Case Study using Khan Academy in a Self-Paced Developmental Mathematics Model
Manchester Community College, Manchester, Connecticut

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1. Overview

Manchester Community College (MCC) in Manchester, Conn., implemented Khan Academy in 2013 to address the mathematical needs of students who did not test into college-level math.

Manchester Community College is one of the largest of the state's 12 community colleges and serves more than 15,000 students a year. There are over 7,000 credit-only students and 40 percent of these students are from under–represented racial and ethnic groups. The average age of our student body is 25, with one-third of our students older than 25. MCC offers associate degrees in more than 40 disciplines, along with certificate and credit-free programs and has graduated more than 25,000 students since 1965.

2. Timeline

The Khan Academy-based course, Math Blast, was introduced in fall 2013. Originally, this course was offered to nontraditional-aged students (over age 25) during the 2013-14 academic year. In Summer 2014, the course was opened to all incoming students who tested into the lowest level developmental mathematics class using the results of the College Board's Accuplacer placement test. The course was offered as a self-paced free alternative to taking a non-credited developmental course. The course was introduced as a 10-week (2.5 hours/week) hybrid where an equal amount of time was expected to be devoted to Khan Academy content outside the lab. A coach/instructor was available in the lab to guide students through the process, review math skills and assist students when needed.

3. Implementation Goals

The main goal of the Khan Academy-based course was to help students strengthen their mathematical foundation skills in arithmetic and algebra basics. Focus was placed on mastering specific skill development exercises found on the Khan Academy platform. Students then retook the Accuplacer mathematics placement test at the end of the 10-week course.

The learning objectives of the course included:

a. Identify areas of strength and weakness in student's mathematical foundation
b. Become more proficient with computer-based learning
c. Gain mathematical competencies in the following areas: arithmetic, fractions, decimals and percents, real numbers, exponents and roots, polynomials, solving equations and inequalities, graphs and linear functions, geometry and measurement.

As part of implementation, students established a Khan Academy account and entered a class code to become part of my class (Exhibit 1).

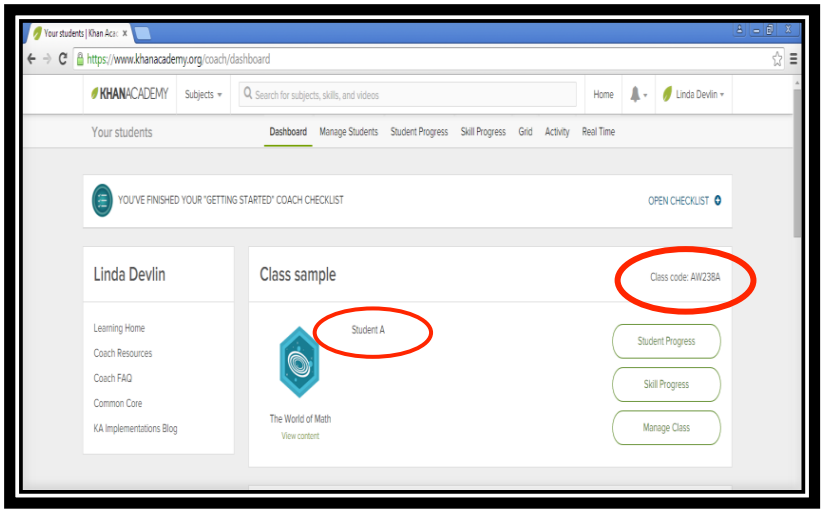

Exhibit 1

Once the students were part of the class, they were given a syllabus with specific videos and skills to complete at their own pace with a mapping of where they should be each week. This playlist/syllabus of skills and videos was developed with skills aligned with the college's developmental mathematics program and Accuplacer. I began each class with a direct instruction mini-lesson on skills that would be covered in that particular week. Since this class was self-paced, students were encouraged to try the new skills that were introduced and continue working on videos and skills from their playlist.

Using Khan Academy as the main instructional approach enabled me to focus on the specific skills that were troublesome for individual students. I could walk around class and answer specific questions of individual students while other students were working.

4. Missions and Playlists

Since the topics and skills needed for this course encompassed a number of Khan Academy missions (areas of study), I was able to customize what skills I wanted students to work on based on our specific developmental math curriculum requirements and Accuplacer topics. This playlist/syllabus was their course content guide during the 10-week session. I did this by making recommendations to the entire class on a weekly basis concerning the skills covered that particular week (Exhibit 2). These recommendations would then appear on the student's Learning Dashboard.

