Time Related Factors in the Education System: Impact on Academic Performance and Student Well-being

By Jack Freimann

The structure of time within the educational system significantly impacts both a student's academic performance and their well-being. This structure includes when school begins, how long classes last, and how many days should make up a school week. Understanding the relationship between these factors and important student outcomes can help educators and education policymakers design a more effective school structure that supports student learning environments and optimizes student achievement.

School Start Times

The first factor that has emerged as crucial when influencing student achievement is school start times. Research has consistently shown that a later school start time has been linked with an increase in academic performance, especially for adolescent students who experience biological changes to their sleep patterns when going through puberty. For example, Heiseel and Norris's (2019) study conducted in the Florida Panhandle revealed that later school start times increase student achievement on standardized tests both in math and reading. To arrive at this conclusion, the researchers tracked individual students who moved across the time-zone boundary (parts of the Florida panhandle sit in different US time-zones), investigating how the resulting changes in morning sunlight exposure before school impacted their performance on standardized tests. The researchers found that adolescents benefited

from later start times relative to the sunrise, with effects strongest at the gender-specific ages when puberty usually begins (Heissel & Norris)[1]. This suggests that rigid, uniform school schedules may not properly address the developmental differences between students. As puberty affects students at different times, it may be worth exploring more flexible scheduling policies that reflect this variation.

A study conducted at the US Air Force Academy provided substantial support for a causal relationship between school start time and academic performance. When freshmen were randomly assigned to either have a first-period class at 7:00 AM or begin their day during the second period, those who started later had significantly higher GPAs overall. This effect diminished considerably when first-period classes were moved to 7:50 AM, suggesting that the greatest benefit for older adolescents may come from eliminating start times before 8:00 AM (Swain, Tran, and Carrier)[2]. These results raise questions about the common compromise of shifting school start times by just 30 minutes or less. While such adjustments may seem logistically easier, they might fall short of delivering the full well-being for students that research suggests.

A study conducted by researchers in Wake County, North Carolina, produced similar findings. There, researchers discovered that a one hour delay in school start time led to a 2 percentile increase in math scores and a 1.5 percent increase in reading scores. The authors of this study examined 38 different reports in a meta-analysis study that researched whether or not school start time affected sleep and other outcomes amongst adolescent students. They concluded that delaying school start time accomplishes the goal of increasing sleep duration among these students, primarily by

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[1] Heissel, Jennifer, and Samuel Norris. 2019. “Rise and Shine.” Education Next.

[2] Swain, Nicole, Tuyet Tran, and Daphne Carrier. n.d. “Academic Impacts of Later School Start Times.” Digital Commons Collin.Edu.

delaying rise time. Delayed school start times also generally corresponded to improved attendance, less tardiness, less falling asleep in class, fewer depression symptoms, and fewer motor vehicle crashes (Wheaton, Chapman, & Croft)[3].

The relationship between school start times and sleep is well-documented across multiple studies. In Shanghai, China, when schools delayed start times from 7:30 AM to either 8:00 AM or 8:30 AM, students at these schools experienced later bedtimes, later wake up times, and less daytime sleepiness compared to control schools where school start times were left the same (Wheaton, Chapman, & Croft). Likewise in Wellington, New Zealand, 12th grade students experienced longer sleep duration, earlier bedtimes, later wake up times, and less sleep discrepancy between school nights and non-school nights when start times were delayed (Wheaton, Chapman, & Croft). These findings are especially relevant given what we know about adolescent sleep patterns and the need for sleep in adolescents. The international consistency of these results suggest that adolescent sleep needs are not culturally bound but biologically universal. This could help counter arguments around later start times being uniquely a Western concern and spark advocacy efforts worldwide.

