriting, familiarity
- Poor typing skills
- Connect and collect my thoughts using handwriting
- Handwriting is faster
- Typing is more stressful
- The noise from typing
- Need to draw diagrams and scribble
- Actual problems typing exam
- No laptop
- Don’t want to bring laptop to university
- Formatting answer on paper
- Not registering for session
- Don’t like working on screens
- Want a choice
- Lack of experience
- Previous poor experiences
- Forgot to attend session
- Health issues using screens
I felt more comfortable handwriting as nothing can go wrong & I wasn't relying on the computer system to complete my exam.

Three years of prior exams writing so stick with what you know.

I am worried about computer malfunctions.

I'm a slow typer and feel disadvantaged.

I was initially planning to type this exam but decided against it due to the unpredictability of machines.

I think more about what I'm writing when I handwrite but my hand gets sore and it isn't fast.

It's easier to handwrite. Though probably not easier for you to read my writing.

Lazy to bring laptop.
Those that used the system said...

Typer's perceptions of the e-Exam System (post exam survey)

Likert scale/rating: 1 = strongly disagree to 5 = strongly agree [N = 69]. Means shown.
Did typers think the exam suited the use of computers?

Those that typed the exam.
All six cohorts combined (ANIM, BIOL, CRIM, OCTY, PHTY & VETS).
Likert Scale: 5 = Strongly Agree, 1 = Strongly Disagree

Mean of 4.2 (value shown) N = 69.

Largely that was a ‘yes’.

Those that typed the exam by cohort:
Student reaction to exam conditions

Typers (left) and Hand writers (right)

<table>
<thead>
<tr>
<th></th>
<th>Typers</th>
<th>Hand writers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall my experience of this exam was positive</td>
<td>4.04</td>
<td>3.76</td>
</tr>
<tr>
<td>I ran out of time</td>
<td>2.61</td>
<td>2.61</td>
</tr>
<tr>
<td>I felt more stressed in this exam than I normally do in other exams</td>
<td>2.56</td>
<td>2.69</td>
</tr>
<tr>
<td>I went back and read over my responses before submitting</td>
<td>3.48</td>
<td>3.49</td>
</tr>
</tbody>
</table>

Likert scale: 5 = strongly agree, 1 = strongly disagree. Means shown.

<table>
<thead>
<tr>
<th></th>
<th>U</th>
<th>Z</th>
<th>Sig. (2-tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall experience</td>
<td>13242.5</td>
<td>-2.132</td>
<td>0.033</td>
</tr>
<tr>
<td>Time out</td>
<td>15203</td>
<td>-0.083</td>
<td>0.934</td>
</tr>
<tr>
<td>Stress</td>
<td>14527.5</td>
<td>-0.751</td>
<td>0.452</td>
</tr>
<tr>
<td>Read before</td>
<td>15145.5</td>
<td>-0.394</td>
<td>0.694</td>
</tr>
</tbody>
</table>
Overall exam experience by cohort
Typers (left) and Hand writers (right)

Agree (better)

Disagree (not good)

Likert scale: 5 = strongly agree, 1 = strongly disagree.
Running out of time by cohort

Typers (left) and Hand writers (right)

Likert scale: 5 = strongly agree, 1 = strongly disagree. Means shown.
Was the sound of typing distracting?
In each boxplot Typers (left) and Hand writers (right)

The two cohorts ANIM and BIOL were removed from the analysis because typers and hand writers sat in different rooms.

Those that could hear typing (who selected 5, 4 or 3) were included in the determination of distraction by typing sound.

Cohort exams were held in different venues.

Means

<table>
<thead>
<tr>
<th></th>
<th>Typers</th>
<th>Hand written</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4</td>
<td>2.47</td>
<td></td>
</tr>
</tbody>
</table>

Both exhibited significant differences to >.01

Likert Scale: 5 = Strongly Agree, 1 = Strongly Disagree
Was the sound of typing distracting (VetSci)?
In each boxplot Typers (left) and Hand writers (right)

VetSci Course:

VETS both the internal and external cohorts used same room, but at different times (4 weeks apart).

VETS internal: warm day, ceiling fans and construction noise.
VETS external: cooler day, no fans, quiet.

Environmental conditions and acoustics play a large role in the degree to which ‘typing noise’ becomes a distracting factor.

Hand-writers were not all quiet either!

Means

I could hear the sound of typing

Typed Hand written

3.4 2.47

> If you could hear typing, was the sound of typing distracting?

