



## Assessing Student Performance Through a Year of Virtual Learning: A Cohort Comparison of Student Performance on 2019-20 Winter and 2020-21 Spring aimswebPlus Assessments and End-of-Year Review

This report, along with the accompanying report on Star Reading and Math, concludes the analyses [in our January 2021 report](#) that focused on student reading and math test performance from 2019-2020 Winter (prior to closing due to the Covid-19 pandemic) to 2020-21 Fall (during virtual learning for all students) and [in our April 2021 addendum](#) that compared the performance of the same set of 2019-20 Winter test takers to their 2020-21 Winter reading and math performance. In this report, we compare aimswebPlus reading performance of the 2019-20 Winter test takers to their performance in 2020-21 Spring and we also present our summary of this cohort's assessment performance progress throughout 2020-21.

The main metric used in this report, as in the previous analyses, is National Percentile Rank (NPR). NPR is a norm-referenced measure that compares student performance to a national sample of students.

### Key Findings

- The overall Winter-to-next-Fall decline in aimswebPlus Reading performance which continued in the Winter testing window did not continue in Spring. Some grade levels, notably 2020-21 first-graders (2019-20 kindergarteners) who experienced the largest Winter-to-next-Fall decline, showed improvements in average NPR performance in 2020-21 Spring.
- In the 2020-21 Spring testing window, as in the year-long trends, the way different demographic groups' performance changed over time did not show inter-group differences. However, the pre-existing performance differentials persisted.

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## District-Wide Testing and Research Analyses During the 2019-20 and 2020-21 School Years

Throughout the 2020-21 school year, we have been examining student performance on interim assessments to better understand how student performance has been affected by the Covid-19 pandemic and the District's shift to 100% virtual learning in March 2020. Beginning in 2020-21, the aimswebPlus assessment was required for grades K-5 and the Star assessment was required for grades 6-12, and these tests were administered online throughout 2020-21. The dates of the 2019-20 and 2020-21 administration windows were as follows:

- 2019-20 Fall (in-person):
  - aimswebPlus (grades K-5\*)-September 3-October 31, 2019;
  - Star (grades 6-12)- Term 1, September 19-October 4, 2019.
- 2019-20 Winter (in-person):
  - aimswebPlus (grades K-5\*)- January 2-31, 2020;
  - Star (grades 6-8)-Term 3, March 2-12, 2020;
  - Star (grades 9-12)-Term 2, February 5-21, 2020.
- 2019-20 Spring (not administered due to Covid-19)
- 2020-21 Fall (online):
  - September 14-October 23, 2020 for both tests, all grades.
- 2020-21 Winter (online):
  - December 14, 2020-January 29, 2021 for both tests, all grades.<sup>1</sup>
- 2020-21 Spring (online/in-person):
  - aimswebPlus (grades K-5\*)-April 14-June 11, 2021;
  - Star (grades 6-12)- May 3-June 11, 2021.

\*AimswebPlus was required for special education students in grades 6-8 and is administered during the aimswebPlus windows for Grades K-5.

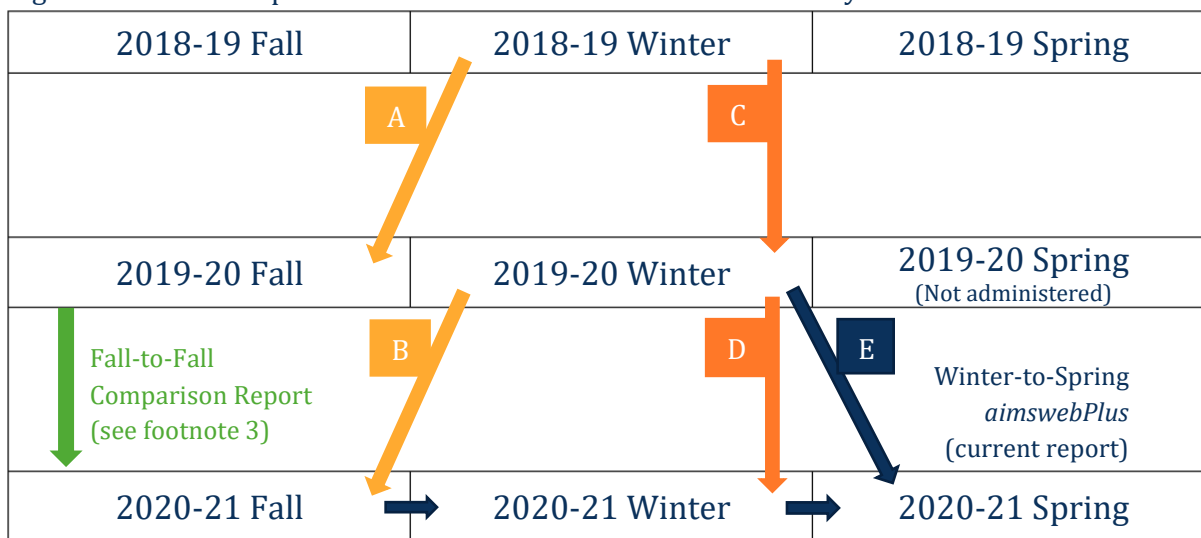
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<sup>1</sup> Results from schools that started aimswebPlus 2020-21 Winter testing on December 1, 2021, were included in the April 2021 addendum.

## Keeping Track of School Years, Testing Windows, and Research Reports

In this report, we always refer to the school year first, followed by the testing window (e.g., 2020-21 Fall).

Figure 1. A Visual Map of Multi-Year Assessment Performance Analyses



The green vertical arrow represents a Fall-to-Fall comparison of average student performance published in a November 2020 report.<sup>2</sup> This was our first examination of how students performed on Fall interim assessments as compared to students who were in that same grade the previous year.

