



Features and Benefits

Research-Based Technology

ALEKS stands for “Assessment and LEarning in Knowledge Spaces.” ALEKS assessment and learning technologies were originally developed by a team of cognitive scientists, mathematicians, and software engineers at the University of California, Irvine, with major funding provided by the National Science Foundation. ALEKS is founded on over 20 years of extensive scientific research in a ground-breaking field of mathematical cognitive science known as Knowledge Space Theory. Through adaptive questioning, ALEKS accurately assesses a student's knowledge state and then delivers targeted instruction on the topics a student is most ready to learn.

Knowledge Space Theory provides a theoretical foundation for efficient knowledge assessment in various domains ranging from mathematics and the sciences, to appropriate topics in business and the social sciences. It is not intended for what are commonly referred to as “tests” and does not produce numerical measures of ability. Rather, Knowledge Space Theory supports the construction of efficient computer assessment procedures which allows for a precise graphical representation of the knowledge state of individuals.

The research behind ALEKS is briefly discussed in non-technical terms in "The Assessment of Knowledge in Theory and in Practice" http://www.k12.aleks.com/about/Science_Behind_ALEKS.pdf.

View a list of key scientific research publications at http://www.aleks.com/about_aleks/publications_kst

School-to-Lab-to-Home Connection

ALEKS is Web-based and can be accessed from any computer with an Internet connection, whether from school, home, or a library. The ALEKS technical requirements are minimal, requiring only an Internet browser and a downloadable plug-in. If the student logs off, or in the event of an unintended conclusion of a session (e.g. loss of Internet connection or computer system crash), the system will always take the student back to the same place she was working at the time the session ended.

Curriculum-Based Assessment

Instruction in ALEKS is based on a cycle of assessment and learning with recurring assessments of individual student knowledge in relation to the comprehensive set of curriculum goals.

ALEKS requires students to solve open-ended problems using realistic input tools. An initial assessment begins after the student learns to use the tools in a brief tutorial. During the initial assessment, ALEKS evaluates the student's current knowledge of the subject by asking a relatively small number of questions. ALEKS chooses each question on the basis of the student's answers to all the previous questions. Each set of assessment questions is unique to each student.

Assessment results are used to guide students to new material according to their preparedness, ensuring that students build on a solid foundation. Instructors and administrators have access at any time to the complete history of a student's assessment results and learning progress in ALEKS.

The ALEKS assessment module provides an efficient guide to learning, in that it differs in principle from any standardized test whose results merely represent the student's achievement as one or more numerical values. An ALEKS assessment determines exactly what a student knows, does not know, and what she is ready to learn next.

Some key features of the assessment module are:

- All problems require that the student produce authentic mathematical input.
- Assessment questions are generated from items based on curriculum standards.
- The assessment is adaptive; the choice of each new question is based on responses to all previous questions. As a result, the student's knowledge

state can be found by asking only a relatively small subset of the possible questions in the curriculum.

- Assessment results are always framed relative to specified educational standards.
- The entire student system and all of the 3-11 content, is available in English and Spanish in assessment and learning mode; students can toggle easily between English and Spanish at any time (administrators can choose to remove the Spanish option).

Automatic Assessment Reports

Following the assessment, ALEKS delivers a color-keyed pie chart report that provides a detailed, graphic representation of the student's knowledge state. The pie chart is divided into slices, each of which corresponds to an area of the curriculum for the student's grade level. In the ALEKS system, a student's progress is shown by the portion of the slice that is filled in by solid color, whereas the lighter portion represents what the student has yet to learn.

As the mouse hovers over a selected slice, a list of items is displayed that reveals what the student is ready to learn. Clicking on any of these items gives the student access to the Learning Mode.

Individualized Instruction

The ALEKS Learning Mode is an interactive environment in which the student is able to choose from a list of mathematical topics for which she has demonstrated readiness. The student is able to work on problems to demonstrate mastery of new skills, and to move ahead toward fulfillment of curricular and state-standard goals.

While in the Learning Mode, students will be presented with a sequence of problems representing a series of concepts to be mastered. Tools offered in the Learning Mode include:

- Ability to toggle between English and Spanish at any time.
- Practice problems.
- Explanations of problems.
- Worksheets individualized for each student's knowledge state.
- ALEKS Calculator (where appropriate).
- Feedback.
- Progress monitoring.
- Review of any problem previously mastered.

ALEKS will at times offer advice in response to a student's answer. For example, if a student has answered a question in practice without adding the appropriate units, ALEKS may suggest that the student check the units. ALEKS may also propose that the student who continually answers a problem incorrectly temporarily abandon the problem at hand and work instead on a different problem.

When a student has demonstrated mastery of a particular item by repeatedly solving problems based on it, ALEKS will add that item to the student's pie, adjust the student's knowledge state (to make additional topics available where appropriate), and encourage the student to proceed to a new item.

Step-by-Step Explanations

A student working on a particular problem may ask for an explanation of that problem by clicking on "Explain." The explanation includes a step-by-step solution of the *exact* problem, meaning that the explanation adjusts to match the algorithmically generated problem. In many cases, an alternative or more detailed explanation is also available.

After reading the explanation(s), the student may return to the "Practice" section, where she will be presented with another problem based on the item or problem type just illustrated. If the student is successful in solving the problem, the system will offer more instances of the same item to make sure the student has mastered that problem type.

ALEKS Learning Rates

ALEKS keeps server statistics that measure learning success of all students, namely how often they succeed at learning a concept that ALEKS offers them as "ready to learn." When ALEKS determines that a student is ready to learn an item, the student is able to learn it a very high percentage of the time. In the small percentage of cases where the student is initially unsuccessful, the item is presented again to the student later on. Because of the artificial intelligence in ALEKS, students are almost always successful at learning the material ALEKS offers them (the level of instructor involvement does not affect this).

The Average Historical Student Learning Rates with ALEKS are ~90%.

State Standards Alignment

ALEKS course products are integrated with all 50 states' standards for grades 3-9. Correlation for grades 10-12 are complete for most states and will be complete for all states by February 2009. Automated reports allow teachers and administrators to monitor student, class, school, and district progress toward state standards.

Comprehensive Teacher Module

The Teacher Module enables educators to easily and conveniently monitor student and class learning and to carry out other administrative tasks. The two levels of users in the Teacher Module are teacher and administrator.

While in the Teacher Module, teachers can:

- View and print a report of an individual student's progress toward the state mathematics standards.
- View and print a summary of information for each student including assessment results, progress in the learning mode, and total time spent in ALEKS.
- View and print reports for an entire class, giving an overview of class strengths and weaknesses.
- Edit student registration data.
- Communicate with students through the ALEKS Message Center using ALEKS math input tools.

An administrator can perform everything above, plus:

- View, print, and edit the list of teachers and classes.
- View and edit the default content standards for any given class.
- Move students between classes and similar administrative tasks.