



Mathematics Performance of ALEKS Users on a State Test across Two Years in the Rural Midwest

The McGraw Hill Efficacy Research team was asked to examine the association between the use of the ALEKS adaptive math solution and students' math state test scores in a medium-sized rural district in the Midwest region of the United States. The state test is administered across grades 3 through 11. ALEKS was implemented in grades 6 through 11 beginning in 2022-2023 and continuing into the 2023-2024 school year.

Study Sample

Table 1 shows the demographic information for the district.

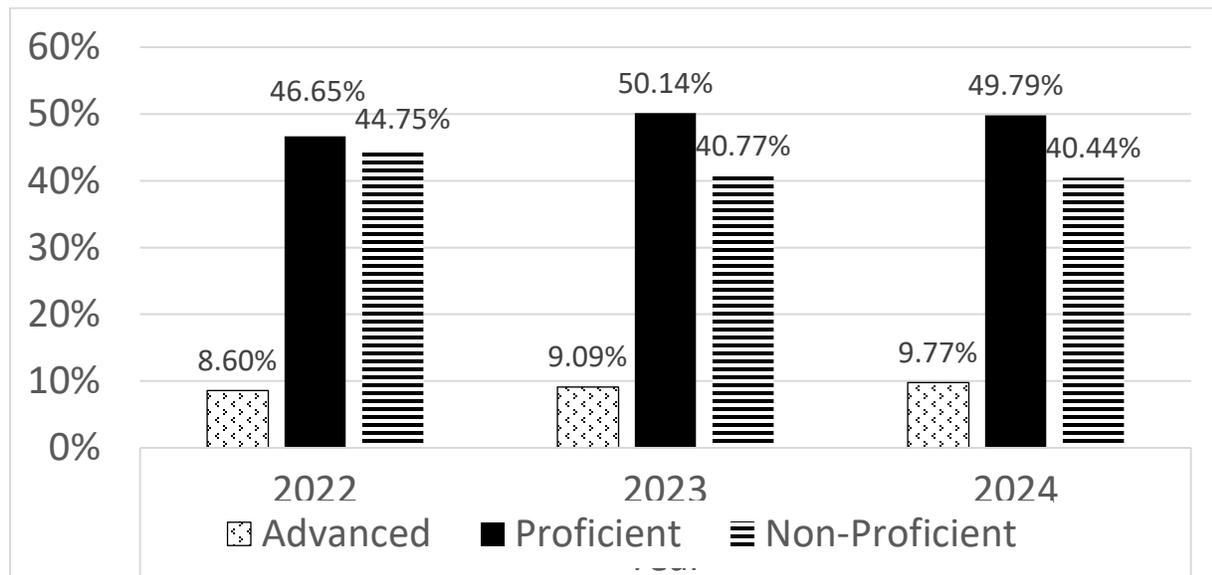
Table 1.

Student characteristics	Percentage
Hispanic	38%
White	42%
English Language Learners	12%
Free/reduced lunch	65%

State Test Performance

Before ALEKS implementation, 55.2% of students were considered as passing the state test (in either Advanced or Proficient achievement levels) in spring 2022. In both years examined after the implementation of ALEKS, the percentage of students passing rose to just over 59% in both 2022-2023 and 2023-2024.

Figure 1. State Test Performance Levels over Time



We examined student scale scores by grade and ALEKS use. Tables 2 and 3 present scale scores and standard deviations (SD) for all students. Scale scores are standardized scores and are often used in state tests, while SD indicates the amount of variation of values around its average.

In the 2022-2023 school year, 3,954 ALEKS users were compared with non-users. Across grades 6 through 10, the ALEKS users had average higher scale scores.

