

Teaching Physical Science With Scientific Inquiry and Science Notebooks

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Student Quotes

"It (Scientific inquiry) gave me a better point of view, when you look at a paper it can explain it, but when you do it, it helps you understand better from your own perspective."

"After we wrote the notes I could always go back and look at it to remind me how to do something."

"It is easier to know how it works because you can see it and touch it."



Sample egg drop carriers used to explore many concepts of physics.



BACKGROUND

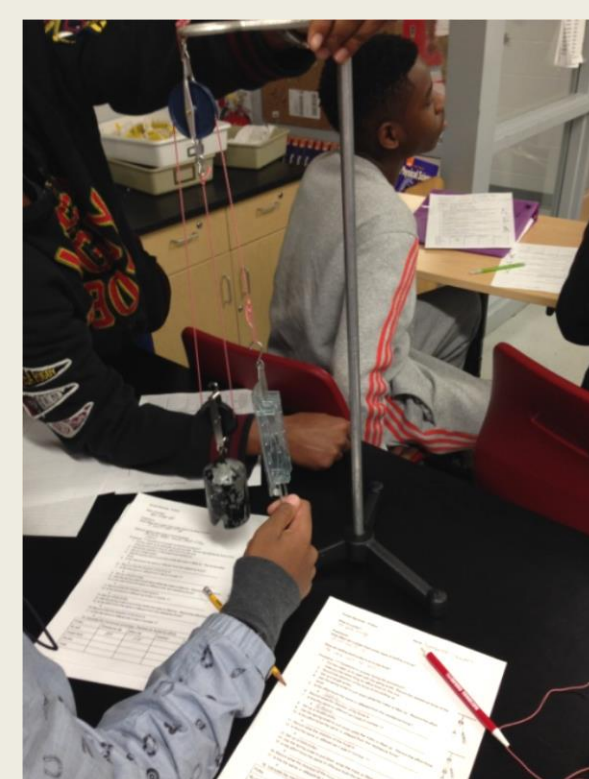
Science classes have the unique opportunity of being a real life experience through the curriculum. Scientific inquiry is a method of teaching that involves scientific practices. This method includes predicting, analyzing, creating, scientifically arguing, and exploring. These practices allow students to explore concepts in a similar manner as scientists. Students can process this information through the use of science notebooks. Scientific notebooks allow students to take ownership of their learning.

RESEARCH CLASS

Princeton High School is a very diverse public high school in Cincinnati, Ohio. The students in the study are in a college prep level physical science class.

METHODOLOGY

There were 36 physical science students involved in this research ($N=36$). Students took a pre and post test for two different units in physical science. During the treatment students used scientific notebooks which were graded using a rubric. Scientific inquiry methods were used during the curriculum. Students were observed for engagement by an outside observer. Likert survey and interviews were conducted at the end of the treatment.



Students exploring simple machines.



Students building a roller coaster to explore energy.

RESULTS

Students showed a normalized gain (g) of 0.38 from the pre to the post test of the forces unit and 0.51 from the pre to the post test of the energy unit (Figs. 1&2) Both units showed medium growth. From Likert data, 66% of students felt better prepared for the tests using science notebooks and 84% of students felt better prepared for the test using inquiry practices.

On average, 90% of students were engaged in the lessons observed. From likert data, 66% of students felt engaged using science notebooks and 84% of students felt engaged using inquiry practices (Fig. 3).

