The Effects of Project-Based Learning in the Middle School Science Classroom

Justine Fox, Edgewood Campus School, Madison, Wisconsin

Background

This research was conducted at Edgewood Campus School (ECS), a K-8 private school, located in Madison, Wisconsin. Problem solving is an essential skill in the workplace, academics, and everyday life. Recognizing the importance of developing this skill and increasing my students' confidence led me to the focus of my study. Additionally, with a one-to-one student-iPad ratio at ECS, I decided to implement Project-Based Learning (PBL) as it is known to prepare students with 21st century technology and problem-solving skills. PBL is an instructional model using authentic, real-world projects, driven by inquiry that requires students to work collaboratively to design many aspects of the assignment and create solutions (Bender, 2012).

Methodology

- The study was conducted on 39 sixth graders.
- There were four treatment phases alternating with four non-treatment phases over a six month period.
- During the treatment phases, units were taught using PBL. Students needed to collaboratively complete a project and present or publish the final product (Fig. 1).
- During the non-treatment phases normal classroom instruction took place.

Fig. 1. PBL projects. Clockwise from upper left: iMovie constellation presentation, egg drop event, planet public presentation, earthquake proof buildings simulation.

Research Questions	Data Collection Instruments		
	1	2	3
Focus Question: Does the implementation of PBL improve comprehension and problem solving skills?	Pre and Post Content Test	Pre and Post Self Evaluation Survey	Pre and Post Self Evaluation Survey
Secondary Question: Does PBL improve student confidence?	Problem Solving Question	Unit Reflection Questionnaire	Unit Reflection Questionnaire
Secondary Question: What are students attitudes towards using iPads to engage in PBL?	Unit Reflection Questionnaire	Interview Questions	Pre and Post Self Evaluation Survey

Data and Analysis

- Students demonstrated consistent medium-high growth on all PBL post-assessments as the average normalized gain ranged from 0.63 to 0.77, whereas the average normalized gain for normal instructional units varied from low-medium-high (*N*=39).
- Problem solving performance was high concluding all PBL units as the average was a 3.27 compared to 2.85 for non-treatment units (Fig. 2).
- At least 69% of students agreed or strongly agreed that they were confident explaining the information from PBL units.
- Concluding treatment of PBL, 64% of the students would rather complete a project than take a test in science class (Fig. 3).
- Post-treatment, 92% of students indicated that using technology in science class makes learning easier (Fig. 4).

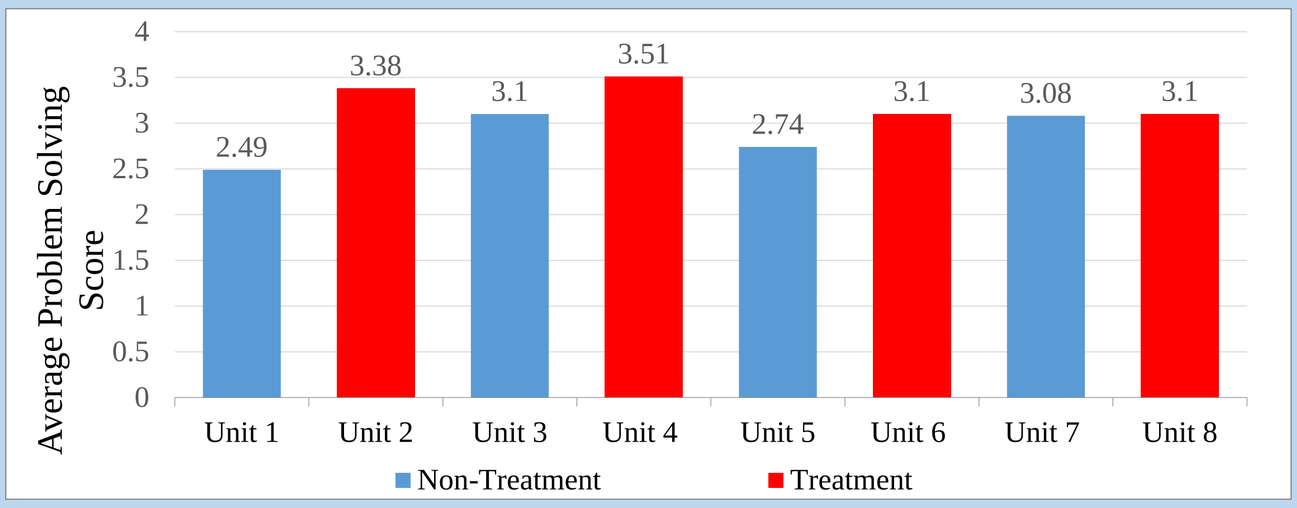

Fig. 2. Average problem solving score concluding each unit, (*N*=39).
Problem solving scores: 4 = problem solved accurately, 3 = appropriate strategies were used but solution is not entirely correct, 2 = appropriate strategies were used but solution is not correct, 1 = incomplete and/or incorrect response, 0 = blank response.