Table 2. 2022-2023 State Test Scale Score among ALEKS Users vs. Non-Users

2022-2023		ALEKS Users	Non-Users
Grade	Overall Scale Score (SD)	Scale Score (SD)	Scale Score (SD)
6	467.15 (43.82)	468.21 (42.53)	456.75 (54.06)
7	486.54 (49.15)	490.22 (50.31)	463.80 (33.42)
8	518.34 (60.58)	520.36 (60.90)	493.81 (50.74)
9	525.14 (57.91)	528.65 (57.68)	500.34 (53.54)
10	554.59 (53.88)	558.94 (53.09)	531.34 (52.26)

In 2023-2024, 2,029 ALEKS users were compared with non-users. ALEKS users in grades 9 and 10 had higher-than-average scale scores. As detailed in the next section, those two grade levels had higher-than-average time spent and topics completed in the 2023-2024 school year as well.

Table 3. 2023-2024 State Test Scale Score among ALEKS Users vs. Non-Users

2023-2024		ALEKS Users	Non-Users
Grade	Overall Scale Score (SD)	Scale Score (SD)	Scale Score (SD)
6	467.68 (41.39)	464.36 (38.44)	473.21 (45.40)
7	489.57 (51.57)	459.02 (43.89)	491.13 (51.47)
8	521.07 (57.64)	486.6 (50.70)	523.76 (57.30)
9	522.54 (63.26)	568.99 (87.55)	509.97 (47.69)
10	553.09 (53.48)	569.16 (53.40)	534.98 (47.50)
11	578.22 (62.03)	561.92 (46.27)	603.92 (73.96)

Detailed ALEKS usage

In the first year of ALEKS usage, more than 4,000 students across grades 6-11 mastered an average of 172.84 mathematics topics and spent an average of 6.13 hours within the ALEKS platform. Consistently, students in grades 8 and 9 had above average usage according to these metrics. Table 4 presents average number of topics and time spent in ALEKS as well as the SD for each grade level.

In 2023-2024, the number of ALEKS users dropped by almost half with just over 2,000 students using ALEKS. How those students used ALEKS also dropped as average usage declined across both measures—111.63 topics mastered on average and 5.01 hours spent. However, grades 6, 9, and 10 did have above average usage on both metrics and grades 7 and 8 had above average time spent in the program.

Table 4. Detailed ALEKS Usage 2022-2023 and 2023-2024

Grade	Number of Students		Number of Topics (SD)		Time in Hours (SD)	
	2022-2023	2023-2024	2022-2023	2023-2024	2022-2023	2023-2024
6	790	591	142.13 (80.14)	128.87 (56.79)	5.06 (4.33)	5.05 (4.15)
7	765	47	131.07 (92.32)	63.55 (56.7)	4.57 (4.63)	5.74 (7.27)
8	862	70	211.63 (125.20)	94.83 (68.62)	7.7 (6.94)	8.61 (9.47)
9	833	238	227.37 (93.47)	150.6 (70.88)	7.45 (6.43)	6.68 (6.43)
10	687	523	143.75 (89.36)	125.48 (63.36)	5.65 (6.66)	5.09 (4.8)
11	78	572	137 (89.52)	70.94 (62.53)	5.07 (5.68)	3.7 (4.25)
TOTAL/ AVERAGE	4016	2041	172.84 (105.86)	111.63 (68.63)	6.13 (6.04)	5.01 (5.12)

Correlations between Scale Score and ALEKS Usage

Pearson product-moment correlations are used to explore the association between two variables. Pearson correlation coefficients, r , range from -1 to 1 , with a value of 0 indicating that there is no association between variables. Values greater than 0 suggest a positive association: as the value of one variable increases, so does the other variable. Here, Pearson correlation coefficients were computed to assess the relationship between usage and state test scale score. The strongest correlations were found in both years at grade 8 but there were positive correlations found at all grade levels and across both years. Topics completed in ALEKS was more strongly associated with scale score, with a correlation of r

= .56, $p < .001$, in 2022-2023, and $r = .23$, $p < .05$, in 2023-2024. These correlations indicate that, particularly in 2022-2023, more topics covered in ALEKS was associated with higher scale score.

Table 5 shows the detailed analysis.