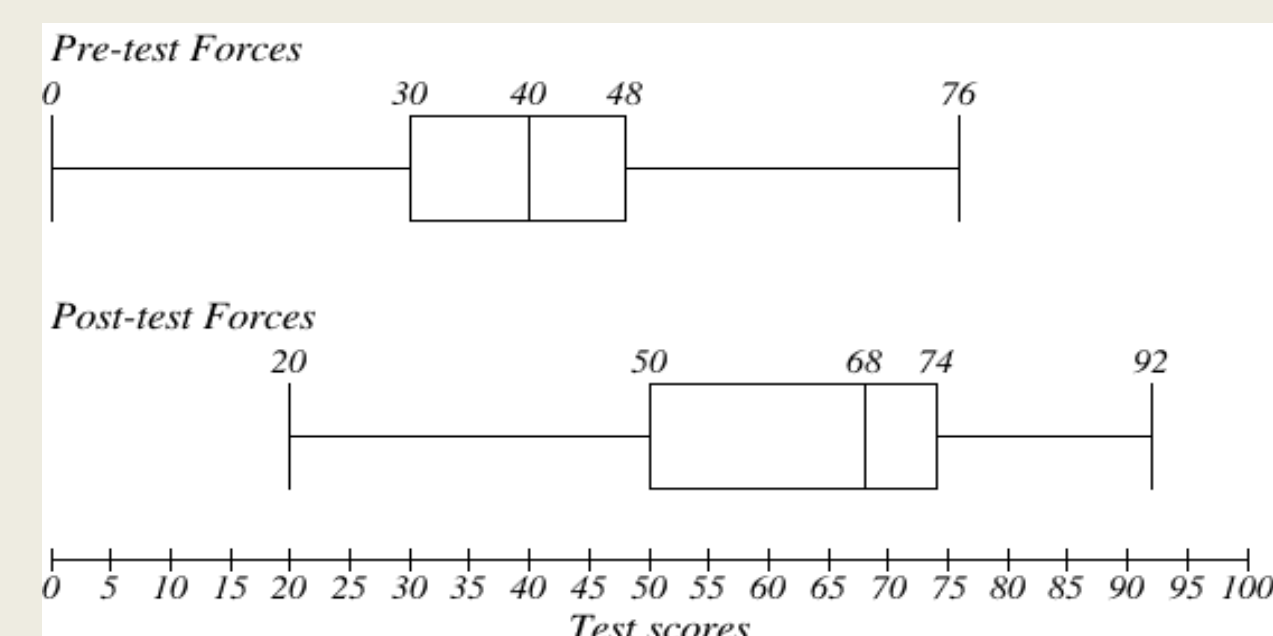


Figure 2: Box-and-whisker plot pre-test and post-test energy data, ($N=33$).

