

Background

I conducted my capstone project at Romulus Central School in Romulus, New York. The project came out of a desire to help my students who have difficulty analyzing test questions and who expressing their knowledge on assessments challenging.

The purpose of this project was to integrate the Claim, Evidence, Reasoning technique into my seventh-grade physical science and eighth-grade life science classes and determine if building this skill will improve student performance and confidence on tests as well as proficiency with the Claim, Evidence, Reasoning process.

Treatment

The treatment group consisted of 15 eighth-grade life science students and 32 seventh-grade physical science students.

- Test scores collected before and during treatment
- Students' testing confidence assessed before and during treatment
- Claim, Evidence, Reasoning technique was integrated into all lab activities and each student's responses were coded with different skill levels
- Use of evidence-based claims was tracked on tests with the same coding scheme
- Students participated in other activities that build their Claim, Evidence, Reasoning skills but were not used as data

Data and Claims

Students did not improve their test scores or testing confidence (Fig. 1).

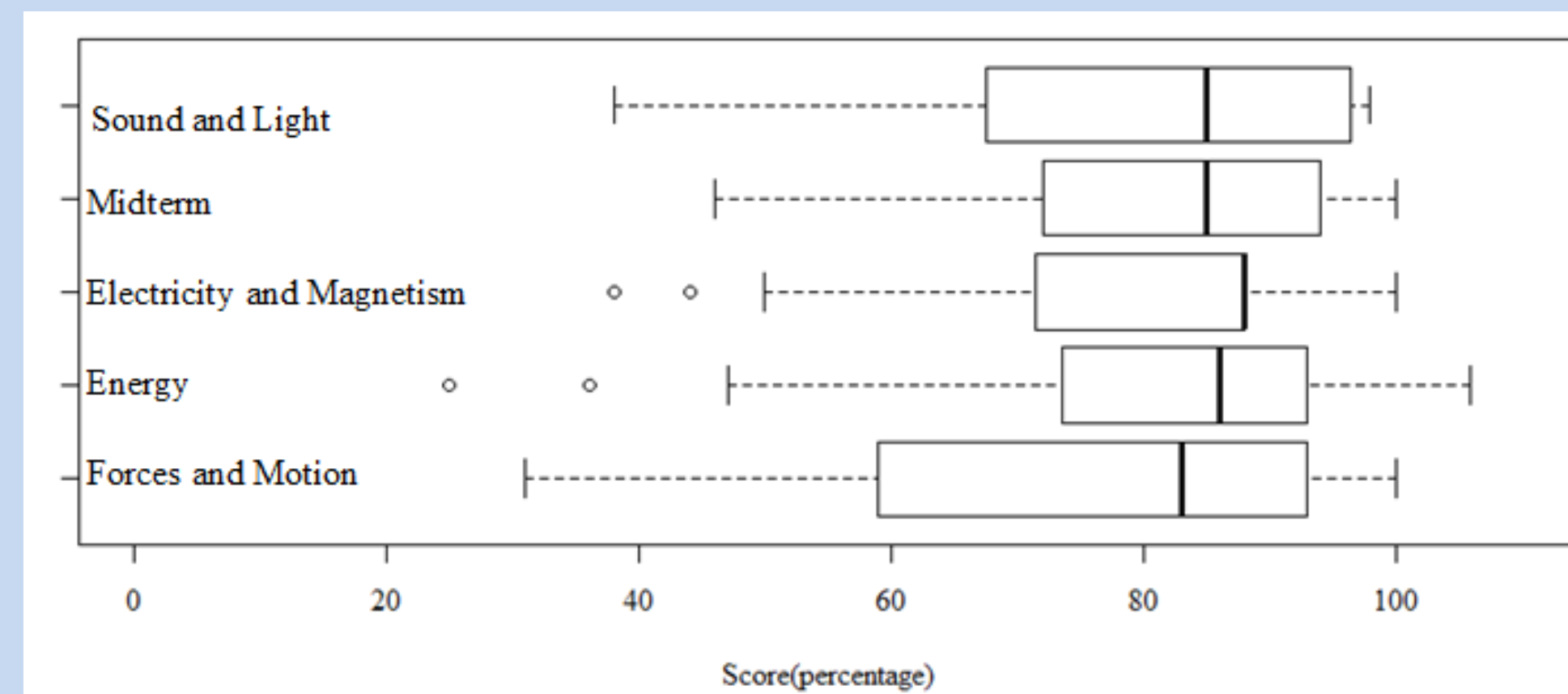


Figure 1. Comparative boxplots for seventh-grade test scores. All of these assessments were given during treatment with Forces and Motion being the first test and Sound and Light being the last, (N=32).

