

Modeling in the Science Classroom:

Using Inquiry to Increase Understanding and Motivation

BACKGROUND INFORMATION

- VCS is a K-12 school that serves a large percentage of underemployed families. The students in my classroom range in academic abilities from gifted and talented to those with learning disabilities.
- Inquiry-based science is a powerful tool in the classroom.
- Science inquiry is a more open-ended approach that uses the educational background and creativeness of the student to form and solve a problem.
- The use of inquiry motivates students and builds their self esteem because they are solving problems with a science investigation formulated by their own imagination.
- Modeling uses conceptual and physical models to help students understand scientific phenomenon.

METHODOLOGY

- The data was collected from two eighth grade physical science classes ($N=64$).
- Surveys were given both before and after the modeling activities to measure growth after the treatment.
- Open-ended questions were used to gain a student perspective of the treatment.
- 2 tailed T-test used to statistically the relationship to pre and post survey and look for qualitative themes.

Research question	Data source 1	Data source 2	Data source 3
<i>Research Question</i> If the students construct their own investigation will it help them understand scientific methodology and increase their motivation to complete work in the classroom.	Pre and Post, Understanding Modeling and the Scientific Methodology Survey with Open-Ended Questions.	Pre and Post, Motivation for Completing Work in the Science Classroom Survey with Open-Ended Questions.	Pre and Post, Construct a Science Investigation Performance Assessment Rubric.

Table 1. Data Triangulation Matrix

Students who Care are Confident

- The more students care about their work the more likely they are to complete the assignment.
- When students create their own solutions to problems presented, they take ownership and are excited to try and find a solution.
- One student said, “I feel confident enough to conduct my own experiments because (he) doesn’t give me the answer, he makes me think.”

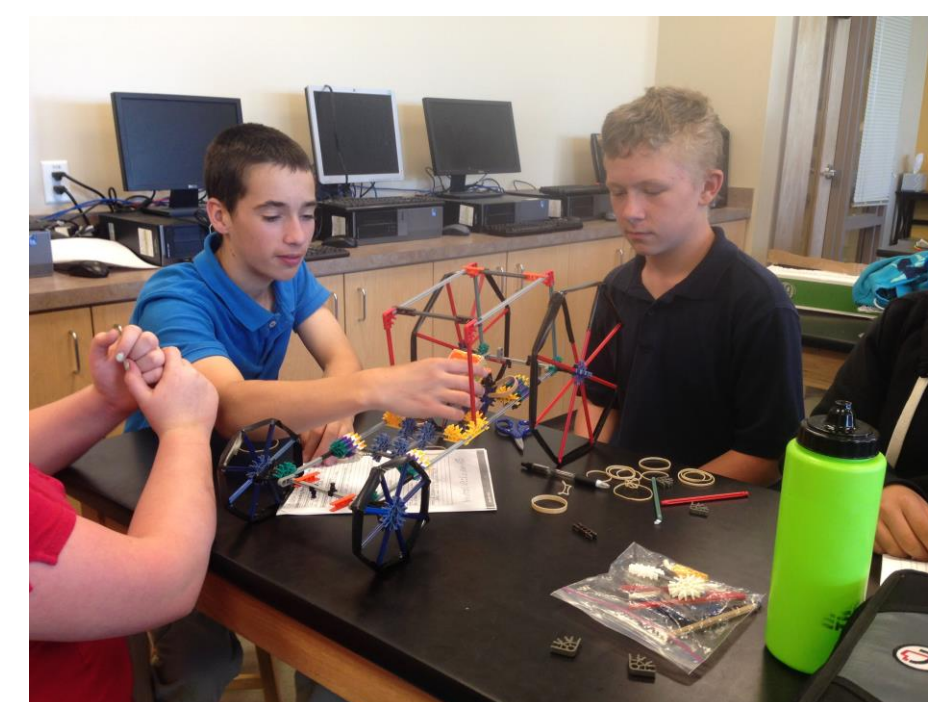


Figure 1. Students working on the physical model.

