

## **Memo 2: What research evidence exists on the association between the four-day school week and educational achievement at primary and secondary schools in the United States?**

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This memorandum is a rapid response to a request for research evidence on the four-day school week (4DSW) at primary and secondary schools in the United States. This second memorandum summarizes findings from recent peer-reviewed journal articles on the association between adopting a 4DSW and student educational achievement. Of the studies identified in the Memo 1 scientific literature search, I focus below on studies that (1) included and analyzed data collected after the Great Recession of 2008, and (2) used the “difference-in-differences” research method to compare the changes in educational achievement over time for the 4DSW with the difference in educational achievement over time for the 5DSW. These seven studies are:

1. Anderson, D. M., & Walker, M. B. (2015). [Does Shortening the School Week Impact Student Performance? Evidence from the Four-Day School Week](#). *Education Finance and Policy*, 10(3), 314–349.
2. Kilburn, M. R., Phillips, A., Gomez, C. J., Mariano, L. T., Doss, C. J., Troxel, W. M., Morton, E., & Estes, K. (2021). [Does Four Equal Five? Implementation and Outcomes of the Four-Day School Week](#). RR-A373-1. RAND Corporation.
3. Morton, E. (2021). [Effects of Four-Day School Weeks on School Finance and Achievement: Evidence From Oklahoma](#). *Educational Researcher*, 50(1), 30–40.
4. Morton, E. (2022). [Effects of 4-Day School Weeks on Older Adolescents: Examining Impacts of the Schedule on Academic Achievement, Attendance, and Behavior in High School](#). *Educational Evaluation and Policy Analysis*. doi: 10.3102/01623737221097420
5. Thompson, P. N. (2021). [Is four less than five? Effects of four-day school weeks on student achievement in Oregon](#). *Journal of Public Economics*, 193, 104308.
6. Thompson, P. N., Tomayko, E. J., Gunter, K. B., & Schuna, J. (2022a). [Impacts of the four-day school week on high school achievement and educational engagement](#). *Education Economics*, 30(5), 527–539.
7. Thompson, P. N., & Ward, J. (2022b). [Only a matter of time? The role of time in school on four-day school week achievement impacts](#). *Economics of Education Review*, 86, 102198.

Disclaimer: Due to the rapid nature of this response and competing demands for time, I have not yet evaluated the quality of these studies, but rather summarize the main results as interpreted and reported by study authors. It is possible that these studies have limitations in their methods that would reduce my confidence in their reported findings, and that I would have a different interpretation of their findings. In addition, I have not had the opportunity to use formal methods for summarizing results, exploring reasons for differences in findings across studies (e.g., characteristics of schools and districts, research method, time period, type of data), and assessing applicability to the La Grande School District.

### **Summary of Findings**

The typical result of adopting a 4DSW on student educational achievement were relatively small, negative average differences in annual standardized test scores for math and reading/ELA, with the potential for small initial differences to grow over time. However, some schools and districts experienced larger negative results, while others experienced no differences or possibly even experienced positive results after 4DSW adoption. Findings suggest negative differences in student educational achievement are less likely among districts that:

- maintained an amount of overall time-in-school comparable to 5DSW districts
- adopted the 4DSW for reasons other than cost-cutting in response to financial pressures
- were located in rural or non-city geographic areas
- served students who may not have home environments equipped to facilitate off-day instructional engagement (e.g., older students for advanced mathematics, ESL for ELA).

In light of these findings that a 4DSW is not necessarily detrimental for student educational achievement, districts interested in the 4DSW may want to consider their ability to:

- maintain a sufficient amount of overall time-in-school
- reallocate cost-savings to targeted student services on the “fifth day” of the 4DSW
- engage families and the local community in discussions about how students will spend their additional days out of school.

The above considerations are specific to research findings on educational achievement. Districts should also consider other outcomes such as educational attainment (e.g., attendance, graduation), student health and wellbeing, resources, and acceptability to important stakeholders.

### **Is the 4DSW associated with changes in student educational achievement?**

- Anderson 2015 examined school-level data from the Colorado Student Assessment Program (CSAP) on elementary student test scores for the years 2000 to 2010. They found elementary school adoption of the 4DSW was associated with an increase of 7.41 percentage-points in fifth-grade mathematics and 3.8 percentage-points in fourth-grade reading.
- Kilburn 2021 examined administrative data from school districts across six states (Colorado, Idaho, Missouri, New Mexico, South Dakota, Oklahoma) for the years 2008 to 2019. They found that achievement levels of ELA and math in 4DSW school districts did not decrease after the adoption of the policy, and their “difference-in-differences” analyses (i.e., the research method used in other studies) did not detect a statistically significant association between 4DSW adoption and ELA/math scores.
  - However, in other analyses comparing 4DSW districts with similar 5DSW districts, they found that student achievement may not have grown as fast as it would have if 4DSW districts retained a 5DSW—and that these differences in achievement scores may have compounded and grown over time.
    - Across various ways of analyzing their data, they found average ELA achievement scores to be between 0.028 and 0.087 standard deviations lower—and average math achievement scores to be between 0.044 and 0.099 standard deviations lower—than comparable 5DSW districts.
      - In other words, a school district that would be in the 50th percentile if they retained a 5DSW would instead be in the 47<sup>th</sup>-to-49<sup>th</sup> percentile on ELA and 46<sup>th</sup>-to-48<sup>th</sup> percentile on math after adopting the 4DSW.
    - Three years after 4DSW adoption, they found ELA scores to be between 0.040 and 0.096 standard deviations lower—and math scores to be between 0.069 and 0.140 standard deviations lower—than comparable 5DSW districts.
      - Three years after adopting the 4DSW, a school district that would be in the 50th percentile if they retained a 5DSW would instead be in the 46<sup>th</sup>-to-48<sup>th</sup> percentile on ELA and 44<sup>th</sup>-to-47<sup>th</sup> percentile on math.
    - Eight years after 4DSW adoption, they found ELA scores to be between 0.145 and 0.229 standard deviations lower—and math scores to be between 0.144 and 0.189 standard deviations lower—than comparable 5DSW districts.
      - Eight years after adopting the 4DSW, a school district that would be in the 50th percentile if they retained a 5DSW would instead be in the 41<sup>st</sup>-to-44<sup>th</sup> percentile on ELA and 44<sup>th</sup>-to-47<sup>th</sup> percentile on math.
- Morton 2021 examined district-level achievement data from the Stanford Education Data Archive for all K–12 public school districts in Oklahoma for the years 2009 to 2016. They did not detect a statistically significant relationship on math and ELA scores for students in Grades 3 to 8.
- Morton 2022 examined district-level ACT data from the Oklahoma State Department of Education for Oklahoma districts that served high school students in a noncity location for the years 2008 to 2019. They did not detect a statistically significant relationship on ACT math and English scores.

