SREE Spring Conference 2015 Proposal

Title:

Self-paced remediation and math placement: A randomized field experiment in a community college.

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Background / Context:

Community college students require an enormous amount of remediation for skills they should have learned in high school. One nationally representative study found 58% of community college students enrolled in some level of remediation in at least one subject (Attewell, Lavin, Domina, & Levey, 2006), and, specific to math remediation, Bailey, Jeong, and Cho (2010) found that 59% of students were placed into developmental math in their sample of community college students. Most community colleges have several levels of developmental math placement such that students may need to take as many as four courses before having the opportunity to enroll in college level coursework.

To determine which developmental courses students should take, colleges offer placement tests usually taken by students in the summer before fall enrollment. Students are often exposed to a battery of tests that assesses their level of preparation in math, English, reading, and writing. The Compass exam, produced by ACT, is a common assessment used to place entering college students into the sequence of developmental math courses at the institution. Whether the Compass exam has substantial predictive validity for college success has been questioned in the literature. A single institution study finds the Compass exam has demonstrated predictive validity with developmental course performance (Donovan & Wheland, 2008), but another study using a state system of community colleges finds that placement exam scores are not associated with college GPA after accounting for previous high school academic performance (Scott-Clayton, Crosta, & Belfield, 2014).

There is an additional concern of misplacing students into an inappropriate course level by using the placement exam. The current placement exam technology is somewhat of a blunt instrument used to funnel students into a course that might not perfectly be suited for the students’ ability level. Scott-Clayton (2012) finds that supplementing placement scores with other measures of likely success could reduce misplacement and reduce remediation rates.

Although many colleges offer the students an opportunity to retest, students might not be aware of their specific deficiencies and could benefit from opportunity for guided self-study to improve their skills in a targeted manner. A new tool called ALEKS provides such an opportunity. The tool provides a computer adaptive math placement exam that assesses which specific topics require remediation and then offers students self-paced remediation modules that target specific skills students need to develop. Students that wish to avail themselves of the opportunity to improve their placement can take the initial ALEKS placement exam, follow the review modules, and retest to achieve a better placement.

In collaboration with Harper College, we experimentally piloted this tool alongside the standard Compass placement exam. Approximately 40% of entering students at Harper College are placed into non-credit bearing developmental math courses, so there is a substantial need to reduce remediation rates. Although the success of these students earning at least a C in their developmental math courses has improved from 50.1% in 2007 to 54.7% in 2011, term-to-term persistence rates for these students are low.

This study makes several contributions to the remediation literature. There is limited experimental work done in community college settings, especially so regarding developmental placement. Although only a single institution study, this experimental analysis provides evidence of whether a self-guided remediation module may reduce the need for remedial coursework among a set of motivated students. Placing directly into college level courses could speed credit accumulation, increase the degree completion rate, and improve transfer rates.
Purpose of Study:

The study is designed to use random assignment to determine the answer to five research questions in an effort to reduce the need for developmental mathematics course enrollment. One, does computerized math placement testing with required, on-line targeted remediation (ALEKS) reduce placements in the developmental math sequence when compared with computerized math placement testing with optional on-line targeted remediation? Two, how do these treatments compare with the business as usual placement test (Compass)? Three, to what extent do students take up the offer of self-paced, computer guided math remediation modules in ALEKS? Four, when offered the opportunity to retest, how often do students do so? Five, are students who receive ALEKS testing and remediation modules more successful in their first college math course (either developmental or college credit) than students who receive Compass testing?

Setting:

In operation since 1967 in the suburbs of northwest Chicago, William Rainey Harper Community College served 25,630 students in the 2013-14 academic year. Harper College is dedicated to being an innovative institution with a focus on continuous improvement. The college has focused resources on remediation and collaborated with local partner high schools to reduce the need for developmental mathematics for recent high school graduates attending Harper College by 21% over a four-year period of time.

Participants:

The study targets all entering degree-seeking (as noted on their application) Harper College freshmen who take math placement exams between May 19, 2014 and August 15, 2014, prior to registering for fall 2014 courses. There are 1,087 students in the experimental sample evenly divided between the three treatment arms. The majority of students (57%) are 18 years of age or younger; however, there is a substantial portion of what Harper College considers to be young adults aged 19-25 (34%).

Intervention:

The business as usual treatment group receives ACT’s Compass math placement test, which is widely used by community colleges to assess incoming students’ levels of math preparation to guide first term math course placement between developmental and college level courses. It is a multiple choice exam that tests students’ skills in pre-algebra, algebra, geometry, and trigonometry.

