VALIDITY REPORT:

Lexia® PowerUp Literacy® and NWEA MAP® Growth™ Reading

Prepared by Lexia® Research & Analytics
Lexia PowerUp Literacy

METHOD

Sample

1,040 students

Grades 6-10

10 schools

10+ weeks of PowerUp usage

Key Findings

PowerUp Achievement and MAP Reading Proficiency

99%

of students who completed the PowerUp program were proficient on the spring MAP Reading assessment.

There was a **strong, positive correlation** between where students ended the year in PowerUp and their spring MAP Reading scores.

PowerUp Achievement and MAP Reading Performance

.76%*

Pearson's correlation coefficient (Pearson's r): Struggling readers who completed the PowerUp program were significantly more likely to be proficient on the spring MAP Reading.

+14

High progress in PowerUp was associated with +14 higher spring MAP Reading percentile ranks.

Lexia POWERUP™ LITERACY

Measures

Lexia PowerUp Literacy

The Lexia® PowerUp Literacy® (PowerUp) program is an adaptive, digital reading curriculum designed to help struggling students in grades 6 and above become proficient readers and confident learners. In PowerUp, students work in three strands of literacy instruction: Word Study, Grammar, and Comprehension. Each literacy strand is broken up into three zones of content: Foundational, Intermediate, and Advanced. The following analyses use students' percent of PowerUp complete, percent of each strand complete, and their zone within each strand at the end of the year as variables. The percent complete variables represent a student's location within the PowerUp curriculum and therefore include content the student tested over and worked through during the year.

NWEA Map

The Northwest Evaluation Association (NWEA) Measures of Academic Progress® (MAP) Growth™ is a computer-adaptive progress-monitoring tool. As part of the MAP Growth interim assessments, reading performance is measured by a RaschunIT (RIT) scale score. The scale is divided into equal intervals, which allows student growth to be monitored from year to year along a developmental continuum. MAP Reading RIT scores, MAP Reading percentile ranks, and MAP Reading proficiency were used in the following analyses. MAP Reading proficiency was determined by whether or not students scored at or above the 40th percentile rank (NWEA, 2015; Petscher & Kim, 2011)