Adolescents experience biological changes during puberty that shift their circadian rhythms and make it difficult for them to fall asleep early. Multiple psychologists, including Kyla Wahlstrom and Lisa Meltzer demonstrate the need for pushing back school start times in order for adolescent students to have a longer sleep duration. There are also downstream benefits for teachers and parents who reported increased sleep duration and improved functioning when school schedules are adjusted

[3]Wheaton, Anne G. and Chapman, Daniel P. and Croft, Janet B. "School Start Times, Sleep, Behavioral, Health, and Academic Outcomes: a Review of the Literature" 86, no. 5 (2016)

(Weir)[4]. The ripple effect on families and educators highlights that reforming school time structures can have compounding benefits across the entire school ecosystem, not just for students. It's an area that I think deserves more research and consideration in future policy discussions. There is also a need for extended research on later start times for pre-pubescent kids. The majority of the literature has emphasized the need for a pushback in start time for adolescents, but has yet to address the needs of younger kids. Despite these gaps, the benefits of later start times can extend beyond just test scores and academic achievement and can improve a student's overall well-being. While the academic benefits might seem modest, the broader impacts reveal that start time reform isn't just an educational issue–it's a public health and equity issue as well. The holistic benefit strengthens the case for change in the educational systems.

Short School Weeks

While school start times have received significant attention in recent years, they are only a fraction of the broader conversation regarding how time is structured in the education system. Another increasingly debated topic is the implementation of a four-day school week. This model has gained traction in diverse school settings for its potential to improve both student and teacher well-being, reduce burnout rates, and even improve academic performance. As with start times, altering the number of instructional days raises complex questions about the relationship between time, learning, and well-being. Exploring the research on four-day school schedules offers an opportunity to better understand how restructuring of time can benefit both academics and the overall educational experience.

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[4] Weir, Kirsten. 2024. "Schools shift as evidence mounts that later start times improve teens' learning and well-being." American Psychological Association.

The research paper, “Exploring the Advantages of a Four-Day School Week” by Kaylee Bowman, at Sacred Heart University[5], advocates for restructuring the American school system to four instructional days per week with a fifth for enrichment activities. Bowman argues that this model would improve the work-life balance for students and teachers, helping to reduce issues like teacher burnout and student anxiety. Bowman’s paper does not present any original findings, instead she builds her case by synthesizing existing data, including examples from over 560 districts in 25 states that have implemented a form of a four-day school week. Bowman’s suggestion for a shift in structure may contribute to student’s becoming more well-rounded individuals with more well-rounded life perspectives.

A study with panel data from Colorado public schools examined how four-day school weeks affect student performance. The study used a difference-in-differences approach measuring performance through the percentage of students scoring proficient or advanced on standardized tests. Researchers analyzed data from fourth grade reading and fifth grade mathematics tests and found that four-day school weeks were associated with increased academic performance, particularly showing a 7.4 percentage increase in math proficiency and a 3.8 percent increase in reading proficiency (Anderson and Walker)[6]. In another study examining the impact of four-day school weeks on student achievement, Missouri public schools reported that since Missouri passed Senate Bill 291 in 2009, allowing districts to adopt four-day school weeks, the implementation of that model has grown dramatically to 144 districts by

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[5] Bowman, Kaylee. 2021. “Exploring the Advantages of a Four-Day School Week: Improving Learning, Wellness, and Work-Life Balance.” Sacred Heart

[6] D. Mark Anderson, Mary Beth Walker; Does Shortening the School Week Impact Student Performance? Evidence from the Four-Day School Week. *Education Finance and Policy* 2015; 10 (3): 314–349.

2023. That is about 27% of all Missouri schools. According to NAEP data, Missouri had been achieving scores above the national average until 2009, with the exception of 2005. Since 2011, the scores of Missouri school districts began declining, and between 2011 and 2022, Missouri districts averaged the same or 1 point lower than the national average (Versemann)[7]. While Versemann's study only examines a specific population of students, this study does conclude that by moving to a four-day school week academic achievement may be negatively impacted. This raises concerns about the four-day school week model and its implementation across school districts. While test scores may not be the optimal metric to measure when evaluating school and teacher performance, it can definitely be an indicator as to how a new system is performing. While other studies and research have raised the benefits for well-being and overall development, the Missouri case illustrates that academic outcomes may not always follow the same upward trajectory.

