

Assessment Autonomy and Student Confidence in Chemistry

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Abstract

Chemistry often elicits anxiety in students. These thoughts can potentially be alleviated with equitable practices, including those with respect to assessment and grading. Traditional summative assessments (multiple-choice, short answer exams) do not allow for communication between student and instructor. Oral exams, on the other hand, allow for this communication during the assessment, helping to build a relationship between student and instructor. The research presented here details the effect of giving students control over their assessments with respect to their confidence in an organic chemistry I class. This control is achieved through allowing students to choose to take an oral exam or a written exam. To analyze the effect of giving students this autonomy, a survey on student confidence in chemistry was given at the beginning and end of the semester. Students who chose to take oral exams were also asked to write a letter to a future student about their experience.

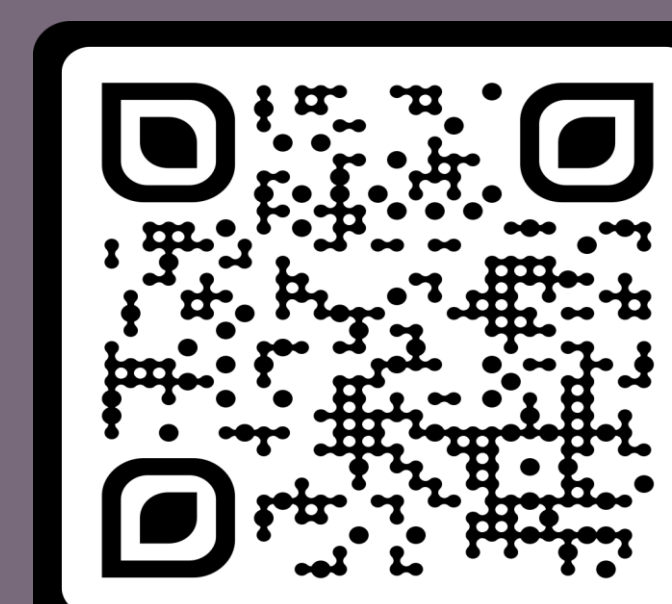
Methods

Students were given the Confidence in Chemistry Survey (CCS) at the beginning and end of the semester. These questions were derived from the Fennema-Sherman Mathematics Attitudes Scales and have been used in chemistry attitude studies.³ Open-ended questions were also included:

- 1) What aspects of chemistry are you most confident about?
- 2) What aspects of chemistry are you least confident about?
- 3) (second questionnaire only) Did you take an oral exam? What did you like or dislike about having the choice to take this exam or a written exam?

START HERE

Imagine this: to achieve your goal career, you must take a class you are not particularly interested in, or you have had bad experiences with it in the past. You're now in that class and to pass you need to take several exams. Unlike in previous semesters where you only had the option to take written exams, you have some control over the format of these exams. You can either take a written exam or an oral exam where you present in front of your professor. Scan the QR code to share how you feel about this choice and what you would do.

