



# The Effect of Weekly Literacy Lessons on Student Ability to Use Evidence to Support Scientific Claims

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## Background

This project focuses on scientific literacy. My students struggle to effectively make arguments based on evidence. Therefore, I am exploring ways to improve students' abilities to gather and synthesize evidence from written sources to support a scientific claim.

The methods explored include teaching students how to annotate text, conduct Socratic seminars, and having students create and critique claim, evidence, reason charts in groups. My two main goals in creating the treatment were to generate lessons that lead students through cycles of constructing and critiquing scientific arguments using written sources, while facilitating student interactions in multiple contexts.

## Student Population

My sample consists of 27 students in a 9<sup>th</sup> grade Physical Science class. They are Track 1, honors level, students at Franklin Towne Charter High School. Franklin Towne Charter is located in Bridesburg, a working class neighborhood in Northeast Philadelphia. Approximately 60% of students are considered economically disadvantaged. In my sample, 21 students are White, 4 students are Black, and 2 are Hispanic. Additionally, 14 are female and 13 are male.

## Focus and Sub-Questions

Primary Research Question:

What effect will weekly lessons focused on science literacy have on the ability of students to gather evidence to support scientific claims?

Secondary Research Questions:

1. How does increased focus on teaching scientific literacy impact student ability to write argument driven essays?

2. How does increased focus on teaching scientific literacy impact student ability to analyze data from science lab activities?

3. What is the correlation between students' learning style and the most effective literacy teaching strategy for them?

## Methodology

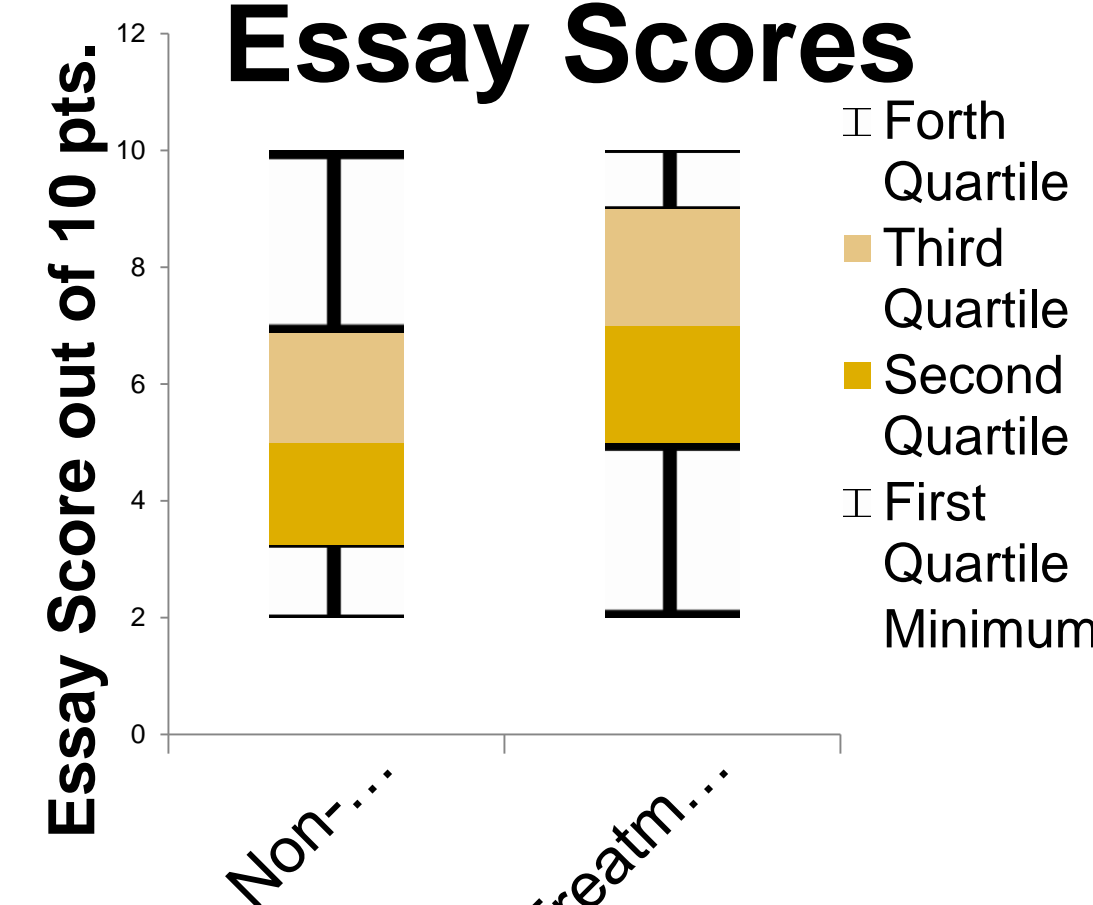
The literacy treatment used has 3 parts. They include annotating text, Socratic seminars (Paideia is the seminar method I will be using), and constructing Claim, Evidence, Reason (CER) charts in groups on whiteboards. Before participating in the Socratic seminar students annotated to refer back to during the Socratic seminar. Socratic seminars are guided group discussions where I act as the facilitator as students discuss a topic as a class. Students debated the validity of claims during these discussions, using the assigned text to find evidence and reasoning for claims. After the Socratic seminar student broke up into groups of four to complete CER charts in groups. When creating CER charts students made a claim on the given topic, and then stated as many evidences as they could to support their claim. They also explained why each piece of evidence was logically connected to the claim.

