PREPARING STUDENTS FOR LABS & PRACTICE

BLENDED LEARNING COMMUNITY
Sharing and fostering good practice in blended learning across all disciplines for both educational practitioners and developers. The BL Community is collegiate based and coordinated by A/Prof Yasir Al-Abdeli and Dr Catherine Moore at ECU. We welcome members from staff at any Perth based university.
## BL Community 12.06.2019

### 09:45-10:00
**Settle-in, Morning tea**

### 10:00-10:05
**A/Prof Yasir Al-Abdell**, Co-ordinator BL Community, School of Engineering

Agenda, “Preparing Students for Labs and Practice”, Acknowledgements (Educational Enhancement Unit - UWA, for hosting the event)

Dr Elaine Lopes, Associate Director, Capability Development, UWA

Welcome to the UWA

### Preparing Students for Laboratories

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Affiliation</th>
<th>Topic</th>
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</thead>
<tbody>
<tr>
<td>10:05</td>
<td>Dr Rina Wong</td>
<td>School of Medical and Health Sciences, ECU</td>
<td>Using Virtual Specimens / Microscopy for Laboratory Based Teaching (and ‘bringing the lab home’)</td>
</tr>
<tr>
<td>10:15</td>
<td>Dr Dino Spagnoli</td>
<td>School of Molecular Sciences, UWA</td>
<td>Introducing the First Year Laboratory to Undergraduate Chemistry Students with an Interactive 360 Degree Experience</td>
</tr>
<tr>
<td>10:25</td>
<td>A/Prof Annette Koenders</td>
<td>School of Science, ECU</td>
<td>Encouraging Student Preparation for Laboratory Classes</td>
</tr>
<tr>
<td>10:35</td>
<td>Tracey McKernan</td>
<td>School of Molecular and Life Sciences, Curtin</td>
<td>When Theory Meets Practice - Making the Most of the Virtual Environment for Radiation Therapy Training</td>
</tr>
<tr>
<td>10:45</td>
<td>A/Prof Yasir Al-Abdell</td>
<td>School of Engineering, ECU</td>
<td>Testing Laboratory Preparation using Blackboard Tests</td>
</tr>
<tr>
<td>10:55</td>
<td>Dr Kristina Lemson</td>
<td>School of Science, ECU</td>
<td>Full STEAM Ahead: Lab Preparation Supporting Visual Literacy in Biology</td>
</tr>
</tbody>
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### Preparing Students for Professional Practice

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<tbody>
<tr>
<td>11:05</td>
<td>Dr Jason Bell</td>
<td>School of Psychological Science, UWA</td>
<td>Conducting a Virtual Reality Laboratory Experiment for 1000 first year Psychological Science Students</td>
</tr>
<tr>
<td>11:15</td>
<td>Dr Alexandra Yeung</td>
<td>School of Molecular and Life Sciences, Curtin</td>
<td>Using Electronic Laboratory Notebooks (ELNs) for Teaching and Research</td>
</tr>
<tr>
<td>11:25</td>
<td>Dr Andrew Valentine</td>
<td>Faculty of Engineering and Mathematical Sciences, UWA</td>
<td>Virtual Work Integrated Learning in Engineering</td>
</tr>
</tbody>
</table>

### EOI’s for the Research Project

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>11:35</td>
<td>Dr Catherine Moore</td>
<td>Co-ordinator BL Community</td>
<td>Open floor discussion and EOI’s for the 2nd BL Community multi-disciplinary research project on “effective preparation” (follow-up meeting, TBA)</td>
</tr>
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</table>

### Wrapping Up

ESO's for the day include Q/A time
Using Virtual Specimens / Microscopy for Laboratory Based Teaching ‘bringing the lab home’

Rina Wong¹, Katrina Strampel², Stephanie Dowdell³

1. School of Medical and Health Sciences, Edith Cowan University
2. BEST Network, University of New South Wales, Sydney
3. Centre for Learning and Teaching, Edith Cowan University
Traditional Modes of Learning:

Out-of-class: **still images** in lecture notes, text book

In-class: **physical blood films** under the microscope (different views of the sample)

Rare disorders: ‘**e-slides**’ or **physical blood films** are **projected** onto a screen at the front of the lab
Interactive Tutorials with virtual slide technology:

• Collaboration with the **BEST network**, a multi-institution online teaching network

• **SLICE** (BEST network image bank), a sophisticated virtual microscope (online)

• **Smart Sparrow**, develops adaptive learning platforms, respond interactively with students
Home based training

- **SLICE** (BEST network image bank), a sophisticated virtual microscope (online)
- Tutorial for practising WBC differential count
“Just wanted to quickly feedback on the online white blood cell counter. I thought it was AMAZING! And I finally got a count that was actually within the ranges! I could not believe it! Its so so brilliant to be able to do this at home. I’m really loving it and even showed my son who thought it was really cool... I’m so grateful for your effort because this will hugely improve my confidence in this task”

“I like the cartoons, it looks abit like you!” “I love it.”

“I have been struggling abit in class, when I tried your new tutorials, I got it! It just clicked”
1. Provided students with greater access to haematology resources at home and in class using virtual specimens

2. Pilot trials showed improvements in student learning outcome using interactive virtual slides compared with ‘traditional’ projected slides or glass slides
Introducing the First Year Laboratory to Undergraduate Chemistry Students with an Interactive 360 Degree Experience

Dr Dino Spagnoli
School of Molecular Sciences
Laboratories can provide a rich learning environment for students in the sciences.

Preparation for the laboratory is a key part of the learning experience.

Students come into university with a variety of laboratory experiences.
360° Laboratory Tour

https://tinyurl.com/ybqpm3em

Information point

Flashing hotspots

Embedded video

Hovering the mouse cursor over an information point causes text to appear

Level 1 in the lab

Level 1 Technician

Safety shower

Navigation bar

Toolbar to allow movement around the photo without the need for the mouse
## Student Usage

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Semester/Year</th>
<th>Number of enrolled students</th>
<th>Number of times tour accessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1001</td>
<td>Semester 2/2017</td>
<td>70</td>
<td>1534</td>
</tr>
<tr>
<td>CHEM1002</td>
<td>Semester 2/2017</td>
<td>147</td>
<td>2298</td>
</tr>
<tr>
<td>CHEM1004</td>
<td>Semester 2/2017</td>
<td>379</td>
<td>7722</td>
</tr>
<tr>
<td>CHEM1001</td>
<td>Semester 2/2018</td>
<td>189</td>
<td>1520</td>
</tr>
<tr>
<td>CHEM1002</td>
<td>Semester 2/2018</td>
<td>75</td>
<td>761</td>
</tr>
<tr>
<td>CHEM1004</td>
<td>Semester 2/2018</td>
<td>372</td>
<td>6027</td>
</tr>
</tbody>
</table>

No assessment task linked to the tour

The usage data does not give us data on the length of time spent in the tour.
Student usage-CHEM1004
Student Feedback

- Over a period of three years we surveyed the students and based on their feedback, improvements were made

- Semester 1 2017, 218 responses
- Semester 2 2017, 43 responses
- Semester 1 2018, 167 responses
“The notes (information points) on everything were absolutely helpful. Being able to view the lab beforehand eased my nervousness and prepared me for the situation of my first lab.”
“The 360 degree image and the ability to leave the lab to see the technicians and what was around the lab was very helpful in helping me find my bearings and getting an idea of where everything is relative to each other, which I found was a big help when I finally entered the lab.”
“When everyone comes into the lab room it’s hard to get your bearings and really look and know where things are so it was nice to be able to do so beforehand so I knew where things were in the room and was slightly more prepared during the really busy lab.”
Conclusions

• The development of the 360° tour has helped students become familiar with the laboratory and aid in their preparation

Acknowledgements

Centre for Education Futures (now EEU) at UWA in the form of scholarship seed grant, Mobilising the laboratory: Using immersive and interactive technology to improve laboratory preparation

Tracey Frayne and Michelle Bunting-Centre for Education Futures (now EEU)

Tristan D. Clemons, Lise Fouche, Cara Rummey, Ryan E. Lopez, Dino Spagnoli- Introducing the First Year Laboratory to Undergraduate Chemistry Students with an Interactive 360 Experience, 2019, Journal of Chemical Education, Article ASAP
http://dx.doi.org/10.1021/acs.jchemed.8b00861
Encouraging Student Preparation for Laboratory Classes

A/Prof Annette Koenders
What could possibly go wrong?