We then looked more closely at the same students' performance over time. The two diagonal arrows labeled A and B illustrate the analyses presented in the report dated January 2021.<sup>3</sup> In that report, we analyzed student performance from 2019-20 Winter, the last in-person/at-school assessment administered, and 2020-21 Fall, the first online/at-home assessments administered (arrow B). The January 2021 report also compared the 2019-20 to 2020-21 change in performance to the previous year (2018-19 to 2019-20) for aimswebPlus Reading (arrow A).

An addendum published in April 2021 repeated the same analyses, comparing the 2019-20 Winter results to the performance of *the same cohort of students* in 2020-21 Winter assessment window (arrow D). The April 2021 addendum also compared the change in performance to the Winter-to-Winter changes in the previous year for aimswebPlus Reading (Arrow C).<sup>4</sup>

<sup>2</sup> See: [K-12 Student Participation and Performance on aimswebPlus and Star Assessments, Fall 2019 and Fall 2020](#), November 2020.

<sup>3</sup> See [Assessing Student Performance Before and During Virtual Learning: A Cohort Comparison of Student Performance on 2019-20 Winter and 2020-21 Fall aimswebPlus and Star Assessments](#), January 2021.

<sup>4</sup> See [Assessing Student Performance Before and During Virtual Learning: A cohort Comparison of Student Performance on 2019-20 Winter and 2020-21 Winter aimswebPlus and Star Assessments](#), April 2021.

This report, which is one of the two final reports in this series, examines student performance *on aimswebPlus Reading assessments* from 2019-20 Winter to 2020-21 Spring (Arrow E) as well as 2020-21 trends in performance across the testing windows. An accompanying report does the same for *Star Reading and Math*.

## Research Questions for the Final Cohort Analyses

The analyses presented in this report complement our previous reports by comparing students' performance on their last in-person/at-school aimswebPlus Reading assessments (2019-20 Winter) to their latest virtual/hybrid learning period assessment (2020-21 Spring) at the time of writing.<sup>5</sup>

Two primary research questions guided this analysis:

1. What were the differences in student performance, as measured by National Percentile Rank, between 2019-20 Winter and 2020-21 Spring for aimswebPlus Reading (2020-21 grade 1-5 students)?
  - 1.a. Were there identifiable patterns in aimswebPlus Reading performance differentials between 2019-20 Winter and 2020-21 Spring with respect to grade, race/ethnicity, English Learner status, 2020-21 Spring performance tier on the test, and Economic Disadvantage?
2. What were the trends in aimswebPlus Reading performance, as measured by average NPR, throughout the 2020-21 school year?

As in the January 2021 report, the primary metric we examine in this report is the average National Percentile Rank (NPR) for aimswebPlus and Star.

## The National Percentile Rank (NPR) Metric

NPR is a norm-referenced score that measures a student's performance in reference to the performance of a national sample of students (the norm sample) at the same grade level. It shows what percentage of students in the norm sample scored lower than the particular student. The vendor for aimswebPlus has established norm samples which are representative of the national demographic distributions of K-12 students. AimswebPlus conducted a norming process using a sample of test takers who were tested during the 2013-14 school year. It is important to note that the norm samples used to identify NPR were established prior to school closures as part of Covid-19 containment efforts. Therefore, NPR norms are not affected by any Covid/virtual learning related performance changes.<sup>6</sup>

<sup>5</sup> Starting on March 8, 2021, SDP started hybrid-learning (students attending in person two days a week) in Phases. For more about hybrid-learning at SDP see: <https://www.philasd.org/coronavirus/schoolstart2020/#highlights>.

<sup>6</sup> More details about the norm samples can be found in the technical reports for these tests: [aimswebPlus Reading](#), p.3; [Star Reading](#), p. 89; [Star Math](#), p. 74.

## Comparable Tests and the Cohort Sample

The comparable aimswebPlus Reading tests in this report are the same as in the January 2021 report and the April 2021 addendum. NPR based on Nonsense Word Fluency (NWF) performance was used for the comparisons of reading performance of students who were in kindergarten in 2019-20 Winter and first grade in the 2020-21 Spring in the analyses below (Table 1). All comparisons for students who were first to fourth grade in 2019-20 Winter and in second to fifth grade in 2020-21 Spring are based on Oral Reading Fluency (ORF) NPR performance.

Table 1. Comparable Tests

Test	Possible Comparisons
aimswebPlus Reading	NPR based on NWF for grades K-1 and ORF for grades 1-5
aimswebPlus Math	No comparisons possible

**Note:** See Appendix Table A.1 in the January 2021 report for more details about the cohorts and comparable aimswebPlus Reading tests.

Students who completed the comparable tests in both 2019-20 Winter and 2020-21 Spring testing windows are the cohort of students used for this analysis.<sup>7</sup> The 2019-20 Winter testing window was the last window in which assessments were administered before District school buildings were closed on March 13, 2020, due to Covid-19 containment efforts in Philadelphia.

Note that the students whose performance is analyzed in this report are not necessarily the same set of students whose performance was analyzed in the January 2021 report or the April 2021 addendum. The January 2021 report analyzed students who were tested in both 2019-20 Winter and 2020-21 Fall, and the April 2021 addendum analyzed students who were tested in both 2019-20 Winter and 2020-21 Winter. While there is a big overlap between the 2019-20 Winter test takers who were then tested in either window of 2020-21, there are students who participated in only one or two of the 2020-21 assessment windows.

The 2020-21 Spring testing window coincided with the administration of Pennsylvania System of School Assessment (PSSA) for grades 3-5 in this cohort. The District prioritized the administration of the state tests, and this might have impacted the number of students in the study cohort who took 2019-20 Winter who also took 2020-21 Spring aimswebPlus Reading test, which is lower than the other two windows in 2020-21. See Table A.1. in the appendix for a comparison of the cohort in this analysis to all 2020-21 Spring test takers. A demographic breakdown of the 2020-21 Spring cohort whose aimswebPlus performance is analyzed in this report is presented in Table A.2. in the appendix.