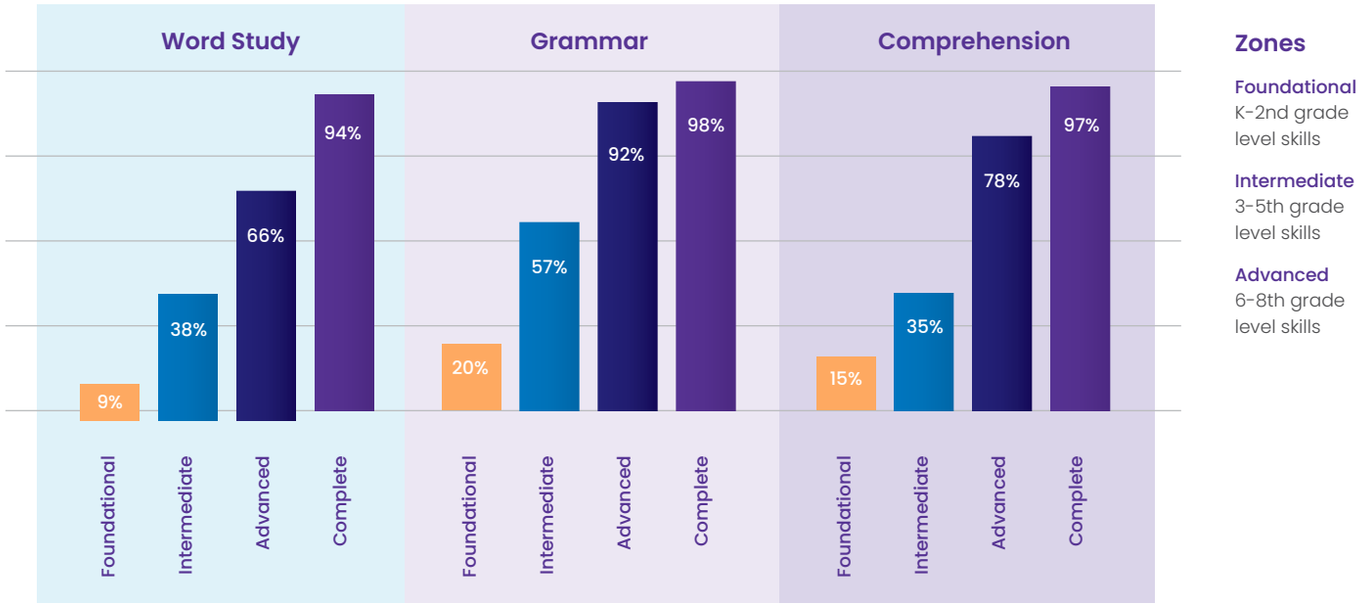
RESULTS

In each strand of PowerUp, students work through three zones of content that increase in complexity, each addressing skills from approximately three grade levels. Analyses showed students working in higher zones at the end of the year had higher spring MAP Reading proficiency rates, both overall and within each strand.

99%

Overall, 99% of students who completed all three strands in PowerUp were proficient on their spring MAP Reading Assessment.

Proficiency Rates on spring MAP Reading by End-of-Year PowerUp Zone



Likelihood of Struggling Readers Achieving Spring MAP Reading Proficiency

Students who were not proficient on the fall MAP Reading (struggling readers) who completed the PowerUp program were two times more likely to be proficient on the spring MAP Reading compared with struggling readers who did not complete the program.

Closing the Gap

Struggling readers who completed PowerUp were significantly more likely to be proficient on the spring MAP Reading. More details about methods and results of these analyses are in the Technical Appendix (page 6).

Strong Correlations Between PowerUp and MAP

On MAP, student reading ability is summarized by their RIT score, which ranges from 100 to 300. Analyses showed strong correlations between indicators of reading ability in PowerUp and MAP. There was a large, positive, and significant correlation between students' RIT scores on the spring MAP Reading and where they finished the year in PowerUp (percent of program complete across all strands). Students' RIT scores were also highly correlated with where they ended the year in each of the three strands. In other words, students who were closer to completing PowerUp or a strand of PowerUp had, on average, higher MAP scores.

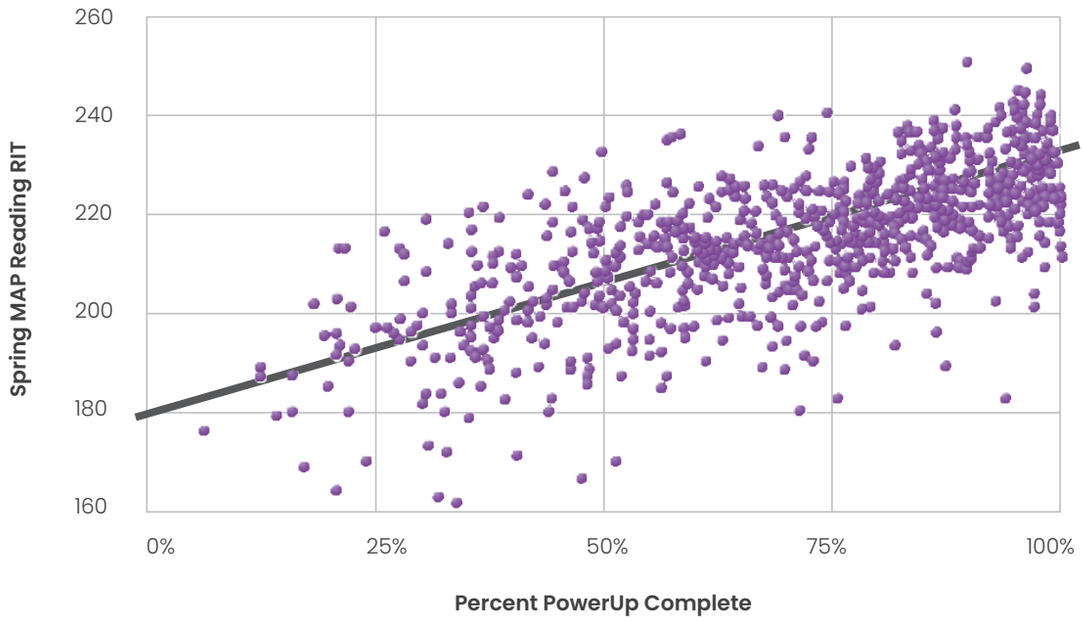
Correlation: Spring MAP Reading Scores and Percent PowerUp Complete

