COVID-19 School Closures and Student Learning Loss
Prepared by the Department of Research & Performance Management

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Key Findings, Winter 2019 to Fall 2020 iReady

The closure of schools across the nation in spring 2020 due to the COVID-19 pandemic led to concerns about the amount of learning that would be lost by the time students returned to school in fall 2020. Most projections at the national or state level were hampered by lack of data that typically are used in estimates of learning loss. To get a better understanding of how SCS students fared, iReady diagnostic assessment data from winter 2019 were compared to the data from fall 2020.

- Administering iReady remotely to students in fall 2020 proved to be challenging. Diagnostic assessment results were likely not valid for students in grades K-2. These grade levels were removed from analyses of learning loss.
- In ELA, median achievement percentiles increased from winter 2019 to fall 2020 for all grade levels, except for students moving from grade 4 to 5. Median percentiles were still quite low, ranging from 29 to 39.
- At all grade levels, and for all subgroups, more students showed an increase in their ELA percentile rank than those who showed a decrease.
- In math, there was more evidence of learning loss. Median percentiles increased for three grade levels and decreased or remained unchanged for the other three. Again, the median percentiles in fall 2020 were low, ranging from 27 to 38.
- Reflecting the mixed picture in math median percentiles, analyses revealed that more students had decreases in percentile rank for many grade levels and subgroups compared to the number of students with increased percentile ranks.

Learning Loss Overview

In K-12 education, learning loss is the phenomenon of students losing proficiency of skills and concepts they had previously mastered after a long break from instruction. Learning loss can occur after any extended absence and has been linked to excessive absences by either the student (Garcia and Weiss, 2018) or the teacher (Miller, 2012), absences due to suspension or expulsion (Arcia, 2006), and extended teacher strikes (Baker, 2011; Johnson, 2009). Learning loss that most commonly occurs happens over the summer months when schools close each year. Summer learning loss is a well-documented occurrence (e.g., Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996) and of concern to educators because, at the beginning of each school year, teachers must spend time re-teaching concepts and skills from the previous grade level before they can move on to grade-level instruction.

When the COVID-19 pandemic forced schools to close in March 2019, conversations about how the lengthy closures would impact students' retention of the information and skills they had learned became frequent and more relevant as school districts tried to prepare for the return of students at the beginning of the 2020-21 school year. News articles reported that school districts across the country were anticipating drastic levels of student learning loss. An analysis by the Center for Research in Education Outcomes (CREDO) at Stanford University estimated that in Tennessee students would lose an average of approximately three months in reading and approximately five months in math due to COVID-19 school closures (Raymond, 2020).

In another study conducted by McKinsey & Company, Dorn, Hancock, Sarakatsannis, and Viruleg (2020) used statistical modelling to estimate COVID-19 learning loss due to remote learning versus in-person classes, student race, and student socioeconomic level. Estimates were based on the assumption that students would be able to return to in-person classes in January 2021. Typical high school students were estimated to lose anywhere from 3-14 months of learning depending on the quality of remote learning and instruction (average quality: 3-4 months lost; low quality: 7-11 months lost; no remote instruction: 12-14 months lost). Based on greater risks students of color and low-income students face in accessing quality remote instruction, the modeling estimated that Black students would suffer an average 10.3 months of learning loss, Hispanic students 9.2 months, and low-income students 12.4 months.

Given these stark projections, it is helpful to examine learning loss of SCS students so the District can understand the academic challenges presented by the COVID-19 pandemic. Unfortunately, there is a paucity of SCS student data for the 2019-20 school year. No year-end testing occurred in spring 2020, including TNReady state achievement tests, MasteryConnect formative assessments, and iReady diagnostic assessments. The last student assessment data available from the 2019-20 school year were from the winter assessment windows. MasteryConnect formative assessments were administered December 2-19, and the iReady diagnostic assessments and Illuminate universal screeners were both administered January 13-31.

However, if analyses of COVID-19 learning loss are conducted similarly to analyses of summer learning loss, student assessment scores from winter 2019 can serve as pretest or baseline scores and be compared to assessment scores from the beginning of the school year in fall 2020. Thus, COVID-19 learning loss would be evaluating an approximate 5 1/2-month gap that SCS students and teachers faced before school began this year in the end of August 2020 in an entirely virtual format.

Student assessment data available from the beginning of the 2020-21 school year consist of a specially-designed MasteryConnect comprehensive diagnostic assessment and the iReady diagnostic assessment. Of those, only the iReady diagnostic assessment is suitable for an analysis of student learning loss. MasteryConnect assessments are not comparable over time due to the different standards being assessed during each assessment window. (The first Illuminate universal screener was not administered until October which was after school had been in session for several weeks. Thus, student scores from this assessment would likely reflect learning levels that benefitted from instruction.)

Approaches to Measuring Learning Loss

Learning loss or gain is usually measured in one of two ways and depends on the types of data that are available. One approach examines absolute measures of change and the second examines relative measures of change (Cooper et al., 1996). The formulas for both approaches use pretest (or baseline) scores and compare them to posttest scores. Absolute measures of change focus on changes in raw score. An example is baseline/posttest measures of the same spelling words. A student might spell 9 of 12 words correctly on a baseline assessment just prior to winter break. Immediately after break, if the student is assessed on the same 12 words and spells 7 correctly, the difference between 7 (posttest score) and 9 (baseline score) is the amount of learning loss of spelling that occurred during the winter break. By contrast, relative measures of change compare a student's baseline and posttest scores to another measure, such as the percentile ranks to which they equate.

Measures of learning loss or gain then examine the difference between the percentile ranks at the two different test times.

iReady diagnostic assessments report an overall scale score for each student as well as the comparable percentile rank which is based on a national sample drawn from school districts that use the iReady diagnostic. Both the scale score and the percentile rank provide information on learning loss or gain in terms of relative change. As percentile ranks are more easily interpreted, they were used for the analyses in this report.

SCS COVID-19 Learning Loss Analyses

iReady data were examined in two different ways to get as full a picture as possible about learning loss in the District as a result of the COVID-19 pandemic. First, to gain an understanding of where students of different grade levels began the 2020-21 school year compared to the previous year, the median iReady percentiles in English Language Arts (ELA) and Math for fall 2019 and fall 2020 were calculated for each grade level. Percentile ranks provided by iReady compare a student's score to that of a nationally-based sample of test takers. A percentile rank of 60, for example, would mean that the student scored better than 60% of the students in the national sample. A median percentile identifies the rank at which half the students scored above and half scored below. Therefore, examining the median percentile ranks for each grade level will provide a picture of how the group of students in each grade level compared to the national sample.

