An investigation of the place of inquiry-based learning in chemistry laboratories in senior secondary school and first-year university

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Background

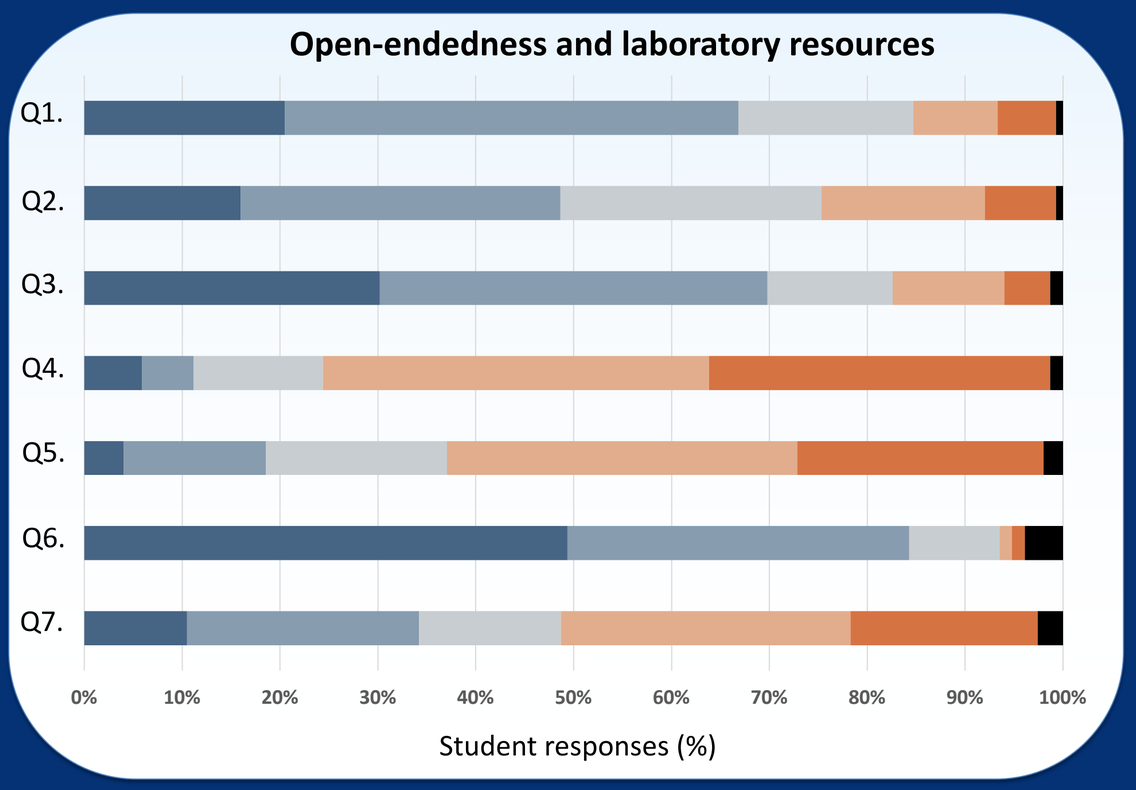
Inquiry within chemistry education is generally taught through laboratory experiments, ranging from traditional, guided inquiry and open inquiry experiments (Furtak et al., 2012). All types of inquiry benefit students, learning a range of laboratory and inquiry skills. Still, due to limited time for high school students and teachers, procedural laboratories tend to be used as default. The research aims to identify the current inquiry level in the common laboratory material and compare that to the level desired by students, teachers and the curriculum to ensure graduating chemists are university or workforce ready.

