The Effects of Direct Mathematical Instruction in Science Classes on Mathematical Based Science Reasoning
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GOAL

• The goal of this project was for students to be able to use and articulate mathematical reasoning strategies when approaching scientific tasks.
• To accomplish this, sophomore level Biology (Genetics) curriculum was pervaded with mathematical instruction.

BACKGROUND

• The nature of science outlined by the Next Generation Science Standards (NGSS) reveals the multidimensional components that comprise scientific practices and understanding.
• Within the eight NGSS science and engineering practices, six use mathematics as a foundation of or tool for science.

DATA AND ANALYSIS

• Data collection for this project involved completion of scoring rubrics by both the student and teacher following a Genetics based laboratory exercise, as well as, a Genetics summative assessment concluding the three week unit of study.
• Students were evaluated on a point scale that included: stating a claim, providing evidence, data-based reasoning, and making an argument.

STUDENT EXPLANATION

• Students may not see the inherent benefit in using mathematics as a method of scientific reasoning until later in their educational career.
• My goal: That the reasoning skills students gain by practices being paralleled in both math and science be able to be applied to new or novel endeavors.
• Using mathematics in the science classroom serves to broaden students’ repertoire of data analysis and reasoning.
• Mathematics need not be confined solely to math class, the same is true with science.

Figure 1. Math and Science Interest Surveys-Question 7.

Figure 2. Math and Science Interest Surveys-Question 14.

Figure 3. Math and Science Interest Surveys-Question 15.

Figure 4. Genetics Questionnaire Pre vs. Post-Evaluating Genetics Claim, (Pre N = 62, Post N = 48).

Figure 5. Treatment Group RSQC2-Recall, (N = 32). Legend: 1 = Most important, 2 = Second most important, 3 = Third most important.

Figure 6. Average "Explanation" Lab Scores, (Treatment N = 34, Control N = 16). Legend: 0 = Not acceptable, 0.5 = Needs improvement, and 1.0 = Great!