The first table below presents median percentiles for ELA scores. The first row in the second column shows that the median percentile was 29 for incoming Kindergarten students in Fall 2019. This means that half the students scored below the 29th percentile and half scored above. By comparison, the median percentile reported in fall 2020 was the 91st percentile, indicating that half the incoming Kindergarten students scored below the 91st percentile and half scored above.

For all grade levels, except grade 5, the median iReady ELA percentile was higher in fall 2020 than winter 2019. Notable are the drastic jumps in median percentiles for grades K and 1 that raise doubts that students in those grade levels completed the iReady diagnostic assessment this year unassisted by adults or other more advanced readers. They also underscore one of the difficulties with virtual instruction and learning which is ensuring that assessments of student performance are valid measures of actual mastery.

iReady Diagnostic ELA Median Percentiles by Grade by Year		
Grade	**Fall 2019**	**Fall 2020**
Kindergarten	29 (N=6,294)	91 (N=6,049)
Grade 1	38 (N=6,820)	61 (N=6,800)
Grade 2	32 (N=6,804)	45 (N=6,957)
Grade 3	30 (N=6,893)	41 (N=6,899)
Grade 4	35 (N=6,563)	36 (N=7,033)
Grade 5	33 (N=6,700)	32 (N=6,892)
Grade 6	22 (N=4,748)	37 (N=5,858)

Grade 7	21 (N=4,376)	31 (N=5,994)
Grade 8	22 (N=4,150)	31 (N=5,877)

The analysis of math scores shows a similar pattern to ELA. Generally, median percentiles in fall 2020 were higher than those in fall 2019, with the exception of grades 4 and 5. Again, there was a large increase in median scores for grades K and 1, raising questions about the validity of the fall 2020 scores.

iReady Diagnostic Math Median Percentiles by Grade by Year		
Grade	**Fall 2019**	**Fall 2020**
Kindergarten	25 (N=6,137)	88 (N=5,952)
Grade 1	36 (N=6,660)	64 (N=6,725)
Grade 2	34 (N=6,754)	41 (N=6,930)
Grade 3	41 (N=6,840)	41 (N=6,887)
Grade 4	34 (N=6,572)	32 (N=7,032)
Grade 5	33 (N=6,719)	29 (N=6,880)
Grade 6	23 (N=4,809)	33 (N=5,937)
Grade 7	23 (N=4,524)	28 (N=6,016)
Grade 8	23 (N=4,184)	30 (N=5,908)

The second analysis of iReady scores examined the change in percentile rank for matched students who were assessed both in winter 2019 before schools closed due to the pandemic and in fall 2020 when schools opened this year. Given the findings above, and the dubious nature of the fall 2020 scores for grades K and 1, subsequent analyses are limited to students who were in grades 3-8 in fall 2020.

In an attempt to further establish data validity, the difference between each student's winter 2019 and fall 2020 percentile ranks was calculated. Any student whose percentile ranks differed by 50 or more percentile points was removed from the analyses, as the likelihood of having such a large change in eight months is low. For ELA, 190 students in grades 3-8 had scores that decreased from winter 2019 to fall 2020 by 50 percentile points or more, and 945 students demonstrated increases greater than or equal to 50 percentile points. These 1,135 students represented 3.3% of all student in grades 3-8 with matched ELA scores, and were removed from all subsequent ELA analyses.

The same criteria were used to determine the student sample to be used for iReady Math analyses. Only students in grades 3-8 in Fall 2020 with iReady Math diagnostic scores in both the winter 2019 and the fall 2020 assessment windows were included. The pool was further limited by removing students whose percentiles for these two assessments differed by 50 or more percentile points. One hundred eighty (180) students had scores that decreased by 50 percentile points or more from winter 2019 to fall 2020, and 716 students had scores that increased by 50 or more percentile points.

These 896 students, representing 2.6% of the students in grades 3-8 with matched assessment scores, were removed from all subsequent analyses of iReady reading.

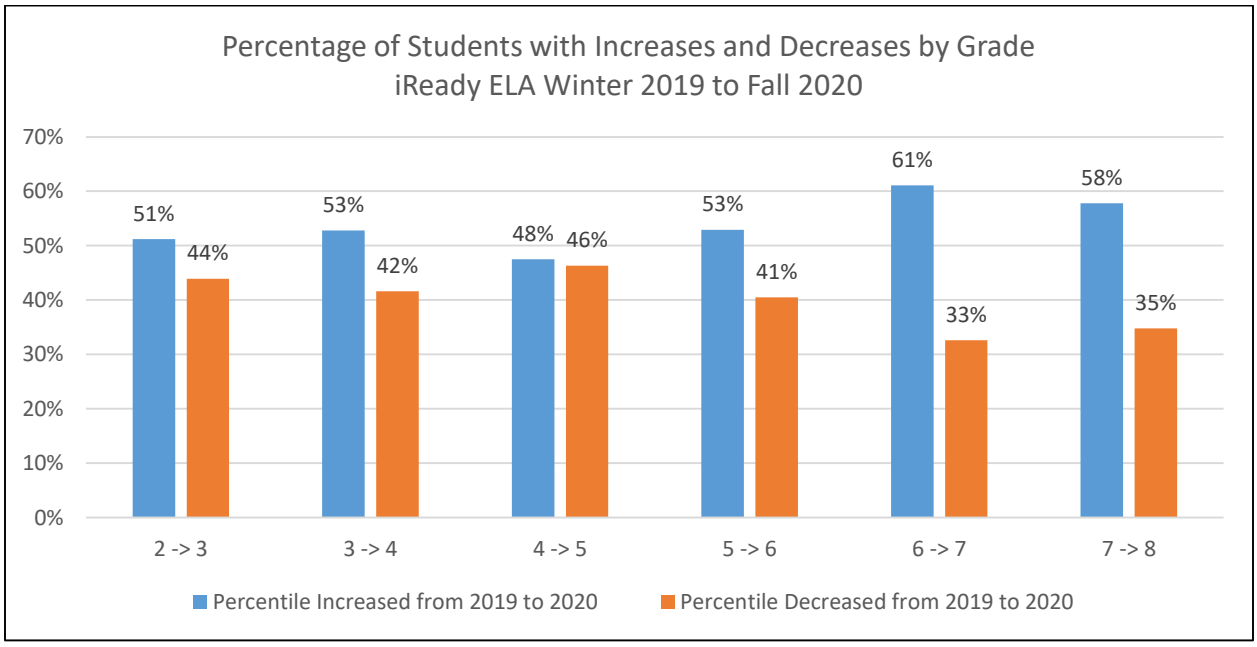
Thus, for all further analyses in both ELA and Math, scores were included only if students were in grades 3-8 in fall 2020 and had a change in percentile rank of less than 50 percentile points (in either direction) between the winter 2019 and fall 2020 assessment windows.

