Perceptions of Confidence of Undergraduate Students in a First Year Organic Chemistry Module

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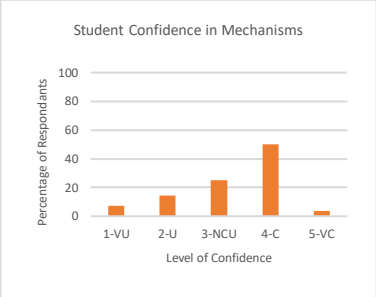
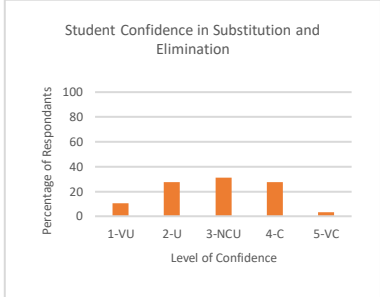
Background

Confidence measures have been used as good predictors of undergraduate attainment and performance outside of cognitive measures such as self-efficacy, self-concept, and test anxiety.[1,2] Within Chemistry courses confidence measures have been used to gauge student understanding of certain topics e.g., transition metal chemistry.[3] Introducing active learning into teaching has also shown to positively affect academic confidence in advanced level students.[4] The main use of confidence measures has been to identify misconceptions or alternate conceptions (AC) among students; overconfidence has been shown to be a large factor in the development of these AC.[5,6]

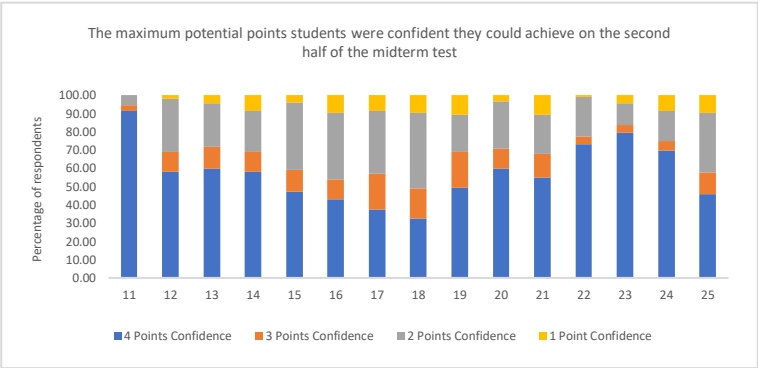
This project uses confidence measures to gauge student perceptions of their confidence on topics within a first-year organic chemistry module compared to both their overall attainment and their measured confidence in answering midterm questions with a degrees of certainty point allocation model. We are looking to see if the points allocation model can show general student confidence in topics compared to students' own perceptions and how this measured confidence compares to students' attainment in this format. We also looked to see if there were any significant differences in confidence in a topic related to the active learning method(s) used during learning.





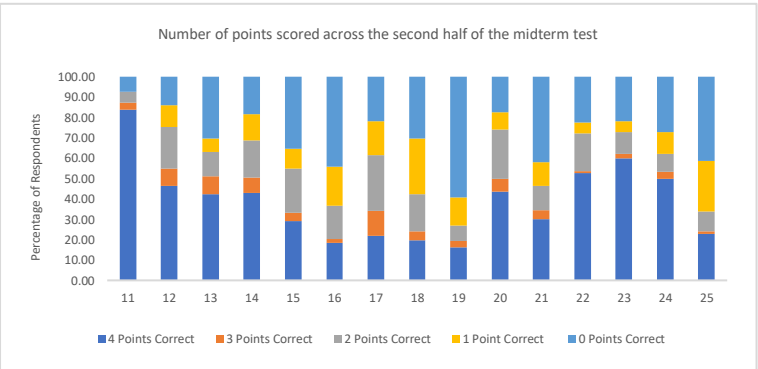
Student Perceptions of their Confidence in Topics in First Year Organic Chemistry

