



KENTUCKY CENTER FOR MATHEMATICS

Considerations for Selecting a K-12 Supplemental Mathematics Diagnostic Intervention Program

ALEKS[®]

Responses submitted by: ALEKS Corporation

KCM DISCLAIMER:

This document presents useful criteria along with publisher-responses regarding a particular diagnostic intervention program and may be used as an informal tool. It is important to note that these **publisher-responses may not necessarily reflect the educational positions of the Kentucky Center for Mathematics**. Towards this end, we encourage the reader to critically evaluate each response with respect to the particular consideration. *We strongly recommend consulting with a mathematics education specialist when making any decisions regarding mathematics curricula.*

KCM Definitions:

A supplemental mathematics diagnostic intervention program is a research/evidence-based program that is used in conjunction with a core curriculum. The essential components of such a program include dynamic diagnostic assessments that inform data-driven differentiated instruction.

A dynamic diagnostic assessment is a measure designed to precisely ascertain a student's level of readiness for learning mathematics. These assessments typically focus on interactions among student, teacher, and task with the intention of dynamically reforming the testing landscape to accommodate the individual. See explanation here: [PDF](#).

Connection to NCTM Guidelines

This document was prepared independently of the NCTM guidelines regarding the creation or selection of an intervention program. Alignment to NCTM intervention guidelines are noted where appropriate. NCTM intervention program guidelines and additional information concerning mathematics intervention may be found by searching for keyword *intervention* at www.nctm.org or access the NCTM guidelines directly at the following web

address: [http://www.nctm.org/uploadedFiles/Lessons_and_Resources/Intervention_Resources/Intervention%20Programs%20\(NCTM,%20Nov%202007\).pdf](http://www.nctm.org/uploadedFiles/Lessons_and_Resources/Intervention_Resources/Intervention%20Programs%20(NCTM,%20Nov%202007).pdf)

Document Categories

- [Program Foundations](#)
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Program Foundations (NCTM Topic 1: Diagnostic Assessment; Topic 2: Instructional Activities; Topic 5: Research Supporting Intervention)

- 1. To what extent is the program based on accurate mathematics and solid theories of teaching and learning which develop conceptual understanding among students? NCTM 2.4**

Vendor Response:

ALEKS stands for “Assessment and LEarning in Knowledge Spaces,” and is based upon Knowledge Space Theory – the result of ground-breaking research in mathematical cognitive science with major funding provided by the National Science Foundation. For a discussion of the research behind ALEKS in nontechnical terms, please review “The Assessment of Knowledge in Theory and in Practice”:

http://www.aleks.com/about_aleks/Science_Behind_ALEKS.pdf (PDF 355K); a copy has also been included with this submission.

- 2. To which levels of the intervention program does the developer’s research apply?**

Vendor Response:

ALEKS is the practical realization of Knowledge Space Theory. ALEKS is capable of efficiently and accurately assessing knowledge in various disciplines, ranging from mathematics and the natural sciences, to selected topics in business and the social sciences. In contrast to standardized tests which typically result in numerical measures of achievement or “aptitude,” the outcome of an ALEKS assessment consists of the precise and comprehensive delineation of an individual’s competence in a subject in the form of his or her knowledge state. A student’s knowledge state describes all the types of problems mastered by that individual, and a comprehensive list of the topics the individual is ready to learn (referred to in Knowledge Space Theory as the outer fringe of that individual’s knowledge state).

- 3. Are there randomized trial experiments that prove positive effects on student achievement? NCTM 5.1**

Vendor Response:

Data is collected in several methods to prove positive effects on student achievement. The first of these methods is the server statistics collected by ALEKS Corporation. Server statistics measure the learning success rates of all students using ALEKS, and specifically how often students succeed at learning a concept that ALEKS offers to 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 at a

later point in time. Due to the ALEKS artificial intelligence engine, students are almost always successful at learning the material ALEKS offers them, regardless of the level of instructor involvement. The average historical student learning rate with ALEKS, according to the collected server statistics, is approximately ninety percent.

The next method of experiment is the collection of informal implementation strategies from educational institutions using ALEKS. These stories summarize school usage of ALEKS and the resulting success. The collected implementation strategies represent numerous possible applications of ALEKS, ranging from Special Education to Gifted and Talented, and from remediation for a few students to full grade-level adoption. To view all available implementation strategies, please review the enclosed book or visit: http://www.aleks.com/k12/ALEKS_Implementation_Strategies_WEB.pdf (PDF 4.2M).

Lastly, several studies have been conducted independent of ALEKS Corporation's influence regarding use of the product. Overall, these studies show significant student improvement as a result of using ALEKS. The resulting articles from these studies are below:

- “Product Review: ALEKS Math Assessment”:
http://www.aleks.com/k12/ALEKS_Product_Review_Web.pdf (PDF 410K).
- “The Effect of the ALEKS Web-Based Learning System on Standardized Math Scores”:
http://www.aleks.com/k12/Shawnee_Mission_Board_of_Education.pdf (PDF 35K).
- “The Better World Report: ALEKS Tutors Students in Learning to Succeed”:
http://www.aleks.com/ALEKS_Better_World_Report.pdf (PDF 220K).

Additional studies have been conducted at the college and university level:

- “Southern Connecticut State College: 2007 ALEKS Summer Workshop”:
http://www.aleks.com/highered/math/ALEKS_Summer_2007_Report.pdf (PDF 43K).
- “Pathways through Algebra”:
http://www.aleks.com/highered/math/Pathways_through_Algebra.pdf (PDF 224K).
- “Observational Findings in an Undergraduate Behavioral Statistics Course”:
http://www.aleks.com/highered/behavior/AERA_Paper.pdf (PDF 28K).
- “Predicting Student Preparedness in Calculus”:
<http://www.asee.org/acpapers/code/getpaper.cfm?paperid=10910&pdf=2006full2585.pdf> (PDF 167K).
- “Integrated Pre-Freshman Engineering and PreCalculus Mathematics”:
<http://www.asee.org/acpapers/code/getpaper.cfm?paperid=10881&pdf=206full933.pdf> (PDF 198K).

4. To what extent do the program’s theoretical framework, diagnostic assessments, instructional design, and content align with your school’s overall vision for mathematics education? *NCTM 1.3, 5.2*

Vendor Response:

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As a third- party vendor not associated with any one school's overall vision for mathematics education, ALEKS Corporation does not have a response to this question.

