Reimagining Khan Analytics for Student Coaches

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ABSTRACT

In this paper, I describe preliminary work on a new research project in learning analytics at Arizona State University. In conjunction with an innovative remedial mathematics course using Khan Academy and student coaches, this study seeks to measure the effectiveness of visualized data in assisting student coaches as they help remedial math students achieve success in an online math class.

Keywords

Learning analytics, data visualization, remedial mathematics.

1. INTRODUCTION

With 77,000 students, Arizona State University has become one of the largest institution of higher learning in the United States second only to the University of Phoenix. A certain slice of newly enrolled students at Arizona State find themselves in a dilemma, they have been admitted to the university, but they have failed to meet the minimum math requirement that would allow them to start taking undergraduate classes.

These students are desirable for many reasons. They can help the university meet goals for diversity and social justice. Often these students are first generation college students. However, this population also poses challenges to the university. Being unable to meet the minimum score on the mathematics placement test not only points to gaps in a student's math background, it often points to larger issues of academic readiness.

Overcoming the hurdle of meeting the minimum math requirement has been challenging. Online remedial math classes using an adaptive learning model have historically had a pass rate of around 50%. These pass rates have remained stubbornly low despite various efforts to improve them.

2. A NEW APPROACH

In the summer of 2014, EdPlus (ASU's online education arm) decided to launch a new version of this remedial math class built around Khan Academy and undergraduate peer coaches. One of the big reasons for making this change was data. Khan, because it is a non-profit, was open to sharing the data generated by students and KA's strategies for student success. Arizona State wanted their remedial math classes to become their most data driven offering. Working with Khan had other advantages as well. Because KA has over 10 million unique users every month and over 2 billion problems worked, Khan is able to deploy and adapt its instruction at scale.

3. CHALLENGES WITH KHAN

While the strategy of building a remedial math class around Khan Academy had many strengths, there were also significant challenges. The first challenge was in the form of a problem that many schools face when working with Khan Academy. While seeking to build a comprehensive universe of math instruction, KA has developed explicit pathways to math success. Khan calls these pathways "missions." However, ASU's end goal: passing an exam that is meant to reflect the many math concepts that a student should know before entering college, cut across many Khan missions. In addition, Khan's powerful analytical tools that are meant to aid instructors in following a student's progress are tied to these missions. When math skills are being served up to students *a la carte*, as they are to accomplish ASU's remedial math program, the analytics are unraveled.

A second major challenge facing the Khan Academy program was the same challenge facing the original remedial math program. Many of these students were failing to pass the minimum math requirement to enter Arizona State University because school in general has been challenging for them for a very long time. Putting these students by themselves in an online math course of any kind could be a recipe for failure. They needed additional support. The kind of personal attention these students need is very expensive. ASU decided to control that cost by employing a system of student "coaches." Coming from a variety of majors and backgrounds, these student coaches were handpicked and given responsibility for 20-25 online students each. Their job was to monitor, guide, tutor, and encourage these students to the end goal of having their coachees pass an exam that was meant to reflect their readiness to take college level math.

In order to be effective, these coaches needed access to the data in Khan Academy about their students' progress, but because ASU's exam at the end of the remedial math course measured math skills that spanned several Khan math missions, the state-of-the-art Khan analytics that are tied to those missions were unavailable to the coaches. After a lot of work, (much of it spearheaded by the student coaches themselves) a spreadsheet was developed that was populated by weekly downloads of Khan data. It showed which math skills were practiced and which skills were mastered and matched these up to a rough metric that told the coaches whether their students were on track to successfully master all the math skills they needed before they had to take the exam.

4. RESEACH GOALS

The goal of my research is create custom data visualizations that fit ASU's mission for this remedial math class and then measure the effectiveness of these analytics in assisting the student coaches in their work of creating student success. These analytics are specifically aimed at enabling the student coaches to visualize the

large amounts of data generated through Khan Academy. Khan stores data on each student's attempt to solve a math problem related to a particular skill. There is also data on how many times a student views a Khan video on a math concept or asks for hints when attempting a math problem. Because we are re-envisioning the analytics from the ground up, we have an opportunity to create analytics that are similar to the ones that Khan has created for its missions yet improve these analytics for ASU's specific purposes and create dashboards that visualize the data in other ways that may be even more useful for the student coaches. Because the coaches only had access to Khan data through a spreadsheet the first semester the new remedial math class was taught, there is an opportunity to compare the success of coaches assisting their students with the spreadsheet data versus those using the more sophisticated data visualizations produced from the student's actions within Khan Academy.

In order to achieve this goal, ASU is teaming up with Blue Canary, a learning analytics company headquartered in Chandler, Arizona. Blue Canary and I are working directly with Khan Academy to address data flow issues including creating API's that will automatically access data from Khan databases that will be feeding the dashboards and graphics created for the student coaches. I am also going to be working with Blue Canary to create dashboards and data visualization tools for the Khan online math class in Tableau. These dashboards are directly aimed at assisting student coaches while they help their math coachees achieve success.

5. RESEARCH QUESTIONS

Once the dashboards are created and the student coaches start using them to assist their math students, we can start to address this research question: Do data visualization tools enable student coaches to better assist remedial math students entering Arizona State University achieve success?

6. RESEARCH DESIGN

The preliminary design of this study is to compare data generated by two cohorts of remedial math students. The first cohort has been guided by student coaches who have been accessing the Khan data on through a spreadsheet created to keep track of skill practice and mastery. The second cohort will be guided by student coaches who have access to the data visualization tools and dashboards created by myself and Blue Canary in Tableau. The ultimate measure of coach success will be the pass rate of their students at the end of the course. In addition, there will be many other metrics to measure, as well, such as student engagement and persistence.

This research is in the early stages. Mike Sharkey from Blue Canary and myself have been meeting with student coaches and instructional designers of the remedial math program to assess the needs of the student coaches and talk about possible data visualizations that may be helpful. API's are being designed pull data from Khan for the analytics and dashboard layouts. While we are working on this, data is being generated by students in Khan Academy who are working with coaches that are relying on the spreadsheet to access data about the progress of their students in Khan. I am currently in second year of a four year PhD program, so we have some time to make adjustments and work out problems as they arise.