# Using ALEKS in a Developmental Modularized Math Lab

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## Introduction

Nationwide we are experiencing reforms in foundational/developmental mathematics designed to accelerate students through this sequence of coursework to college readiness. As these efforts continue a few models of instruction have emerged, namely the inverted classroom, the emporium model and modularized mathematics.

This paper will inform participants about a redesign we have undertaken at South Seattle Community College in our Modular Math Lab course to utilize ALEKS software to assist students in strengthening their weaknesses with the foundational/developmental mathematics concepts and skills and further them on their path toward college level mathematics courses.

This redesign was conducted under a Title III grant that specifically addresses the need to better prepare and accelerate our students through the foundational/developmental sequence, while also involving concerns with initial placement issues for our student population.

This document will address our various reasons for adopting the use of ALEKS, introduction of the format of ALEKS' interface for both students and instructors, the wealth of data available to instructors on individual student progress and performance, as well as our overall data on student success as a result of our year long pilot with this software program.

## Background

The original lab structure for SSCC's modular math lab used a learning management system that included three components; video lessons, practice problems and certifications. Over years of teaching with this LMS we learned that students rarely, if ever, watched or listened to the lessons, performed a few practice problems and then proceeded straight into the certification phase of the software. The certification phase of this software invoked a baseball analogous strategy for success with a three strikes and you are out model to master the certification. Consequently, many students would perform well through the majority of the certification, but, essentially, strike out and have to begin all over again to attempt mastery. This led to a decline in their motivation and their sense of self-confidence with the math concepts. Despite having failed to master the

certification, very few students viewed the lesson before subsequent attempts to master the certification.

A further concern stemmed from the structure of the lab, as initial diagnosis of students' pre-existing math knowledge was left to the instructor to determine. A system was established for instructor's to utilize diagnostic tests to determine what math concepts students held strengths and weaknesses in and this information was to be used by the instructor to establish an individual learning plan for each student. The idea was that students would only have to study what they didn't already know, thus not wasting time studying concepts that they had already mastered. Yet, difficulties emerged due to lack of consistency amongst lab instructors with regard to this diagnostic piece.

The length of time a student could continue in the lab presented another barrier to success. Our existing lab model consisted of 20 modules covering the curricular concepts from Basic Mathematics through Intermediate Algebra. Our course structure is as follows:

Math 083 - Basic Mathematics
Math 084 - Algebra I
Math 085 - Algebra II
Math 098 - Intermediate Algebra

Each course consisted of five modules. A student could potentially begin working on a particular course, only filling in where weaknesses in their understanding existed and finish more than one course within one quarter, depending upon their proficiency with the software and the course material. The idea was that this would become an acceleration model for students to make their way through the foundational math and lead to success in a college level math class.

Students registered in a placeholder numbered course, namely Math 081 and were transferred into one of the aforementioned courses at the end of the quarter, given that they completed all of the requisite modules to earn credit in that course. Students were allowed to return to the lab the following quarter and begin from where they left off the prior quarter until they completed the entire four quarter sequence. Students who failed to complete five required modules for a course could earn an S or Satisfactory grade in Math 081 and return the next quarter to continue their work to complete a defined course. Unfortunately, for many students this model did not lead to acceleration, as they languished in the lab for more than the necessary quarters to successfully complete the coursework needed to advance to a college level math course. In addition, our former LMS' course content spanning the range of our foundational curriculum was housed within three separate software products. Students incurred significant materials costs to continue in this format of instruction.

It was time to seek out a system that would lend itself to greater student success, ease of use, and lower student cost.

**The Redesign**

ALEKS software, created by the ALEKS Corporation and marketed by McGraw-Hill publishing company was chosen as the software to replace our existing LMS within the lab environment. ALEKS stands for **A**ssessment and **LE**arning in **K**nowledge **S**paces and is a Web-based, artificially intelligent assessment and learning system.[1] As a colleague of mine recently noted, ALEKS is "smart" software that takes us in the direction we need to go to ensure student success. McGraw-Hill, the marketer of ALEKS, describes it as, "ALEKS uses artificial intelligence and adaptive questioning to assess precisely a student's knowledge, and deliver individualized learning tailored to the student's needs." Our pilot has shown this to be the case with great outcomes in terms of student success.

The following characteristics led to the pilot of ALEKS in our modular math lab redesign:

- Internal assessment of students' pre-existing knowledge
- Immediate feedback to students on incorrect responses
- Periodic reassessment to ensure mastery and retention
- Quality of explanations and responses to student input
- Lower materials costs to students.