Changes in iReady ELA Scores from Winter 2019 to Fall 2020

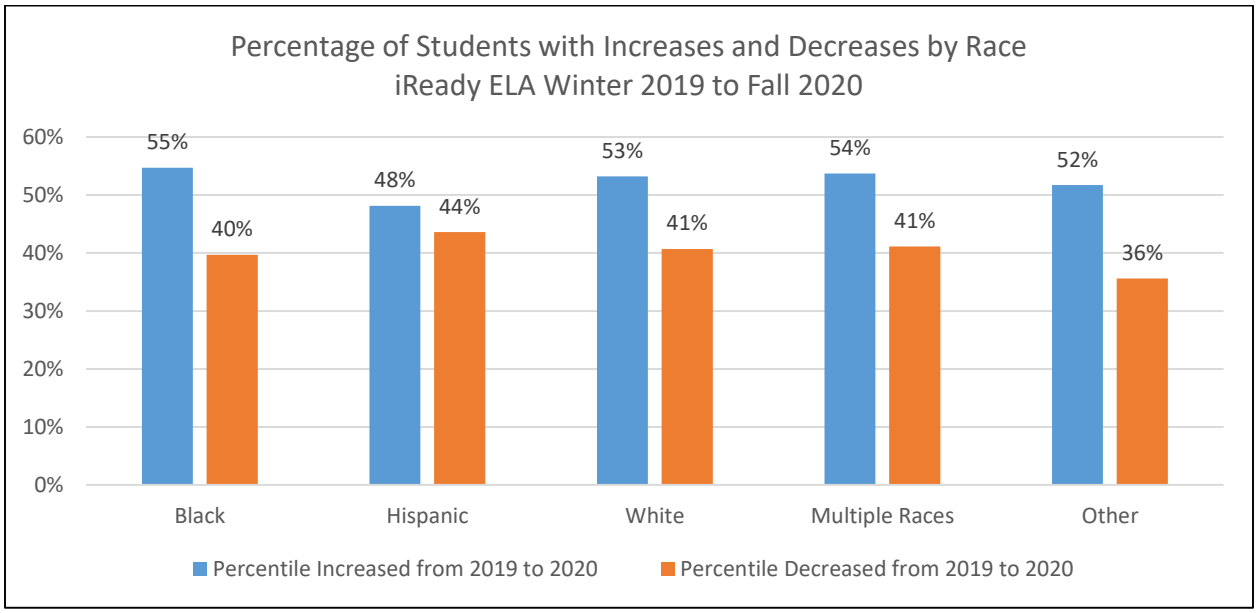
The iReady ELA median percentiles for each grade level are presented in the table below. For all grade levels, with the exception of students moving from grade 4 to 5, the median percentiles increased from winter to fall. The increase for students shifting from grade 6 to 7 and grade 7 to 8 were more marked than for students in elementary school.

iReady Diagnostic ELA Median Percentiles by Grade by Assessment Window			
Grade	**N**	**Winter 2019**	**Fall 2020**
2 -> 3	5,906	35	39
3 -> 4	6,266	35	36
4 -> 5	6,180	34	32
5 -> 6	5,110	34	37
6 -> 7	4,787	23	30
7 -> 8	4,574	23	29

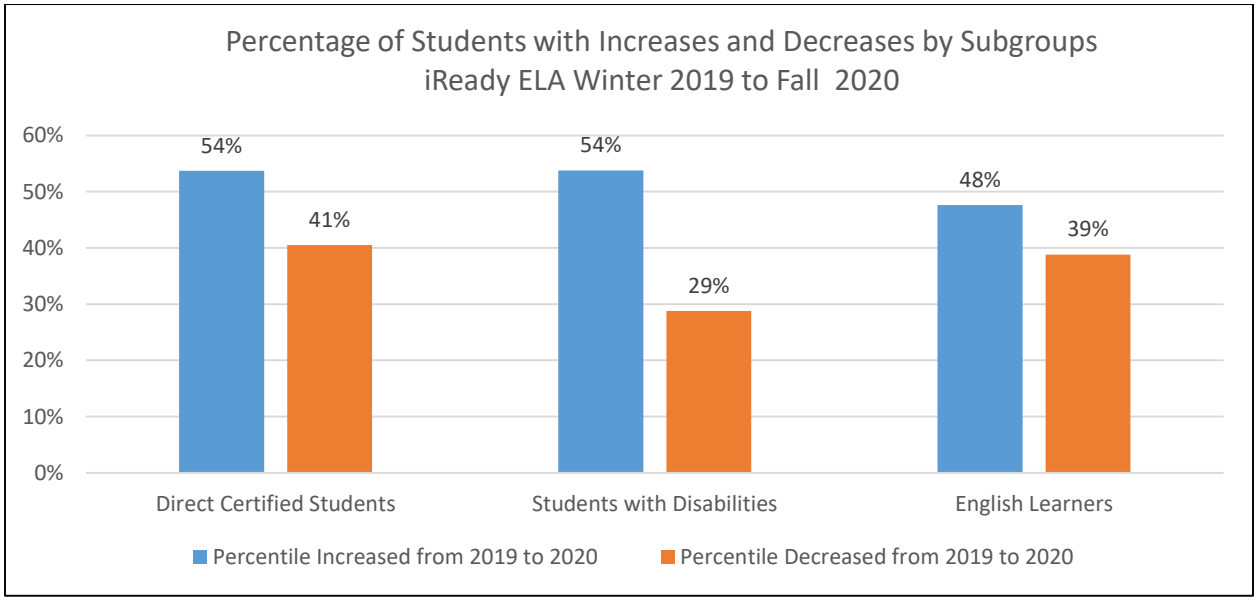
The graph below shows the percentage of students whose percentile ranks increased (blue bars) or decreased (orange bars) from winter to fall. (Students whose percentile rank stayed the same are not included in the graph.) For both grade 6 to 7 and grade 7 to 8 the majority of students' percentiles increased. This is consistent with the more marked increases in median percentiles for these grade levels. By contrast, in elementary school there was less difference in the percentage of students whose scores increased versus decreased, reflected by less drastic changes in median percentiles from the two assessment windows.



Additional demographic information is presented in the graphs below. For all races, a higher percentage of students demonstrated increased percentile ranks, although the percentage of Hispanic students with increased versus decreased percentile ranks was more equal compared to other race subgroups.



Direct certified students, students with disabilities, and English learners followed the same pattern with a higher percentage of students with increases in percentile ranks in ELA from winter 2019 to fall 2020.



