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Exploring Academic Outcomes in Arkansas Schools:

A Study of Four-Day School Week and Year-Round Calendar Districts

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Abstract:

In 2021, Arkansas's state legislature passed Act 688 allowing school districts to adopt non-traditional calendars. Districts could choose from four calendar options: traditional, four-day school weeks (4DSW), year-round calendar (YRC), and alternative. During the 2022-23 school year, 33 districts adopted new calendars; twenty-seven districts operated using a 4DSW, and six used a YRC. Several more districts adopted 4DSW in the 2023-24 school year. At present, thirty-four Arkansas districts use a 4DSW. This report used publicly available data from the Arkansas Department of Education to explore the relationship between adoption of a 4DSW or YRC and the following student outcomes: academic growth, academic achievement, and absenteeism. Using a quantitative analysis of multiple cohorts, the study found positive, and statistically significant results in student value-added growth in literacy for districts that adopted a 4DSW. Outside of this result, there were no discernable positive or negative effects for districts that adopted a 4DSW. Districts that adopted YRC, however, experienced more negative and statistically significant results. The findings underscore the complexity of non-traditional calendar adoption and the need for further research, particularly exploring individual district implementation strategies.

Keywords:

Four-Day School Weeks, Year-Round Calendars, Student Achievement, Academic Growth, Attendance

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I. Introduction

The traditional school calendar has been the standard in the US public education system for generations. In recent years, however, there has been a growing interest in exploring non-traditional calendars, such as four-day school weeks (4DSW) and year-round calendars (YRC). These alternative schedules may offer a range of potential benefits, including increased flexibility for students, families, and staff, as well as the prospect of cost savings for school districts.

In 2021, Arkansas's legislature passed Act 688, giving school districts flexibility in choosing calendars. As a result, several Arkansas districts adopted non-traditional calendars. In the 2022-23 school year, twenty-seven districts operated under a 4DSW, and six operated using a YRC. The number of districts using 4DSW continues to increase around the state. In the 2023-24 school year, thirty-four districts use a 4DSW calendar. The number of districts operating a YRC remains at six.

Previous Office for Education Policy research explored the motivations behind non-traditional calendar adoption. Our qualitative analysis found that the primary motivations for calendar adoption included increasing teacher recruitment and retention, improving the mental health of students and teachers, and targeting learning loss through block scheduling or increased time for interventions (Barnes & McKenzie, 2023). Additionally, district leaders discussed monitoring the evidence of the successful implementation of a new calendar through academic performance and student absenteeism. This report serves as a continuation of the research mentioned above. Using a quantitative analysis, we seek to answer the following question:

> **What changes were observed in student academic growth, academic achievement, and absenteeism after districts implemented a four-day school week or year-round calendar? Do these changes vary by student's socio-economic status?**

The report continues as follows: the structure of and prior research on non-traditional calendars, the context and methodology of the research, analysis results, and a conclusion, including a discussion of the findings and policy recommendations.

II. Structure and Prior Research of Non-Traditional Calendars

A traditional school calendar in Arkansas is structured for 178 school days from August to May. Schools divide the nine months into two semesters with a two-week winter break, a one-week break in the spring, and a twelve-week break in the summer. The structure of a four-day school week (4DSW) differs depending on the state or district. The most popular schedules hold classes Monday through Thursday or Tuesday through Friday. The fifth day is not required, but some districts offer enrichment or childcare opportunities. To meet state regulations for a minimum of 1,068 hours of instructional time, Arkansas districts operating with a 4DSW have longer school days compared to districts operating on the traditional calendar. Year-round calendars (YRC) have been more prevalent in the history of public education in the United States than the 4DSW. There is more variability in the structure of YRC compared to 4DSW. Typically, YRC features a shorter summer break than traditional calendars, with longer and more frequent breaks, called intersessions, throughout the school year. Despite being structured differently, Arkansas's YRC districts still operate with students in school for the same 178 days as the traditional calendar.

Although Arkansas districts have comparatively recent experience in adopting and implementing non-traditional school calendars, these calendar structures have been a consistent feature of the United States educational landscape since the 1960s (Pedersen, 2012). The enduring utilization of non-traditional calendars has enabled researchers to explore their impacts through a variety of investigative approaches. The sections below present the prior literature about 4DSW and YRC in regard to student growth, student achievement, and absenteeism.

Four-Day School Week

The outcomes of adopting a 4DSW on academic achievement and absenteeism have been a subject of growing interest in recent years. The existing literature reveals a nuanced picture, with studies presenting varying findings across different states and student populations.

Academic achievement has been a central concern of 4DSW research, with studies yielding mixed results. Anderson and Walker (2015) found statistically significant positive relationships between a 4DSW and reading and mathematics performance on the state-administered assessment among students in Colorado for grades 3-5. In contrast, Morton's (2021) analysis of district-level data from Oklahoma suggested negative, though statistically insignificant, average effects on standardized math and English Language Arts (ELA) achievement in grades 3-8. Thompson's (2021) study also indicated adverse average effects on standardized math and reading test scores for Oregon students in grades 3-8, attributing the decline, in part, to reduced instructional hours in four-day schools compared to their five-day counterparts. Additionally, Morton et al. (2023) completed a multi-state student-level analysis of the effects of 4DSW on student achievement and growth and found no significant negative effects on student growth for students in 4DSW districts. This study also yielded statistically significant negative effects on reading and math achievement for all students on the NWEA Growth Test. Morton's study also reports that the negative effects of a 4DSW are disproportionately larger in non-rural schools. A report from the Rand Corporation (2021) examined standardized estimates of student's academic achievement in five states for grades 3-8. Rand's study did not find adverse effects in terms of student achievement, but student growth did not increase at the same rates in 4DSW districts compared with similar districts using a traditional calendar.

As for absenteeism, anecdotal evidence suggests that the longer weekend associated with a 4DSW may lead to improved attendance due to flexibility for student activities and appointments (Thompson et al., 2021). However, empirical studies focusing on students in grades 3-8 by Anderson and Walker (2015) and Thompson (2021) utilizing a difference-in-differences strategy found no statistically significant effects on student attendance rates for students enrolled in 4DSW schools. Furthermore, the implementation of 4DSWs has been associated with considerations beyond the length of the school week, including daily start times. Although not extensively explored in existing literature, the timing of the school day may impact student outcomes. Variations in school start times could influence factors such as student fatigue and attendance (Carskadon, 2011). While not a primary focus, these aspects of the school schedule contribute to the complex web of factors influencing students' academic achievement and absenteeism.

Overall, the literature on 4DSWs suggests that the effects on student outcomes are mixed and complex. Varying factors, such as the specific implementation of the schedule and institutional settings, could be driving the variation in results from prior research. Further research is needed to fully understand the implications of 4DSWs on student growth, academic achievement, and absenteeism.

Year-Round Calendar

The literature on YRC presents a complex picture with both positive and concerning findings regarding its implications on student achievement. One prominent concern addressed in several studies is the issue of summer learning loss, particularly affecting economically disadvantaged students. Alexander, Entwisle, and Olson (2007) discovered that low-income students experienced similar achievement gains to their peers during the school year, but the achievement gap between the two groups widened over the summer months. This phenomenon has

led to considering YRC as a potential solution for summer learning loss, as it shortens summer breaks and, in theory, reduces summer learning loss.

On the positive side, research indicates that students in year-round schools perform as well as or slightly better in student achievement than their counterparts in traditional schools (Cooper et al., 2003). Cooper's study also noted that economically disadvantaged students in districts with YRC were associated with higher achievement, offering a potential benefit for this demographic group. A key aspect of a successful YRC appears to be more than just rearranging the school calendar. Schools that implement YRCs and concurrently provide remediation and enrichment activities during breaks seem to achieve higher academic outcomes (McMillen, 2001).

However, the effectiveness of YRCs is a subject of debate. A meta-analysis conducted by Cooper and colleagues (2003) expressed reservations about the quality of evidence available, noting that most YRC studies suffered from small sample sizes and insufficient control for confounding factors. Despite the average higher test scores reported in some studies, the meta-analysis emphasized the difficulty in producing a credible estimate of the effects of YRC due to methodological shortcomings.

Some rigorous studies have found no significant benefits and, in certain cases, evidence of harm associated with YRC. For instance, McMillen's (2001) value-added analysis comparing year-round and traditional calendar schools in North Carolina found no effect on student reading and math scores. Similarly, studies on calendar switching in North Carolina and California revealed essentially no influence on average test scores (Graves, 2019; McMullen & Rouse, 2012).

Moreover, concerns have been raised about the purported benefits of YRCs in addressing summer learning loss. Arguments that shortening summer vacation would lead to increased learning throughout the year are challenged by research suggesting that, while students at year-round schools

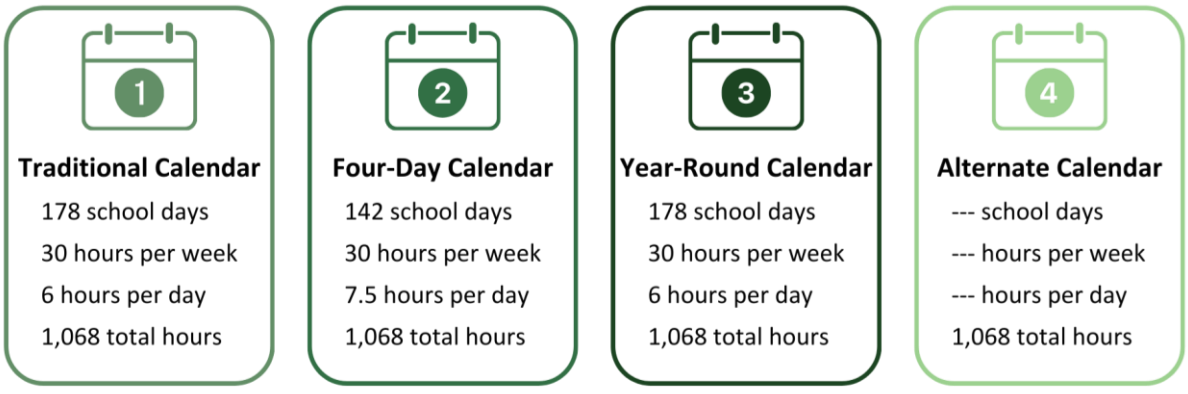
may learn more during the summer, they learn less during the rest of the year than their peers in traditional schools (von Hippel, 2015).

In conclusion, the literature on YRC reflects a nuanced landscape with conflicting findings. While positive outcomes in student academic achievement and academic achievement for economically disadvantaged students are observed in specific contexts, methodological limitations and contradictory evidence underscore the need for further rigorous research to establish a more definitive understanding of the impact of YRCs on student achievement.

III. School Calendars in the Context of Arkansas

In the past several years, there has been an increase in the number of districts in Arkansas moving to the use of a non-traditional school calendar, particularly the four-day week calendar. The first noticeable increase happened between the 2019-20 and 2020-21 school years. In December of 2021, it was announced that Arkansas districts would have four options for establishing a school year calendar for the 2022-23 school year: a traditional school calendar, a four-day week school calendar, a 12-month/year-round school calendar, and an alternate school calendar. The differences between calendar options are displayed below.

Figure 1:
Arkansas Calendar Options by Type, 2022-23



All calendars require students to have 1,068 total hours of instruction throughout the school year. The alternate calendar is based solely on hours attended. Districts that have adopted this calendar create schedules and calendars that fulfill the requirements of the instructional hours. Most schools using the alternate calendar mirror the traditional calendar with slightly modified instructional times. Our analysis, therefore, treats alternate calendars as traditional calendars since the structure is so closely aligned.

Act 688 introduced flexibility for districts to adopt different calendars starting in the 2022-23 school year (Ark. Code Ann. § 6-10-108 and § 6-10-117). The figures below present information about non-traditional calendar use in Arkansas by number of districts and enrollment.