<sup>7</sup> The 2020-21 Winter analysis studies the outcomes for students who took comparable tests in both 2019-20 Winter and 2020-21 Winter. The January 2021 report studied the outcomes for students who took the same tests in both 2019-20 Winter and 2020-21 Fall. We did not restrict the analysis to students who took all three tests; thus, although the two sets of students analyzed highly overlap, they are not exactly the same.

## Findings

The results from the analyses for student performance on aimswebPlus Reading are presented below. First, the comparison of 2020-21 Spring and 2019-20 Winter aimswebPlus Reading performance is presented, including the performance of student subgroups. In the next section, we summarize the progression of 2019-20 Winter test takers' aimswebPlus Reading performance through the three testing windows of 2020-21.

### AimswebPlus Reading

#### **Analysis of Winter-to-Spring Changes in Average National Percentile Rank: 2019-20 to 2020-21**

There were 37,832 grade 1-5 students in 2020-21 who took the aimswebPlus Reading test in 2019-20 Winter and 2020-21 Spring. Of these students, 18,565 were female and 19,267 were male students. A great majority (85%) were non-English Learners (32,165) and 5,667 were English Learners. The largest racial/ethnic group was Black/African American (17,008 students, or 45%), followed by 9,342 Hispanic/Latino, 6,175 white, 3,724 Asian, 1,471 multiracial, 58 Native Hawaiian/Pacific Islander, and 54 American Indian/Alaskan Native students. Consistent with District averages, 29,068 of the students were economically disadvantaged and 8,764 were not.

#### ***Winter-to-Spring Changes by Grade***

Table 2 shows the average NPR for students in grades 1-5 in 2020-21, who were enrolled in grades K to 4 in 2019-20. It presents average NPR for 2019-20 Winter and 2020-21 Spring, in addition to the difference between the two. The overall average decline in NPR between the two testing periods was 7.81 percentiles. This represents a less than one percentile difference from the Winter-to-Winter average decline of 8.46 percentiles reported in our previous analysis. That is, the Winter-to-Winter decline did not continue further into the Spring.

While the average NPR declined about 4-8 percentiles for grades 2 to 5, students who progressed from kindergarten to first grade experienced a larger drop in average NPR (16 percentiles) (Table 2). In comparing Winter-to-Winter and Winter-to-Spring performance differences, first and second grade NPR declines were 3 percentiles and 2 percentiles lower, indicating a minor improvement (see the end-of-year trends section below). Third and fifth grades did not show a change in the amount of NPR decline between Winter-to-Winter and Winter-to-Spring, but the fourth grade NPR decline was 2 percentiles higher.

Table 2. AimswebPlus Reading National Percentile Rank by Grade, 2019-20 Winter to 2020-21 Spring

Grade in 2020-21	Number of students	Average 2019-20 Winter NPR*	Average 2020-21 Spring NPR	Average NPR Differential
1	7102	43.00	27.20	-15.80
2	8056	32.36	28.81	-3.55
3	8127	32.72	26.52	-6.20
4	7551	31.87	25.55	-6.32
5	6996	32.60	24.54	-8.06
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>

\*The students whose results are shown here are those who have been tested both in 2019-20 Winter and 2020-21 Spring. This is not necessarily the same set of students who have been tested both in 2019-20 and 2020-21 Fall or Winter. For this reason, results for 2019-20 Winter may differ from the January 2021 report and the April 2021 addendum.

**How to read this table:** The table shows performance in 2019-20 Winter and 2020-21 Spring for each grade and the change from Winter to Spring. For example, there were 7,102 2020-21 first graders who took an aimswebPlus Reading test and also took the comparable test in the 2019-20 Winter window, when they were kindergarteners. These students' average NPR was the 43<sup>rd</sup> percentile in 2019-20 Winter and the 27<sup>th</sup> percentile in 2020-21 Spring. The change from 2019-20 Winter to 2020-21 Spring for 2020-21 first graders (2019-20 kindergarteners) was 16 percentiles.

### Winter-to-Spring Changes by Race/Ethnicity

In the section above, Table 2 showed how the overall 8-percentile decline from 2019-20 Winter to 2020-21 Spring was distributed across grades. Examining the 2019-20 Winter to 2020-21 Spring average NPR changes across racial/ethnic groups shows that the overall decline in average NPR was similar across all groups. All groups experienced declines in the 6-9 percentile range (Table 3), although Hispanic/Latino students experienced the smallest decline (6 percentiles).

Table 3. AimswebPlus Reading National Percentile Rank by Race/Ethnicity, 2019-20 Winter to 2020-21 Spring

Race/Ethnicity	Number of students	Average 2019-20 Winter NPR	Average 2020-21 Spring NPR	Average NPR Differential
American Indian/Alaskan Native	54	29.22	23.00	-6.22
Asian	3724	47.65	38.67	-8.98
Black/African American	17008	31.02	22.60	-8.42
Hispanic/Latino	9342	26.06	20.27	-5.79
Multiracial/Other	1471	41.33	32.77	-8.56
Native Hawaiian/Pacific Islander	58	38.86	32.29	-6.57
White	6175	46.56	38.27	-8.29
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>

The comparison of Winter-to-Spring average NPR performance shows mostly equal changes across different racial/ethnic groups. As the January 2021 report and the April 2021 addendum concluded, **the year-to-year comparison shows the persistence of differences across racial/ethnic groups in overall performance as measured by NPR.** Asian and white students in this sample consistently scored at or above the 35<sup>th</sup> percentile, despite recent declines. Black/African American students in this sample consistently scored within the 20-30<sup>th</sup> average NPR range. Hispanic/Latino students in this sample scored lower, on average, between the 19<sup>th</sup> and 27<sup>th</sup> NPR.



