MAKING A CASE FOR ONLINE EXAMS
EFFICIENCY, INTEGRITY AND INSIGHT

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UNSW
Outline

Proposed DA Strategy at UNSW (Mathew)
DA Framework (Patrick)
  Authenticity
  Efficiency
  Integrity
  Insight
DA pilots and examples (Mathew)
A holistic digital assessment strategy is needed

**Pedagogic alignment** across and within curriculum – formative to summative.

**Technical Architecture** –

A common core capability with the ability to plugin custom assessment tools used by discipline areas and connect to other services

- UNSW: On campus contexts: Moodle Quiz + Safe Exam Browser
- UNSW: Off-campus contexts: Moodle Quiz + Examity (remove invigilation and recording)

Additional services – configuration, recording, integrity checking, e-marking, analytics, reporting...

**Support for academics** – Professional development, training, development, exemplars: UNSW: Digital Assessment Community of Practice, Digital Assessment tool kit, technology training ...

**Support for students** – including a broader BYOD strategy, equity, transition support.

**Policy and procedure** – assessment, exams, equipment...

**An eye to the future** – student performance at the macro and micro across the curriculum needs access to data (avoid isolated black boxes).

**Working together** – faculties, schools, TELT admins, learning designers, PVCE, ETS, exams unit, IT, student support, disability office, ... and many others!
DA strategy for UNSW (possible)

Proposal: A holistic assessment architecture across multiple contexts

Enable secure digital assessments to be done across a range of context using common core tools.

On-campus invigilated spaces

Moodle: provides exam content

SOE Lab PCs SEB
Other Lab PC SEB
Classroom Laptop SEB
Exam hall Laptop SEB

Invigilation service

Home BYO laptop Browser + Examity

Off-campus remote

SEB = safe exam browser: secures a computer for an exam

Digital assessment anywhere, anytime, anyhow!
DA architecture for UNSW (core + extensible)

A common core that is extensible to include other assessment tools and services. UNSW: Moodle and Safe Exam Browser or remote proctoring.

Digital assessment anywhere, anytime, anyhow!
Towards authentic invigilated e-assessment (DET BYOD roadmap)

<table>
<thead>
<tr>
<th>Start</th>
<th>&gt; &gt; &gt;</th>
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<th>&gt; &gt; &gt;</th>
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<th>&gt; Future</th>
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<tbody>
<tr>
<td>Get Ready</td>
<td>Phase 1</td>
<td>Phase 2</td>
<td>Phase 3</td>
<td>Phase 4</td>
<td>Phase 5</td>
</tr>
<tr>
<td>Institutional approvals, research ethics, hardware and infrastructure</td>
<td>Paper equivalent small scale. Basic doc exams to begin!</td>
<td>Post-paper small to medium. Expanding the app and media landscape.</td>
<td>Medium to large scale. Adding the power of an LMS.</td>
<td>Whitelisted and logged Internet Network BYOD exam.</td>
<td>Open but fully logged Internet Network mixed mode BYOD exam.</td>
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Crawling | Walking | Running | Jumping | Flying!

Get Ready:
- Institutional approvals, research ethics, hardware and infrastructure

Phase 1:
- Paper equivalent small scale. Basic doc exams to begin!

Phase 2:
- Post-paper small to medium. Expanding the app and media landscape.

Phase 3:
- Medium to large scale. Adding the power of an LMS.

Phase 4:
- Whitelisted and logged Internet Network BYOD exam.

Phase 5:
- Open but fully logged Internet Network mixed mode BYOD exam.

http://ta.vu/e-exam-roadmap

Extension work:
An offline e-learning platform see moleap.org

Moodle resistant to network outages + encrypted autosave.
Digital Assessment (Online Exams) Framework

- **AUTHENTICITY**: Significance, Relevance, Problem Solving, Application
- **INTEGRITY**: Assessment Protocols, Lockdown Applications, Invigilation
- **EFFICIENCY**: Submission, Grading, Feedback, Data Storage, Flexibility (Time & Place)
- **INSIGHT**: Learning Outcomes, Test Performance, Psychometric Quality
DA Authenticity

Authentic assessment* = realism, contextualisation and problematisation (Villarroel et al 2018). Means offering worthwhile, significant and meaningful tasks for students.