Overall

.76*

Pearson's r

Correlation coefficient for spring MAP Reading RIT scores and percent of PowerUp program complete at end of year



Correlations: Spring MAP Reading Scores and Percent of PowerUp Strand Complete

Word study	Grammar	Comprehension
r = .65*	r = .73*	r = .71*
Pearson's r	Pearson's r	Pearson's r

* p < 0.05 – Pearson's r sizes: Small .10 to .29; Medium .30 to .49; Large ≥ .50 (Cohen, 1992) More details about methods and results of these analyses are in the Technical Appendix

PowerUp Progress Predicts MAP Performance

In PowerUp, students progress through three zones of content associated with skills of increasing complexity in each strand. Analyses showed students who made greater PowerUp progress outperformed peers who made less PowerUp progress on the spring MAP, controlling for fall MAP performance. Making average progress (moving three zones across all strands) was associated with performing 6 percentiles higher on the spring MAP Reading compared to students who made minimal progress (<1 zone moved). Students who made high progress (moving six+ zones) had, on average, MAP Reading percentile ranks that were 14 percentiles higher than minimal progress students.

High progress in PowerUp was associated with +14 higher spring MAP Reading percentile ranks

Progress in PowerUp is quantified in these analyses as the number of zones a student moved up across all strands. Given three zones of content in three instructional strands, a student could move up between 0 and 9 zones.

Percentile Rank represents how a student's performance compares relative to their peers nationally. Because MAP's norms change based on typical student growth from fall to

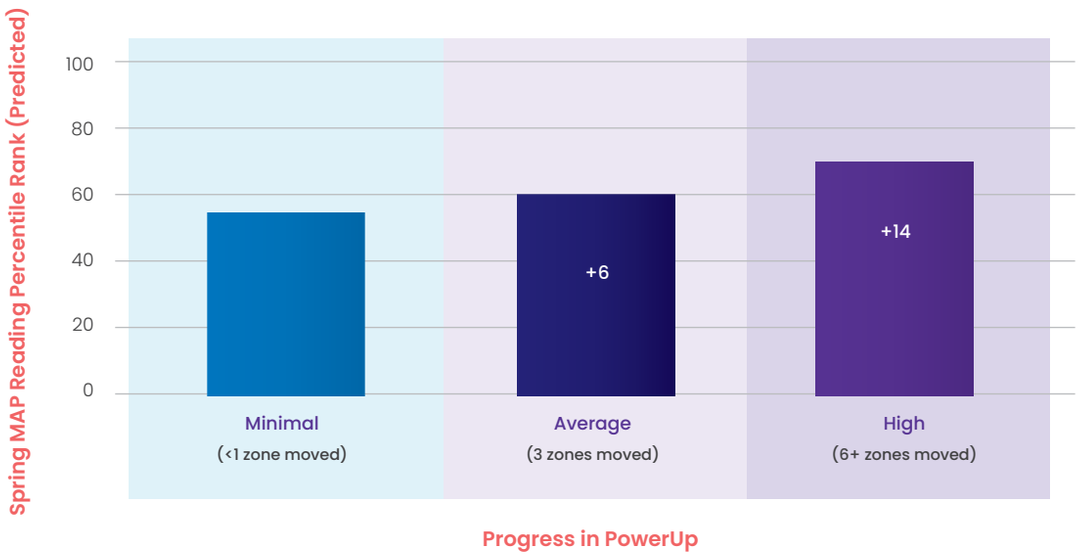
+14

High progress in PowerUp was associated with +14 higher spring MAP Reading percentile ranks.

