Investigating the Effect of Values Affirmation on the Persistence and Performance of Introductory Chemistry Students

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Motivation

- STEM fields suffer from a lack of representation
- Less than half of the three million students who enter U.S. colleges yearly intending to major in a STEM field persist in STEM until graduation[1]
- The retention rates are especially low for underrepresented groups in STEM fields[1]

Values Affirmation

- Values affirmation is the practice of writing or thinking about what you value in life and why
- Values affirmation has been shown to be effective in closing achievement gaps for first-generation students in undergraduate biology[2] and females in undergraduate physics[3]
- Our study aims to consider if values affirmation can similarly improve performance and retention, specifically among underrepresented groups in STEM, in introductory chemistry courses at St. Olaf
- For example, a question we used was "circle the two or three potential personal values listed below that are most important to you, and describe why"

Data Collection

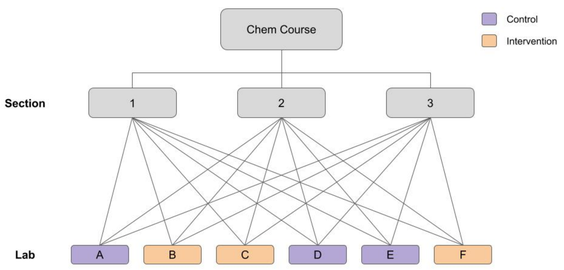

Figure 1 – Structure of experiment

- Data was gathered for two of three introductory chemistry courses
- Data was collected from Fall 2017 – Fall 2018
- A total of 296 students were surveyed
- The study received IRB approval
- Each lab section was randomly assigned to the control or the intervention group
- The intervention group received a values affirmation assignment
- The control group received a values based assignment unrelated to their personal values

Methodology

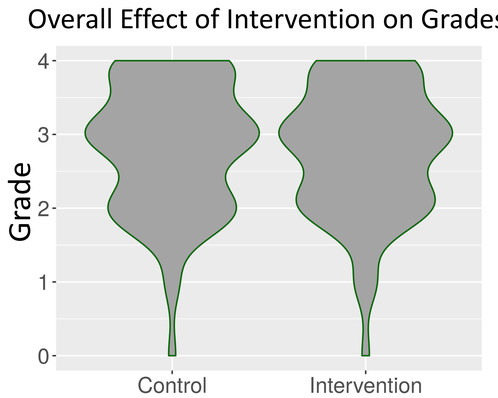

Figure 2– Differences in grades between students who received the values affirmation assignment and those who received a control assignment. Note that the distributions are very similar and the difference in average grades is not statistically significant.

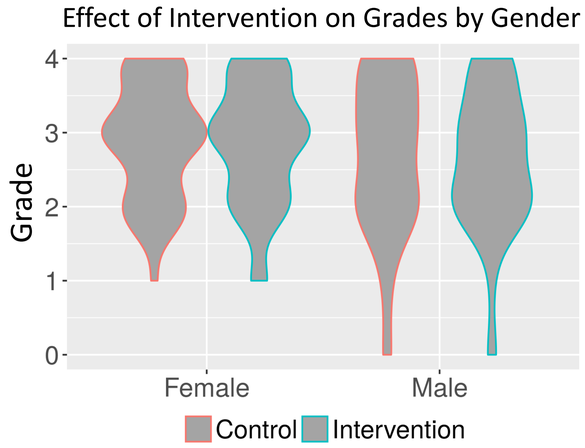

Figure 3 – Grade distributions for different genders in the control and intervention groups. Note that males do not perform as well as females in both groups. Therefore, we do not have significant evidence that values affirmation was successful in closing the performance achievement gap by gender. We obtained similar results for other achievement gaps considered.

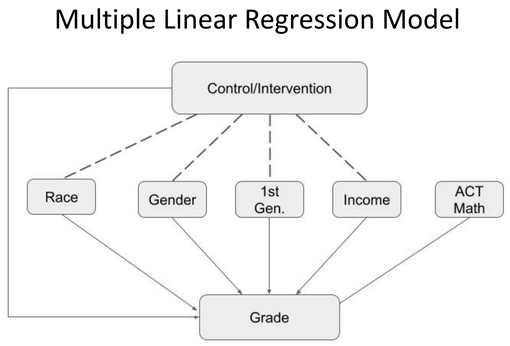

Figure 4 – The relationships we considered when constructing a complete model. In light of the proposed relationships, we explored how all the variables considered work together to explain variation in performance. ACT Math was persistently the most significant predictor, indicating that even controlling for various demographic factors, mathematical reasoning potential remains predictive of performance.

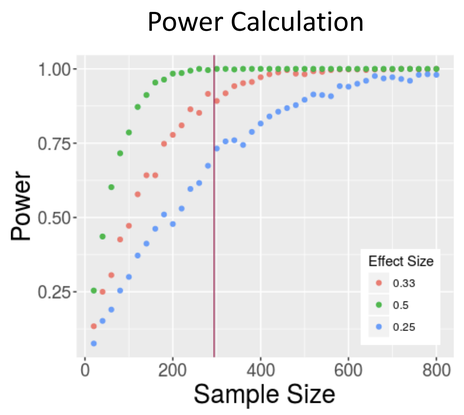

Figure 5 –Statistical power as sample size increases. Power measures the likelihood of a model picking up a significant relationship given that one exists. Our total sample size (indicated by the vertical red line) is sufficiently large that we would have picked up an overall effect of the intervention if there actually was an effect of at least 1/4 of a letter grade.

Results

- Statistically significant achievement gaps in class performance did exist for some underrepresented groups
- The effect of the values affirmation intervention did not differ significantly by the demographics considered, thus we did not find evidence that the intervention closed achievement gaps at St. Olaf
- Similar significant achievement gaps did not exist when considering retention rates

	Retention Rate
Male	66.67%
Female	69.77%

Table 1 – Retention rates were not significantly different between males and females.

	Retention Rate
Control	68.75%
Intervention	63.33%

Table 2– Retention rates were not significantly different between the values affirmation and control groups.

Conclusions

- We did not find an overall effect of the intervention on grades or retention rates
- We hypothesize that this discrepancy may result from specific characteristics of the St. Olaf community
- Perhaps, the environment that allowed for values affirmation to have an effect might not exist at a liberal arts college
- Some of the previous research also did not reveal an overall effect, but then did find differing effects closing achievement gaps
- However, we did not find values affirmation assignments to be effective in closing achievement gaps in intro chemistry at St. Olaf

References

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2. Harackiewicz, J. M., Canning, E. A., Tibbetts, Y., Giffen, C. J., Blair, S. S., Rouse, D. I., Hyde, J. S. (2014). Closing the Social Class Achievement Gap for First-Generation Students in Undergraduate Biology. *Journal of Educational Psychology.* 106, 375-389.
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