



USING FORMATIVE ASSESSMENT TO GUIDE CHEMISTRY INSTRUCTION

CLARISSA BAY, MONTANA STATE UNIVERSITY,
SILVERTON HIGH SCHOOL, OREGON
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INTRODUCTION

Formative assessment strategies are used to enhance instructional practices in educational settings. Chemistry students typically struggle with problem solving that involves dimensional analysis, significant figures, scientific notation, and unit ratios. During the time that I have taught chemistry, I have searched for a way to improve student performance in these areas. For this research, formative assessment strategies such as: Frayer Model, True or False Statements, Card Mapping, Concept Maps, Check Lists, and Muddiest Point Exit Cards were used throughout the unit to determine student readiness as well as to drive instruction during the measurement unit of study.

CLASS DEMOGRAPHICS

Silverton high school is located in rural Oregon. The school has a population of 1260 students. Students in this research study have elected to take the dual enrolment college chemistry course. Thirty five ($N=35$) students participated in the study that incorporated formative assessment into their instruction.

RESEARCH QUESTION

The determined focus of this study was, To what extent can the implementation of consistent formative assessment increase student learning of math concepts in high school chemistry?

METHODOLOGY

The research in this study was conducted in a dual enrollment high school chemistry course. During this study participants completed the following:

- confidence survey at the beginning, middle, and end of the unit of study
- pretest and posttest to determine growth in ability
- summative unit test
- formative assessments at the end of each lesson

Each formative assessment was used to drive instruction for the next lesson

CONCLUSION

Overall the claims made in this study are (a) student achievement for math concepts increased with the use of formative assessment, (b) student confidence in their ability to solve chemistry problems in chemistry improved while using formative assessment check-ins, and (c) the number of students earning a C or better on the college level Unit 1 Measurement exam increased after using formative assessment. Furthermore, the process of the action research project allowed for daily reflection of the researcher and provided a time for constant and productive improvement of lessons relating to math concepts in chemistry.

ANALYSIS

Results of this study can be divided into three parts: the unit one pre and posttest, chemistry confidence survey, and the summative college level exam about measurement.

- For the Measurement in Chemistry Pre/Posttest (Unit One), it was determined that the mean medium growth (gains of 0.68) and 58.82% of students had normalized gains between 0.7-1, which is significant. the p-value for these results was much less than 0.5 which would allow the researcher to reject the null hypothesis.
- The Chemistry Problem Solving Survey showed that students' confidence in their ability to solve quantitative problems in chemistry went from a pre-treatment value of 21% to a post-treatment value of 52.94%.
- Finally, while the results of this study did not show a significant difference between the treatment and non-treatment groups for the mean of the exam (p value =0.69), there was an improvement of students that earned a C or better on the exam.