Figure 2:
Number of Arkansas Traditional Public School Districts Using 4DSW and YRC, 2018-2024

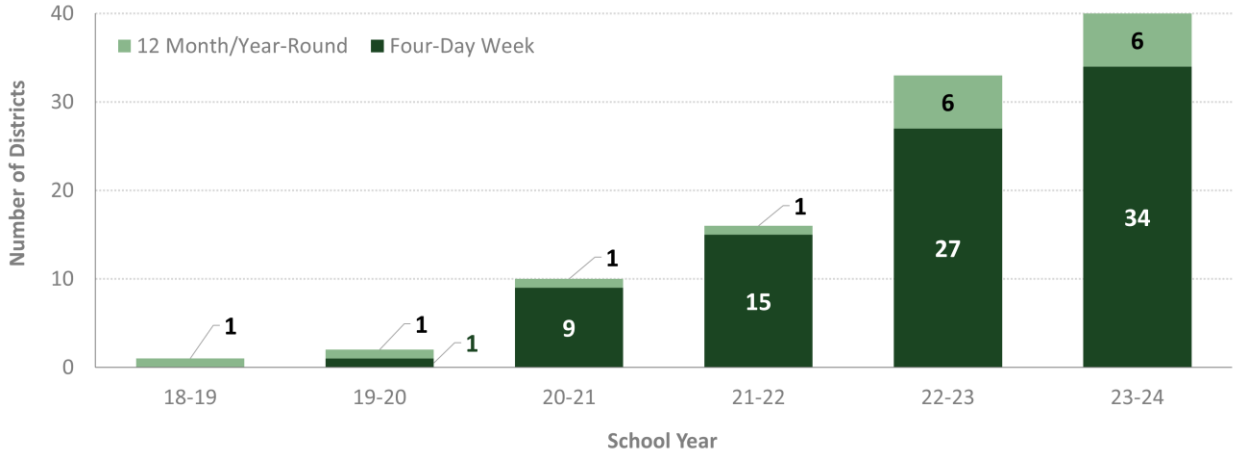
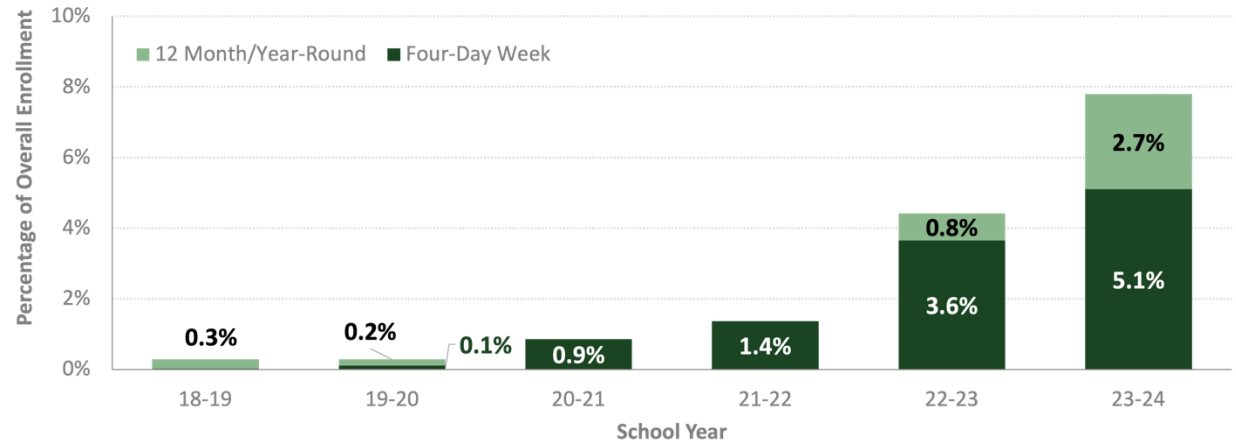


Figure 3:
Percentage of State Enrollment in 4DSW and YRC, 2018-2024



From the 2022-23 to the 2023-24 school year, the number of districts operating a 4DSW increased. In 2022-23, 27 districts and charter schools utilized a 4DSW. In the current school year, seven additional districts adopted a 4DSW, bringing the total number of public school districts using this calendar to 34. This represents an approximate 26% increase in the number of 4DSW districts over the prior school year. Additionally, the districts operating a 4DSW represent roughly 13% of all Arkansas districts. Conversely, the number of districts utilizing a YRC stayed the same in 2023-24. Although the number of districts is the same, one district previously utilizing a YRC moved back to a traditional calendar in 2023-24, while another district using a traditional calendar adopted a YRC calendar. As more districts adopt non-traditional calendars, the percentage of students enrolled in a district using a non-traditional calendar has also increased. Following Act 668, the percentage of Arkansas students enrolled in a 4DSW or YRC has increased from 1.4% to 4.8%. In the 2023-24 school year, 7.8% of Arkansas students are enrolled in a district utilizing a 4DSW or YRC.

Characteristics of Arkansas schools with Non-Traditional Calendars

Currently, there are forty districts in Arkansas operating a 4DSW or YRC. Thirty-four districts operate using the 4DSW, and six districts use a YRC. The map below shows the location of the districts utilizing non-traditional calendars.

Figure 4:
Arkansas School Districts Operating on Non-Traditional Calendars, 2023-24

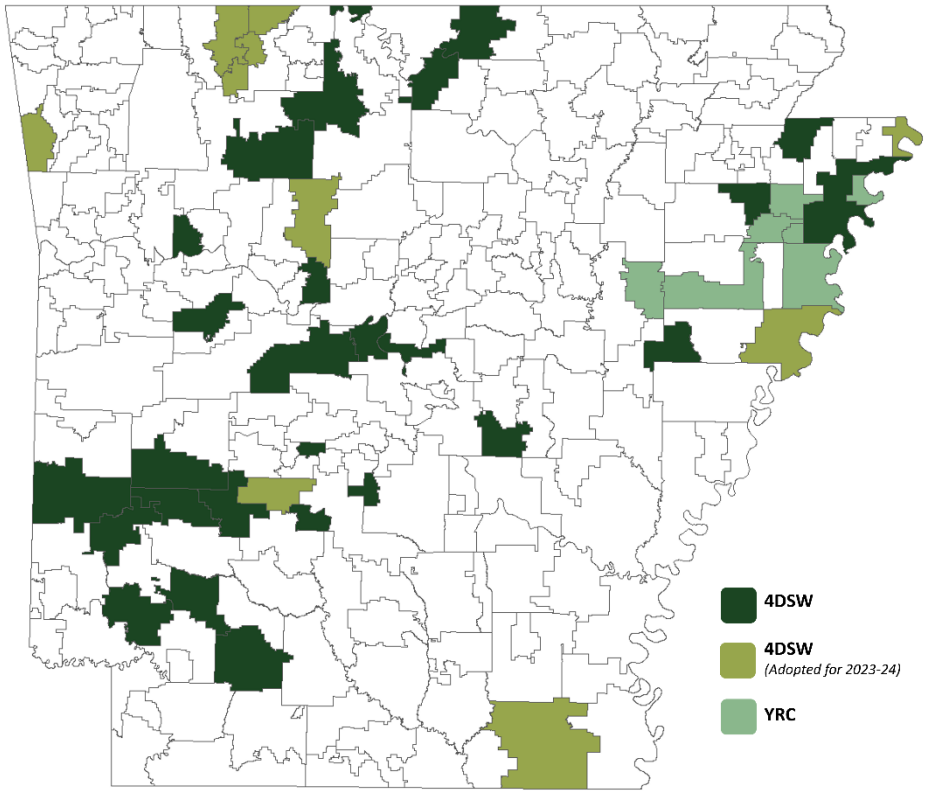


Table 1:
Weighted Average Comparisons of District Characteristics by Calendar Option, 2023-24

	4DSW	YRC	Arkansas
Average Enrollment	667	1,454	1,828
% Free and Reduced Lunch	71	75	59
% Proficient ACT Aspire Literacy (2023)	35	30	39
% Proficient ACT Aspire Math (2023)	34	29	39
Value-Added Growth Literacy (2023)	79.51	79.22	80.01
Value-Added Growth Math (2023)	79.02	79.19	80.02
ACT Composite Score (2022)	18.31	16.6	19.03
Total Districts	34	6	260

Noticeable differences appear when comparing the districts using 4DSW or YRC calendars to all Arkansas districts, as presented in Table 1 above. First, average student enrollment in 4DSW and YRC districts is lower than that of Arkansas public school districts. The difference is especially

noticeable in 4DSW districts, with an average of 667 students enrolled compared to the state average of 1,828 students. Next, the percentage of students qualifying for free or reduced-price lunch (FRL), a proxy for poverty, is higher by 12-16 percentage points in 4DSW and YRC districts. Additionally, the average student in 4DSW and YRC districts is less likely to score proficient in literacy and mathematics than all Arkansas districts. Since the percentage of students who face economically disadvantages is higher in 4DSW and YRC districts, poverty is the most likely explanation for lower rates of students meeting readiness benchmarks in literacy and mathematics. The connection between poverty and achievement is well documented in prior research (*Consequences of Growing Up Poor*, 1997; Hair et al., 2015; Lacour & Tissington, 2011). Average ACT Composite scores of high school students in 4DSW districts are slightly lower than in the state. The same ACT scores are notably lower than the state in YRC districts. This discrepancy can also be driven by poverty.

Value-added growth measures the difference between what a student is expected to achieve based on their prior achievement and what they achieved in the past school year. Since this value-added growth is based on individual student's assessment scores and how they change over time, this metric is not impacted by factors outside of school, such as poverty. Students in 4DSW and YRC districts have lower average student value-added growth in literacy and mathematics.

IV. Methodology

This research study examines the relationships of 4DSW and YRC on academic growth, student achievement, and absenteeism. Our report uses publicly available school data provided by the Arkansas Department of Education through the ADE Data Center. This data allows the public to search and compare public schools and districts across Arkansas. To explore these outcomes, we placed districts utilizing 4DSW and YRC into cohorts based on the year a non-traditional calendar

was adopted. We used grouping by cohort to account for the variation in the timing of different districts adopting non-traditional calendars. This allowed us to compare districts that adopted the same calendar in the same year, thereby mitigating any potential effects of the calendar itself on the outcomes of interest. Table 2 below displays the districts in each cohort, and the year they first adopted a non-traditional calendar.

Table 2:
Districts Operating an Alternative Calendar by Adoption Year

Cohort 1: 2020-21	Cohort 2: 2021-22	Cohort 3: 2022-23
Cossatot River (4DSW)	Atkins (4DSW)	Blevins (4DSW)
East End (4DSW)	Buffalo Island Central (4DSW)	Caddo Hills (4DSW)
England (4DSW)	Mineral Springs (4DSW)	Centerpoint (4DSW)
Kirby* (4DSW)	Nevada (4DSW)	Cutter-Morning Star (4DSW)
Norfork (4DSW)	Ouachita (4DSW)	Deer/Mt. Judea (4DSW)
Ozark Mountain (4DSW)		Dierks (4DSW)
Viola (4DSW)		Mayflower (4DSW)
Western Yell County (4DSW)		Palestine-Wheatley (4DSW)
Westside (Johnson) (4DSW)		Perryville (4DSW)
		Poyen (4DSW)
		Rivercrest (4DSW)
		Trumann (4DSW)
		East Pointsett County (YRC)
		Marked Tree (YRC)
		McCrory (YRC)
		Osceola (YRC)
		Wynne (YRC)
		Osceola (YRC)

**Kirby School District adopted a 4DSW in the 2019-20 school year. They have been included in Cohort 1 due to a lack of testing data from the 2019-20 school year.*

Districts in Cohort 1 adopted a 4DSW in the 2020-21 school year. In Cohort 1, we can examine the outcomes of interest one, two, and three years after adopting a new calendar. As Cohort 2 adopted a 4DSW in 2021-22, we can examine their scores one and two years post-adoption. Cohort 3 represents the districts that changed calendars following the passage of Act 688—the 2022-23 school year marked Cohort 3 districts starting a new calendar. We can examine the outcomes of interest only one year after adoption for Cohort 3.

For our analysis, we removed one charter school that operates using a 4DSW. This school, Graduate Arkansas, is a drop-out and credit-recovery charter high school. Graduate Arkansas does not receive a state letter grade on school performance. Due to their unique student population and lack of school performance data, they were excluded from our sample.

V. Analytic Approach

Our analysis comprises two parts: examining trends in student academic growth, achievement, and absenteeism before and after calendar adoption, and employing a differences-in-differences (DiD) model to statistically assess the implications of adopting a non-traditional calendar on student outcomes.

We employed a rigorous matching procedure to ensure that our analyses compare districts that are similar in nearly all aspects except for the type of calendar they use. Matching analysis is a statistical technique that helps account for factors that can affect the type of calendar a district uses and the outcomes of interest. These factors, known as confounding variables, can make it difficult to determine the true effect of the calendar on student outcomes. Matching analysis helps to control for confounding variables by creating pairs or groups of districts that are similar on specific factors but differ in the type of calendar they use. Matching allows for a more direct comparison of the outcomes of districts that use different calendars, allowing us to draw accurate conclusions about student performance.

We matched each 4DSW and YRC districts with three comparison districts based on the following criteria: total enrollment size the year prior to calendar adoption, the percentage of students eligible for free and reduced-price lunch the year prior to calendar adoption, and achievement growth and proficiency rates in literacy and mathematics for the two school years prior to calendar adoption. A complete table of 4DSW and YRC calendar districts and their comparison

districts are listed in Tables 1.A – 4.A in the appendix. It is important to note that districts self-select their calendar change, and this decision may reflect inherent differences between districts that adopt 4DSW or YRC calendars and those that do not. These unobserved differences could potentially influence our findings.

Trend Analysis

We first examined trends in outcomes of interest before and after adopting a 4DSW or YRC for each cohort. We calculated the average outcomes for each cohort from 2016-17 to 2022-23, excluding the 2019-20 school year due to COVID-19 testing disruptions. We use comparison groups from the abovementioned matching process to identify variation between 4DSW and YRC districts and comparison districts on the traditional calendar. The results from this analysis display the averages of all non-traditional calendar districts in the cohort compared to the average of all traditional calendar districts. This analysis allows us to observe the general trends in student outcomes for both 4DSW and YRC districts compared to similar districts using a traditional calendar. By grouping districts, we can focus on the overall trend related to the calendar change rather than the variation between individual districts using a non-traditional calendar.

Difference-in-Differences Analysis

While the trends analysis allows us to see how non-traditional calendar districts perform over time, we employ a difference-in-differences (DiD) analysis to assess any changes in our outcomes of interest after calendar adoption. The DiD method is a quasi-experimental approach that compares the changes in outcomes over time between a treatment group (districts that adopted a non-traditional calendar) and a control group (comparison districts using a traditional calendar). By comparing the changes in outcomes between the two groups, we can isolate the effect of the

calendar change from other factors that may be affecting student outcomes. DiD can be explained using the following equation:

$$(\mu_{Treatment\ Post} - \mu_{Treatment\ Pre}) - (\mu_{Control\ Post} - \mu_{Control\ Pre})$$

In this equation, μ represents the average of our outcome of interest. Our treatment group consists of districts operating a 4DSW or YRC. Our control group consists of comparison districts from our matching process described above.

Outcomes of Interest

We had several outcomes of interest for our analysis. Each outcome was identified based on responses from interviewing superintendents or district leaders of districts operating non-traditional calendars.

Student Value-Added Growth in Literacy and Mathematics

As measured using a multilevel residual gain model, Arkansas's student value-added growth reflects a student's progress in literacy and mathematics over time, as reflected in their performance on state-required assessments for grades 3-10. Unlike academic achievement or attendance measures, value-added growth has a low correlation with non-school factors like poverty, making it a strong indicator of student progress. This model compares a student's actual growth to their expected growth based on up to four years of prior achievement. These values are calculated annually by the Arkansas Department of Education and reported at the district and school level for each grade and content area.

