# Implementing an Adaptive Learning System in Introductory Chemistry to Emphasize Mastery Learning

Kathryn S. Asala, Department of Chemistry, UNC Charlotte
Alexandra Hurst, Ph.D. Student, Nanoscale Science, UNC Charlotte

## Introduction

### Course Background

CHEM 1200 (Fundamentals of Chemistry) is a preparatory chemistry course for students with little or no chemistry background and who intend on enrolling in General Chemistry I. Adaptive learning courseware was introduced as a key instructional component of CHEM 1200 in Fall 2018 to improve course completion and student success in introductory chemistry courses.

### Adaptive Learning Courseware

The adaptive learning courseware chosen was **A**ssessment and **LE**arning in **K**nowledge **S**paces (ALEKS), a Web-based, artificially intelligent assessment and learning system.

- Uses adaptive questioning to quickly and accurately determine exactly what a student knows and doesn't know in a course.
- Instructs the student on the topics she is most ready to learn.
- Periodically reassesses the student to ensure that topics learned are also retained (i.e. mastered).

### Research Questions

1. Does the integration of ALEKS improve student performance in Fundamentals of Chemistry?
2. How does ALEKS impact students' engagement and attitude about Fundamentals of Chemistry?

## Methods

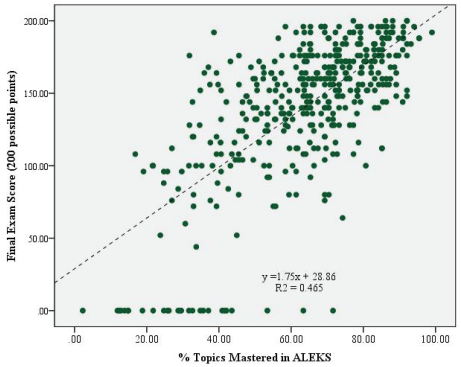
### Participants

- Participants (n = 439) were students enrolled in Fundamentals of Chemistry (CHEM 1200) at UNC Charlotte during Fall 2018.

### Measures

- Quantitative: final exam scores (total possible points = 200) and ALEKS topics mastered (%)
- Qualitative: a survey examining student engagement and attitudes was administered the last week of Fall 2018. Of the 439 students, 261 students completed the survey.

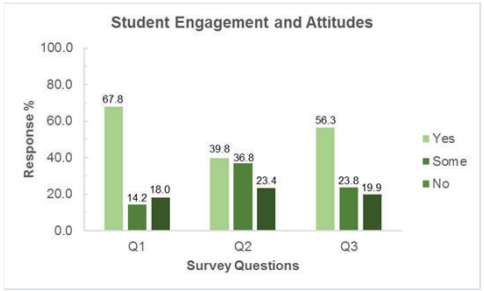
## Results: Student Performance

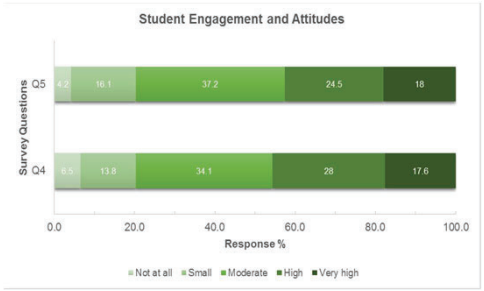



- A Pearson *r* correlation was used to calculate the relationship between student final exam scores and topics mastered in ALEKS (n = 261).
- Final exam average (points): 140.3 ± 48.6
- Topics mastered average (%): 63.7 ± 18.8
- A significant positive correlation was found: *r* (435) = + .682, p < .001
- ALEKS was used for mastery of foundational concepts in chemistry to improve student performance.
- This result indicates that students performance (measured using final exam scores) tended to increase as the percentage of topics mastered in ALEKS increased.

## Results: Student Survey

- A satisfaction survey was used to examine the impact ALEKS has on student engagement and attitudes in CHEM 1200.
- The results indicate that students perceived that ALEKS improved their understanding of the topics in CHEM 1200, helped to keep students on task with learning the course content each week, and increased their engagement with the course material outside of class.




## Conclusion

- A significant positive correlation between the percent of ALEKS topics mastered by a student and his comprehensive final exam score was found.
- All sections of CHEM 1200 in Spring 2019 continue to use ALEKS as a key component of instruction.
- Student success percentages (ABC%) in the subsequent course (General Chemistry I) will be determined after the Spring 2019 term concludes.

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