

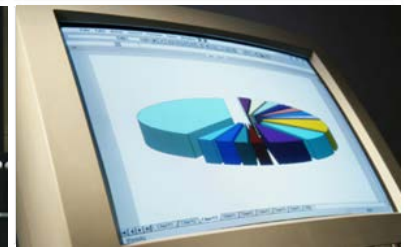
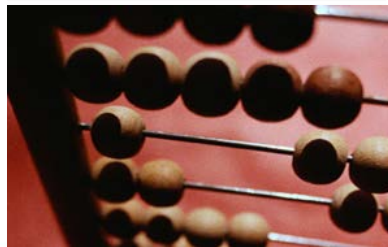


ALEKS MTEL Teacher Preparation Pilot Study

Phase III: Summary of Evaluation Results

Prepared for the Massachusetts Department of
Elementary and Secondary Education

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Executive Summary

The purpose of this study was to determine whether the ALEKS (Assessment and Learning in Knowledge Spaces) series of web-based mathematics courses could help teachers prepare for the Massachusetts Test for Educator Licensure (MTEL) exams in Elementary, Middle School, and General Curriculum mathematics. This report describes findings from the third year of a multi-year study.

Four cohorts of adults participating in the 2009-10 academic year administrations of the mathematics MTEL exams were invited to use ALEKS prior to taking their exam. Participants received a free subscription to ALEKS for up to 3 months and were asked to use the program for a minimum of 10 hours. All were required to start with the ALEKS Middle School Mathematics 3 course, and could then take additional courses if they chose. For comparative analyses, MTEL test takers from the same four exam dates who did not participate in the study provided a comparison group. Analyses yielded the following main findings:

- **ALEKS participation may be responsible for substantial increases in pass rates on the MTEL Elementary, Middle School, and General Curriculum mathematics exams.** Average MTEL score increases for ALEKS users were estimated at 15 points on the Elementary exam, 40 points on the Middle School exam, and 17 points on the General Curriculum mathematics exam. When applied to this sample, those score increases would account for 21% of the Elementary group, 48% of the Middle School group, and 25% of the General Curriculum group moving from failing to passing. This represents a plausible interpretation of the findings, but confidence could be increased by applying similar analyses to other samples or by conducting a randomized study.
- The number of hours that a study participant spent using the ALEKS software was not a good predictor of whether or not that participant would pass the MTEL.
- ALEKS users scored significantly higher on the MTEL than the comparison group, but ALEKS users and the comparison did not differ significantly on pass rates on the MTEL Elementary, Middle School, or General Curriculum mathematics exams.
- The ALEKS group scored significantly higher than the comparison group on two subtests of the Elementary School exam.
- Sixty-seven percent of ALEKS users reported that the software prepared them moderately well or very well for the MTEL exam. Perceptions of how well ALEKS prepared them for the MTEL were not significantly related to whether or not they actually passed the exam.

In addition to completing the ALEKS course, participants were expected to complete three web-based surveys that inquired about demographics, professional background, mathematics knowledge, and experiences with the ALEKS software. Survey data were gathered from 106 ALEKS pilot study participants who also took the Middle School (#47), Elementary School (#53), or General Curriculum (#03) Mathematics MTEL. Data were retained from the 60 ALEKS participants who completed all three of the surveys during the course of the study. Overall, 57% of the participants responded to all surveys. The responses are summarized in the three appendices.

Introduction

The purpose of this study was to determine whether the Assessment and Learning in Knowledge Spaces (ALEKS) web-based software program is a useful tool to help teachers prepare to pass the Massachusetts Test for Educator Licensure (MTEL) exams in Elementary (Test #53), Middle School (Test #47), and General Curriculum (Test #03) mathematics. Four cohorts of teachers participating in the 2009-10 academic year administrations of the mathematics MTEL were invited to use ALEKS prior to taking their exam. ALEKS is a web-based, artificially intelligent assessment and learning system organized as a series of courses that uses adaptive questioning to determine what a student knows and does not know in a given course. ALEKS instructs the student on the topics he or she is most ready to learn. As a student works through a course, ALEKS periodically reassesses the student to ensure that topics learned have been retained. Previously in Phases I and II, ALEKS addressed some of the same content as the MTEL mathematics tests, but was not specifically designed for, or aligned with, the MTEL mathematics test objectives or test items. During Phase III, an attempt was made to align the ALEKS modules with the MTEL test objectives and test items.

Information about the pilot study was available to potential participants through the Department of Elementary and Secondary Education (ESE) website under ‘Test Preparation Resources,’ and was sent to all Massachusetts superintendents through the Commissioner’s Update. Local teacher preparation institutes and urban mathematics administrators were also notified of the study and encouraged to inform potential MTEL test takers. Participants received a free subscription to ALEKS for up to three months and were asked to use the program for a minimum of 10 hours. All participants were required to start in the ALEKS Middle School Mathematics 3 course and could then take additional courses if they chose. Participants were also expected to complete three web-based surveys that inquired about demographics, professional background, mathematics knowledge, and experiences with the ALEKS software.

The specific questions addressed by this study included the following:

1. What is the influence of ALEKS participation on MTEL scores and pass rates?
2. What is the profile of participants (in terms of initial and final ALEKS scores, mathematics or MTEL preparation courses taken in addition to ALEKS, and other characteristics) for whom ALEKS is most effective (in terms of MTEL scores and pass rates for the Elementary, Middle School, and General Curriculum mathematics MTELS)?
3. Do ALEKS users think the software was effective in preparing them for MTEL?

An additional question for consideration in this Phase III report is:

4. How do results from Phase III compare with results from Phase I and Phase II?

The University of Massachusetts Donahue Institute (UMDI) conducted the study. This included collaboration with ESE staff to develop all survey instruments, analyze all survey data, and synthesize findings into a comprehensive technical summary. The report is organized into the following sections:

- **Method** – Describes the survey instruments, response rates, and data analysis.
- **Results** – Summarizes findings related to the specific evaluation questions.
- **Conclusion** – Provides an overall summary and discussion of key findings.
- **Appendices** – Summarize findings for the three web-based user surveys.

Method

This section describes the data sources, participants, survey instruments, and data analysis used in this study.

Data Sources

Data sources for this study include the following:

- The Massachusetts Department of Elementary and Secondary Education ALEKS database, documenting participant pre- and post-test scores on the ALEKS assessment, as well as usage measured in number of courses and hours completed in the ALEKS software for each participant
- The ALEKS database of participant responses to the three surveys described below
- The Massachusetts Department of Elementary and Secondary Education MTEL mathematics databases, including scores of all test takers

All data for analysis were provided by the Massachusetts Department of Elementary and Secondary Education.

Study Participants

Cohorts 1, 2, 3, and 4 correspond to the November 2009 and March, May, and July 2010 administrations of the mathematics MTEL. The September 2009 administration of the mathematics MTEL was eliminated from this study because different surveys were used that were not aligned. Over the course of the four test administrations, a total of 106 ALEKS users took the mathematics MTEL exams. Data were retained from the 57% of these participants who also completed all three user surveys (N=60). Eighteen of the original participants were "retakers," although only one is included in this group, having completed 10 hours of ALEKS use, the same MTEL, and all 3 surveys twice. The total number of valid responses sometimes varies across items, because not all participants responded to every question.

Survey Instruments

In order to gather statewide data on each cohort of participants, three web-based surveys were developed collaboratively by the ESE project team and the UMDI evaluator. Each survey consisted of multiple choice and open-ended items. Survey revisions were made through an iterative process of drafts and feedback. ESE administered all surveys online using Zoomerang or Survey Gizmo. Each participant was asked to complete Survey 1 before starting to use ALEKS, Survey 2 after using ALEKS for at least 10 hours but before taking the MTEL, and Survey 3 after taking the MTEL but before receiving score reports.

The first survey contained primarily demographic questions. Respondents were asked to provide information related to their current position, teaching experience, educational background, current Massachusetts teaching licenses held, and grade level(s) taught. They were further asked to document postsecondary mathematics courses they had taken, and to provide information on mathematics content/pedagogy courses they had participated in, during the previous two years. The final set of questions asked participants to rate their level of understanding relative to seven mathematics topics.