VETSi VETSe

2.85 3.57

Likert Scale: 5 = Strongly Agree, 1 = Strongly Disagree
Future intention to type
Typers (left) and Hand writers (right)


Two cohorts:
BIOL 10 typers, 75 handwrote
OCTY 3 typers, 24 handwrote

Mean shown for each.

For typers ‘yes’ (n = 13).
For handwriters ‘no’ (n = 99).

Likert Scale: 5 = Strongly Agree, 1 = Strongly Disagree
Are some students overestimating the neatness of their hand writing?!  

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

* Note 20% response rate by VETS for this item. All others near 90%
**Issue log:** 15 of the 69 who typed reported ‘technical issues’ via the post-exam survey. 1 more was identified by observation. The majority were minor.

<table>
<thead>
<tr>
<th>Issue</th>
<th>N</th>
<th>Notes, Additional Observations, Suggested Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot/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 ID</td>
<td>0</td>
<td>All good. (some students entered ‘s’ rather than 8 digit number but system copes fine).</td>
</tr>
<tr>
<td>Using the software</td>
<td>1</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’) now fixed</td>
</tr>
<tr>
<td>Software crashed/computer froze</td>
<td>4</td>
<td>1 x Old 2009 white Macbook. Office suite quit to desktop. 3 x System drive ran out of space causing the system to crash (now fixed).</td>
</tr>
<tr>
<td>Touchpad/mouse</td>
<td>7</td>
<td>Sensitivity reported by participants. <em>Some adjustments were made.</em> <em>USB wired mice highly recommended!</em> Investigate drivers.</td>
</tr>
<tr>
<td>Scrolling</td>
<td>15</td>
<td>Two finger scrolling opposite to OSX, keyboard shortcuts. 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>

**Further development** is needed to address these issues. Warnings remain in readme files available on public download sites.
Student consideration of general exam conditions when using computer versus pen:
All six cohorts. Response pairs: those who typed (line 1) & those that hand-wrote* (line 2)

* 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.

Note! Updated March 2015 edition places ‘same equally’ in the middle rather than on the right.
Writing strategies under non-exam conditions – general writing habits:
All six cohorts. Response pairs: Typers (line 1) and Hand writers (line 2)

Nonparametric U & Z used to compare those who typed in the exam to those that hand wrote.

Note! The September 2014 edition of this chart was incorrectly reversed against the stats.
Student writing

Typers (left) and Hand writers (right)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Typers Mean</th>
<th>Handwriters Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>I type faster than I handwrite</td>
<td>4.52</td>
<td>3.28</td>
</tr>
<tr>
<td>I type accurately</td>
<td>4.23</td>
<td>3.48</td>
</tr>
<tr>
<td>When I make errors, I am able to quickly correct them as part of typing</td>
<td>3.49</td>
<td>3.67</td>
</tr>
<tr>
<td>I often rely on spell check to detect errors</td>
<td>3.88</td>
<td>4.46</td>
</tr>
<tr>
<td>I work more efficiently when I type on a familiar keyboard</td>
<td>3.37</td>
<td>3.17</td>
</tr>
<tr>
<td>My handwriting is normally neat and legible</td>
<td>3.61</td>
<td>3.88</td>
</tr>
</tbody>
</table>

Likert scale: 1 = strongly disagree, 5 = strongly agree.

Mann-Whitney U
- Typers mean: 8213
- Handwriters mean: 7551.5

Z
- Typers mean: -4.637
- Handwriters mean: -4.248

Sig. (2-tailed)
- Typers mean: >.001
- Handwriters mean: >.001
Did the nature of prior experience of e-exams impact on the decision to type this exam?
All participants, all cohorts.

Of those with Prior exp. | All
---|---
Mann-Whitney U | 502
\( Z \) | -2.734
Sig. (2-tailed) | >.01

Looks like a ‘yes’!

Before this exam, I had used a computer to type responses to a short answer or essay style exam.

Was your prior experience positive?

Positive

Negative

I typed this exam

Yes

No
Does the nature of prior experience of e-exams impact future intended use?

All participants, all cohorts.

Hand writers, all cohorts.

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Hand writers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
<td>22.5</td>
<td>21</td>
</tr>
<tr>
<td>Z</td>
<td>-3.262</td>
<td>-2.248</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>&gt;.01</td>
<td>&gt;.05</td>
</tr>
</tbody>
</table>

Looks like a ‘yes’!
The role of gender in exams and writing habits

All participants, all cohorts: 9 out of 52 items were statistically significant (so most were not).

The significant items are shown below with Male (Line 1) and Female (Line 2).
e-Exam Project Resources

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
Cite this resource

Feedback Survey
http://ta.vu/eexamsurv