We used ALEKS' Beginning and Intermediate Algebra Combined course for this redesign, because the course content spanned the full spectrum of our foundational math content, namely from Basic Mathematics through Intermediate Algebra. Students, therefore, purchased an 11 week (quarter) access code and registered into the course.

The course content was still broken out into 20 objectives, however the structure of the lab was altered to improve student success. ALEKS uses the terminology of objectives vs. modules, so the new designation of objectives was adopted.

Human nature dictates that if one is given a longer time frame to complete a task or goal, they tend to procrastinate and slow their progress toward its eventual completion. For this reason, the redesign of the lab required students to work as far within the scope of the 20 objective curriculum as they could and then they would exit the lab format into the next designated developmental course.

The first day of an ALEKS lab, the instructor takes on the role of salesperson and motivational speaker, explaining to students not only the course structure, but the benefits of working to complete all 20 objectives within a quarter. This equates to four courses in

one quarter and can realize a savings of just under $1,800 in tuition and books, not to mention the time and energy they would have to put forth over three additional quarters. It is articulated to students that they should try to set a goal of completing all twenty objectives within a quarter and if they did so, they would then exit into a college level math class.

When students begin in ALEKS they take an Initial Assessment that is driven by the software and comprises 25-30 random questions from the entire course content. Based upon a student's responses, ALEKS then creates an individual learning path through the remaining math concepts that the student needs to learn. ALEKS populates a pie chart with those topics they already know and what they need to learn. All work is driven through this pie chart, as seen in Figure 1 below.

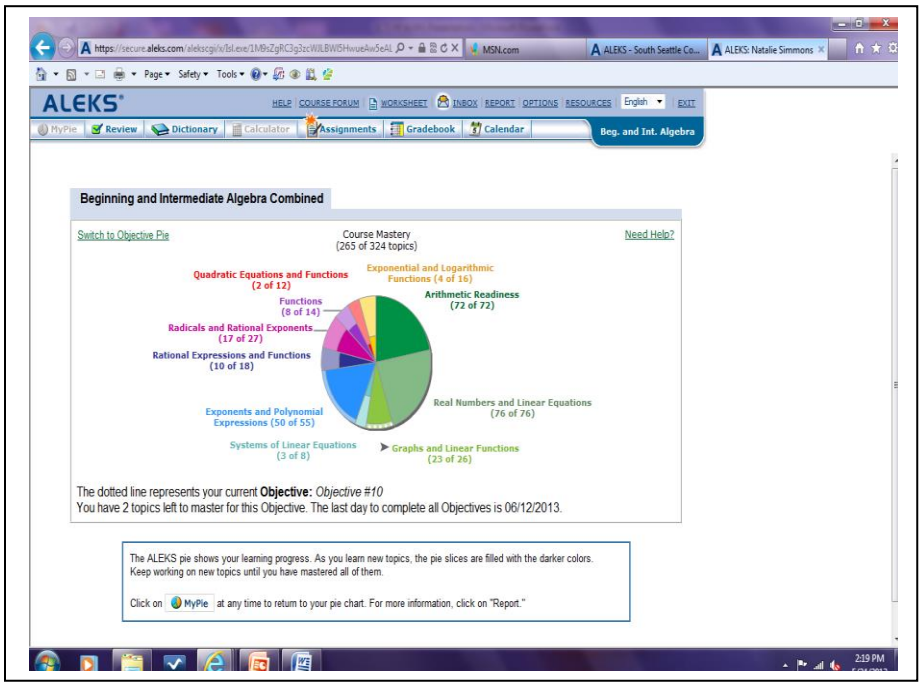


Figure 1: The Student View with ALEKS

What we have found is that the pie is very motivating for students. They are excited to see it fill up and are genuinely excited to work toward the goal of completing the pie. This simple visual of their overall progress translates into increased self-confidence in their math ability and a willingness to go beyond their pre-existing knowledge to learn new material.

The lab, as with our former lab, is set up with one instructor and a TA, who assist students with their work, when questions arise. The goal with this redesign was also to fully automate the lab, as our former lab was very paper intensive, as all tests were paper and pencil, despite the fact that the LMS supported computer based testing. We

successfully met this goal as all work, tests and assessments are done within the ALEKS software. The exception being that we ask students to turn in their scratch paper upon completing a test and this is used by the instructor to assign any partial credit when reviewing the student's online test submission.

Students must master each objective at 100% and then take a test for each objective they successfully master. Tests must be taken in the classroom for proctoring purposes. They also take the Initial Assessment and a Final Assessment. The Final Assessment is again assigned by the instructor, but controlled by ALEKS in content and only covers that portion of the material that the individual student has learned during the quarter.

The eventual goal, given time and space improvements is to expand this lab to an emporium model, so that we can better accelerate our student population through the foundational levels.