Students improved their Claim, Evidence, Reasoning skills on labs. By the end of treatment, the percentage of eighth-grade students who showed mastery level on providing evidence increased to 87% and the percentage of students who were able to write effective reasoning increased to 43%. For the seventh-grade classes, 100% showed they could write a fully valid claim by the end of treatment and 96% wrote a Claim, Evidence, Reasoning with sufficient evidence. Seventy-seven percent of seventh-grade students reached mastery level of writing reasoning and the percentage of students connecting their claims to scientific principles increased from 17% to 54%.

Conclusions

I will continue to use Claim, Evidence, Reasoning on every lab that I can. It streamlined the way my students learned from labs and helped them make connections between what they did in lab and what they were learning. It also fostered good discussion in lab groups about what was the best evidence. It was always exciting to hear my students' conversations as they tried to figure out the scientific explanations behind what they were seeing.

I will begin using the Claim, Evidence, Reasoning skill at the beginning of the school year. My seventh-grade classes made greater gains than my eighth-grade because the eighth-grade students began learning how to use the Claim, Evidence, Reasoning skill in December instead of September to allow for a pre-treatment phase. This showed me that learning to write evidence-based claims in science takes a times and that frequent practice is the best way to learn.

I will continue to look for other ways to improve test scores and test confidence.

Students improved the quality of their short-answer questions on tests after learning the Claim, Evidence, Reasoning technique.

By the end of treatment, 90% of seventh-grade students included fully valid claims on tests along with 80% providing a mastery level of evidence and 65% connecting scientific principles to their claims (Fig. 2).

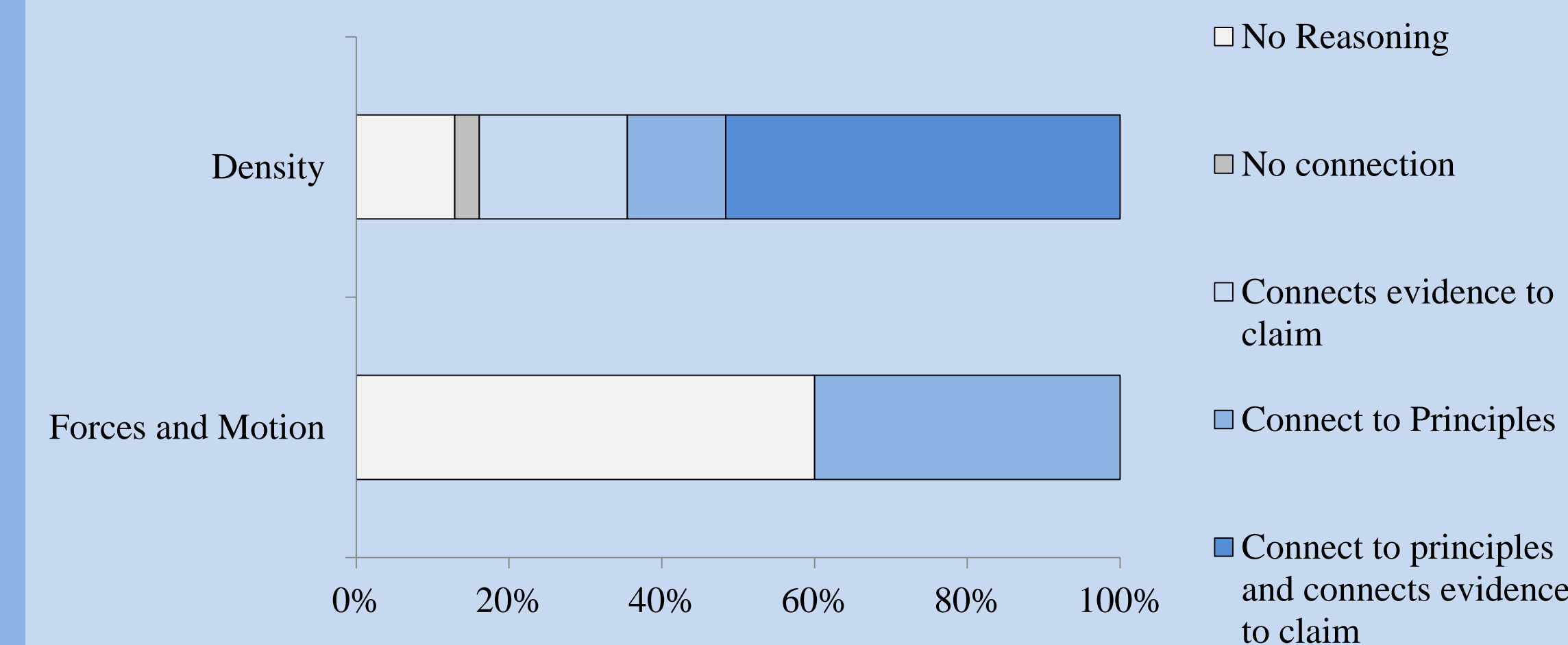


Figure 2. Seventh-grade coding for reasoning on assessments. The Forces and Motion test was given during treatment and the Density quiz was given post-treatment, (N=32).

