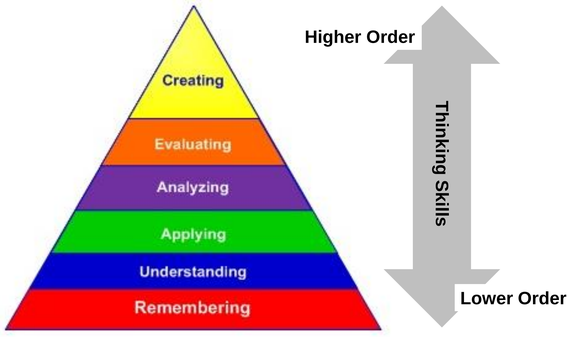
To poll or not to poll? Assessing the impact of interactive polling versus group discussion on student engagement and learning

Heather Evans Anderson

Abstract

Active learning is known to promote student depth of knowledge, engagement in the classroom, and retention in the sciences. The purpose of this project was to compare the effectiveness of two different active learning strategies: 1) problem-based learning using interactive polling of individual students interspersed in between brief lectures 2) team-based learning using group discussions after an in-class hands or activity that illustrates a physiological concept. Targeted learning objectives were assessed by ranking exam questions using Blooms taxonomy on separate exams and again on a cumulative final exam. The effectiveness of each strategy was determined by student performance on exams.



Blooms Taxonomy- Revised

Background

The objective of this project is to implement and assess active learning strategies in Anatomy and Physiology. There is a plethora of evidence that demonstrates active learning promotes student depth of knowledge, engagement in the classroom, and retention in the sciences (Freeman et al, 2014). The literature also indicates that faculty skill development is key in realizing the potential benefits of active learning, specifically in the development of higher order skill proficiency (Hopper and Brake, 2018).

This project will determine which of the following active learning strategies is more effective toward promoting student learning gains and higher order skill development:

Strategy 1) problem-based learning using interactive polling of individual students interspersed between brief lectures

Strategy 2) team-based learning using group discussions after an in-class activity that illustrates a physiological concept.

Methods

Alternate strategies were used to address these 4 learning objectives (LO):

Compare and contrast the depolarization of a nodal cell in SA node and a cardiac myocyte.

Strategy 1-*Poll Everywhere will be used for polling of students in between mini-lectures coupled to worksheet with graphs and images*

Detail the spread of the action potential through the heart's conduction system and how this depolarization wave passes through the myocardium to initiate contraction of the heart.

Strategy 2- *In class activity will be conducted where groups produce sketches of conduction system pathway and use materials to illustrate depolarization wave propagation through heart. Students will then discuss activity as a table (2 groups of 4 students each at each table) and report out to entire class.*

Detail the three layers that make up the glomerular filtration membrane and describe what is filtered and not filtered out of blood.

Strategy 2-*In class activity will be conducted where students construct a filtration membrane and use different materials to represent components of blood that are filtered or not into renal tubule. Students will then discuss activity as a table (2 groups of 4 students each at each table) and report out to entire class.*

Describe what occurs when the filtration membrane is damaged (ie. kidney trauma, high blood glucose in diabetes, heavy metals, and some bacterial toxins). Explain what effect would this have on relative permeability of the membrane and the substances that are filtered.

Strategy 1- *Poll Everywhere will be used along with mini-lectures and student worksheet that includes graphs and relevant images*

For each strategy and learning objective, 4 exam questions were targeted (2 lower order, 2 higher order). Student performance on each question was assessed. Total points earned on all questions was also used as a comparison. In addition, an engagement survey was also conducted during the final exam to gather students' perceptions of class activities.