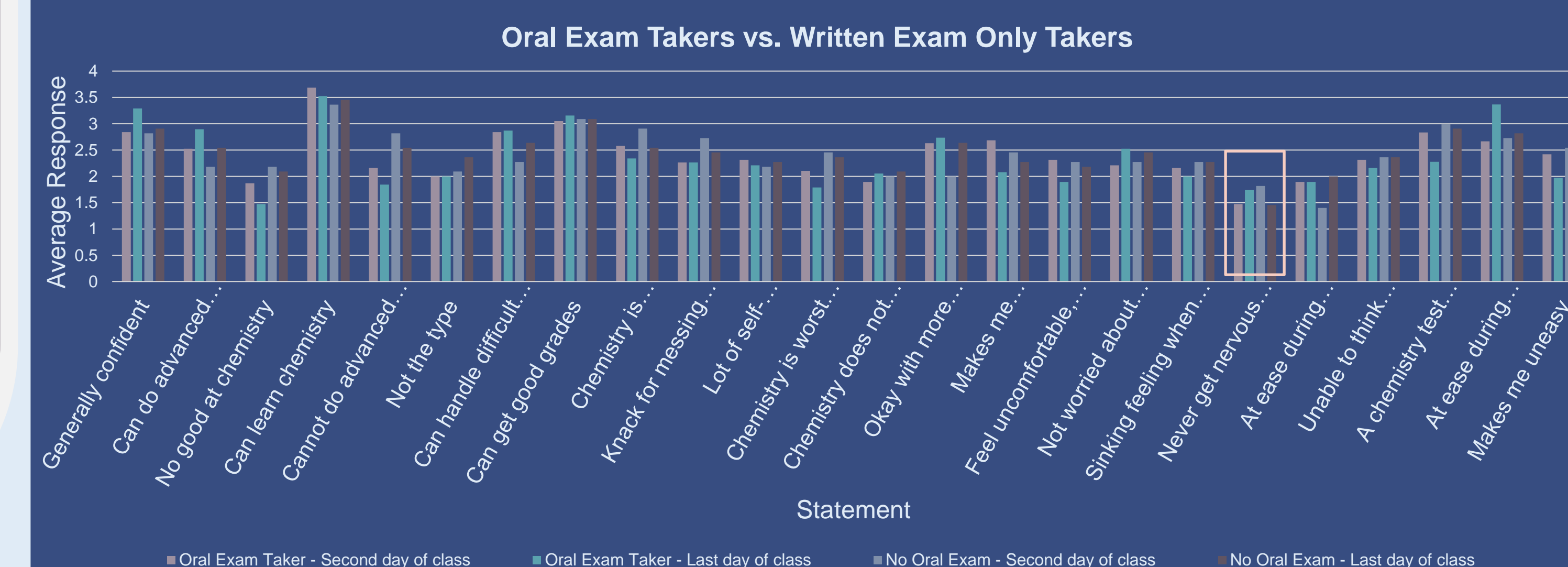


SCAN ME

“Along with your grade the professor provides the rubric and any corrections they notice during the presentation...leaving you with the opportunity to learn from your mistakes and grow instead of getting questions wrong on the written exam with no idea as to why.”

Conclusions

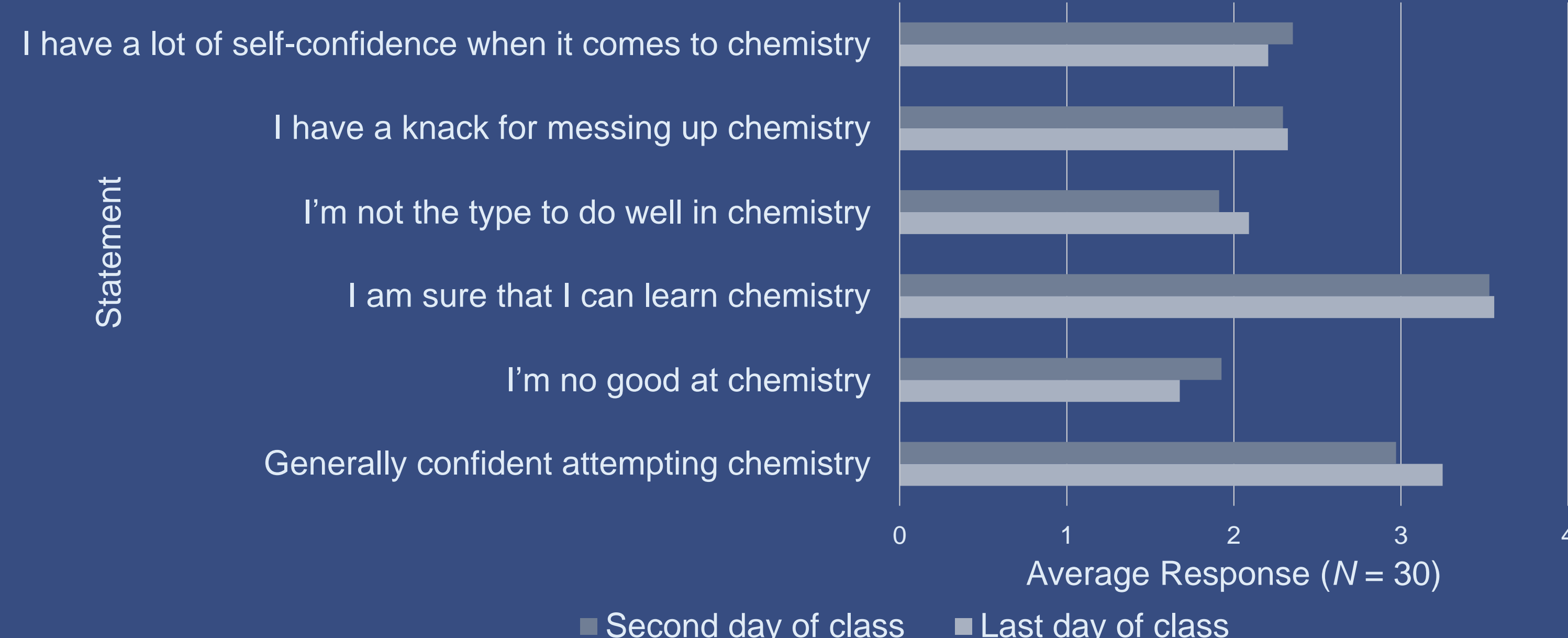
There appears to be a general trend of improved confidence for the students who participated in the pre- and post-questionnaire. The general confidence statements have conflicting outcomes. Overall, general anxiety seems to have improved. Most responses for class work show increased confidence and all statements for test anxiety have improved feelings. Out of the 30 students that took the questionnaires, 19 took chose to take oral exams (63%). When dissecting the results into students who took an oral exam vs not, it appears there is no difference. There does appear to be an interesting difference with the statement “I almost have never gotten nervous taking a chemistry test.”



