

Flipped Classroom Learning in High School Physics



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Introduction

As science educational standards have evolved in recent years, student-centered learning and relevant experiences have become increasingly important to student success in secondary science courses (Tomory & Watson, 2015). In order to accommodate more inquiry-based and experiential learning, the flipped classroom approach has become increasingly popular in science classrooms.

The focus of this study was to determine how implementing a flipped classroom affects student engagement and achievement.

Methods

The study involved 90 students who had been taught one semester of physics using a traditional approach.

- For a 2 month period, students were taught using a flipped approach.
- Lecture videos were assigned for homework using EDpuzzle and Edmodo.
- Practice problems and lab reports were completed during class time rather than at home.



Student progress was tracked using the following data collection instruments:

- **Student Engagement Survey:** Measured students' engagement pre- and post- treatment. Analyzed using a Wilcoxon Signed Rank Test.
- **Unit Assessments:** Given at the beginning and end of each unit to measure student learning. Analyzed using normalized gain.
- **County-wide Assessment Data:** Data from schools across the county from 2016 and 2017 administrations was analyzed for overall trends.
- **Student Interviews:** Conducted throughout the study to provide additional qualitative evidence.

Results

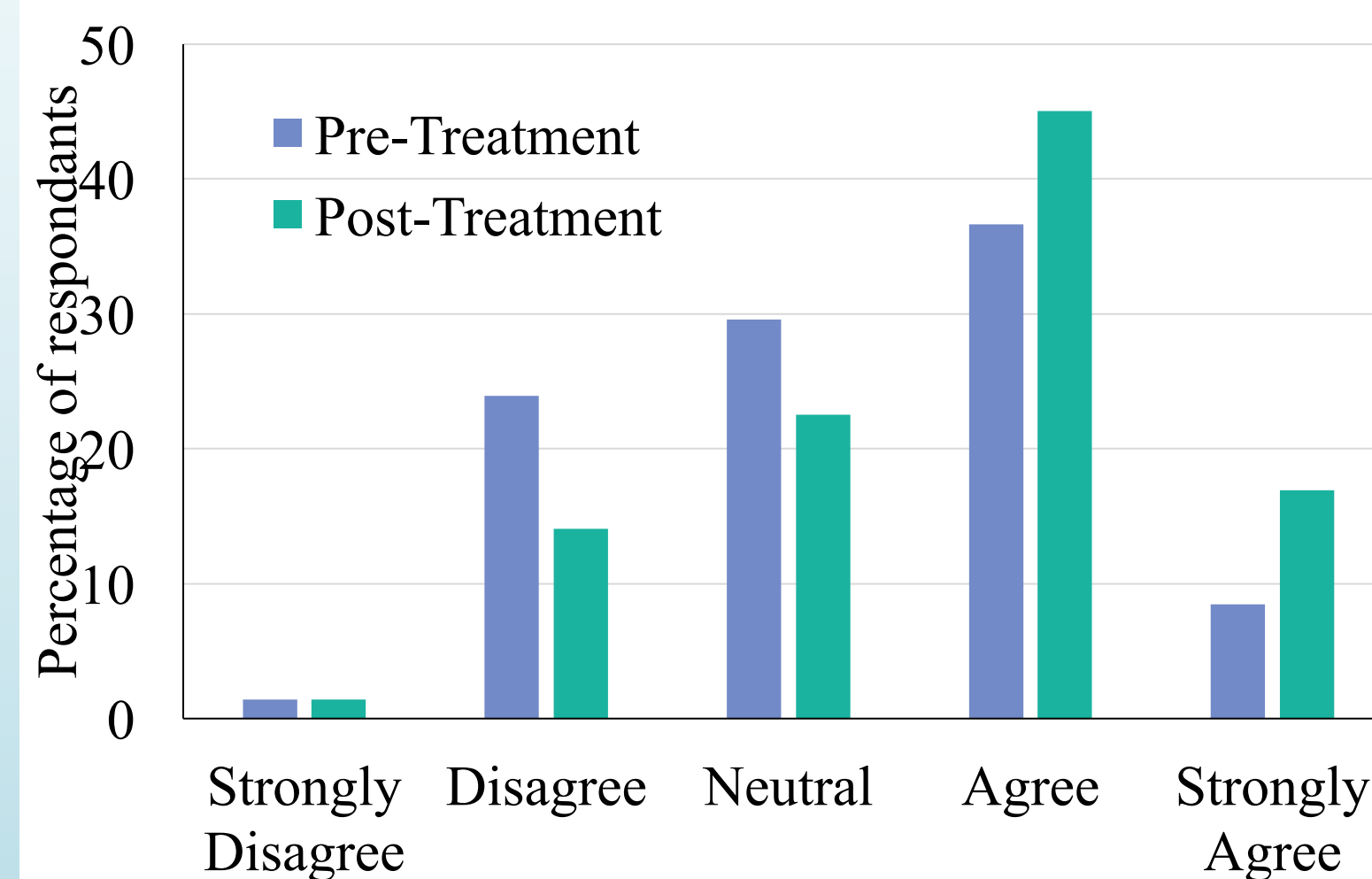


Figure 1. Pre- and post-treatment responses to *I am satisfied with my performance in physics class*, of the Student Engagement Survey, (N=71).