The Arkansas Department of Education established the intercept of value-added growth at 80 through input sessions involving stakeholders who were asked to determine the score a school should earn if students, on average, were meeting their expected growth. The statewide average growth score is 80 which indicates that students in the school, on average, achieved academic

growth at the same rate as similar students throughout the state. At the school level, values range from 70 to 90. For this outcome of interest, we focused on districts' growth scores in literacy and mathematics for the overall student population and FRL students. We calculate a wighted average growth score for the non-traditional and traditional calendar groups.

Student Achievement in Literacy and Mathematics

Student achievement is measured by student performance in literacy and math on the state-required assessment for students in grades 3-10. Student performance on the ACT Aspire is reported as percentages across four performance levels: In Need of Support, Close, Ready, and Exceeding. For this outcome, we examined the percentage of students in each district who achieved the Ready or Exceeding levels in literacy and/or mathematics for both the overall student population and FRL students. We calculate a wighted average proficiency rate for the non-traditional and traditional calendar groups.

While standardized tests like the ACT Aspire provide valuable insights into student achievement, it is important to recognize that they are not without limitations. Standardized tests can be influenced by various factors beyond a student's true academic abilities, such as test-taking anxiety, cultural biases, and unequal access to resources. Therefore, student academic growth may allow us to better understand how students' academic performance changed after implementing a new calendar.

Attendance

We analyzed attendance rates to explore differences in non-traditional calendars on student absenteeism for grades K-12. Chronic absenteeism, defined as missing 10% or more of the school year, is a marker for students at academic risk, making absenteeism an important measure of student success. In interviews, district superintendents in non-traditional calendar districts often noted

decreasing student absences as a primary objective (Barnes & McKenzie, 2023). We analyzed each district's overall attendance rates and FRL students' attendance rates. Attendance rates represent the average percentage of students attending school each day. This metric does not reflect individual chronic absenteeism rates, but it provides a more sensitive metric of a district's daily attendance rates, offering insights into how non-traditional calendars may influence student engagement and academic success.

VI. Results for Trends Analysis – 4DSW

The results from our analysis of 4DSW districts are presented below by outcome of interest. Each figure displays values for our outcomes of interest pre- and post-implementation of a 4DSW calendar and comparison district groups for both the overall student populations and the population of students eligible for free or reduced-price lunch.

Literacy & Math Growth Value-Added Growth

Literacy Growth

Figures 1, 2, and 3 below display the trends in literacy value-added growth scores at the district level for Cohorts 1, 2, and 3, respectively. Literacy growth scores are presented for all 4DSW districts and the comparison districts prior to and after the calendar change for all students and students eligible for FRL.

Figure 1:
Cohort 1 Average Literacy Growth Scores for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

Figure 2:
Cohort 2 Average Literacy Growth Scores for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

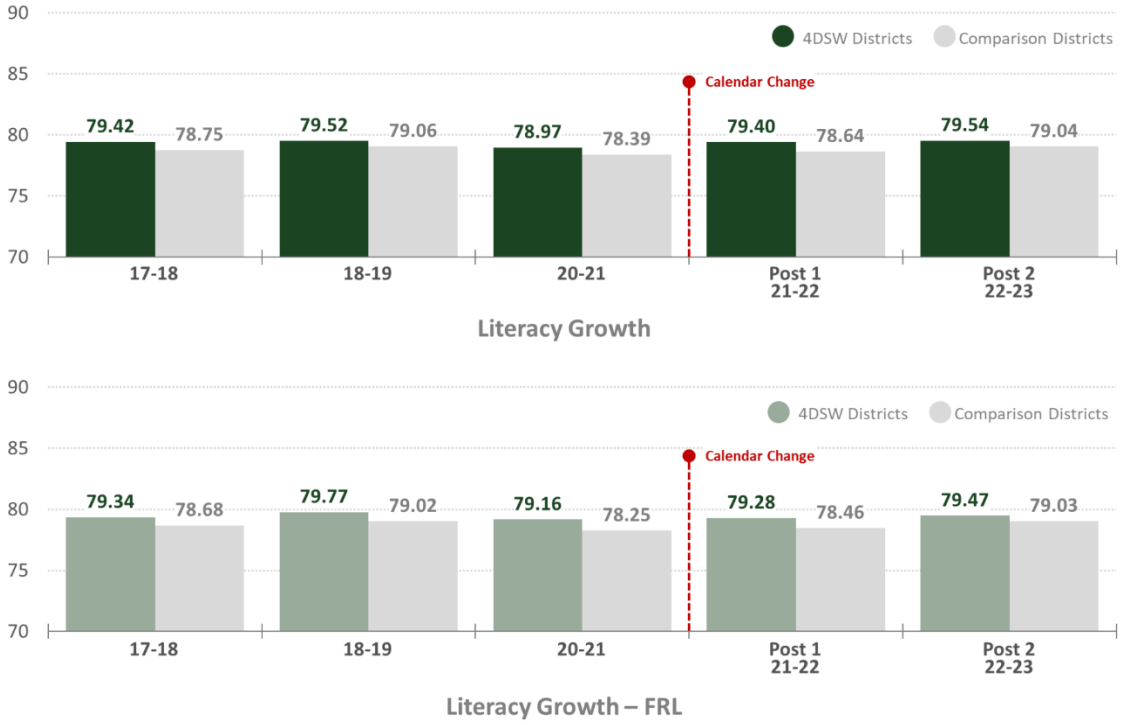
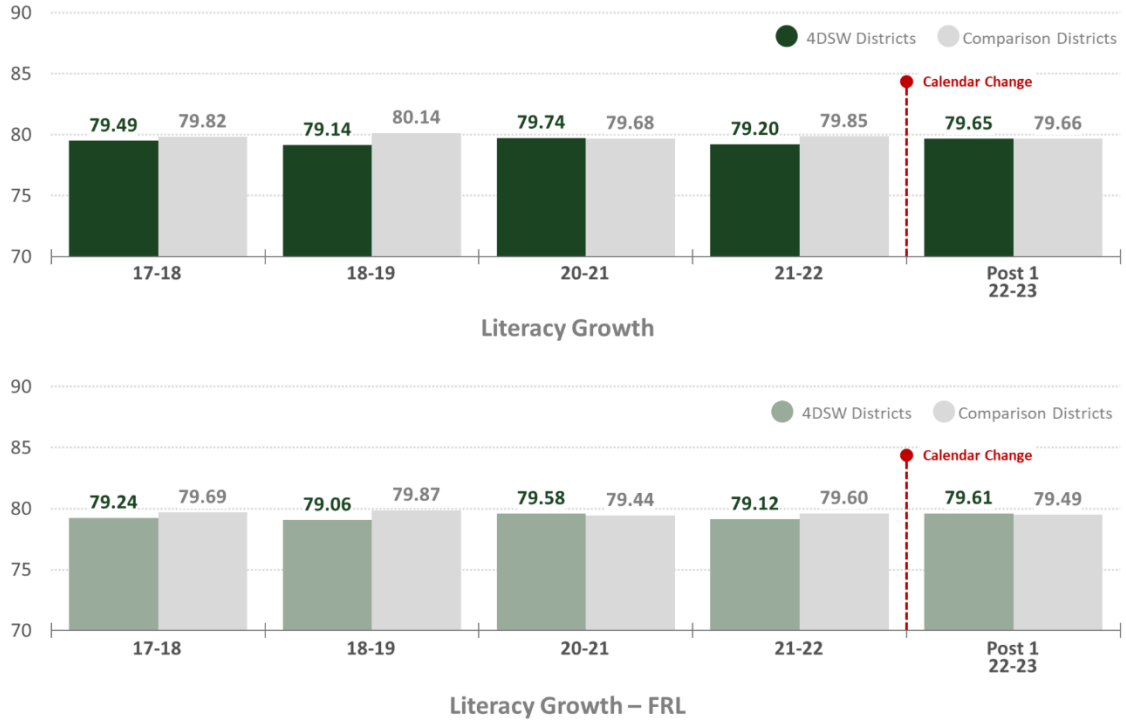


Figure 3:
Cohort 3 Average Literacy Growth Scores for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023



Students in Cohort 1's 4DSW districts displayed consistent increases in literacy growth since adopting the new calendar. Literacy growth for the overall student population saw year-over-year improvement, surpassing the scores of the comparison districts. Although literacy growth dipped slightly for FRL students one year post-adoption, subsequent years showed increases, with literacy growth scores for FRL students consistently outpacing those in the comparison districts. Notably, the literacy growth scores for the overall student population at 80.0 points and FRL students at 79.99 points in Cohort 1 peaked in 2022-23, surpassing all previous years examined.

Like the 4DSW districts in Cohort 1, students in Cohort 2's 4DSW districts demonstrated consistent increases since adopting the new calendar for both student groups, surpassing average literacy growth scores in comparison districts. Notably, the overall student population in Cohort 2's

4DSW districts achieved the highest math growth scores, reaching 79.54 two years post-adoption of the new calendar.

One year following calendar implementation, students in Cohort 3's 4DSW districts evidenced an increase of 0.45 and 0.49 points in literacy growth scores for the overall student population and FRL students, respectively. In comparison districts, there were slight declines in literacy growth scores over the same period. While the literacy growth scores between Cohort 3's 4DSW districts and comparison districts were similar for the overall student population, FRL students in Cohort 3's 4DSW districts achieved a higher average growth score one year post-implementation, albeit with a marginal difference of 0.12 points.

Math Growth

Figures 4, 5, and 6 below display the trends in math value-added growth scores at the district level for for all students and students eligible for FRL for Cohorts 1, 2, and 3, respectively.

Figure 4:
Cohort 1 Average Math Growth Scores for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

Figure 5:
Cohort 2 Average Math Growth Scores for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

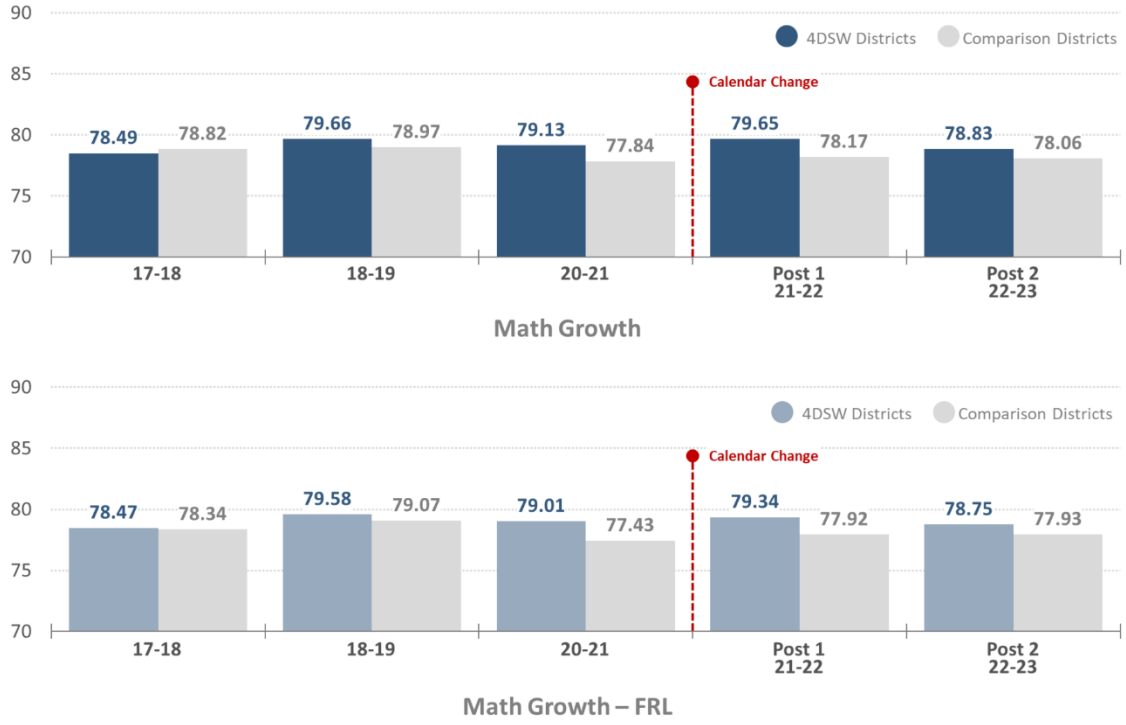
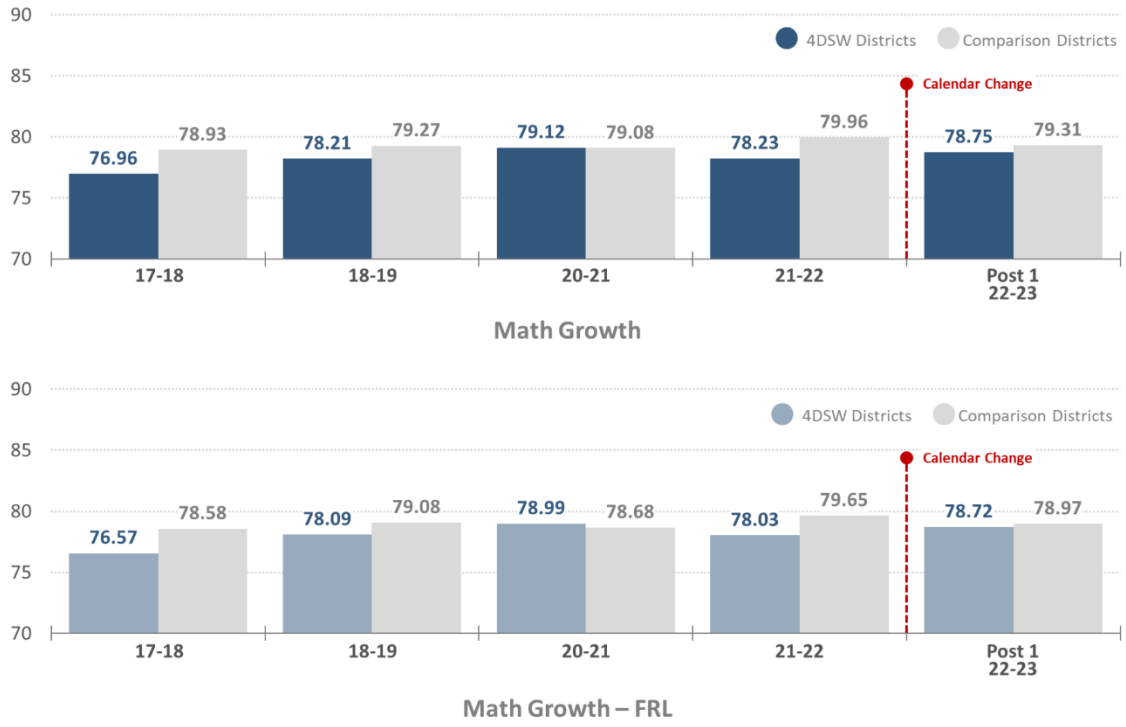


Figure 6:
Cohort 3 Average Math Growth Scores for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023



One year after adopting the new calendar, there was a marginal decrease in Cohort 1's 4DSW districts' math growth scores. FRL students experienced a further small drop in the second year post-adoption. However, in 2022-23, the third-year post-adoption, the overall student population and FRL students in 4DSW districts achieved their highest average math growth scores throughout the sample period. Moreover, in 2022- 23, math growth scores in 4DSW districts surpassed those of comparison districts for both the overall student population and FRL students.