No preparation → Mistakes → Reduced confidence/motivation → Lack of time → Learning → Employability

Employability X

Learning X

Reduced confidence/motivation

Lack of time

Mistakes

Equipment broken/Injuries

No preparation
Pre-lab
- Prepare protocols and results tables
- Grades for completion before lab

Lab
- Check/correct tables with demonstrator
- Complete activities

Post-lab
- Update portfolio
- Corrections to protocols
- Load results
Protocol/results

Model
- Pipetting exercise

Copy
- Written instructions converted to
  - Table, or
  - List of actions

Do
- Errors/omissions become clear
- Refine protocols/results notation
- Reinforces importance of process

Repeat
• Prepare a results table using Table 2 as an exemplar.
• The results table should have the following columns:
  – Amount of p-nitrophenol (umol)
  – One column each for absorbance at pH 7.0, 7.5, 8.0, 8.5 and 9.0.
## Standard curve results

**Absorbance (400nm)**

<table>
<thead>
<tr>
<th>p-nitrophenol (umol)</th>
<th>pH 7.0</th>
<th>pH 7.5</th>
<th>pH 8.0</th>
<th>pH 8.5</th>
<th>pH 9.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>4</td>
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<td>80</td>
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<tr>
<td>160</td>
<td></td>
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</tbody>
</table>
### Standard curve results

**Absorbance (400nm)**

<table>
<thead>
<tr>
<th>p-nitrophenol (umol)</th>
<th>pH 7.0</th>
<th>pH 7.5</th>
<th>pH 8.0</th>
<th>pH 8.5</th>
<th>pH 9.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>0.013</td>
<td>0.016</td>
<td>0.000</td>
<td>0.020</td>
<td>0.007</td>
</tr>
<tr>
<td>4</td>
<td>0.025</td>
<td>0.027</td>
<td>0.120</td>
<td>0.075</td>
<td>0.016</td>
</tr>
<tr>
<td>20</td>
<td>0.056</td>
<td>0.074</td>
<td>0.096</td>
<td>0.205</td>
<td>0.088</td>
</tr>
<tr>
<td>40</td>
<td>0.119</td>
<td>0.262</td>
<td>0.181</td>
<td>0.316</td>
<td>0.187</td>
</tr>
<tr>
<td>80</td>
<td>0.248</td>
<td>0.413</td>
<td>0.362</td>
<td>0.520</td>
<td>0.374</td>
</tr>
<tr>
<td>160</td>
<td>0.474</td>
<td>0.809</td>
<td>0.753</td>
<td>0.900</td>
<td>0.784</td>
</tr>
</tbody>
</table>
Outcomes

- Employability
  - Experimentation
    - Labs
      - Safer
    - Record keeping
      - Better results
    - Learning
      - Organised
      - On time
      - Repeated engagement
      - Self-checking of efficacy
When theory meets practice

Making the most of the Virtual Environment for Radiation Therapy Training

Tuesday, June 18, 2019
Blended learning collaborative learning community  Tuesday, June 18, 2019

Blended learning collaborative learning community  

**Action Research**

- **Ask the students to prepare for class**
  - Provide workbooks and reference material based on the learning outcomes for the week
  - Online quiz on Blackboard - to be completed before the class, marked before class
  - Result - better preparation, discussion of common points of misunderstanding
  - VERT used for most of the class

- **Ask the students to prepare for class**
  - Provide workbooks and reference material based on the learning outcomes for the week
  - Socrative quiz in class
  - Result - better preparation, discussion of answers in class
  - More use of VERT

- **Ask the students to prepare for class**
  - Provide workbooks and reference material based on the learning outcomes for the week
  - Online quiz on Blackboard - to be completed before the class, marked before class
  - Result - better preparation, discussion of common points of misunderstanding
  - VERT used for most of the class

- **Ask the students to reflect**
  - Brief reflection on 3 things that they learned
  - Brief reflection about how they interacted in class
  - Brief reflection on what they might change for the next class

**Tuesday, June 18, 2019**
Outcomes

**Students**
- Well prepared
- Contribute to class
- Ready to be an active participants
- Thinking about the next class

**Tutor**
- Finds out about common misunderstandings and can correct
- Able to conduct the class confident in a base level of knowledge
- Able to advance practice/thinking
Does it work?