Progress in PowerUp is quantified in these analyses as the number of zones a student moved up across all strands. Given three zones of content in three instructional strands, a student could move up between 0 and 9 zones.

Percentile Rank represents how a student's performance compares relative to their peers nationally. Because MAP's norms change based on typical student growth from fall to spring, a student making typical development would not be expected to make gains in percentile rank throughout the year.

Predicted Spring MAP Reading Percentile Rank by PowerUp Progress



More details about methods and results of these analyses are in the Technical Appendix (page 6).

TECHNICAL APPENDIX

Introduction

A program's level of validity depends on how effectively it measures what it claims to measure. This report documents the validity of PowerUp by evaluating various program indicators as measures of reading ability and showing how achievement and progress in PowerUp are associated with meaningful differences in literacy performance.

Program Overview

Overview

Lexia PowerUp Literacy (PowerUp) is an adaptive, blended learning program that provides personalized literacy instruction for struggling and non-proficient readers in grades 6 and above. PowerUp helps educators simultaneously address gaps in fundamental literacy skills while helping students build the higher-order skills they need to meet College- and Career-Ready Standards.

Strands

Students work online in three different areas of literacy instruction based upon the Simple View of Reading (Grough & Tunmer, 1986). The three strands—Word Study, Grammar, and Comprehension—improve student proficiency and independence in reading and understanding complex, authentic texts. In Word Study, students develop automatic word-recognition skills and an understanding of multisyllabic academic vocabulary words. In Grammar, students learn how words function in sentences, as well as how various text genres are structured, to further develop their comprehension and composition skills. In Comprehension, students develop skills and strategies to analyze literary and informational texts of increasing complexity for deep meaning and understanding.

Zones

The content students work through within each strand of PowerUp can be grouped into three zones that correspond with a range of grade-level skills and instruction. The Foundational (K–second grade skills) and Intermediate (third–fifth grade skills) zones provide the practice that builds automaticity of essential literacy skills. In the Advanced Zone (sixth–eighth grade skills), students tackle higher-order literacy skills needed to master grade-level materials.

Methods

Sample

The sample for this analysis included 1,040 students, grades 6–10, from 10 schools in a midsize district in the United States. Sample sizes varied across analyses based upon the availability of fall and spring data from the NWEA MAP Growth Reading assessment.

Students included in this analysis used PowerUp for at least 10 weeks and up to 36 weeks, averaging 26 weeks of use during the 2018-2019 school year. These students spent an average of 29 hours in PowerUp and completed an average of 63 activities. In all, 306 students were excluded from these analyses because they had not used the program for a minimum of 10 weeks.

Measures

PowerUp Zone Status
indicates what zone (Foundational, Intermediate, and Advanced) a student was working in at the end of the school year. Students can be working in different zones in different strands.

Percent of PowerUp Complete
is a measure of how close a student is to completing PowerUp by the end of the year. (A student with 100% has completed the entire program). This is calculated by adding the number of activities a student placed over to the number of activities the student completed throughout the year and dividing by the total number of activities in PowerUp.

Percent of Strand Complete
is a measure of how close a student is to completing a strand by the end of the year. For example, a student with 100% has completed the entire strand. This is calculated by adding the number of activities a student placed over in the strand to the number of activities the student completed in the strand throughout the year and dividing by the total number of activities in the strand. Each student has one Percent of Strand Complete for each strand.

MAP Reading RIT
is a standardized measure of reading ability based upon Northwest Evaluation Association's (NWEA) computer-adaptive progress-monitoring tool (MAP Growth). Performance on MAP is measured by a RaschunIT (RIT) scaled score. The scale is divided into equal intervals, which allows student growth to be monitored from year to year along a developmental continuum.