- Thompson 2021 examined student-level data on the Oregon Assessment of Knowledge and Skills test scores for students in Grades 3 through 8 in Oregon for the years 2005 to 2019. They found math scores to be between 0.037 and 0.059 standard deviations lower—and reading scores to be between 0.033 and 0.042 standard deviations lower—for students at schools that have adopted the 4DSW than comparable students at schools that have retained the 5DSW. In other words, a student that would be in the 50th percentile if their school retained a 5DSW would instead be in the 48<sup>th</sup>-to-49<sup>th</sup> percentile in both math and reading after adopting the 4DSW. Using the probability that a student scores above the proficiency threshold (rather than actual test scores), they found that students at schools with 4DSW were 2-to-3.6 percentage-points less likely to score above the proficiency cutoff in math and 1.4-to-2.6 percentage points less likely to score above the proficiency cutoff in reading than if their school had retained a 5DSW.
  - They found that these negative associations with achievement were most evident immediately after 4DSW adoption and faded over time—primarily due to transitory 4DSW schools switching back to the 5DSW after a few years (rather than permanent 4DSW schools becoming more acclimated to the new schedule).
    - By four years after permanent 4DSW adoption, math achievement fell by 0.088 standard deviations and reading achievement fell by 0.104 standard deviations relative to the year before adoption (i.e., 46<sup>th</sup> percentile rather than 50<sup>th</sup> percentile for the average student). Conversely, math achievement grew by 0.093 standard deviations and reading achievement grew by 0.099 standard deviations four years after transitory 4DSW adoption (i.e., 54<sup>th</sup> percentile rather than 50<sup>th</sup> percentile for the average student).
  - They also found a noticeable positive association between greater time in school and improvements in educational achievement—suggesting that maintaining exposure to the school environment may mitigate negative associations with achievement.
    - Specifically, they found that a one-hour increase in weekly time in school was associated with higher math achievement scores by 0.0185 standard deviations (i.e., 51<sup>st</sup> percentile rather than 50<sup>th</sup> percentile for the average student). However, they did not detect a statistically significant relationship reading.
- Thompson 2022a examined student-level data on the Oregon Assessment of Knowledge and Skills test for high school students in 11<sup>th</sup> grade in Oregon for the years 2005 to 2019. They did not detect a statistically significant relationship for reading achievement. They did find math scores to be 0.09 standard deviations lower (i.e., 46<sup>th</sup> percentile rather than 50<sup>th</sup> percentile for the average student) for students who started in a 4DSW school upon entry into high school, compared to students at schools that retained a 5DSW. Furthermore, these findings were driven by non-rural school districts: they found that math achievement scores were 0.125 standard deviations lower in non-rural settings (i.e., 45<sup>th</sup> percentile rather than 50<sup>th</sup> percentile for the average student), whereas they did not detect statistically significant differences in rural schools.
- Thompson 2022b examined district-level data from the Stanford Educational Data Archive for students in Grade 3 through 8 across 12 states for the years 2009 to 2018. They separate districts into three groups by time in school: “low time in school” (averaging 29.95 weekly

hours), “middle time in school” (averaging 31.03 weekly hours), and “high time in school” (averaging 32.14 weekly hours). They found math and ELA achievement to be 0.039 standard deviations lower for the “low time in school” 4DSW districts compared to “low time in school” 5DSW districts (i.e., 48<sup>th</sup> percentile rather than 50<sup>th</sup> percentile for the average district), but they did not detect statistically significant differences in achievement within “middle time in school” and “high time in school” districts.

### **Is the 4DSW associated with differences in achievement for specific student populations?**

- Anderson 2015 found a positive relationship between the percentage of students at a school receiving free lunch and higher test scores for fifth-grade mathematics, but they did not detect a statistically significant relationship for fourth-grade reading.
- Thompson 2021 found that special education students had math scores 0.026 standard deviations higher on average than general education students (i.e., 51<sup>st</sup> percentile rather than 50<sup>th</sup> percentile for the average student), but they did not detect a statistically significant relationship for reading. Conversely, they found that students participating in an English as a second language (ESL) program had reading scores 0.041 standard deviations lower on average in reading than non-ESL students (i.e., 48<sup>th</sup> percentile rather than 50<sup>th</sup> percentile for the average student), but they did not detect a statistically significant relationship for math. Lastly, they found that students in 8<sup>th</sup> grade had the most prominent associations between 4DSW adoption and lower math and reading scores compared to other grades.
  - They did not detect statistically significant relationships for student race/ethnicity, gender, eligibility for free or reduced-price lunch, or participation in gifted education.