Results

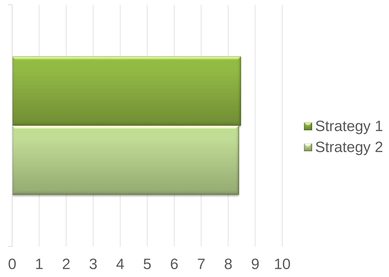


Figure 1 – Comparison of Strategy 1 vs. Strategy 2. The total points earned from targeted questions for each strategy was averaged. There was no significant difference in student performance between strategies (p=0.79)

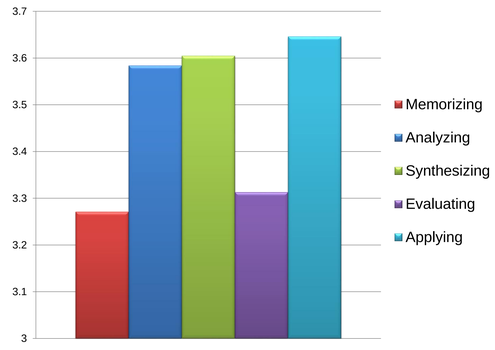


Figure 2 – Higher order skill development in students. Results from student engagement survey show increased emphasis on higher order skills such as applying, synthesizing, and analyzing over lower order skills such as memorizing and evaluating. Scale: 4: very much; 3: quite a bit; 2: some; 1: very little (Ahlfeldt et al, 2005).

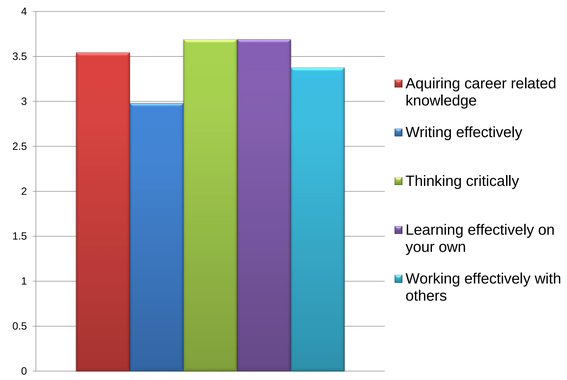
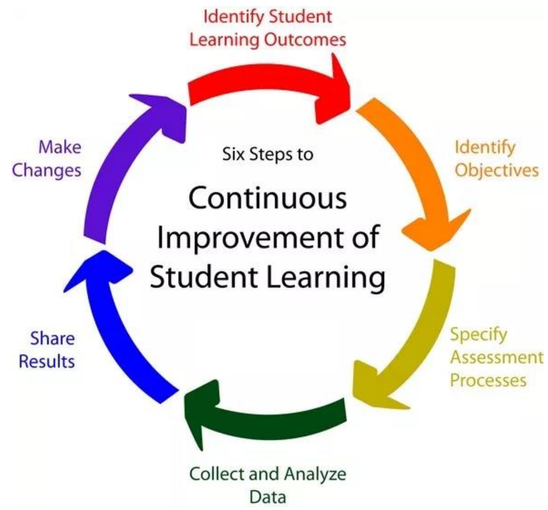


Figure 3 – Student perception of course contributions to their knowledge, skills and personal development. Student responses indicate their perceived gains from this course, which are all positive outcomes for this course.

Future Directions

- Review exams in order to determine if a strategy resulted in improved performance on questions that required higher order thinking skills
- Examine previous courses to compare exam performance without active learning intervention
- Expand use of active learning strategies to additional learning objectives in API in fall semester.



References

Freeman S, Eddy SL, McDonough M, et al. Active learning increases student performance in science, engineering, and mathematics. Proc Natl Acad Sci U S A. 2014;111(23):8410–8415.

Hopper MK, Brake DA. Student engagement and higher order skill proficiency: a comparison of traditional didactic and renewed integrated active learning curricula. Adv Physiol Educ. 2018 December 01;42(4):685-92.

Stephanie Ahlfeldt, Sudhir Mehta and Timothy Sellnow. Measurement and analysis of student engagement in university classes where varying levels of PBL methods of instruction are in use. Higher Education Research & Development. 2005 Feb;24(1):5-20.

Funding Sources and Acknowledgements

Support for this project was provided by Stetson University and a Promoting Active Learning Mentoring (PALM) fellowship to HJEA with mentor, Dr. Mari Hopper. PALM is funded by NSF Research Coordination Network in Undergraduate Biology Education grant #1624200. Project support from Professional Societies Alliance for Life Science Education. For questions regarding PALM network, please email Sue Wick at swick@umn.edu or see https://palm.ascb.org/

Special thank you to Dr. Mari K. Hopper for her mentorship and guidance on this project.