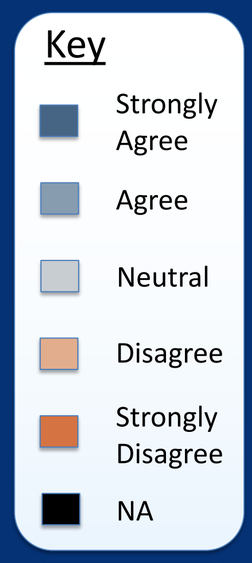
Survey information and methodology

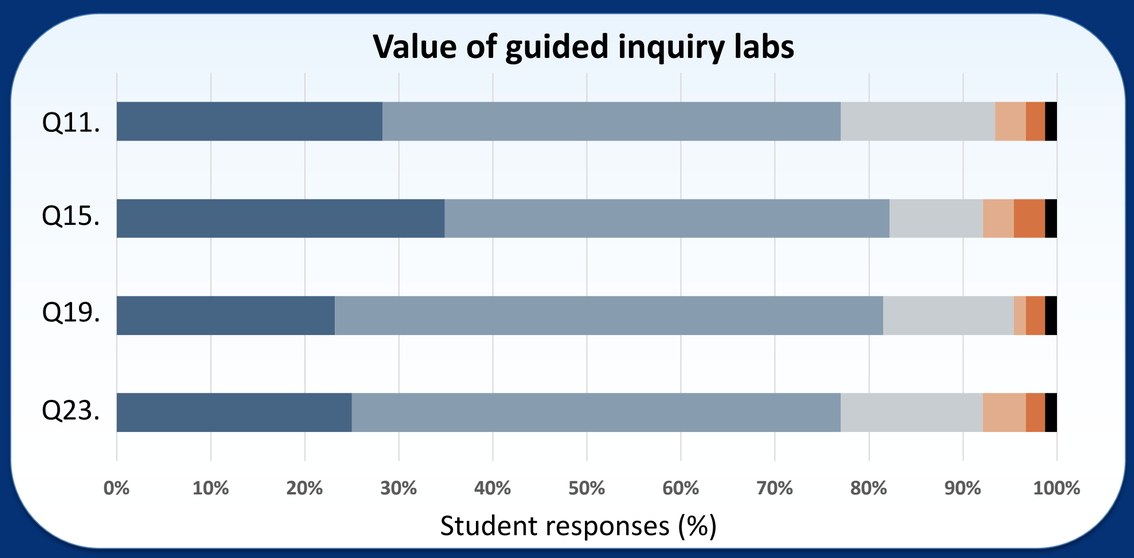
Curtin university 1st-year students were asked about their year 11 laboratory experiences using the survey scales in open-endedness, values of guided inquiry, limitations of procedural and guided laboratories and comparing open and guided laboratories. 152 Curtin university students participated in the research.

Scale: Open-endedness and laboratory resources (Fraser et al., 1993)
Q1. There was an opportunity for me to pursue my scientific interests in the laboratory class
Q2. I decided the best way to proceed during laboratory experiments
Q3. In the laboratory class, different students collected different data for the same problem
Q4. In the laboratory class, I was allowed to go beyond the regular exercise and do some experimenting of my own.
Q5. In the laboratory class, different students conducted different experiments.
Q6. The teacher/instructor decided the best way to carry out the laboratory experiments in the laboratory class
Q7. In the laboratory class, I was required to design experiments to solve a given problems

Scale: Value of guided inquiry labs (Cheung, 2011)
Q11. Designing experiments should be a formal part of the chemistry curriculum
Q15. Worth asking students how to represent and analyse data though the findings may be imperfect
Q19. Guided inquiry experiments are worthwhile though more time is spent
Q23. worthwhile designing experiments though the design may be imperfect