Math growth scores for students in Cohort 2's 4DSW districts remained higher than those of comparison districts in the first- and second-years post-adoption. While there was an overall increase in math growth scores for the overall student population in both years post-calendar adoption, FRL students experienced a slight decrease in math growth in the second year.

Math growth scores for students in Cohort 3's 4DSW districts increased by 0.49 points for the overall student population and 0.69 points for FRL students one year post-implementation. Although the average math growth score was higher for the overall student population in Cohort 3's 4DSW districts than in comparison districts, the growth score for FRL students was slightly lower by 0.25 points.

The trends indicate that implementing 4DSWs is associated with an increase in students' academic growth in literacy and math. Students in Cohorts 1 and 2's 4DSW districts consistently demonstrated increases in literacy growth rates, outperforming comparison districts. Students in Cohort 3's 4DSW districts also evidenced an initial rise in literacy growth, with FRL students achieving higher average literacy growth scores than those in comparison districts. Regarding math growth, there was variation in trends across cohorts. While students in Cohort 1 experienced a temporary decline in math growth rates followed by an increase, students in Cohort 2 maintained higher math growth scores than comparison districts throughout the observation period. Like

literacy growth, Cohort 3 exhibited an upward trajectory in math growth rates, with the overall student population outperforming comparison districts. These findings suggest that students in 4DSW districts may experience greater literacy and math academic growth than those attending similar districts using a traditional calendar.

Literacy & Math Proficiency Rates

Literacy Proficiency Rates

Figures 7, 8, and 9 below display the average percentage of students scoring proficient in literacy for 4DSW districts and comparison districts. Proficiency rates are presented by cohort pre- and post-calendar change for all students and students eligible for free or reduced-price lunch (FRL).

Figure 7:
Cohort 1 Average Literacy Proficiency Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

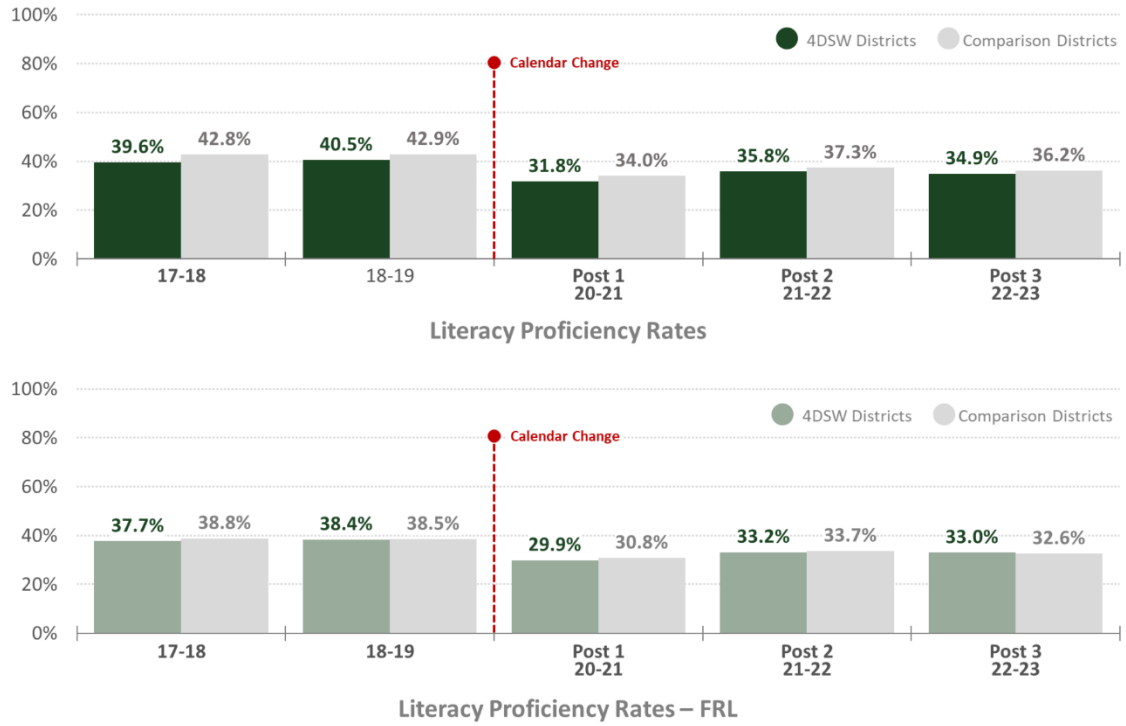


Figure 8:
Cohort 2 Average Literacy Proficiency Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

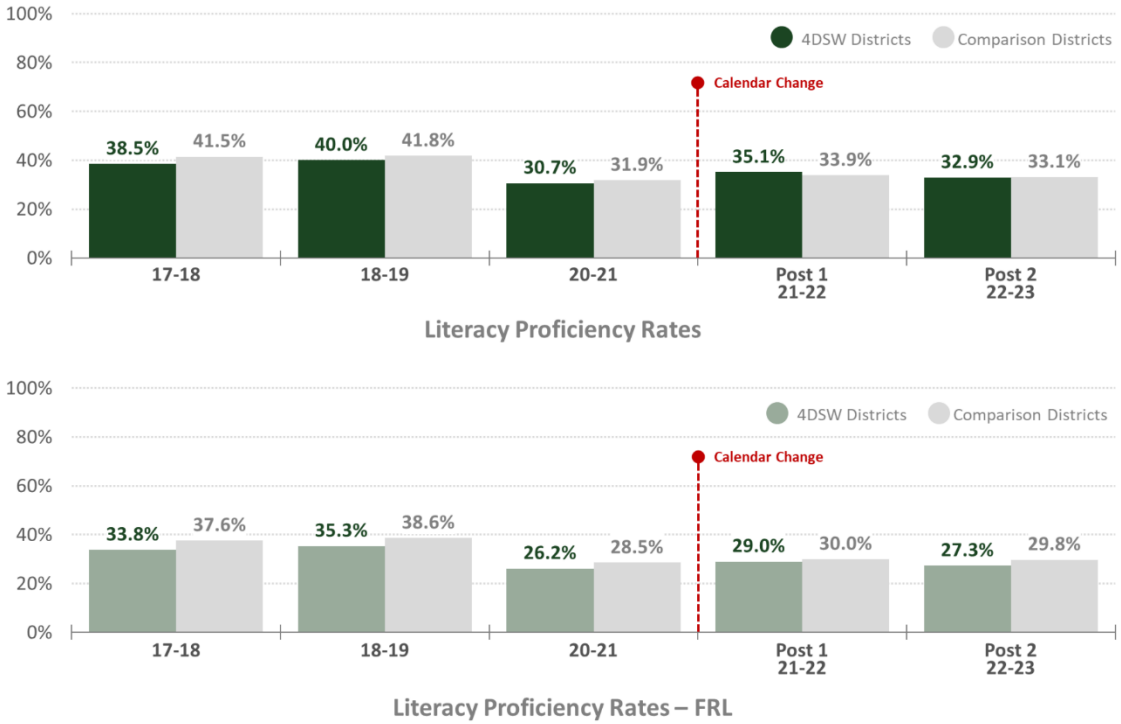
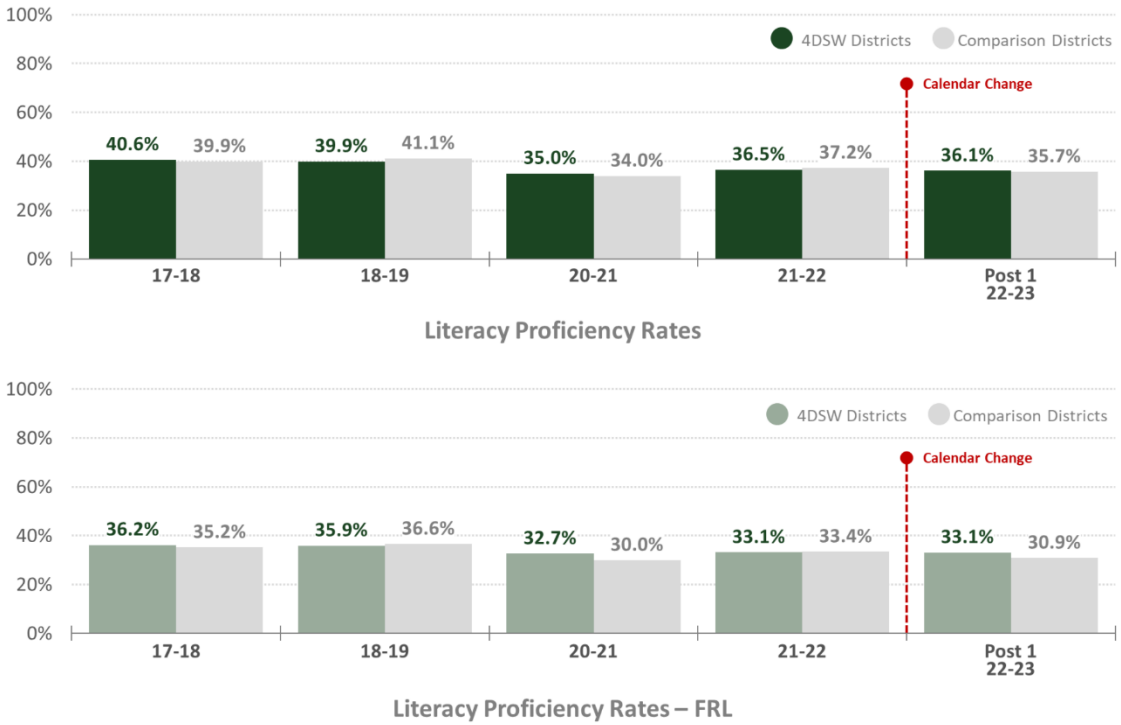


Figure 9:
Cohort 3 Average Literacy Proficiency Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023



Cohort 1's 4DSW districts observed a decline in literacy among the overall student population and FRL students after introducing a new calendar. Similar declines were noted in comparison districts, with the primary attribution being the impact of the COVID-19 pandemic. Subsequently, the literacy rates for both groups saw an increase in the second year post-calendar adoption, followed by a slight decrease in both groups in the third year.

In contrast, Cohort 2's 4DSW districts experienced an improvement in literacy proficiency rates one year after adopting a 4DSW for both the overall student population and FRL students. These positive trends were similarly reflected in comparison districts. Although Cohort 2's 4DSW districts initially lagged in literacy proficiency rates prior to the calendar change, one year after implementing a 4DSW, they surpassed the proficiency rates of comparison districts. However, in the second year, literacy proficiency rates in Cohort 2's 4DSW districts declined for both the overall student population and FRL students. In 2022-23, the literacy rates for both groups were slightly lower than those of comparison districts by 0.2 and 2.5 percentage points, respectively, but still higher than the preimplementation year of 2020-21.

Following adopting a 4DSW, Cohort 3's 4DSW districts saw a marginal decrease in literacy proficiency rates for the overall student population, from 36.5% to 36.1%. Literacy proficiency rates for FRL students remained unchanged for one year post-calendar implementation. Comparison school districts also experienced a decline in literacy proficiency rates from 37.2% to 35.7% from 2021-22 to 2022-23. On average, Cohort 3's 4DSW districts exhibited slightly higher literacy proficiency rates than their counterparts in comparison districts following 4DSW calendar adoption.

Math Proficiency Rates

Figures 10, 11, and 12 below display changes in the average percentage of students scoring proficient in math for all 4DSW cohorts and comparison districts pre- and post- calendar change.