Note. Blue color is used to represent mastery and gray color represents a lower skill level.

The samples selected from one student's work from the beginning and end of data collection are representative of the progress made by many students in my classes (Fig. 3; Fig. 4).

This student's work was selected because they are an average student from my non-advanced seventh grade class.

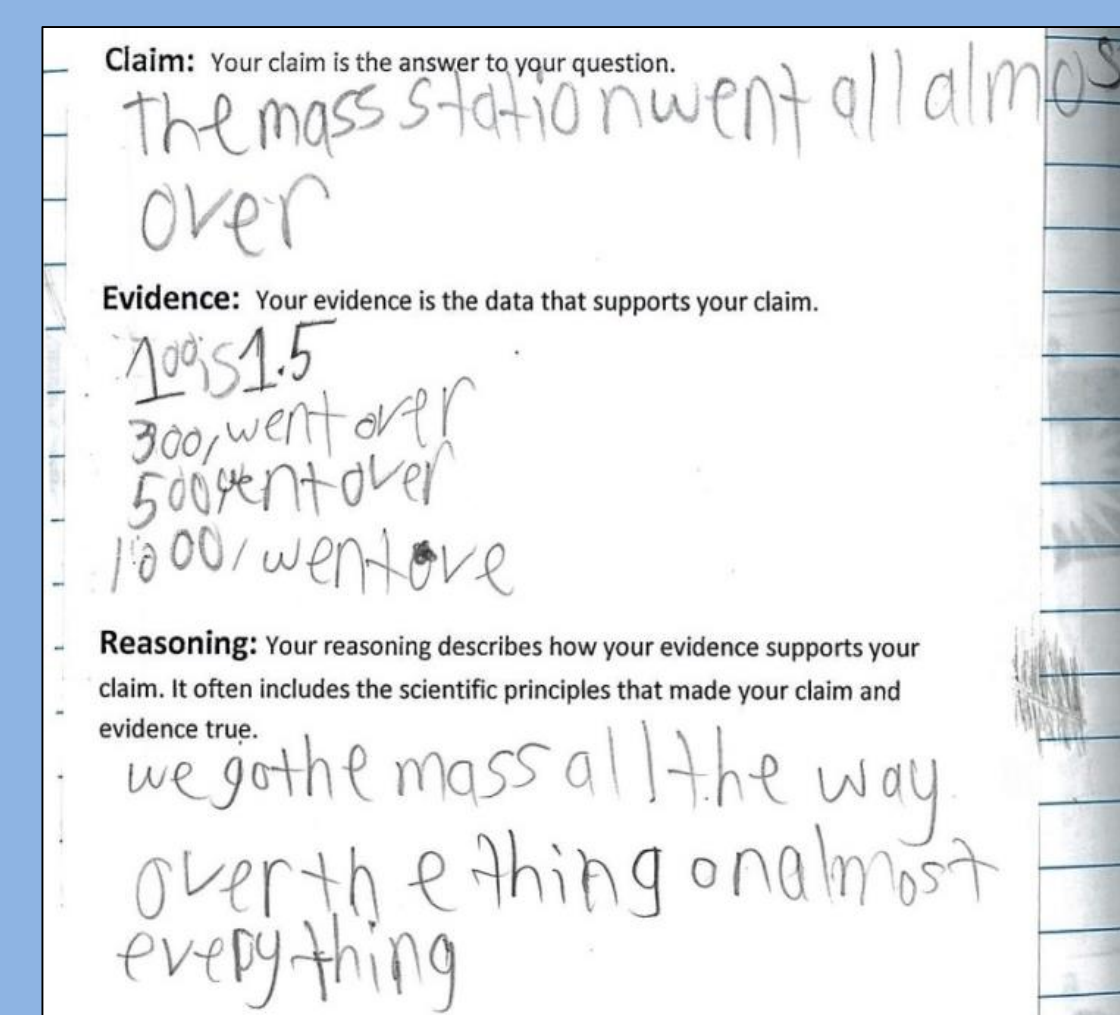


Figure 3. A student's response on the Friction Lab. This lab was completed during the beginning of treatment. This student was responding to the question "How does mass affect friction?"