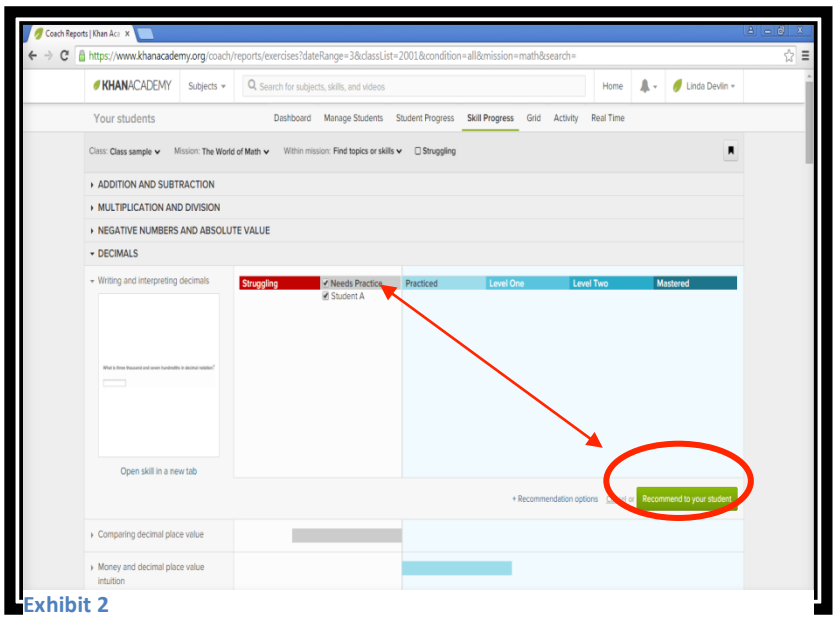

Exhibit 2

5. Khan Academy Reports – Mastery Challenge, Recommendations, & Student Reports

Khan Academy has an “Exercise Progress Levels” chart (Exhibit 3) that allows both the instructor and students to see the student’s competency level for a specific skill. This was very helpful and motivational for students and was used extensively within this course in different reports. By using the ‘Exercise Progress Levels” of Khan Academy (Exhibit 3), I was able to easily track student skill progress.