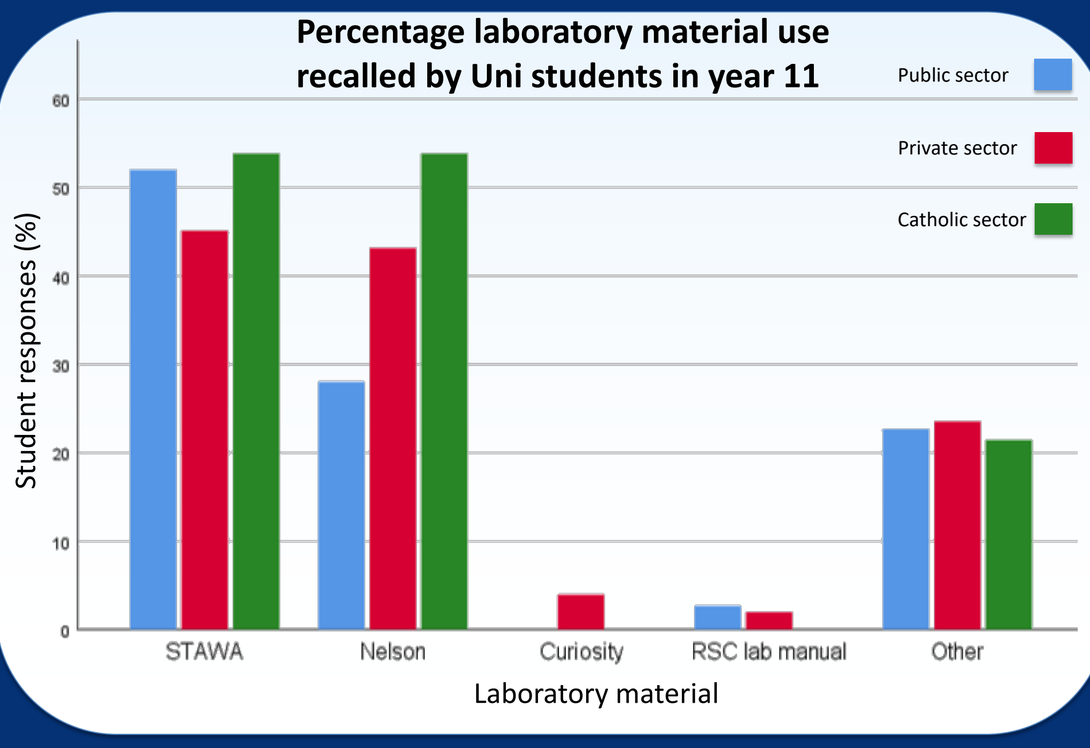






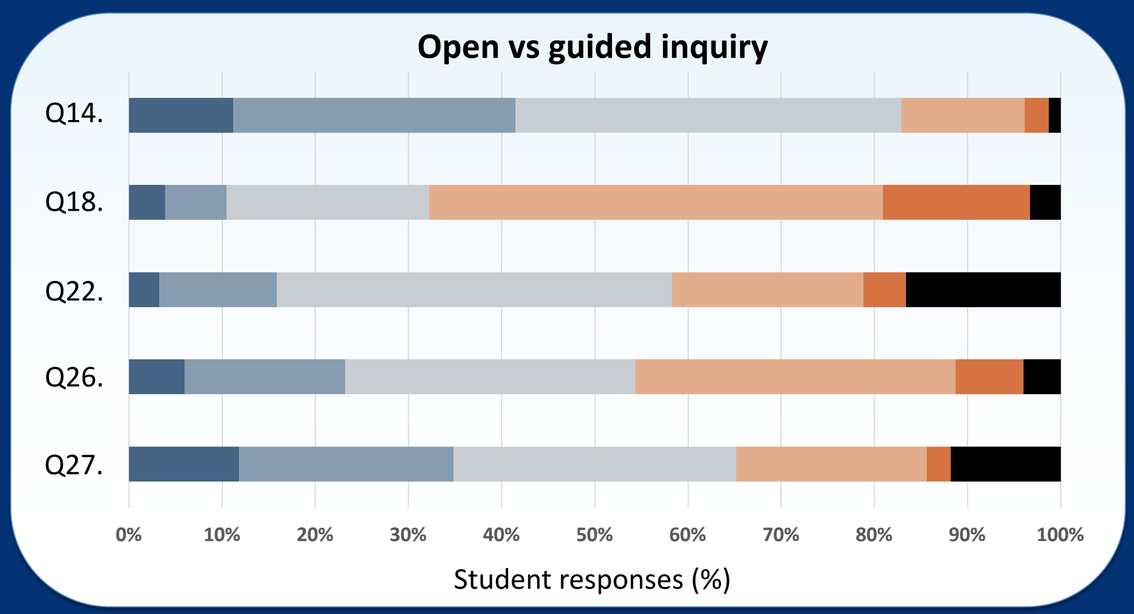
University students survey

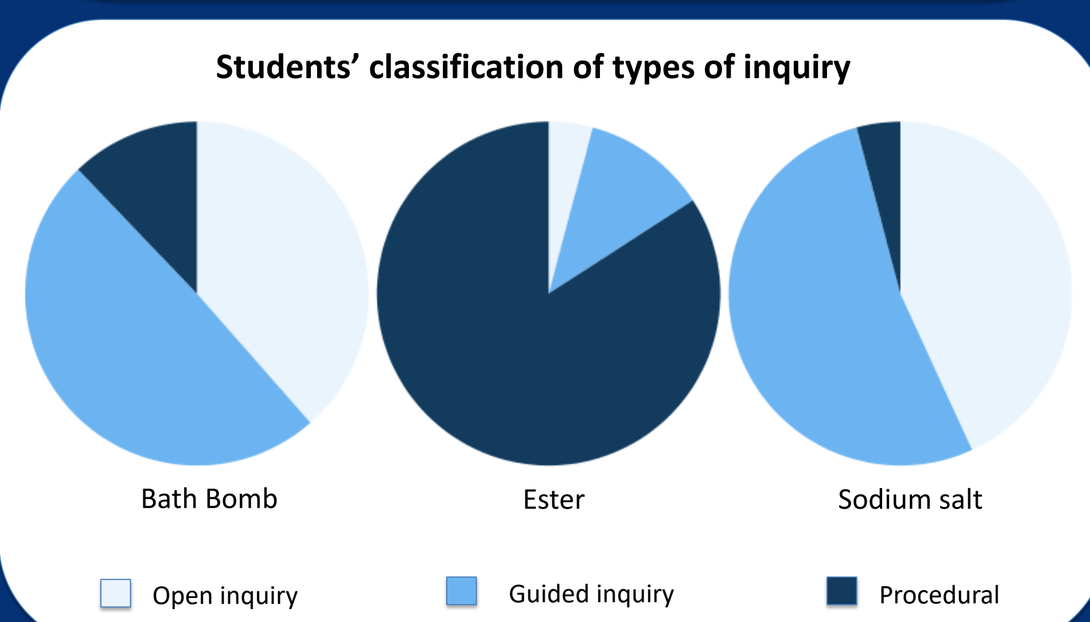
Scale: Open vs guided inquiry (Chatterjee et al., 2009)
Q14. Students should design their own procedure for conducting experiments.
Q18. Open inquiry laboratories take a shorter time to complete compared to guided-inquiry laboratories
Q22. I scored better grades on open inquiry than guided inquiry laboratory work
Q26. I preferred to choose an open inquiry laboratory over a guided inquiry laboratory
Q27. I learned more with an open-inquiry laboratory compared to a guided inquiry laboratory