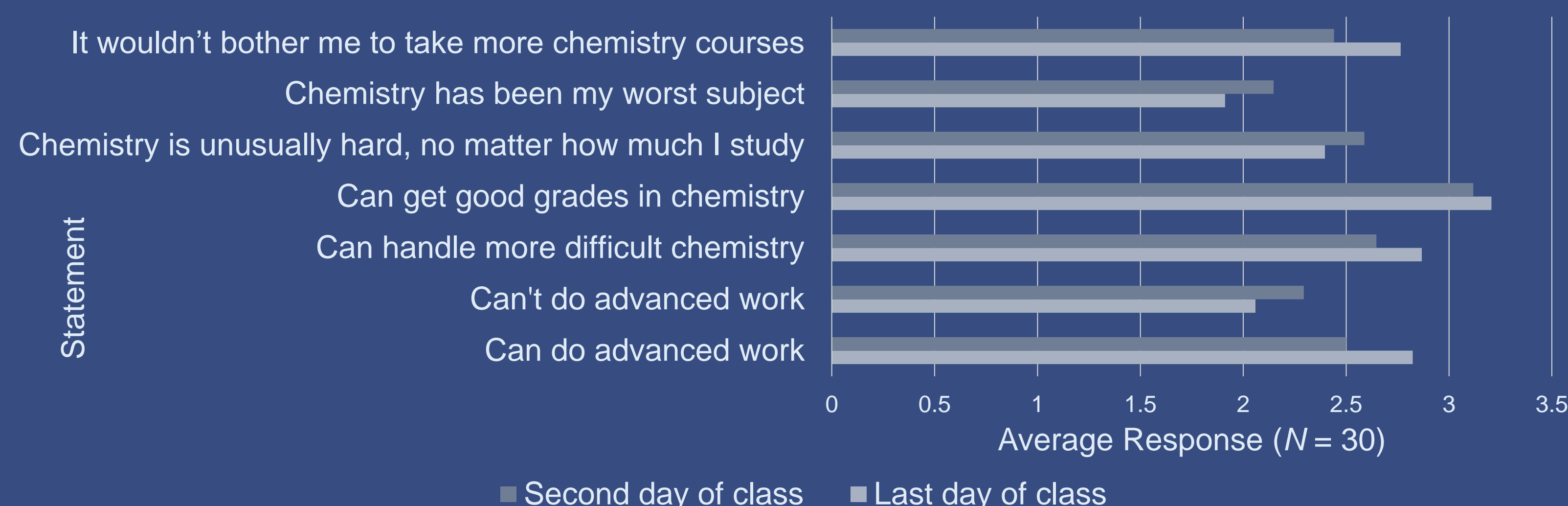
A more refined version of this study, including larger sample size and university diversity, should take place. Autonomy and confidence should be compared more directly. It should also be measured if simply taking an oral exam increases confidence. Most student letters reflected apprehension of the oral exam at first, but a positive experience and recommendation to take it.