Table 5. Correlations between Scale Score and Number of Topics Completed in ALEKS

Grade	2022-2023 <i>r</i> (Scale Score and Number of topics)	2023-2024 <i>r</i> (Scale Score and Number of topics)
6	0.74**	0.51**
7	0.31**	0.53**
8	0.83**	0.70**
9	0.56**	0.53**
10	0.58**	0.36**
11	--	0.30**

Note. ** = $p < .001$

State Test Passing Rates and ALEKS Usage

As with the correlations between scale scores and ALEKS usage, there is a similar relationship between the number of topics completed and hours spent by students who passed the state test (Advanced or Proficient) and those who were considered as not passing (Non-Proficient). Across both years examined, Advanced and Proficient students used ALEKS for more hours and completed more topics than their Non-Proficient peers, a statistically significant difference in all grades.

Figure 2. Hours in ALEKS and State Test Performance Level

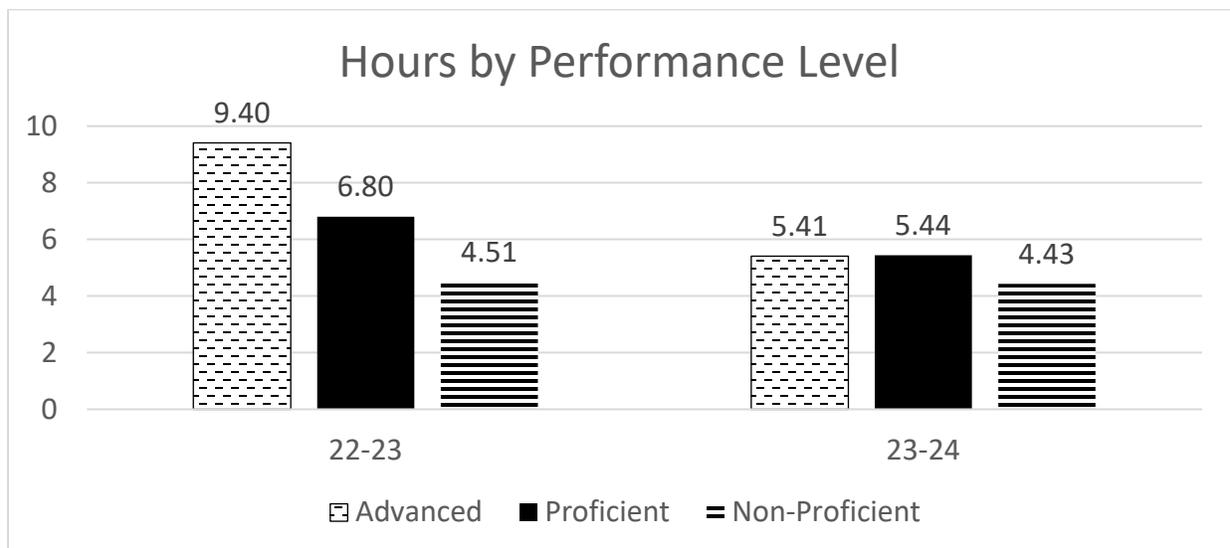
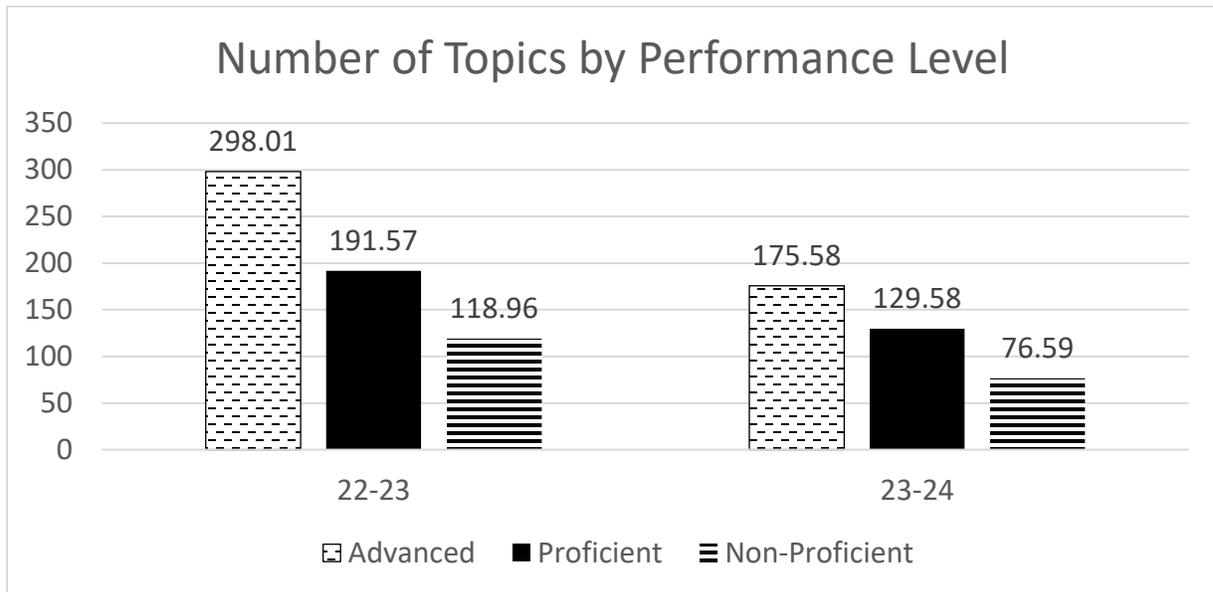