The second survey asked participants to respond to several aspects of their experiences using the ALEKS software. These items included respondents' perceptions of the ease or difficulty of using the software, the helpfulness of the mathematical concepts provided, the accuracy of ALEKS ratings related to content mastery of topics, and the ability of the software program to prepare participants for the MTEL effectively. The final set of

questions asked participants to rate their level of understanding relative to the same mathematics topics asked about in Survey 1.

The third survey asked participants to respond to their experience of using ALEKS. Respondents were asked to indicate their motivation for using ALEKS and the degree to which they believed that ALEKS had prepared them in each of the seven mathematical topics that had been covered. They were also asked to indicate topics that they encountered on the MTEL that had not been presented as part of their ALEKS work, any additional courses or test preparation they participated in during their three-month subscription to ALEKS, and whether they would recommend ALEKS to others as a strategy for MTEL preparation. Final questions asked participants whether they planned to complete any additional non-required mathematics courses or professional development in the future, and to provide any final comments about the software.

Data Analysis

For quantitative data, descriptive statistics—including mean scores, frequencies, and percentages—are provided, as appropriate. Correlation analyses and t-tests were conducted to determine whether statistically significant relationships existed among several variables, and linear and logistic regression were used to address the relative strength of the relationships of multiple predictor variables to a single outcome variable.

For all qualitative data, open-ended responses to survey questions were entered into a database and analyzed using a standard qualitative technique. The approach involved multiple readings of the data set and the assignment of themes around recurring ideas. Once themes were identified, each response was coded by its appropriate theme. The coded responses were then read and re-read in their thematic grouping to further identify patterns.

Results

The following section presents findings related to the principal evaluation questions. Additional survey findings are presented in the appendices. Data from all four cohorts were combined prior to analysis.

Overview and Comparison Group Analyses

All study participants were asked to use ALEKS for a minimum of 10 hours during the study, and 93% of users complied with this request. Based on data captured in ALEKS, participants used ALEKS from 15 minutes to 108 hours. The table below summarizes ALEKS usage for study participants who completed the Elementary (#53), Middle School (#47), and General Curriculum (#03) MTEL mathematics exams. Participants who passed the MTEL used ALEKS for 26.8 hours on average, compared to 26.6 hours for those who failed the MTEL (not a statistically significant difference). The number of hours that each study participant spent using the software was not significantly correlated with their MTEL pass rates ($r=.127$, $p=.333$), meaning that spending more time using ALEKS, on average, was not a good predictor of whether a participant would pass the MTEL. However, a statistically significant positive correlation ($r=.469$, $p=.000$) exists between ALEKS pre-test scores and MTEL scale scores.

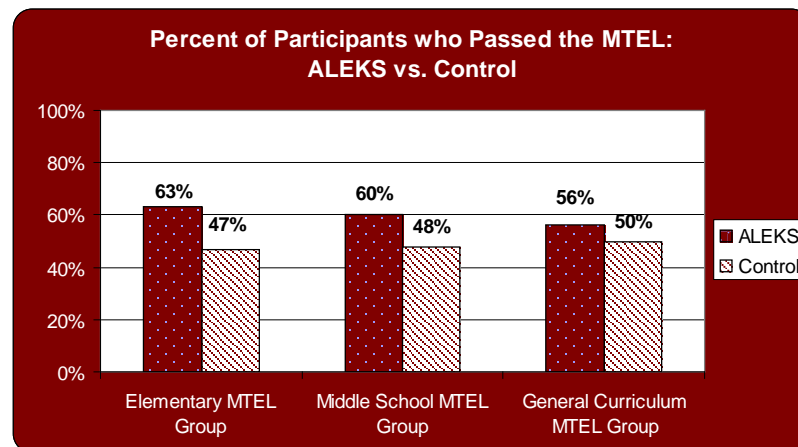
Hours using ALEKS	Elementary		Middle School		General Curriculum		Total	
	N	%	N	%	N	%	N	%
< 10 hours	2	10.5	0	0.0	2	12.5	4	6.7
10-19 hours	8	42.1	8	32.0	9	56.3	25	41.7
20-29 hours	5	26.3	7	28.0	2	12.5	14	23.3
30-39 hours	2	10.5	2	8.0	2	12.5	6	10.0
> 40 hours	2	10.5	8	32.0	1	6.3	11	18.3
Total	19	100.0	25	100.0	16	100.0	60	100.0

Users of ALEKS were asked about their motivation for using the software preparation. The most common reasons given were: “I am pretty confident in my math abilities but wanted a review of topics I hadn’t seen in a while,” reported by 63% of the Elementary group, 60% of the Middle School group, and 31% of the General Curriculum group, and “I struggle with math and was eager to use any resources that might help me pass,” reported by 16% of the Elementary group, 8% of the Middle School group, and 50% of the General Curriculum group. The difference in these responses across the Elementary, Middle School, and General Curriculum groups is statistically significant ($X^2=29.20$, $p<.05$).

For comparative analyses, MTEL scores of ALEKS users ($N=60$) were compared to scores for those who took the MTEL during the same four exam dates but did not participate in the ALEKS study ($N=5,682$). There was a statistically significant difference ($t=3.77$, $p<.000$) between MTEL scores of ALEKS users (mean=244) and the comparison group (mean=230). However, these differences did not lead to significant differences between MTEL pass rates of the study and comparison groups as a whole, or when the Elementary, Middle School, and General Curriculum MTEL groups were analyzed separately. Nevertheless, these differences between study and comparison pass rates may be meaningful, as shown in the table on the following page. It is possible that the differences did not show statistical significance due to the small sample size in the ALEKS group. It should also be noted that these differences do not infer causation. As acknowledged above, ALEKS users are conscientious and motivated to do well on the exam.

MTEL Study Group	ALEKS				Control			
	Pass		Fail		Pass		Fail	
	N	%	N	%	N	%	N	%
Elementary	12	63.2	7	36.8	158	46.5	182	53.5
Middle School	15	60.0	10	40.0	420	48.2	451	51.8
General Curriculum	9	56.3	7	43.8	2250	50.3	2221	49.7
Total	36	60.0	24	40.0	2828	49.8	2854	50.2

The graph below shows a comparison of the pass rates on the Elementary, Middle School, and General Curriculum mathematics exam between ALEKS users and the comparison group.



The Elementary, Middle School, and General Curriculum exam score reports include four and six subscores, respectively, that summarize performance on specific mathematics content areas such as "Geometry and Measurement" or "Number Sense and Operations." The only subscores with a significant difference between the ALEKS and comparison groups were Subtest #1 and Subtest #4 on the Elementary exam. On Subtest #1 the ALEKS group's mean score was 259 points and the comparison group's mean score was 241 points ($t=2.25$, $p<.05$). This subscore is based on "Number Sense, Operations, and Data Analysis" items from the MTEL. On Subtest #4 the ALEKS group's mean score was 252 points and the comparison group's mean score was 228 points ($t=2.38$, $p<.05$). This subscore is based on "Integration of Knowledge and Understanding" items from the MTEL.

Comparative analyses of demographic variables revealed that females were no more likely than males to become ALEKS study participants. The overall sample (ALEKS and comparison groups combined) was 85% female, while the ALEKS group was 80% female. Likelihood of becoming a study participant was not different for racial/ethnic groups including Asians, Blacks (not Hispanic), Hispanics, Native American/Alaska Native, and Whites, although this analysis is limited by the fact that 12% of the sample ($N=688$) didn't respond and 2% ($N=124$) provided responses that didn't fit into one of these five categories.

ALEKS users were all required to start with the Middle School Mathematics (MSM3) course and could then opt to take additional courses. However, only about one out of four ALEKS users ($N=15$) spent more than an hour on one or more of the other courses. Specifically, the numbers of participants using each ALEKS course were: Algebra I (1) and Math Review for AP Calculus (15). These provided inadequate sample sizes to draw meaningful conclusions about the impact of the other courses, so the analyses below are based primarily on MSM3 usage.

Since ALEKS was focused on participants taking the Middle School Mathematics MTEL, and participants were specifically recommended to take the AP Calculus course in addition to the MSM3 course, a chi square analysis was performed to determine whether completing both the basic and AP Calculus courses gave these participants an advantage on the MTEL. As stated above, 15 participants completed the two courses; however, only 14 took the Middle School mathematics MTEL (the remaining person took an elementary-level exam). Results indicated that while those who took both courses were more likely to pass the test than those who didn't take both courses (79% vs. 54%), the differences were not statistically significant. The small sample size (N=14) may not allow an accurate assessment of the true difference and may underestimate an effect.