Figure 10:
Cohort 1 Average Math Proficiency Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

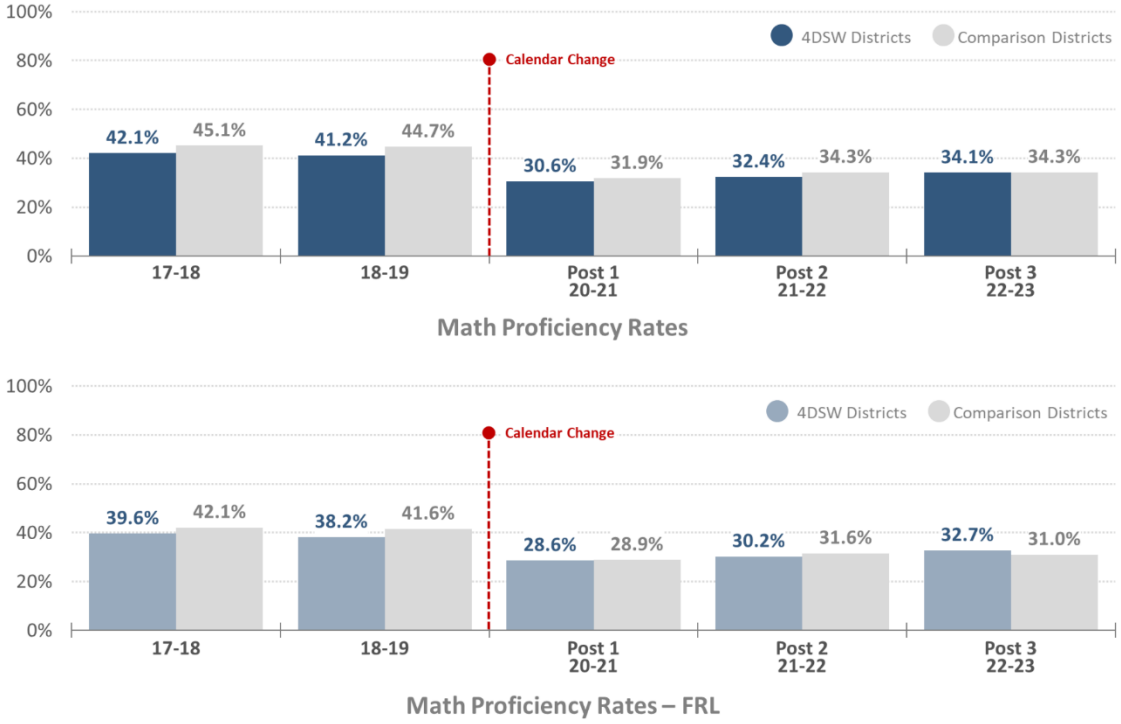


Figure 11:
Cohort 2 Average Math Proficiency Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

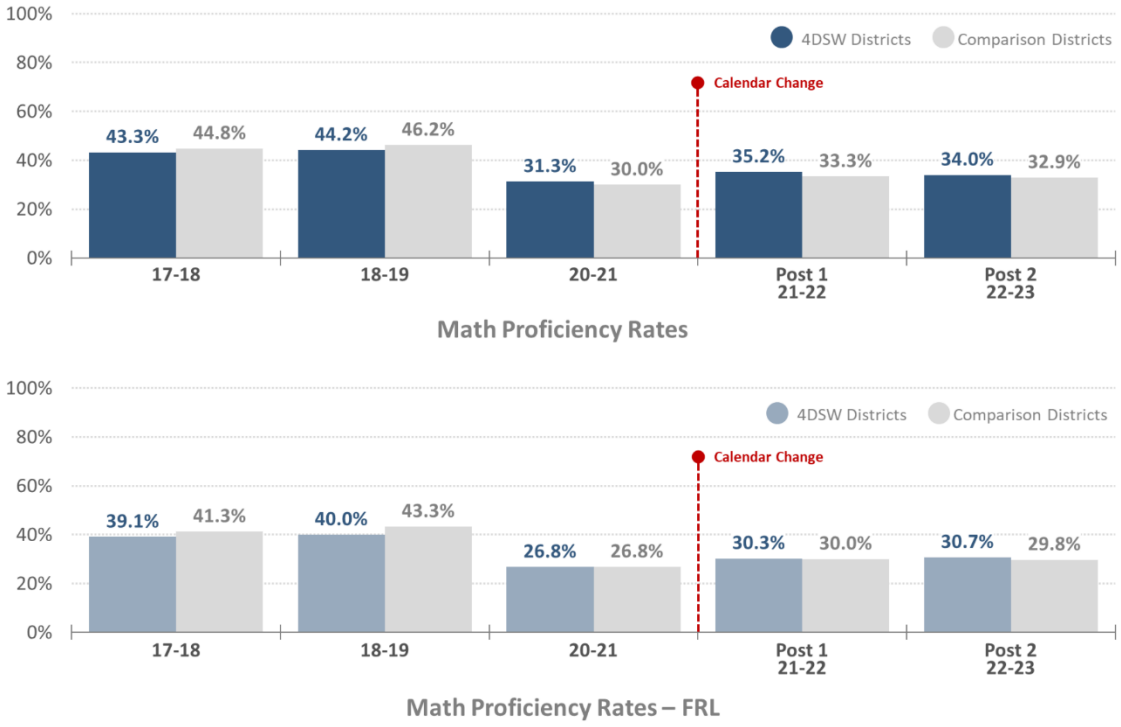
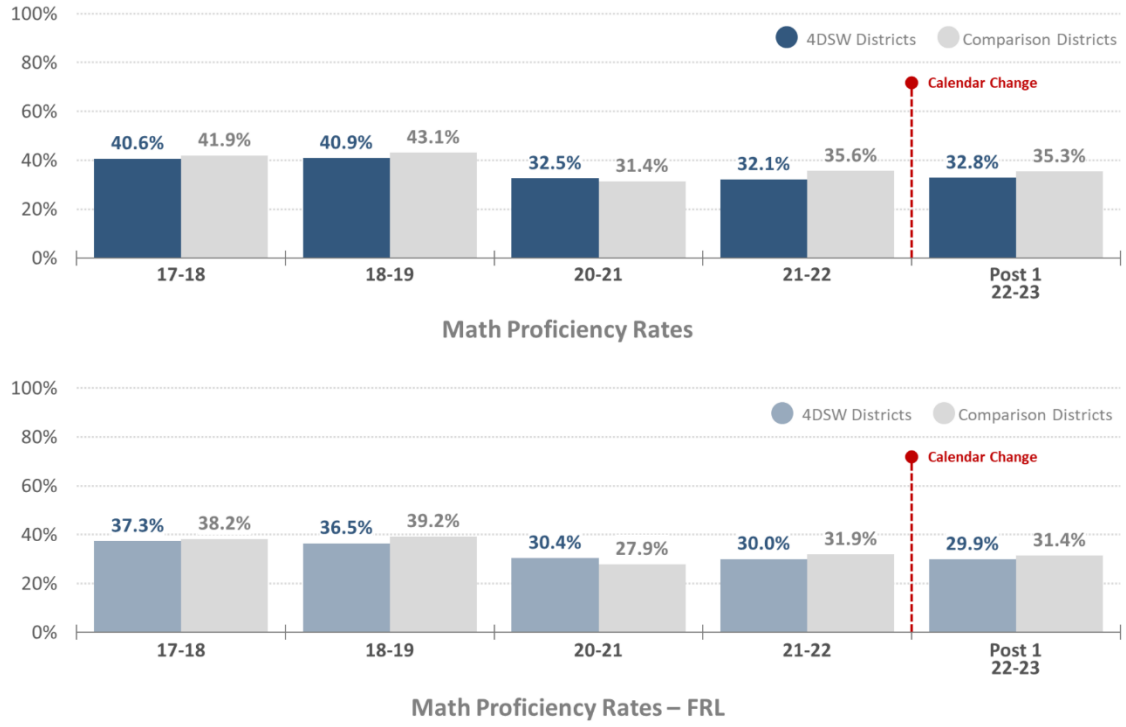


Figure 12:
Cohort 3 Average Math Proficiency Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023



In tandem with the literacy trends, Cohort 1's 4DSW districts experienced a reduction in math proficiency rates one year after adopting a 4DSW. The decrease in math proficiency rates was mirrored in the comparison districts. In the two and three years post-adoption, however, math proficiency rates increased for both the overall student population and FRL students in Cohort 1. While the percentage of 4DSW students testing proficient in math increased, proficiency rates remained below pre-COVID proficiency rates. Notably, the comparison districts only demonstrated an increase in math proficiency rates in 2021-22; by 2022-23, their rates either remained steady or saw a slight decline.

Following 4DSW implementation, districts in Cohort 2 experienced a one-year increase in math proficiency for both the overall student population and FRL students, rising by 3.9 and 3.5 percentage points, respectively. In the second year, FRL students saw a slight increase in math proficiency rates, while the overall student population experienced a 0.8 percentage point decline.

Despite fluctuations, math proficiency rates for Cohort 2's 4DSW districts remained higher than those of comparison districts.

One year after implementing a new calendar, Cohort 3's 4DSW districts experienced a slight increase in math proficiency rates in the overall student population, from 32.1% to 32.8%. The math proficiency rates one year post-implementation of a new calendar were the highest observed in three years for the overall student population in Cohort 3, but they still lagged behind those of comparison districts by 2.5 percentage points. In contrast, math proficiency rates for FRL students decreased slightly, from 30.0% to 29.9%, marking the lowest FRL math proficiency rates for Cohort 3 since 2016. Although the FRL math proficiency rates declined in comparison districts, their scores remained higher by 1.5 percentage points.

The findings regarding the influence of calendar changes and 4DSWs on literacy and math proficiency are mixed and vary depending on the cohort and year. While some cohorts experienced initial declines in literacy proficiency after adopting new calendars, these rates rebounded in subsequent years. Similarly, math proficiency rates initially declined in some cohorts but later increased. The COVID-19 pandemic negatively influenced literacy and math proficiency across all cohorts, and all districts are still working to recover from these educational setbacks. Comparison districts experienced similar literacy and math proficiency trends, suggesting that these patterns are not exclusively associated with the 4DSW cohorts that implemented calendar changes. Overall, the results suggest that the relationship between 4DSW and proficiency rates is small and that more rigorous analyses are needed to determine if a relationship exists.

Attendance

The information in Figures 13, 14, and 15 below displays changes in the average student attendance rates for the overall student population and FRL students for all 4DSW Cohorts and comparison districts.

Figure 13:
Cohort 1 Average Attendance Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

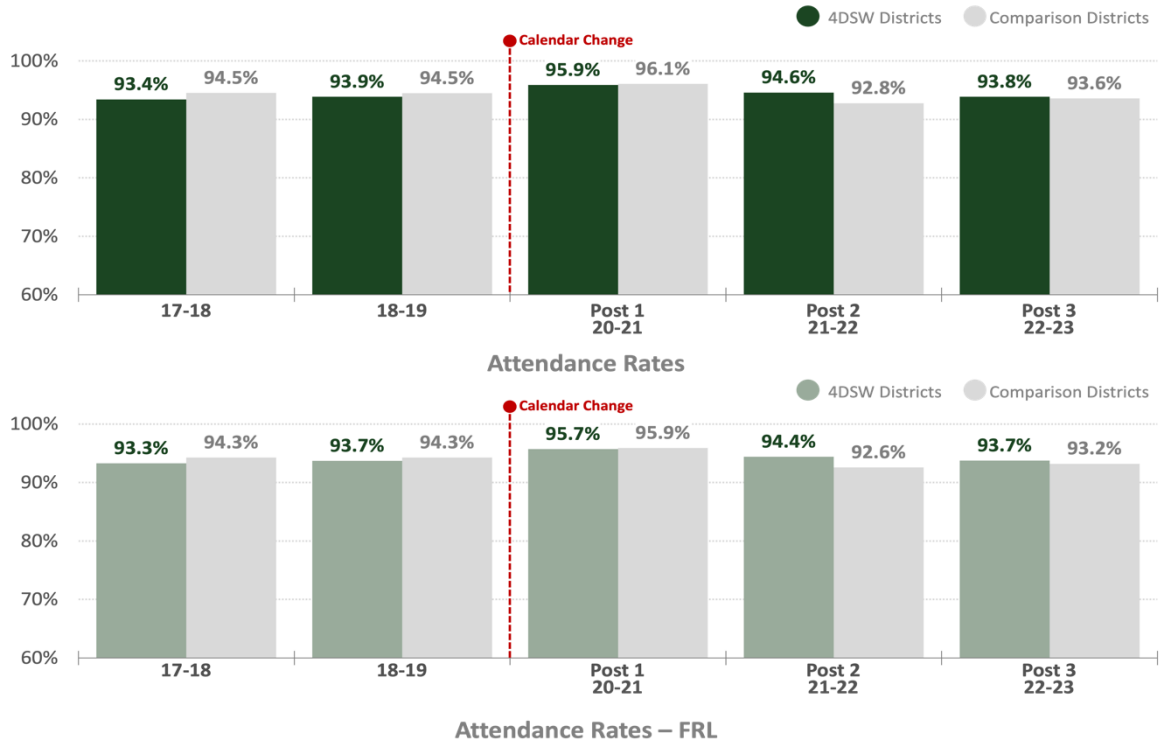


Figure 14:
Cohort 2 Average Attendance Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023