***Winter-to-Spring Changes by English Learner Status***

Table 4, below, examines aimswebPlus Reading average NPR from 2019-20 Winter to 2020-21 Spring by English Learner status. Interestingly, the Winter-to-Spring decline during this period of online learning was smaller for English Learners (3 percentiles) compared to non-English Learners (9 percentiles). However, the average NPR for English Learners was around 10 percentiles lower than non-English Learners, despite a higher decline for non-English Learners.

Table 4. aimswebPlus Reading National Percentile Rank by English Learner Status, 2019-20 Winter to 2020-21 Spring

<b>English Learner Status</b>	<b>Number of Students</b>	<b>Average 2019-20 Winter NPR</b>	<b>Average 2020-21 Spring NPR</b>	<b>Average NPR Differential</b>
Non-English Learner	32165	36.63	28.04	-8.58
English Learner	5667	21.64	18.23	-3.41
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>

**Note:** English Learner status as of Spring 2020-21.

***Winter-to-Spring Changes by 2020-21 Spring Performance Tiers***

As detailed in the January 2021 report,<sup>8</sup> SDP uses performance tiers based on the number of correct answers on aimswebPlus for targeting necessary interventions. In order to understand whether students at different performance levels experienced Winter-to-Spring performance changes differently, Table 5 compares the Winter-to-Spring change in average NPR by the performance tiers the students were placed in based on their performance in the 2020-21 Spring testing window. Students were grouped into the three performance tiers based on their aimswebPlus Reading scores in the 2020-21 Spring window for NWF (first grade) or ORF (other grades) and the change from 2019-20 Winter to 2020-21 Spring average NPR was analyzed for the three groups. Because performance tiers are indirectly associated with NPR, it is expected that students in Tier 1 have a higher average NPR and those in Tier 3 have a lower average NPR.

The change in average NPR from Winter to Spring varied by tier (Table 5). Students in Tier 2 in 2020-21 Spring experienced the largest average decline, from the 38<sup>th</sup> percentile in 2019-20 Winter to the 24<sup>th</sup> percentile in 2020-21 Spring. This 14-percentile decline was higher than the decline experienced by students in Tier 1 (3 percentiles) or Tier 3 (10 percentiles) showed (Table 5).

<sup>8</sup> See [the January 20201 report](#), p. 5.

Table 5. aimswebPlus Reading National Percentile Rank by 2020-21 Winter Performance Tiers, 2019-20 Winter to 2020-21 Spring

2020-21 Winter Performance Tier	Number of Students	Average 2019-20 Winter NPR	Average 2020-21 Spring NPR	Average NPR Differential
Tier 1	13199	61.25	58.38	-2.87
Tier 2	4594	38.35	24.40	-13.96
Tier 3	20039	15.77	6.12	-9.65
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>

**How to read this table:** This table includes 37,832 students who were in grades 1-5 in 2020-21 Spring, in grades K-4 in 2019-20 Winter and took comparable tests in both testing windows. These students are grouped according to the performance tiers they placed in based on their 2020-21 Spring performance and average NPR were calculated for the three groups for both testing windows. According to the table, 13,199 students placed in Tier 1 in 2020-21 Spring and these students, on average, scored at 61<sup>st</sup> percentile in 2019-20 Winter and at 58<sup>th</sup> percentile in 2020-21 Spring. These represent, on average, a 3-percentile decline between the two windows.

***Winter-to-Spring Changes by Economic Disadvantage***

We analyzed average NPR changes from 2019-20 Winter to 2020-21 Spring by economic disadvantage status in Table 6. Results are similar to the results of other demographic breakouts: There was an 8-10-percentile decline under online instruction. This decline was similar among economically disadvantaged and non-disadvantaged students; the decline for students who were not economically disadvantaged was 1 percentile higher. However, as was the case in the January 2021 report and the April 2021 addendum, students who are not economically disadvantaged perform, on average, about 14 percentiles higher than economically disadvantaged students. One relatively positive finding might be that the performance difference between the two groups has not increased during the period of online instruction.

Table 6. aimswebPlus Reading National Percentile Rank by Economic Disadvantage, 2019-20 Winter to 2020-21 Spring

Economic Disadvantage Status	Number of Students	Average 2019-20 Winter NPR	Average 2020-21 Spring NPR	Average NPR Differential
Economically Disadvantaged	29068	31.02	23.43	-7.59
Not Economically Disadvantaged	8764	45.53	37.02	-8.51
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>

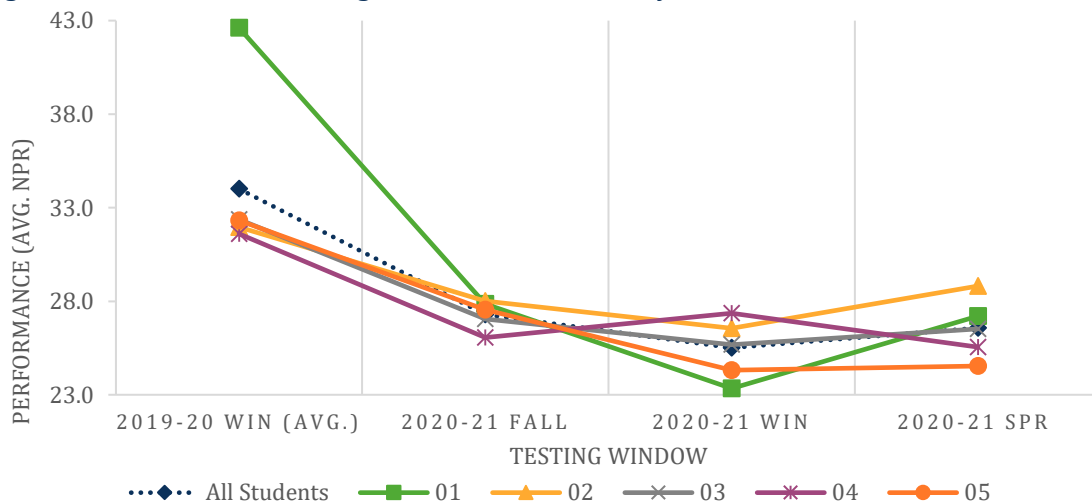
## Trends in National Percentile Rank throughout 2020-21

In this section we compile the average NPR for different student groups represented in the cohort across all testing windows studied: 2019-20 Winter, 2020-21 Fall, 2020-21 Winter, and 2020-21 Spring. As Table A.1 in the appendix shows, different numbers of 2019-20 Winter test takers took aimswebPlus in the fall, winter, and spring testing windows of 2020-21. It is noteworthy that the sample for 2020-21 Fall was the largest and 2020-21 Spring was the smallest, likely because the Spring test window coincided with state tests, whose administration was prioritized.