The data from ELA look hopeful in that many students demonstrated increases in percentile rank from winter 2019 to fall 2020 despite school closures and virtual school due to COVID-19 concerns. However, two factors should give District leaders pause in interpreting these results. First, the median

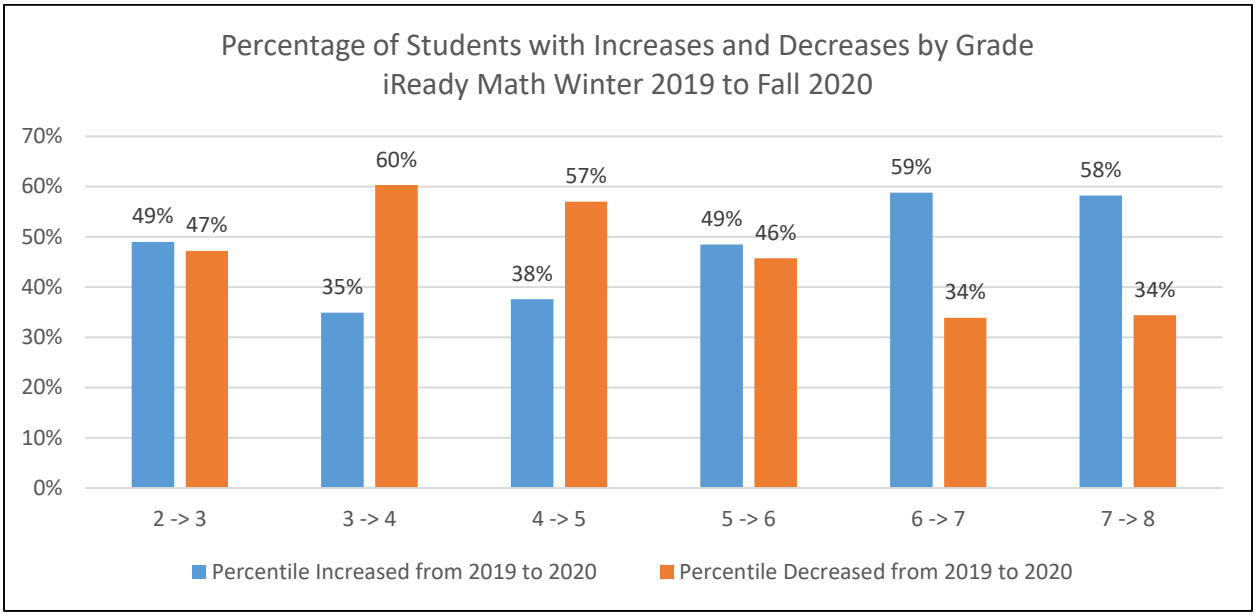
percentiles in fall 2020, while higher than winter 2019, are still quite low. The highest median percentile is for grade 3 at the 39th percentile. Half the students in grade 3 are performing below the 39th percentile. The medians are lower for other grade levels. Thus, although students are doing better than last winter, they are still performing quite low compared to the national sample. Second, it is important to keep in mind the percentage of students whose percentile rank decreased. Thirty to forty percent (30% - 40%) or more of students showed declines in percentile rank from winter to fall.

Changes in iReady Math Scores from Winter 2019 to Fall 2020

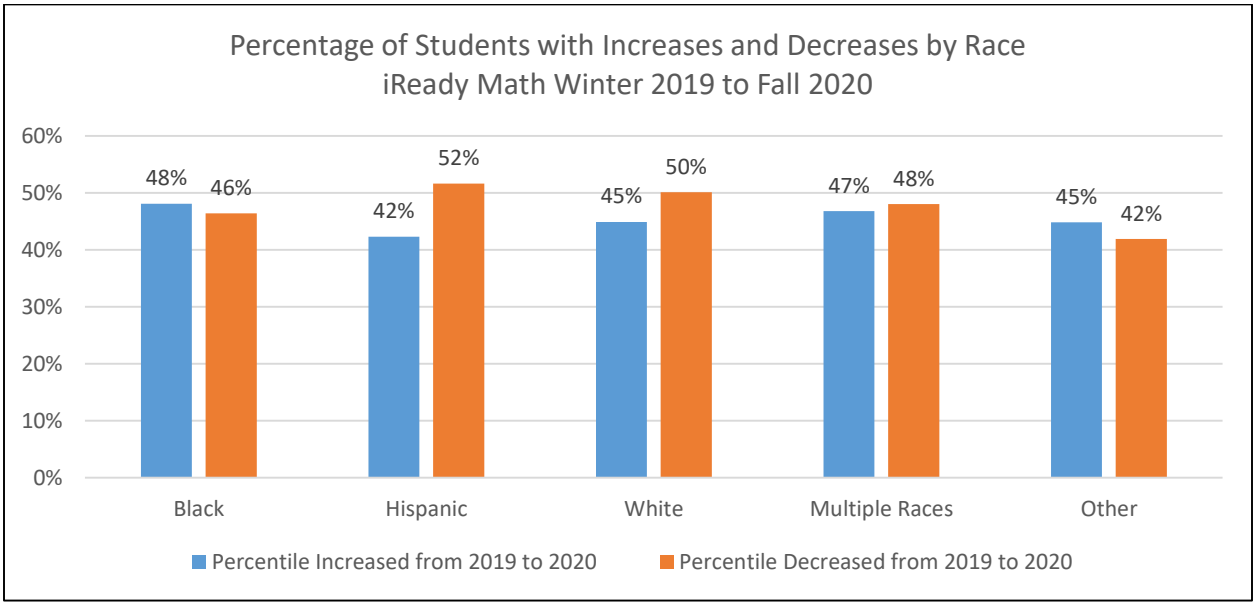
The iReady Math median percentiles show a bit more variation than the ELA median percentiles. Increases in median percentiles were observed for students moving from grade 2 to 3, grade 6 to 7, and grade 7 to 8. Decreases in median percentiles were seen for students shifting from grade 3 to 4 and grade 4 to five, while students moving from grade 5 to 6 had the same median percentile in winter 2019 and fall 2020.

iReady Diagnostic Math Median Percentiles by Grade by Assessment Window			
Grade	**N**	**Winter 2019**	**Fall 2020**
2 -> 3	5,892	36	38
3 -> 4	6,334	38	32
4 -> 5	6,249	34	29
5 -> 6	5,233	34	34
6 -> 7	4,756	23	27
7 -> 8	4,772	26	30

