# Improving Aptitudes and Attitudes through Student-Generated Case Studies

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## RESEARCH QUESTION

Can writing standardized test passages improve research-critical skills?

## Methods

Students (N = 72) completed pre- and post-tests of attitudes toward cell biology (BIO-CLASS; Semsar, Knight, Birol & Smith, 2011) and research-critical skills (Cell Biology concepts, data analysis [understanding data], identifying primary literature, and technical reading [comphrension]) in one of 3 semesters of an upper-level cell biology course. Students wrote experimental passages like those in the MCAT or GRE by selecting a quantitative figure in a primary literature article, writing a "narrative" related to the figure, and creating 5 multiple choice questions for the narrative and figure.

## Results

Students reported significant increases in self-perceptions ($ts[22] > 2.64$, $ps < .02$), assignment scores ($t[56] = 6.57$, $p < .001$), test-scores ($ts[68] > 4.44$, $ps < .0001$), and significantly closer to expert attitudes on "real world connections" ($t[65] = 2.43$, $p = 0.017$), "problem solving (PS): reasoning" ($t[65] = 2.49$, $p = 0.015$), "PS: strategies" ($t[65] = 4.23$, $p < .001$), "PS: effort" ($t[65] = 4.67$, $p < .001$) and "conceptual connections / memorization" ($t[65] = 3.71$, $p < .001$). Greater alignment with experts across the semester was associated with improvement on primary literature identification ($r[63] = -0.43$, $p < 0.001$), data interpretation ($r[63] = -0.37$, $p < 0.005$), and mastery of course concepts ($r[63] = -0.46$, $p < 0.001$).

## Discussion

We believe this is a promising approach to improve research reading skills in many sciences. Although students showed improvements in most assessed areas, no correlation was found between skill improvement and assignment improvment. This may be due to changes in assignment assessment across semesters. Future studies should have a control group

### Reference

Semsar, K., Knight, J. K., Birol, G., & Smith, M. K. (2011). The Colorado Learning Attitudes about Science Survey (CLASS) for use in Biology. CBE life sciences education, 10(3), 268–278. doi:10.1187/cbe.10-10-0133

Student research-critical skills, perceived abilities, and attitudes toward science improve across a GRE/MCAT passage writing assignment.
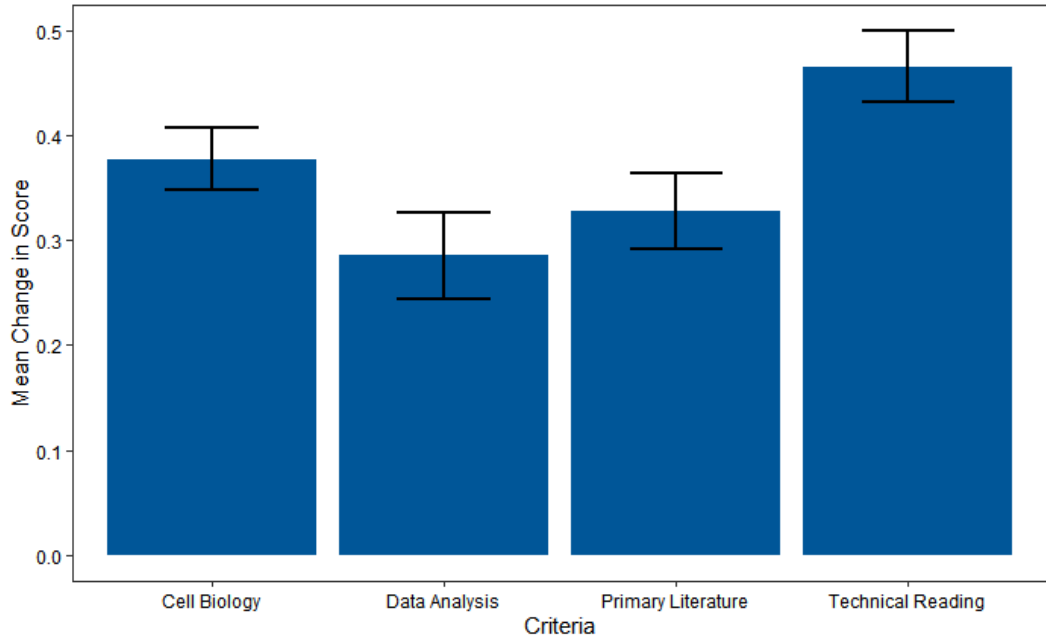


