

The Effect of Project-based Learning on Academic Achievement in a Freshman Biology Classroom

Background

My capstone research project was conducted with my three biology classes, most of whom are in ninth grade. My topic was chosen based on the observation of a common trend among many of my students; an inability to connect what they are learning to the real world away from our classroom. To solve this problem, I chose to implement the educational practice project-based learning (PBL). This practice is touted as an excellent method for relevant connections between what they learn in the classroom to their everyday lives outside of the classroom

Treatment

The project consisted of two treatment cycles where students were taught using the principles behind project-based learning. Lessons for the PBL treatment units focused on Mendelian Genetics and Molecular Genetics. Instructional activities from each PBL unit lead students towards the production of a final project also known as a PBL artifact.

Multiple choice assessments were used to assess student understanding during each treatment cycle. Scores from these assessments were compared against students from the 2014-2015 school year. Likert-style surveys were conducted pre and post-treatment cycle and interviews (student and teacher's aide) were conducted at the mid and end-point of the project.

Data Collection and Analysis

	Data Source 1	Data Source 2	Data Source 3
Primary Question	Pre and post-PBL student survey	PBL artifact, formative, and summative assessments	Student Interviews
Sub question #1	Pre and post-PBL student survey	PBL artifact, formative, and summative assessments	Student interviews
Sub question #2	Pre and post-PBL student survey	Field notes from observation	Student Interviews
Sub question #3	Pre and post-PBL student survey	Teacher interview (special education aide)	Teacher journal

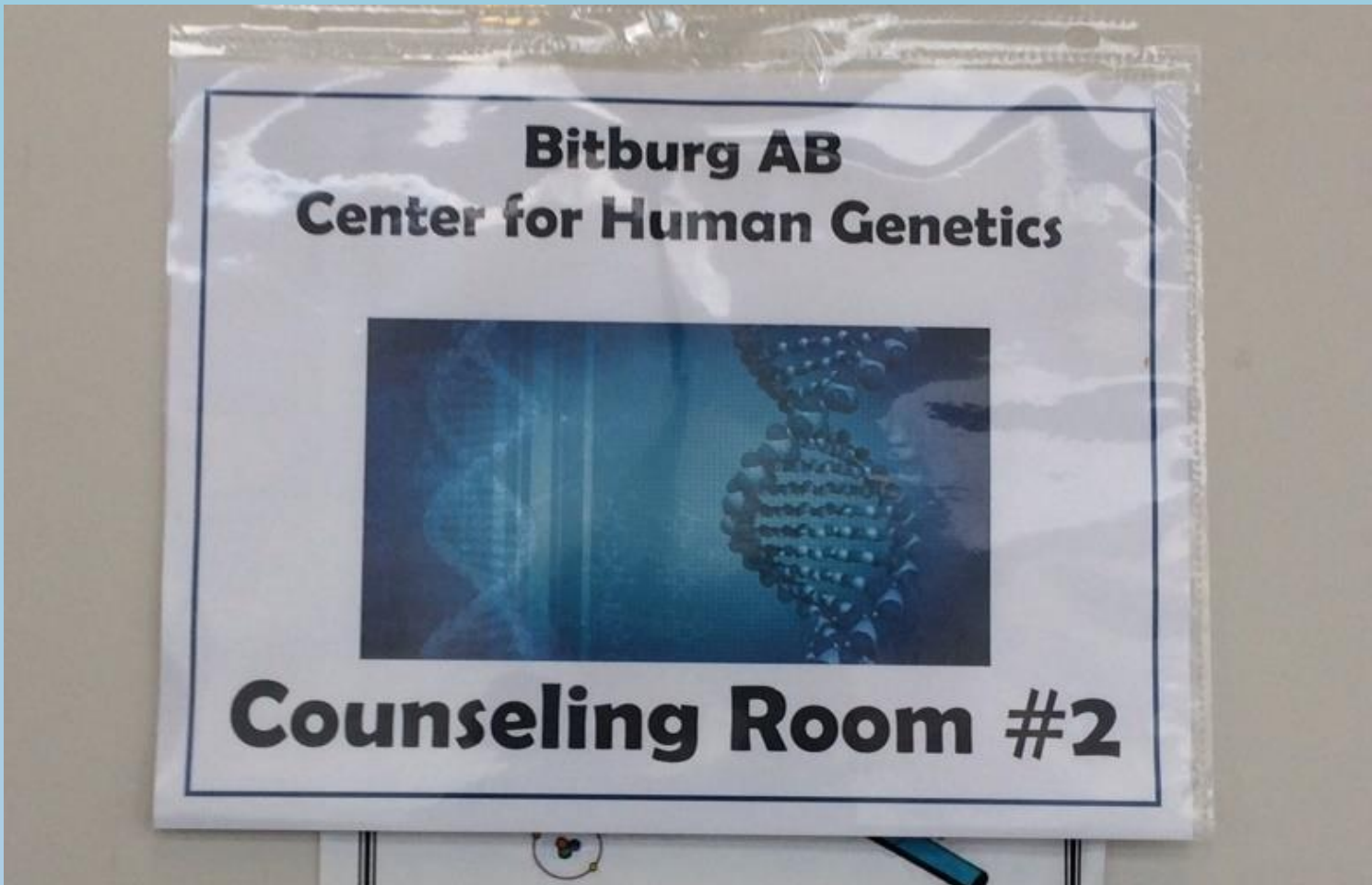


Figure 1: “Counseling Room” for molecular genetics PBL presentations.