## Research Matrix

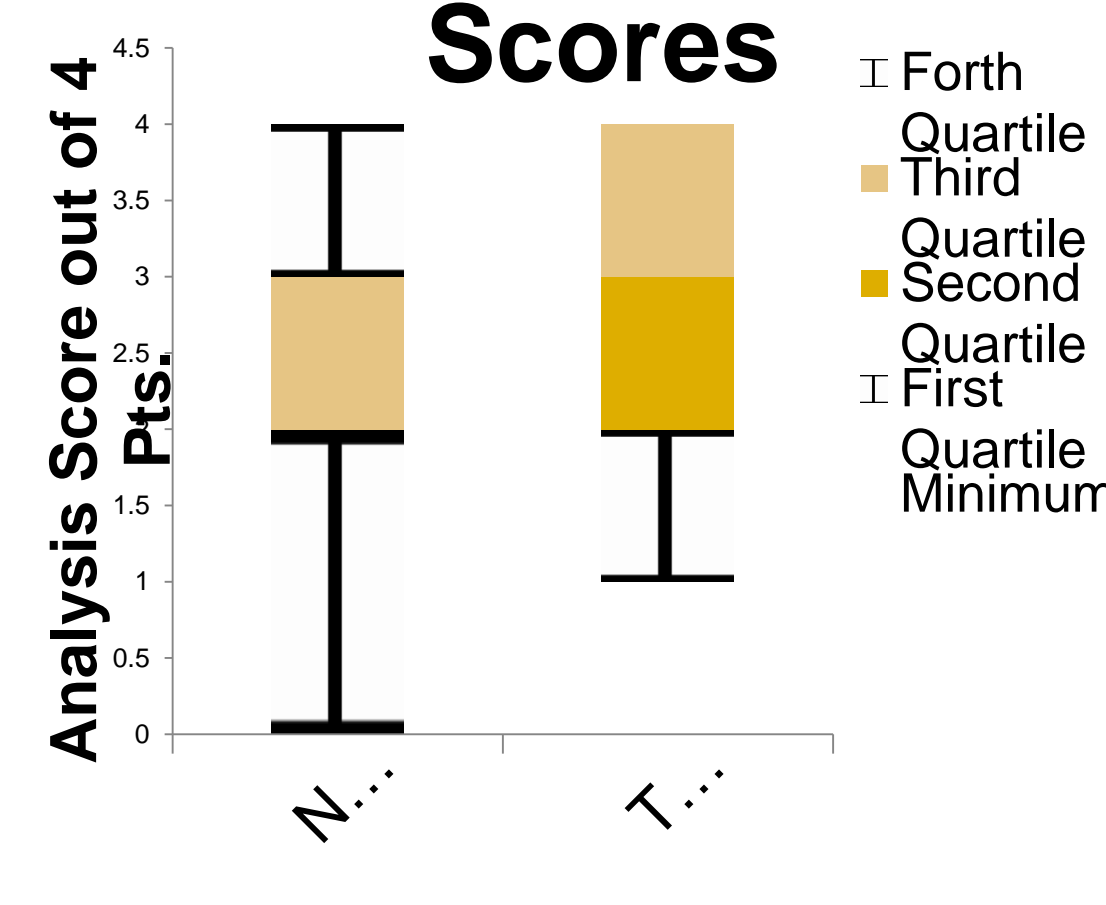
Questions	Data Source		
Primary: What effect will weekly lessons focused on science literacy have on the ability of students to gather evidence to support scientific claims?	CER Pre-Test/ Post-Test Scores	Argumentative Essay and Lab Analysis Scores	Student Surveys
Secondary 1: How does increased focus on teaching scientific literacy impact student ability to write argument driven essays?	Argumentative Essay Scores	Individual Interviews	Student Surveys
Secondary 2: How does increased focus on teaching scientific literacy impact student ability to analyze data from science lab activities?	Lab Analysis Scores	Individual Interviews	Student Surveys
Secondary 3: What is the correlation between students' learning style and the most effective literacy teaching strategy for them?	Argumentative Essay and Lab Analysis Scores	Individual Interviews	Student Surveys