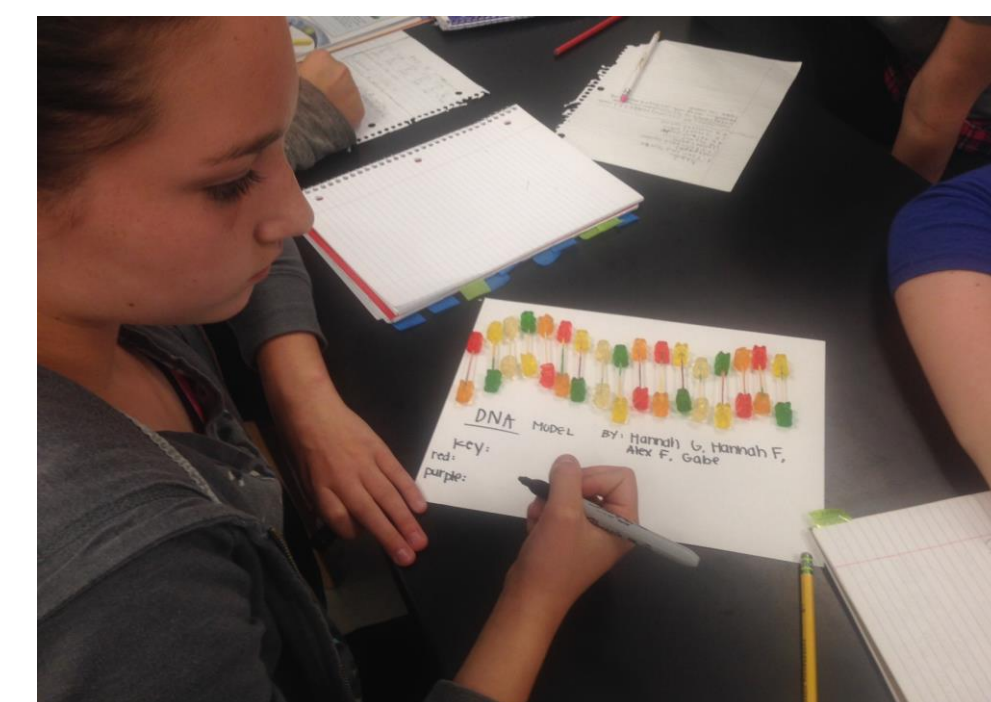


Figure 2. Students working on the conceptual model.

Using Creativity and Imagination

- The students designed their own experiments from a theme presented on the board.
- They created their question from the theme, then designed their own experiments to gather data.
- Their imagination helped them create solutions to real-world problems.
- The students summarize the inquiry process and present their hard-won findings to their peers in a moment of pride to their dedication and hard work.



Figure 3. 8th grade students presenting to the 5th grade.

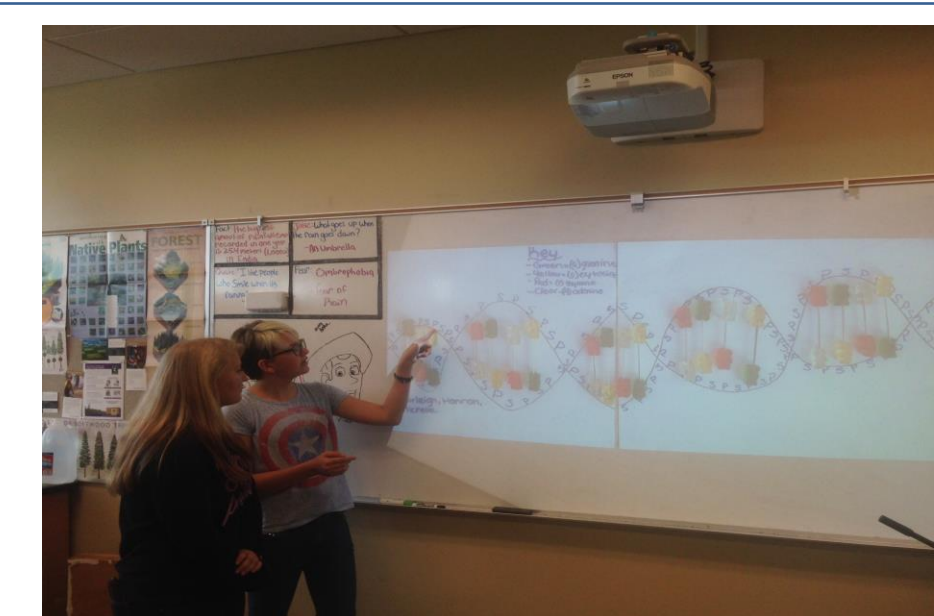


Figure 4. Students presenting their results to the class.