Results

- A comparison of assessment scores between the treatment cycle students and students from the 2014-2015 school year showed no statistical difference.
- While the data collected did not show that instruction via PBL was a more effective method, it did prove to be just as effective as traditional instruction methods.
- Students found instruction via project-based learning more engaging and thought that it offered a level of flexibility they did not have in previous instructional units.
- In the open-ended explanation of their Likert scale ratings, 72% of students clearly stated that the PBL units were more effective in helping them explain the science behind things in their lives.

Primary Question

Does the implementation of project-based learning increase academic achievement in the classroom?

Sub Questions

1. Will implementation of PBL increase student’s abilities to make connections between the coursework and their everyday lives?
2. Does PBL increase student attitudes toward learning science?
3. What are some of the problems a teacher may encounter when first implementing PBL in the classroom?

Student Quotes

“I think that the PBL better prepares me to explain everyday life because it helps give context to the things that we learn.”

“PBL lessons did prepare me for the quizzes/tests because of the fact that I could take as much time with a concept as I needed (within certain parameters) until I fully grasped the topic or area of study.”

“I was having more fun with the PBL during science class. It made me wonder what we are going to do next.”

“PBL allows me to learn topics in a way that works for me, but maybe not for the teacher.”

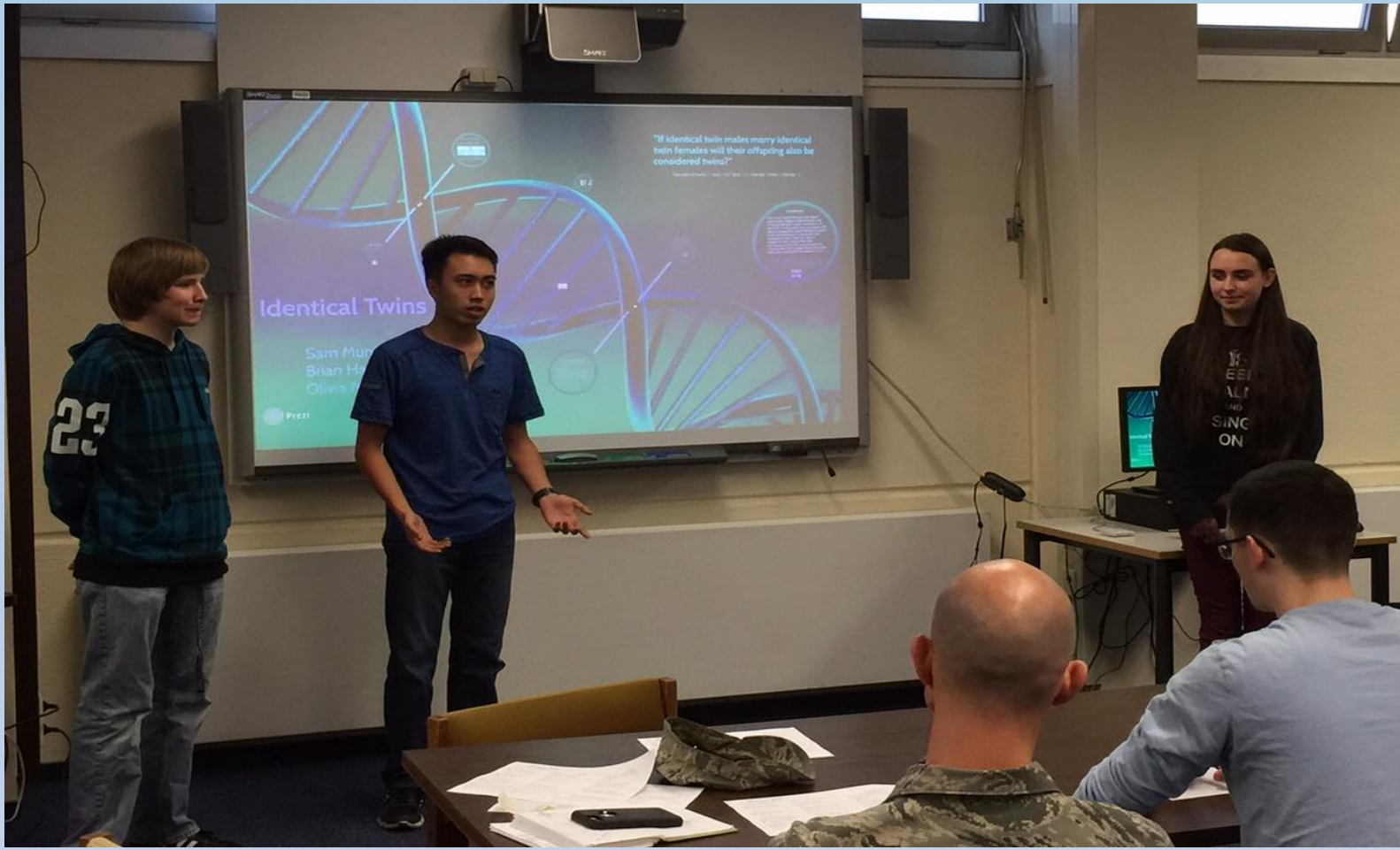


Figure 2: Presentation to community members during identical twins PBL

Conclusion

- While PBL instruction requires a lot of up front planning by a teacher it does provide greater opportunities for students to identify real-world connections to the topics learned in class.
- Group dynamics are a challenging aspect of this instructional method but they also allow students who were normally in the background to step up as leaders.
- Instruction via PBL lends itself to varying levels of learners as a teacher can provide more support in the beginning and slowly take away the support as the comfort level increases.

