Some Basic Information about ALEKS

What is ALEKS?

ALEKS is web-delivered tutoring or computer-based instruction that (1) provides some modest amount of instruction, (2) provides plenty of tasks/problems, (3) tracks individual student success on the tasks or problems, and (4) both probes for evidence that the student has some competency in the task and returns the student to practicing tasks where the student's competence is low.

What is the education domain of ALEKS?

The easiest way to think of ALEKS is as tutoring in mathematics. The system also offers content in some science course areas (e.g. college level Chemistry) and business. The domain extends from elementary school up through college. In general, the content is quantitative in nature and does go so far as differential equations or mathematical statistics.

What does ALEKS mean?

Assessment and LEarning in Knowledge Spaces or ALEKS. A knowledge space is defined both by the nature of the knowledge (concepts) and the student's accomplishment in applying the knowledge. A knowledge state is predictive of what a student is ready to learn next. Suppose that students are given a wide variety of tasks to choose from and suppose also that the students' successes and failures on the tasks are tracked. It would be possible to empirically determine which successes (that is which tasks or learning spaces) tend to precede successes on other tasks.

The pace of instruction is matched to the pace of each student's success by updating the competences of the individual student as the student works in the online environment. For more details see:
https://www.aleks.com/about_aleks/Science_Behind_ALEKS.pdf. Or https://arxiv.org/pdf/1511.06757.pdf.

Is ALEKS computer adaptive?

ALEKS monitors student successes to determine which modules to offer to the student, but students choose which modules in the computer-offered list to attempt. ALEKS is a formative assessment system that checks on individual student progress and then guides the student to modules that advance the student's learning based on student responses to a very few tasks/problems. A topic will be considered "learned" when the student correctly responds to as few as three tasks/problems in that topic. The ALEKS approach is different than the use of the term "computer adaptive" in the context of large scale summative assessment systems for state testing and high stakes decision making.

Where did ALEKS originate?

ALEKS began as a National Science Foundation (NSF) grant to the University of California Irvine in 1994 and was acquired by McGraw-Hill in 2013.

What does ALEKS cost?

Available as a family subscription, ALEKS costs $19.95 per month or $179.95 for a 12 month, single student subscription. The price is volume discounted for multiple students in a single family and likely also discounted for district purchase.

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What are the research properties for ALEKS and a similar product offered by another provider?
Craig, et al. (2011) did a study of ALEKS that showed a statistically significant effect size of 0.47 – well above the norm for typical interventions, but the sample size is small (22). Mojarad, et al. (2018) did a quasi-experimental study of ALEKS that showed statistically significant higher classroom pass rates for treated students in several comparisons, but pass rate is not an objective measure. Platko's 2011 dissertation (U. Kansas) showed that the least able students showed statistically significant gains on state tests for the ALEKS treated group. Xu, et al. (2009) failed to find evidence of a performance benefit when using ALEKS in a Statistics I class for graduate students in a College of Education. The University of Maryland's University College reported several studies where Intelligent Tutoring Systems (ITS) including, but not exclusively, ALEKS are associated with positive student outcomes. A 2016 report from the University of California system indicates that ALEKS when used as a preparation for a first course in college chemistry was associated with higher course grades in chemistry. The Committee on Developmental Mathematics at Clarion University recommended ALEKS for a possible placement tool in a pilot study in 2016. More studies reporting use of ALEKS either as a tutoring system or as a placement system are available but for the most part the studies reported in this paper are representative of the scope of application and the range of outcomes.

The Institute of Educational Sciences provided a grant to John Pane at Rand for a study as a randomized control trial in Algebra I instruction for ninth grade students. Dr. Pane reports the participation of 31 teachers and about 2,500 students. The treatment dose was prescribed by teachers and it is suspected that the ALEKS software was used too infrequently to generate statistically significant positive results. The final report has not been submitted for publication.

John Pane at Rand also studied the efficacy of Carnegie Learning's Cognitive Tutor Algebra I product. According to the Rand research brief (https://www.rand.org/pubs/research_briefs/RB9746.html):

> Schools from each state participated in both the middle school and high school arms of the study, except Alabama (middle school only). Nearly 18,700 students in grades 9–12 participated in the high school study, with 89 percent of the participants in 9th grade. Nearly 6,800 students in grades 6–8 participated in the middle school study, with more than 99 percent of them in 8th grade.

Pane, et al. report the effect size for the Cognitive Tutor product at 0.20. Typically an effective treatment has an effect size of at least 0.25. However Hill, et al. (2007), state that the average annual gain in effect size for the grade eight to nine transition is but 0.22 . So, the educational benefit of Cognitive Tutor was comparable to a year's worth of learning.

Why not ALEKS for everyone?
Possibly ALEKS strengths are also, to some students, liabilities. Students cannot move forward too many topics until they have, for the most part, shown they are ready to advance. Even when students advance, ALEKS keeps tabs on prior content by administering a test item from that content after a number of hours of practice as a check on whether to remediate topics already "learned". This might be a detriment to some students because the student has to repeat a topic that was previously "learned" and the number of "learned" topics will decrease on the student dashboard.

ALEKS is also, possibly, alienating in the sense that learning is not just individualized but also solitary. While the method of instruction might be sound, some students need interpersonal emotional support from fellow humans who are similarly struggling. Or perhaps the student needs a tutor or instructor to cover a few points if the student becomes stuck on some topic.

ALEKS as a remediation treatment at a community college.
One Ohio community college reports using ALEKS as one of two approaches to remediating students. According to a math faculty member, the ALEKS product seems to work well for students that are a bit rusty and are not math-phobic. ALEKS is used in a laboratory-classroom environment with a flexible but attendance required policy and supported by having one or two tutors/faculty circulating while students work at their own pace. The tutor actively monitors for students that seem to be stuck on a topic so that human tutoring can "unstick" the student. Typically students complete their self-paced ALEKS work in far less than the full semester term.

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