

Tim Lies, Washburn High School, Minneapolis, MN, July 2024

FOCUS QUESTION

What is the effect of NGSS Practices on students?

BACKGROUND

Minnesota has taken the Next Generation Science Standards (NGSS) and adapted them to better represent Minnesota. The intention is to begin implementation of them by the 2024-25 school year. This means that Minneapolis schools will need to begin actively implementing those practices that year.

CONTEXT

This research project was conducted across four classes of general chemistry. Each class consisted of an average of 30 student, leading to a total of around 120 students.

METHODOLOGY

The research itself consisted of two units within the curriculum. Unit 3 was the treatment unit, and unit 4 was the non-treatment unit. In both units a pre- and post-assessment was conducted to allow for a normative gains test. In addition, at the end of each unit surveys about the unit were administered to the students. In addition, students were randomly selected from the top, middle, and bottom third of class for individual interviews. In the treatment unit, there was the addition of a phenomenon at the beginning of the unit, as well as students building and developing models around that phenomenon.

DATA ANALYSIS

Student Surveys were used to gain general attitudes of each unit. They were grouped into 4 categories for analysis. Chi-squared tests were performed on the student surveys to determine if there were statistically significant differences between the student experiences of each unit. Interviews were used to get specific supporting evidence to tie with the surveys. A t-test was performed to determine if there was a statistically significant difference between the unit assessments. A normative gains test was performed between the pre and post assessment for each unit as well.

CLAIM – EVIDENCE - REASONING

Students performed better on the non-treatment unit than on the treatment unit. Students had a better personalization experience in the non-treatment unit than the treatment unit.

The gain of averages for the treatment unit was 0.68, whereas the gain of averages for the non-treatment unit was 0.82. The gain of averages shows how much students improved between the pre- and post-assessments. The t-test performed had a value of 0.005 indicating there was a statistically significant difference between the two units.

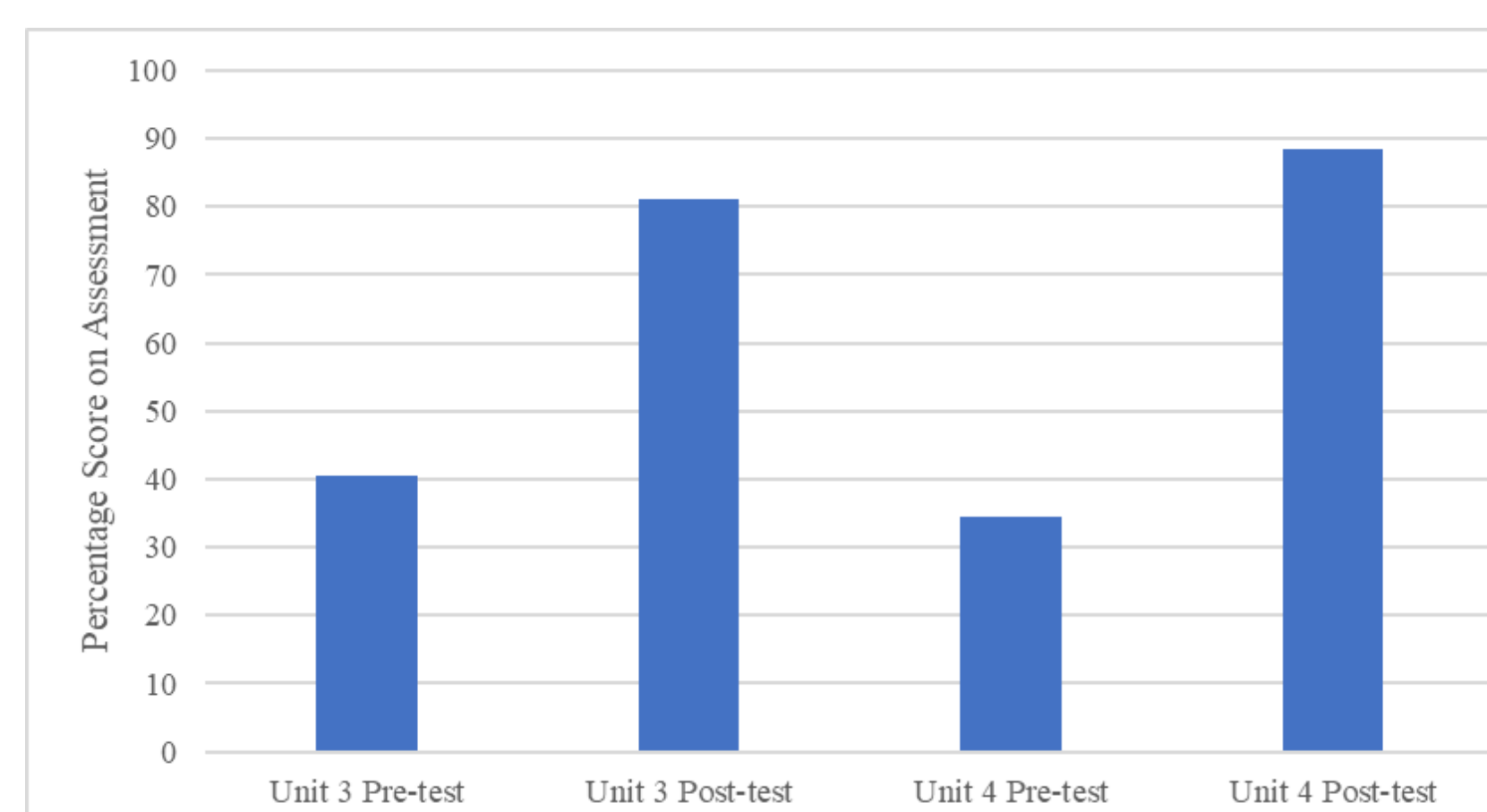
The chi-squared tests showed that most categories of the survey were not statistically significantly different, except for personalization with a p-value of 0.0119 which is lower than 0.05 stating that there is a difference. This means that students had a better personalization experience with the non-treatment unit than the treatment unit.