Survey Responses

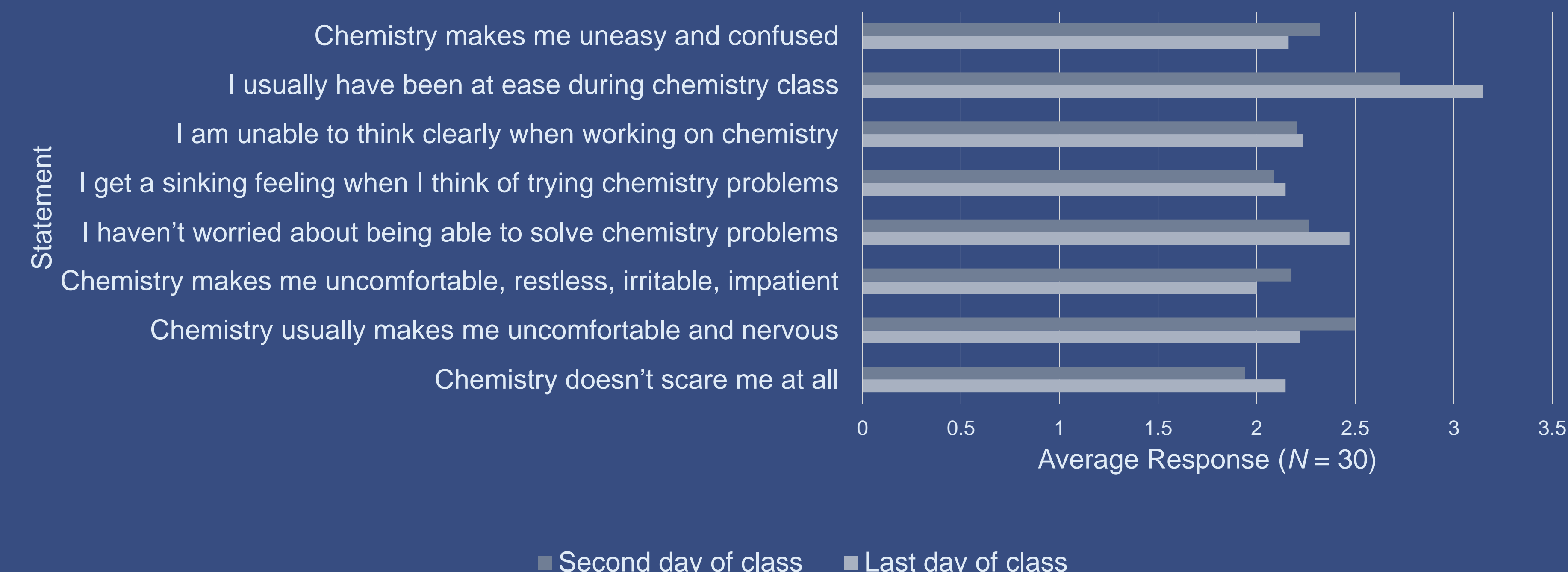
General Confidence Responses



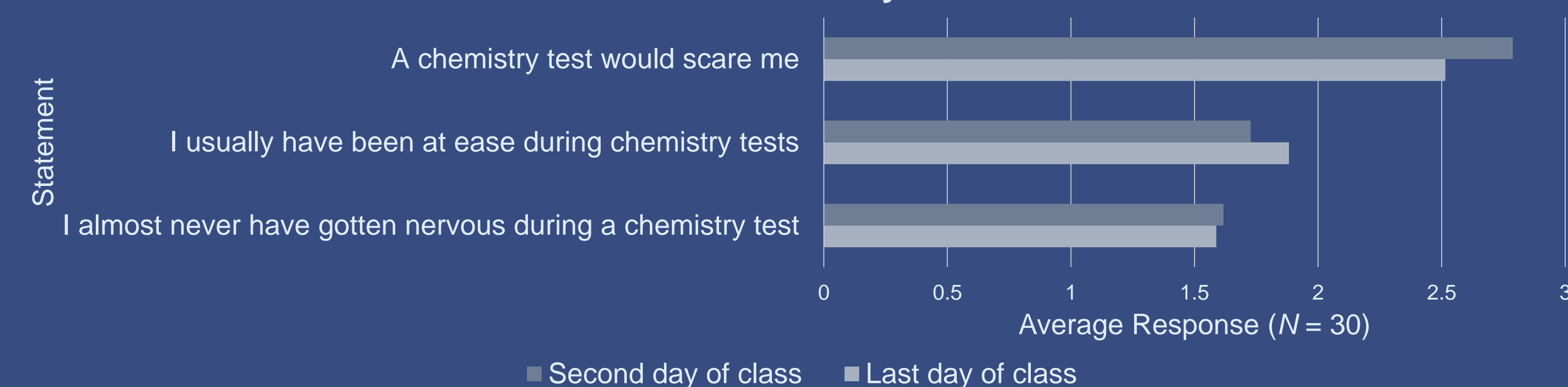
Confidence in Class Work



General Anxiety



Test Anxiety



References: 1) White, K. N.; Vincent-Layton, K.; Villarreal, B. Equitable and Inclusive Practices Designed to Reduce Equity Gaps in Undergraduate Chemistry Courses. *J. Chem. Educ.* **2021**, *98*, 330-339. 2) Dicks, A. P.; Lautens, M.; Koroluk, K. J.; Skonieczny, S. Undergraduate Oral Examinations in a University Organic Chemistry Curriculum. *J. Chem. Educ.* **2012**, *89*, 1506-1510. 3) Brist, A. H. The Effect of a Contextual Approach to Chemistry Instruction on Students' Attitudes, Confidence, and Achievement in Science. M.S. Thesis, Montana State University, Bozeman, MT, 2012. The questionnaires used in this study were approved by the UWRF-IRB as protocol number FY2022-89.



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