The demographic make-up of these three subsets of 2019-20 Winter base cohort was consistent across the 2020-21 testing windows; however, these were not exactly the same set of students. The trends shown in this section are the results of these overlapping but non-identical subsets of 2019-20 Winter test takers. Each subset had a different 2019-20 Winter average NPR, although they were very close (See Table A.1); we use the average of these three values as the 2019-20 Winter average NPR below.

The most striking observation about the aimswebPlus Reading performance trends by 2020-21 school year grade is the big decline in student performance when 2019-20 Kindergarteners returned to school as first-graders in 2020-21 Fall (Figure 1). Other grades also experienced declines in average NPR, but they were smaller. Average performance continued to decline in the 2020-21 Winter testing window for all grades except fourth. However, by 2020-21 Spring all grades except fourth made gains in aimswebPlus Reading performance compared to 2020-21 Fall.

Figure 1. aimswebPlus Reading Performance Trends by 2020-21 Grade

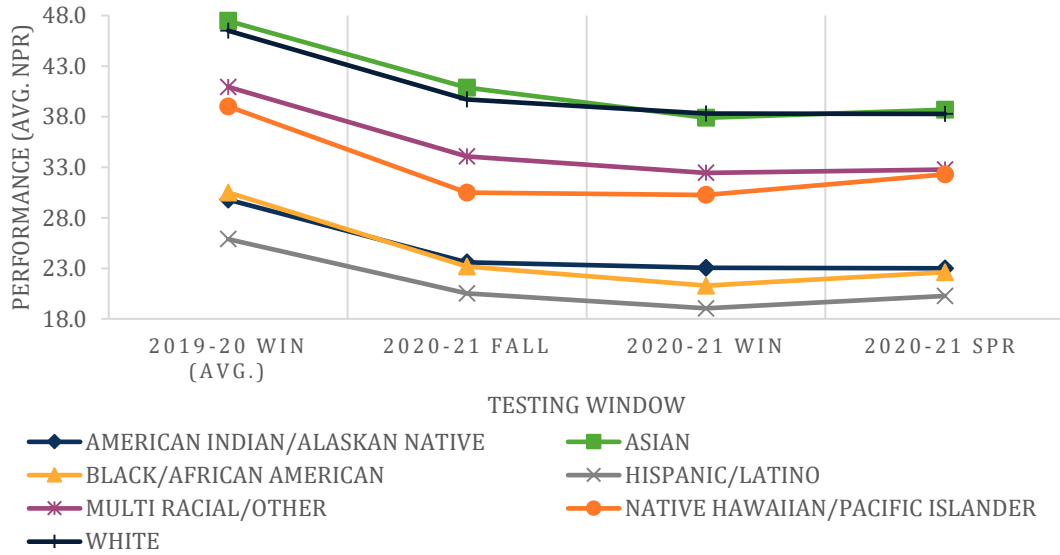


Although there were performance increases in the last testing window of 2020-21, end-of-year performance was lower than the previous year; students did not make enough gains to make up for their initial Winter-to-next-Fall decline. Some of the Winter-to-next-Fall decline across grades should be expected, as explained by the literature on “summer learning loss.” However, their continuing low performance compared to 2019-20 Winter is likely due to the challenges posed by Covid-19 virtual learning.

Performance trends throughout 2020-21 are similar between racial/ethnic groups: an initial decline compared to 2019-20 Winter, then largely stable (Figure 2). The persistence of

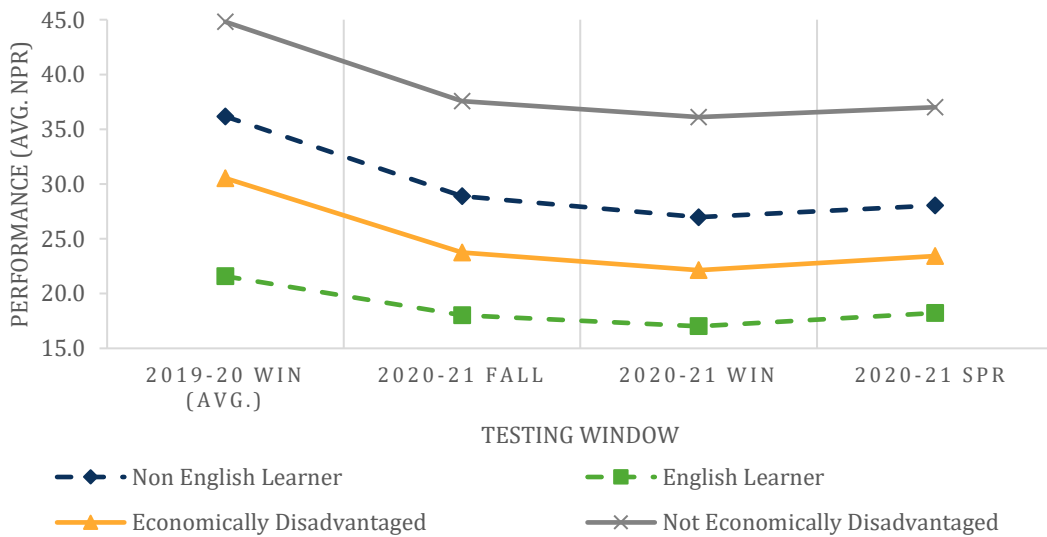
performance differences between groups throughout 2020-21, however, was the more notable finding. While no racial/ethnic group fell behind due to the challenges of virtual learning, average NPR among Asian and white students continued to be higher than average NPR among Black/African American and Hispanic/Latino students.