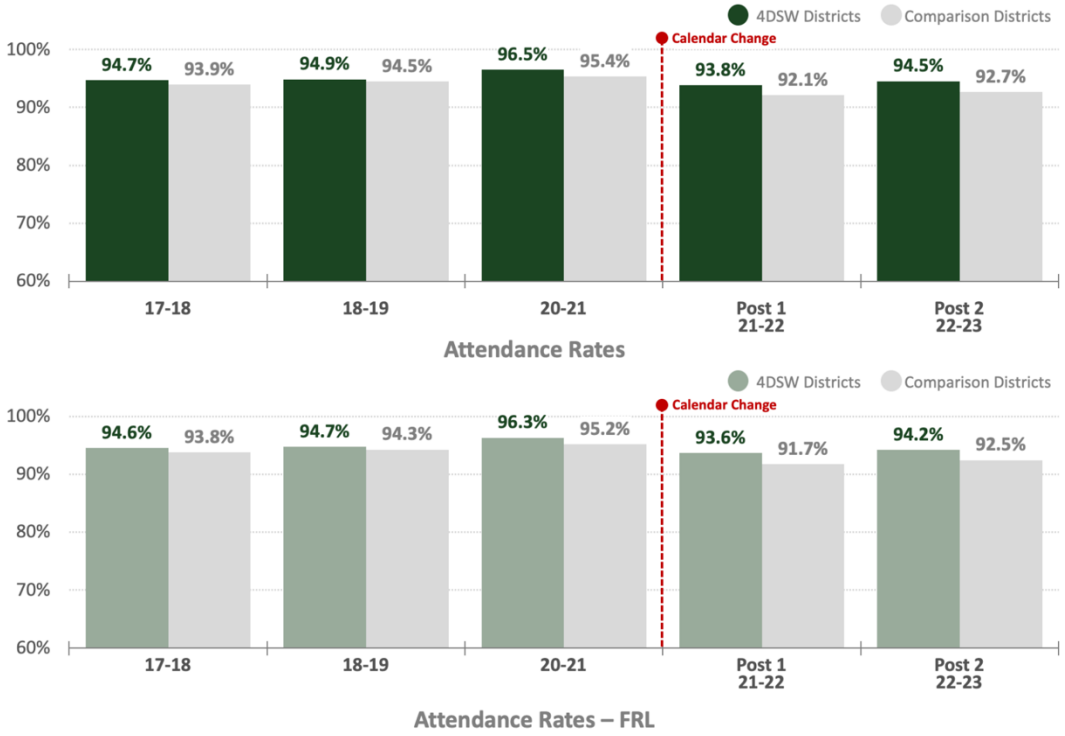
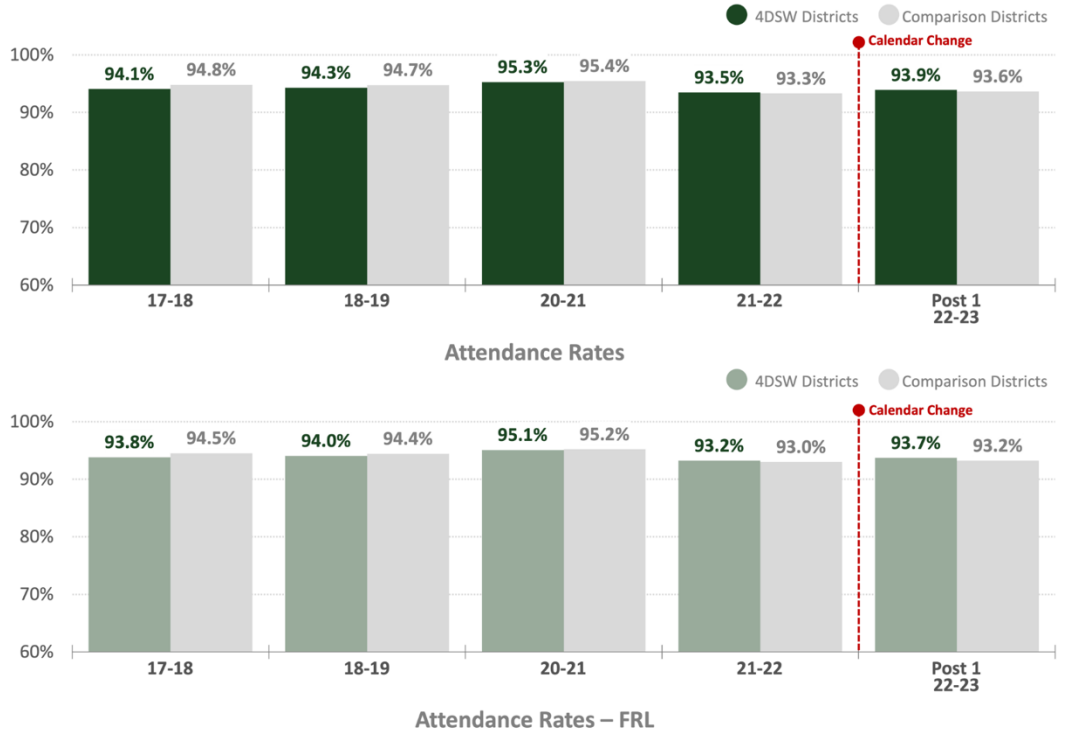


Figure 15:
Cohort 3 Average Attendance Rates for All Students and FRL Students, 4DSW and Comparison Districts, 2017-2023



Shifting to attendance rates, Cohort 1's 4DSW districts and comparison districts experienced an increase in 2020-21 for the overall student population and FRL students. In the subsequent years, 4DSW in Cohort 1 witnessed a decline in attendance rates for both the overall student population and FRL students. Presently, the attendance rates for both student groups approximate those of the pre-implementation period. Cohort 1's 4DSW districts' attendance rates remain higher than those observed in comparison districts using a traditional calendar.

Diverging from the pattern observed in Cohort 1, Cohort 2's 4DSW districts experienced a decline in attendance one year after implementing a 4DSW for both student groups. The overall attendance rate decreased from 96.5% to 93.8%, and the attendance rate for FRL students decreased from 96.3% to 93.6%. Comparison districts also saw decreased attendance rates from 2020-21 to 2021-22. However, in the second year post-implementation, student attendance rates for Cohort 2's 4DSW districts showed a slight increase, ultimately surpassing those of comparison districts.

Lastly, attendance rates for Cohort 3's 4DSW districts increased one year post-implementation of a 4DSW for both the overall student population and FRL students. The overall student population increased its attendance rate by 0.4 percentage points, and the FRL student population increased its rate by 0.5 percentage points. Although comparison districts also saw increased attendance rates for both student groups, the average for 4DSW districts remained higher.

The influence of calendar changes and 4DSWs on attendance rates is mixed. Cohort 1's 4DSW district experienced a decline in attendance rates following the first year of implementation of a new calendar, but rates have since stabilized and remain higher than those of comparison districts. Cohort 2's 4DSW districts experienced declining attendance rates one year after implementing a 4DSW, but rates rebounded in the second year. Like Cohort 1, Cohort 2's 4DSW districts' attendance rates are higher than those of comparison districts. Cohort 3's 4DSW districts

experienced an increase in attendance rates one year after implementing a 4DSW, which are higher than those of comparison districts. Overall, the trends indicate that 4DSW districts may be associated with a slight increase in attendance rates. Further investigation using more sensitive tools is needed to fully understand the long-term implication of 4DSW adoption on attendance rates.

VII. Results for Trends Analysis – YRC

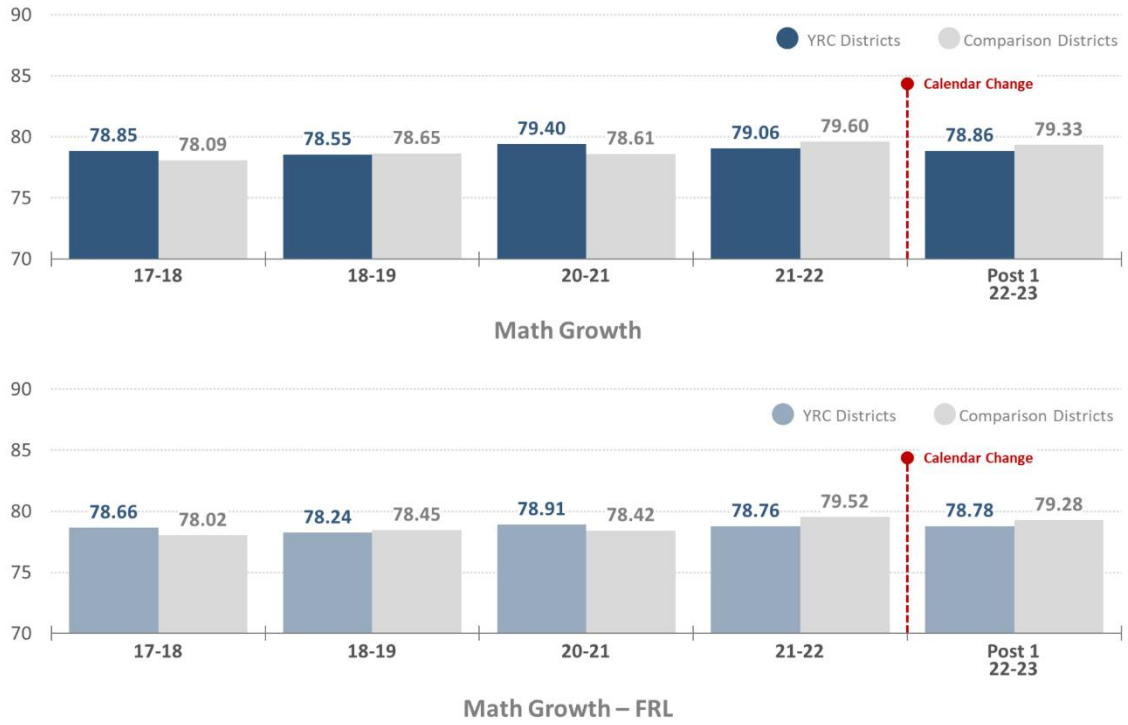
The results from our analysis of YRC districts are presented below. In the 2022-23 school year, only six districts operated using the YRC. All but one of the districts adopted the YRC immediately following the change in policy from Act 688 so our analysis of YRC groups all districts together into one cohort. We then examine the same outcomes of interest pre- and post- calendar change. Each figure displays values for our outcomes of interest post-implementation of a YRC calendar and comparison districts.

Literacy & Math Growth Value-Added Growth

Figures 16 and 17 below display the trends in literacy and math value-added growth scores at the district level for YRC districts and comparison districts. Growth scores are presented for all students and students eligible for free or reduced-price lunch (FRL).

Figure 16:
YRC Average Literacy Growth Scores for All Students and FRL Students, YRC and Comparison Districts, 2017-2023

Figure 17:
YRC Average Math Growth Scores for All Students and FRL Students, YRC and Comparison Districts, 2017-2023



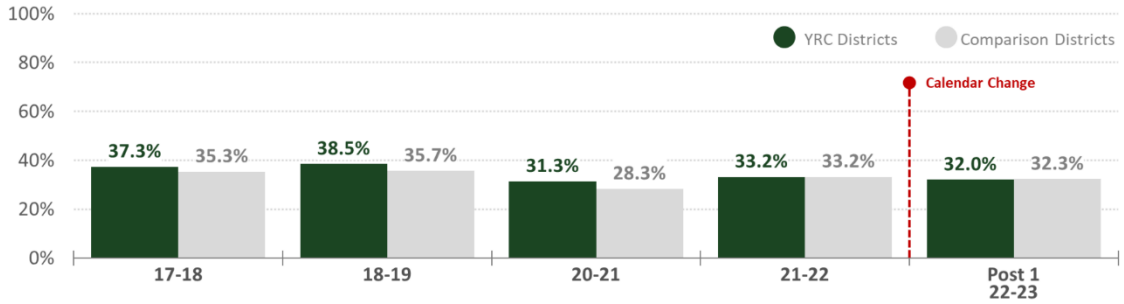
One year after implementing a YRC, districts evidenced an increase in literacy growth scores for both the overall student population and FRL students. Specifically, literacy growth scores for the overall student population increased by 0.08 points, while FRL students' literacy growth scores increased by 0.4 points. In contrast, literacy growth declined in comparison districts over the examined time period. Although literacy growth scores increased for YRC districts, they remained lower than their comparison districts. Similarly, one year after implementing a YRC, YRC districts exhibited lower mathematics growth scores than their comparison districts for both the overall student population and FRL students. Despite these lower scores, math growth scores increased one year post-calendar adoption. For the overall student population, math growth scores increased from 78.65 to 79.05, while for the FRL student population, math growth scores remained relatively stable, increasing by only 0.02 points.

The implementation of a YRC showed promise in promoting literacy growth, with an increase in growth scores for both the overall student population and FRL students one year post-implementation. However, literacy growth scores for YRC districts remained lower than those of comparison districts. Math growth scores did not show the same level of improvement as literacy growth scores.

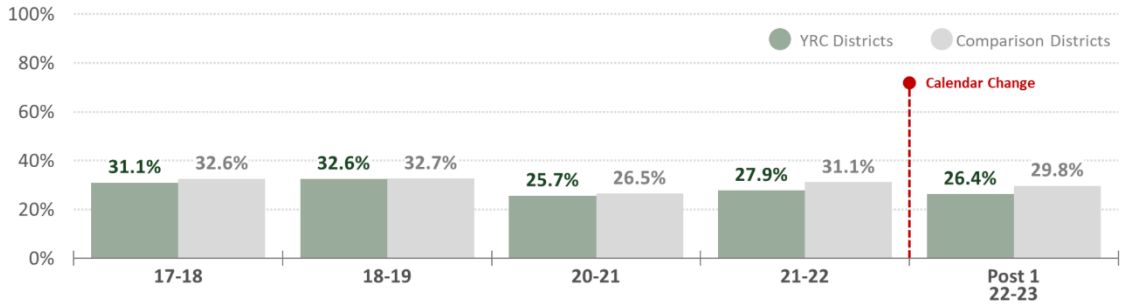
Literacy & Math Proficiency Rates

Figures 18 and 19 below display changes in the average percentage of students in grades 3-10 scoring proficient on the state assessment in literacy and math over time for YRC and comparison districts.