“This session, I brought along my notes that I typed in preparation for the quiz. By doing this, I had easy access to any information I had blanks in, but I was also able to add information too it that I have missed/may have been changed.” (B)

“I prepared for the session by completing the case study to the best of my ability, which helped me to follow the discussion in class and contribute more fully.” (P)

“I also made sure to go through the pre-reading thoroughly in order have a solid foundation of knowledge, so I could then both answer questions in class, and ask questions to clear up any gaps in my knowledge.” (A)

“Next time, I would like a go at setting the VERT lasers to the tattoos and performing the moves me a better appreciation of the thought process required to initiate a move and how to voice out my decisions to my RT partner.” (S)
References


Blended Learning Community presentation

Testing Laboratory Preparation using Blackboard Tests

A/Prof Yasir Al-Abdeli
※ y.al-abdeli@ecu.edu.au
School of Engineering, ECU

12th June 2019
UWA
Tool: Blackboard Tests

Tests
Tests are sets of questions that are marked to measure student performance. Once a test is created here, it must be deployed within a content folder before students can take the test. Test results are reviewed in the Grade Centre. Note that some question types are not graded automatically.

Surveys
Surveys are not graded and Student Responses are anonymous. They are useful for gathering data from students that is not used to evaluate student performance. Surveys must be deployed in a content folder for students to respond to the survey.

Pools
Pools are sets of questions that can be added to any Test or Survey. Pools are useful for storing questions and reusing them in more than one Test or Survey.
Two Labs: group work, but pre-labs to be done individually, 24-7

**Laboratory Work - Prelab TH5: Expansion Processes of a Perfect Gas**

Students must gain a **full-mark (20 / 20)** in the prelab to be eligible to undertake the experiment once they complete the safety inductions.

Prelab scores are only used to ascertain readiness for the lab experiment and do not contribute to the overall unit score of any student.

Under the *My Grades* tab (left panel), the the highest achieved score is shown. You need to make sure you have a full mark here before attending the lab.

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**Laboratory Work - Prelab TE93: Cross-Flow Heat Exchanger**

Students must gain a **full-mark (33 / 33)** in the prelab to be eligible to undertake the experiment once they complete the safety inductions.

Prelab scores are only used to ascertain readiness for the lab experiment and do not contribute to the overall unit score of any student.

Under the *My Grades* tab (left panel), the the highest achieved score is shown. You need to make sure you have a full mark here before attending the lab.
INSTRUCTIONS

Description
* Students must gain a full mark (33 / 33) in the prelab to be eligible to undertake the experiment once they complete the safety inductions.
* Prelab scores are only used to ascertain readiness for the lab experiment and do not contribute to the overall unit score of any student.
* Under the My Grades tab (left panel), the highest achieved score is shown. You need to make sure you have a full mark here before attending the lab.

Instructions
* Repeat the prelab as many times as necessary in order to attain a full mark. This must be achieved before your weekly lab slot is due.
* It is not advised to do the prelab on a small screen device (e.g., mobile phone) as in some instances you need to accurately click on specific points of an image. The use of a full screen device (laptop, computer etc) is advised.

Force Completion
This Test can be saved and resumed later.

Multiple Attempts
This Test allows multiple attempts.

Click Continue to continue: Laboratory Work - Prelab TE93: Cross-Flow Heat Exchanger. Click Cancel to go back. You will be previewing this assessment and your results will not be recorded.
Question Coverage: expectations

QUESTION 1

Beyond undertaking the lab safety induction that was done in the lab, students are also expected to (select all that apply):

1: Have the appropriate “dress code” for safety:
   * fully enclosed shoes
   * full-length pants
   * full-length sleeve shirts/ tops
   * long hair is secured (to avoid entanglement)
   * bring along their own Personal Protective Equipment PPE unless they are happy to use the PPE provided in the lab

2: Know the particulars of what needs to be done:
   * have read the lab report (template, PDF)
   * ideally, bring along a print out of the lab report
   * familiarised themselves with all the pages in the equipment manuals that have been referred to in the lab report (equipment manuals are on the BB site for this unit)

3: Be ready to access the lab at least five minutes before the start of the lab session to ensure they are on time
   (students who arrive later than the lab start time can expect to miss out on that lab)

4: Expect to do the lab experiment themselves after being given the go-ahead by the lab demonstrator (that's why you need to prepare well)

5: Have the needed stationary and resources:
   * pens, pencils, erasers, sharpeners (as applicable)
   * a copy of the text book (as applicable, will be needed to answer some of the questions in the lab reports)
QUESTION 3

When calculating the flow velocity in the duct pressure measurements are done using a pitot tube. To find the flow velocity the following equation is used (see pg 19 of the equipment manual / user guide).

\[ V_1 = \sqrt{\frac{2(p_1 - p_d) - 287\,T_1}{p_d}} \]

When using the above equation, what value should be inserted for \( P_A \) (the atmospheric or barometric pressure)?