<table>
<thead>
<tr>
<th>Learning Objectives</th>
<th>DA Ideas and Tools</th>
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<tbody>
<tr>
<td>Ability to access and manage information (collecting data, observing and interpreting)</td>
<td>Research tasks (using Library resources), Create a digital artefact (image, audio, video, blog)</td>
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<tr>
<td>Knowledge and concept understanding (recalling, describing, relating)</td>
<td>Online quizzes, Oral presentations (via Zoom), Create online glossaries, Online discussion forum</td>
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<tr>
<td>Knowledge application (problem solving)</td>
<td>Online quizzes, Case studies, Capstone projects, Group work, <strong>Interactive</strong> assignments (with simulation, game-based, using software to construct responses)</td>
</tr>
<tr>
<td>Analysis (defining and solving problems, analyzing data, designing experiments)</td>
<td>Research proposal, Project-based tasks, Case studies</td>
</tr>
<tr>
<td>Evaluating (critical thinking, building arguments, reflecting)</td>
<td>Online quizzes, Literature review, Response to trigger questions posted on forums, Online discussion in professional network, Group work</td>
</tr>
<tr>
<td>Designing, creating</td>
<td><strong>Online portfolio, Create a digital artefact</strong> (image, audio, video, blog)</td>
</tr>
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</table>
DA Efficiency

The most important motivating factor for adopting DA (Online Exams)

- **Efficiency** (marking, anywhere/anytime, record keeping, paperless, audit)
- **Instant result and feedback** (or at least quicker)
- **More control** (randomization, overrides, exam keys, session recording)
- **Various question types** (MCQ, calculated questions, drag-drop, drawing ...)
- **Practical exams** (software tools - Excel, CAD, programming ...)
- **Rich resources** (webpages, multimedia, databases)
- **Data analysis**
Quiz Markup Language (QML)

Patrick Tran, UNSW Canberra

http://patricktran.info/quiz-generator-for-moodle/

Using the web forms

Using QML

Online QML Converter: [http://qml2xml.pro/](http://qml2xml.pro/)

Demo: [https://youtu.be/dkfYsj-Hpm8](https://youtu.be/dkfYsj-Hpm8)

- External graphic files
- Human-readable format (vs XML)
- Copy & Paste
- Find & Replace
- Sharing
DA Integrity

- **Assessment protocols** (exam rules from central office + online context)
- **Online Proctoring** (live, recorded, automated)

- **Lockdown Application**

  ![Diagram](image)

  - **Invigilator**
  - **Off-Campus Invigilated Exams**
  - **Quiz Taker**
  - **Administrator**
  - **Use default configuration**
  - **Preset Config**
  - **Exam Key**
  - **Provided Start-Exam File**
  - **Lockdown**
  - **Web Resources**
  - **Applications**
  - **Moodle Quiz**

Demo: [https://youtu.be/K_4-IkSAljw](https://youtu.be/K_4-IkSAljw)
DA Insights: usage patterns

Filtered to teaching courses with > 5 enrolments during 2015 to 2019.
Mathew Hillier & Samuel Zhang (Student as partner, ETS)

The LMS is a file repository

Approx. 17% of quizzes have a password.
Sophisticated question types need more support, APD, resources?
We love MCQs a bit too much?!

After just 2 months!
Moodle is a rich tool set for assessment but is much under utilised. A holistic support effort is required!
DA Insights
Assessment Analytics

- Psychometric quality
  - Facility index (question difficulty)
  - Discrimination index/coefficient

<table>
<thead>
<tr>
<th>Total Score (%)</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
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<tbody>
<tr>
<td>90</td>
<td>1</td>
<td>0</td>
<td>1</td>
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<tr>
<td>90</td>
<td>1</td>
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<td>50</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>50</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Q3 Difficulty = correct / all = 6 / 10 = 0.60
Q3 Discrimination = (high.correct – low.correct) / group size = (5-1)/5 = 0.80

Moodle: Quiz>Results>Statistics
DA Insights – Visual Analytics

Moodle quiz: Grade distribution and confidence intervals (Export from Moodle into Tableau)
Picking DA tech: Good e-Exams – Three dimensions – A trade off?

Must acknowledge the tensions,
Pick two? ....
We need to strive for all three.