These were two very different units, students are unaccustomed to the new practices, new practices need new assessments, and was only a part of the practices.

REFLECTION

The main way that I changed through the process was that it really reinforced an idea that I had on there still being a place for traditional instruction with Next Generation Science Standards. They are wonderful techniques that serve all our students, but if they are only techniques that are used, very little content will be covered.

RESULTS



Scores for assessments (n=49,65,28,65)

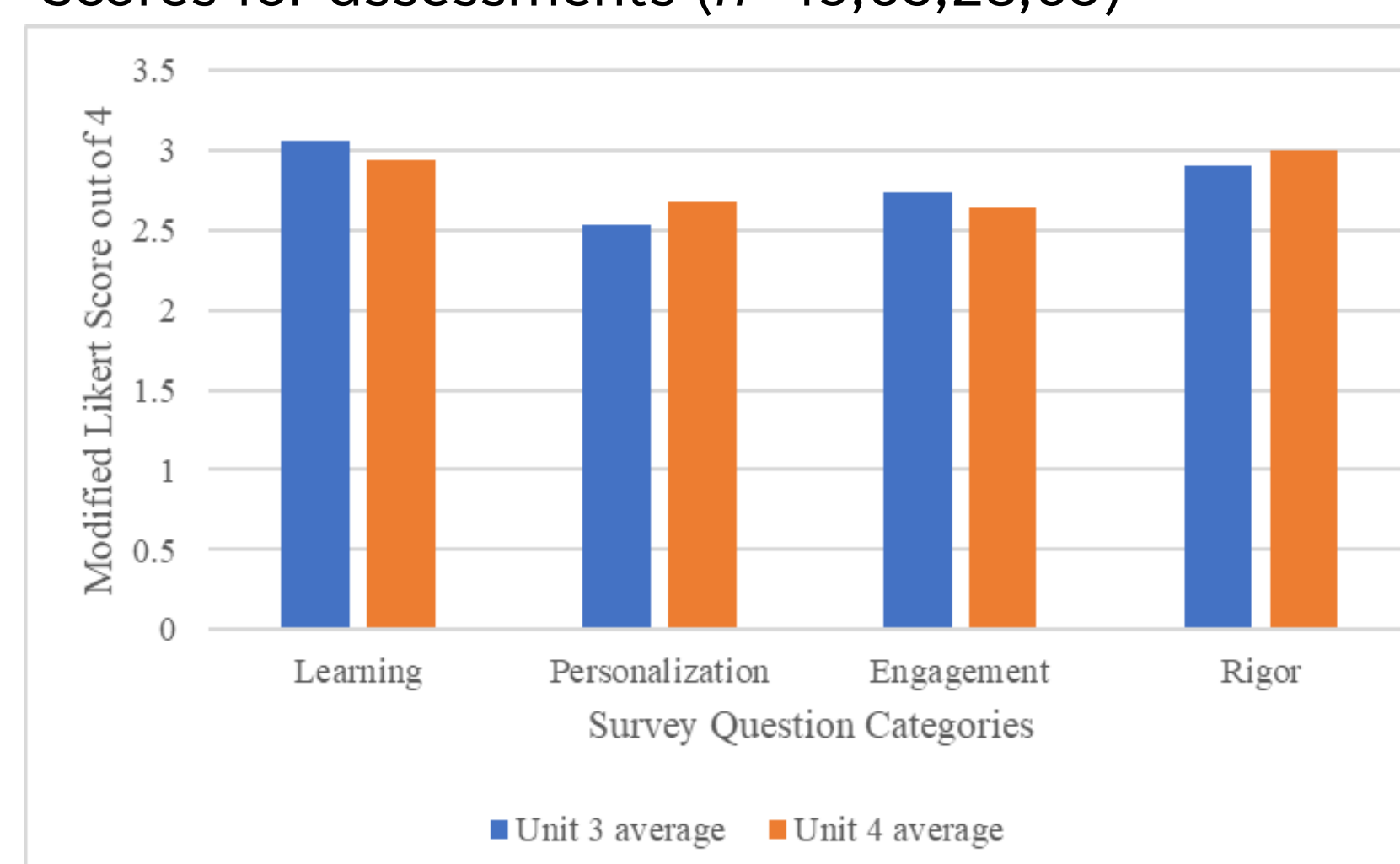


Figure 4. Comparison of survey results by category (n=40,38)

Three dimensional learning in the NGSS