Figure 2. aimswebPlus Reading Performance Trends by Race/Ethnicity



Year-long aimswebPlus performance trends among English Learners and economically disadvantaged students were similar to the trends observed when analyzing performance by race/ethnicity (Figure 3). Although we did **not** observe that virtual learning affected one group more adversely than another, we did observe that English Learners, on average, continued to perform lower in NPR than non-English Learners, and students who were economically disadvantaged, on average, continued to perform lower in NPR than those who were not.

Figure 3. aimswebPlus Reading Performance by English Learner and Economic Disadvantage Status



## Conclusions

As a result of Covid-19 school closures in 2019-20 Spring, SDP did not administer the planned District-wide assessments for reading and math (aimswebPlus for grades K-5 and Star for grades 6-12) or the state standardized assessments (PSSA). To examine whether student performance declined as a result of Covid-19 school closures and the resulting online learning approach, we examined student performance on the last available test in 2019-20 (administered during the Winter testing window) and compared it to student performance on tests administered throughout 2020-21. In this last report in this series, which is accompanied by a report on Star Reading and Math performance for grades 7-11, we analyzed 2020-21 Spring assessment results from the same set of students who took comparable tests in the 2019-20 Winter testing window, as well as an analysis of performance trends throughout 2020-21.

We found that aimswebPlus Reading performance for students in grades 1-5 in 2020-21 (who were in grades K-4 in 2019-20) declined an average of 8 percentiles from 2019-20 Winter to 2020-21 Spring. Under usual conditions, students might experience a “summer learning loss” from the previous year to the first fall testing window; as detailed in our January 2021 report, this was observed in both 2018-19 to 2019-20 and 2019-20 to 2020-21. However, under usual conditions, students are expected to recover from the summer learning loss by the subsequent testing window. Our April 2021 addendum showed that this recovery was observed in Winter-to-Winter comparisons of 2018-19 to 2019-20 performance; however, 2019-20 to 2020-21 comparisons showed further decline. This report shows that the Winter-to-Winter decline did not continue further into the Spring and some grade levels, most notably 2020-21 first-graders, started showing improvements. Students in grades K-3 and 5 in the analytic sample all demonstrated gains from 2020-21 Fall to 2020-21 Spring.

Analysis of performance details across demographic groups shows no difference in the way performance changed before and after the transition to online learning, aside from persistent performance differences between subgroups that remained consistent during this period of change.

The changes from 2019-20 Winter to 2020-21 Spring were not very different between demographic groups; that is, online learning did not impact different groups disproportionately. However, as our previous work in this series—as well as the accompanying Star Reading and Math report—found, pre-online learning performance differences between demographic groups persisted.

## Appendix

### Appendix A: Demographic Details for the Cohort

Table A.1. Comparison of the Winter-to-Spring Cohort to All Test Takers in the Three 2020-21 aimswebPlus Reading Testing Windows

	Assessed in 19-20 Winter and 20-21 Spring (Current Cohort)	All 1-5 Students Assessed in 20-21 Spring	Assessed in 19-20 Winter and 20-21 Winter (April Addendum Cohort)	All 1-5 Students Assessed in 20-21 Winter	Assessed in 19-20 Winter and 20-21 Fall (January Report Cohort)	All 1-5 Students Assessed in 20-21 Fall
Number of Students	37,832	41,449	40,480	44,247	41,145	44,202
Average NPR in 2020-21 Window	26.57	26.14	25.51	25.01	27.29	26.78

Table A.2. Demographic Breakdown of 2019-20 Winter to 2020-21 Spring Cohort

Subgroup	aimswebPlus Reading	
	Number of Students	% of Cohort
American Indian/Alaskan Native	54	0.1%
Asian	3724	10%
Black/African American	17008	45%
Hispanic/Latino	9342	25%
Multiracial/Other	1471	4%
Native Hawaiian/Pacific Islander	58	0.1%
White	6175	16%
<b>Non-English Learner</b>		
Non-English Learner	32165	85%
English Learner	5667	15%
<b>Economically Disadvantaged</b>		
Economically Disadvantaged	29068	77%
Not Economically Disadvantaged	8764	23%
<b>All Students</b>	<b>37832</b>	<b>100%</b>

## Appendix B: National Percentile Rank Analyses Compared to Normal Curve Equivalent-Based National Percentile Rank

National Percentile Rank was used as the measure for student performance in this report and in the other cohort analyses in this series. However, when student assessment scores are normally distributed, which is often the case, NPR is not an interval measure. That is, the range of scores that students receive in the lower and upper ends of the NPR spectrum (around the 1<sup>st</sup> and 99<sup>th</sup> percentiles) will be much larger than the range of scores that students receive around the 50<sup>th</sup> percentile (Figure B.1.). For example, scale scores at the 99<sup>th</sup> percentile for the 2020-21 Spring aimswebPlus Oral Reading Fluency assessment correspond to between 195 and 326 (a 131-unit difference).<sup>9</sup> In contrast, the scaled score range at the 50<sup>th</sup> percentile on the same test was 105 to 159 (a 49-unit difference). In other words, in order for a student to move from one percentile to the next, the student would have to improve their scaled score by a larger amount at the lower and higher ends of a normal distribution and by a smaller amount around the 50<sup>th</sup> percentile.