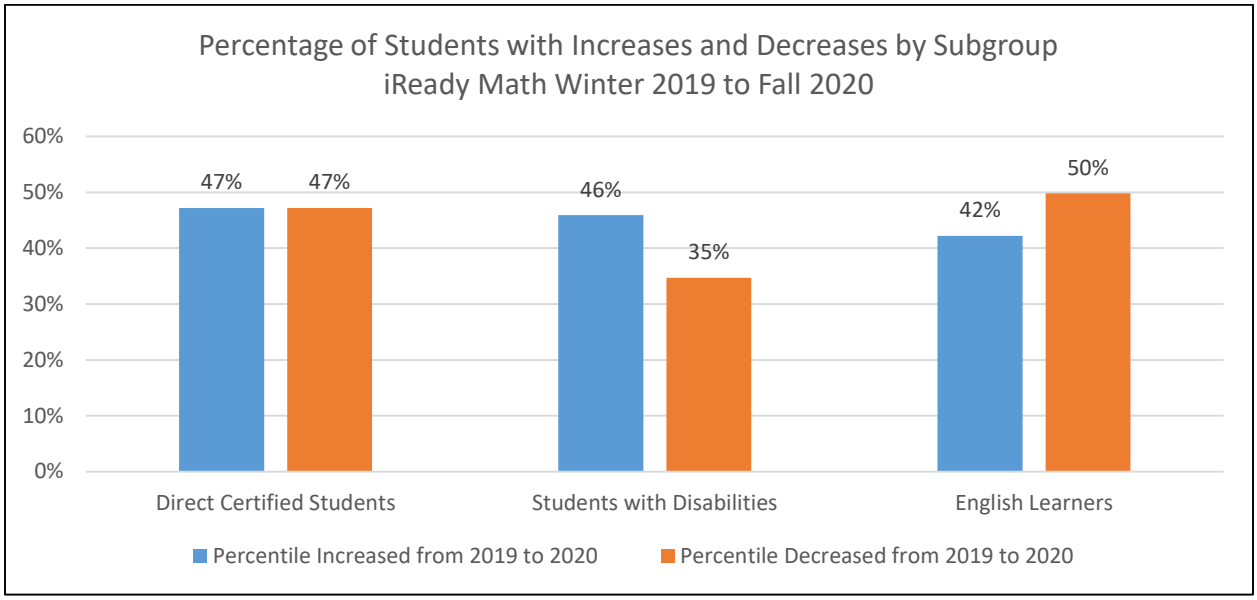
Again, the percentage of students whose percentile ranks increased or decreased was examined. More students demonstrated decreases (orange bars) in their percentile ranks for grade 3 to 4 and grade 4 to 5 while fewer students had increased percentile ranks for these grades. The opposite is true of grade 6 to 7 and grade 7 to 8 where more students demonstrated increases (blue bars) in percentile rank from winter 2019 to fall 2020, and fewer demonstrated decreases. These changes mirror the median percentile changes by grade in the table above.



When examining the subgroups of race, a different pattern emerged in math compared to ELA. A higher percentage of students who identified as Hispanic, White, or Multiple Races, had a decrease in percentile rank from winter 2019 to fall 2020, whereas a higher percentage of Black students or students of other races had an increase in percentile rank.



An equal percentage of direct certified students had an increase in percentile rank as those who had a decrease. A higher percentage of students with disabilities demonstrated an increase in percentile rank; however, a higher percentage of English learners demonstrated a decrease in percentile rank in math.



The data for math show a more severe picture compared to ELA. More students moving from grade 3 to 4 and grade 4 to 5 actually had lower a percentile rank in fall than the previous winter compared to the number of students whose percentile rank increased. This same pattern was seen in race and other demographic subgroups as well. Additionally, the median percentiles at the different grade levels are low, ranging from 27 for grade 7 to 38 for grade 3.

Conclusion & Recommendations

Analyzing all students' iReady diagnostic assessment data from winter 2019 to fall 2020, at first glance, suggests that SCS students did not suffer much academically in ELA and math as a result of schools closing last spring due to the COVID-19 pandemic. However, further inspection of the data suggests that fall diagnostic results for students in grades K-2 are probably not valid. It appears that many young students may have received adult assistance on the diagnostic since the assessment was administered remotely. To help ensure data validity, suspect assessment results (all K-2 students and any student whose winter 2019 and fall 2020 percentile ranks differed by 50 or more percentile points in either direction) were removed from all subsequent analyses.[1]

With the resulting data, findings revealed that, for ELA, across all grade levels and all subgroups, the percentage of students whose percentile rank increased from winter to fall was greater than the percentage of students whose percentile rank decreased over this time period. For math, the picture was less clear. In some grades and subgroups, a higher percentage of students demonstrated increases in percentile rank, but the opposite was true for others. This mixed picture suggests that the District must proceed carefully in assessing student achievement and progress this school year.

[1] While these measures help, it may be that there were other factors that also affected student scores that cannot be controlled. For example, some older students may have used the internet to help find answers during the remote diagnostic assessment administration. The extent to which this may have occurred is unknown, as is the impact it may have had on the assessment results overall. However, it serves as another reminder for the District to interpret findings with caution.

Unfortunately, there is not a more complete picture of how much learning was lost due to COVID-19 school closures. In all likelihood, it is a question that will not be answered. A recent article in *Chalkbeat* (Barnum, 2020) suggests exactly that. Further, it cautions both school districts and state and federal Departments of Education to understand the limitations of learning loss projections, such as the analyses done by CREDO or McKinsey & Company. In addition to spring assessment scores, much of the data needed to fully examine the impact of COVID-19 on student learning gains and losses are not available. Information on influencing factors mostly exists anecdotally.

SCS worked diligently to help students and families overcome potential obstacles that might inhibit learning, including providing digital devices for all students to help with remote instruction, distributing internet hotspots to assist with connectivity challenges, and providing to-go meals for students. Some challenges, however, are largely out of the purview of the District (or any school district), such as families facing the financial and emotional tolls of lost jobs, family illness, or family deaths due to COVID-19. Still others must be navigated carefully, such as when family expectations of students' responsibilities during remote learning do not align with District expectations (e.g., when older students are expected to assist or care for younger siblings who are at home while they are in class).

SCS can continue to make strides to support students throughout the 2020-21 academic year. Although they do not provide the whole picture of COVID-19 learning loss, the iReady analyses can be used to help the District address current challenges. In light of what the analyses reveal, the following approaches are recommended.

Recommendation 1 – Use available data to provide additional context to help interpret iReady findings. For example, according to the analyses, more students at each grade level and in each subgroup demonstrated increases in iReady percentile ranks in ELA than decreases. While this seems hopeful, examining the median percentiles for each grade level show that performance of many students is still quite low. Assessment results from MasteryConnect and Illuminate can provide additional information on individual student progress. Class assignments and assessments can also identify student strengths and areas of need.

Recommendation 2 – In an attempt to ensure valid assessment results, the District should reinforce with parents and students its expectations and the appropriate protocols for virtual assessments, including classroom assessments, formative assessments, and diagnostic assessments. Teachers should be kept abreast of these communications so they are fully able to serve as a resource for families who have questions about assessment protocols.

Recommendation 3 – District staff and teachers should delve into the data and identify the students who showed decreases in their iReady percentile ranks from winter 2019 to fall 2020. Although several students showed gains, a large percentage of students lost ground. These students should be supported to enhance their academic progress this year and monitored to pinpoint where additional support would be most useful. Supporting students may look different this year. In a time when teachers are facing unprecedented challenges as they work to educate students, they most likely will have to do even more to draw on their expertise to devise additional effective ways to support students in academic need.