Figure 18:
YRC Average Literacy Proficiency Rates for All Students and FRL Students, YRC and Comparison Districts, 2017-2023

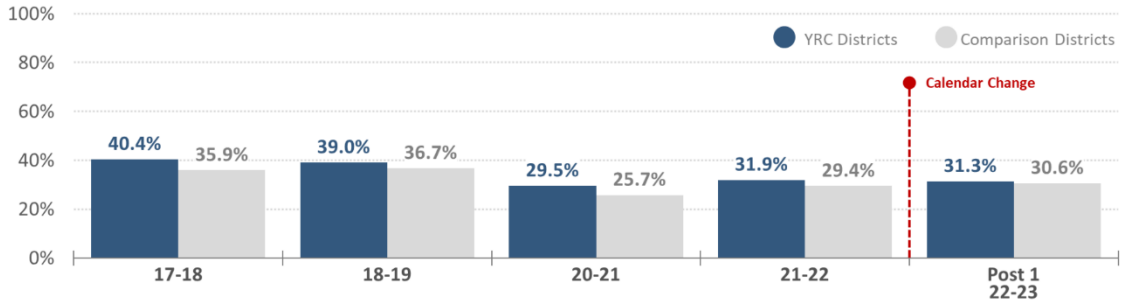


Literacy Proficiency Rates

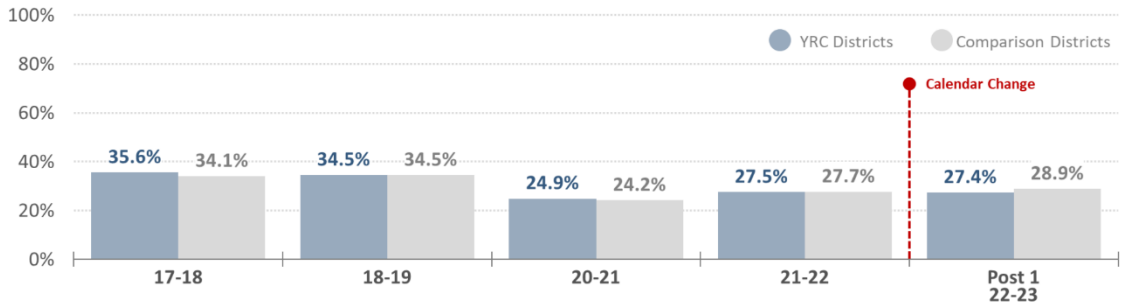


Literacy Proficiency Rates – FRL

Figure 19:
YRC Average Math Proficiency Rates for All Students and FRL Students, YRC and Comparison Districts, 2017-2023



Math Proficiency Rates



Math Proficiency Rates – FRL

Following the implementation a new calendar, literacy proficiency rates for districts utilizing a YRC declined for both the overall student population and FRL students. Specifically, literacy proficiency rates for the overall student population dropped by 1.2 percentage points, decreasing from 33.2% to 32.0%. Similarly, the rates for FRL students decreased by 1.5 percentage points, declining from 27.9% to 26.4%. Comparison districts also witnessed a decrease in literacy proficiency rates during the same period. In comparison districts, literacy proficiency rates dropped 0.9 percentage points from 33.2% to 32.3% for the overall student population and 0.3 percentage points from 31.1% to 29.8% for FRL students. However, one year after the implementation of the YRC, comparison districts exhibited higher literacy proficiency rates than YRC districts.

In parallel with literacy proficiency rates, math proficiency rates also experienced a decline one year post-implementation of a YRC. However, the decrease in math proficiency rates was smaller than that observed in literacy proficiency rates. The overall student population's math proficiency rates decreased by 0.6 percentage points, moving from 31.9% to 31.3%. Meanwhile, math proficiency rates for the FRL student population decreased by a minimal 0.1 percentage points, shifting from 27.5% to 27.4%. Interestingly, comparison districts saw a slight increase in math proficiency rates during the same period. One year post-implementation of the YRC, districts displayed slightly higher percentages of students scoring proficient in math than comparison districts. However, within the FRL population, comparison districts maintained higher percentages of students scoring proficient in mathematics.

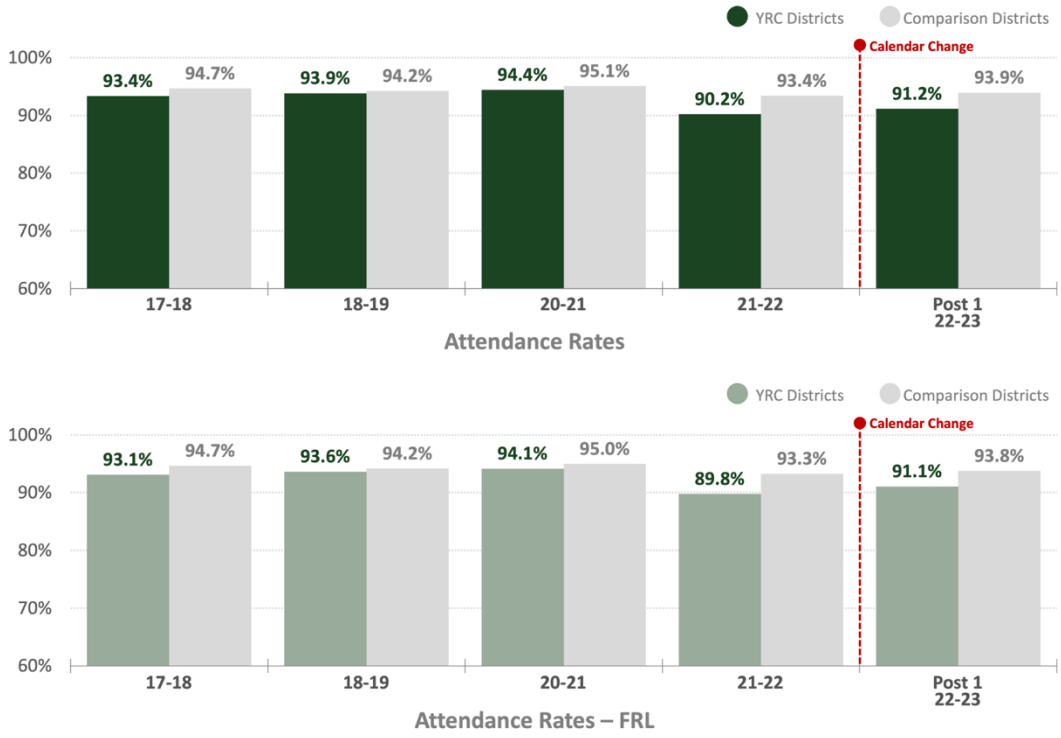
The implementation of a YRC was followed by a decline in literacy and math proficiency rates one year later for both the overall student population and FRL students. This decline was also observed in comparison schools, suggesting that other factors outside of school calendars may have played a role. Despite the overall decline, YRC districts displayed higher percentages of students

scoring proficient in math than comparison districts, indicating a potential benefit for math achievement. However, comparison districts maintained higher percentages of FRL students scoring proficient in mathematics, raising concerns about the influence of YRCs on this particular group.

Attendance

The information in Figure 20 below displays changes in the average attendance rates for the overall student population and FRL students for all YRC districts and comparison districts.

Figure 20:
YRC Average Attendance Rates for All Students and FRL Students, YRC and Comparison Districts, 2017-2023



Attendance rates for YRC districts increased one year after implementing a new calendar for the overall student population and FRL students. The overall student population increased attendance rates by one percentage point, and the FRL student population increased rates by 1.3 percentage points. Although comparison districts also experienced increased attendance rates for both student

groups, the increase was greater in YRC districts. However, for the 2022-23 school year, comparison districts exhibited higher attendance rates than their counterparts using the YRC.

VIII. Results from Difference-in-Differences Analysis

The results from the difference-in-differences analysis are listed in Table 3 below. The single coefficients in the table represent the difference in averages of each outcome of interest between non-traditional calendar districts and their comparisons. DiD can be explained using the following equation with μ representing the average of our outcome of interest:

$$(\mu_{Treatment\ Post} - \mu_{Treatment\ Pre}) - (\mu_{Control\ Post} - \mu_{Control\ Pre})$$

If our outcome of interest is attendance rates, we could use the equation above by calculating the average attendance rate for non-traditional calendar districts before and after adopting a non-traditional calendar. We then calculate the average attendance rates for our comparison districts on the traditional calendar for the same periods. To evaluate the impact of the calendar, we would find the difference in attendance rates between the two groups before and after the change. This involves subtracting the average attendance rate for the treatment group before the change from the average attendance rate for the treatment group after the change. We would then do the same for the control group. Finally, we would subtract the difference in attendance rates for the control group from that for the treatment group. This would generate the DiD estimate, which represents the influence of the calendar change on attendance rates. If districts are not experiencing an impact from changing calendars, the returned coefficients should be zero. The following sections discuss the results of the DiD analysis for 4DSW districts and YRC districts.

Table 3:
Pooled Results from Difference-in-Differences Analysis by Calendar Type

Outcomes of Interest	4DSW (All Cohorts) *N=26* Average Treatment Effect	YRC *N=6* Average Treatment Effect
Literacy Growth	0.672* *(0.330)*	-0.536 *(0.746)*
Literacy Growth FRL	0.513 *(0.352)*	-0.534 *(0.766)*
Math Growth	0.115 (0.547)	-0.866 (0.767)
Math Growth FRL	0.277 *(0.536)*	-0.685 *(0.804)*
Literacy Proficiency	0.004 *(0.011)*	-0.027* *(0.015)*
Literacy Proficiency FRL	0.002 *(0.010)*	-0.028 *(0.016)*
Math Proficiency	0.010 *(0.012)*	-0.024 *(0.022)*
Math Proficiency FRL	0.016 *(0.012)*	-0.019 *(0.022)*
Attendance	0.008 *(0.005)*	-0.015** *(0.006)*
Attendance FRL	0.009 *(0.006)*	-0.012* *(0.006)*

*** p<0.01, **p<0.05, *p<0.1*

4DSW DiD Results

Only one of the ten DiD results for 4DSW Cohorts is statistically significant, implying that the observed changes in that outcome of interest can be attributed to the 4DSW calendar. As shown in Table 3, compared to similar districts, 4DSW districts showed a 0.67-point increase in literacy growth for the overall student population, which is statistically significant at the 90% confidence level. A similar estimate is observed for literacy growth in the FRL student population, with a 0.51-point increase; however, this result is not statistically significant. Compared to similar districts, 4DSW districts are associated with a 0.11- and 0.28-point increase in math growth for the overall student population and FRL students, respectively. These results, however, are not statistically significant.

Focusing on proficiency rates, 4DSW districts, holding all else equal, are associated with a 0.4 percentage point increase in literacy proficiency scores for the overall student population. Similarly, a 0.2 percentage point increase in literacy proficiency scores is observed for the FRL student population. Examining math proficiency, adopting a 4DSW is associated with a 1.0 percentage point increase for the overall student population and a 1.6 percentage point increase for FRL students. The estimated coefficients for both student populations' math and literacy proficiency rates are not statistically significant. Lastly, in terms of attendance, districts that have adopted a 4DSW are associated with a 0.8 percentage point increase in attendance rates for the overall student population and a 0.9 percentage point increase for the FRL student population. These results are not statistically significant.

The lack of statistical significance, combined with relatively small coefficient estimates, suggests that adopting a 4DSW does not significantly influence the student outcomes of interest. We conclude that students in 4DSW districts perform similarly to students in comparison districts on the examined outcomes. It is important to acknowledge that 4DSW districts have the flexibility to tailor their schedules and school structures within the 4DSW framework. This suggests that the results above may not be uniform across all 4DSW districts, as our findings represent the average experience of all 4DSW districts.

YRC DiD Results

The results of the DiD analysis for YRC districts differ from those of the 4DSW districts. In the context of adopting a new calendar, holding all else equal, adopting a YRC calendar is associated with decreased literacy and mathematics proficiency rates for both student populations. Implementing a YRC is associated with a 0.53-point decrease in literacy growth scores for both the overall student population and FRL students. Adopting a YRC is associated with a 0.87-point

decrease in math growth scores for the overall student population and a 0.69-point decrease for the FRL student population. The estimated coefficients for all student growth scores in YRC calendar districts are not statistically significant.

Compared to similar districts, YRC districts are associated with a statistically significant 0.27 percentage point decrease in literacy proficiency scores for the overall student population. This result is statistically significant at the 90% confidence level. For FRL students, adopting a YRC is associated with a 0.28 percentage point decrease in literacy proficiency rates, although this result is not statistically significant. The results for math proficiency show a similar decrease of 0.24 percentage points and 0.19 percentage points for the overall student population and FRL students, respectively. These results are not statistically significant.

Finally, in terms of attendance, districts that adopt a YRC are associated with a statistically significant 0.15 percentage point decrease in attendance rates for the overall student population. This result is statistically significant at the 95% confidence level. A similar result is observed when focusing on the FRL student population, where these students are associated with a 0.12 percentage point decrease in attendance rates, statistically significant at the 90% confidence level. While this result may seem to differ from the trends analysis results where YRC districts experienced an increase in attendance after adoption, the average attendance rates for the five previous years of attendance data are higher than that of the average attendance rates post-calendar adoption.

Only three out of ten outcomes of interest had any statistical significance, indicating that adopting a YRC did not significantly impact all outcomes of interest. However, the presence of some statistical significance in literacy proficiency rates and attendance, along with the negative coefficient estimates, leads to a conclusion that students in YRC districts may be impacted more by adopting a new calendar than students in 4DSW districts. It is important to note, however, that

districts have the autonomy to create their own schedules and school structures within the YRC. Not all YRC districts are possibly experiencing the same adverse effects, as our results represent the average of six YRC districts.

IX. Conclusions and Discussion

This research contributes to understanding the relationship between implementing a non-traditional school calendar, specifically 4DSW and YRC, and specific educational outcomes within Arkansas. This comprehensive analysis of multiple cohorts explored trends and outcomes related to student academic growth, achievement, and attendance. Since all calendar options must adhere to a minimum number of instructional hours, there is little reason to expect changes in educational outcomes for students enrolled in districts that have switched to a 4DSW or YRC. A general summary of the positive and negative findings from the trends and DiD analyses are displayed in Tables 4 and 5 below.

