TECHNICAL APPENDIX

Technical appendix for the MAP Growth National Dashboard

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Introduction

The purpose of this technical appendix is to describe the sample and methods used to create the **MAP Growth National Dashboard.** The dashboard provides information on: (1) current year achievement percentiles and RIT scores by subject and grade (updated seasonally), (2) conditional growth percentiles, (3) the percentage of students on track for proficiency for states with studies that link MAP tests to end of year state tests. These data are presented nationally, by state, and disaggregated by student group (i.e., race/ethnicity, gender, school poverty level, and urbanicity). The dashboard also presents data that allows national comparisons over time to pre-pandemic baselines to support recovery tracking. These data are presented in five different tabs that focus on the following areas:

1) **National Trends** – national achievement in Math and Reading
2) **Group Insights** – comparison of subgroup performance
3) **State Trends** – state vs. national comparisons
4) **State Group Insights** – comparison of subgroup performance within a state
5) **Trends over Time** – national and group longitudinal comparisons

This technical appendix provides documentation of the dashboard's design, including:

- Data sources
- Sample and target population characteristics
- Definitions of key metrics (e.g., conditional growth percentiles, proficiency projections)
- Page-specific calculations

Data Sources

Measure of Achievement

The data included in the dashboard are drawn from the NWEA anonymized longitudinal student achievement database. School districts use NWEA® MAP® Growth™ assessments to monitor elementary and secondary students' reading and math achievement and gains, with assessments typically administered in the fall (usually between August and November), winter (usually December to March), and spring (late March through June).

MAP Growth is a computer adaptive test that precisely measures achievement, even for students above or below grade level, and is vertically scaled to allow for the estimation of gains across time. MAP Growth assessments are also aligned to state content standards. Test scores are reported on the RIT (Rasch unIT) scale, which is a linear transformation of the logit scale units from the Rasch item response theory model. For more details on the MAP Growth assessment, see the MAP Growth Technical Report.

The NWEA data also include demographic information, including student race/ethnicity and gender. An indicator of student-level socioeconomic status is not available.

Changes to MAP Growth during the study period

In the 2023-24 school year, NWEA began the phased implementation of an enhanced item-selection algorithm for the MAP Growth assessment. This update more closely aligns the assessment with grade-level content to enhance its content validity. The enhanced item-selection algorithm (EISA) prioritizes grade-level content while still adapting to off-grade items where necessary to provide items of appropriate difficulty for students. Nineteen states implemented MAP with EISA in the 2023-24 school year. NWEA conducted a comparability study of the scores with traditional MAP Growth and MAP with EISA and found that prioritization of grade-level test content appears to make the test more sensitive to instruction in math. As a result, fall-spring growth appears to be larger on the new version of the test in math. To account for the differences in test version, we concorded the legacy MAP Growth scores to be on the MAP with EISA math scale. For more detail on the score concordance process, please see NWEA's EISA documentation.

Common Core of Data

A set of school-level characteristics, including enrollment, racial/ethnicity distribution, school urbanicity, and percent of students eligible for free or reduced priced lunch (FRPL), was obtained from the 2023-24 school-level Common Core of Data (CCD) files from the National Center for Education Statistics (NCES).

The NCES created a school level variable for urbanicity that defines a geographic locale as urban, suburban, town, or rural. A school is in a rural or non-rural area based on U.S. Census definition of a rural area where rural refers to an area with a housing density less than 425 housing units per square mile. Non-rural areas are further divided into urban, suburban, and town areas. Urban refers to a non-rural territory with a population of 50,000 or more inside a principal city.[1] Suburban refers to a non-rural territory with a population of 50,000 or more outside of a principal city. A town refers to a non-rural area with a population of less than 50,000.

The proportion of students eligible for free and reduced lunch (FRPL) is calculated from CCD's total counts of student enrollment within a school and CCD's total counts of FRPL eligibility within a school. The FRPL counts from the CCD include direct measures of FRPL and district measures of student poverty for schools that participate in the community eligibility provision (CEP) program.[2] The CCD data provided counts of students in poverty measured by FRPL counts and also direct certification counts. If FRPL counts were zero or missing and direct certification counts existed, we used the direct certification counts to calculate percent FRPL.[3]

We classified schools into poverty levels based on the percentage FRPL eligibility: low-poverty schools had less than or equal to 25% FRPL eligibility; mid-poverty schools had greater than

[1] A principal city is the largest incorporated city greater than 10,000 in a core based statistical area (CBSA), CBSA's used to be called metropolitan areas.