Recommendation 4 – The District should understand that the question of learning loss due to COVID-19 may never be answered fully. It may well be that assessment data from this year should be used as a new baseline for student progress. District efforts may best be spent supporting all students

who are below grade level regardless of whether there was learning loss from last year to this fall. As noted above, supporting students may look different this year. Many teachers are facing multiple challenges as they work in the current educational setting. It is important to keep in mind that many students and families are also facing extreme challenges that impact academic success. The District's extended support of students and families may need to continue for several years as the nation recovers from the COVID-19 pandemic.

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Key Findings, Fall 2020 to Winter 2021

In fall 2020, student learning loss was analyzed by examining student iReady diagnostic data in ELA and math from last year (winter 2019) and the beginning of this year (fall 2020). This report updates those analyses by comparing student iReady diagnostic data from the two administrations so far this school year, fall 2020 and winter 2021. Findings include the following:

- Fall median achievement percentiles were higher than winter median percentiles for all grades (K-8) in both ELA and math.
- As with the original report, students whose percentile ranks changed by 50 or more percentile points (either increasing or decreasing) were removed from further analyses. 8% of students in ELA (4,158) and 9% of students in math (4,652) were removed for this reason.
- Analyses that examined matched students only, or those with test scores in both fall and winter, also revealed that median percentiles decreased from fall to winter for all grade levels and both ELA and math.
- The percentage of students whose individual percentile ranks increased from fall to winter was less than the percentage of students whose individual percentile ranks decreased. This was true for both ELA and math across all grade levels (K-8), priority groups, and races.

Finding 1: Median Achievement Percentiles on the iReady Diagnostic Decreased from Fall to Winter

Student scores from fall 2020 and winter 2021 were analyzed to track student progress in ELA and math during the 2020-21 school year. In ELA, median achievement percentiles decreased across all grade levels (K-8). Some drops were expected, especially in grades K-2 where fall median percentile scores were unusually high and likely due to adult assistance on the assessment at the beginning of the year.

iReady Diagnostic ELA Median Percentiles by Grade by Assessment Window		
Grade	**Fall 2020**	**Winter 2021**
Kindergarten	91	67
1	61	42
2	45	35
3	41	30
4	36	27
5	32	26
6	37	28
7	31	23
8	31	24

The same pattern was also found in math. Median achievement percentiles decreased for all grade levels from fall to winter.

iReady Diagnostic Math Median Percentiles by Grade by Assessment Window		
Grade	**Fall 2020**	**Winter 2021**
Kindergarten	88	67
1	64	43
2	41	33
3	41	27
4	32	24
5	29	22
6	33	25
7	28	23
8	30	25

Finding 2: Just Under 10% of Students in ELA and Math had Individual Percentile Ranks that Differed by 50 Percentile Points or More in Fall and Winter

To help maintain data validity for subsequent analyses, students whose percentile ranks differed by 50 percentile points or more in either direction (i.e., increased or decreased) were removed from the analyses. In ELA, 1,026 students demonstrated such an increase and 3,132 students displayed this level of decrease. These 4,158 students comprised 8% of all K-8 students with matched scores who took the ELA iReady diagnostic. In math, 1,337 students' scores increased by 50 or more percentile points and 3,315 students' scores decreased for a total of 4.652 students, or 9% of all K-8 test takers with scores for both fall and winter. Analyses reported below were conducted without these student scores.

Finding 3: Median Achievement Percentiles for Matched Students also Decreased from Fall to Winter for Both ELA and Math

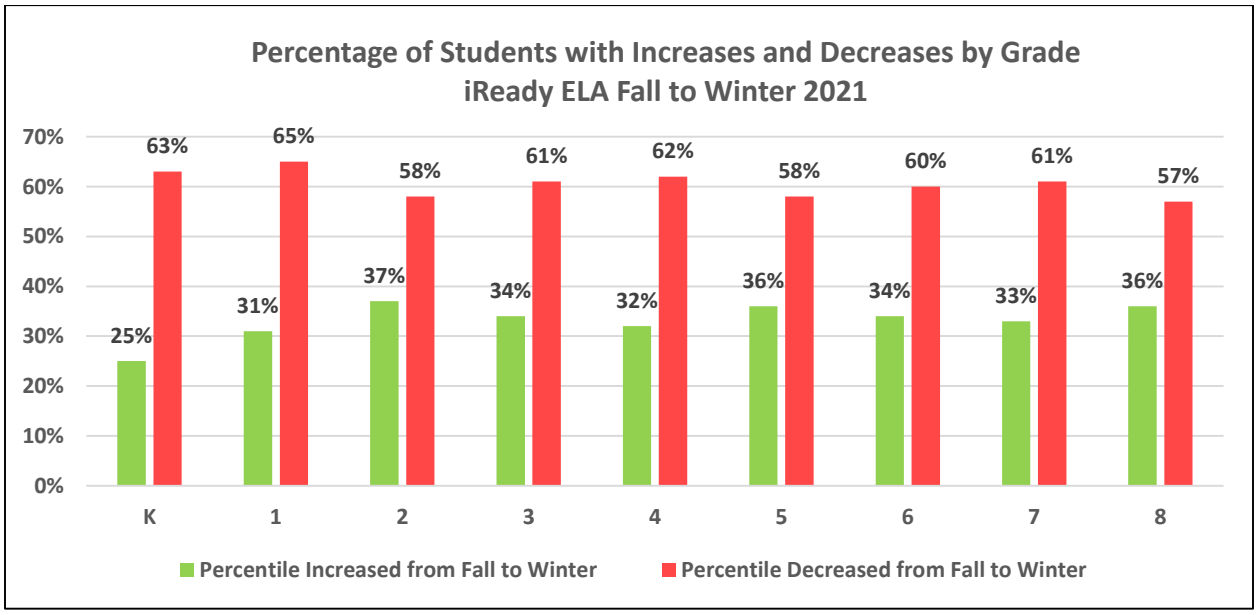
After removing the outlier scores described above, median achievement percentiles were recalculated only for matched students, or those with a test score from both fall and winter. These analyses revealed decreases in median percentiles for all grade levels for both ELA and math.