Professional Development (NCTM Topic 4: Organizational Structure of the Intervention)

5. **To what extent does the program provide rigorous professional development that contributes to a teacher's robust understanding of program framework, instructional technique, and use of materials? NCTM 4.3**

Vendor Response:

In order to properly implement and pilot the program, teachers and administrators receive a robust schedule of training that occurs prior to implementation and includes program pedagogy, instructional techniques, and use of its materials. At the conclusion of the pilot period, discussions of the efficacy of the program, its results, and any additional professional development are discussed. If a school purchases ALEKS, training and consultations are provided annually. In addition to onsite training and consultations, teachers are also offered continued online professional development. Resources include daily Webinar sessions and pre-recorded training tutorials that demonstrate both basic and advanced uses of the ALEKS program.

6. **To what extent does the professional development aid teachers' growth to conduct formative assessment by deliberately reflecting on practice and student performance following each lesson?**

Vendor Response:

Inherent in the program are assessment tools and suggestions for intervention that help teachers understand how ALEKS assessments differ from the traditional tests used in mathematics. Teachers can reflect on a student's performance during Learning Mode and following assessments, which guarantees that intervention is consistent, feedback is immediate, and adjustments to the program are effective. Teachers can also schedule assessments and print out individualized worksheets that are connected to the student's individualized learning. Furthermore, customized quizzes can be created to make targeted instructional decisions.

7. **To what extent does the professional development incorporate coaching visits?**

Vendor Response:

ALEKS provides a 75-minute introductory training via Webinar at no charge. A computer with an Internet connection and a telephone are required and need to be supplied by the school or district to take advantage of the Webinar training. Additionally, ALEKS offers day-long (approximately six hours per day) in-person trainings. ALEKS will also provide up to 25 teachers or administrators with a half-day in-person complimentary training for every 2,000 52-week or 40-week ALEKS subscription units purchased by a district. However, as ALEKS is web-based, getting started requires little more than accessing the ALEKS Website via a standard Internet browser and Internet connection. The majority of teachers and administrators have little difficulty in getting started and find that the complimentary 75-minute introductory Webinar training session is sufficient to get started with a successful implementation of ALEKS.

Complimentary pre-recorded trainings are also available on-demand at: http://www.aleks.com/k12/training_center

ALEKS also provides downloadable user guides at:
http://www.aleks.com/k12/user_guides

8. To what extent does the professional development facilitate establishment of an engaged learning community?

Vendor Response:

ALEKS facilitates an engaged learning environment through the use of the ALEKS Pie Chart. Students are able to view their progress immediately as they master topics and fill in sections of their pie. Furthermore, the ALEKS Message Center allows teachers to communicate with students using sophisticated input tools to demonstrate mathematical problems.

9. To what extent does the professional development prepare teachers to guide student attainment of conceptual understanding of mathematics?

Vendor Response:

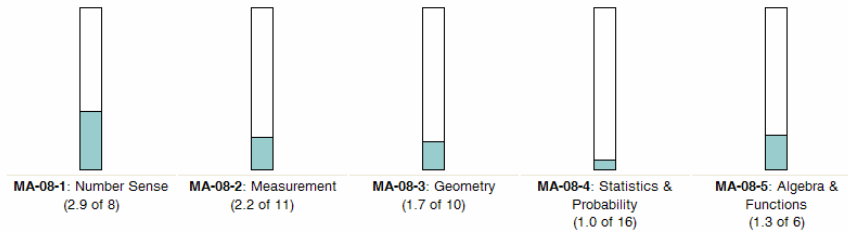
The professional development prepares teachers to guide students in attaining conceptual understanding of mathematics through its copious reporting feature. ALEKS provides teachers with detailed reports on topics that students are ready to learn, giving teachers the opportunity to call groups of students together for direct instruction. Teachers can also view students' average learning rates, and items mastered and not mastered at both the class and individual student levels. Additionally, there are class and individual reports that detail how students compare to Kentucky standards (see below state standards report for a class).

8th Grade Math 109 / Middle School Math Course 3
Kentucky Core Content for Mathematics Grade 8 Report

Average standards mastery per student*

Overall average: 9.1 out of 51 standards mastered
(Number of students: 27)

Breakdown by strand:



*A student is considered to have mastered a standard when she has mastered at least 50% of the ALEKS topics for that standard. Change this to 50%, 60%, or 70%.

Breakdown by standard: (You can switch this to [Breakdown by student.](#))

MA-08-1: Number Sense (2.9 out of 8 standards mastered)

MA-08-1.1.1: Identify rational and irrational numbers (square roots and pi)	0% mastery
MA-08-1.1.2: Use representations of rational and irrational numbers	85% mastery
MA-08-1.1.3: Convert and compare rational and irrational numbers	14% mastery
MA-08-1.2.1: Estimate to solve problems with rational numbers	7% mastery
MA-08-1.3.1: Compute with rational numbers and order of operations	22% mastery
MA-08-1.3.2: Explain how operations are inversely related.	100% mastery
MA-08-1.4.1: Use ratios and proportional reasoning to solve problems	0% mastery
MA-08-1.5.2: Identify the use of properties of operations	59% mastery

10. To what extent does the professional development support teachers in becoming mathematics education leaders within their schools?

Vendor Response:

The professional development enables teachers to become mathematics education leaders within their schools by providing them knowledge in the following areas: access to tracking student learning compared to Kentucky standards; understanding how ALEKS integrates with a number of mathematics textbooks; knowledge of the research behind the ALEKS program; access to ALEKS User Guides and Implementation Strategies, as well as quarterly newsletters and a discussion forum on the ALEKS website.

11. To what extent does the professional development prepare teachers to advance student thinking?

Vendor Response:

Through its dynamic and thorough reporting feature, ALEKS prepares teachers to advance student thinking. Teachers can use reports to group students according to chosen criteria, enabling teachers to target specific topics. For

instance, teachers can view a list of all students in a course who are ready to learn the same item and then conduct a focused lesson on that topic while students who have already mastered that topic or who are not yet ready to learn that topic can work on ALEKS to build their knowledge. Additionally, teachers have access to individual student reports that illustrate how a single student is performing in a class by showing the students Pie Chart, a list of topics they have learned and what they are ready to learn next, and the student's history in bar graph form.