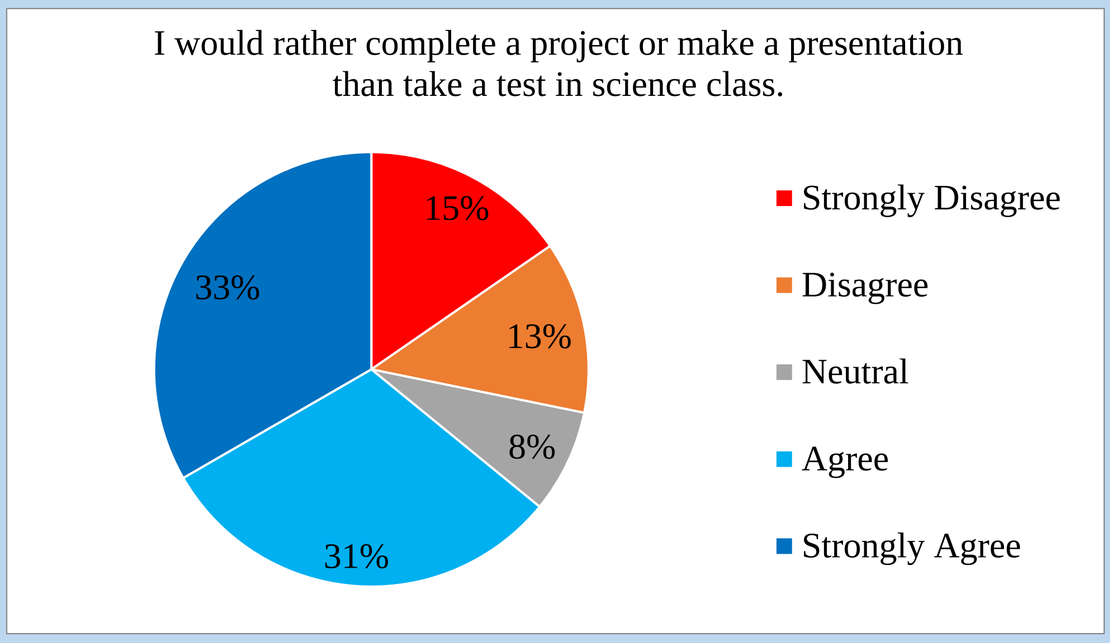

Fig. 3. Post-treatment attitudes of projects vs. tests, (*N*=39).

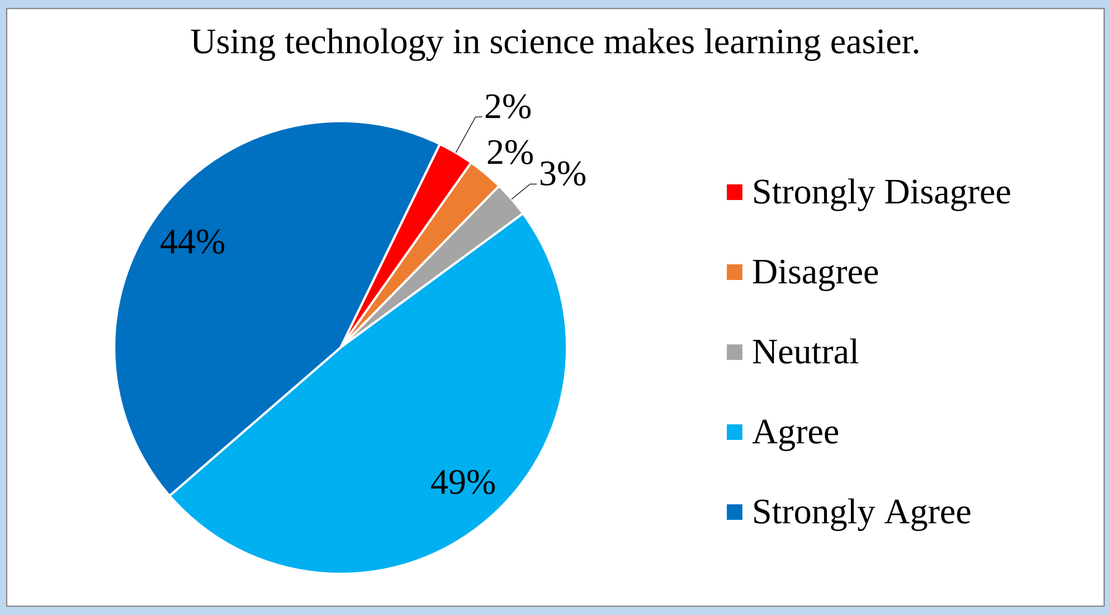

Fig. 4. Post-treatment attitudes of using technology during science, (*N*=39).

Conclusion

This study supports that PBL has a positive effect on student comprehension and problem solving. The results from the unit reflections indicated that students were more confident during treatment units. Students felt strongly that technology makes learning easier in science class. Providing my students with this greater sense of responsibility, I observed improvement in my students management and leadership development from the first PBL unit.

References

Bender, W. (2012). *Project-Based Learning: Differentiating Instruction for the 21st Century*. Thousand Oaks, California: Corwin.