Table 4 illustrates the comprehensive positive and negative trends for 4DSW and YRC districts compared to the respective districts' pre-calendar adoption conditions. A plus sign (+) indicates that the cohort's average score for the outcome of interest was higher than the average score for the same outcome in the year prior to the adoption of the new calendar. A minus sign (-) indicates that the average value for the outcome of interest was lower after adopting the new calendar. An equal sign (=) indicates that the value for the outcome of interest remained the same after adopting the new calendar.

Table 4:
Overall Positive and Negative Results Compared to Pre-Adoption Outcomes from Trends Analysis, by Cohort and Calendar Type

	4DSW Cohort 1			4DSW Cohort 2		4DSW Cohort 3	YRC
Outcomes of Interest	*1 Year Post*	*2 Years Post*	*3 Years Post*	*1 Year Post*	*2 Year Post*	*1 Year Post*	*1 Year Post*
Value-Added Growth Literacy	+	+	+	+	+	+	+
Value-Added Growth Literacy FRL	-	+	+	+	+	+	+
Value-Added Growth Math	-	-	+	+	-	+	-
Value-Added Growth Math FRL	-	-	+	+	-	+	+
Literacy Proficiency	-	-	-	+	+	-	-
Literacy Proficiency FRL	-	-	-	+	+	=	-
Math Proficiency	-	-	-	+	+	+	-
Math Proficiency FRL	-	-	-	+	+	-	-
Attendance	+	+	-	-	-	+	+
Attendance FRL	+	+	=	-	-	+	+

Average literacy growth for students in 4DSW and YRC districts was higher than pre-adoption scores in all years for the overall student population. This trend is similar for literacy growth for FRL students except for Cohort 1's 4DSW districts, which experienced a lower growth score one year following calendar adoption.

Average student math growth varied more than literacy growth for students in the 4DSW and YRC districts. No consistent pattern emerged. Literacy and math proficiency rates for Cohort 1's 4DSW students were lower post-calendar adoption for the overall student population and FRL students one, two, and three years post-calendar adoption. Since pre-adoption scores for Cohort 1 districts were gathered from the 2018-19 school year, the decreases in literacy proficiency are most likely driven by the COVID-19 pandemic. No discernable patterns emerge for other 4DSW cohorts or YRC. Additionally, attendance rates varied with no consistent pattern between 4DSW cohorts or YRC.

Table 5 summarizes the overall positive and negative trends observed in 4DSW and YRC districts compared to comparison districts using a traditional school calendar. A plus sign (+)

indicates that the average score for the cohort's outcome of interest was higher than the average score for the same outcome in comparison districts. A minus sign (-) indicates that the average value for the outcome of interest was lower than in comparison districts.

Table 5:
Overall Positive and Negative Results Compared to Comparison Districts by Analysis and Calendar Type

	Trends Analysis							**DiD Analysis**	
	4DSW Cohort 1			**4DSW Cohort 2**		**4DSW Cohort 3**	**YRC**	**4DSW**	**YRC**
Outcomes of Interest	*1 Year Post*	*2 Years Post*	*3 Years Post*	*1 Year Post*	*2 Year Post*	*1 Year Post*	*1 Year Post*	*Pooled*	*Pooled*
Value-Added Growth Literacy	+	-	+	+	+	-	-	**+***	-
Value-Added Growth Literacy FRL	+	-	+	+	+	+	-	+	-
Value-Added Growth Math	-	-	+	+	+	-	-	+	-
Value-Added Growth Math FRL	+	-	+	+	+	-	-	+	-
Literacy Proficiency	-	-	-	+	-	+	-	+	**-***
Literacy Proficiency FRL	-	-	+	-	-	+	-	+	-
Math Proficiency	-	-	-	+	+	-	+	+	-
Math Proficiency FRL	-	-	+	+	+	-	-	+	-
Attendance	-	+	+	+	+	+	-	+	**-****
Attendance FRL	-	+	+	+	+	+	-	+	**-***

*** p<0.01, **p<0.05, *p<0.1*

The results presented in Table 5 do not show any consistent trend for any outcome of interest. The pooled results from the 4DSW DiD analysis showed a positive and statistically significant coefficient in literacy growth scores, meaning the average literacy growth scores after calendar adoption for students in 4DSW are higher than those of comparison districts post-adoption. All other values from the pooled DiD analysis for 4DSW returned positive yet small and statistically insignificant results. The DiD analysis for YRC returned all negative results. Three of the outcomes of interest, literacy proficiency rates for the overall student population, and attendance rates for both student groups returned negative statistically significant values. The results from the DiD analysis, as well as the trends analysis, lead to the conclusion that students in YRC districts are not performing as well as students in comparison traditional calendar districts.

As policymakers, educators, and communities contemplate the potential benefits of adopting non-traditional school calendars, such as 4DSW and YRC, it is essential to approach the decision-making process with careful consideration and a complete understanding of the potential implications. While calendar changes may offer the possibility of improved school outcomes and student well-being, it is crucial to recognize that the success of these initiatives hinges on a range of factors beyond the mere adoption of a new calendar structure.

Several key recommendations emerge for districts contemplating a transition to a non-traditional calendar. Firstly, engaging in a collaborative planning process is crucial for ensuring that the decision is grounded in the collective input of stakeholders, including teachers, staff, students, parents, and the broader community. This participatory approach fosters a sense of ownership and shared responsibility, which may increase the likelihood of successful implementation and sustained support.

Secondly, district leaders must carefully consider the implications of non-traditional calendar structures on the school day's organization and instruction delivery. Prioritizing high-quality instruction, particularly in core subjects like literacy and math, is essential to maximizing learning opportunities and minimizing disruptions to academic progress. Therefore, districts should equip educators with effective pedagogical strategies and ongoing professional development to support high-quality instruction within the modified school calendar. Additionally, districts should also thoughtfully structure unscheduled time to ensure it is utilized effectively for enrichment activities, targeted support, and student well-being initiatives. Prior OEP literature from Barnes and McKenzie (2023) revealed that some non-traditional calendar districts intentionally dedicate more time to literacy and math instruction to foster more in-depth instruction.

Variations in school schedules lead to our third policy recommendation: More research is needed to monitor the effects of various calendars on academic growth, achievement, as well as family dynamics, teacher recruitment, and the utilization of unscheduled time. Continual focus on non-traditional calendar districts allows for identifying best practices and policy adjustments as needed, ensuring a responsive and adaptive educational environment.

In conclusion, adopting a new school calendar is a nuanced decision that demands a deep understanding of the local context and an ongoing commitment to reevaluating these choices. The Arkansas districts' experiences provide valuable insights for policymakers, educators, and communities, steering future discussions on optimizing educational structures for enduring student success. While calendar changes may be enticing for the school's potential benefits, it is crucial to recognize that school and community culture and the quality of instruction play pivotal roles in shaping student outcomes. Fostering a positive and supportive school environment, empowering educators with effective pedagogical strategies, and engaging families and communities as active education partners are essential to achieving holistic student success. As districts consider calendar adjustments, they must prioritize these fundamental elements to ensure that any changes align with the school community's overall educational goals and aspirations.

X. References

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XI. Appendix

Table 1.A

4DSW Cohort 1 and Comparison Districts, Total Enrollment and Percentage of FRL Students, Matching Year, 2018-19

District Name	Total Enrollment	FRL	District Name	Total Enrollment	FRL
Cossatot River	566	72.5%	Ozark Mountain	606	74.9%
Maynard	*471*	*73.1%*	*Nemo Vista*	*446*	*64.6%*
Lee County	*637*	*90.9%*	*Barton*	*708*	*85.5%*
Flippin	*845*	*72.9%*	*Marvell-Elaine*	*347*	*97.2%*
East End	648	64.1%	Viola	362	67.8%
Fordyce	*755*	*70.4%*	*Magazine*	*509*	*80.9%*
Melboune	*850*	*50.5%*	*Claredon*	*436*	*92.3%*
Riverside	*750*	*60.2%*	*Omaha*	*385*	*74.3%*
England	645	76.2%	Western Yell County	355	87.4%
Alpenea	*516*	*67.3%*	*Des Arc*	*535*	*70.9%*
Nevada	*389*	*76.5%*	*Mammoth*	*458*	*72.5%*
Hillcrest	*420*	*71.3%*	*Magazine*	*509*	*80.9%*
Kirby	347	77.3%	Westside (Johnson)	636	75.6%
Claredon	*436*	*92.3%*	*Quitman*	*700*	*56.6%*
Omaha	*385*	*74.3%*	*Hermitage*	*417*	*75.4%*
Nemo Vista	*446*	*64.6%*	*Salem*	*850*	*63.6%*
Norfork	428	77.0%			
Cedarville	*760*	*72.4%*			
Guy-Perkins	*332*	*66.6%*			
Paris	*1,012*	*74.6%*			

Note: We matched districts using the information above as well as student growth and achievement scores for the identified year and the year prior.

Table 2.A

4DSW Cohort 2 and Comparison Districts, Total Enrollment and Percentage of FRL Students, Matching Year, 2020-21

District Name	Total Enrollment	FRL	District Name	Total Enrollment	FRL
Atkins	912	65.3%	Nevada	388	100.0%
Barton	*689*	*100.0%*	*County Line*	*496*	*74.1%*
Salem	*836*	*63.7%*	*Piggott*	*782*	*51.7%*
Paris	*967*	*100.0%*	*Hazen*	*522*	*72.2%*
Buffalo Island Central	707	63.7%	Ouachita	492	44.5%
Perryville	*895*	*61.4%*	*Marvell-Elaine*	*328*	*99.7%*
Hector	*615*	*100.0%*	*Mammoth Spring*	*453*	*100.0%*
Carlisle	*620*	*63.4%*	*Blevins*	*448*	*82.9%*
Mineral Springs	356	100.0%			
Eureka Springs	*557*	*60.1%*			
Dierks	*496*	*78.2%*			
Brinkley	*434*	*98.8%*			

Note: We matched districts using the information above as well as student growth and achievement scores for the identified year and the year prior.

Table 3.A

4DSW Cohort 3 and Comparison Districts, Total Enrollment and Percentage of FRL Students, Matching Year, 2021-22

District Name	Total Enrollment	FRL	District Name	Total Enrollment	FRL
Blevins	429	82.3%	Mayflower	969	59.5%
Concord	*374*	*71.2%*	*Cedar Ridge*	*622*	*71.2%*
DeWitt	*1,111*	*60.5%*	*Fordyce*	*706*	*69.2%*
Bearden	*473*	*75.5%*	*Ouachita River*	*740*	*71.6%*
Caddo Hills	532	75.4%	Palestine-Wheatley	763	85.4%
Mount Ida	*421*	*70.8%*	*Bay*	*552*	*62.5%*
Hermitage	*404*	*74.9%*	*Jessieville*	*823*	*71.7%*
Des Arc	*572*	*67.1%*	*South Pike County*	*668*	*70.6%*
Centerpoint	995	70.3%	Perryville	903	62.3%
Clarendon	*431*	*92.6%*	*Lee County*	*580*	*90.7%*
Dover	*1,194*	*57.5%*	*Hampton*	*519*	*70.6%*
KIPP Delta	*1,059*	*89.7%*	*Mountainburg*	*602*	*73.4%*
Cutter-Morning Star	647	74.2%	Poyen	491	51.3%
Smackover-Norphlet	*1,007*	*55.6%*	*Lee County*	*580*	*90.7%*
East Poinsett County	*559*	*75.4%*	*Mammoth Springs*	*463*	*72.4%*
County Line	*523*	*70.9%*	*Mountainburg*	*602*	*73.4%*
Deer/Mt. Judea	361	73.0%	Rivercrest	1,012	77.6%
Genoa Central	*1,177*	*37.4%*	*Lafayette County*	*494*	*85.6%*
Bradford	*430*	*78.3%*	*Green Forest*	*1,384*	*79.5%*
Mountain Pine	*614*	*82.9%*	*Nemo Vista*	*454*	*64.9%*
Dierks	508	71.1%	Trumann	1,441	74.1%
South Pike County	*668*	*70.6%*	*Magnet Cove*	*686*	*46.1%*
Corning	*808*	*74.2%*	*Southside*	*1,924*	*64.6%*
Calico Rock	*366*	*72.0%*	*Lawrence County*	*932*	*58.8%*

Note: We matched districts using the information above as well as student growth and achievement scores for the identified year and the year prior.

Table 4.A

YRC and Comparison Districts, Total Enrollment and Percentage of FRL Students, Matching Year, 2021-22

District Name	Total Enrollment	FRL	District Name	Total Enrollment	FRL
East Poinsett	559	75.4%	McCrory	542	57.4%
Cedarville	*722*	*72.0%*	*Bay*	*552*	*62.5%*
Dierks	*508*	*71.1%*	*Dermott*	*330*	*94.4%*
Mountainburg	*602*	*73.4%*	*Guy-Perkins*	*288*	*69.2%*
Marion	3,710	72.0%	Osceola	987	90.1%
Clarksville	*2,422*	*70.6%*	*Corning*	*808*	*74.3%*
Hot Springs	*3,587*	*82.5%*	*Lee County*	*580*	*90.7%*
McGehee	*1,066*	*75.1%*	*Mountainburg*	*602*	*73.4%*
Marked Tree	508	82.9%	Wynne	2,487	61.9%
Augusta	*322*	*86.3%*	*Lonoke*	*1,543*	*68.7%*
Bradford	*430*	*78.3%*	*Berryville*	*1,750*	*70.9%*
Midland	*422*	*71.7%*	*Mountain View*	*1,494*	*71.1%*

Note: We matched districts using the information above as well as student growth and achievement scores for the identified year and the year prior.