12. To what extent does the professional development foster a sense of purpose and commitment to the instructional mission?

Vendor Response:

Teachers can use ALEKS to discover ways to further student achievement while also meeting Kentucky state standard goals, which fosters a sense of purpose and commitment to the instructional mission.

13. To what extent does the professional development incorporate reading materials that provide teachers with rigorous exposure to current research in teaching and learning?

Vendor Response:

During professional development and beyond, teachers have access to various reading materials that provide exposure to current ALEKS research in teaching and learning. Teachers have access to research that highlights Knowledge Space Theory, which is the foundation for the ALEKS program. ALEKS stands for "Assessment and LEarning in Knowledge Spaces" and is the result of research in mathematical cognitive science initiated by Professor Jean-Claude Falmagne at New York University (NYU) and the University of California, Irvine (UCI) and Professor Jean-Paul Doignon at the University of Brussels. The core mathematical theory was created between 1983 and 1992 with the financial support of several National Science Foundation (NSF) grants to Falmagne at NYU and UCI.

Knowledge Space Theory is authoritatively set forth in Falmagne and Doignon's monograph, Knowledge Spaces, published by Springer in 1999. A brief list of key scientific research publications is available at: http://www.aleks.com/about_aleks/publications_kst

Other scientists joined the efforts to investigate Knowledge Space Theory, and currently more than three hundred scientific papers and several books have been published on this subject. A bibliographical database is maintained by Cord Hockemeyer at the University of Graz in Austria: <http://wundt.unigraz.at/kst.php>

14. To what extent will teachers enjoy and engage in the professional development?

Vendor Response:

Teachers will enjoy the professional development by learning to utilize the engaging hands-on experience that ALEKS provides. Teachers will learn how to promote an interactive learning community that is beneficial to both their students and themselves.

15. To what extent does the professional development align to the KDE Professional Development Standards?

Vendor Response:

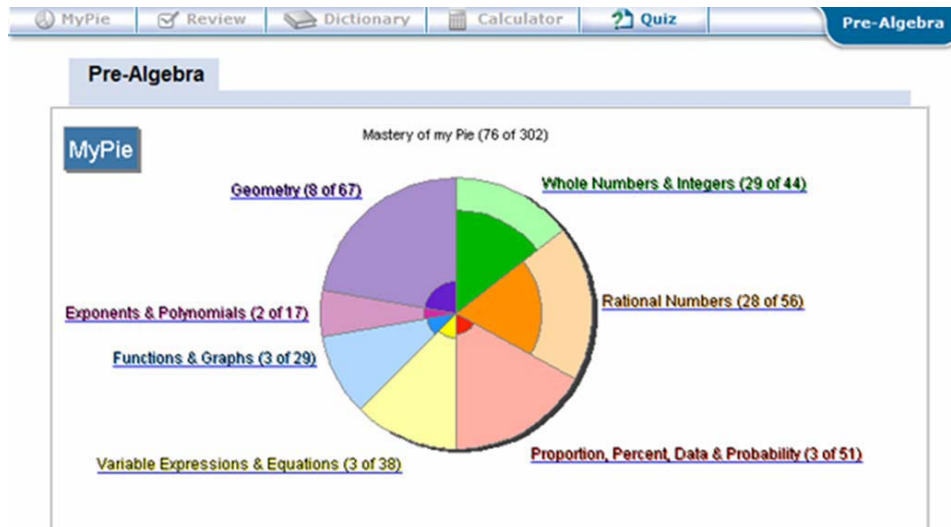
ALEKS professional development aligns itself well with the KDE Professional Development Standards. ALEKS provides engaging, hands-on learning experiences with full and half-day workshops and online training that fosters effectiveness and collaboration among teachers.

Diagnostic and Formative Assessment (NCTM Topic 1: Diagnostic)

16. To what extent does the program prepare teachers to diagnose, with precision, a student's level of readiness for learning mathematics? NCTM 1.2

Vendor Response:

ALEKS provides several pieces of information that will assist a teacher to diagnose, with precision, a student's level of readiness for learning mathematics. First, ALEKS requires students to complete an initial diagnostic assessment. This initial assessment uses an artificial intelligence engine to determine, within 20-30 questions, exactly what a student knows, does not know, and what topics the student is ready to learn next within a given course. Based on this assessment, the teacher and student will be able to view the results in a color-keyed pie chart (below). Generally, if a student has completed less than 10% of the pie chart after completing the initial assessment, the student is not ready for the course and should be moved to a lower mathematics level. If a student finishes the initial assessment with 90% or more of the pie chart completed, she should be moved into a more advanced math course. The pie chart, as a result, provides a quick view of a student's readiness in mathematics.



If a teacher would prefer a more detailed view of the student's level of readiness for the course, she can access a complete list of topics that the student can do and those that the student is ready to learn next. The ability to view this information in detail allows the teacher to see a student's current knowledge state in mathematics, and, as a result, her exact level of readiness.

17. To what extent does the program provide systems for organizing student data for the purposes of instructional design and for anecdotal reporting in ways that both teachers and parents may understand? **NCTM 1.4**

Vendor Response:

ALEKS includes a robust Teacher Module that contains numerous automated reports that can be used for instructional design and anecdotal reporting. The "Ready to Learn (Learning)" view in the Average Report (Pie Chart), is a powerful tool for instructional design (below). This report allows the teacher to view all of the topics within a course, and the number of students who are ready to learn each topic. This data can then be used to organize a lesson plan based on what the students are ready to learn at that time. It can also be helpful when grouping students within a classroom because it provides the names of the students who are ready for each topic, as well as any other topics that the particular group of students is also ready to learn.