NPR is an easily accessible measure; therefore we used average NPR for different student groups' performance in our cohort analyses without any conversions. The usual practice is converting NPR into a "Normal Curve Equivalent (NCE),"<sup>10</sup> which is an interval measure, to average the NCE scores and then to convert those averages back to percentile equivalents rather than averaging an ordinal scale (such as NPR). Other than a few notable exceptions, the average NPR improvements or declines in our samples were not big. In this report, we repeat the tables for the average NPR-based analyses discussed above with NCE conversions and report them out together. For this analysis, we first converted each student's NPR to NCE scores, then averaged the NCE scores, and converted the average NCE back to NPR ("Average 2019-20 Winter/2020-21 Spring NCE-based NPR" columns). We report the improvement/decline in performance between 2019-20 Winter and 2020-21 Spring in terms of average NCE that is back-converted to average NPR in "NCE-based Average NPR Differential" columns. We also calculated the difference between the average NPR differential between the two testing windows we originally reported and the post-NCE conversion back-converted average NPR ("Average NPR-Average NCE-based NPR Difference" columns). This column shows the difference between the two methods of reporting performance.

We report overall performance in terms of average NCE-based NPR in Table B.1. A comparison of the decline we reported based on average NPR and the decline when NCE conversions are performed shows that the difference is around 1 percentile. NPR-based declines over the course of 2020-21 testing windows ranged from 6 to 9 percentiles. When average NCE-based NPR was used, the overall declines fell in the 7-10 percentile range.

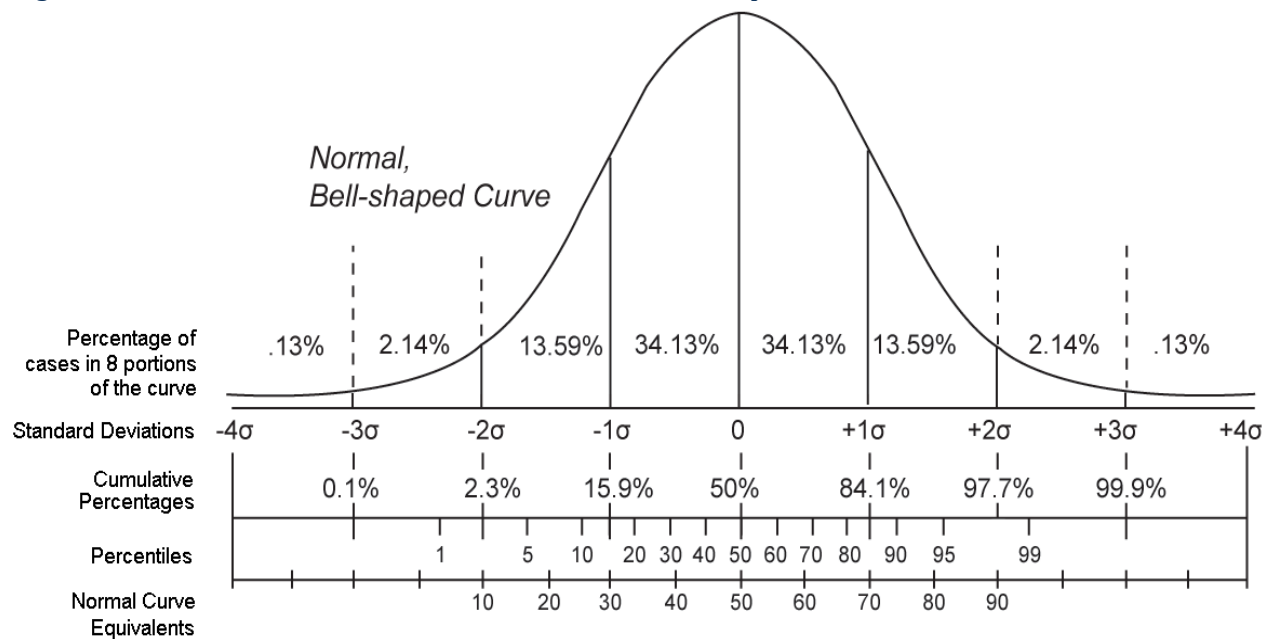
<sup>9</sup> When scale scores are listed from the highest to the lowest, students who are in the 1st percentile represent the bottom 1% of the whole list. In the same case, 99th percentile will be the group of students who scored higher than 99 percent of the list (i.e. top 1%). The 50th percentile would be the group of students who scored higher than half of the sample (but lower than the group of students whose score places them in 51st percentile).

<sup>10</sup> For a more detailed explanation see: "Making Sense of NCEs and Standard Errors" by Pennsylvania Department of Education available at: <https://www.education.pa.gov/Documents/K-12/Assessment%20and%20Accountability/PVAAS/Methodology/MakingSenseOfNCEsAndStandardErrors.pdf>

The comparison of Winter-to-Spring performance we originally reported and the NCE-based analysis shows that the direction of change from 2019-20 Winter to 2020-21 Spring was always consistent between the two methods. Any improvement or decline in performance with average NPR-based analyses was still an improvement or decline in performance when NCE conversions were used.

There was variation in the magnitude of the reported change between performance in the two assessment windows; however, the reported changes based on average NPR and average NCE-based NPR was within 1 percentile. The highest NPR/NCE-based NPR difference in the 2019-20 Winter to 2020-21 Spring analysis was for students who were in Kindergarten in 2019-20 and first grade in 2020-21. The 16-percentile Winter-to-Spring decline they experienced between the two testing windows was more pronounced; it translates to a 24-percentile decline when NCE conversions are applied. Aside from this student group, the next-highest difference between average NPR and average NCE-based NPR Winter-to-Spring performance was 4 percentiles.