Question #1 - What is the influence of ALEKS participation on MTEL scores and pass rates?

When participants begin an ALEKS course, they complete an initial assessment to determine their prior knowledge of course materials. That assessment yields the initial score. Progress is then periodically assessed, yielding a final score that indicates the extent to which course materials were mastered.

To investigate the influence of ALEKS participation on MTEL outcomes, the key question is whether final scores on ALEKS courses were still significant predictors of MTEL success even after taking into account the skills that participants had demonstrated via their initial score before starting to use ALEKS. This question was addressed using a linear regression model, which made it possible to estimate the actual increase in MTEL scores that would be anticipated based on specific gains in ALEKS scores.

The regression analysis indicated that, for every percentage point increase in MSM3 final scores, an average increase of 0.51 points on the Elementary exam, 1.49 points on the Middle School exam, and 0.59 points on the General Curriculum exam would be expected.¹ Average MSM3 gains from initial score to final score were 30 points for the Elementary group, 27 points for the Middle School group, and 28 points for the General Curriculum group, so the regression model predicts an average increase of 15 points (30 times 0.51) on the Elementary MTEL, an average increase of 40 points (27 times 1.49) on the Middle School MTEL, and an average increase of 17 points (28 times 0.59) on the General Curriculum mathematics MTEL.²

The next step is to ask what percentage of ALEKS users passed their MTEL exams by these margins. In the Elementary group, 21% (4 out of 19) passed the MTEL by 15 points or fewer. In the Middle School group, 48% (12 out of 25) passed the MTEL by 40 points or fewer. In the General Curriculum group, 25% (4 out of 16) passed the MTEL by 17 points or fewer. **When applied to this sample, those score increases would account for 21% of the Elementary group, 48% of the Middle School group, and 25% of the General Curriculum group moving from failing to passing.** If use of the ALEKS software is responsible for the MTEL score increases predicted by the regression model, then ALEKS would have a substantial influence on the overall MTEL pass rates for the population from which this sample is drawn. This represents a plausible interpretation of the findings, but confidence could be increased by applying similar analyses to other samples or by conducting a randomized study.

¹ The regression equations were:

(1) Elementary MTEL Score = $156.3 + (1.013)(\text{Initial MSM3 Score}) + (0.508)(\text{Final MSM3 Score})$ points,
 (2) Middle School MTEL score = $123.4 + (-0.081)(\text{Initial MSM3 Score}) + (1.487)(\text{Final MSM3 Score})$ points, and
 (3) General Curriculum MTEL score = $174.9 + (0.406)(\text{Initial MSM3 Score}) + (0.594)(\text{Final MSM3 Score})$ points.

² These estimates are based on the specific sample used in this study. The true values for the population from which this sample is drawn could be substantially higher or lower. For the Elementary group, using a 95% confidence interval and the standard error of 0.492 for the Final MSM3 Score regression coefficient, the actual values could range from a 29-point decrease to a 29-point increase. For the Middle School group, using a 95% confidence interval and the standard error of 0.459 for the Final MSM3 Score regression coefficient, the actual values could range from a 24-point decrease to a 24-point increase. For the General Curriculum group, using a 95% confidence interval and the standard error of 0.608 for the Final MSM3 Score regression coefficient, the actual values could range from a 33-point decrease to a 33-point increase. Subsequent phases of the study will enable further investigation of the generalizability of these findings to other samples.

Question #2 - What is the profile of participants (in terms of initial and final ALEKS scores, mathematics or MTEL preparation courses taken in addition to ALEKS, and other characteristics) for which ALEKS is most effective (in terms of MTEL scores and pass rates for the Elementary, Middle School, and General Curriculum MTELS)?

To answer this question, it is first necessary to ask what it means to say that ALEKS was effective. As explained above for Question #1, ALEKS can plausibly be credited for MTEL success only if final MSM3 scores are still significant predictors of MTEL success *after* adjusting for initial MSM3 scores.³

Of the many subgroups tested, none of them met these criteria. Due to the small sample size (N=60) of ALEKS study participants, most of the subgroups were too small to be tested statistically. Two subgroups that were tested showed significance at a level ($p < .10$) that falls short of conventional criteria for significance, but is often reported as possibly indicative of a trend. The subgroups are those who had taken a postsecondary Algebra I course (N=26, 43% of participants) and those who used an MTEL preparation book (N=32, 53% of participants).

Subgroups that were tested but did not show significance included ALEKS users who reported having taken a postsecondary calculus course (N=21, 35% of the sample), or a postsecondary statistics course (N=24, 40% of the sample). Additional subgroups tested that did not show significance included females (N=46, 77% of the sample), Whites (N=48, 80%), and pre-service teachers (N=24, 40%).

Finally, subgroups of fewer than 20 participants were not tested, because very small groups often yield results that, by random chance, are not representative of the population from which they were sampled. These untested groups included males (N=11, 18% of the sample), Asians (N=1, 2%), Blacks not of Hispanic origin (N=1, 2%), Hispanics (N=1, 2%), those who had taken postsecondary courses in Algebra II (N=16, 27%), Geometry (N=12, 20%), Probability (N=10, 17%), Applied Math (N=4, 7%), Differential Equations (N=4, 7%), Discrete Mathematics (N=3, 5%), Finite Mathematics (N=1, 2%), Linear Algebra (N=8, 13%), Multivariable Calculus (N=3, 5%), and/or Trigonometry (N=6, 10%).

Question #3 - Do ALEKS users think the software was effective in preparing them for the MTEL?

Overall, 67% of ALEKS users reported that the software prepared them moderately well or very well for the MTEL exam. Another 27% indicated that ALEKS prepared them somewhat well, and 5% indicated that ALEKS did not prepare them to take the MTEL exam. These reports were solicited before study participants received their MTEL scores, and it is notable that their perceptions of how well ALEKS prepared them for the MTEL were not significantly related to whether or not they actually passed the MTEL exam ($X^2=7.210$, NS). Results of how effective participants gauged ALEKS to be in their MTEL preparation are presented by MTEL group in the table below.

Overall, how well do you think ALEKS prepared you for the MTEL? (1=ALEKS did not prepare me, 2=ALEKS prepared me somewhat, 3= ALEKS prepared me moderately well, 4=ALEKS prepared me very well)	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	Mean	N	Mean	N	Mean
	19	2.8	24	2.9	16	2.7

ALEKS users were also asked to provide open-ended comments about how well they thought ALEKS prepared them for the MTEL. Of the 33 responses to this question, the most common answer was that ALEKS prepared

³ This question was addressed in terms of MTEL pass rates (using logistic regression) and MTEL scores (using linear regression).

them well for the MTEL (N=18). Five respondents reported that the topics covered in ALEKS were not as complex as those on the MTEL; three reported that ALEKS did not prepare them for the open-ended questions on the MTEL; and two reported that there was a discrepancy whereby calculators could be used with ALEKS but not on the MTEL. Comments offered by one respondent, respectively, included that ALEKS should be timed like the MTEL and that there were technical difficulties with the program. Additionally, in response to this question four participants provided complaints about the MTEL, which were unrelated to ALEKS.

Question #4 - How do results from Phase III compare with results from Phase I and Phase II?

Several questions have framed the analyses for evaluating the effectiveness of the ALEKS software as a tool to improve pass rates on the MTEL Elementary, Middle School, and General Curriculum mathematics exams. This section of the reports attempts to compare the results across the three project phases. It should be noted that Phase I and Phase II analyses included only the Elementary (#53) and Middle School (#47) mathematics MTEL results, while Phase III analyses included the Elementary (#53), Middle School (#47), and General Curriculum (#03) mathematics MTEL results. The sample size of ALEKS users has decreased each year while the comparison group size has increased, as shown in the table below. One possible explanation for the decrease in ALEKS users during Phase III could be that the September 2009 mathematics MTEL administration was dropped from this phase of the study due to non-alignment, while September administrations were included in previous phases.