Tip: see the table on pg14 of the equipment manual / user guide.
Select only 1 option.

- 101325 Pa
- 101.325 kPa
- 100000 kPa
- 101.325 kPa
QUESTION 2

The flow accelerates to twice its (upstream) flow speed at which of the following locations?
Select only 1 option.
Watch the movie: TP92_Blockage.mp4

- Within the narrow length of the test section which is occupied by the rods and as the flow approaches rods (in the upstream as well).
- Across the entire test section, i.e., within the narrow length of the test section which is occupied by the rods and both in the upstream and downstream.
- Only within the narrow length of the test section which is occupied by the rods.
- Within the narrow length of the test section which is occupied by the rods and when the flow moves out of the rods (in the downstream as well).
There is an upstream and downstream end to the test section.
Column 4 is at the upstream end of the test section.
Select only 1 option.
Watch the movie: Tc93_Columns.mp4
True
False
Question Coverage: hardware operation

Identify the location of the following in the picture: Fan or electric motor start (OK) button
Click on the image to make your selection.
A pitot tube is connected to a vertical vernier and protrudes into the duct. The pitot tube should be face the incoming flow but also positioned at a certain height or incorrect measurements may arise. The vernier is used to help achieve the correct height placement.

At what height within the duct should the pitot tube be positioned?

1. The pitot tube should be positioned at the very top of the duct (maximum height)
2. The pitot tube should be positioned at the mid-point of the duct (half the height)
3. The pitot tube should be positioned at the very bottom of the duct (minimum height)
Question Coverage: safety

QUESTION 21

Which Personal Protective Equipment (PPE) or safety measure must be used as a consequence of the heated rod used in this experiment?

Watch the movie: TE93_Risk.mp4

Click on the image to make your selection.
Summary

- Blackboard tests used (integrated into Grade Book)
- Pre-lab completion an eligibility criteria for doing the labs
- 100% to be attained in each pre-lab, highest attempt (not last attempt) shown in Grade Book
- Lab demonstrator checks before admitting students to lab
- Pre-lab availability is 24-7, but must be completed before attendance
- Questions formats used: true / false, multiple choice, hot-spots
- Movies integrated (short clips, made by lecturer on mobile phone)
- Pre-labs now used over several years, gradually developed
- Advantages: better use of lab time, better preparation, interactive, “fairer”
Full STEAM Ahead!

Lab preparation supporting visual literacy in biology

Dr Kristina Lemson
School of Science
Edith Cowan University
Biology relies on visual data
Visual literacy

“...a set of abilities that enables an individual to effectively find, interpret, evaluate, use, and create images and visual media.”

Association of College and Research Libraries (2105) Framework for Information Literacy for Higher Education
Understanding fundamental evolutionary concepts requires sophisticated visual skills.
SCI1187 Form and Function in Biology

- Visual Literacy made explicit
- Authentic artifacts
  - Visual models
  - Biological drawings
  - Workflow
- Assessed - low stakes, ‘no cost’ first attempts
- Supported
  - Preparation tasks
  - Demonstrator driven

**Visual models**

**Draw the Core**

Label if you’re able
Annotate if you’re great
Stephen Taylor
SCI1187 Form and Function 2019

- Student resistance to production lowered
- Sense of confidence & agency
- Quality improved
- Students organised!

1A Extraction of chloroplasts

1. Cut the leaves into small pieces.

2. Place into cold mortar. Add 20mL of Isolation medium. Grind.

3. Place the beaker in an ice-water-salt bath. Arrange funnel with mesh so that it will empty into the beaker. Wet mesh with a few mL of cold isolation medium.