- Authenticity
  - Relevant and rigorous
- Integrity
  - Valid and identity verified
- Scalability
  - Doable and cost effective

We need to avoid a technological and pedagogic cul-de-sac due to poor technology choice!
UNSW Pilots: PC Labs: SEB + Moodle (or other)

Safe Exam Browser can be used to secure other tools such as Ed

Potential (approx):
SOE labs 1400 seats
Other labs + 500 seats
Total 1900 seats

Moodle quiz in lock down browser (SEB)
Digital open book with controlled e-notes

Pilot BIOC 11 July 2019
220 students across 4 labs
UNSW Pilots 2019

Post-exam student feedback (Mean)

- I would like to use a computer for exams in the future
- I would recommend this approach to doing exams to others
- I felt the exam system was secure against cheating
- I felt the exam system was reliable against technical failures
- Overall I feel the software used for this exam was easy to use
- It was easy to start the exam
- The written instructions were easy to follow
- I type faster than I handwrite

N: 107

- 2018 Moansh
- BYOD USB
- SOLAR3010
- SEB Moodle
- BIOC2181
- CHEM1011
- 2018 Moansh
- BYOD USB
- SOLAR3010
- SEB Moodle
- BIOC2181
- CHEM1011

1 Strongly disagree
2 Disagree
3 Neutral
4 Agree
5 Strongly agree
In-class BYO Laptops. SEB + robust Moodle

Option A: SEB installed in student’s OS (Windows / MacOS) – less secure than Labs or option B.

Option B: Boot from alternative operating system (Network or USB).

Example: DET e-Exam project pilots. Robust to network outages with offline autosave (student work can continue regardless of the network conditions).

◦ Tables + chairs in standard ‘collaborative’ layout classroom.
◦ Power sockets in tables + WiFi (Ethernet can be used too, but not in this case).
1. Boot host computer with e-Exam USB.
2. System starts up in a minimal locked state.
3. Logon to network (via user credential or auto logon).
4. Download configuration settings from configuration server.
5. Apply new configuration to system.
6. Download exam content and settings from exam content server (or Moodle server).
7. Deploy exam content, apply exam setting.
8. Launch exam and do the exam.
9. Progressive upload of response data and monitoring data during the exam to Moodle or submission server. Includes offline backup during network outages*.
10. Exam ends. System finalises data upload then cleans-up the USB (wipes user and exam data), then shuts down.

* Manual data retrieval is possible in cases of total network failure. Use Admin tool and USB hub.
Digital Exams for Halls

Pop-up lab

a) Networking: wired LAN then move to WiFi.

b) Computers: Uni laptops then move to BYOD.

Isles for power cables (no access).

Inverted seating.
DET e-Exam pilots in halls (phase 1 and 2): BYOD + USB boot + no network.
Digital Exams for Halls

Towards more authentic assessments in exams.

• We first start with Moodle quiz with SEB.
• Then add other apps to the white list e.g Word, excel, calculator... simulations.

Monash University 2019 – Caulfield racetrack (limited to sub-set of LMS quiz questions)
Digital Inking for e-Exams at UNSW

Moodle free hand drawing installed 8 Aug – piloted 15 Oct remote online exam

Annotate an image or free hand drawing, writing formulae and diagrams.

Commodity $60 USB graphics tablet works fine (with some practice) or touch screen device.
Off-campus Invigilated Digital Exams

**Steps:**

1. **Well before the exam:**
   - **Academic prepares exam:** Set up exam in Moodle and set up exam rules and schedule in invigilation service provider site.
   - **Student pre-registers** at the invigilation service provider (create account, set time zone, set up ID).

2. **Before the exam:** Student books exam time with invigilation service provider and does technology compatibility checks.

3. **Exam time:** Student login to Moodle. Clicks link to exam. Lands at invigilation provider. Does technology check, pre-id checks, room scan. Invigilator does system checks. Clicks start exam. Is taken to Moodle (or other tool). Does exam while monitored by invigilation service. Follow exit steps when done (submit file, clear cache etc).

4. **After Exam:** Exam available for marking in Moodle and recording reviewed/flagged by invigilator. Video viewable by teacher.

**Equipment at home:** BYO laptop with webcam. Standard web browser with connections to invigilation service provider and exam materials in Moodle (or O365). Optional / add-on – USB graphics tablet (digital pen) for digital ink input.