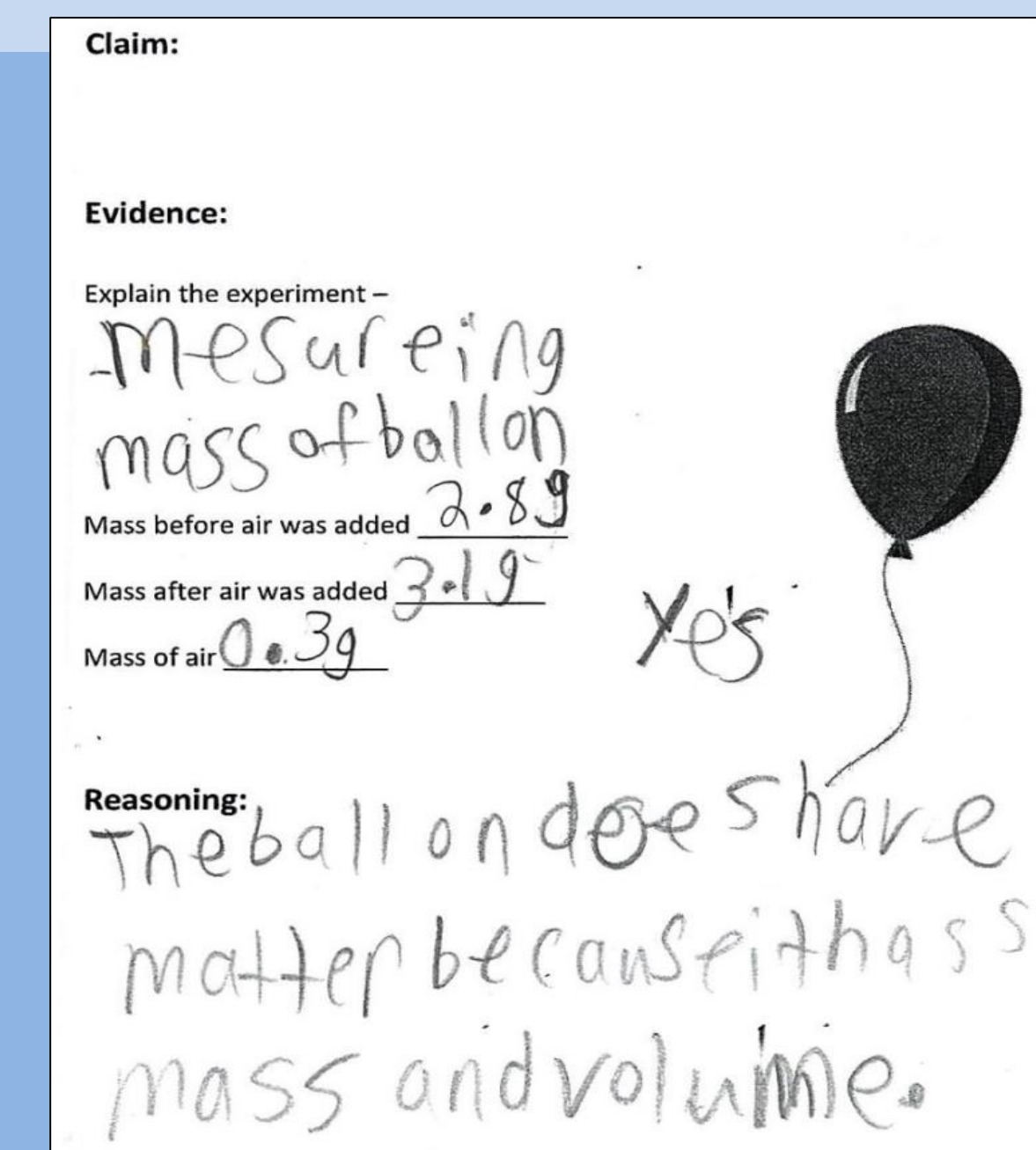


Figure 4. A student's on the lab called Is Air Matter?. This lab was completed near the end of treatment. This student was responding to the question "Is air matter?"

Research Question	Data Source	Data Source
Will purposeful teaching of CER skills and repeated use of CER in inquiry experiments and assessments improve student test scores traditional tests?	Test scores from unit tests	
Will it improve student confidence on tests?	After-Test Confidence Survey	Student Interviews
Will it improve student success with the CER technique?	CER Coding Scheme on Tests and Labs	Student Interviews