Number of Participants by Phase		
	ALEKS Users	Comparison Group
Phase I	156	349
Phase II	112	1,269
Phase III	60	5,742

Question 1: What is the influence of ALEKS participation on MTEL scores and pass rates?

Consistently across the three phases analyzed, there are no statistically significant differences between MTEL pass rates for those who used ALEKS for MTEL preparation compared to those who did not use ALEKS. In Phase III there are statistically significant differences in the MTEL scores, and perhaps meaningful differences in the pass rates on the Elementary, Middle School, and General Curriculum mathematics exams (although not statistically significant, perhaps due to the small sample size).

Phase II and Phase III studies used regression analysis, including initial and final scores on the ALEKS Middle School Mathematics 3 course, as predictors of MTEL performance. When applied to the Phase II sample, the ALEKS course score increases would account for 15% of the Elementary group and 29% of the Middle School group moving from failing to passing. When applied to the Phase III sample, those score increases would account for 21% of the Elementary group, 48% of the Middle School group, and 25% of the General Curriculum group moving from failing to passing. These analyses represent a plausible interpretation of the data and show stronger results for the Phase III sample. This effect may be related to the fact that the ALEKS curriculum had not been specifically aligned with MTEL content during Phases I and II. However, based on Phase II results, it was decided to align the curriculum to a greater extent for Phase III.

If use of the ALEKS software is responsible for the MTEL score increases predicted by the regression model, then ALEKS could have a substantial influence on the overall MTEL pass rates. This represents a plausible interpretation of the findings, but confidence could be increased by applying similar analyses to other samples or by conducting a randomized study.

Question 2: What is the profile of participants (in terms of initial and final ALEKS scores, mathematics or MTEL preparation courses taken in addition to ALEKS, and other characteristics) for which ALEKS is most effective (in terms of MTEL scores and pass rates for the Elementary and Middle School MTELS)?

Data analyses across the three phases do not show similarities related to this question. Phase I found that ALEKS users who completed at least 85% of the ALEKS Middle School Mathematics 3 course had higher pass rates than the comparison group, and that teachers with a master's degree had higher pass rates than those who did not.

Phase II and Phase III used the regression analyses as the starting point for subgroup analyses. Phase II analyses indicated that the only subgroup that met the criteria of the regression analysis findings were ALEKS users who reported having taken a postsecondary calculus course. Phase III analyses did not show statistical significance for any characteristic of participants that met the criteria, perhaps due to the small sample size.

Question 3: Do ALEKS users think the software was effective in preparing them for the MTEL?

Across the three phases analyzed, there was some variability in how effective ALEKS users thought the software was in preparing them for the MTEL. For example, in Phase I, 80% of participants reported that ALEKS prepared them moderately well or very well for the MTEL exam. However, during Phase II, only 48% of ALEKS users reported that the software prepared them moderately well or very well. Most recently, during Phase III, 67% of ALEKS users reported that ALEKS prepared them moderately well or very well for the MTEL. The increase in perceived effectiveness from Phase II to Phase III may be related to the changes made to ALEKS after Phase II to align the modules with the MTEL test objectives and test items.

Additional analyses were conducted with these data during Phases II and III that were not conducted during Phase I, and therefore the information below only relates to Phases II and III. Participants' perceptions of how well ALEKS prepared them for the MTEL were not significantly related to whether or not they actually passed the MTEL exam in either Phase II or Phase III. In both Phases II and III there was an open-ended question related to ALEKS' perceived effectiveness for MTEL preparation. The open-ended responses to this question reflect the same trend towards increasingly positive feedback related to ALEKS from Phase II to Phase III. For example, in Phase II the most common answer to the open-ended portion of the question was that ALEKS was not at a high enough level or did not cover enough topics. During Phase III, however, the most common answer reported by participants was that ALEKS prepared them well for the MTEL.

Conclusion

The purpose of this study was to determine whether the ALEKS series of web-based mathematics courses could help teachers prepare for the Massachusetts Test for Educator Licensure (MTEL) exams in Elementary, Middle School, and General Curriculum mathematics. This report describes findings from the third year of a multi-year study, and provides some comparison with findings from the first and second years of the study.

Four cohorts of adults participating in the 2009-10 academic year administrations of the mathematics MTEL exams were invited to use ALEKS prior to taking their exam. Participants received a free 3-month subscription to ALEKS and were asked to use the program for a minimum of 10 hours. All were required to start with the ALEKS Middle School Mathematics 3 course and could then take additional courses if they chose to. In addition to completing the ALEKS course, participants were also expected to complete three web-based surveys.

The analyses below are based on 60 participants who used the ALEKS software, completed all 3 surveys, and took either the Elementary (#53), Middle School (#47), or General Curriculum (#03) mathematics MTEL. A comparison group included 5,682 adults who took the same 3 MTEL tests on the same 4 exam dates but did not use the ALEKS software or complete the surveys. Principal analytic findings and their implications are discussed below.

- **The study provided strong evidence in favor of ALEKS as a preparation tool for the Elementary and Middle School MTEL mathematics exams.** Average MTEL score increases for ALEKS users were estimated at 15 points on the Elementary exam, 40 points on the Middle School exam, and 17 points on the General Curriculum mathematics exam. When applied to this sample, those score increases would account for 21% of the Elementary group, 48% of the Middle School group, and 25% of the General Curriculum group moving from failing to passing. Although this represents a plausible interpretation of the findings, it is essential to emphasize that replication with other samples would substantially increase confidence in the regression model on which the findings are based. To be able to state conclusively that ALEKS participation *caused* increases in MTEL pass rates would require a design in which some adults who requested access to ALEKS were randomly assigned to the non-ALEKS group but still completed the three surveys.
- Increased hours using the ALEKS software was not correlated with increased MTEL pass rates, but this finding should be interpreted carefully. While it could reflect negatively on ALEKS as an MTEL preparation tool, the data are also consistent with a plausible alternative explanation. Participants with less mathematics knowledge might not be able to raise their scores enough to pass the MTEL even after spending long hours using ALEKS, while those with more mathematics knowledge might achieve the gains needed to pass the MTEL in fewer hours of using ALEKS. If so, then hours of ALEKS use would not be correlated with MTEL pass rates, as was the case in this study. Further, a statistically significant correlation exists between ALEKS pre-test scores and MTEL scale scores.
- Motivation for using ALEKS was different for Elementary, Middle School, and General Curriculum groups. Elementary (63%) and Middle School (60%) group participants noted that they were confident in their mathematical abilities but wanted a review of topics they had not seen in a while, while the General Curriculum participants (50%) noted that they struggle with mathematics and were eager to use any resource that might help them pass.
- ALEKS users and the comparison group differed significantly on MTEL scores, although this difference did not translate to significantly higher pass rates. These differences must be interpreted in light of other relevant

characteristics of the two groups. Enrolling in the ALEKS study was optional, so the study and comparison groups might have pre-existing differences that are relevant to the study's outcomes. For example, if MTEL takers with above-average mathematics knowledge felt that they could pass the MTEL without much preparation, they might have been less likely to enroll in ALEKS than MTEL takers with below-average mathematics knowledge. The comparison group would then have a higher initial level of mathematics ability than the ALEKS group. Under those conditions, even if ALEKS was beneficial, it might not raise ALEKS users' MTEL performance to a level that is significantly higher than the comparison group's MTEL performance. The level of motivation of ALEKS users may also be greater than that of the comparison group, since they chose to use ALEKS to better prepare for the exam. In addition, comparison group members might have used effective preparation methods other than ALEKS.