Whole Numbers & Integers	Operations with Whole Numbers	2 students
	Quotient and remainder: Problem type 3	Send message to students
	Doe, Nicole C.	
	Schwarz, Paul T.	Other topics (26) these students are ready to learn
	Quotient and remainder: Problem type 2	1 student
	Number Sense, Rounding, and Estimation	
	Estimating a quotient	6 students
	Estimating a product	2 students
	Rounding: Problem type 2	1 student
	Estimating a sum	1 student
	Order of Operations	
	Order of operations: Problem type 2	7 students
	Introduction to order of operations	3 students
	Factors, Prime Numbers, and Divisibility	
	Word problem with common multiples	12 students
	Prime number factorization	9 students
	Least common multiple	7 students
	Divisibility rules for 3 and 9	3 students
	Prime numbers	1 student
	Greatest common factor	1 student
	Measurement	
	Customary unit conversion with whole number values, two-step conversion	20 students
	Metric distance conversion with whole number values	14 students
	Metric mass or capacity conversion with whole number values	8 students
	Customary unit conversion with whole number values	7 students
	Integers	
	Integer subtraction: Problem type 1	13 students
	Integer subtraction: Problem type 2	9 students
	Integer subtraction: Problem type 3	4 students
	Absolute value of a number	1 student
	Integer addition: Problem type 1	1 student
	Integer multiplication and division	1 student

Additionally, ALEKS has created a supplementary report for parents that can be accessed through the Student Module. This report provides a complete overview of a student's work in ALEKS, updated in real-time. The parent will be able to see the student's Pie Chart, State Standards Report, a complete list of the topics that the student has mastered and what she is ready to learn next, and a Progress History report. As a result, a parent is able to view the exact topics that a student knows, what she is ready to learn, how her knowledge measures up to Kentucky state standards, and how much progress the student has made in ALEKS during her logged time. The report is provided in simple language so that all parents will be able to read it with accuracy.

18. To what extent does the program prepare teachers to fully utilize formative assessment to design data-driven instruction targeted at each student's zone of proximal development?

Vendor Response:

ALEKS includes comprehensive student assessments to prepare teachers to fully utilize formative assessments to design data-driven instruction targeted at each student's zone of proximal development. For students, ALEKS uses a cycle of recurring assessments that are automatic and occur whenever a student has added 20 new items to her pie, or if she spends 10 hours in ALEKS without an assessment. Automatic assessments check a student's retention of topics she has worked on; if review is needed for any of these topics, ALEKS will subtract that topic (and possibly other topics that depend upon it) from the student's pie, making them available again for selection in Learning Mode. Additionally, teachers can view individual student progress using data from student assessments by viewing the Detailed Progress History report in the Teacher Module. This report allows teachers to view and track individual student progress throughout the course using both scheduled and progress assessments as markers of student development (below). This permits teachers

to focus on both a student's progress within the course, as well as topics that the student may need additional instruction on. Teachers can choose to work with students one-on-one using this report as a guideline to advance individual learning.

Reporting



9th Grade Math 112 / Algebra 1
Progress report for Chang, Ken J.

[Download Excel Spreadsheet](#)

Last login: 06/26/2008

From host: mypc.mycollege.edu

Enroll date: 06/06/2008

Hours/week: 24.5 (5.9 from school)

Total Hours: 69 hours 55 minutes (16 hours 46 minutes from school)

Algebra 1

	Last assessment (Plus-In)	Assesment performance		Time to completion (Time to top grade Current learning rate)			
		goal	grade	hours per week	items learned per hour of use	expected hours necessary to reach the goal	expected weeks necessary to reach the goal
Requested Assessment 2	06/17/2008		C	-	1.9	-	-
Progress Assessment	06/15/2008			-	1.7	-	-
Progress Assessment	06/13/2008			-	2.4	-	-
Progress Assessment	06/09/2008			-	1.2	-	-
Initial Assessment	06/06/2008			-	1.3	-	-

Legend: Assesment (), progress in learning mode (), still to learn (), assesment not completed (), not assesed in this domain () [Show these assesments](#)

19. To what extent do the formative assessment mechanisms allow a teacher to explore student progress in different domains of learning (i.e. conceptual/critical thinking as it relates to supporting procedural/skill performance)? **NCTM 1.1**

Vendor Response:

Assessments within ALEKS allow teachers to explore student progress in different domains of learning by encouraging students to complete problems that explore introductory concepts, which creates a firm foundation for more advanced thinking. Students use basic problem types, such as fractions, to advance their critical thinking by applying the knowledge they have to construct answers to more complex topics within a course. This development throughout the curriculum enables ALEKS to be an effective mastery system that aids in both fundamental student understanding and application of concepts.

- 20. To what extent does the program require that students engage in sustained hard thinking in order to construct concepts that build facility with mathematical skills?**

Vendor Response:

ALEKS avoids the use of multiple choice questions, and thus eliminates the skewed results that those types of questions can create. By requiring students to answer free-response questions using realistic input tools, students must use sustained critical thinking to demonstrate a higher level of understanding of each problem type they encounter. Through built-in reassessments and required repetition of attempted problem types, ALEKS encourages students to build facility with mathematical skills. Additionally, ALEKS has created QuickTables, a math fact mastery tool, to assist in the memorization of basic math facts for multiplication, division, addition, and subtraction.

- 21. To what extent does the program allow students to experience and internalize the idea of *quantity* in a variety of settings presented by the teacher with a progression of diminishing support in order to guide thinking from concrete/unitary to abstract/composite? *NCTM 2.5***

Vendor Response:

As students progress through ALEKS, they work through problems that explore introductory concepts in order to lay a firm foundation for abstract thinking. For example, while exploring the concept of a fraction in ALEKS, students interpret and construct models of fractional parts of a whole. This helps to establish a foundation for more abstract concepts with fractions like converting a fraction to a repeating decimal and solving real world applications. In another instance, students beginning their study of geometry are able to explore attributes of three-dimensional shapes in preparation for more abstract concepts. For example, students will count the number of unit cubes that comprise the volume of a rectangular prism in order to effectively apply the concepts of volume in application problems. This granular progression throughout the curriculum enables ALEKS to be an effective mastery system that aids in both fundamental student understanding and application of concepts.

- 22. To what extent can the program be flexibly adapted to meet the instructional needs of students who are at a variety of readiness levels?**

Vendor Response:

ALEKS provides an individualized learning experience for every child. Fundamentally different from other educational software, ALEKS uses an artificial intelligence engine to provide highly-targeted assessment and

learning correlated to Kentucky state standards. Through adaptive questioning, ALEKS accurately assesses a student's knowledge then delivers targeted instruction on the exact topics a student is most ready to learn. As the student learns new topics, ALEKS constantly updates its map of the student's knowledge state. This individualized instruction builds tremendous learning momentum.

