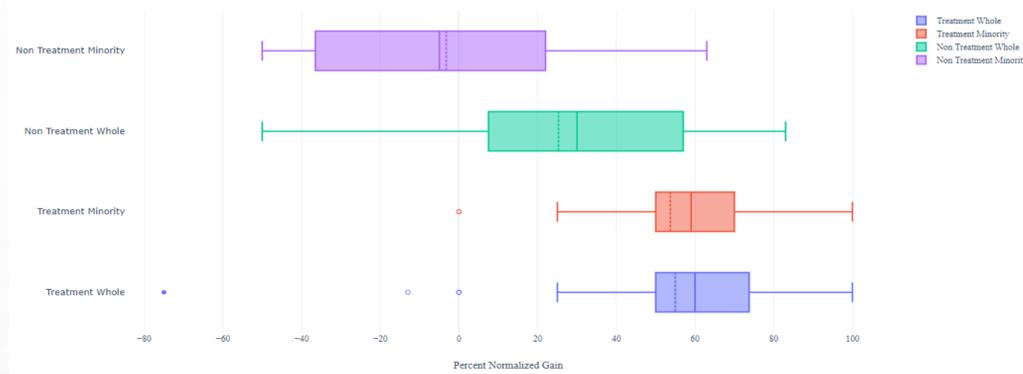
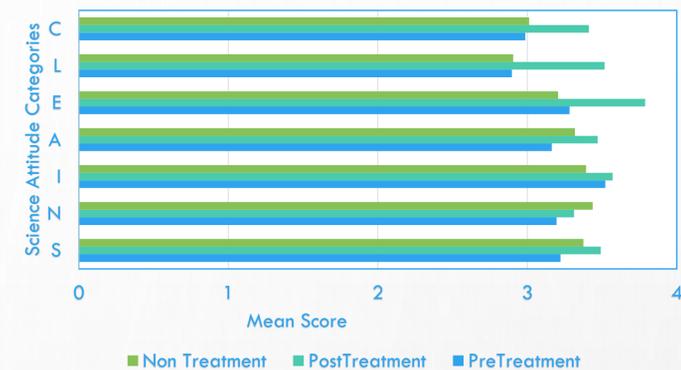


Effects of Phenomenon on Assessment and Science Attitudes

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Pre, Post, and Non-Treatment Groups Mean Group Scores for Seven Categories of TOSRA survey



Background

Wilson Middle School is a 6-8 building in Cedar Rapids, Iowa. This study was conducted with 97 seventh grade general science students for 9 weeks. The school is 76% free and reduced lunch and rated as a "priority" school by the state of Iowa. In an effort to increase engagement a phenomenon was encouraged to be used by middle school science teacher. The purpose of this study was how the use of this phenomenon impacts how well student perform on NGSS inspired 3D assessments.

Research Question

How does using a phenomenon impact student achievement on 3D assessments

Sub Questions

- How does using a phenomenon impact student engagement
- How does using a phenomenon impact achievement for minority and special education students

Methodology

- Phenomena are specific natural events used to inspire wonder and curiosity in students while helping them explain a scientific concept
- The treatment group's science classes were focused around a natural phenomenon.
 - Earth Science: Formation of the Grand Canyon
 - Potential and Kinetic Energy Roller Coasters
- This project was conducted from December 7, 2018 until February 15, 2019.
- It consisted of three treatment rounds each consisting of approximately three weeks in duration.
- At the beginning of treatment students were given the Test of Science Attitudes Survey developed by Barry Fraser along with a study on how they feel about assessments in science.
- A group of students was also chosen to complete interviews at the beginning and end of treatment to delve more deeply into the thoughts and opinions of students experiencing the use of a phenomenon.



Results

The normalized gain for Earth History from the pre and posttest of 47 students in the treatment group showed a mean gain of .35 and for the second unit was Potential and Kinetic Energy. The results showed a normalized gain of the treatment group was .54. The results of the Test of Science Related Attitudes (TOSRA) showed an increase in mean score from 31.84 to 35.12 with a p-value of .0390 for the treatment group after one round of data collection. The largest increase was for category Leisure Interest in Science (L) which saw a mean increase of .610 from 2.897 to 3.517. In the Washburn Phenomenon Survey, 71% of students reported to like having a phenomenon along with their unit during the Earth science unit (N=38). During the Potential and Kinetic Energy Unit, 84.4% of student reported to like having a phenomenon (N=45). The results from the Potential and Kinetic Energy CER show the treatment group had a mean score of 2.36. The nontreatment group has a mean score of 1.92 (N= 82).

Student Quotes

- "I feel like we do more this year in science class [with a phenomenon] than last year and I definitely feel like I am learning more."
- "Last year it was like the teacher taught us something then we took the test, but this year it's like we have a theme and we study it and do something with it and then take a test over what we learned."
- "I like to have a phenomenon because it helps me remember from one day to the next."

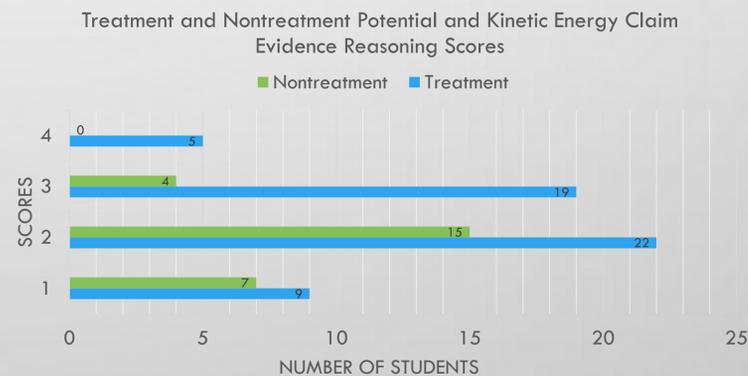
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- S- Societal Implications of Science
- N-Normality of Science
- I-Attitude towards Science Inquiry
- A-Adoption of Science Attitudes
- E-Enjoyment of Science Lessons
- L-Leisure Interest in Science
- C-Career Interest in Science

| Focus Question | Data Source 1 | Data Source 2 | Data Source 3 |
|---|---|--|--|
| Primary Question: Student Achievement | Compare scores on earth history unit between treatment and non-treatment groups | Compare scores on electromagnetic spectrum unit between treatment and non-treatment groups | Compare score on Claim Evidence Reasoning writings between treatment and nontreatment groups |
| Sub-Questions 1 Student Engagement | Pre- Mid- and Post-Treatment Surveys | Pre- Mid- and Post-Treatment Interviews | Test of Science Attitudes Survey |
| Sub Question 2 Minority and Special Education Population Impact | Compare scores for subgroups on between treatment and non-treatment groups | Test of Science Attitudes Survey for subgroups | Pre- Mid- and Post-Treatment Surveys for subgroups |



Conclusion

The goal of this study was to try and determine the size, if any, of the impact using a phenomenon would have on how students learn science and what they think about science. This study across two units has led to several possible conclusions about how using a phenomenon can impact students in the middle school science classroom. First, the achievement data for students does not look very remarkable when taken as a whole, but when the data is looked at in pieces it shows how using a phenomenon helps acts specific students with additional barriers to learning, engage more and have a greater interest in science and this does have a positive impact on student achievement.