MAP Reading percentile
rank is a measure of reading ability relative to a normed sample. A student's percentile rank indicates the student scored as well as, or better than, that percentage of students in the norm group.

MAP Reading proficiency
is an indicator of whether a student had a MAP Reading RIT score at or above the 40th percentile rank (NWEA, 2015). This is a commonly used cut point for proficiency on a reading measure (Petscher & Kim, 2011).

Analysis
The following sections present detailed analyses of the association between achievement and progress in PowerUp and performance on NWEA MAP Growth Reading. The first section explores MAP Reading proficiency rates disaggregated by students' PowerUp Zone Status. The second section describes a logistic regression analysis exploring whether or not PowerUp completion predicted MAP Reading proficiency. The third section presents correlations between MAP Reading RIT scores and where students ended the year in PowerUp (i.e. Percent of PowerUp Complete and Percent of Strand Complete). The last section presents regression analyses that estimate the effect of zone movement on spring MAP percentile rank.

PowerUp Achievement and MAP Proficiency Rate

Analysis
To understand how students' performance in PowerUp by the end of the year was associated with their proficiency on MAP Reading, cross-tabulations of proficiency rates were calculated. The following section presents the distributions of students who were and were not proficient on MAP Reading, disaggregated by PowerUp Zone Status.

Results

Table 1: End-of-Year Proficiency on MAP by PowerUp Completion

	Not Proficient	Proficient
Not Complete	39.76% (N=326)	60.24% (N=494)
Complete	1.36 (N=3)	98.64% (N=217)

Table 2: Proficiency on MAP by Word Study Zone Status

	Not Proficient	Proficient
Foundational	90.91% (N=40)	9.09% (N=4)
Intermediate	62.04% (N=170)	37.96% (N=104)
Advanced	34.01% (N=84)	65.99% (N=163)
Complete	6.44% (N=30)	93.56% (N=436)

Table 3: Proficiency on MAP by Grammar Zone Status

	Not Proficient	Proficient
Foundational	79.621% (N=125)	20.38% (N=32)
Intermediate	43.07% (N=177)	56.93% (N=234)
Advanced	8.041% (N=18)	91.96% (N=206)
Complete	1.67% (N=4)	98.33% (N=235)

Table 4: Proficiency on MAP by Comprehension Zone Status

	Not Proficient	Proficient
Foundational	85.291% (N=29)	14.71% (N=5)
Intermediate	64.92% (N=198)	35.08% (N=107)
Advanced	21.87% (N=82)	78.13% (N=293)
Complete	2.90% (N=9)	97.10% (N=301)

Table 1
presents the distributions of students who were and were not proficient on the spring MAP Reading and whether or not they completed PowerUp. Nearly all of students (98.64%) who completed the program by the end of the year were proficient on MAP (positive predictive value). Notably 60.24% of students who did not complete the program were also proficient.

This combination of rates suggests that completing the program was a strong indicator of proficiency, but not completing the program was not necessarily an indicator of non-proficiency.

Tables 2, 3, and 4
present the spring MAP Reading proficiency rates by strand and zone. Most of the students (93.56%-98.33%) who finished individual strands were proficient on MAP (positive predictive value). Similarly, the majority of students (65.99%-91.96%) who ended the year in the Advanced Zone were also proficient on MAP. Notably the proficiency rates were lower among students who ended the school year in lower zones.

Taken as a whole, these distributions suggest an alignment between MAP and PowerUp standards. Finishing one or more strands is a good indicator of reading proficiency as measured by MAP and being in Advanced in each or any of the strands is a fairly good indicator. Conversely, being in Foundational in each or any of the strands is a pretty good indicator of not being proficient.

