

Conceptual Framework: Critical thought should be an outcome of education according to the Education Policies Commission (EPC, 1961). Built from a constructivist understanding of learning, the Science Writing Heuristic should help students demonstrate a higher degree of critical thought in the writing they do for science class.

Table 1. Science Writing Heuristic Template

Process Steps	Questions answered
Step 1: Beginning	What are my questions?
Step 2: Tests	What did I do?
Step 3: Observations	What did I see?
Step 4: Claims	What can I claim?
Step 5: Evidence	How do I know? Why am I making these claims?
Step 6: Reading	How do my ideas compare with others?
Step 7: Reflection	How have my ideas changed?

Focus Question: Is there more evidence of higher order thinking in the writing of students after being taught with the SWH than before they were taught with the SWH?

Methodology: Students were taught one unit with the Science Writing Heuristic (SWH) in an online setting. The critical thought demonstrated in samples written before this treatment was compared with the critical thought demonstrated in the culminating writing project of the SWH unit using the Critical Thought Rubric.

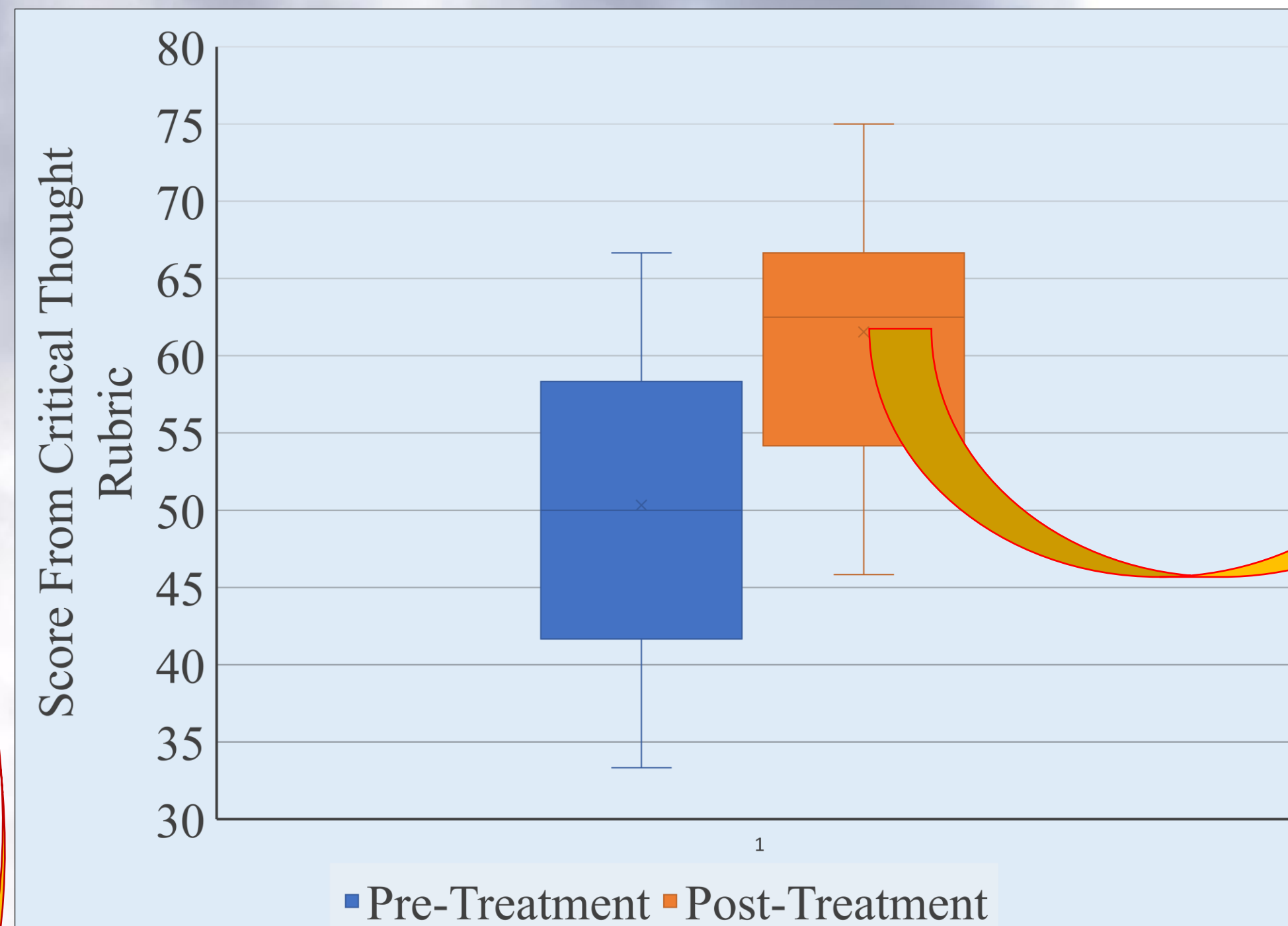


Figure 1. Pre and Post Treatment Critical Thought Rubric Scores, (N=13)

Simplified Critical Thought Rubric				
	Capstone	Milestone	Milestone	Benchmark
	4	3	2	1
Domain 1: Explanation	Expert	Advanced	Intermediate	Basic
Domain 2: Evidence	Expert	Advanced	Intermediate	Basic
Domain 3: Student's position	Expert	Advanced	Intermediate	Basic
Domain 4: Conclusions	Expert	Advanced	Intermediate	Basic

Methodology Continued: Pre-treatment work was evaluated from the 13 students who also completed the final SWH writing project. Both sets of work was evaluated with the Critical Thought Rubric. There were six juniors and seven sophomores. Nine biology students and four advanced biology students made up the Sample of students who completed the work.

**Claim:** Student scores on the Critical Thought Rubric increased for the SWH unit.

**Evidence:** According to a Wilcoxon Signed-Rank test, there was a significant increase in score (M = 62.5%, were significantly higher than the median pre-treatment scores, M = 50%, W = 15, p < 0.024)

**Reasoning:** Planning for and implementing the SWH, the teacher builds in more explicit opportunities for students to exercise critical thought.

**Impact on the researcher:** Continued experimentation with how to best implement the SWH will continue to increase my effectiveness at teaching my students to exercise critical thought.