Just as the student view lends itself to ease of use, the instructor side of this software does just the same. Figure 2 below shows the instructor interface.

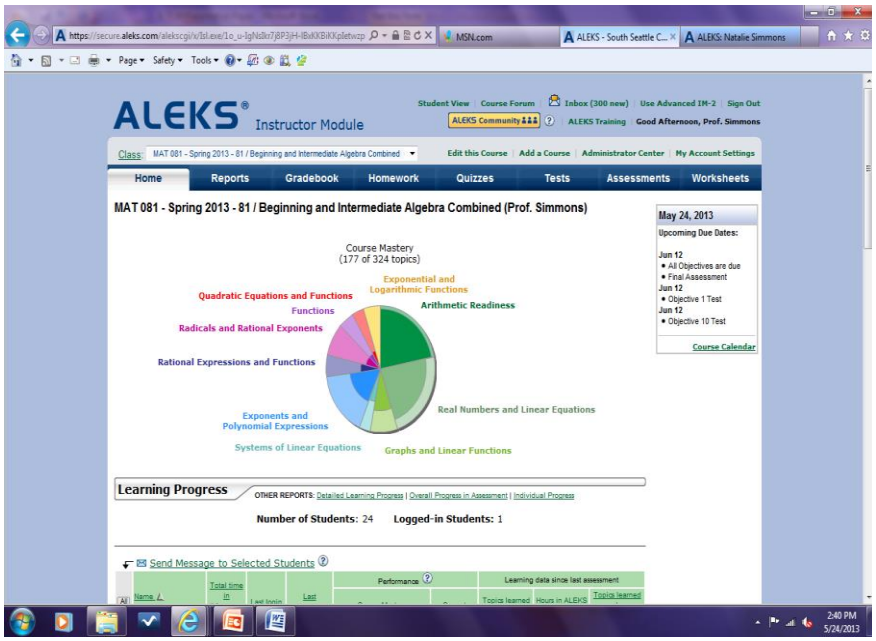


Figure 2: ALEKS' Instructor Interface

Instructors will find ALEKS very data rich in that you can track how students progress in terms of topics learned and time spent within the software. As a result of its ease of use and functionality we have found many other uses for this software on our campus. For example, it has been used to help us more accurately place incoming scholarship recipient students into their proper beginning math course on our campus.

**Data on Student Success**

Our success with this model is measured not only by quarterly success, but also student acceleration all of which are addressed in the information below.

Student Course Progression

Winter 2012:

Total students: 27
Students successfully progressing 1 course level: 5
Students successfully progressing 2 course levels: 8
Students successfully progressing 3 course levels: 10
Students successfully progressing 4 course levels: 1

Spring 2012:

Total students: 28
Students successfully progressing 1 course level: 7
Students successfully progressing 2 course levels: 8
Students successfully progressing 3 course levels: 5
Students successfully progressing 4 course levels: 6

Fall 2012:

Total students: 27
Students successfully progressing 1 course level: 5
Students successfully progressing 2 course levels: 4
Students successfully progressing 3 course levels: 4
Students successfully progressing 4 course levels: 6

A comparison of ALEKS to our former LMS in terms of student success is as follows:

Former LMS
(mean of course sections)
Winter 2012: (3 sections)
w/S grade: 66% passing
w/o S grade: 35% passing
Spring 2012: (3 sections)
w/S grade: 56% passing
w/o S grade: 34% passing
Summer 2012: (2 sections)
w/S grade: 60% passing
w/o S grade: 34% passing

ALEKS
1 section/quarter
No sections summer quarter
Winter 2012:
89% passing
Spring 2012:
93% passing
Fall 2012:
81% passing

In the final analysis of whether a redesign is ultimately successful and sustainable, one must also look beyond the quantitative data and look to the qualitative data, as well. The following represent student comments about ALEKS and the newly designed lab.

"It has changed my attitude and confidence in math. If one is motivated, this is an excellent route to take."

"ALEKS is rewarding and boosts confidence."

"I LOVED it! I got to work at my pace, and I really liked how ALEKS would keep track of what I needed to review."

"With this software, the ability to move at my own pace was vital. I was able to cover much more ground than in a traditional classroom."

"I liked the way it first let you try to figure it out, then would change it up a bit so that you learned the lesson from every angle."

Full implementation of this piloted lab begins summer quarter 2013 in all of our lab format sections at South Seattle Community College. We expect to continue to see exemplary student results and performance within this new structure and especially, with this "smart" technology.

**References**

What is ALEKS? (2013). Retrieved May 24, 2013, from http://www.aleks.com/about_aleks