## Results

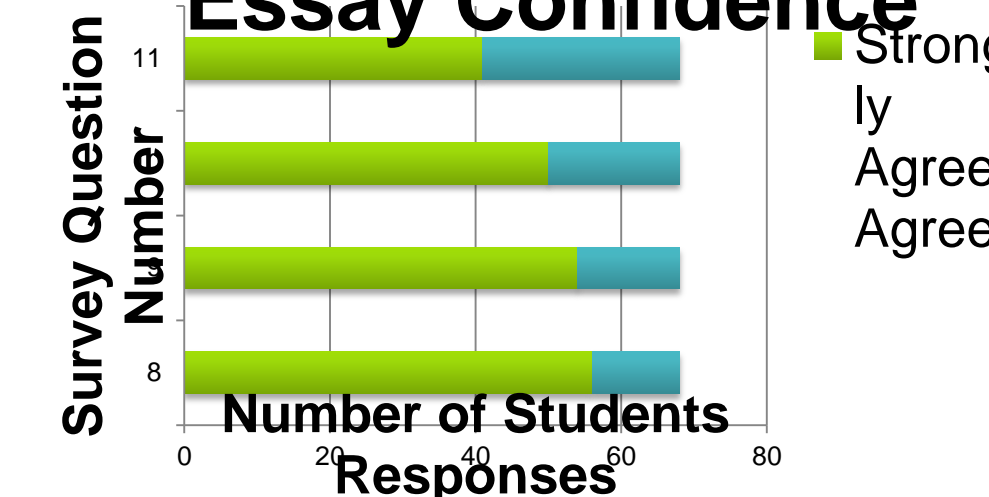
### Argumentative Essay Scores



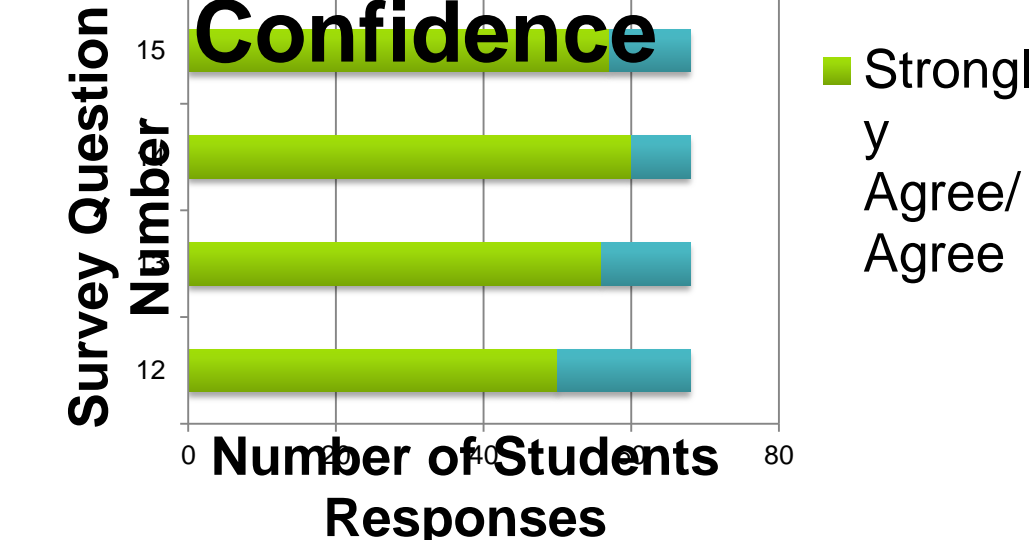
### Data Analysis Scores



