Flexible Laboratory Learning Opportunities To Make Chemistry More Accessible For Students

Karin van der Pal[a] and Vicky Barnett[b]

[a]Centre for Enabling Pathways, Curtin University, karin.vanderpal@curtin.edu.au
[b]School of Molecular and Life Sciences, Curtin University, vicky.barnett@curtin.edu.au

Since 2019, we have been developing chemistry units for UniReady at the Bentley Campus, in Schools and at the Centre for Aboriginal Studies. The diversity of students enrolled in these enabling pathways means some students cannot attend regular university laboratory sessions.

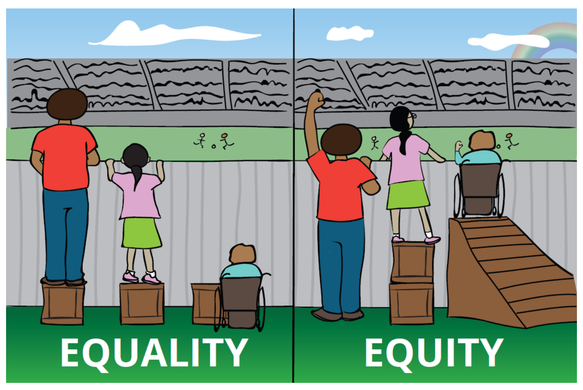
The goal was to develop meaningful lab experiences for ALL our students, so they would be better prepared for future tertiary studies.

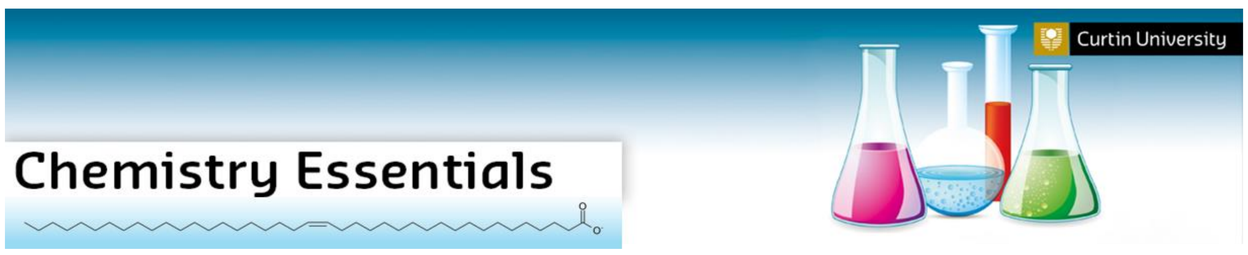
Inexperience + Anxiety = Greater Safety Risk

THE CHALLENGE

Each tailored lab program must be equitable…

- Time/commitment
- Learning outcomes
- Assessment





A — Internal students able to come to lab classes

Laboratory Journal
- Blended safety induction
- Three on-campus experiments

"…interactive labs… were really helpful as they were hands on which allowed us to interact with our peers and also gain an understanding of the lab experiments that we were doing, visually"

"It was helpful understanding …how to thoroughly follow instructions in a laboratory work place"

B — Students unable to come to campus for lab classes (Work (Full-time, farming); Covid lockdown; Health; Distance (>2000km); Carer/ Single Parent)

Laboratory Awareness Journal
- Online safety awareness quiz
- Three online simulations

"The iLabs helped alot (sic)"

"I've learnt so many new things about titrations…"

"I really enjoyed and did well in the measuring and set-up for the titration analysis, and it was helpful to learn these processes in an online, interactive manner"

C — Online students able to attend campus only on occasion (Flexible Work/ FIFO; Distance (>300km))

Blended Laboratory Journal
- Blended safety induction
- Blended lab experiences:
  - One on campus experiment
  - Two online simulations

"…attending and completing a laboratory experiment …helped me get familiar with equipment, and be confident in handling substance..."

"my very first lab experiment … helped give me confidence in tackling some challenges in a real laboratory (which I have never seen until my first lab experiment)."

D — Online students able to attend a campus, but not a Curtin one (Student lived close to an interstate university)

Blended Laboratory Journal
- Blended safety induction
- Blended lab experiences
  - One online simulation
  - One experiment proposal
  - One on-campus outreach lab at a different university

"Thank you so much for sorting out my lab classes! … the lab was very fun and enjoyable:)"

Common Task Take-Home experiment

Take-Home Experiment Kit was posted or given to students in class.

Students were supplied with written instructions and video demonstrations.

"…this experiment made me feel I am on top of the world as I felt I could do chemical things by my own"

"The Vitamin C experiment … caused me to remember how passionate I am about science."

"I enjoyed the overall experience of small scientific discoveries that I was not aware of before (e.g. capsicum has more vit c than lemon)"

"This brings in a fun 'real results in real time ' element to chemistry learning that counterbalances the bookwork."

"I enjoyed it and it improves my scientific investigation skills."

By sharing our experiences, we hope that other educators will be inspired to develop innovative and equitable access to laboratory learning experiences for students that are unable to attend regular laboratory classes. The students will therefore be more confident when they attend their first university lab class.

Curtin University

Acknowledgements: We would like to thank the students that participated in this study for their feedback. Kathy Lawson, Sheldon Smith, Marko Zegarac, Julianne Reid and the Centre of Enabling Pathways Lab Demonstrating Team. Mick Moylan and Evan Bieske from the University of Melbourne for the use of their lab space. This study has been approved by the Curtin University Human Research Ethics Committee (HRE2021-0180)