4. Filter the extract through the mesh into the cooled beaker.

5. Pour filtrate into a precooled centrifuge tube in ice-water bath.

6. Centrifuge for 10 mins.

7. Check tube contains the same amount of fluid as the others (the centrifuge must be balanced), load it into the centrifuge.

8. Check for pellet of chloroplasts at the base. If supernatant is green, centrifuge for a few minutes, if it is clear proceed to the next step.

9. Gently pour off supernatant liquid into labelled test tube. Don't lose the pellet! Store supernatant in ice-water bath.

10. Resuspend pellet with about 2mL of cold isolation medium. Use a glass rod, or squat the medium in and out of a pipette several times to resuspend the materials.

11. Store the isolated chloroplasts in ice-water bath and use as soon as possible.
Virtual and Augmented reality in Psychology teaching and research

Jason Bell information session June 12, 2019
Overview of my talk

- The Technology
- The teaching philosophy
- Research-led teaching
- World first research showcasing UWA’s research strengths
VR

- VR = Virtual reality. Here you are completely immersed into an alternate reality that is entirely constructed and presented within the Head mounted Display unit (HMD)
AR

AR = Augmented Reality. This is when the real world is being captured by the camera, loaded into the HMD and then synthetic material is supplemented over the top.
The UWA Faculty of Science has invested in VR technology

- 16 HTC Vive Pros
- Fully portable setup
- Each “VR Kit” is comprised of:
  - 1 x HTC Vive PRO HMD
  - 2 x hand controllers
  - 2 x tripods for the base stations
  - 1 x gaming laptop - you need a great graphics card. Essentially you are running 3 x monitors of the laptop.
Teaching philosophy

- Psyc1101 has approximately 1000 students, so the labs play a key role in creating that interactive, engaging environment for small group discussion. It’s hard to provide this in the lecture setting (esp when they don’t all fit in the Octagon).
- We want an active learning experience that facilitates learning core course content.
- I teach perception, and a fundamental principle is that perception is influenced by context
  - See below two basic examples from the text

  The Café Wall Illusion

  ![Café Wall Illusion](image)

  The Ebbinghaus Illusion

  ![Ebbinghaus Illusion](image)
Research-led Teaching

- Students in PSYC1101 carry out an experiment to write up as a lab report
  - Rather than give them something which has worked for 50 years, we want to help them build a brick in the wall of knowledge
  - Working on a ‘world first’ novel project is exciting for them and a great demonstration of a point of difference at a world class research institution
  - The study maps onto my research expertise in perception and perceptual biases
  - In addition, the study we ran is the first study for one of my new PhD students. So a great research/teaching training exercise for Georgia.

- So in their study, we asked whether perception of familiar objects, such as human bodies, is also influenced by context
  - We set up an Ebbinghaus illusion with bodies
  - We are also asking how decision making is altered in virtual environments
UWA VR- a great Academic, Student, IT partnership
Our study: Estimating body size in different contexts
World-first research and its communication

Educational outcome

- 850 students ran through the VR setup and completed the study
  - This included our Albany students. I flew down to run it there
    - equity of experience
  - Students had very positive experiences.
    - They loved it
    - In hindsight I would allow more time to simply ‘experience the VR environment’
- Results were written up in a lab report (1500 words).
  - Because the research was novel, the traditional lab report hypothesis formation is in tact-no replication
  - Students gained experience using new-age technology.
  - For many it was their first VR experience
  - Many couldn’t resist the star wars light saber simulation...
World-first research and its communication

Research training outcome

- My PhD student Georgia successfully ran her first PhD study.
  - This was a wonderful (but stressful) experience for her to take charge of a laboratory class and exercise, working closely with the unit coordinator.
  - Georgia also helped develop the lab slides and content for the subsequent “lab report” writing class.

Showcasing UWA research excellence (for students who consented to the use of their data beyond the lab report- ethics obtained)

- I have submitted and will present the research for presentation at the Asia Pacific Conference on Vision (APCV) in Osaka, Japan, in July 2019
  - World class research on the world stage
  - Showcasing the technology and research strengths of UWA
  - Tackling important problems about perception in VR environments
Table of Contents
Hello from Alexandra Yeung

Dr Alexandra Yeung is a lecturer in the Department of Chemistry at Curtin University in Western Australia. She has been using Electronic Laboratory Logbooks (ELLs) or Electronic Laboratory Notebooks (ELNs) in a teaching context and was the first to bring ELL/ELNs into laboratory classrooms at her institution.

