Introduction & Background

Erie High School, an engineering focus school, is located 20 miles north of Denver with a population of 1,250 students. Like other chemistry programs in secondary education and post-secondary facilities, many general and honors chemistry students struggle with the math proficiencies and confidences needed to succeed in an introductory chemistry course (Wink & Gislason, 2000). This project focused on 104 students enrolled in four honors chemistry classes and the efficacy of teaching the necessary math concepts and applications before introducing the chemistry. Measurements were taken on student success in math/chemistry problem solving along with confidence and attitudes toward math and chemistry.

Methodology

Treatment groups were taught selected math concepts, calculations and applications at beginning of each of two chemistry units while non-treatment groups were taught how to work the formulas used in each of the units when they were introduced within the curriculum. The chemistry units used were Moles and Intermediate Algebra Curriculum. Of the four Honors Chemistry classes, different combinations were chosen to receive the treatment lessons with each three-week unit, ensuring intellectual diversity in the data (N=104).

Research Questions and Instruments

<table>
<thead>
<tr>
<th>Focus Question</th>
<th>Data Source</th>
<th>Data Source</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Question: How does purposefully teaching the necessary math concepts and skills at the beginning of each chemistry unit affect the academic achievement of chemistry students?</td>
<td>Pre- and Post-Formative Content Assessments</td>
<td>Summative Assessments (CAT’s)</td>
<td>Teacher Journal</td>
</tr>
<tr>
<td>Sub-Questions: 1. How does teaching the necessary math concepts at the beginning of each unit affect students’ general attitudes toward math and science?</td>
<td>Teacher Journal</td>
<td>Pre- and Post-treatment Student Math/Science Likert Survey</td>
<td>Student Interviews</td>
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<tr>
<td>2. How will the students’ math proficiencies be affected by the extra math exposure?</td>
<td>Math Pre- and Post Test</td>
<td>Pre-and Post-Formative Content Assessments</td>
<td>Student Interviews</td>
</tr>
<tr>
<td>3. How will frontloading the math concepts and practice affect the teacher’s inspiration and enthusiasm for teaching the units?</td>
<td>Teacher Journal</td>
<td>Pre- and Post-treatment Student Math/Science Likert Survey</td>
<td>Student Interviews</td>
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Data

Outcomes

✓ The Math and Chemistry Confidence and Attitude Survey prelesson data concluded that 78.9% of the non-treatment students felt confident using math in chemistry problems. After the lesson, 85.7% felt confident. Of the treatment group, 76.3% felt confident before the lesson and 80.5% felt confident after.
✓ Unit pre- and post-test comparisons revealed that the non-treatment group had a gain of 51.4% while the treatment group presented with a gain of 47.1%.

Student Quotes

“Learning the math in the beginning gave me an idea of what to look forward to.”
“I like learning the math part when we get to it in the unit, not before, but it did teach me to not be a robot and think for myself.”
“I realized how much I used my calculator for simple stuff.”

Value and Further Research

I found the more advanced math students in the honors classes were able to grasp the math quicker and were willing to help their peers be successful. I will have general chemistry students with lower level math abilities next year and plan to use this strategy again to compare the impact on those students.

References