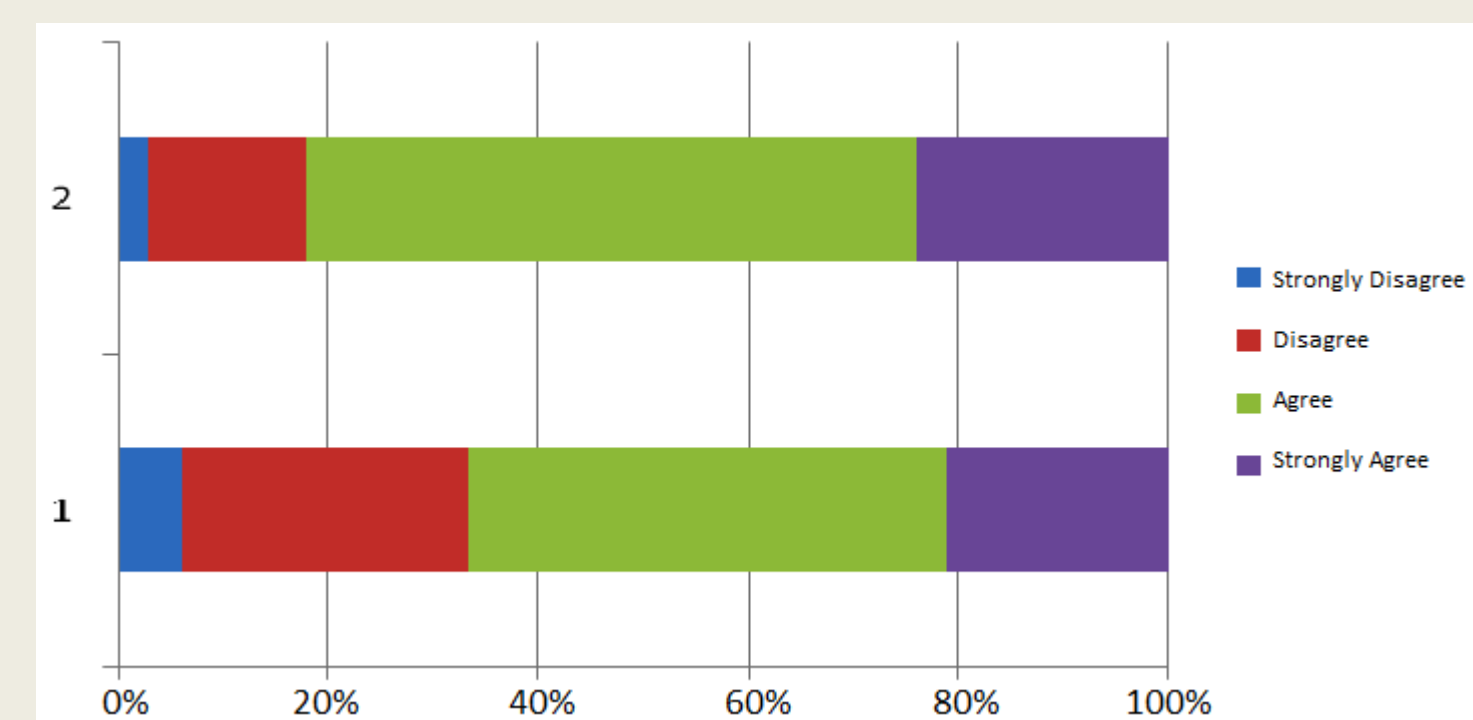
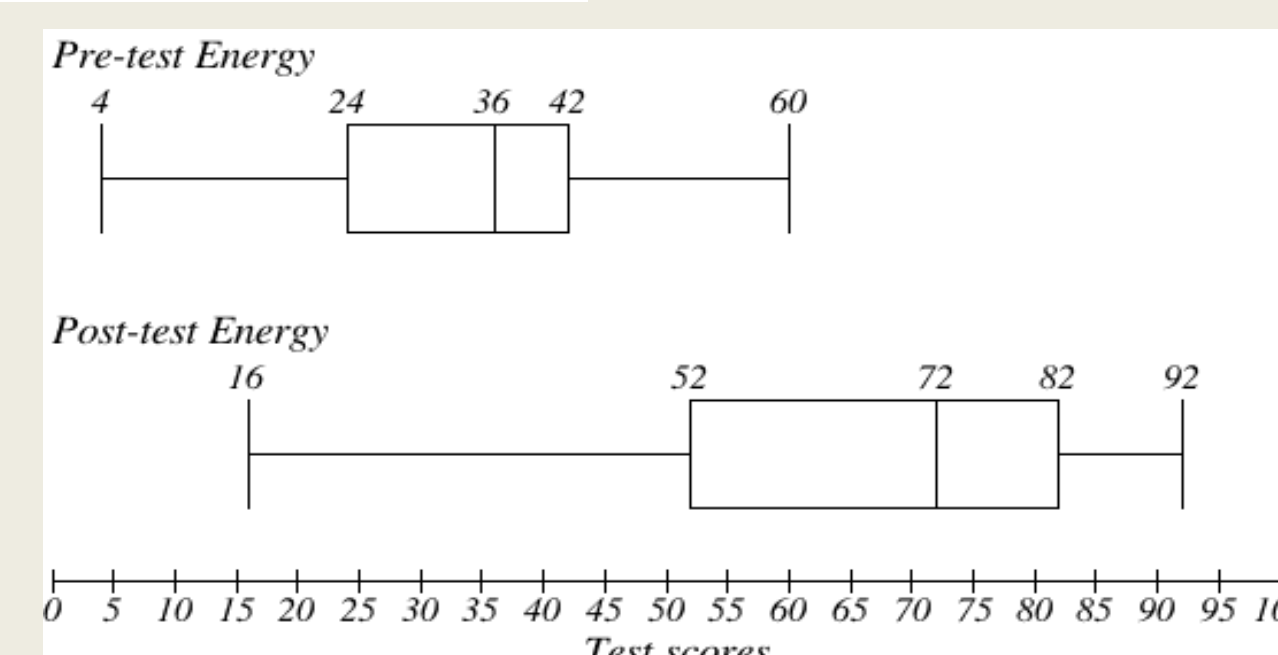


Figure 3: Likert survey data about engagement using scientific notebooks and inquiry activities, ($N=33$). On the Y axis 1 = I felt engaged in the learning by using science notebooks and 2 = I felt engaged in the learning by doing inquiry activities.

OBJECTIVE

- What is the effect on student engagement while doing scientific inquiry activities?
- What is the effect on student achievement on a post-test after doing scientific inquiry activities?
- What is the effect on student engagement while using science notebooks?
- What is the effect on student achievement on a post-test after using science notebooks?

CONCLUSION

Students made achievement gains in both units with the use of scientific inquiry methods and science notebooks. There is a positive correlation with both methods as noted by students responses to questions about feeling prepared. More students felt prepared using the science inquiry than the notebooks. There is a positive correlation in the engagement during lessons with both methods as well. Students were on task 90% of the time, which is high for the classes observed. Students responded in agreement that these methods improved their engagement as well. There was a similar trend in that more students felt engaged with the inquiry activities.

DISCUSSION

Scientific inquiry along with science notebooks can be a positive influence in the science classroom. Both must be used with purposeful intent and not just as a novelty to break up the monotony of lecturing. Scientific inquiry is a way of facilitating students to become life-long learners and giving them the practices to do this. I will continue to grow and perfect these methods.