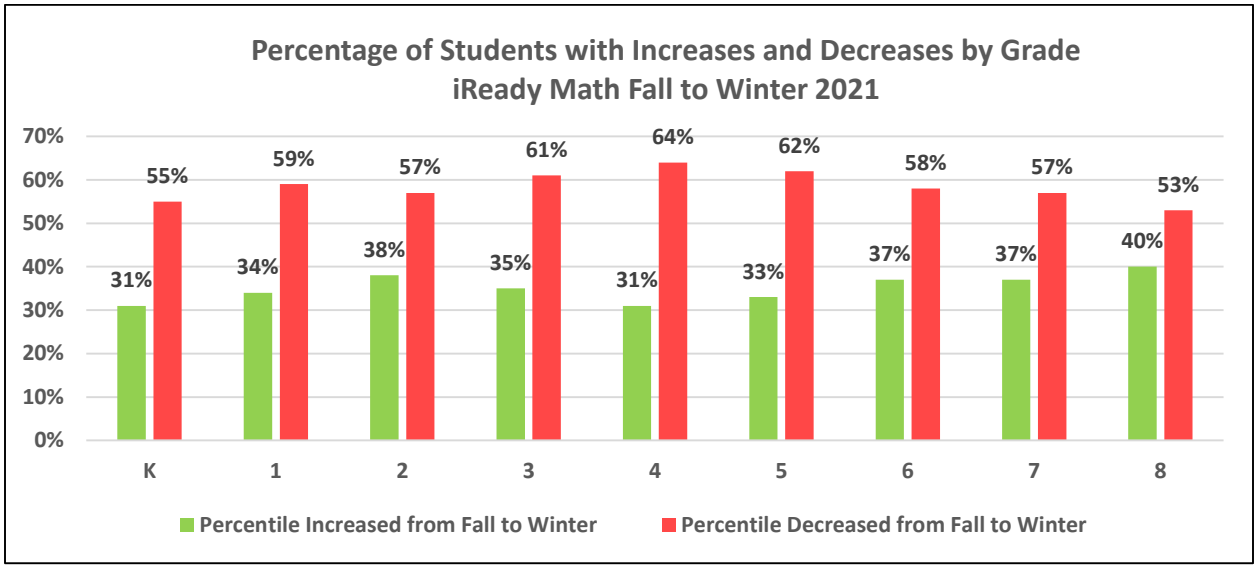
iReady Diagnostic ELA Median Percentiles by Grade by Assessment Window for Matched Students		
Grade	**Fall 2020**	**Winter 2021**
Kindergarten	90	75
1	53	51
2	44	37
3	40	32
4	36	28
5	32	26
6	37	29
7	32	25
8	32	25

iReady Diagnostic Math Median Percentiles by Grade by Assessment Window for Matched Students		
Grade	**Fall 2020**	**Winter 2021**
Kindergarten	86	75
1	57	53
2	40	37
3	40	29
4	32	24
5	29	22
6	33	26
7	30	24
8	33	28

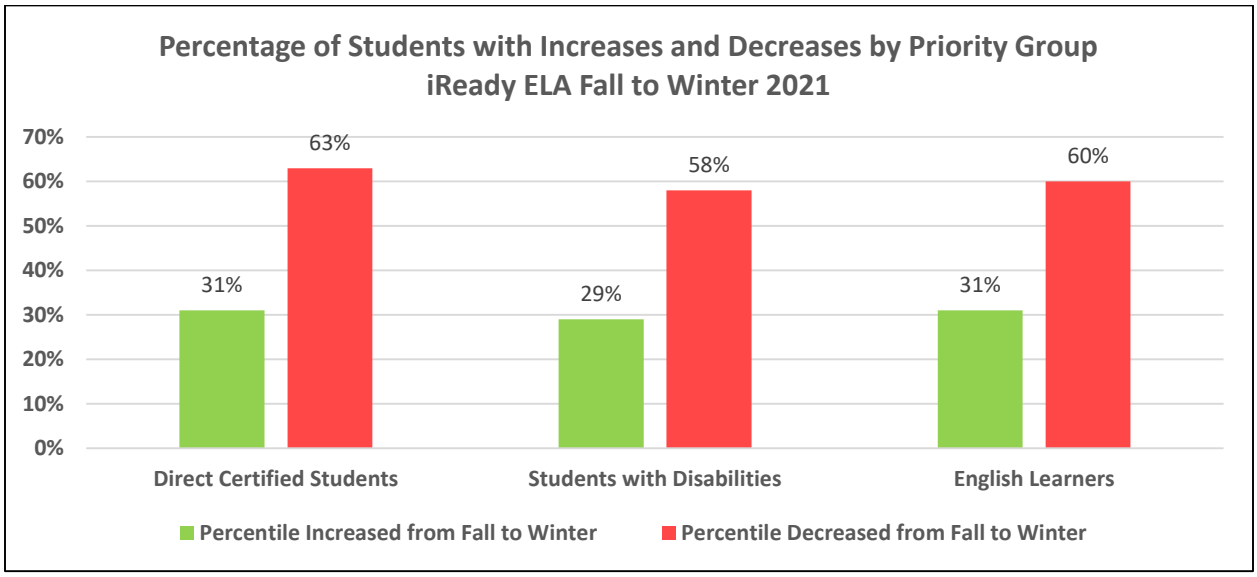
Finding 4: Comparisons of Individual Students' Percentile Ranks Show a Higher Percentage of Students with Decreases than Increases in Rank from Fall to Winter

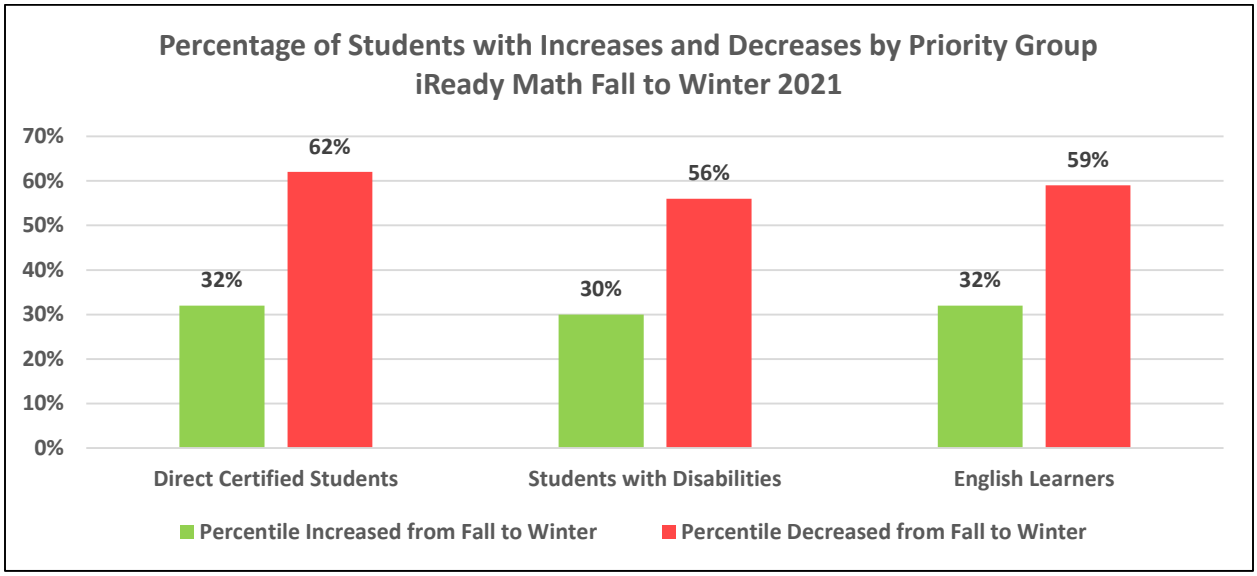
A final set of analyses examined the percentage of individual students whose percentile rank increased versus decreased from fall to winter. Across all grade levels, a higher percentage of students exhibited decreased percentile ranks than increased for both ELA and math.