Probability of Reaching Proficiency on MAP Reading

Analysis

Logistic regression was used to determine the differences in probabilities of reaching end-of-year MAP Reading proficiency for students based upon their performance in PowerUp. Whether students were proficient on MAP Reading at the end of the year was regressed on whether or not they completed PowerUp by the end of the year, whether or not they were proficient on MAP Reading at the beginning of the year, and their demographics (grade, gender, race, special education status, and English Language Learner status). Variables were added sequentially to the model and only retained in subsequent models if they were significant predictors of MAP proficiency and significantly improved model fit. The final model is presented in Table 5. Students were only included in the analysis, if they had both a beginning-and end-of-year MAP Reading percentile rank.

Results

As seen in Table 5, completing PowerUp was a significant, positive predictor of end-of-year MAP Reading proficiency ($B = 0.10$; $CI = 0.37 – 0.47$; $p < 0.001$). Completing PowerUp was associated with a higher probability that students had proficient scores on MAP at the end of the year. This was true even when accounting for the variance explained by beginning-of-the-year proficiency ($B = -0.51$; $C I= -0.46 – -.056$; $p < 0.001$), grade ($B = -0.05$; $C I= -0.07 – -0.02$; $p < 0.001$), and special education status ($B = -0.21$; $C I= -0.26 – -0.15$; $p < 0.001$). Gender, race, and English Language Learner status were not predictive of proficiency on MAP in this sample, so these variables were not included in the final model. To better understand this, model predicted probabilities were computed based upon whether or not students completed

the program and whether or not they were proficient at the beginning of the year. To compute these probabilities, grade and special education status were held constant.

Students who were proficient at the beginning of the year and did not complete PowerUp had a probability of being proficient at the end of the year of 92.5%. Students who were proficient at the beginning of the year and completed PowerUp had a probability of being proficient at the end of the year greater than 99.3%.

Students who were not proficient at the beginning of the year (struggling readers) and did not complete PowerUp had a probability of being proficient at the end of the year of 45.41%.

Struggling readers who completed PowerUp had a probability of being proficient at the end of the year greater than 90.01%.

This translates into struggling readers who completed PowerUp being 1.98 more likely to be proficient than struggling readers who did not complete PowerUp (calculation based off of the Relative Risk equation in Osborne, 2006).

Table 5: Logistic Regression Predicting MAP Proficiency

	Final Model	
Predictors	**Odds Ratios**	**CI**
Intercept	0.83	0.59-1.17
PowerUp Complete	10.83***	3.25-36.07
Grade (Low Centered)	0.69***	0.55-0.86
Beging of Year MAP Proficiency	14.82***	9.90-22.21
Special Education Status	0.31***	0.20-0.48
Observations	986	
Cox & Snell's R^2/Nagelkerke's R^2	0.427/0.601	

*p<0.05 **p<0.01 *** p<0.001

PowerUp Achievement and MAP Scores

Analysis

To measure the association between where students ended the year in PowerUp and their spring MAP Reading performance, correlations (Pearon's r) were calculated between students' MAP Reading RIT scores and their percent of PowerUp complete. This percent complete included the portion of PowerUp students placed over. Correlations were calculated for the percent of the entire program complete as well as the percent of each strand complete and disaggregated by grade. Correlations for ninth-, 10th-, and 11th-grade students were grouped together because of the small sample sizes in each of those grades.

Results

Table 6 shows the correlations (Pearson's r) between students' percent of PowerUp/strands complete and Spring Map Reading RIT scores. There were large, positive correlations across grades and moderate to large positive correlations within all grade levels. Notably, the correlations are stronger in the lower grades when compared to the higher grades. Strength of the correlations is fairly similar across strands but it is consistently higher for the percent of PowerUp complete than it is for any of the individual strands. This suggests students' achievement across strands is more tightly related to their MAP Reading performance than students' achievement in any one strand.