Contrasting perspectives highlight the importance of considering local context, implementation strategies, and support systems when evaluating alternative models. Ultimately, the effectiveness of a four-day school week may depend less on the reduction of hours and more on how that time is being utilized–both in and out of the classroom. As education structures continue to evolve to optimize student learning and well-being, a balanced approach will be essential in shaping the future of learning. There are also still unanswered questions on the motives for implementing a four-day school week schedule. The outcomes of a district who implement this policy for financial reasons may be much different than a district that implements the structure for purely a

[7] Versemann, Stacey. "The Impact of a Four-Day and Five-Day School Week on Student Achievement in Reading and Math." (Jan 2024).

student achievement purpose. Answering this question would also help to address the inconsistencies in previous literature as more conclusive evidence can be drawn.

Class or Period Duration

Another critical component of time in school structure that warrants examination is the duration of individual class periods both across the semester and school day. Just as reducing the number of instructional days can have complex effects on student outcomes, the amount of time students spend in each class can significantly impact academic performance. Understanding how time is allocated during the school day is important to evaluating the effectiveness of any broader structure changes.

Some research suggests that shorter, more intensive learning periods are optimal because they create a more focused learning experience. For example, Petrowsky (1996)[8] found that on exams measuring basic recall, student scores were higher in compressed class structure. However, on final exams requiring more comprehension, students in traditional class length formats performed better. This suggests that by altering the length of a class schedule, different cognitive processes may be differently affected.

Santa Monica College discovered that students have higher success rates in compressed 6-week sessions than in full semesters. They used searches of the Santa Monica College database from the fall of 1994 through the summer of 1999 where they compared the final grade students received in each of the different structured classes (Ruth and Geltner)[9]. These findings can challenge the belief that students, especially

[8] Petrowsky, Michael C. 1996. “The Two Week Summer Macroeconomics Course: Success or Failure?”
[9] Logan, Ruth, and Peter Geltner. 2000. “The Influence of Session Length On Student Success.” Montgomery College.

struggling ones, need considerable amounts of time to digest content and incorporate it into their knowledge bases. When students took classes with both formats of length, the majority of students who were enrolled in both spring and summer classes had higher GPAs and lower dropout rates for their summer work than for their spring work. They took their spring courses first and then proceeded to take compacted summer classes.

There has been significant research on block scheduling, where instead of 40-50 minute periods, classes are extended to 90-120 minute lengths. The primary variations include the “semester 4x4” model where students take four classes per semester, the “A/B alternate-day” model, and hybrids of the two. Empirical research of block scheduling has highlighted mixed results on academic performance. Proponents argue that the extended class periods allow for students to further their engagement with content, especially during science laboratories and other classes that require longer periods of uninterrupted time. Critics argue however that block scheduling comes with its challenges. These include potential reduction in total contact hours between students and teachers, difficulty in content retention, and reported additional boredom in students during longer periods of class[10]. More research is needed in order to fully understand the effects of block scheduling, what type of student is most likely to benefit from this model of scheduling, and what type of classes a block schedule would most benefit. Understanding these context-dependent factors can help administrators make decisions for when to implement a block schedule to allow for the highest effectiveness in student achievement.

Beyond just academic metrics, the length of class periods can significantly impact qualitative aspects of the educational experience. Some of these aspects include

[10] Merritt, Roy D. 2021. “Block Scheduling.” EBSCO. https://www.ebsco.com/research-starters/education/block-scheduling.

engagement in content, teaching approaches, and just the overall well-being of students. Extended class periods provide opportunities for more interactive teaching approaches that could enhance student engagement. Longer class periods may also allow for more collaboration, with students having the ability to work in groups and share their ideas with their peers. One of the only studies available that examined class duration looked at whether either a 50-minute session held three times per week or a 75-minute session held twice a week had a more positive correlation with students' academic performance and attendance in an introductory level computer science class. Researchers analyzed exam scores, final grades, attendance rates, and test results from 125 undergraduate students. The results showed no statistically significant differences between the two groups in any of the measured outcomes (Shultz & Sharp)[11].