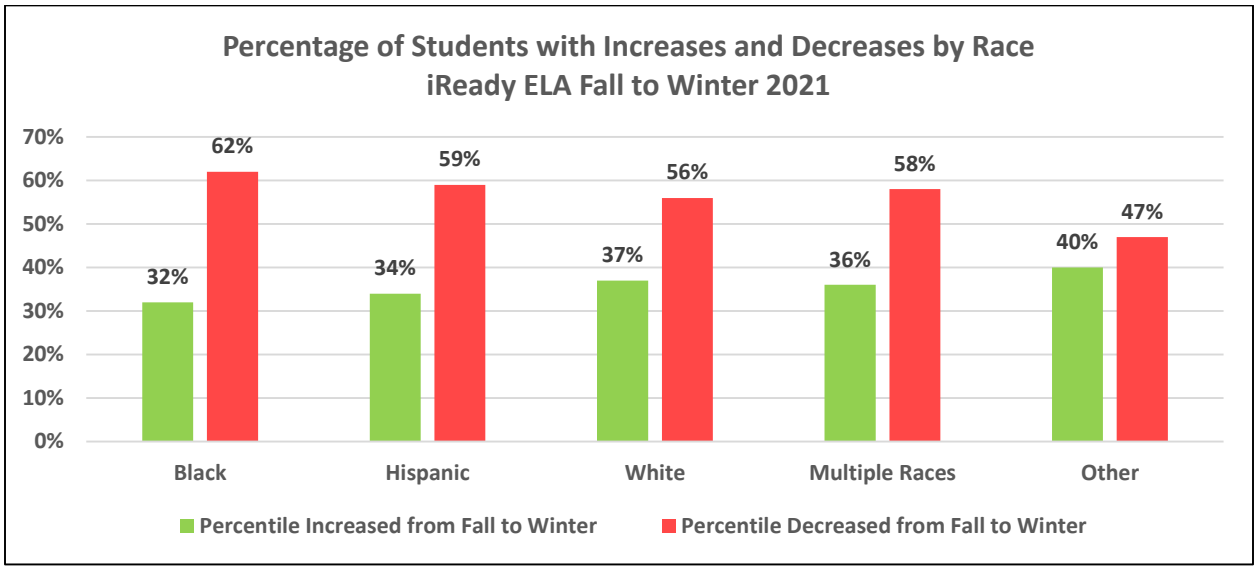


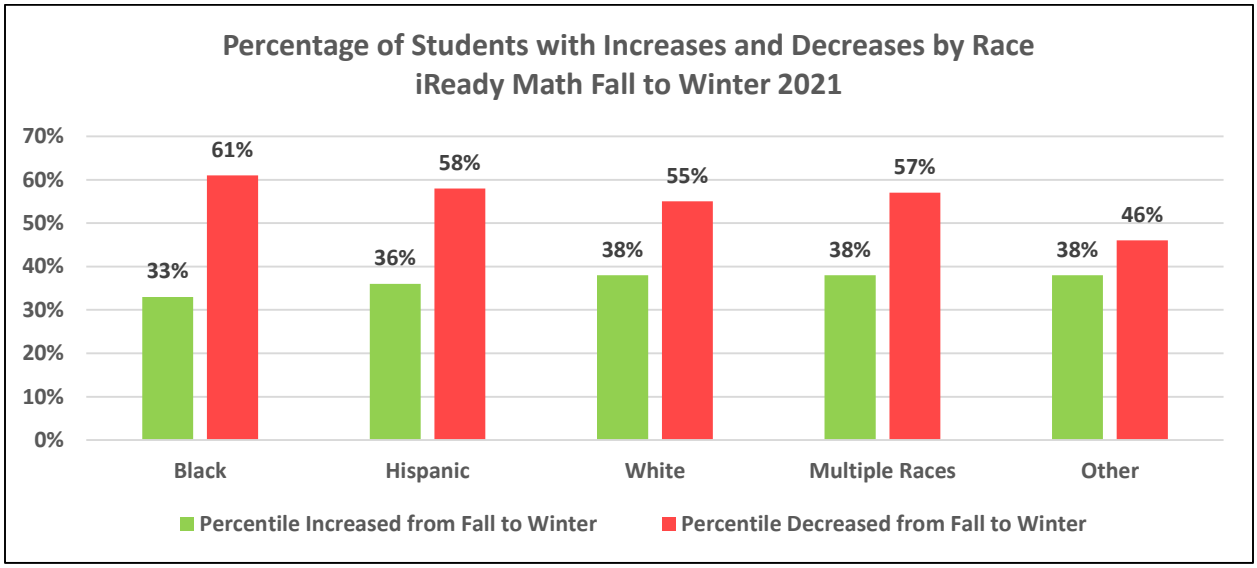
The same pattern held for students in priority groups (direct certified students, students with disabilities, and English learners) for both ELA and math.





The final analysis examining differences across race showed the same pattern for in both ELA and math.





Conclusion & Recommendations

The analyses above show that SCS students, as a whole, in grades K-8 performed less well on the winter 2021 iReady diagnostic assessment in both ELA and math than they did at the beginning of the school year. Some of the decreases are likely due to changes that occurred during assessments in student homes as schools emphasized the testing protocols and expectations for the virtual instruction and learning format. Other decreases, however, likely reflect students this year struggling to keep up with class instruction. Decreases may reflect difficulties students are having with the virtual learning format, but they also may reflect other struggles brought on by the pandemic, such as family loss of income, family illnesses, or family deaths.

As with all assessments this year, additional context can help interpret the findings. Schools should look to student performance on classroom assignments and classroom assessments to help understand their level of mastery of the curriculum content. It may be that some of the students who showed a decrease in their individual percentile rank from fall 2020 to winter 2021 are still performing at (or above) grade level. Likewise, approximately one third of K-8 students demonstrated individual increases in their percentile rank in ELA and math from fall 2020 to winter 2021. While this finding shows these students moving in the right direction, this group still should be examined by schools to determine whether they are on grade level or in need of additional academic support.

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