- The ALEKS group scored significantly higher than the comparison group on two subtests of the Elementary exam that focused on "Number Sense, Operations, and Data Analysis" and "Integration of Knowledge and Understanding." Conventional high school and college mathematics sequences often leave out data analysis, so it may be that ALEKS, by presenting this topic, confers a significant advantage. More familiar MTEL topics, such as algebra and geometry, might not present the same type of opportunity for ALEKS. However, it would be useful to investigate how ALEKS addresses number sense, operations, and data analysis, and the integration of knowledge and understanding, and how that compares with the presentation of these same topics on the MTEL, to see if there are ways that the ALEKS curriculum could be altered to confer similar advantages for other topics.
- Subgroup analyses did not identify particular characteristics of study participants relating ALEKS performance to MTEL success. For the most part, subgroups were too small for statistical analysis.
- If ALEKS is indeed helpful for MTEL preparation, it is important to determine which strategies were most effective for enlisting ALEKS participants of both genders and from other demographic subgroups. Perhaps most important is the finding that only 2% of eligible ALEKS participants (i.e., those who took the Elementary, Middle School, or General Curriculum mathematics MTEL during the year of Phase III data collection) used the free, online ALEKS course. The availability of ALEKS could be more systematically publicized to future MTEL takers.
- Sixty-seven percent of ALEKS users reported that the software prepared them moderately well or very well for the MTEL exam. Perceptions of how well ALEKS prepared them for the MTEL were not significantly related to whether or not they actually passed the exam.
- Across the three years of the study there were no statistically significant differences in MTEL pass rates between those who used ALEKS for MTEL preparation compared to those who did not use ALEKS. However, regression analyses with Phase II and Phase III data provide a plausible model for the possible influence the ALEKS curriculum could have on moving participants from failing to passing on the MTEL.

Given the findings in this report, it appears that ALEKS is a useful tool for mathematics MTEL preparation. Additional suggestions are provided for how these findings could be confirmed with larger samples and/or more rigorous study designs in future studies. The fact that ALEKS can apparently have a significant impact on MTEL scores suggests that more specific targeting in some areas could further raise the software's effectiveness. In addition, recruiting additional MTEL takers to use ALEKS could substantially increase its impact as a test preparation strategy.

Appendix A: Survey 1 Results

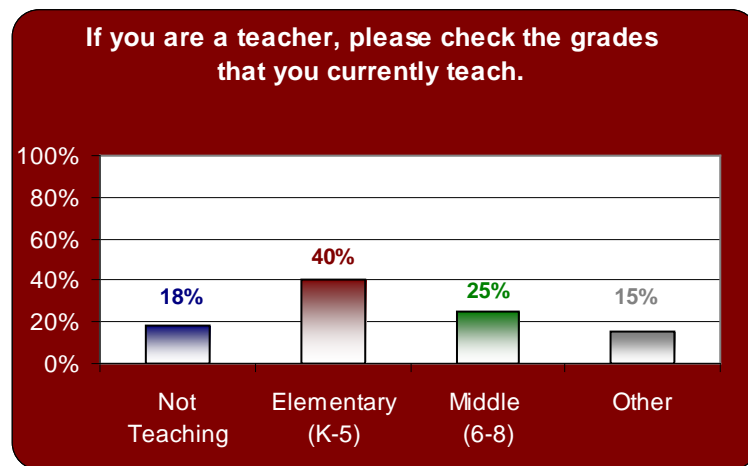
Survey 1 included several questions related to participants' demographics, professional backgrounds, and understanding of mathematical content areas.

Approximately one third of the participants (32%) were current mathematics or multi-subject teachers, 30% were prospective teachers, and 28% described themselves as "other." Other responses included special education teachers (N=4) and substitute teachers (N=2). The remaining respondents identified as: adult education teacher, math support specialist, homemaker, behavioral therapist, inclusion aid, instructional leadership specialist, paraprofessional, music teacher, reading teacher, and former teacher (N=1 for each).

Which best describes your current position?	N	%
Prospective Teacher	18	30%
Teacher - Elementary, multi-subject	10	17%
Teacher - Middle/Junior High, math ONLY	1	2%
Teacher - Elementary, Math ONLY	5	8%
Teacher - Middle/Junior High, multi-subject	3	5%
Student	6	10%
Other, please specify	17	28%
Total	60	100%

The most frequently represented school districts among ALEKS participants were Revere (N= 4), Cambridge (N=5), Holyoke (N=3), Springfield (N=3), Boston (N=2), and Lynn (N= 2). The remaining districts, each represented by one teacher, were Agawam, Barnstable, Billerica, Boston, Brockton, Gill-Montague Regional School District, Lowell, Nauset, Newton, Norwood, Old Rochester Regional School District, Quincy, and Seekonk. In addition, 12 participants reported that this question was not applicable, four reported that they were not currently teaching, and three participants reported that they worked in private schools.

The table on the following page shows the percentage of teachers working at elementary and middle schools. Forty percent reported they were teaching elementary school, and 25% were teaching middle school. Another 18% of participants reported that they were not currently teaching, and 15% of participants indicated that they taught in an "other" area. "Other" responses included the following: high school teacher, high school special education teacher, GED teacher, grades 7 and 8 Title I, K-5 mathematics coach, K-8 mathematics coach, K-12 ELL, Title I mathematics, and a grade 3 student teacher (N=1 each).



Participants' teaching experience was very diverse, as demonstrated in the table below. Some had never taught in a K-12 school (27%), and others had been teaching for more than 20 years (7%).

How many years have you taught elementary, middle, or secondary school?	N	%
I have never taught in a K-12 school	16	27%
This is my first year teaching	2	3%
2	3	5%
3	2	3%
4	6	10%
5	1	2%
6 to 10	8	13%
11 to 15	5	8%
16 to 20	4	7%
More than 20	4	7%
No response	9	15%
Total	60	100%

Sixty-three percent of the Elementary test takers, 32% of the Middle School test takers, and 25% of the General Curriculum test takers reported having a master's degree in education. Two participants had degrees in mathematics and both were Middle School test takers. Two Elementary test takers and one Middle School test taker had bachelor's degrees in mathematics education.

Highest Degree in Education Obtained	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	%	N	%	N	%
Bachelor's	3	16%	9	36%	5	31%
Master's	12	63%	8	32%	4	25%
C.A.G.S.	2	11%	2	8%	0	0%
Doctorate	0	0%	0	0%	0	0%
No degree in Education	1	5%	6	24%	7	44%
No response	1	5%	0	0%	0	0%
Total	19	100%	25	100%	16	100%

Highest Degree in Mathematics Obtained	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	%	N	%	N	%
Bachelor's	0	0%	2	8%	0	0%
Master's	0	0%	1	4%	0	0%
C.A.G.S.	0	0%	0	0%	0	0%
Doctorate	0	0%	0	0%	0	0%
No degree in Mathematics	18	95%	22	88%	16	100%
No response	1	5%	0	0%	0	0%
Total	19	100%	25	100%	16	100%

Highest Degree in Mathematics Education Obtained	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	%	N	%	N	%
Bachelor's	2	11%	1	4%	0	0%
Master's	0	0%	0	0%	0	0%
C.A.G.S.	0	0%	0	0%	0	0%
Doctorate	0	0%	0	0%	0	0%
No degree in Mathematics Education	16	84%	23	92%	16	100%
No response	1	5%	1	4%	0	0%
Total	19	100%	25	100%	16	100%

There were 12 participants who did not have a degree in education, mathematics, or mathematics education. Of these, 10 participants reported that they had a degree in another area. Three participants reported that they held a bachelor's degree in psychology. Additionally, three participants reported that they were enrolled in a bachelor's degree program and did not yet have any degree. Two participants had their master's of business administration, one participant had a master's degree in child development, and one participant had a bachelor's degree in marketing.

Thirty-three percent of the participating teachers reported that they had an Elementary License. Another 43% indicated that they did not hold a current teaching license, and 3% were licensed in Elementary Mathematics. Many participants (N=19) indicated that they had other licenses, with some reporting more than one area of licensure. These included Special Education/Moderate Special Needs (N=7), K-8 (N=4), Early Childhood Education (N=3), and Business Management (N=3). The remaining license areas reported by respondents were: Guidance, Music, General Science, English, and Elementary and Middle School Science (N=1 each).

Which of the following Massachusetts teaching licenses do you currently hold?	N	%
Elementary	20	33%
Elementary Mathematics	2	3%
No license	26	43%
No response	12	20%
Total	60	100%

Participants were asked to indicate the postsecondary courses they had taken prior to the study. A breakdown of courses by MTEL test taken is provided in the table on the following page. In most cases, participants who took

the Middle School MTEL reported taking higher-level mathematics courses than participants who took the Elementary MTEL or the General Curriculum MTEL. In addition to those courses listed in the table below, some participants reported taking courses other than those listed below: Number Theory (N=3), Math for Elementary Teachers, Introduction to Mathematics, and Numbers and Operations (N=1 each).

