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

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CHEM 1200: Fundamentals of Chemistry

Preparatory chemistry course for students with little or no chemistry background

Structure
- 5 sections offered in Fall 2018
- 4 sections: 2 x 75 minutes per week; 1 hybrid section
- Pre-class and in-class assignments (10%)
- Adaptive learning homework - ALEKS (15%)
- Weekly assessments (15%)
- Four unit exams + comprehensive final exam (60%)

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CHEM 1200: Fundamentals of Chemistry

ALEKS implementation
- Weekly objective assignments due 11:59 pm Friday
  - 5 – 8 topics per assignment
  - Reports available to determine the topics on which students struggled the most
  - Revisited these topics in help session on Monday

- Knowledge Checks every four weeks
  - Reassessed the student to ensure that topics learned are also retained
  - Promote mastery of objectives

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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?

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Research Methods

Participants
- Participants (n = 439) were students enrolled in Fundamentals of Chemistry (CHEM 1200) at UNC Charlotte during Fall 2018.
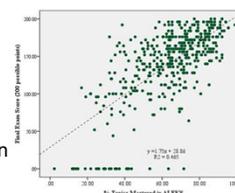
Measures
- Quantitative: final exam scores (total possible points = 200) and ALEKS topics mastered (%)

- 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.

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Results: Student Performance

- A Pearson r correlation was used to calculate the relationship between student final exam scores and topics mastered in ALEKS.

- A significant positive correlation was found:
  r (435) = + 0.682, p < .001

- Students' performance (measured using final exam scores) tended to increase as the percentage of topics mastered in ALEKS increased.

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2/18/2019

Results: Student Survey

- Satisfaction survey was administered at the end of the term (N = 261).

- Examined the impact ALEKS has on student engagement and attitudes in CHEM 1200.

Did ALEKS help improve your understanding of the topics in CHEM 1200?	N	%
No	47	18.0
Some	37	14.2
Yes	177	67.8

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Results: Student Survey

Did working in ALEKS help keep you on task with learning the course content each week?	N	%
No	52	19.9
Some	62	23.8
Yes	147	56.3

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Results: Student Survey

Do you think ALEKS helped you engage outside of class with the course material compared to other courses you have taken at UNC Charlotte and used online homework systems?	N	%
Not at all	17	6.5
Small degree	36	13.8
Moderate degree	89	34.1
High degree	73	28.0
Very high degree	46	17.6

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Results: Student Survey

- Students perceived that ALEKS:
  - improved their understanding of the topics in CHEM 1200
  - helped to keep them on task with learning the course content each week
  - increased their engagement with the course material outside of class.

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Conclusion

- A significant positive correlation between the percent of ALEKS topics mastered by a student and his comprehensive final exam score was found.

- Students perceived ALEKS as helpful to their learning, keeping them on task, and engaged outside of class.

- All sections (3) of CHEM 1200 in Spring 2019 using 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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