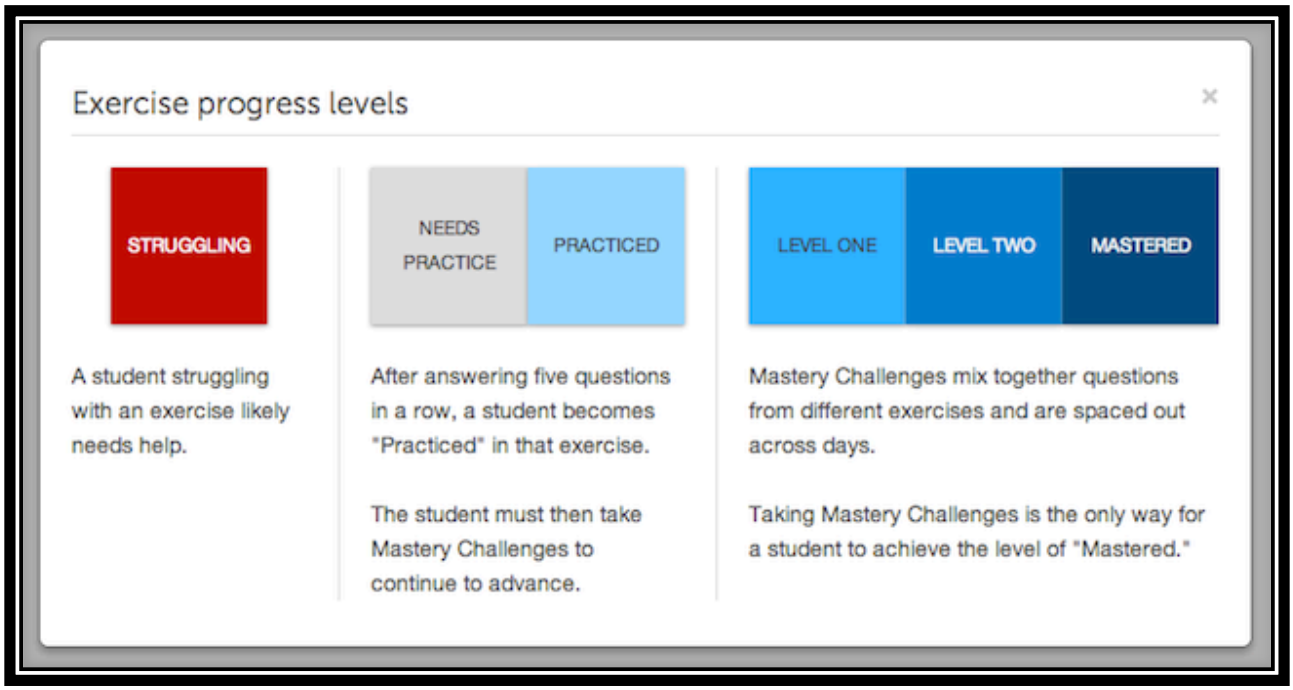

Exhibit 3 Progress levels: **struggling, needs practice, practiced, level one, level two, mastered**

a. Mastery Challenges

I emphasized the importance of “mastering” specific skills within the class and with each individual student. Students could do this by taking “Mastery Challenges” from their home page (Exhibit 4). This feature allowed students to practice skills in a mixed skill format based on the skills they had practiced. Immediate feedback was given and students could view their progress through “Exercise Progress Levels” from “Struggling” (red) to “Mastered” (navy blue).

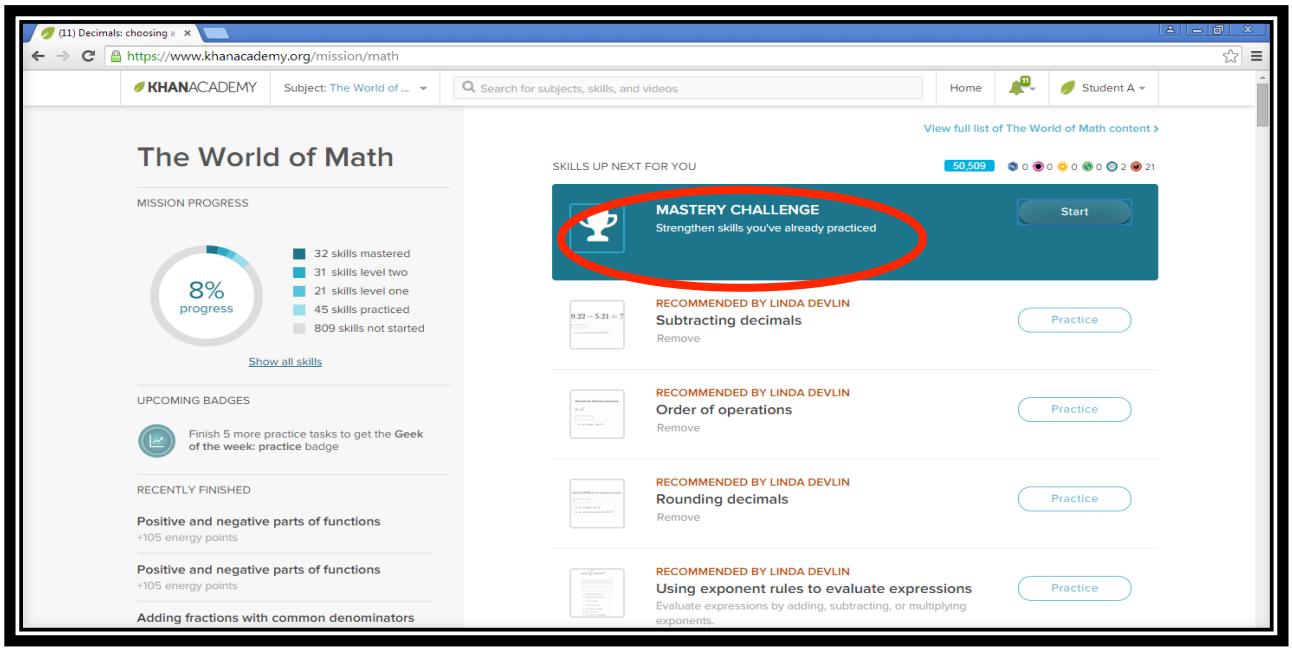

Exhibit 4

b. Individual Student Progress Reports & Recommendations

I was able to track skill progress by monitoring their “Student Progress” report (Exhibit 5) that showed which exercises they were working on and what competence level they had achieved. I could also view how much time the student had spent working on Khan Academy. This could all be viewed within different time/date parameters that I had set.