[2] Thirty-eight percent of schools participate in CEP, which is a program that began in 2013 where all students are giving free lunch when a school has more than 40% of students eligible for income-based food or medical assistance. In these schools, since all students receive a free lunch, schools do not need to collect income data from individual families to determine free and reduced-price lunches. https://www.urban.org/sites/default/files/2025-03/How_Many_Students_Would_Lose_Access_to_Free_Meals.pdf

[3] The CCD file occasionally omits or inconsistently reports certain fields. For example, Illinois did not report any FRPL data in 2023–24. As a result, subgroup indicators based on these data may be incomplete for some states and years.

25% and less than or equal to 75% FRPL eligibility; and high-poverty schools had greater than 75% FRPL eligibility.

Target Population, Sample Characteristics, and Weights

Target Population

The dashboard focuses on math and reading achievement trends of U.S. public school students in kindergarten through 8th grade. Therefore, our results are intended to generalize to the population of students in U.S. public schools (in the 50 states plus the District of Columbia) that are currently operational and serve K-8 students. In 2023-24 (the most recent year in which CCD data are available), this population is 35.4 million students in 77,000 schools.

Sample Description

NWEA's MAP Growth tests are non-mandatory assessments that districts opt into administering. Therefore, the samples of schools used in the dashboard are not inherently a nationally representative sample of U.S. public schools (or perfectly representative of any given state) in any given term. We use multiple strategies described below to ensure sufficient representativeness of the reported samples across the various dashboard pages.

The first two tabs in the dashboard (**National Trends** and **Group Insights**) use a national sample of about 20,000 schools that tested in the 2024-25 school year. The national sample consists of data from 300,000 to 800,000 students in each term/grade (see Table 2 in this technical appendix). Table 1 at the end of this technical appendix provides a description of the sample of schools included in the **National Trends** tab relative to population of public schools. The NWEA sample reflects the economic and demographic diversity of U.S. schools and a diversity of schools from across various locales (urban, suburban, rural, and town). Relative to the population of U.S. schools, our sample reflects schools serving a similar percentage of FRPL eligible students, a similar average percentage of White students and Black students, and a similar proportion of urban, suburban, and rural students (see Table 1).

The data in Table 1 in this document are also presented in the "Sample Representativeness" section at the bottom of the **National Trends** tab on the dashboard which includes a bar chart that compares the demographic characteristics of the NWEA sample to the national population.

The third tab (**State Trends**) and the fourth tab (**State Groups**) of the dashboard present state-specific results. These samples are described in the section below that provides more details on the **State Trends** tab. We only present data from states where at least 20% of the enrolled students in each grade/subject/subgroup took the MAP Growth test in a term. Following NCES guidelines, cells with fewer than 10 observed students are suppressed.[4]

[4] https://nces.ed.gov/pubs2012/2012151.pdf

Table 1 in the appendix shows the demographic composition of the state NWEA sample compared to the state population of public schools. The state specific data in Table 1 in this document are also presented in the "Sample Representativeness" section at the bottom of the **State Trends** page on the dashboard that includes a bar chart that compares the demographic characteristics of the NWEA state sample to the overall state demographics.

The final tab (**Trends Over Time**) uses a weighted (see more details below) longitudinal panel of schools testing between 2017-18 and 2024-25. While the other dashboard tabs examine one year of MAP Growth data at a time, this page compares achievement trends across multiple school years by grade/subject. The sample sizes per grade/term can be found in Table 3 in this appendix. Table 4 in this appendix provides the demographic characteristics of the longitudinal sample compared to the population of U.S. public schools.

Weighting

Only the **Trends Over Time page** contains weighted data. We weight the **Trends Over Time** data because the NWEA sample changes in composition year to year. As a result, observed trends in raw sample means may reflect true changes *and* shifts in the sample over time. To address this issue, we used entropy weightsto weight the sample to approximate the population of U.S. schools in a grade, based on the average percentage of students eligible for FRPL, average percentage of White, Black, Hispanic, and Asian Students.[5] The entropy weighting method uses information about the dispersion of the variables to create weights for each observation. These weights are derived from the data directly, rather than a researcher's subjective modeling decisions.

Key Metrics

Below we describe the methods used to calculate RIT scores, achievement percentiles, conditional growth percentiles, and predicted percent proficient.

Reported Metrics

RIT Scores. Student test scores from the NWEA MAP Growth reading and math assessments, called RIT scores, were used in this study. RIT scores range from 100 to 350.

