Combining Computer Adaptive and Persistence Software for Motivation and Placement of Adult Students in Gateway College Math

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Due in part to a large number of major military bases in the region and partially because of the nature of many Las Vegas work opportunities, the University of Nevada Las Vegas enrolls a significant number of adult learners that are taking advantage of higher education opportunities for the first time. Many of these students do not have a current placement assessment to report and must demonstrate readiness for college in some other fashion. This session examines the particulars and the implications of engagement with the ALEKS Learning and Knowledge Spaces Placement Assessment and computer-adaptive instructional modules to better place and prepare adult learners (N=300) who were deemed "not yet ready for college math coursework." Data affirmed that 10+ hours of additional study in ALEKS modules had large effects on subsequent placement scores and on problem-solving success and deeper engagement in subsequent Gateway math classes.

Introduction

The Mathematics Learning Center (MLC) at the University of Nevada Las Vegas (UNLV), a R1 university, was established for several related reasons, each connected in some fashion to the importance of addressing the needs of beginning or returning adult students that are engaged in remedial or preparatory mathematics course for "gateway" college credit courses.

The University of Nevada Las Vegas, and other institutions, use the results of a sophisticated, computer-adaptive, diagnostic mathematics placement assessment (ALEKS) to help determine adult student readiness for, and placement into, college level courses upon acceptance. The unique benefit of using the ALEKS Placement, Preparation, and Learning "package" is that it allows adult students to establish a benchmark and then study personalized prescriptions designed to improve their level of preparedness and likelihood of success in a course. Our research demonstrates that students who spend time mastering topics in an ALEKS Preparation and Learning Module prior to (or during) any course, then perform better in that course. The impact of establishing higher cut scores is to encourage students to make use of an ALEKS Preparation and Learning Module and therefore to achieve better success in whatever mathematics course they must take as a requirement of their chosen degree.

Framework and Study Aims

Assessment and Learning in Knowledge Spaces (ALEKS) is a widely used adaptive math problem solving software designed to provide math instruction to a wide range of learners. Universities use ALEKS placement assessments to determine students' readiness for college level mathematics. The placement, preparation, and learning (PPL) interface assesses proficiency needed to enroll in credit-bearing university math courses and, for students not yet proficient, provides adapted problem-solving lessons to improve their proficiency prior to future placement attempts. Little is known about how not-yet-proficient learners use ALEKS to prepare for second attempts, and whether they benefit from doing so. If aspiring students can indeed achieve proficiency and eligibility to enroll in credit bearing math through brief restudy, universities can adopt ALEKS PPL to speed credit acquisition, and shorten time to degree. The study focuses on events of 296 aspiring adult college students who earned admission to university, but who had no placement information or whose initial placement score confirmed a lack of proficiency needed for credit bearing math..

Methods

We examined trace data from ALEKS sessions after an initial failed placement assessment attempt and before the second assessment attempt. Students (N = 296) graduated high school, failed their initial placement assessment, spent 10 additional hours solving problems in ALEKS prior to a second assessment attempt. We examined (1) improvement in ALEKS assessment scores after 10 hours of additional study, (2) how traced problem solving events in ALEKS relate to learning outcomes AND (3) whether positive outcomes are associated with elective, self-regulated learning behaviors not prompted by ALEKS: seeking out problem solutions using Explain features and Review mode.

Table 1: Definitions of Variables for the Analysis

Variable	Definition
C vs. W	Correct/Wrong response to the item.
E vs. L	Student looks at an explanation page called by the student / prompted by ALE KS Review. Student elect to access a review mode to any previously mastered.
% Correct	Correct responses divided by total correct + wrong responses to items

Results

We compared placement scores on attempts 1 and 2 using a dependent samples t-test and found a significant and large effect of restudy on assessment scores, $t(295) = 31.224$, $p < .001$, $d = 2.29$. Scores rose 29.7 points (SD = 16.3) from 33.1% mastery (SD = 8.6) to 62.8% (SD = 17.3) and of the 296 who completed 10 hours of study and a second assessment, a significantly greater

proportion achieved proficiency (i.e. > 46% mastery) and gained eligibility to enroll in credit bearing math than did not, c2 (296) = 109.46, p < .001. Having confirmed that scores increased after engagement with ALEKS, we next examined how learning events during that engagement (i.e., Table 1) associated with six learning outcomes: ALEKS placement attempt 2 score, improvement across attempts, Eligibility to enroll in Credit-bearing math (binary), Fall Math course GPA, Semester GPA, and Spring re- enrollment at the university. Bivariate correlations revealed no association between behaviors and second placement score nor credit-bearing math eligibility. Those who earned higher placement scores answered more items correctly during study (r [296]= .119, p = .04). Those who engaged with more ALEKS-prompted explanations achieve greater gains (r [296] = .125, p = .03); the relation between gains and learner prompted views of explanations was weaker and not significant, r (296) =.065. The act of seeking explanations was, however, significantly associated with performance in math courses once enrolled, r (211) = .213, p = .002, and may thus confer benefits at university. Additional results indicate more complex relations wherein performance during learning in ALEKS predicts initial Math GPA differentially by course type (credit-bearing vs. developmental).

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