Figure 3. Number of Topics in ALEKS and State Test Performance Level



Longitudinal Usage

In this analysis we were also able to examine the data for 1,140 students categorized as longitudinal ALEKS users, i.e., users of ALEKS in two consecutive school years, 2022-2023 and 2023-2024. These students were in grades 8-11 in 2023-2024. In grades 9 and 10, those longer-term ALEKS users had significantly higher state test scale scores.

Table 6. Scale Score Performance after Two Years of ALEKS Usage

Grade	Spring 2024 Scale Score				
	Non-ALEKS User Scale Score (SD)	N	ALEKS User Scale Score (SD)	N	Sig.
6	473.21 (45.40)	354	464.36 (38.44)	589	$p = .001$
7	491.13 (51.47)	903	459.02 (43.89)	46	$p < .001$
8	523.76 (57.30)	897	486.6 (50.70)	70	$p < .001$
9	509.97 (47.69)	872	568.99 (87.55)	236	$p < .001$
10	534.98 (47.50)	463	569.16 (53.40)	522	$p < .001$
11	603.92 (73.96)	359	561.92 (46.27)	566	$p < .002$

When looking at performance levels, 66% of students who had longitudinal ALEKS use in 2022-2023 and 2023-2024 were in either the Advanced or Proficient levels in the 2024 state test, compared with 59% of non-longitudinal users.

Conclusion

This study examined the performance of students in a medium-sized rural district in the midwestern United States who used ALEKS in grades 6-11. During the first year (2022-2023), when usage was higher across measures (i.e., hours spent and activities completed), ALEKS users performed better than their peers on the state mathematics test. In 2023-2024, ALEKS-using students in grades 9 and 10 outperformed their peers. It was also found that the number of topics completed had the strongest relationship with the scale score across both years. The analysis also showed that the students who passed the state test (Advanced or Proficient) completed a larger number of topics on average than those who were considered as not passing (Non-Proficient). Significantly higher scale scores and a higher percentage of students designated as passing the state test across grades 8-11 were seen after the two consecutive years of ALEKS usage for the grade 9 and grade 10 students.

Disclaimer

Differences on state test performance can be due to a number of factors, including the innate ability and prior education of the students participating, as well as differences among teachers and their pedagogies. We believe that, even taking these factors into account, *ALEKS* can contribute to improvements in student outcomes.