What is an ELN?

Electronic Laboratory Notebooks (ELN) is a digital platform that is designed to replace traditional paper research notebooks with a digital and secure version.

Key features of ELNs:

- **Research data management and organisation** – you are able to manage and organise all of your research data and information in one place (central HUB).
- **Searchable** – ELNs can be searched by keywords or tags and even by the contents of files.
- **Portability** – the cloud-based platform can be accessed anywhere, anytime from both iOS and Android devices.
- **Sharing** – data can be accessed by your research group and collaborators.
- **Inventory** – samples, reagents and consumables can be kept up-to-date in an easy-to-use visual display.
- **IP protected** – intellectual property is protected with third party data and timestamps.
- **Data security** – data is centrally stored including historical versions of every file, recording the date, time and username kept for audit-ability.
- **Seamless** – files, photos and documents can be moved directly into ELNs and stored.

https://www.monash.edu/library/researchers/researchdata/eln
Why use ELN in teaching?

- Electronic laboratory notebooks (ELNs) are increasingly used in the workforce
  - accepted practice in industry
- Ideal time to introduce ELNs in undergraduate classes
  - up-skilling students with electronic recording and data management skills
- Need to prepare students for a technological rich workplace
  - help them develop skills that are easily transferable to any workplace environment
- Institutional push towards electronic data management and record keeping and away from paper
- Interest from department in using ELNs in teaching
How I use ELNs in teaching

How to get started?

- Start small
- Get staff buy-in
  - Efficiencies in grading and providing feedback
  - Professional skill development
- Get student buy-in
  - Real world skill development
  - Potential for data sharing and collaboration
  - Permanent record of their work (better chance they will collect and read feedback)
- Institutional support – Leverage off the needs of researchers – institution might be more likely to adopt for research before teaching

Acknowledgements

- Curtin Teaching Academic Scholarship Seed Grant
- Diana Taylor - FLET
- Department of Chemistry
- Demonstrators
- Technical staff
- Students
Dr Alexandra Yeung, Curtin University

Using Electronic Laboratory Notebooks (ELNs) for teaching and research

Blended Learning Community, 12 June 2019
Pedagogical transformation

Phase 1
- Paper-based laboratory notebook (PLN)
- Introduction of exercise books
- Semester 1, 2015

Phase 2
- Electronic laboratory notebook (ELN)
- Introduction of tablet PC
- Semester 2, 2015

Phase 3
- Rollout across whole unit
- Semester 2, 2019
Implementation

- Software
  - OneNote
  - Lab Archives

- Tablet PCs
  - Surface 3
  - Lenovo Thinkpad

- Maintenance
  - Lab technician
Two forms – classroom edition (CE) and professional edition (PE)

- CE has the same features as the PE but with specialised instructional features
  - teacher control, gradebook, every edit is logged against users name and time stamped, pages can be converted to pdf and submitted through Turnitin.

- Flexible design and permanent record
- Add photos, videos, graphs, math calculations etc.
- Data hosted in Australia

**HURDLES**

- Cost
- Can be difficult to get started
- Buy-in from colleagues and teaching staff
- Some students take some time to learn how to use it
Leaping them…
Preliminary findings – Survey results

- I was comfortable using LabArchives as my ELL: 62% strongly agree/agree, 23% neutral, 15% strongly disagree/disagree
- LabArchives works the way I want it to work: 62% strongly agree/agree, 15% neutral, 23% strongly disagree/disagree
- I would recommend LabArchives to a friend: 62% strongly agree/agree, 23% neutral, 15% strongly disagree/disagree
- I am satisfied with LabArchives: 69% strongly agree/agree, 15% neutral, 15% strongly disagree/disagree
- I quickly became skillful with LabArchives: 54% strongly agree/agree, 31% neutral, 15% strongly disagree/disagree
- It is easy to learn to use LabArchives: 54% strongly agree/agree, 31% neutral, 15% strongly disagree/disagree
- I learned to use LabArchives quickly: 54% strongly agree/agree, 38% neutral, 8% strongly disagree/disagree
- I can recover from mistakes quickly and easily when using LabArchives: 54% strongly agree/agree, 23% neutral, 23% strongly disagree/disagree
- I can use LabArchives without printed written instructions: 62% strongly agree/agree, 31% neutral, 8% strongly disagree/disagree
- LabArchives user friendly: 54% strongly agree/agree, 31% neutral, 15% strongly disagree/disagree
- LabArchives is easy to use: 54% strongly agree/agree, 31% neutral, 15% strongly disagree/disagree
- LabArchives makes the things I wasn’t to accomplish easier to get done: 38% strongly agree/agree, 38% neutral, 23% strongly disagree/disagree
- I found LabArchives useful: 85% strongly agree/agree, 0% neutral, 15% strongly disagree/disagree
- I was satisfied with the overall experience with using ELL: 77% strongly agree/agree, 15% neutral, 8% strongly disagree/disagree
Preliminary findings – Survey results