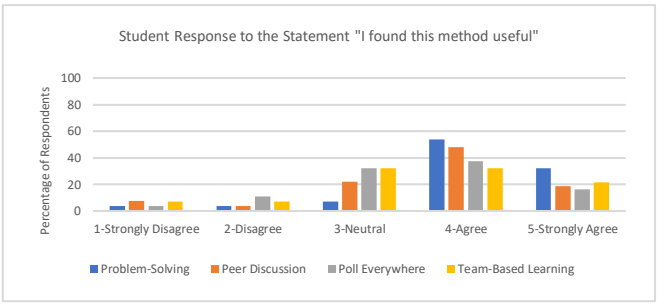
- Students were asked to rate their confidence regarding the 16 topics within the first semester of the first-year organic chemistry module as defined by the instructors.
- Confidence was rated along a 5-point Likert-type scale ranging from 1 - Very Unconfident to 5 - Very Confident.
- Two examples are given here, pertaining to the topics of Mechanisms and Substitution and Elimination.
- The students surveyed showed confidence in their understanding of Mechanisms, while there were mixed responses when surveyed on their understanding of Substitution and Elimination.



Confidence and Attainment in the First Year Organic Chemistry Midterm

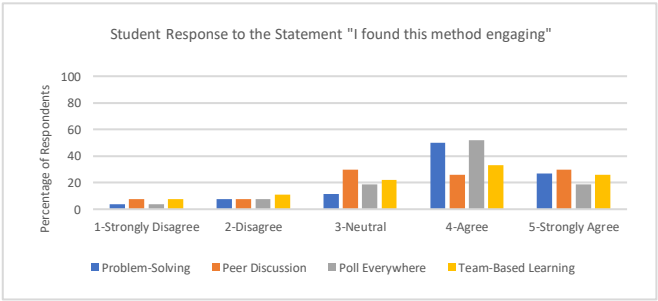
- The Midterm consists of 25 multiple choice questions (MCQs) to be answered in the space of an hour.
- Each MCQ had four possible answers and students had four points to place for each question.
- Confidence was determined by looking at where students placed their points across the possible answers where placing four points on a single answer was rated as most confident while placing one point across all answers was the least confident.
- The maximum points students can achieve for each of these possibilities are 4, 3, 2 and 1 with the confidence in obtaining a maximum of two points having two possibilities.
- The charts presented here show the confidence and attainment of the students in questions 11-25 of the midterm.
- Question 11 on the midterm related to Mechanisms and most students were highly confident in their answers with most placing four points on one answer like their own perceptions regarding their understanding.
- This confidence can be seen translated into high attainment in that questions.
- Question 19 relates to Substitution and Elimination in which students showed mixed levels of confidence in the topic although in answering the question most students still placed four points on a single answer.
- In terms of actual marks, students scored poorly in this question reflecting the mixed levels of confidence they perceived in the questionnaire.
- Students are more likely to place four points on a single answer when answering a question to varying degrees of attainment.
- This shows that students are more aimed towards maximising their chances for obtaining marks in an exam setting.
- It is also noted that other than 4 point confidence students often chose to split their points for confidence in obtaining a maximum of 2 points rather than 3 points or 1 point.
- Students also sat the midterm after being assigned into groups which showed greater attainment and group confidence.





Active Learning Techniques and Student Confidence

- One of the two instructors used four Active Learning methods in their teaching: Problem-Solving, Peer Discussion, PollEverywhere and Team-Based Learning.
- The charts on the right depict student responses of a 5-point Likert-type scale of statements on usefulness and engagement
- Students were surveyed on useful and engaging they found each of the four techniques with Problem-Solving being the most useful and engaging of the four techniques.
- It is interesting to note how Peer Discussion was seen to be useful for students, but not as engaging as Problem-Solving and PollEverywhere which could provide some insight on students' perceptions of active listening.
- Questions 11-25 on the midterm pertained to the part of the module where these techniques were used in certain topics.
- From the results of this study it was not discernible if the active learning technique, topic, or another factor had the most prevalent effect on students' confidence or attainment.



Further Work

- Further work includes a deeper look into the reasoning behind how students are assigning points in this type of exam format and the effect of pre-university student mentality regarding assessment.
- A closer look into the factors that affect student confidence especially active learning techniques and how they are implemented and students' perception of them as well as the topics that are covered and the questions that are used to assess students' understanding.
- Also looking into the group dynamics of students sitting the midterm in this style and how working in groups affects answering questions in terms of participation and active listening.

References:
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