The innovation studied in this experiment is a newly developed math placement tool called ALEKS (Assessment and LEarning in Knowledge Spaces) produced by McGraw-Hill. In contrast to Compass, ALEKS is a web-based computer adaptive placement test that uses free response questions instead of multiple choice. It claims to provide more accurate placement than standard placement test tools. ALEKS also provides self-paced remediation modules that students can complete after their initial placement exam. These modules target areas of required remediation and enable students to self-remediate before taking a subsequent placement exam potentially enabling them to place into a higher level of coursework in the fall.
Research Design:

Initial placement testing is conducted during the summer before fall enrollment in Harper College’s placement testing center. The study employs a blocked cluster randomized design in which students are clustered by the day in which they attended the placement center to take the placement exam. Days were randomly assigned (blocked on day of the week) to business as usual (Compass placement test) or one of two ALEKS interventions such that all of the students who test on that day receive the same exam and treatment conditions. Both ALEKS interventions use the ALEKS placement exam in their initial visit to the placement testing center and allow students to use the self-paced remediation modules on their own time after their initial placement exam. The first ALEKS intervention, labeled ALEKS-2, provides students with one additional opportunity to retake the ALEKS placement exam at any time after the initial exam. The second ALEKS intervention, labeled ALEKS-5, allows students up to four additional opportunities to retake the placement exam but requires several hours of use of the self-paced remediation modules between each testing. Compass students in the business as usual treatment group are allowed to take a second placement test but only upon returning to the placement center for retesting. ALEKS students can use the remediation modules and retest from any computer with internet access. Students’ highest score across all of the placement exams is used for final fall math course placement.

Data Collection and Analysis:

The study uses a combination of administrative data provided by Harper College and data from the ALEKS placement and remediation tool. Harper College provides data on demographics, previous math performance, and college course enrollment and performance. The ALEKS tool provides student level placement scores for all exams and participation and performance data on the remediation modules. Regression analysis controlling for blocking variables with cluster-adjusted standard errors will enable comparisons in the outcomes across treatment groups and across subpopulations divided by gender, age, race/ethnicity, and math ability level to determine whether the ALEKS tool might be more appropriate for certain types of students. In addition to intent to treat estimates, treatment on the treated estimates will inform us of the effect of taking up the self-paced ALEKS remediation modules on course placement and performance.

Findings / Results:

At this stage, we are cleaning individual level data for analysis; therefore, we present results below from aggregated summary data. Figure 1 presents the developmental and college placement levels for each of the three experimental conditions. T-tests for difference in independent means suggest no difference between ALEKS-2 and ALEKS-5 treatment arms for placing into either developmental or college level math courses. However, there is a large and significant difference between the pooled ALEKS groups and the Compass test treatment on placement into college level mathematics. ALEKS treatment students are significantly more likely to be placed into college level math (effect size = 0.1534, p-value = 0.0196). The major caveat of this preliminary analysis is that it neither controls for the blocking by day of the week.
procedure nor clustering of students by day. These caveats will be resolved once we analyze individual level data.

Beyond the initial placement outcome, it is interesting to observe retesting behavior. Although Compass students retest at slightly lower rates than either of the ALEKS treatment groups, the likelihood of retesting for an ALEKS-2 and ALEKS-5 student is the same. This is somewhat surprising given that the ALEKS-5 students were required to participate in several hours of the remediation modules before retesting. It appears as if the required time spent in the modules did not serve as a deterrent for retesting. Fifty eight percent of the ALEKS-2 group voluntarily chose to participate in the review modules prior to retesting. The ALEKS-5 students were allowed to take up to four retests; however, only 18 students (5.0%) took more than one retest.

Furthermore, it appears as if the time spent in the remediation modules is useful. Figure 2 displays retesting results for all three treatment groups. Students who retested using ALEKS were substantially more likely to increase their placement level than those that retested using Compass. This suggests that remediation modules are helping students address their deficiencies, although we will need to examine student level time spent in the modules to confirm this conclusion.

We will conduct further analyses to determine subgroup effects by demographic characteristics. Once fall math course performance is available, we will be able to determine the success rates of Compass and ALEKS placement and whether the students who improved their placement from retesting were well served. Subsequent persistence outcomes will assist us in determining whether the initial placements are successful at reducing the need for remediation without causing a loss of student success.

Conclusions:

While we await further data and analysis, these aggregate results provide at least promising suggestive evidence that the ALEKS placement and remediation module tool could be used to reduce remediation need in the first term of community college enrollment. Such a tool would promote enormous savings in cost of tuition and time for students who need to refresh a limited number of skills which can be accomplished in the summer prior to enrollment with support from the remediation modules. These students would not have to spend an entire semester taking a developmental math course. Community colleges would also be able to offer more college level math courses improving that pathway to student degree completion and possible transfer to a four-year college.
Appendices

Appendix A. References


Appendix B. Figures

Figure 1. Placement Level Across Three Treatment Groups

![Placement Level Graph]

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<th>Developmental</th>
<th>College</th>
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<tr>
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<td>76%</td>
<td>24%</td>
<td>79%</td>
<td>21%</td>
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<tr>
<td>ALEKS-5</td>
<td>79%</td>
<td>21%</td>
<td>84%</td>
<td>16%</td>
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Figure 2. Retesting Results Across Three Treatment Groups

![Retesting Results Graph]

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