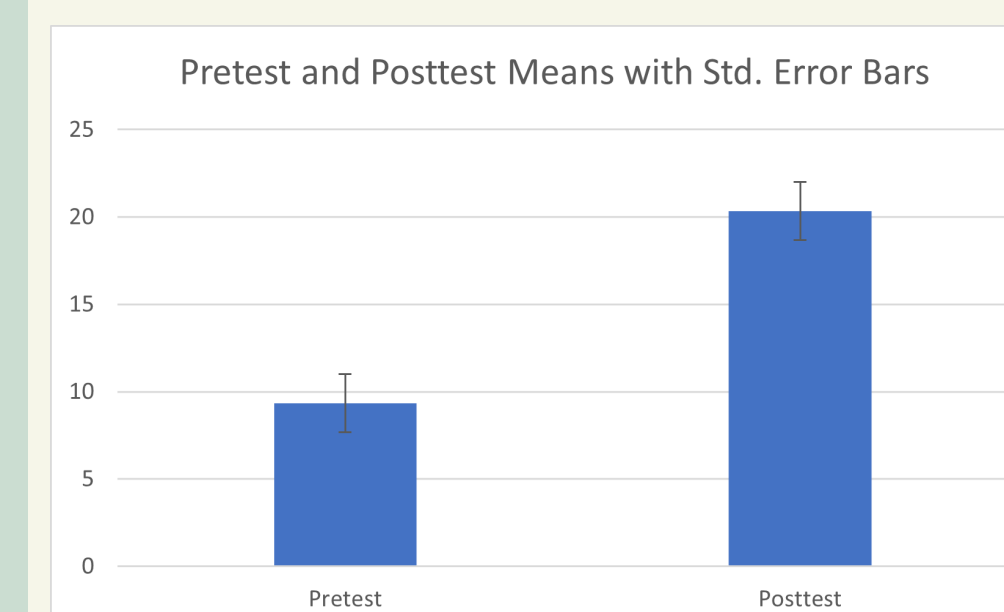


Figure 1. Pretest and Posttest Summative Data

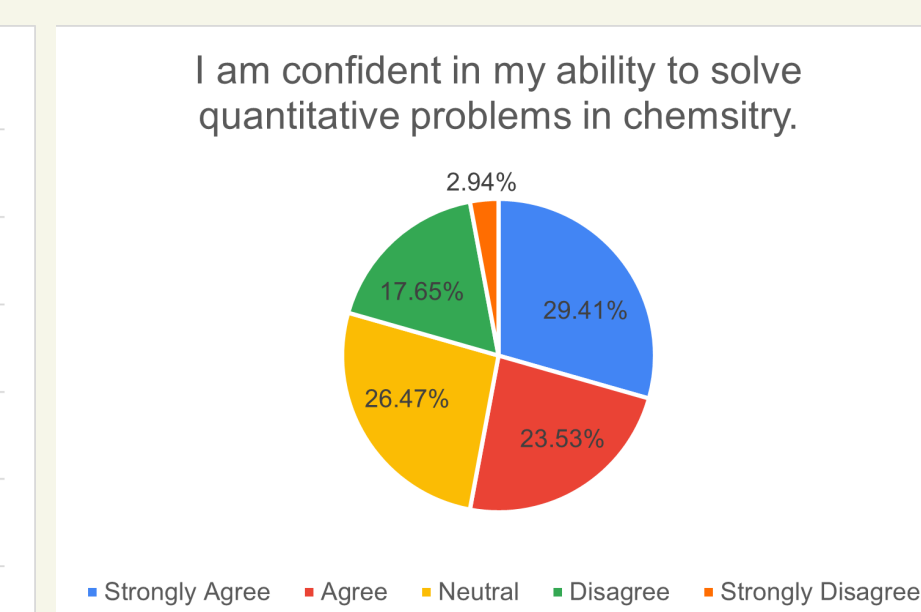


Figure 2. Results of confidence survey taken and the end of the unit.

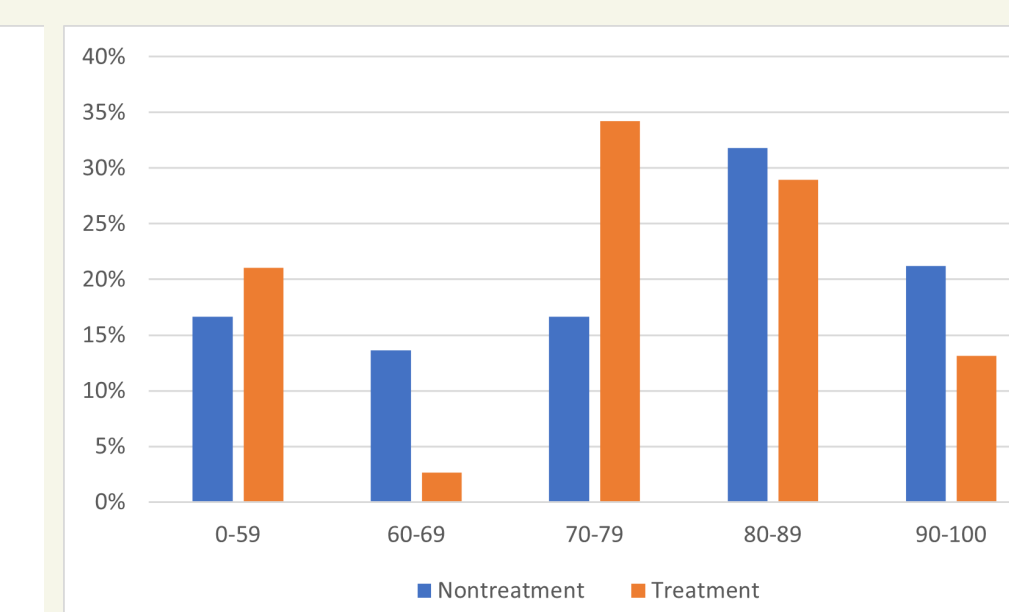


Figure 3. Results of Treatment and Nontreatment Summative Exam Grades.