Taken together, this suggests that while shifts in class duration can result in differences in academic performance, these effects are not uniform across every student population. There needs to be further discussion on how to truly optimize instructional time, given that it depends heavily on the context–both in terms of subject matter and individual student learning style. A compressed class schedule might benefit self-motivated students who are okay under pressure, while others may fail under that same style of class and require extended time to fully engage with and retain material. Rather than a one-size-fits all model, policymakers should research the idea of flexible scheduling that accommodates different needs and prioritizes a student's well-being.

[11] Schultz, Leah, and Jason Sharp. 2007. "The Effect of Class Duration on Academic Performance and Attendance in an Introductory Computer Class." Research Gate.

This kind of nuanced policy design could lead to more equitable and effective educational outcomes.

The literature reviewed clearly outlines that the structuring of time within the school systems play a crucial role in shaping both academic performance and student well-being. The research already conducted strongly supports the idea of aligning school start times and school schedules with adolescent sleep patterns, particularly by delaying the start of school, to help improve both academic performance and mental and physical health. However, there are several important gaps in the literature that still remain. While research has assured that there are benefits of later start time for adolescents, there is less known about the optimal start times for elementary-age children, who have much different sleeping patterns from teenagers. Also, the implementation of this model for later start times could create logistical issues, including transportation costs, bus scheduling, and impacts on family child care arrangements.

With the four-day school week model, future research should be conducted that examines the reasoning behind districts choosing to implement this structure. Districts that adopt the shortened weeks due to financial constraints may show different outcomes than districts implementing the change for student-wellness reasons or teacher retention. Understanding the motivations amongst districts can help explain the inconsistencies observed across studies.

Studies on class duration highlight the diversity of student preferences and unique learning styles. However, the literature lacks enough evidence of how subject areas might require different optimal amounts of time. Additionally, research exploring

how different developmental stages interact with class duration could help to inform more age-appropriate scheduling decisions.

Based on the growing body of evidence, I believe school systems should prioritize reforms that reflect the biological needs of adolescent students, especially around sleep and cognitive functioning. By doing so, schools can better support academic and character development. Research can also help support the idea that thoughtfully designed temporal structures can create significant benefits for students and teachers, shifting the educational system in meaningful waysAs educational institutions continue to evolve, a more nuanced approach to time management should be central for policy reform. The challenge lies not only in changing when and for how long students should learn, but in reforming how time can be used more effectively to enable a more equitable education for all students.

Big Questions & Articles to Read

Week 15: Time within the Education System
How should schools balance the biological sleep needs of adolescents against logistical considerations like transportation and family schedules when determining start times? What factors should schools prioritize when considering a shift to a four-day school week? How might optimal time structures differ across elementary, middle, and high school levels? What role should student and teacher input play in decisions about restructuring school time?

Tuesday:

- Heissel, Jennifer, and Samuel Norris. 2019. “Rise and Shine.” Education Next.
- Swain, Nicole, Tuyet Tran, and Daphne Carrier. n.d. “Academic Impacts of Later School Start Times.” Digital Commons Collin.Edu.
- Wheaton, Anne G. and Chapman, Daniel P. and Croft, Janet B. "School Start Times, Sleep, Behavioral, Health, and Academic Outcomes: a Review of the Literature" 86, no. 5 (2016)

Thursday:

- D. Mark Anderson, Mary Beth Walker; Does Shortening the School Week Impact Student Performance? Evidence from the Four-Day School Week. *Education Finance and Policy* 2015; 10 (3): 314–349.
- Versemann, Stacey. "The Impact of a Four-Day and Five-Day School Week on Student Achievement in Reading and Math." (Jan 2024).
- Schultz, Leah, and Jason Sharp. 2007. “The Effect of Class Duration on Academic Performance and Attendance in an Introductory Computer Class.” Research Gate.