**Figure 1.** *Mean change in test criteria scores.* Error bars represent within-subjects, multiple-comparison corrected confidence intervals
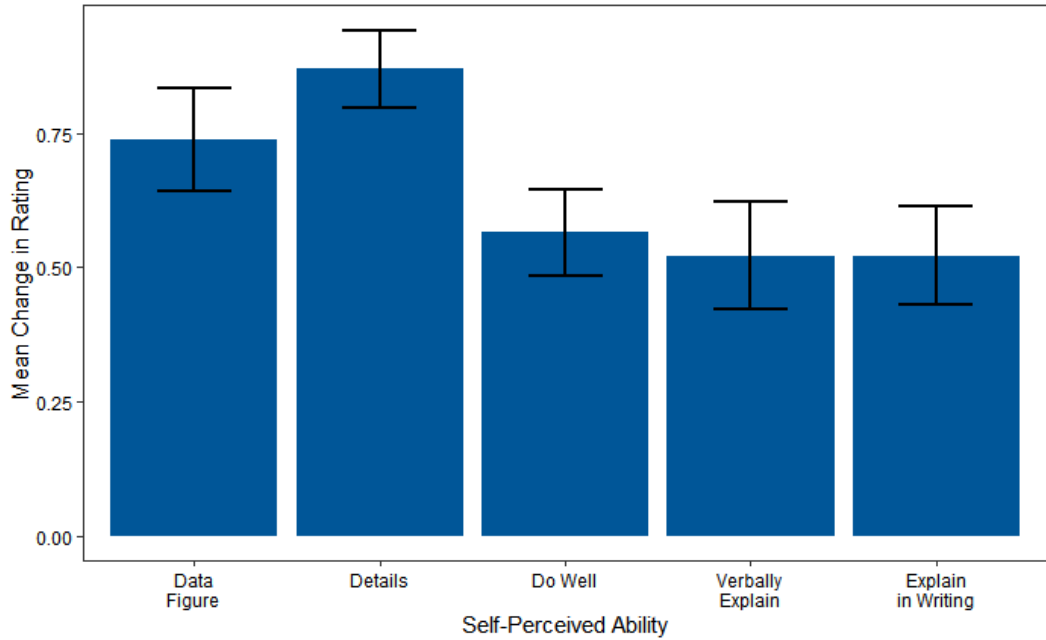


**Figure 2.** *Mean change self-rating in ability rating.* Error bars represent within-subjects, multiple-comparison corrected confidence intervals
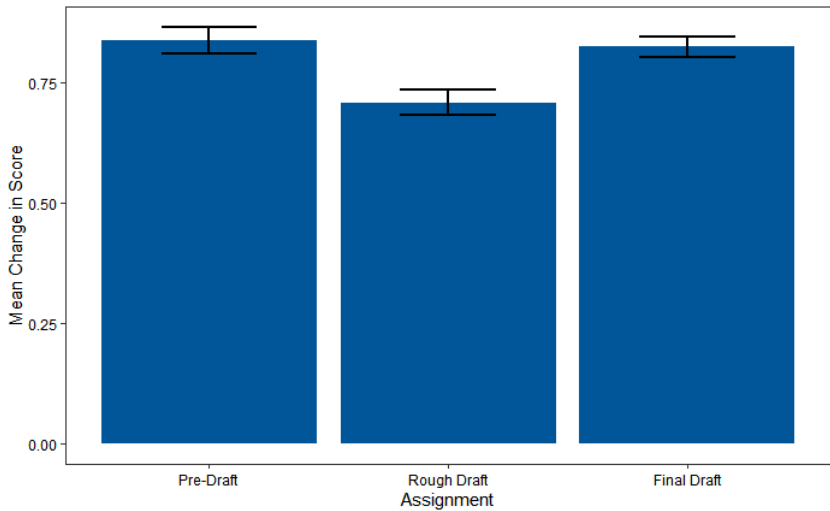