Which of the following postsecondary mathematics courses have you taken?	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	%	N	%	N	%
Algebra I	9	47%	11	44%	6	38%
Algebra II	3	16%	9	36%	4	25%
Applied Mathematics	0	0%	3	12%	1	6%
Calculus	3	16%	14	56%	4	25%
Differential Equations	1	5%	3	12%	0	0%
Discrete Mathematics	0	0%	3	12%	0	0%
Finite Mathematics	1	5%	0	0%	0	0%
Geometry	3	16%	6	24%	3	19%
Linear Algebra	1	5%	6	24%	1	6%
Multivariable Calculus	0	0%	3	12%	0	0%
Probability	1	5%	5	20%	4	25%
Statistics	3	16%	11	44%	10	63%
Trigonometry	1	5%	4	16%	1	6%

There were 29 responses to the question about additional mathematics content and/or pedagogical professional development programs that respondents had participated in during the previous two years. While not all responses mentioned a provider, when stated, the most common provider was the school, school district, or city (N=9). Two respondents reported taking courses through the Department of Elementary and Secondary Education, one reported taking courses through the University of Massachusetts Amherst, and one reported taking courses through Lesley University. Courses reported by participants included: Teaching Elementary Math and Science; Proportional Reasoning; AER International Conference; Planning and Teaching with the Elementary Everyday Math Curriculum; Number Sense; Math Differentiation for PDD-NOS, Autistic, and ADHD children; Math Leadership; Number Theory; Number and Operations; Functions and Algebra I; Connected Math; Basic Concepts in Mathematics I and II; Investigations; and MADESE/Intel Math Initiative. In addition, one respondent reported studying mathematics independently and two respondents reported teaching courses to master's candidates.

The amount of professional development participants attended ranged from none (37%) to more than 80 hours (7%).

During the past two years, approximately how many hours of professional development on mathematics content and/or pedagogy have you attended?	N	%
0	22	37%
1 - 10 hours	15	25%
11 - 40 hours	13	22%
41 - 80 hours	3	5%
Over 80 hours	4	7%
No response	3	5%
Total	60	100%

Participants were asked to rate their level of understanding of the seven mathematics content areas presented in the table below. In every case, Middle School test takers reported the highest levels of understanding related to each of the content areas.

Please rate your level of understanding of each of the following mathematical topics. (1=Poor, 2=Below Average, 3=Average, 4=Good, 5=Excellent)	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	Mean	N	Mean	N	Mean
Number Sense & Operations	11	4.0	22	4.3	10	3.1
Measurement	11	3.5	22	4.0	10	3.0
Patterns, Relations, & Algebra	11	3.7	21	4.0	10	2.8
Geometry	11	3.4	22	3.5	10	2.7
Data Analysis	11	3.5	22	3.7	10	2.9
Statistics and Probability	11	2.8	22	3.2	10	2.9
Trigonometry, Calculus, & Discrete Mathematics	11	1.9	22	2.3	10	1.6

Appendix B: Survey 2 Results

Survey 2 asked participants to respond to several aspects of their experiences using the ALEKS software. These items included respondents' perceptions of the relative ease or difficulty of using the software, helpfulness of the mathematical concepts provided, accuracy of ALEKS ratings relative to content mastery of topics, and the ability of the software program to prepare participants for the MTEL effectively. The final set of questions asked participants to rate their level of understanding related to the same mathematics topics asked about in Survey 1.

Most participants reported that ALEKS was "somewhat easy" or "very easy" to use, as summarized in the table below.

Please rate how easy/difficult you found the ALEKS software to use. (1=very easy, 2=somewhat easy, 3=somewhat difficult, 4=very difficult)	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	Mean	N	Mean	N	Mean
	19	1.6	24	1.4	16	1.4

There were 29 additional comments related to the ease or difficulty of using the ALEKS software, with some responses fitting into more than one category. Nine participants used this opportunity to comment that ALEKS was easy to use or offered other generally positive comments about the program. The most commonly cited difficulties were that the compass and ruler tools were difficult to use (N=10) and that it was difficult to use the graphing tools (N=9). Additional comments included that it would have been better if tests could be postponed, it would be nice to have the ability to skip sections, and technical difficulties with the program were frustrating.

All participants reported that the ALEKS explanations of mathematics concepts were "moderately helpful" or "very helpful," with most participants reporting that the explanations were "very helpful," as summarized in the table below.

Please rate how helpful you found the ALEKS explanations of math concepts. (1=not helpful, 2=a little helpful, 3=moderately helpful, 4=very helpful)	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	Mean	N	Mean	N	Mean
	19	3.7	25	3.8	16	3.6

If participants had any comments about how helpful they found the ALEKS explanations of mathematical concepts, they were invited to provide them. There were five open-ended responses to this question. Three of the comments stated that the explanations of the mathematics concepts were good. The other two comments remarked that hints would have been nice, and it would have been nice to have varied questions when doing a problem multiple times.

Most respondents reported that they felt they had mastered topics at the same point that the ALEKS software indicated they had.

Please rate how accurately you felt that ALEKS rated your mastery of a topic.	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	Mean	N	Mean	N	Mean
1=ALEKS continued to give me practice AFTER I felt I had mastered a topic	18	1.8	18	2.2	13	1.8
2=I felt I had mastered a topic at about the same point as ALEKS						
3=ALEKS said I had learned a topic, but I needed a little more practice						
4=ALEKS said that I had learned a topic, but I needed a lot more practice						

There were nine open-ended responses to this question, with three participants commenting that ALEKS was very accurate. Two participants commented that ALEKS continued to give them practice after they had mastered a topic, and two participants commented that they appreciated that they could continue to practice a concept even if ALEKS thought that they had mastered it. Additional responses indicated that sometimes ALEKS gave too much practice, because of incorrect answers due to technical difficulties using the tools, and that ALEKS did not always explain the rationale behind the right answers.

After using ALEKS for more than a month, participants were again asked to rate their level of understanding of the seven mathematics content areas presented in the table below. As in Survey 1, Middle School test takers reported the highest level of understanding related to each of the content areas. Of note, participants' self-rated levels of understanding increased in almost every mathematical content area (across all MTEL groups) compared to participants' self-rated levels of understanding before they completed ALEKS.

Please rate your level of understanding of each of the following mathematical topics.	Elementary MTEL Group		Middle School MTEL Group		General Curriculum MTEL Group	
	N	Mean	N	Mean	N	Mean
(1=Poor, 2=Below Average, 3=Average, 4=Good, 5=Excellent)						
Number Sense & Operations	19	4.5	25	4.5	16	4.1
Measurement	19	4.1	25	4.2	16	3.9
Patterns, Relations, & Algebra	19	3.8	25	4.2	16	3.6
Geometry	19	3.3	25	3.7	16	3.3
Data Analysis	19	3.9	25	4.0	16	3.8
Statistics & Probability	19	3.3	25	3.8	16	3.3
Trigonometry, Calculus & Discrete Mathematics	18	1.9	25	2.4	16	2.0

Appendix C: Survey 3 Results

Survey 3 was administered to all participants after they had taken the MTEL but before they had received their scores. Participants were asked to indicate whether they thought they had passed the MTEL, and the degree to which they believed that ALEKS had prepared them in each of the seven mathematical topics they had been asked about in the previous two surveys. They were also asked to indicate topics that they encountered on the MTEL that had not been presented as part of their ALEKS work, any additional courses or test preparation they participated in, and whether they would recommend ALEKS to others as a strategy for MTEL preparation. Final questions asked whether participants planned to take any additional nonrequired mathematics courses or professional development in the future, to respond to their experiences with ALEKS customer support if they had used it, and to provide any final comments about the software.

All test takers were asked to indicate what they were currently teaching. Forty percent of respondents were not currently teaching, 25% taught multiple subjects, 10% taught mathematics only, and 5% were mathematics coaches. Other responses included special education teacher (N=2), substitute teacher (N=2), and ESL/ELL teacher (N=2). The remaining areas were reported by one respondent each: Title I math teacher, math/science instructional leadership specialist, elementary tutor, and daycare manager.

