

Concept Mapping Improves Student Scores in an Introductory Biochemistry Course

Carly Kibbe^a, Lisa Lenertz^b, and Devin Wixon^c

^a Department of Medicine, Division of Endocrinology, University of Wisconsin-Madison

^b Department of Biochemistry, University of Wisconsin-Madison

^c Wisconsin Center for Education Research, University of Wisconsin-Madison



INTRODUCTION

- Concept maps are graphical tools for visualizing knowledge structure.
- Key concepts are enclosed in circles or boxes and connecting lines are used to indicate the relationship between concepts.
- There is extensive literature showing that building concept maps can help enhance student learning by improving student knowledge structure.
- Previous studies in biochemistry courses¹, large undergraduate classrooms², and with nursing students³ have shown that concept mapping enhances student learning.
- The purpose of this study was to find new activities to incorporate into Biochemistry 501 discussion sections to improve student learning.

TAR Question: Will a concept mapping activity improve student scores in an introductory biochemistry course?

METHODS

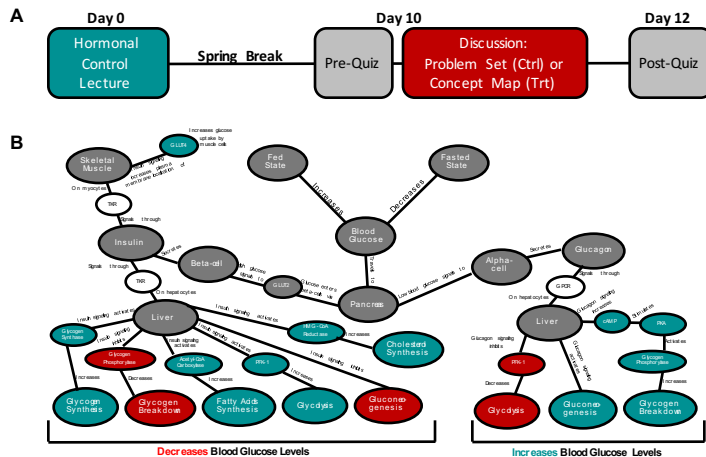


Figure 1. The study timeline (A) began with the hormonal control lecture on Day 0 which was followed by the discussion activity the week after spring break. All students took the pre-quiz prior to the discussion activity, five discussion sections completed the normal problem set (Control) and five discussion sections took part in the concept mapping activity (Treatment). Two days after the discussion activity all students completed the post-quiz. An example of the concept map (B) students were asked to construct is shown above.

RESULTS

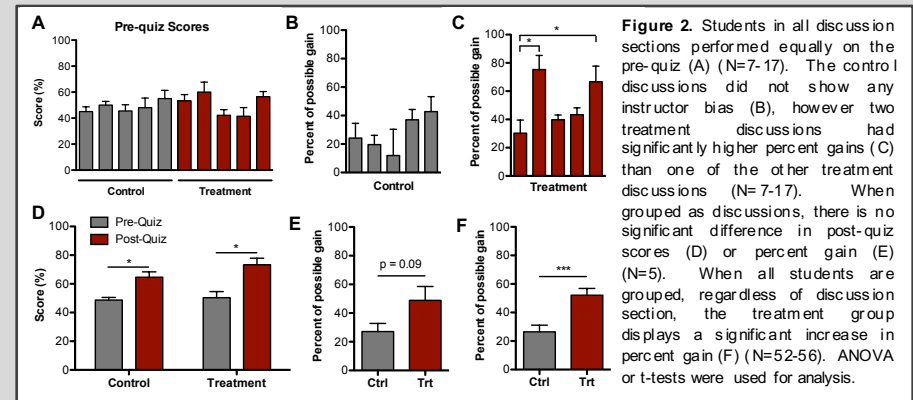


Figure 2. Students in all discussion sections performed equally on the pre-quiz (A) (N=7-17). The control discussions did not show any instructor bias (B), however two treatment discussions had significantly higher percent gains (C) than one of the other treatment discussions (N=7-17). When grouped as discussions, there is no significant difference in post-quiz scores (D) or percent gain (E) (N=5). When all students are grouped, regardless of discussion section, the treatment group displays a significant increase in percent gain (F) (N=52-56). ANOVA or t-tests were used for analysis.

CONCLUSIONS

- There was no observed difference in pre-quiz scores across the discussions, suggesting all students came into the study with similar background knowledge.
- There does appear to be an instructor bias in the treatment groups, demonstrated by two discussions having significantly higher percent gains than one other treatment discussion.
- When students are grouped by discussion average, concept mapping appears to increase the percent of possible gain, however it is not statistically significant.
- When students are grouped by control or treatment, regardless of discussion section, the effect of concept mapping on percent of possible gain is highly significant.
- Further studies will be needed to determine if the concept mapping activity is responsible for the increased gains or if the two exceptional treatment discussion sections skewed the results.

LITERATURE CITED

1. Surapaneni KM, Tekian A. Concept mapping enhances learning of biochemistry. *Medical Education Online*. 2013;18:10.
2. Morse D, Justas F. Implementing Concept-based Learning in a Large Undergraduate Classroom. Wright R, ed. *CBE Life Sciences Education*. 2008;7(2):243-253.
3. Jaafarpour M, Azami S, Mozafari M. Does concept mapping enhance learning outcome of nursing students? *Nurse Education Today*. 2016.