Table 6: Correlations (Pearson's r) between EOY MAP Score and the percentage of PowerUp complete by strand and grade

	N	PowerUp	Word Study	Grammar	Comprehension
Grand Total	1,040	.76*	.65*	.73*	.71*
Grade 6	398	.81*	.72*	.79*	.78*
Grade 7	443	.74*	.60*	.69*	.69*
Grade 8	154	.53*	.47*	.46*	.46*
High School	45	.60*	.44*	.58*	.54*

Correlations are considered small if they fall between .10 and .29; medium if they fall between .30 and .49; and large if they fall above .50 (Cohen, 1992).

* $p<0.05$

Predicting MAP Performance Based on PowerUp Progress

Analysis

Linear regression analysis was used to assess the relation between students' progress in PowerUp across the school year and their spring MAP Reading performance. Students' spring MAP Reading percentile rank was regressed on the number of zones they moved during the year, their fall MAP Reading Percentile Rank, and demographics (grade, gender, race, special education status, and English Language Learner status). MAP Reading percentile rank was used as the outcome variable because percentile ranks provide valid, easily interpretable estimations of effects in education research (Baird & Pane, 2018).

Variables were added sequentially to the model and only retained in subsequent models if they were significant predictors of spring MAP Reading percentile rank and significantly improved model fit. The final model is presented in Table 7. Students were only included in the analysis if they had both a beginning- and end-of-year MAP Reading percentile rank.

Results

As shown in Table 7, zone movement was a significant predictor of students' spring MAP percentile rank ($B = 1.87$; CI = 1.32 – 2.41; $p < 0.001$). Students who advanced more zones across the school year had, on average, higher scores than students who advanced fewer zones. This was true even after accounting for the variance explained by fall MAP Reading percentile rank ($B = 0.78$; CI = 0.74 – 0.82; $p < 0.001$), grade ($B = -3.35$; CI = -6.00 – -.1.07, $p < 0.001$) and special education ($B = -1.95$; CI = -2.95 – -0.96; $p < 0.001$). Race, gender, and English Language Learner status were not significant variables in predicting spring MAP Reading percentile rank and were not included in the final model.

Moving one zone was associated with a 1.87 higher MAP Reading percentile rank at the end of the year. The average number of zones completed for this sample was three and the maximum was nine. Based upon this model, a student who advanced the average number of zones (3) would have a predicted MAP percentile rank 5.61 percentiles higher than a student who did not move any zones. Students who advanced more than six zones would be predicted to perform between 11.22 and 16.83 (average of 14.02) percentiles higher than a student who did not advance any zones.

Table 7: Regression predicting end of year MAP Reading percentile rank

Predictors	Estimates	CI
Intercept	53.97***	51.84-56.10
Number of Zones Advanced	1.87***	1.32-2.41
Beginning-of-year MAP rank (Mean of Centered)	0.78***	0.74-0.82
Grade (Low Centered)	-3.53***	-6.00-1.07
Special Education Status	-1.95***	-2.95-0.96
Observations	986	
R^2 / adjusted R^2	0.788 / 0.788	

*p<0.05 **p<0.01 *** p<0.001

GLOSSARY

Correlation
is a standardized measure of the association between two variables. Pearson's r is the statistic typically used to quantify the correlation between two continuous variables.

Likelihood
is the probability that something will occur.

Linear Regression
is a method of analysis used to predict a continuous outcome variable based upon multiple predictor variables. The effect sizes are interpreted based upon the scale of each predictor variable.

Logistic Regression
is a method of analysis that predicts the likelihood of something occurring based upon multiple variables. Put differently, it is used to predict a dichotomous variable. The effect sizes (B) are in log odds. These can be converted to odds ratios or probabilities. The predicted outcomes of a logistic model can be used to compare the likelihood of something occurring for different populations.

Odds Ratio
is the probability that something will happen divided by the probability that something will not happen.

Positive Predictive Value
is the number of true positives divided by the number of true and false positives. Put differently, it is the proportion of students who actually had a positive outcome out of the students identified with a positive indicator.

Relative Risk
is a way of comparing the likelihood that something will occur for two different populations. To calculate relative risk, divide the probability that something will occur for one population by the probability that it will occur for another population.

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