One of the most informative aspects of this report for this course was the “Recommendations” tab. This tab allowed the coach and student to view what recommendations the coach/instructor had made to the student as well as show what proficiency level the student attained. Here, students could view their proficiency progress ranging from Struggling (red) to Mastered (navy blue).

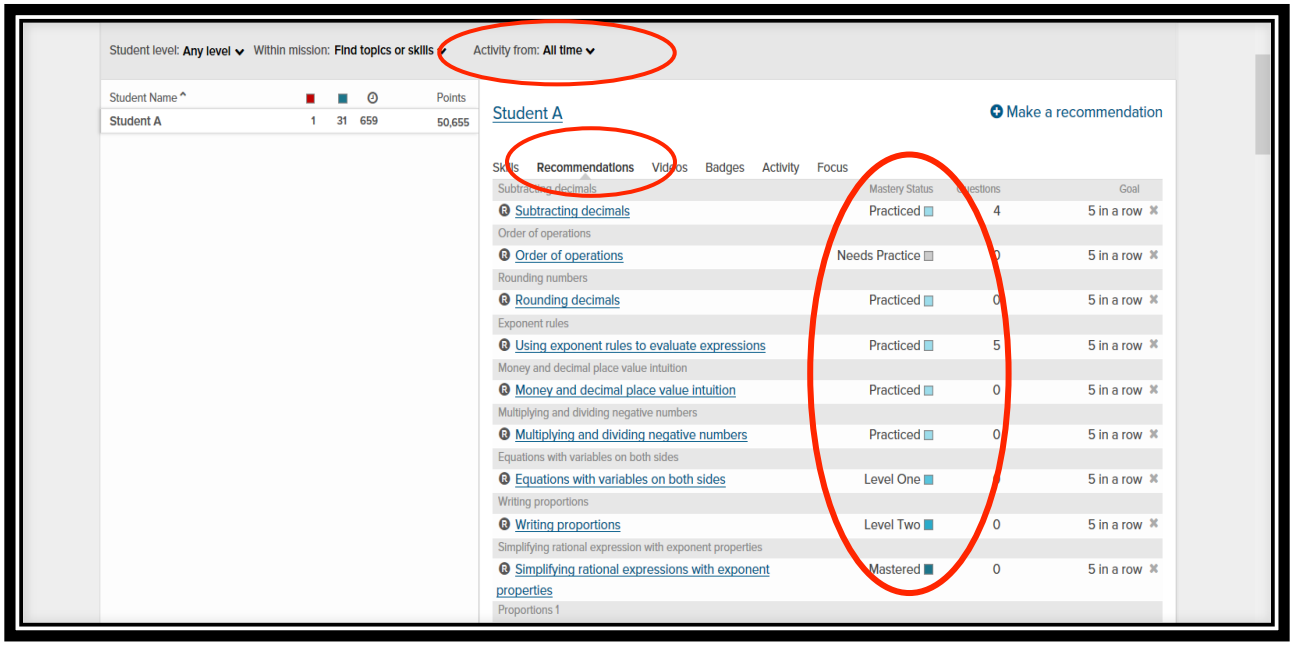

Exhibit 5

6. Assessment

Assessment of student progress was determined on an individualized level by viewing the skills in the Recommendation tab. By going to the Individual Student Progress report (Exhibit 5) and looking at the skill recommendations, both the instructor and student could view the student's level of proficiency for each skill—Struggling through Mastery. I would do this with each student and then spend time with them reviewing areas of difficulty. There were a number of intervention strategies at Khan Academy to assist students. By clicking on the troublesome skill title, the student could either:

a. Re-watch an instructional video that was suggested by the Khan Academy site or
b. Obtain help by getting step-by-step hints in the "Show me How" section.

If needed, direct individualized instruction was provided as well.

