

INCREASING STUDENT MOTIVATION AND CONTENT KNOWLEDGE THROUGH INQUIRY BASED TEACHING IN BIOLOGY



Background

My research was conducted at Caledonia High School, in rural southeast Minnesota. I chose my topic based on observations over several years of low student motivation towards learning science coupled with low student understanding and achievement. I believe that lack of opportunity to experience inquiry based science is at the heart of both problems. The opportunity to learn science through a hands-on inquiry based approach can provide students with more enjoyment of the subject, which in turn can lead to better student motivation towards achieving a greater understanding of content material.

Research Questions

Focus Question:

- Do inquiry based teaching practices improve scientific literacy and student motivation in high school biology?

Sub-questions:

- How does teaching using different inquiry strategies improve student understanding of biological concepts?
- How does teaching using different inquiry strategies improve student motivation and attitudes towards biology and science in general?
- How can inquiry increase student participation and understanding during lab activities?

Table 1. Data collection Methods.

	Data Source 1	Data Source 2	Data Source 3
Focus Question	Survey of Science Related Attitudes	MCA Test scores	Student observations and questions
Sub question 1	Pre- and post-unit tests	MCA Test scores	Post-lab notebook reflection
Sub question 2	Survey of Science Related Attitudes	Individual inquiry projects	Post-lab notebook reflection
Sub-question 3	Pre- and post-unit tests	Individual Inquiry Projects	Student observations and questions

Methodology / Treatment

- The study started and ended with a survey designed to gauge student attitude and motivation towards science, as well as their preferred methods of learning.
- The study alternated between a treatment unit each taught using a different inquiry based curriculum and a unit taught with more traditional classroom lecture and practice techniques.
- Pre- and post tests were administered for each unit to measure student understanding of concepts.
- Students reflected upon their learning in a digital lab notebook after each activity or lab to gauge whether inquiry or traditional methods gave students a better understanding of the topic, and discover what questions they still had, or struggled with.
- Students also undertook an independent research project lasting the semester on a topic of their own choosing.
- Students took a state assessment in science (MCA) at the end of the course, which was compared to previous state assessment scores.

Results

- An improvement in student attitude and motivation was observed during the inquiry activities. This was shown in the increase in positive responses on the student survey.
- Test scores were analyzed at the 95% significant level using a Wilcoxon test.
 - No difference in student content knowledge was observed between the traditional units and inquiry units on the pre- and post-unit tests.
 - A significant differences in MCA scores was observed with 38% of students having previously passed the MCA in 8th grade and after inquiry instruction 73% of students passing the tenth grade MCA.

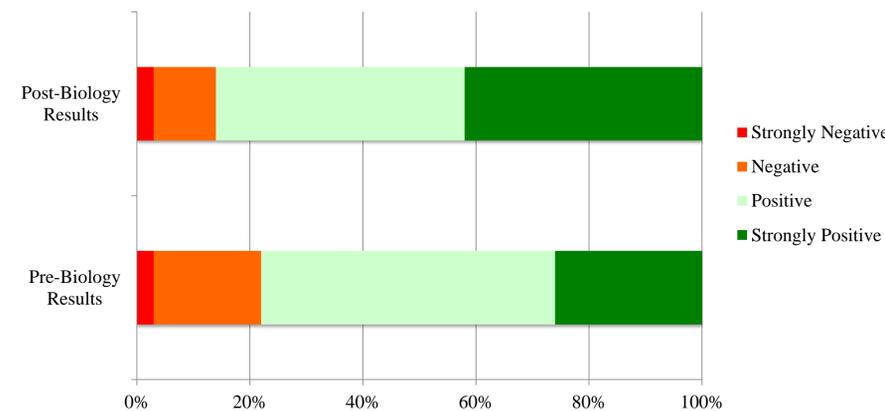


Figure 1. Student Enjoyment of Science Lessons

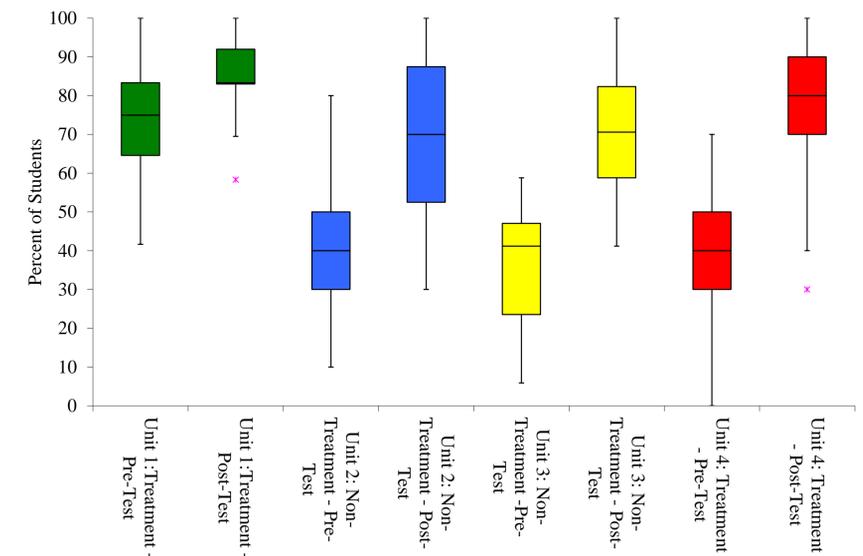


Figure 2. Pre- and Post-Unit Test Scores.

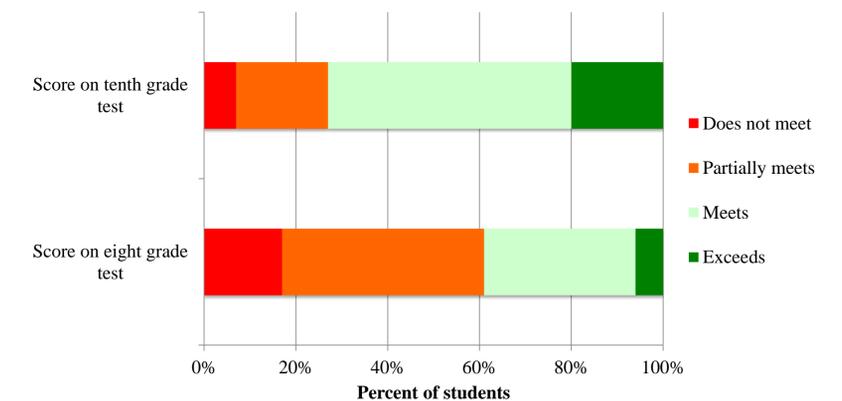


Figure 3. 8th and 10th Grade MCA Scores

Conclusions

Overall I believe that inquiry based teaching is of benefit when it come to classroom culture, as student motivation and attitude towards science are improved. Inquiry based teaching also proved to be a useful tool for improving student understanding of scientific practices, and as such helped improve state standardized test scores. There was no significant change to subject specific content acquisition through inquiry based teaching practices, but as there were no decreases in learning either, the benefits shown by this study outweigh these results.