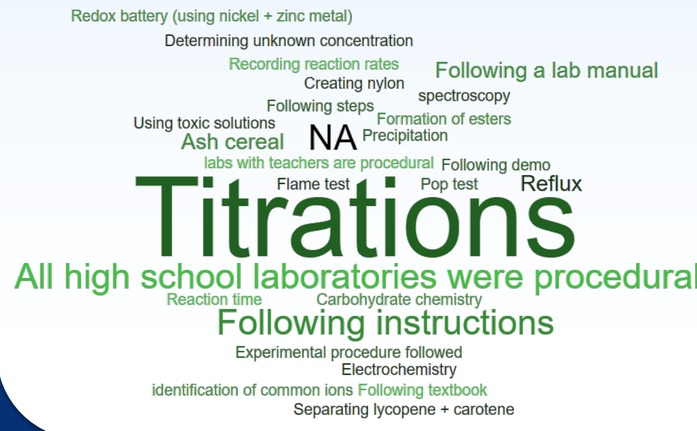
Could you help us?

How would you clarify the level of inquiry in the following experiments; bath bomb, ester and sodium salt? Scan the QR link below for more details. Your results will be compared to other participants.

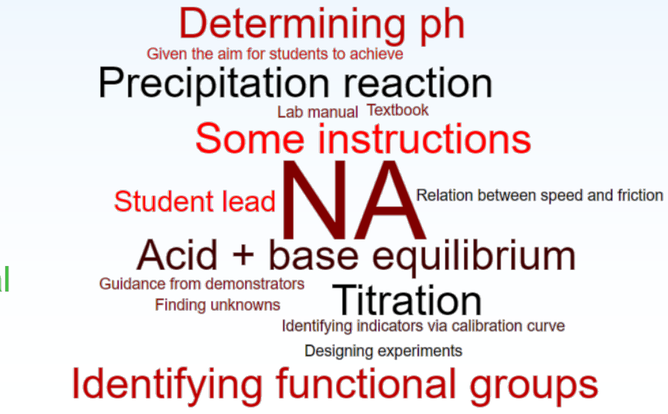




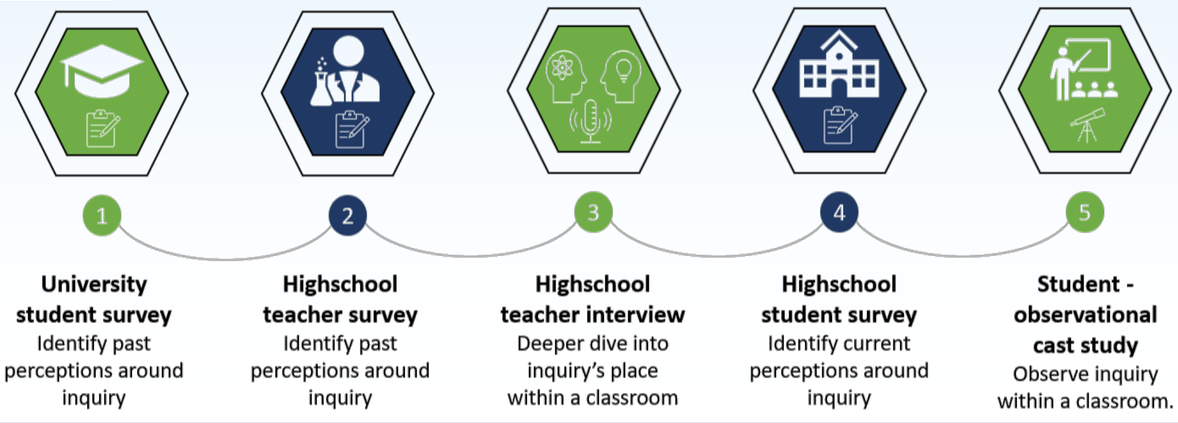
Students recalling procedural laboratory (N=53)



Students recalling guided inquiry laboratory (N=36)



Future Work



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