### Argumentative Essay Confidence



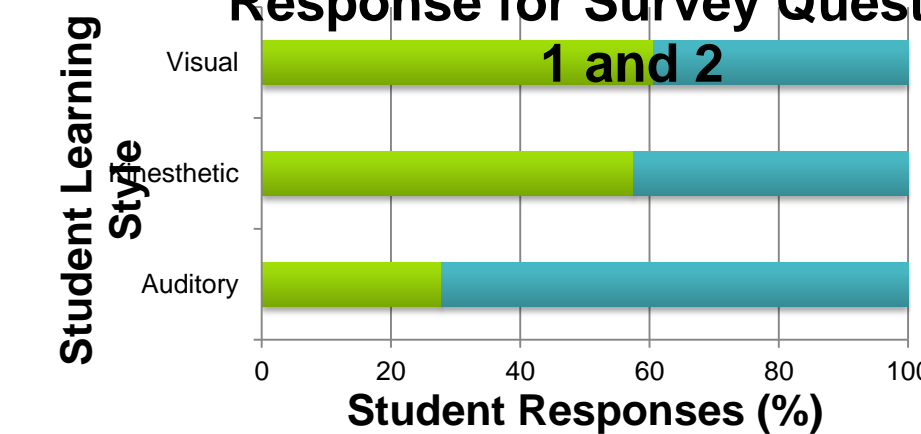
### Data Analysis Confidence



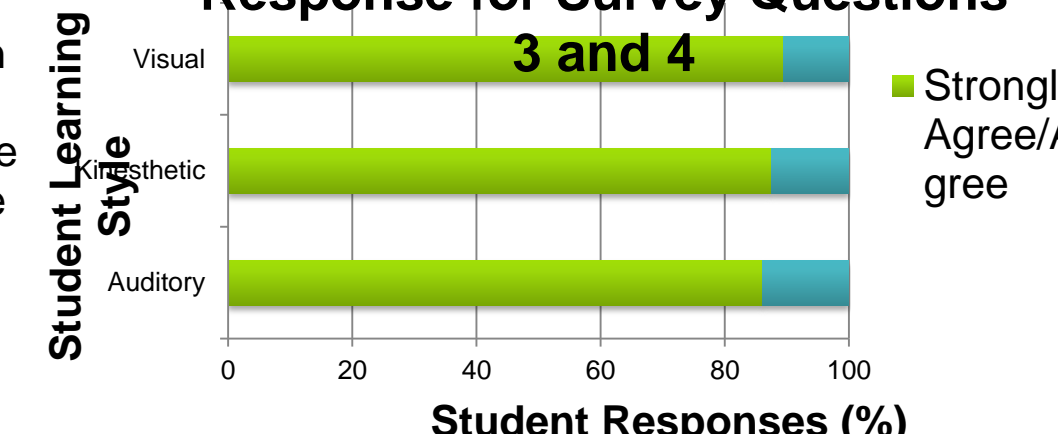
Survey Questions:

- I enjoy annotating text.
- I find annotating text before talking about it in class helps me better understand the text.
- I enjoy participating in Socratic Seminars during science class.
- I find that Socratic Seminars in science class help me better understand the material.
- I enjoy working in groups to complete Claim, Evidence, Reason charts.
- I find that working in groups to complete Claim, Evidence, Reason charts helps me better understand the material.
- I am able to easily think of evidence from science class or everyday life to support the claims I make when I write scientific essays.
- I am able to easily come up with scientific reasons why my evidence supports my claim when I write scientific essays.
- When I write essays, I feel like I can convey my thoughts in an organized manner that are easy to understand.
- I feel confident that I can write an A essay on any science topic we have learned this unit.
- When I read about an experiment and view data (graphs and tables) about scientific findings regarding the experiment, I am able to easily recognize patterns in the data.
- When I write an analysis for the type of data mentioned above, I am easily able to describe the relationship between the independent and dependent variables.
- When I write an analysis for the type of data mentioned above, I am easily able to explain the relationships I see with real numbers from the data given.
- I feel confident that I can write an A analysis after reading about an experiment and examining the related data.

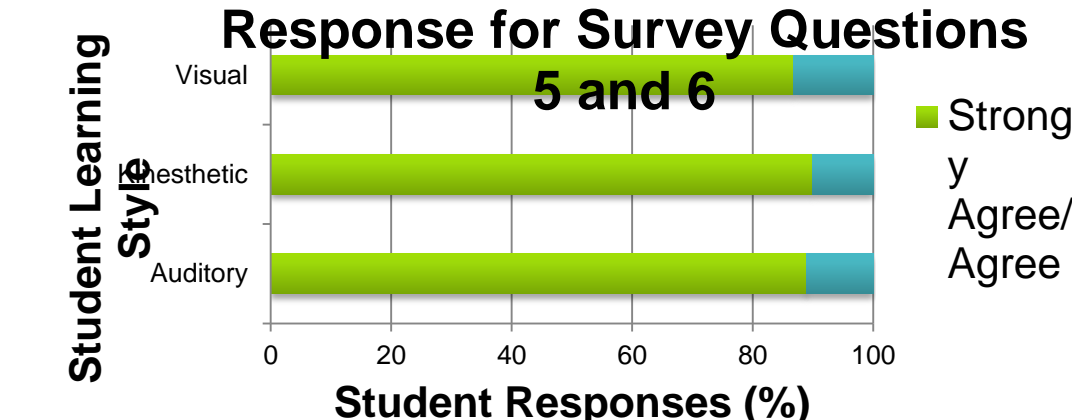
### Annotation Preference - Response for Survey Questions 1 and 2



### Socratic Seminar Preference - Response for Survey Questions 3 and 4



### CER Chart Preference - Response for Survey Questions 5 and 6



## Interpretation of Results

Altogether, the data demonstrates that weekly lesson plans focusing on science literacy have a significant impact on student ability to gather evidence to support scientific claims. There was a distinct positive shift in student ability to both write argument driven essays and analyze data from science lab activities during treatment units. However, treatment was less effective in helping students use evidence to support claims for problems based on common misconceptions. Additionally, there was no correlation seen between students' learning style and the most effective literacy strategy for them as was hypothesized.