Benefits of ELLs
- I didn’t like the idea of drawing graphs. Having the tablet was much easier to use.
- I like the idea of ELL due to syncing function.
- Can be edited and expanded on easily. Can add photos.
- Easier to manage and format. Quicker than writing.
- Good record keeping and can access anywhere and keep it for future reference.
- Having everything together, not losing anything and being able to access previous experiments.

Possible improvements
- Most comments were about the hardware and getting used to that, e.g. using the pens more efficiently.
Leaping them…
VIRTUAL WORK INTEGRATED LEARNING IN ENGINEERING

Andrew Valentine
Sally Male
Ghulam Mubashar Hassan
Each module engages students in completing an authentic task from engineering practice.
  - Modules are 1-2 hour in length.

Some modules engage students in engineering practice activities using simulations/software.

Modules integrated into courses:
  - Safety in Engineering Design (130 students)
  - Ethics in Engineering (430 students)

Some of the modules piloted:
  - Presenting at an engineering meeting
  - Performing on-site Job Safety Analysis
Safety in Engineering Design Module
Hazardous Materials Case

**Background**

During the seminar, safe uses of many chemicals are discussed, including a lead and arsenic based compound that is being used by a fellow graduate student, Dan, who did not attend the session. Dan is following several safe uses of the compound, but drilling into the solid form and heating above 204°C are specifically mentioned as unacceptable. Dr. D states that drilling and heating cause particles to become airborne, which means they can be inhaled by anyone in the area. You know that Dan is drilling and heating the lead compound up in a conventional oven to about 208°C.

**You selected not to speak to anyone yet**

**What Would You Do Next?**

- **Talk to Professor Creason again**
  - Approach her again when she has cooled down and explain your concerns concretely, using the regulations described in the hazardous material seminar.

- **Say nothing**
  - Professor Creason has already been informed.
  - Agree that she is probably correct in stating that 4 degrees Celsius is not much of an increase, and the drilling is irrelevant.

- **Do more research**
  - Research the lead compound’s effects on health and pregnancy, as well as proposed costs and feasibility of altering the experiment.

- **Check the job board**
  - Check the graduate student job board for openings in a different research lab.

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**Do More Research**

**Consequences**

- From your research you find lead exposure can:
  - Impair intellectual development and damage the brain if levels are high enough
  - All women should minimise their exposure to lead both before and during pregnancy
  - Be harmful if swallowed or breathed in
  - Be stored in the bones one is the body
  - Causes: abdominal pain, headaches, fatigue and anemia

What will be your decision with this new found information?
Presenting at an Engineering Meeting
Performing an on-site Job-Safety Analysis

Pan the camera around by clicking and dragging in the desired direction until you find the Kerosene Pump "08043". Hovering over the pump will highlight it in red and show the following. The motor guarding is the entire housing labeled "TIB-GB".

A cross sectional shape of this guarding is shown below where the circle is the motor shaft and the outline the guarding. The guarding is belted at the bottom to the ground and will need to be unboltsed and lifted vertically up. The guarding is heavy and requires proper lifting technique.

The three nodes highlighted in red may be useful in completing your JSA.

Pay attention to possible hazards that could occur in these three nodes. Keep in mind that this plant has highly flammable materials being pumped periodically and uses industrial high voltage equipment.

It may also be beneficial to watch the plant safety video on the home page under "Activities" for a list of PPE used on site. This may be useful for mitigation measures. (Note that the activity for choosing PPE does not function correctly, use this as a visual)