

The Effects of the Application of the Next Generation Science Standards Science and Engineering Practices on Student Achievement

Introduction

Woodland Jr./Sr. High School is located on the eastern border of the United States in Baileyville, Maine. Approximately 170 students, grades 7 through 12, attend the school. The student body is comprised of Baileyville residents, as well as students from 16 surrounding towns. All ninth grade students enroll in Introduction to Physics and Earth Science. Students are heterogeneously grouped and there is a broad range of abilities in each class. Twenty-eight Introduction to Physics and Earth Science students participated in this study.

Background

I want my students to experience academic success. Saeed and Zygnier (2012) indicate that academic success depends on engagement and motivation. Blumenfeld, Kempler, and Krajcik (2006) argue that student achievement depends on how committed the learner is to building knowledge and utilizing deeper learning strategies. Newmann (1989) contends that high school students are unable to meet the cognitive rigor of secondary education by passive listening and reading. Hunter (2014) identifies the science and engineering practices and inquiry as powerful tools to engage students in learning experiences. He maintains that success can be realized when the student is an active willing participant in the learning process.



Research Questions	Data Source 1	Data Source 2	Data Source 3
Focus Question What is the effect of the application of the science and engineering practices on student achievement?	Pre- and Post-Interest and Engagement Surveys	Student Interview	Pre- and Post-Test
Sub-Question 1 How is interest affected?	Pre- and Post-Interest and Engagement Surveys	Student Interview	Student Engagement Timeline
Sub-Question 2 How is engagement affected?	Pre- and Post-Interest and Engagement Surveys	Student Interview	Student Engagement Timeline

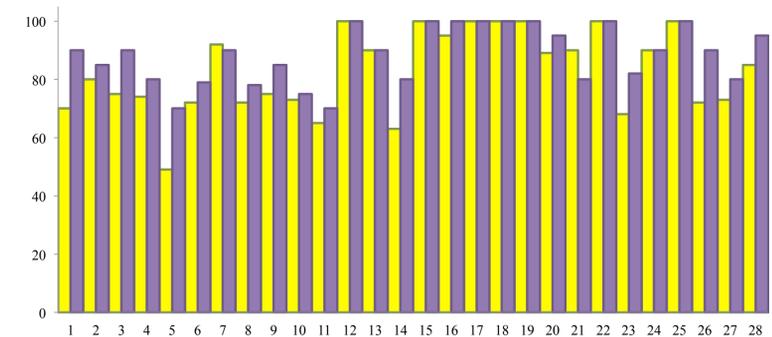
Research Design

The intervention was applied after the completion of a typical unit on motion. Students, acting as employees of the Maine Emergency Management Agency, had to deliver insulin to a small island community off the coast of Maine after a severe winter storm. Students had to utilize the Next Generation Science Standards Science and Engineering Practices to save the lives of several Type 1 diabetes residents who had run out of insulin. Students defined and determined the constraints surrounding their problem. They designed and tested parachutes and cargo containers so the insulin could be safely air-dropped from an airplane. The data generated from their product testing helped refine their design and offered opportunities to help them better understand motion and graphs of motion.

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Data



Data Analysis

Eighty-six percent of students showed an increase or scored the same on the Pre- and Post-Interpreting Graphs Exams. The mean score increased from 82.5 on the pre-test to 88 on the post-test. The median score increased from 82.5 on the pre-test to 90 on the post-test.

Conclusions

This study concludes that improvements in interest and engagement, as a result of the application of science and engineering practices, positively impacts student motivation which correlates to improved academic achievement. Students respond to learning opportunities that are grounded in the science and engineering practices favorably and experience higher levels of achievement.

References

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