23. To what extent is the intervention instruction carefully linked with the results of each student's diagnostic assessment? [NCTM 2.1](#)

Vendor Response:

Students are required to complete an initial diagnostic assessment in ALEKS. This initial assessment is adaptive, meaning it adjusts to the student's response to each question. Because the assessment is adaptive, there is no set number of questions, but assessments generally contain 20-30 questions. The purpose of the ALEKS assessment is to determine what a student knows, does not know, and is ready to learn next. The Learning Mode is then based upon that initial diagnostic assessment. Students will be provided with a selection of topics to work on, based upon what they have demonstrated they are ready to learn. If a student revealed any gaps in mathematical knowledge during his assessment, he will be directed to remediate and fill in those gaps and missing skills. As a result, the ALEKS Learning Mode is closely linked to the initial diagnostic assessment.

24. To what extent are formative assessments embedded within ongoing instructional activities? [NCTM 2.3](#)

Vendor Response:

ALEKS contains automatic formative assessments, referred to as reassessments within the program. These reassessments occur when a student has completed 20 new topics in the ALEKS Learning Mode, or has been logged in to the program for over five hours. The purpose of the reassessment is to verify that students are retaining the mathematical skills that they have mastered in the program. Additionally, instructors have the ability to assign reassessments to students. These can either be progress assessments, based on what the students have been working on recently, or comprehensive assessments, based on the full course content. Instructors will also have the option to assign grades to each scheduled reassessment.

25. To what extent can the program be flexibly adapted to meet the optimal instructional pace of the individual?

Vendor Response:

ALEKS creates an optimal learning path for the student by gradually introducing new material when the student is ready for it. Through the Initial Assessment, ALEKS determines what a student knows, doesn't know, and what

he or she is ready to learn next. Based on the prerequisite knowledge demonstrated by the student, ALEKS introduces only the topics that the student is ready to learn and will be successful with, rather than providing everything that the student doesn't know. This framework allows each student to successfully work at his or her optimal pace within ALEKS. Additionally, if a student works at a more advanced rate and finishes a course before his or her subscription expires, the teacher is able to move that student into another ALEKS course at no additional cost or penalty. An ALEKS subscription provides access to the full library of ALEKS K-12 course products, and a student may be moved into another course level at any time during the subscription period.

26. To what extent does the program provide specific remediation strategies for recognizing and addressing *common* student misconceptions?

Vendor Response:

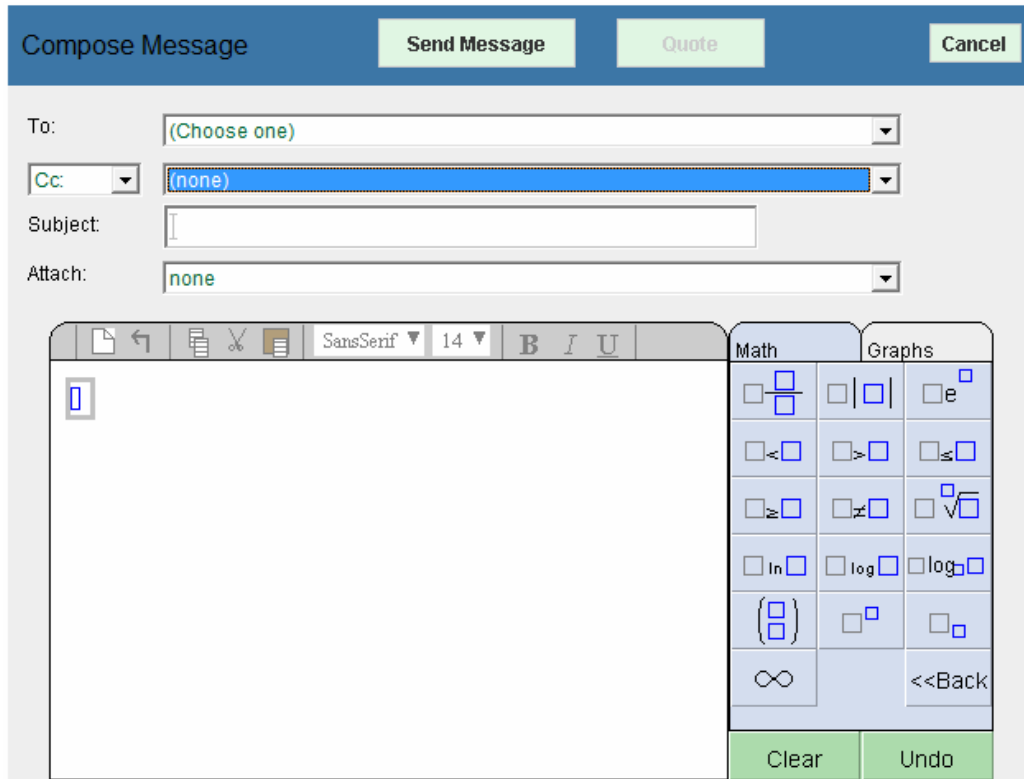
The ALEKS Artificial Intelligence engine is able to diagnose common student misconceptions in mathematics. For example, the below screen shot demonstrates one instance of such a diagnosis. In the below problem, the answer is correct, but per the instructions, the fraction has not been entered in simplest form. Rather than simply telling the student that he or she is wrong, ALEKS can diagnose this type of error to let the student know where a mistake was made and provide the student with a chance to correct the answer. The same is true for many common student misconceptions; ALEKS provides students with an opportunity to learn from their mistakes rather than notifying them that they are simply wrong.

The screenshot shows the ALEKS interface. At the top, there is a navigation bar with 'ALEKS' logo, 'HELP', 'WORKSHEET', 'INBOX', 'REPORT', 'OPTIONS', 'English', and 'EXIT'. Below this is a secondary bar with 'MyPie', 'Review', 'Dictionary', 'Calculator', and 'Math'. The main content area displays a math problem: 'Subtract. Write your answer as a mixed number in simplest form.' Below the problem is the equation $3\frac{1}{10} - 1\frac{7}{10}$. A feedback message on the left says 'Your answer is incorrect. The fraction can be reduced.' A yellow speech bubble on the right says 'Try to answer again.' Below the equation is a calculator interface with a display showing $1\frac{4}{10}$ and buttons for 'Clear', 'Undo', and 'Help'. At the bottom, there are 'Next >>' and 'Explain' buttons.

27. To what extent does the program encourage the development of students' abilities to communicate their mathematical ideas?