Figure B.1. Normal Curve, Percentiles, and Normal Curve Equivalents



Source: Public Domain, <https://commons.wikimedia.org/w/index.php?curid=58891646>



Table B.1. Overall aimswebPlus Reading NPR and NCE-based NPR for All Assessment Windows Analyzed

Cohort Analyzed	Number of students	Average 19-20 Winter NPR	Average 20-21 Window NPR	Average NPR Differential	Average 19-20 Winter NCE-based NPR	Average 20-21 Window NCE-based NPR	Average NCE-based NPR Differential	Average NPR-Average NCE-based NPR Difference
Winter-to-Fall	41145	33.66	27.29	-6.37	26.30	19.13	-7.17	0.80
Winter-to-Winter	40480	33.97	25.51	-8.46	26.77	16.96	-9.81	1.35
Winter-to-Spring	37832	34.38	26.57	-7.81	27.31	18.31	-9.00	1.19

**How to read this table:** This table shows the results for all students included in the aimswebPlus analyses in this series of cohort studies without any grade or subgroup break-outs. For example, the January 2021 Winter-to-next-Fall report analyzed performance for 41,145 students who were tested for aimswebPlus Reading in 2019-20 Winter and the 2020-21 Fall, the testing window analyzed in that report. These students had an average NPR of 33.66 in 2019-20 Winter and 27.29 in 2020-21 Fall, a .637 percentile decline. Then, we averaged the NCE scores for these students and calculated the NPR equivalents of the average NCE scores and found that the average NCE-based NPR was 26.30 for 2019-20 Winter and 19.13 for 2020-21 Fall, a .717 percentile decline.

The last column shows the difference between the two ways of calculating the improvement/decline between 2019-20 Winter and the 2020-21 window noted in the respective row. In this example, our original analysis based on NPR underestimated the Winter-to-next-Fall decline change by .8 percentiles.

### Winter-to-Spring aimswebPlus Reading Tables with NCE-based NPR Comparison

Table B.2. aimswebPlus Reading NPR and NCE-based NPR by Grade, 2019-20 Winter to 2020-21 Spring

Grade in 20-21	Number of Students	Average 19-20 Winter NPR*	Average 20-21 Spring NPR	Average NPR Differential	Average 19-20 Winter NCE-based NPR	Average 20-21 Spring NCE-based NPR	Average NCE-based NPR Differential	Average NPR-Average NCE-based NPR Difference
1	7102	43.00	27.20	-15.80	41.25	17.65	-23.60	7.80
2	8056	32.36	28.81	-3.55	22.85	19.91	-2.94	-0.61
3	8127	32.72	26.52	-6.20	25.30	18.51	-6.79	0.59
4	7551	31.87	25.55	-6.32	24.73	17.72	-7.01	0.68
5	6996	32.60	24.54	-8.06	25.05	17.60	-7.45	-0.61
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>	<b>27.31</b>	<b>18.31</b>	<b>-9.00</b>	<b>1.19</b>

Table B.3. aimswebPlus Reading NPR and NCE-based NPR by Race/Ethnicity, 2019-20 Winter to 2020-21 Spring

Race/Ethnicity	Number of Students	Average 19-20 Winter NPR*	Average 20-21 Spring NPR	Average NPR Differential	Average 19-20 Winter NCE-based NPR	Average 20-21 Spring NCE-based NPR	Average NCE-based NPR Differential	Average NPR-Average NCE-based NPR Difference
American Indian/Alaskan Native	54	29.22	23.00	-6.22	22.21	15.80	-6.41	0.19
Asian	3724	47.65	38.67	-8.98	45.53	34.24	-11.30	2.31
Black/African American	17008	31.02	22.60	-8.42	23.75	14.67	-9.08	0.66
Hispanic/Latino	9342	26.06	20.27	-5.79	17.45	12.11	-5.33	-0.46
Multiracial/Other	1471	41.33	32.77	-8.56	36.78	25.57	-11.20	2.65
Native Hawaiian/Pacific Islander	58	38.86	32.29	-6.57	32.55	25.55	-7.00	0.43
White	6175	46.56	38.27	-8.29	43.87	32.37	-11.50	3.20
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>	<b>27.31</b>	<b>18.31</b>	<b>-9.00</b>	<b>1.19</b>

Table B.4. aimswebPlus Reading NPR and NCE-based NPR by English Learner Status, 2019-20 Winter to 2020-21 Spring

English Learner Status	Number of Students	Average 19-20 Winter NPR*	Average 20-21 Spring NPR	Average NPR Differential	Average 19-20 Winter NCE-based NPR	Average 20-21 Spring NCE-based NPR	Average NCE-based NPR Differential	Average NPR-Average NCE-based NPR Difference
Non-English Learner	32165	36.63	28.04	-8.58	30.45	19.98	-10.47	1.89
English Learner	5667	21.64	18.23	-3.41	13.02	10.54	-2.48	-0.93
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>	<b>27.31</b>	<b>18.31</b>	<b>-9.00</b>	<b>1.19</b>

Note: English Learner status as of Spring 2020-21.

Table B.5. aimswebPlus Reading NPR and NCE-based NPR by Economic Disadvantage, 2019-20 Winter to 2020-21 Spring

<b>Economic Disadvantage Status</b>	<b>Number of Students</b>	<b>Average 19-20 Winter NPR*</b>	<b>Average 20-21 Spring NPR</b>	<b>Average NPR Differential</b>	<b>Average 19-20 Winter NCE-based NPR</b>	<b>Average 20-21 Spring NCE-based NPR</b>	<b>Average NCE-based NPR Differential</b>	<b>Average NPR-Average NCE-based NPR Difference</b>
Economically Disadvantaged	29068	31.02	23.43	-7.59	23.42	15.31	-8.12	0.52
Not Economically Disadvantaged	8764	45.53	37.02	-8.51	42.05	30.62	-11.43	2.92
<b>All Students</b>	<b>37832</b>	<b>34.38</b>	<b>26.57</b>	<b>-7.81</b>	<b>27.31</b>	<b>18.31</b>	<b>-9.00</b>	<b>1.19</b>