Achievement Percentile. The achievement percentile is an estimate of the relative ranking of a student's RIT score within a given term and grade compared to the national 2025 NWEA MAP Growth Norms. Since MAP Growth can be administered at any point during the school year, the MAP Growth achievement norms condition on each student's grade, subject, and instructional week of testing (i.e., the week in the school calendar in which a student tested). Instructional

https://nces.ed.gov/forum/ldsguide/book3/ch_7.asp#:~:text=Agencies%20may%20also%20need%20to,and%20Local%20Education%20Agencies%20(2004)

[5] Entropy weighting uses entropy balancing to "reweight a survey sample to known characteristics from a target population"

weeks were calculated for each student based on their school start date and the individual student's testing dates (for more details on the calculation of instructional weeks, see the norms study).

Within each grade and subject, let Y_{it} be a student *i*'s RIT score at instructional week *t*. The predicted mean ($\hat{Y}_t$) and standard deviation $\left(SD(Y_t)\right)$ for a given grade/subject/instructional week combination were pre-calculated based on the NWEA norms model (see 2025 MAP Growth Norms Technical Manual). Based on these values, we calculated a standardized estimate of the student's RIT score:

$$z(Y_{it}) = \frac{(Y_{it} - \hat{Y}_t)}{SD(Y_t)}. \qquad \text{(Equation 1)}$$

From the standardized score, we calculated the score percentile (e.g., the proportion of the distribution with scores less than or equal to the student's score):

$$ps(Y_{it}) = Pr(Y_{it} \leq y_t) = \int_{-\infty}^{y_t} \phi(z)dz, \qquad \text{(Equation 2)}$$

where $\phi(z)$ represents the probability density function. The student normative percentile used in this study was scaled to range from 1 to 99:

$$\text{Perc} = \ 100 \times p_s(Y_{it}). \qquad \text{(Equation 3)}$$

Conditional Growth Percentile. The Conditional Growth Percentile, or CGP, is a student's percentile rank for growth. If a student's CGP is 50, this means that the student's growth was greater than or equal to 50 percent of similar students in the NWEA norm group. Students are similar with regard to starting achievement level, grade, subject area, and number of instructional weeks between test events.[6]

The CGP is calculated by first calculating the projected growth based on a student's starting RIT score at a given number of instructional weeks for a grade for a given subject. [7] Next a z-score is calculated based on (observed growth - predicted growth)/standard deviation of growth. Next that z-score is converted into a percentile using an inverse normal function (see equations 2 and 3 above).

Projected likelihood to be proficient on state summative tests. NWEA linking studies estimate the spring RIT score that a student must be or at or above to have at least a 50% likelihood of scoring proficient or higher on the state summative assessment. To estimate whether a student is on track to reach proficiency in the spring, we compare a student's spring RIT score to the relevant linking study cut score, and if the spring RIT is at or above than the cut score then the student is considered on track to be proficient. To estimate whether a fall or winter RIT score is on track to be proficient, we use a student's growth projection based on 2025 norms to calculate their expected spring score. The expected spring score is then compared to the spring cut score to determine if a student is projected to be proficient.

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[7] https://connection.nwea.org/s/article/Conditional-Growth-Percentile?language=en_US

Effect size estimates anchored on spring 2019. The national effect size estimates are calculating by standardizing the spring average RIT scores relative to the 2019 mean/standard deviation for a grade/subject. The equation below describes our standardization approach where $\hat{Y}_t$ is average MAP score at time *t*, $\hat{Y}_{2019}$ is the mean achievement in 2019, and $SD(Y_{2019})$ is the national standard deviation in 2019.

$$Standarized\ (Y_{it}) = \frac{(\hat{Y}_t - \hat{Y}_{2019})}{SD(Y_{2019})}. \qquad \text{(Equation 4)}$$

Tab-Specific Descriptions, Calculations, and Caveats

The **National Trends** tab provides a snapshot of student achievement (RIT scores and achievement percentiles) and growth (CGP) across the country within an academic year. This page is designed to offer a high-level view of national patterns, with data updated throughout the year to reflect fall, winter, and spring results as they become available. National results are presented by grade and subject.

The **Group Insights** tab examines differences single-year achievement (RIT scores and achievement percentiles) and growth (CGP) across student groups (race/ethnicity, gender, school poverty levels, and urbanicity) compared to national overall trends.