Vendor Response:

ALEKS provides many diverse opportunities for students to communicate their mathematical ideas in a correct and appropriate manner. First, ALEKS avoids multiple choice questions. This requires students to enter real mathematical values to express their answers to the problems presented, rather than just allowing them to guess using the aid of multiple choice questions. Second, students are able to use realistic input tools to enter their answers. ALEKS provides tools that mimic the tools that a student would normally have available to solve a specific problem type. Such tools include rulers, pencils and erasers for graphing, as well as a compass, protractor, calculator, and numerous other tools. As a result, students are able to correctly communicate their mathematical ideas within ALEKS. Next, ALEKS includes a message center that allows students to communicate with their teacher and ALEKS Customer Support. The Message Center includes mathematical input tools that allow students to communicate mathematical ideas and or problems via email, while using proper notation. The below screen shot shows the algebra options available for students when sending a message in the Message Center (additional tools exist for basic math, trigonometry, matrices, and graphing).



Lastly, either students or teachers can generate worksheets in ALEKS that would be completed off-line, using paper and pencil. This provides yet another medium for students to express and develop their mathematical communication. Overall, ALEKS provides numerous opportunities for students to learn proper communication of mathematical expressions and ideas.

28. To what extent is the mathematical content appropriately focused (according to the National Council of Teachers of Mathematics *Focal Points*) to deepen understanding of key concepts?

Vendor Response:

ALEKS courses introduce, develop, and extend the mathematical content addressed by the NCTM Curriculum Focal Points and the Connections to the Focal Points at all grade levels three through eight. Students who demonstrate mastery in ALEKS courses will have been exposed to all of the key topics defined by the Focal Points and approximately 95% of the subtopics. Students will deepen their understanding of the key concepts as they work through ALEKS and develop mastery of the content addressed by the Connections to the Focal Points. While ALEKS course are highly customizable according to the curricula covered across the states, the core content of each course is focused on developing the concepts that all students need for success in mathematics. Additionally, to view the correlation of ALEKS QuickTables, a math fact mastery tool, to the NCTM Focal Points key concepts, please visit: http://www.aleks.com/k12/QT_Correlation_with_NCTM_Focal_Points.pdf

29. How can this program be used or expanded to accommodate all the tiers of intervention associated with RtI under IDEA 2004?

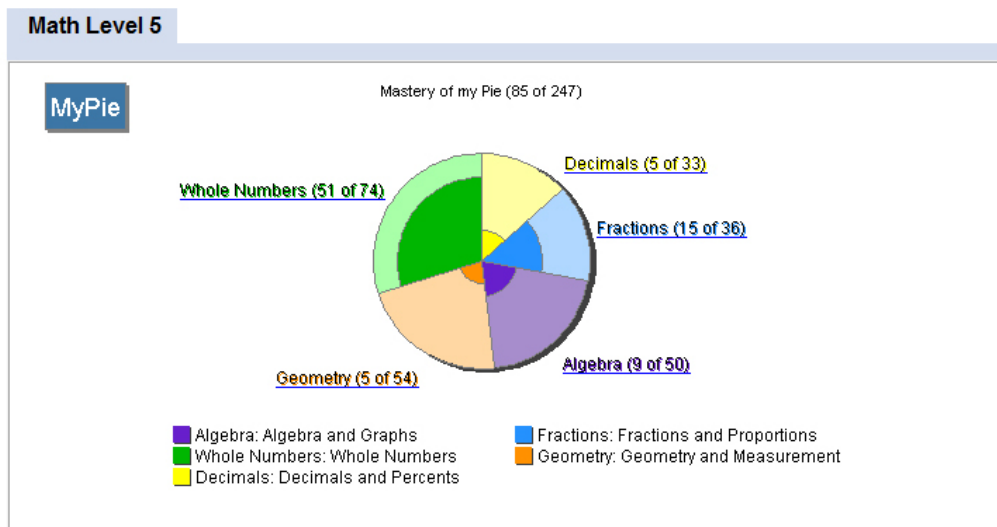
Vendor Response:

The components, or tiers, of intervention associated with Response to Intervention are: 1) school-wide screening, 2) progress monitoring and tiered delivery of instruction and assessment, and 3) fidelity in implementing the process. Under the first tier, school-wide screening, ALEKS uses an artificial intelligence engine that assesses each student individually and continuously. Through adaptive questioning, ALEKS accurately assesses a student's knowledge and then delivers targeted instruction on the exact topics the student is most ready to learn. With the second tier, progress monitoring and tiered delivery of instruction and assessment, ALEKS allows teachers to better prepare students for state-mandated testing by providing detailed reports that correlate student progress to state standards. Furthermore, teachers and administrators can track student, class, school, and district progress. As with any RTI program, the third tier includes implementing ALEKS with fidelity to produce positive and dramatic learning outcomes. Data shows that using ALEKS at least two hours per week will result in substantial growth.

30. To what extent will teachers and students enjoy and engage in the teaching of this program? **NCTM 2.6**

Vendor Response:

Students and teachers have both expressed a positive response to ALEKS. Many teachers enjoy ALEKS because it provides individualized instruction for every student on his or her level – something which can be difficult for a single teacher to provide to a classroom of students. Additionally, ALEKS provides a robust Teacher Module that facilitates a teacher’s use of ALEKS. The Teacher Module includes easy-to-use tools to create automatically graded quizzes and homework, align course syllabi with ALEKS content, manage student accounts, and more. Reports have also been created to show student, class, school, and district progress in ALEKS. These features have all been created to save teacher time so that he or she can focus on the students’ educational development instead of administrative tasks. Students generally feel an increase in their math confidence after using ALEKS, regardless of their previous math ability. Because ALEKS provides students with topics that they are ready to learn, they are successful at mastering topics and progressing through the course. For many students, this newfound success with a subject they previous struggled in can be extremely motivating. Additionally, many teachers and parents have noted that the ALEKS Pie Chart has also become a great motivator for students. The Pie Chart allows the student to see a graphic representation of his or her progress within a given math course, and provides concrete goals to work toward. Some teachers have also created incentive programs to correspond with the Pie Chart, and provide a prize for completed slices and/or completed pie charts.