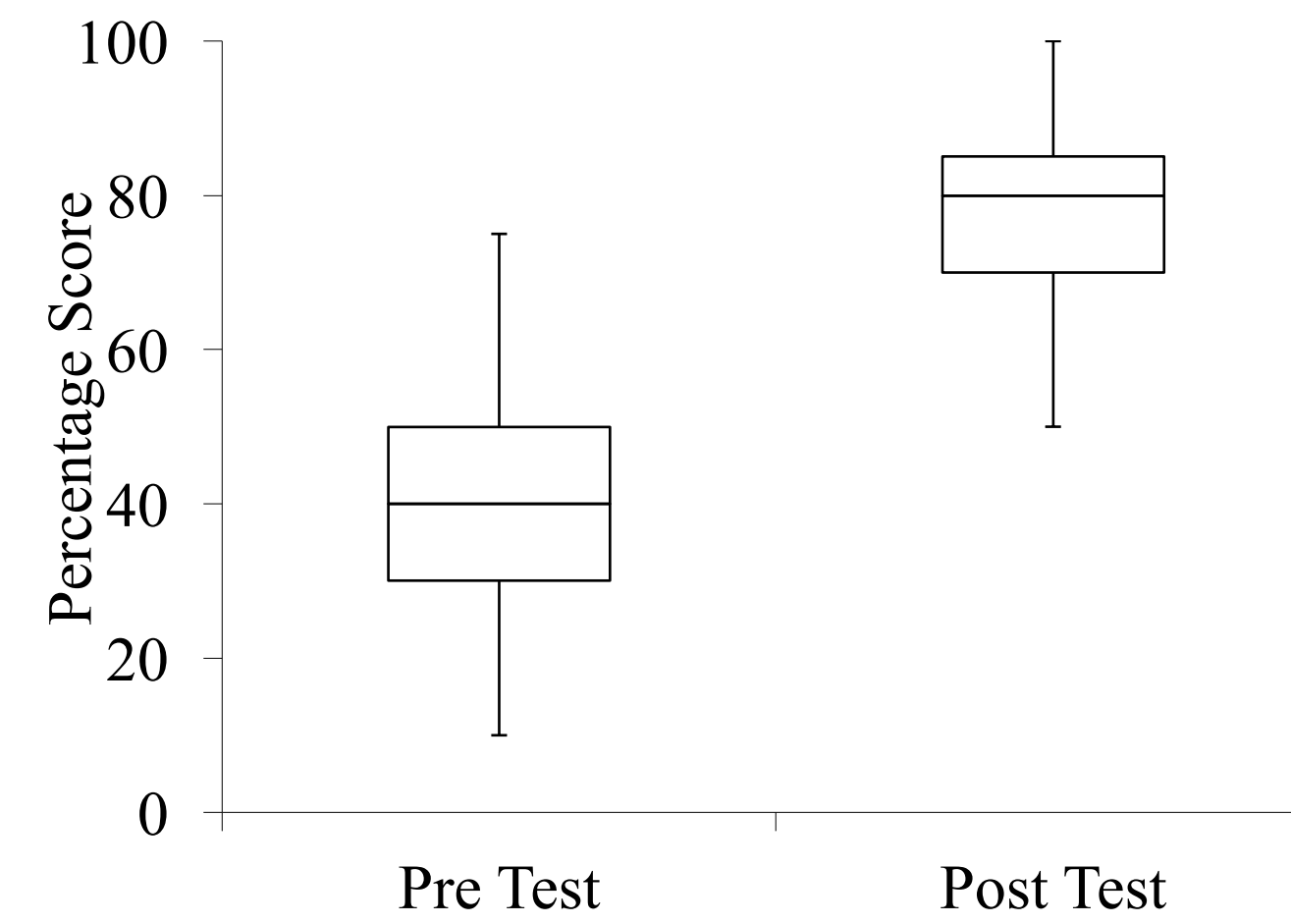


Figure 2. Comparison of pre-test and post-test scores on the Energy Transfers and Nuclear Energy Unit Assessment, (N=81).

Table 2. County-Wide Third Quarter Assessment Results for 2016 and 2017 Administrations

Year:	2016		2017	
	Average Score	Rank	Average Score	Rank
School:				
Broadneck	70	1	75.8	1
South River	65	4	75.5	2
Severna Park	68	2	73.6	3
Chesapeake	66	3	69.6	4
Old Mill	50	7	67.8	5
Arundel	---	n/a	65.7	6
Northeast	54	6	56.4	7
Meade	---	n/a	51.7	8
Annapolis	55	5	---	n/a
Overall	62		71.1	

Conclusions

Achievement

- The majority of students were able to reach an acceptable proficiency level in the material under the flipped classroom approach.
- South River's ranking on the county-wide assessment improved under the flipped method.
- The study showed that the flipped classroom method is a viable alternative to traditional methods.

Engagement

- At the end of the study, students reported they felt better prepared to tests and quizzes and were more satisfied with their performance in physics class.
- Most areas of the engagement survey showed a modest increase.
- Some students responded less positively to the videos than others, with the most common complaint being unable to ask questions about new material immediately after it was presented.

Student Quotes

- "I study for physics by reviewing the homework videos. I think they are extremely useful and a huge help."
- "Yes! The videos are a fun, interactive way to learn new subjects. I love the videos."
- "[The videos] made my note taking better, and are preparing me for what's to come next year at online college."

References

Tomory, A., & Watson, S. (2015). Flipped Classrooms for Advanced Science Courses. *Journal of Science Education and Technology*, 24(6), 875-887.