The **State Trends** tab provides state-specific trends compared to the national sample to give partners a more localized lens. This page includes: average RIT scores at the state vs. national level, median achievement percentiles at the state vs. national level, CGP at the state vs. national level, and percent of students on track to meet state-defined proficiency benchmarks.

The **State Group Insights** page provides the same measures as the **State Trends** page disaggregated by state-specific subgroup views (where sufficient data are available) and compares those results to national trends for the same subgroups.

The **Trends Over Time** tab examines changes in achievement by grade/subject between spring 2017 and spring 2025. Trends in achievement are shown as RIT scores and as standardized scores anchored in spring 2019. As discussed above, each year of these data are weighted to match the 2023/2024 student demographics. Trends are presented nationally and by student subgroup.

The table 5 at the end of this technical appendix summarizes which metrics are used for which page.

Caveats

The **State Trends** page is intended to examine growth trends in a given state versus the national sample. It is not intended to facilitate state by state comparisons. Because MAP Growth participation varies widely by state, the samples differ in size and representativeness. These differences mean that state-to-state comparisons may be misleading and are not appropriate.

The **Trends Over Time** page allows comparisons over time with all results weighted to the 2023–24 national sample. This approach controls for shifts in sample size and demographic composition. However, if the national composition has changed since 2023–24, the values shown here may differ from the actual national averages in a given year.

Conclusion

These methods and sample characteristics describe the 2024–25 data. The technical appendix will be updated alongside future dashboard releases to reflect new data, methodological refinements, and any changes to sample composition.

Table 1

*Sample School Information Relative to U.S. Population of Schools (data shown on **National Trends** and **State Trends** tabs)*

Level	Sample	Number of Schools	Average School Enrollment	% FRPL	% White	% Black	% Hispanic	% Asian	City	Suburb	Rural	Town
U.S.	Population	77,095	459	57%	48%	15%	26%	4%	29%	31%	29%	11%
U.S.	NWEA Sample	20,394	474	58%	48%	15%	26%	4%	30%	32%	29%	10%
CO	Population	1,521	405	51%	52%	4%	36%	3%	36%	30%	24%	11%
CO	NWEA Sample	704	370	50%	59%	2%	33%	2%	23%	31%	34%	11%
GA	Population	1,911	641	71%	35%	39%	17%	4%	19%	39%	33%	10%
GA	NWEA Sample	861	631	72%	35%	39%	17%	4%	20%	40%	34%	7%
IL	Population	3,123	415	—	50%	18%	24%	4%	25%	43%	22%	10%
IL	NWEA Sample	1,258	421	—	52%	14%	23%	6%	14%	61%	19%	6%
IN	Population	1,565	487	52%	66%	13%	13%	2%	27%	22%	39%	12%
IN	NWEA Sample	770	483	49%	68%	11%	13%	3%	24%	27%	38%	10%
KY	Population	1,120	417	65%	74%	10%	8%	2%	20%	13%	44%	23%
KY	NWEA Sample	477	454	64%	66%	16%	10%	2%	35%	13%	38%	15%
MI	Population	2,647	379	59%	64%	18%	9%	3%	22%	37%	29%	11%
MI	NWEA Sample	1,617	390	60%	65%	17%	9%	3%	18%	36%	32%	14%
MT	Population	647	160	56%	79%	1%	5%	0%	13%	2%	76%	9%
MT	NWEA Sample	276	148	56%	80%	1%	5%	0%	16%	1%	78%	5%
NV	Population	606	565	85%	32%	12%	42%	4%	53%	22%	18%	8%
NV	NWEA Sample	464	574	91%	31%	13%	42%	4%	51%	20%	21%	9%
OH	Population	2,747	447	46%	64%	19%	8%	2%	23%	36%	28%	12%
OH	NWEA Sample	979	515	44%	64%	19%	8%	3%	21%	42%	26%	12%
SC	Population	990	572	78%	44%	36%	13%	2%	19%	30%	39%	12%
SC	NWEA Sample	475	605	76%	45%	34%	13%	1%	21%	35%	31%	13%
SD	Population	502	197	40%	76%	2%	6%	1%	12%	1%	73%	14%
SD	NWEA Sample	245	266	39%	72%	3%	7%	1%	23%	2%	60%	15%
TX	Population	7,330	537	67%	26%	13%	53%	4%	41%	26%	24%	9%
TX	NWEA Sample	3,735	577	66%	26%	14%	51%	5%	44%	28%	19%	9%

Note: FRPL=free or reduced priced lunch. The source of the variables is the Common Core of Data (CCD) collected by the National Center for Educational Statistics.