What are you currently teaching?	N	%
I am not currently teaching.	24	40%
I teach multiple subjects.	15	25%
I teach math only.	6	10%
I am a math coach.	3	5%
Other	10	16%

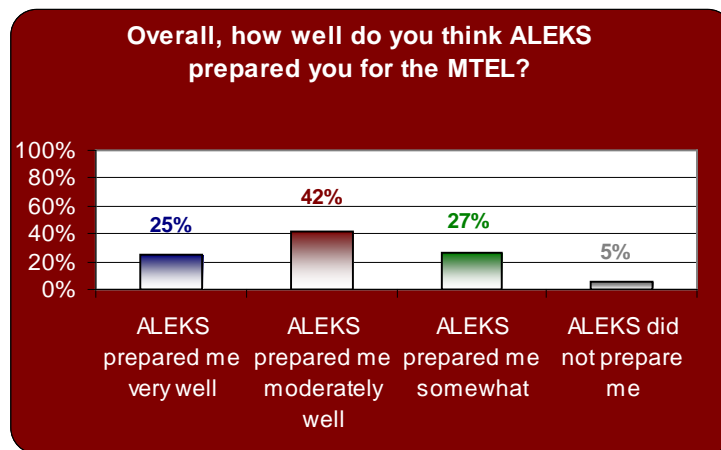
In many content areas, most Elementary, Middle School, and General Curriculum respondents indicated that ALEKS gave the right amount of emphasis to the topic, as summarized in the table on the next page. Approximately 20% of respondents reported that there was not enough emphasis on Patterns, Relations, and Algebra; Geometry; or Data Analysis. For the Trigonometry, Calculus, and Discrete Mathematics category, the majority of respondents (60%) indicated either that ALEKS did not emphasize it enough or that ALEKS did not include it all.

Please rate to what degree your ALEKS course(s) prepared you for the MTEL in each of the following topics.	ALEKS emphasized this too much (%)			ALEKS gave this the right amount of emphasis (%)			ALEKS didn't emphasize this enough (%)			I didn't see this section/topic within ALEKS (%)		
	ES	MS	GC	ES	MS	GC	ES	MS	GC	ES	MS	GC
Number Sense and Operations (N=60)	0	4	0	84	92	94	11	4	6	5	0	0
Measurement (N=60)	11	8	13	74	92	88	11	0	0	5	0	0
Patterns, Relations, and Algebra (N=59)	0	8	13	63	80	60	32	12	27	5	0	0
Geometry (N=60)	0	8	13	74	64	63	21	28	25	5	0	0
Data Analysis (N=59)	0	0	6	83	72	75	11	28	13	6	0	6
Statistics and Probability (N=58)	6	4	13	83	79	69	11	17	19	0	0	0
Trigonometry, Calculus, and Discrete Mathematics (N=58)	11	4	6	28	38	25	11	50	31	50	8	38

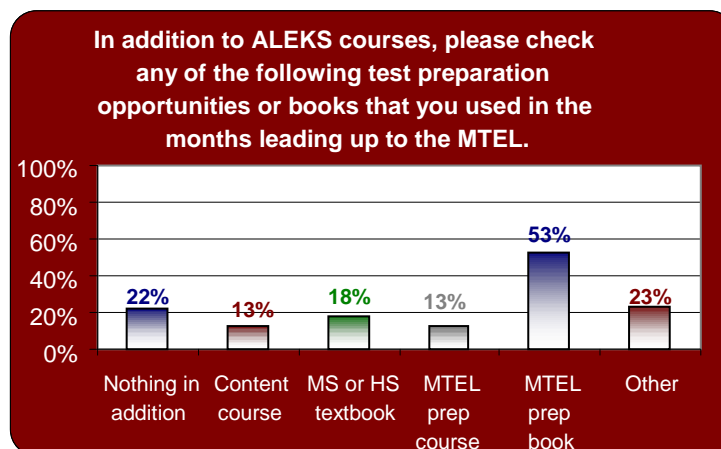
Respondents were asked to list any topics on the MTEL that were not part of their ALEKS course(s). There were 25 responses to this question, with some topics listed by more than one respondent. The most frequently cited responses included: open response or word problems (N=7) and trigonometry (N=7). Two respondents listed geometry as a topic not covered in ALEKS, and two more cited tessellations as a topic not covered. In addition, two respondents indicated that, in general, the topics covered in ALEKS were not as complex as those on the MTEL. The remaining topics were each cited by one respondent: calculus; quadratic equations; mean, median, and mode; statistics; algebra; and ratio/proportion problems. One respondent additionally reported that the timed nature of the MTEL was not a part of the ALEKS course.

Respondents were asked which parts of the ALEKS course(s) were most helpful for their MTEL preparation. There were 45 responses, including the following: geometry (N=12), algebra (N=10), all or most of ALEKS' sections were helpful (N=7), immediate feedback, and/or explanations (N=5). Three respondents reported that the basic review and practice were most helpful, and three indicated that the problems related to patterns were most helpful. Two cited each of the following topics: trigonometry, number sense, and functions. The remaining topics listed as helpful were graphs, probability, data analysis, and linear equations (N=1 each). Two respondents reported that the topics covered in ALEKS were not as complex as those on the MTEL, and one respondent indicated that ALEKS was not helpful.

Respondents were asked to indicate how well they thought that ALEKS prepared them for the MTEL, and their responses are summarized in the graph below. Overall, 67% of ALEKS users reported that the software prepared them moderately well or very well for the MTEL exam. Another 27% indicated that ALEKS prepared them somewhat well, and 5% indicated that ALEKS did not prepare them to take the MTEL exam. In addition, respondents were asked to provide any comments about how well they thought that ALEKS prepared them to take the MTEL. There were 33 responses to this open-ended question, and of these, more than half of the responses (N=18) contained positive feedback about how well ALEKS prepared participants for the MTEL. Five respondents reported that the topics covered in ALEKS were not as complex as those on the MTEL, three reported that ALEKS did not prepare them for the open-ended questions on the MTEL, and two reported that there was a discrepancy whereby calculators could be used with ALEKS but not on the MTEL. The remaining responses included that the quizzes should be more varied, ALEKS should be timed like the MTEL, and that there were technical difficulties with the program. Additionally, in response to this question, four participants provided complaints about the MTEL that were unrelated to the ALEKS program.



Respondents were asked what MTEL preparation strategies they used other than ALEKS, and their responses are summarized in the table below. The most common strategy was using an MTEL preparation book (53%). Eighteen percent indicated that they used a middle or high school textbook, 13% took a content course, 13% took an MTEL preparation course, and 22% did not use anything in addition to ALEKS.



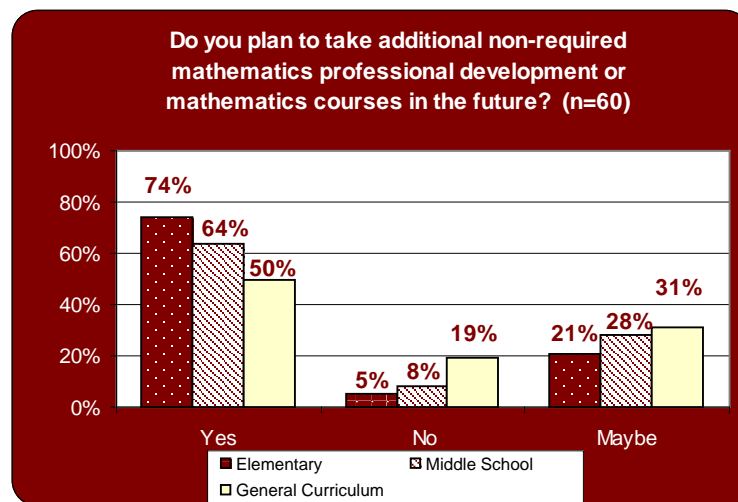
"Other" responses included the online MTEL guide/practice tests (N=3), district provided test preparation (N=2), individual tutoring (N=2), college textbooks (N=2), as well as Cliff's math prep, GED prep, *EZ Math Preparation Guide*, *Math Doesn't Suck*, *Kiss my Math*, *THEA Study Guide*, *Math for Standardized Tests* reference book, other mathematics books, and a study group with other mathematics teachers (N=1 each).

