Scientific Argumentation in a Middle School Science Classroom

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INTRODUCTION

Scientific literacy and argumentation are essential skills for our students to develop to become productive members of society. If students are expected to apply their learning to authentic problems and situations, they must have an understanding of how to make a claim and collect and identify evidence to support it. The purpose of this study was to investigate the effectiveness of the Claim, Evidence, and Reasoning (CER) format as a model for developing these arguments.

RESEARCH QUESTION

How does proficiency of scientific argumentation through CER affect students' ability to justify a claim?

METHODOLOGY

- The study was completed in three 6th grade science classes over 10 weeks
- Sixty-five students participated in the study
- All students were given the same assessments and surveys at the same time.

DATA COLLECTION INSTRUMENTS

NON-TREATMENT
- Data Analysis Part 1 Pre-assessment
- Scientific Interest and Attitudes Survey
- Data Analysis Part 1 Post-assessment

TREATMENT
- Data Analysis Part 2 Pre-assessment
- CER Assessments
- Scientific Interest and Attitudes Survey
- Data Analysis Part 2 Post-assessment

RESULTS

- Student scores on both data analzysis and CER increased during the non-treatment period (Figure 1). During the treatment period, data analysis assessment scores increased slightly, while CER scores decreased slightly (Figure 2).
- Survey responses showed relatively constant results in the Interest in Science and Personal Values categories. There was an increase in the Purpose and Perception category from 88% in the first survey to 96% in the final survey.

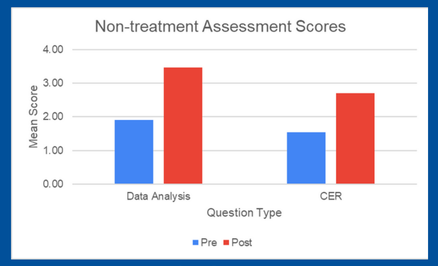


Figure 1. Results from non-treatment Data AnalysisAssessment Part 1 comparing scores from data analysis and CER questions.

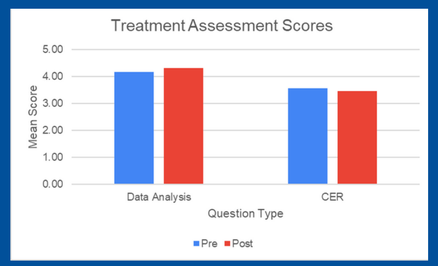


Figure 2. Results from treatment Data Analysis Assessment Part 2 comparing scores from data analysis and CER questions.

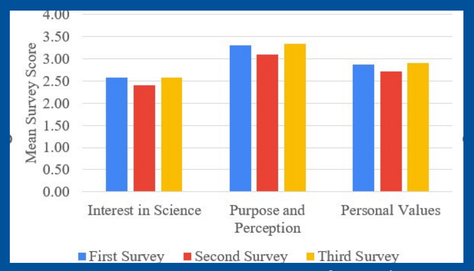


Figure 3. Mean survey scores from the Student Interest and Attitudes Survey sorted into categories. Surveys were administered on 1/24, 3/2, and 4/10.

CLAIMS

- Students did not show significant growth in data analysis and argumentation during the treatment period, but did show growth in both categories from the beginning of the study to the end.
- Students' attitudes toward science and its importance remained high throughout the study.

CONCLUSION

- Science instruction is often "left behind" in favor of increased math and reading, especially since the pandemic.
- Students did not show significant improvement on argumentation during the treatment period. However, the average student score on the more than doubled from the beginning of the non-treatment period to the end of the treatment period.
- Argumentation and data analysis instruction will be taught early in the year and emphasized throughout.
- Argumentation will be incorporated across content areas.