**Figure 3.** *Mean change assignment score.* Error bars represent within-subjects, multiple-comparison corrected confidence intervals. Pre-Draft graded for effort.
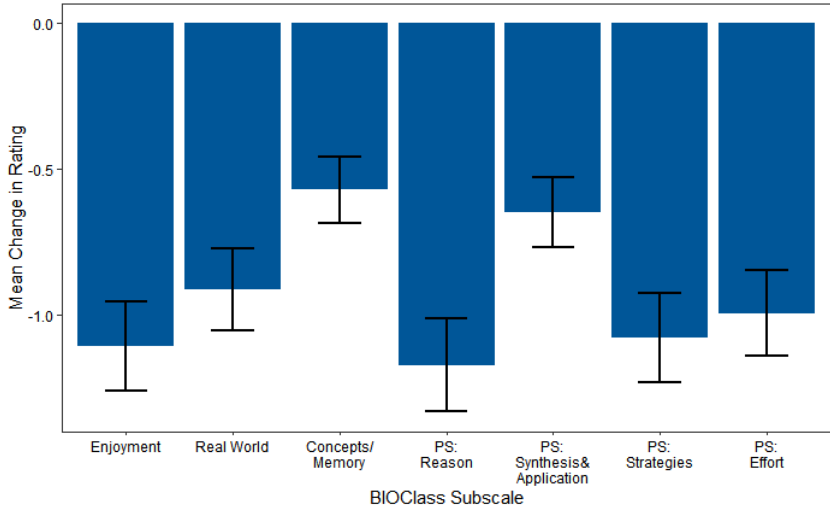


**Figure 4.** *Mean change attiutde ratings.* Negative indicates closer expert alignment. Error bars represent within-subjects, multiple-comparison corrected confidence intervals
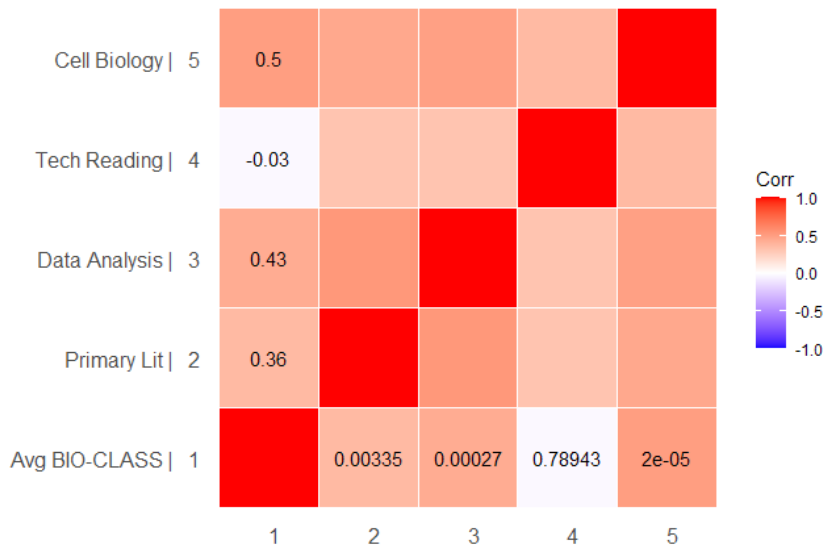


**Figure 5.** *Heatmap of test criteria and BIO-CLASS.* Pearson's correlation coefficient above diagonal, *p*-value below diagonal.