“The kids and I really enjoy ALEKS. I have found that the program has sped up and expanded my curriculum. Some kids are usually ready for an operation before I am so I ‘fast teach’ and they are so prideful due to knowing something before other children... I guess the biggest thing about ALEKS is that the kids

love ALEKS day. In education, you cannot ignore enthusiasm.” – Sharon Aisenbrey, Wings Park School, IA

Additional ALEKS success stories are available at:
http://www.aleks.com/k12/success_stories

31. To what extent are the student materials and technology user-friendly and developmentally appropriate?

Vendor Response:

ALEKS is highly intuitive and easy to learn. As it is web-based, getting started requires little more than accessing the website via a standard Internet browser and Internet connection. Most teachers and administrators find that the complimentary 75-minute introductory Webinar training session is sufficient to get started with a successful implementation of ALEKS. To ensure that ALEKS is user-friendly for students, the student is first introduced to a 15-minute hands-on tutorial. While most students will complete the tutorial in less than 15-minutes, it does not assume the student possesses a high level of technical or computer knowledge and starts off very basic. The tutorial teaches the student to use the answer input tools in a step-by-step, hands-on process. Additionally, if the student at any time forgets how to use any of the answer input tools, she has access to a “Help” menu that will revisit the tutorial for that particular tool. Furthermore, according to the Lexile Framework, the problems and explanations for Essential Mathematics, a sample course designed for middle school students, assess at between 400 and 800 points, which equates to a reading level between second and fifth grade. Foundations of High School Math, designed for high school students, received an average Lexile score between 500 and 1000, or a reading level from third to seventh grade. This demonstrates that the reading level for each ALEKS course is developmentally appropriate for its intended audience.

Summative Assessment (NCTM Topic 3: Postassessment)

32. To what extent do summative assessments illustrate the degree of instructional efficacy by identifying aspects of student progress over time?

NCTM 3.1

Vendor Response:

Teachers can elect for students to complete a Goal Completion Assessment, or a summative assessment, for the course that the student is enrolled in. The Goal Completion Assessment illustrates the degree of instructional efficacy by testing a student’s knowledge and abilities in her chosen course. If a student completes the Goal Completion Assessment and shows mastery of all topics, she will reach 100 percent mastery of the course and will completely fill her ALEKS Pie Chart. However, if a student misses questions on the assessment, the

items that were incorrect are added back to the student's Pie Chart and the student must complete additional work in the Learning Mode in order for those items to be considered "mastered" once again.

33. To what extent do summative assessments generate practical data in a timely manner that may be used to guide further instruction? *NCTM 3.2, 3.3*

Vendor Response:

As with all ALEKS assessments, the summative assessment in ALEKS generates practical data immediately. Data that is generated from a student's assessment is available to teachers immediately and enables them to see exactly what a student knows, does not know, and what she is ready to learn next. Using this data, teachers can help guide student learning with ALEKS.

Logistics (*NCTM Topic 2: Instructional Activities; Topic 4: Organizational Structure of the Intervention*)

34. What are the grade levels targeted by this program? *NCTM 4.1*

Vendor Response:

ALEKS offers assessment and learning with standards-based content for grades 3-12, from Mathematics Level 3 through PreCalculus. A full list of K-12 course products is outlined below.

Mathematics - LV 3 (with QuickTables)
Mathematics - LV 4 (with QuickTables)
Mathematics - LV 5 (with QuickTables)
Mathematics - LV 6
Essential Mathematics (with QuickTables)
QuickTables
Middle School Geometry
Middle School Math Course 1
Middle School Math Course 2
Middle School Math Course 3
Pre-Algebra
Foundations of High School Math
Algebra 1
High School Geometry
Algebra 2
PreCalculus
Trigonometry
Math Prep for California High School Exit Exam
Math Prep for TAKS -- HS Exit Exam
AP Statistics (Quantitative)
Math Review for AP Calculus
Math Review for AP Physics

Chemistry
Fundamentals of Accounting (Sole Proprietorship)
Fundamentals of Accounting (Corporation)
Business Math

ALEKS course recommendations by grade level are also included.

Please note: After a student takes the initial ALEKS assessment, it is recommended that students be placed in a higher course level if their pie is more than 90 percent full, or moving them to a lower course level if less than 10 percent is complete.

Here are three common sequences of progression through the K-12 mathematics curricula:

Typical Placement for "On Grade Level" Students

3rd Grade Mathematics - LV 3
4th Grade Mathematics - LV 4
5th Grade Mathematics - LV 5
6th Grade Mathematics - LV 6 or Middle School Math Course 1
7th Grade Middle School Math Course 2 or 3
8th Grade Middle School Math Course 2 or 3, or Pre-Algebra
9th Grade Algebra 1
10th Grade High School Geometry
11th Grade Algebra 2
12th Grade PreCalculus or Trigonometry

Suggested Placement for Faster or AP Students

3rd Grade Mathematics - LV 3 or 4
4th Grade Mathematics - LV 4 or 5
5th Grade Mathematics - LV 5 or 6, or Middle School Math Course 1
6th Grade Middle School Math Course 2 or 3
7th Grade Middle School Math Course 3 or Pre-Algebra
8th Grade Algebra 1
9th Grade High School Geometry
10th Grade Algebra 2
11th Grade PreCalculus
12th Grade AP Statistics (Quantitative)

Suggested Placement for Students Working More Slowly

3rd Grade Mathematics - LV 3
4th Grade Mathematics - LV 3 or 4
5th Grade Mathematics - LV 4 or 5
6th Grade Mathematics - LV 5 or Middle School Math Course 1
7th Grade Middle School Math Course 1 or Essential Mathematics
8th Grade Middle School Math Course 1 or 2

9th Grade Pre-Algebra or Foundations of High School Math
10th Grade Algebra 1
11th Grade High School Geometry
12th Grade Algebra 2

35. What is the cost of training? NCTM 4.2

Vendor Response:

All teachers using ALEKS with their students within an adopting school or district are eligible for a 75- minute introductory ALEKS training via a Webinar at no charge. These sessions are held weekly at times that are convenient to teachers. A computer with an Internet connection and a telephone are required and need to be supplied by the school or district to take advantage of these Webinars. ALEKS will provide up to 25 teachers or administrators with a half-day in-person complimentary training for every 2000 52-week or 40-week ALEKS subscription units purchased by a district. Complimentary pre-recorded trainings are also available on-demand at: http://www.aleks.com/k12/training_center

ALEKS Corporation provides a complete range of customer support services. Highly trained ALEKS experts assist faculty and administrators with course implementation at no additional charge. ALEKS Customer Support assists with any and every aspect of system use from registration through course completion. ALEKS provides downloadable user guides that are available to every teacher and administrator using the system at: http://www.aleks.com/k12/user_guides

While the vast majority of ALEKS customers find that the complimentary Webinar sessions are sufficient for a successful implementation, ALEKS does offer additional for-fee professional development services. Onsite Professional Development is an ideal option for schools and districts seeking additional training for a number of teachers at once. Onsite training can be customized to meet specific school or district needs. The customer will select the site and ALEKS will provide the Professional Trainer. The training site must have a computer lab, an LCD projector, a whiteboard, a viewing screen, and an Internet-connected computer for each participant and for the Trainer.