7. Challenges and Solutions

The most common challenge was keeping students on task with the Coach Recommendations. Because there are over one thousand videos and exercises on Khan Academy and this course covered skills in many Missions or subject areas, it was important to remind students to complete the videos and exercises from the syllabus only—unless further help was needed. In the first couple classes, I reminded students of this and also monitored the skills and videos on which they were working. Once the students understood this, they seemed more motivated to continue as the number of skills they needed to review decreased and they were able to clearly see their proficiency on course content by viewing their "Coach Recommendations" skill progress.

8. Student Outcomes and Anecdotal Evidence

After three semesters (Fall 2013, Spring 2014, & Summer 2014) of implementing this program, I found consistent course trends. On average, approximately 60% of students moved up at least one level on Accuplacer. This equated to being able to take the next higher-level course in the developmental math sequence. Of those students who placed into a higher-level math placement, two-thirds of those moved up two math levels! These students were then able to move directly into a college-level credited math course and bypass having to take a developmental mathematics course. Below is the most recent data from the summer 2014 cohort (Exhibit 6).

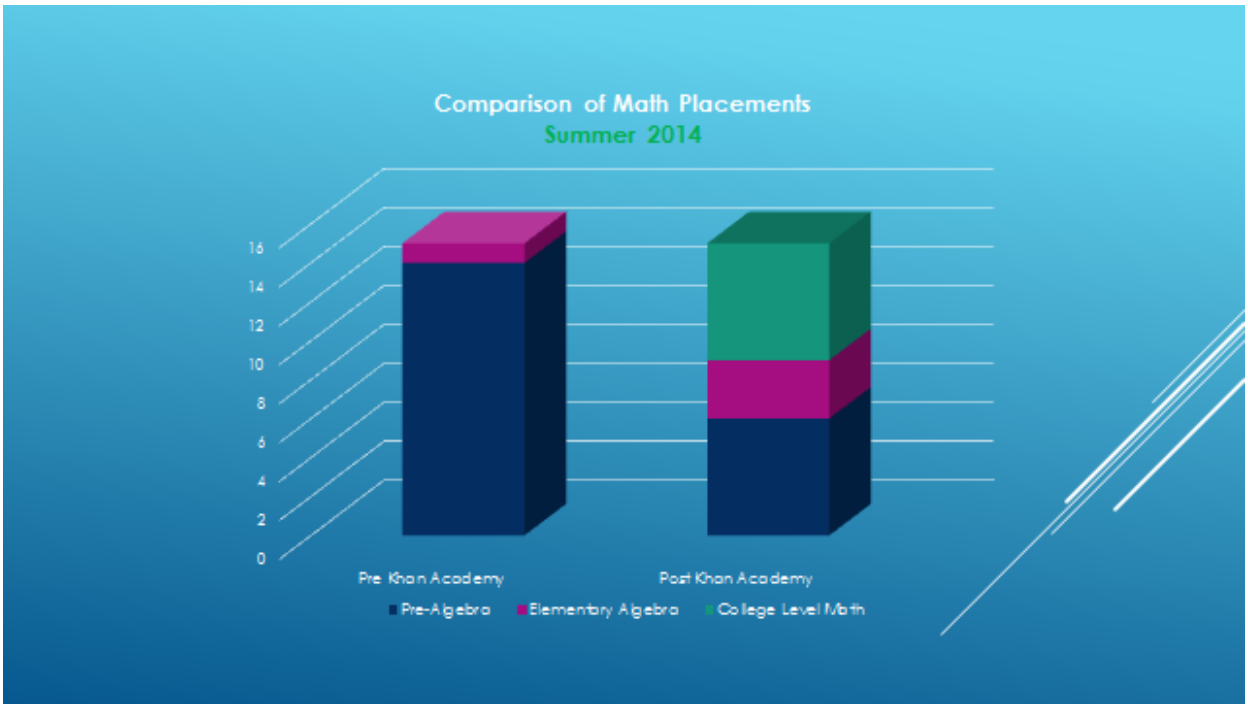

Exhibit 6

Also, when evaluating skills mastered on Khan Academy versus subsequent math placement, I found that those students who mastered the recommended skills as per the playlist seemed to have a better correlation with improvement on Accuplacer than by looking at the amount of time spent on Khan Academy alone.

In all, offering a course using Khan Academy in this way allowed students the opportunity to increase their math skills and reduce or eliminate the need for developmental mathematics classes.