Pre and Post Survey Results

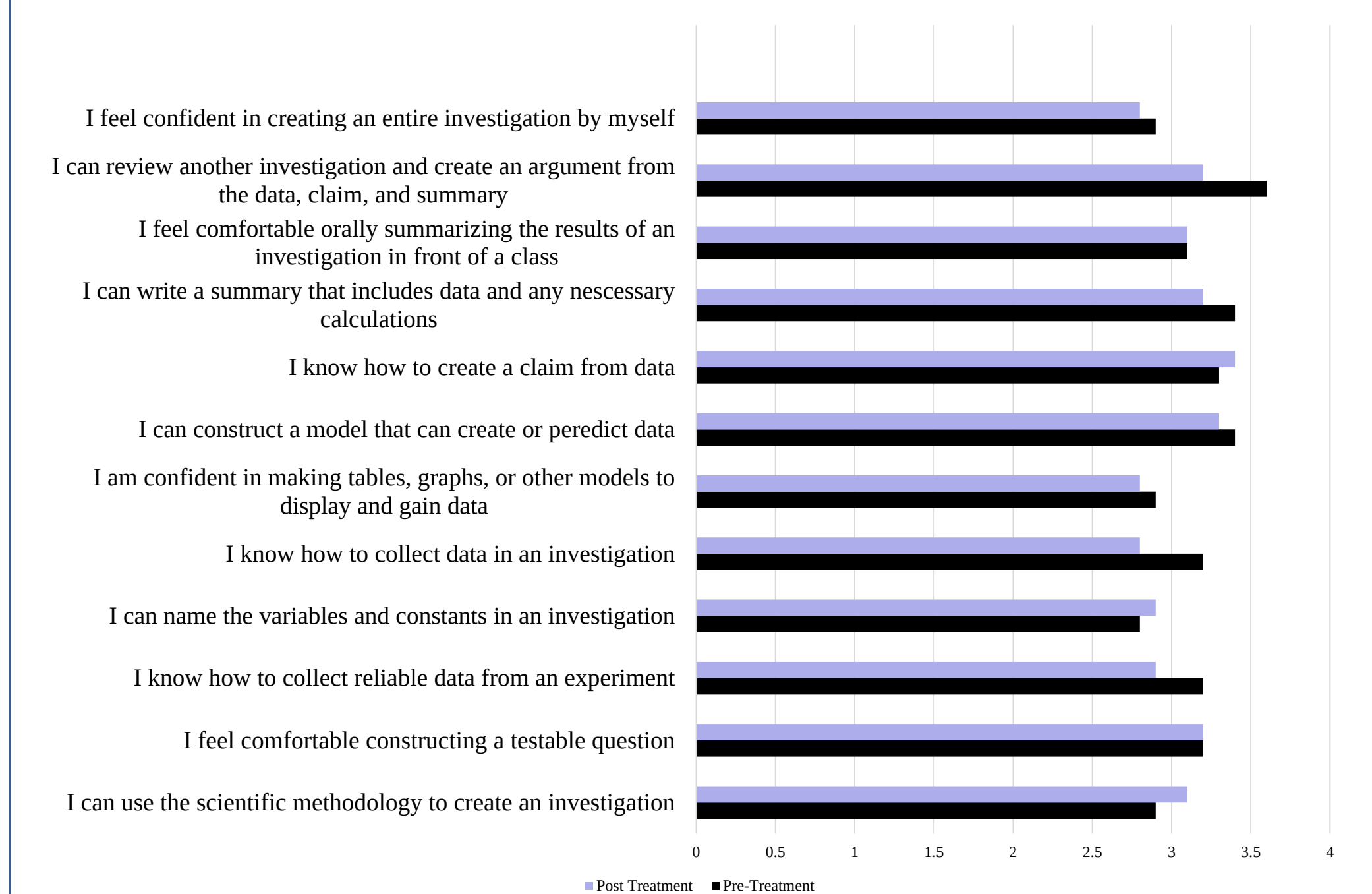


Table 2. Data Analysis Table

REFLECTION

- The above graph does not show an increase in the survey results, but the students did increase their performance task scores.
- Having the students design their own experiments without the use of pre-made labs was not easy for students who want to be told what to do to get a good grade.
- Classroom management was frustrating at first and required controls such as strict time deadlines and proximity control.
- The continued use of formative assessment ensured that the students understood the scientific methodology and the academic content that was presented in class.
- This process required an active instructor that monitored the progress of the students and reflected on the results of formative assessment.
- Peer editing was a key component to the success of this project, students gained much needed confidence from reading the work of others. This helped them understand that they completed each task correctly and felt better when submitting work for a grade.

Contact

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When your child asks, “Why is there a moon?” don’t reply with a scientific answer. Ask him, “What do you think?”

He will understand that you are telling him, “You have your own mind and your own interpretation and your ideas are important to me.” Then you and he can look for the answers sharing the wonder, curiosity, pain - everything.

It is not the answers that are important it is the process – that you and he search together.

-Carlina Rinaldi, Reggio Emilia