**Invigilation service:** Examity provides human invigilators. Identity checks. **Session oversight via web cam and machine session recording (screen, webcam and audio stream)** and post session review.
Pilot exam: remote invigilation with inking

Data science 15 Oct 2019: 60 students simultaneous. Mixed text and inking drawing and formulae.

In discussion of the Google Flu Trends (GFT) failure it was noted that the simple regression model (below) did just as well as GFT in predicting flu levels:

\[ \text{flu}_t = \beta_0 + \beta_1 \text{flu}_{t-2} + \epsilon_t \]

where \( \text{flu}_t \) = CDC estimate of flu like illness in week \( t \).

[Model answers]

Question 7:
Not yet answered
Marked out of 1.00
**Flag question**

Given time series data \( \text{flu}_{t,i} \), \( i = 1, \ldots, T \), explain how you would use this model to provide a prediction of \( \text{flu}_{T+1} \). Explain why this is published weekly but with a delay.

Explain your response below:

Please see my answer below.

Path, p

Question 8:
Not yet answered
Marked out of 1.00
**Flag question**

Show any mathematical working out below.

The model states that \( \text{flu}_{T+1} \) is a linear function of the previous week's flu levels and the week before's flu levels.
Authentic problem solving in exams?!

**Authentic**

Authenticity is understood as realism, contextualisation and problematisation (Villarroel et al 2018)

**Not**

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**F.E (PART-II) MCQ Test, 2012**

**BASIC CIVIL ENGINEERING**

**Day and Date:** Tuesday, 26/03/2012  
**Time:** 08.50 a.m. to 09.50 a.m.  
**Total marks:** 50

**SECTION I**

1. The curvature of earth is ignored in  
   a) Geodetic surveying  
   b) Hydrographic surveying  
   c) Plane surveying  
   d) Astronomical surveying

2. In an optical square; the mirror are fixed at an angle of  
   a) 30°  
   b) 60°  
   c) 45°  
   d) 90°

3. The true meridian passes through  
   a) Geographical poles  
   b) Arbitrary poles  
   c) Magnetic poles  
   d) only N-pole

4. In WCB system; a line is said to be free from local attraction, if the difference between FB and BB is  
   a) 0°  
   b) 90°  
   c) 130°  
   d) 360°

5. When higher values are inside the loop; it indicates a  
   a) Hill  
   b) slope  
   c) pond  
   d) Overhanging cliff

6. The line of collimation and axis of the telescope should  
   a) coincide  
   b) be perpendicular  
   c) be parallel  
   d) intersecting

7. The canal taken directly from reservoir is called as  
   a) Main canal  
   b) Distributary  
   c) branch canal  
   d) Field canal

8. For national highway the road way width is  
   a) 9 m  
   b) 12 m  
   c) 7.5 m  
   d) 25 m

9. Cumulative error is proportional to  
   a) L  
   b) 2L  
   c) √L  
   d) L

10. The compass box is made of  
    a) Iron  
    b) Aluminum  
    c) Brass  
    d) Wood
Authentic Questions in LMS

1. Download file

2. Software application used to interrogate and construct a response.

3. Respond via form

Question 20
Use the [attached spreadsheet] to determine the output level where profit is maximised.
Enter a whole number as your answer for the output level.

Answer:

Question 21
Use the Australasian Legal Information Institute (AustLII) online database portal to find the title of last Australian appeal case heard by the Privy Council.

Answer: Port Jackson Stevedoring Pty Ltd v Salmond and Spraggion (Aust) Pty Ltd [1980] UKPCCHCA 1; (1980) 1
Authentic Questions in LMS

Constructed response (file upload)

1. Open software
2. Use software application to construct a response.
3. Respond by file upload
Enhancing LMS

Possibility?

Code Runner question type:
Structured responses evaluated against test cases.
Examples:
programming languages
R statistics.

Note: Requires separate ‘Jobe’ server to evaluate the code responses submitted by students.

This is similar to ‘STACK’ (math) using scriptable question type (wx Maxima) available in UNSW Moodle.
Get in touch!

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UNSW Digital Assessment tool kit (with cases etc by DA CoP group)

Other Info:
DET national e-Exam project http://TransformingExams.com