Onsite Full Day Training is \$1,895

This fee includes Trainer travel and lodging expenses in the continental United States. Trainings must be scheduled a minimum of four weeks in advance. A customer-provided lab setting with an Internet-connected computer is required for every participant and an Internet-connected computer for the trainer with adequate projection/display for the room. Up to 25 participants can be included per training day.

Onsite Half Day Training: \$1,200

This fee includes Trainer travel and lodging expenses for select parts of the continental United States; additional expenses may apply depending on geography. Trainings must be scheduled a minimum of four weeks in advance. A customer-provided lab setting with an Internet-connected computer is required for every participant and an Internet-connected computer for the trainer with adequate projection/display for the room. Up to 25 participants can be included per training day.

Additional Training Day(s): \$1,500 per day

This option is ideal for training additional teachers or for to conduct more advanced training. The day(s) must occur chronologically the day before or after the initially contracted training day. Additional training day(s) must also be scheduled a minimum of four weeks in advance.

Online Professional Development is available to all ALEKS customers on an ongoing basis. There is no charge for the initial ALEKS online Professional Development session. Supplemental or additional online Professional Development is \$495 per 75-minute session for up to 15 teachers. Online Professional Development requires that each participant have access to the Internet and a phone.

36. What is the cost of materials? [NCTM 4.2](#)

Vendor Response:

ALEKS offers a variety of subscription lengths and prices to meet the needs of individual schools and districts. Additionally, there is no minimum purchase, and any subscriptions that are purchased and not immediately used can be saved for future activation. Furthermore, there is no site license required to use ALEKS, and no additional hardware or set-up fees.

Annual Subscription Price per Student				
Subscription Length	1-999 Students	1000-4999 Students	5000+ Students	AP Stats
1 Month	\$20.00	\$16.00	\$14.00	n/a
2 Months	\$22.50	\$18.00	\$15.75	\$45.00
3 Months	\$25.00	\$20.00	\$17.50	n/a
5 Months	\$27.50	\$22.00	\$19.25	\$65.00
7 Months	\$31.25	\$25.00	\$21.88	n/a
40 Weeks (school year)	\$35.00	\$28.00	\$24.50	\$95.00
12 Months	\$40.00	\$32.00	\$28.00	n/a
Quick Tables Only (5 Months)	\$5.00	\$5.00	\$5.00	n/a

Quick Tables Only (40 Weeks)	\$7.00	\$7.00	\$7.00	n/a
Quick Tables Only (12 Months)	\$10.00	\$10.00	\$10.00	n/a
ALEKS subscriptions may be purchased at any time and activated when they are ready to be used.				

37. What materials and/or software are included in the cost? *NCTM 4.2*

Vendor Response:

ALEKS subscriptions include student access to all K-12 courses, with the exception of QuickTables Only and AP Statistics subscriptions, which include access to those specific course products only. ALEKS is Web-based and can be accessed from any computer with an Internet connection; a site license is not needed or offered. The ALEKS technical requirements are minimal, requiring only an Internet browser and a downloadable plug-in. Specific system requirements can be found at http://www.aleks.com/support/system_requirements

Additionally, teachers and administrators have access to the robust Teacher Module. The Teacher Module enables educators to easily and conveniently monitor student learning progress through automated reports; to view and change the conditions applied in the generation of assessment reports; and to carry out other administrative tasks.

38. What are the suggestions and costs for additional materials? *NCTM 4.2*

Vendor Response:

There are no additional hardware or set-up fees associated with ALEKS.

39. What is the recommended group size? *NCTM 4.1*

Vendor Response:

There is no recommended group size as ALEKS can accommodate the learning needs of any number of students, with or without the aid of an in-class instructor. ALEKS provides individualized instruction that is customized to each student's learning needs. 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 practice problems, to demonstrate mastery of new skills, and to move ahead toward fulfillment of curricular and state-standard goals.

40. How can this program be used to benefit additional struggling students not directly participating in the intervention?

Vendor Response:

ALEKS works best in creating dramatic learning outcomes if students use the program for a minimum of two hours per week. Students not directly using the program will not benefit from the individualized assessment and learning that ALEKS offers.

41. What is the recommended lesson length? [NCTM 4.1](#)

Vendor Response:

ALEKS is highly individualized; however, data shows that using ALEKS two hours per week will result in substantial growth.

42. What, if any, is the total recommended pull-out time (missed regular class time) per student? [NCTM 4.1](#)

Vendor Response:

ALEKS can be implemented as a supplemental or core curriculum and easily adapts to the current pedagogy of most classrooms and schools. ALEKS should be implemented as an integral component of the mathematics curriculum as opposed to an activity to be addressed during pull-out time from class work.

43. Since mathematics intervention is intended to be supplemental to the core mathematics program, is the mathematical content of the intervention program appropriate for accommodating each student's foundational learning needs and aligned to a subset of the *Kentucky Core Content for Assessment, Kentucky Program of Studies, National Council of Teachers of Mathematics* standards, and the school's overall vision for mathematics education, rather than being an attempt to cover all topics? [NCTM 2.2](#)

Vendor Response:

ALEKS provides individualized assessment and learning in a manner that accommodates each student's foundational learning needs. ALEKS courses introduce, develop, and extend the mathematical content addressed by the NCTM Curriculum Focal Points and the Connections to the Focal Points at all grade levels three through eight. Additionally, courses are correlated with the Kentucky Core Content standards for all grade levels three through eight, and allow administrators to easily view student, class, school, and district progress toward state standards. For a detailed breakdown of each course's correlation to the Kentucky Core Content standards, please visit http://www.aleks.com/k12/state_standards.

A printed version of each correlation has also been included with this submission. ALEKS can be implemented as a supplemental or core curriculum to identify and fill-in gaps in student mathematical skills, as opposed to covering all topics for every student.