Table 2

*Sample Size of the National Sample by Term and Grade (data shown on **National Trends** tab)*

		Number of Schools			Number of Students		
Subject	Grade	F24	W25	S25	F24	W25	S25
Math	K	8,465	8,912	9,396	490,420	530,680	577,600
Math	1	10,770	10,382	10,747	659,155	649,891	694,785
Math	2	11,768	11,423	11,720	742,988	741,331	779,474
Math	3	12,048	11,647	10,942	787,444	777,885	768,989
Math	4	11,952	11,500	10,770	762,558	753,140	737,864
Math	5	11,536	11,109	10,333	768,392	758,024	739,342
Math	6	7,957	7,417	6,990	789,986	727,591	737,290
Math	7	7,199	6,552	6,240	787,542	703,555	717,407
Math	8	7,137	6,439	6,053	712,860	636,050	633,223
Reading	K	7,254	7,720	8,148	382,288	419,521	465,938
Reading	1	9,337	9,066	9,420	529,486	530,007	571,904
Reading	2	10,781	10,475	10,871	644,399	647,746	696,775
Reading	3	11,814	11,441	10,995	743,883	741,213	743,085
Reading	4	11,991	11,444	10,738	740,491	727,981	717,538
Reading	5	11,565	11,084	10,251	745,025	735,624	721,979
Reading	6	8,478	7,852	7,414	806,483	740,982	751,144
Reading	7	7,806	7,078	6,708	820,904	729,511	739,355
Reading	8	7,735	6,951	6,522	810,468	722,179	714,335

Table 3

*Sample Size over Time by Grade and Subject for Data Used in **Trends over Time** tab*

		Student N							
Subject	Grade	S17	S18	S19	S21	S22	S23	S24	S25
Math	K	475,972	547,788	583,911	510,260	668,723	641,819	584,978	574,901
Math	1	564,641	652,653	679,960	603,597	765,988	782,513	723,595	691,424
Math	2	714,043	772,056	797,966	699,368	854,748	837,179	801,545	776,107
Math	3	704,206	762,376	782,880	714,293	821,155	801,021	741,480	765,885
Math	4	694,426	745,468	779,680	721,672	818,622	798,001	745,779	735,075
Math	5	682,897	747,567	785,637	730,904	822,982	794,452	742,497	735,996
Math	6	651,413	711,604	762,544	683,065	791,218	765,339	712,142	730,360
Math	7	627,752	668,017	713,779	661,910	793,674	750,323	698,776	711,498
Math	8	579,935	600,881	624,783	588,757	711,400	682,779	614,317	625,641
Reading	K	452,146	520,625	566,226	469,415	579,209	541,756	486,624	463,541
Reading	1	540,158	616,541	645,867	555,407	671,497	676,099	599,080	568,890
Reading	2	701,946	752,431	782,425	660,596	779,931	769,975	714,572	693,594
Reading	3	703,692	762,144	784,096	698,128	793,396	774,385	703,087	739,722
Reading	4	691,340	741,686	769,711	692,999	786,453	769,773	718,891	714,612
Reading	5	680,972	739,978	776,692	699,859	791,173	766,467	715,555	718,693
Reading	6	642,583	702,025	752,355	673,801	769,327	753,243	700,974	744,205
Reading	7	623,756	663,448	709,354	657,675	773,600	735,113	693,361	733,336
Reading	8	579,428	619,532	651,568	631,264	759,742	721,353	657,028	706,527

Table 4
*Sample Characteristics for **Trends Over Time** Page*

	Population of U.S. Schools	NWEA Sample
Number of Schools	77,847	30,213
Average Enrollment	458	467
Demographic and Socio-Economic Characteristics		
% FRPL	56%	57%
% White	48%	48%
% Black	14%	16%
% Hispanic	26%	26%
% Asian	4%	4%
Urbanicity		
City	29%	30%
Suburb	31%	30%
Rural	29%	29%
Town	11%	11%

Note: FRPL=free or reduced priced lunch. The source of the variables is the Common Core of Data (CCD) collected by the National Center for Educational Statistics.

Table 5

Metrics Used for Each Tab

Tab #	Label	Average RIT Score	Median Achievement Percentile	CGP	Percent on track to meet proficiency	Effect Size Estimates
1	National Trends	X	X	X		
2	Group Insights	X	X	X		
3	State Trends	X	X	X	X	
4	State Group Insights	X	X	X	X	
5	Trends over Time	X				X