Respondents were asked to give the name of any content or test preparation courses they took in addition to the ALEKS courses. There were eleven responses, including district-provided preparation courses (N=4), Concepts of Basic Mathematics I and II (N=2), and Bridgewater State College MTEL preparation (N=2). Additional responses included Number Theory, Numbers and Operations, Functions and Algebra, Geometry I, YourTeacher.com MTEL preparation, and a MTEL preparation course that covered both middle school and high school (N=1 each). Respondents were asked where they took their content or test preparation courses. In addition to the schools and locations mentioned above, two participated in courses at Gordon College, one participated in a course at Lesley University, one participated in a course at Salem State College, and one participated in a course online. Respondents were also asked the names of their instructors, and those listed were Dr. Richard Stout (N=2), Eileen Gagnon, Jane Lynch, and Chris Christopher (N=1 each). In addition, three respondents reported that the

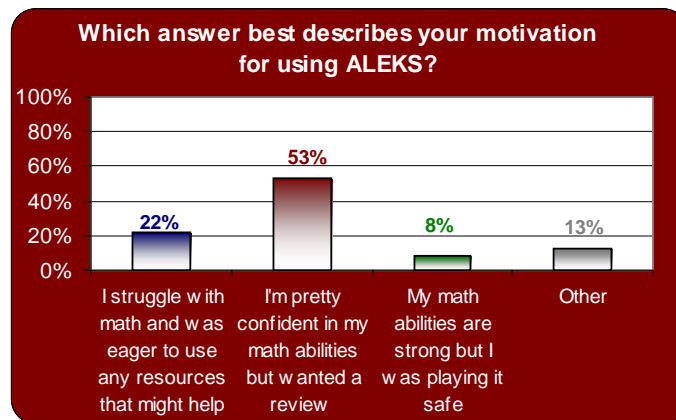
instructors came from their school district, although they did not provide the name of the instructors, and one respondent reported having numerous instructors, but did not provide any names.

Respondents were asked what textbooks and MTEL preparation materials they used in addition to ALEKS courses. Several MTEL preparation guides were used, including the *Best Teacher's Preparation for the Mathematics MTEL Guide* by the Research and Education Association (N=8), guides from the ESE website (N=3), and the MTEL mathematics preparation book (N=3). The remaining materials were reported by one respondent each: *XAM Guide*, MTEL general curriculum preparation book, *MTEL Middle School Exam Secrets Study Guide*, *MTEL Test Info Booklet #47*, and *Test Review for the Massachusetts Tests for Educators*. Many textbooks were mentioned, including: *McDougal Littell Geometry*, *McDougal Littell Algebra I*, *Glencoe Algebra I*, *Glencoe Geometry*, *Contemporary's Number Power* mathematics books, and several unnamed algebra, geometry, developmental mathematics, discreet mathematics, calculus, and trigonometry texts. Additional study resources cited included the Cliff's books and an SAT book.

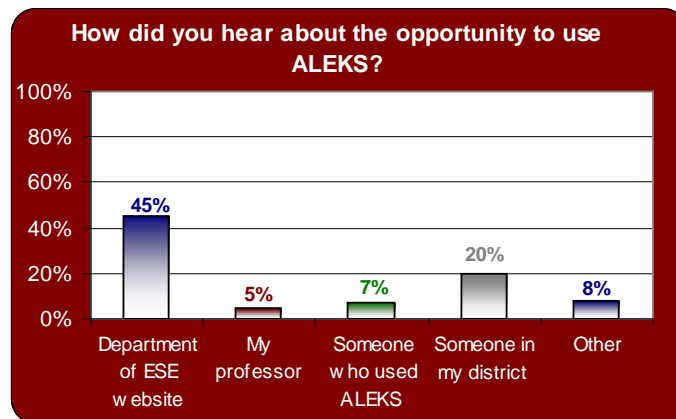
Respondents were asked if they planned to take additional nonrequired mathematics professional development or mathematics courses in the future, and, as shown in the table below, the majority said 'yes' or 'maybe.'



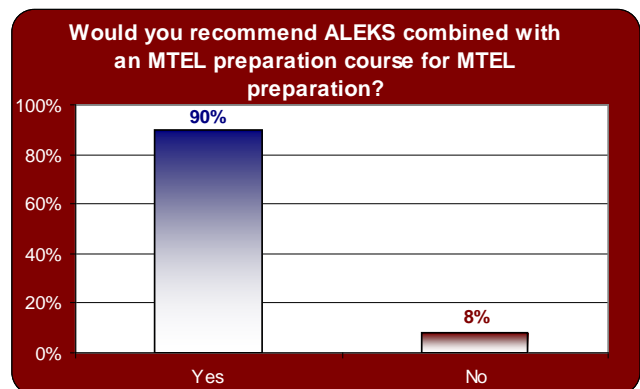
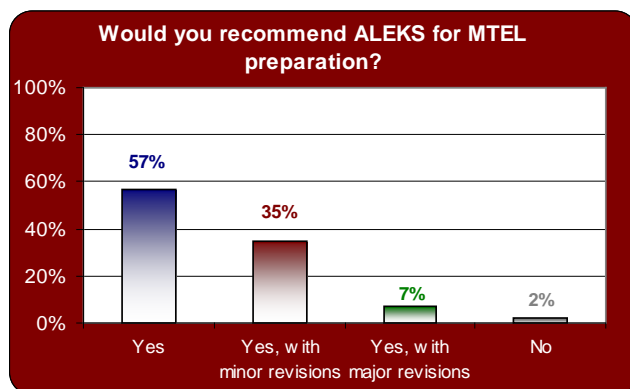
Respondents were asked to describe their motivation for using ALEKS. Just over half of the respondents indicated that they were pretty confident in their mathematics abilities, but wanted a review of topics they had not seen in a while. If respondents indicated "other" to describe their motivation, they were then asked to specify. However, only two participants elaborated. One participant indicated that although mathematics was an area of strength, he or she had not taken a mathematics class in many years, and the other participant reported that he or she took the class to be well-prepared.



Respondents were asked how they heard about the opportunity to use ALEKS. The majority of participants reported that they heard about ALEKS through the Department of Elementary and Secondary Education website. “Other” responses included having previous experience with the program (N=2), hearing about the opportunity to use ALEKS from a family member (N=1), and hearing about it in a district-wide class for mathematics leaders (N=1).



Respondents were asked if they would recommend the ALEKS courses as a strategy for MTEL preparation. As shown in the table below, 99% said they would recommend ALEKS. Respondents were asked if they would recommend ALEKS combined with an MTEL preparation course for MTEL preparation: 90% of respondents indicated that they would recommend ALEKS in combination with an MTEL preparation course.



When asked to indicate why they would or would not recommend ALEKS for MTEL preparation, 38 respondents answered the question. Of these, the majority (N=23) stated that ALEKS provided good practice and review and was a good general refresher. Seven reported that they appreciated the explanations of concepts and problems, and four appreciated the convenience and ease of use of ALEKS. Six respondents commented that ALEKS did not offer content at a high enough level to pass the MTEL. Four indicated that ALEKS was not enough to prepare for the MTEL on its own, but should be used with other sources. One respondent each offered of the following comments: any review is good, it is great that the program is free, there is nothing else available to review the content of the test, would recommend skipping the problems with calculators and graphing, will focus more on the AP calculus and middle school math sections next time, ALEKS was too advanced for the elementary test, ALEKS has been updated with new problems that correspond well with the MTEL, ALEKS is great but the MTEL is not a good test of teacher ability.

The final survey question asked respondents to provide any final comments regarding ALEKS. There were 31 responses, some of which fit into more than one category. Ten respondents indicated that ALEKS was a helpful resource, useful tool, or good course. Seven used the space to express gratitude for the opportunity to use ALEKS. Six respondents indicated that they would like to use it again in the future. Four wished it had been more aligned to the MTEL. Two respondents mentioned time concerns, wishing that they had had more time with the program or could have used their time more efficiently. The final responses, cited by one participant each, were: would like to see more multiple choice options, liked the pie visual to show results by topic, did not like the exercises using the compass and graphing, would be nice to have a choice about which assessments to take, liked that there was not a need for software installation, would keep using ALEKS to keep math skills sharp if continued to have access, will recommend ALEKS to others, ALEKS was a good motivational tool, would like an option to skip parts of the course and add them to the pie chart if the content is already understood, did not like the MTEL exam.