Madison Education Partnership

Full Day 4K Revisited: Growth Between 2022–2023 and 2023–2024

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Executive Summary

The Madison Education Partnership (MEP), in collaboration with Madison Metropolitan School District (MMSD), has conducted ongoing evaluations of Full-Day 4K (FD4K) since its implementation in 2021. Earlier evaluations revealed minimal differences in growth in literacy, numeracy, or executive function between full-day and half-day 4K programs (**2021–2022**; **2022–2023**). In contrast, our current evaluation of 2023–2024 outcomes, based exclusively on assessment data from TS-GOLD, shows *strong evidence* that FD4K is associated with significantly greater student growth in literacy, numbers, and socioemotional skills than half-day 4K (HD4K). Differences were most pronounced in literacy and for students with lower levels of academic skills in the fall of 4K.

Findings

- *Literacy.* In 2023–2024, FD4K was associated with an average gain of 11 additional points in literacy on TS-GOLD assessment compared to HD4K, representing about a third of a year more growth. While students with the lowest initial literacy skills saw substantial gains in FD4K in 2022–2023, the following year showed sustained literacy growth across all students in FD4K, with gains ranging from 6.4 to 10.4 points compared to half-day peers with similar TS-GOLD scores in the fall of 4K.

- *Numeracy.* In 2023–2024, students in FD4K gained an average of 4 additional points in math skills compared to those in HD4K. This represents a little less than a third of a year more growth. The full-day advantage in math growth seems to be almost entirely due to those with the lowest levels of math skill in the fall of 4K: these students in FD4K have on average 10.5 additional points compared to students with similar fall scores in HD4K.

- *Social-Emotional Learning.* In 2023–2024, students in FD4K gained, on average, 2 more points in social-emotional skills compared to their half-day peers. This is about a seventh of a year more growth. The full-day advantage in social-emotional growth seems to be almost entirely due to those with the lowest levels of social-emotional skills in the fall of 4K. Students in FD4 improved, on average, by 8 points more compared to students in the half-day program with similarly low social-emotional skills in fall.

Conclusion

- FD4K contributes to improved literacy outcomes.

- FD4K is a promising strategy to achieve equity, as it provides significant benefits to students with lower initial achievement levels and level of social-emotional skills.

Background

Full-Day 4K (FD4K) was introduced in MMSD in fall of 2021 as part of the district's broader commitment to educational equity, with the goal of expanding access to high-quality early learning. The Madison Education Partnership (MEP) has collaborated with MMSD to evaluate FD4K since the start of its implementation in 2021. Previous evaluations[1] showed little difference between full- and half-day students' learning outcomes: in **2021-2022** we found no difference, and in **2022-2023** we found weak evidence of an effect of full-day relative to half-day participation on literacy.

In 2024, Culleen Witthuhn, Director of Early Learning at MMSD, identified greater growth among students in Full-Day 4K (FD4K) relative to those in Half-Day 4K (HD4K) during the 2023–2024 school year based on TS GOLD data. At her request, we analyzed the TS GOLD data independently to assess whether the changes Culleen observed were statistically reliable and could plausibly be attributed to participation in the full-day program. This report summarizes our findings regarding differences in growth during the 2022–2023 and 2023–2024 school years.

Questions

To understand the impact of FD4K implementation this report seeks to address the following questions:

1. Do students in FD4K experience more growth than those in HD4K in literacy, numeracy, and/or socio-emotional learning?

2. Do any differences in learning across full- and half-day programs vary by skills students possess in literacy, numeracy, and socio-emotional learning at the start of the academic year?

Data and Methods

This study leverages assessment data routinely collected by district teachers and staff. Students' skills are measured using **Teaching Strategies-GOLD** (TS GOLD), a performance-based assessment aligned with MMSD's early learning curriculum and used by all 4K teachers. Teachers record whether a given student has reached certain objectives in several domains, including literacy, math, and social-emotional skills, based on their observations of students in class. This analysis focuses on student

1 Previously funded work used direct student assessments by teachers, including Phonological Awareness Literacy Screening (PALS) and Teaching Strategies GOLD (TS-GOLD), and by researchers assessing numeracy and executive function.

growth from fall to spring in three core domains: literacy, math, and socio-emotional learning. Table 1 presents descriptive statistics for fall scores.

Domain	# of Items	2022–2023			2023–2024		
		N (% in full-day)	Range	Mean	N (% in full-day)	Range	Mean
Literacy	13	608 (52%)	0-156	82.2	1250 (39%)	0-160	80.3
Math	10	608 (52%)	0-59	30.5	969 (50%)	0-60	25.3
Socio-emotional learning	9	606 (52%)	0-79	44.9	980 (50%)	0-71	39.3

Table 1.

Note: The final sample includes all 4K students in the 2022-23 or 2023-24 academic year with complete fall and spring TS GOLD scores in at least one domain of interest. In 2022–23, 63% of full-day and 34% of half-day students had complete data. In 2023–24, the proportions were 96% and 99% respectively.

We calculated student growth as the change in TS GOLD domain scores from fall to spring. To evaluate the impact of FD4K over time, we modeled student growth as a function of program type (full-day vs. half-day) and academic year (2022–2023 vs. 2023–2024), allowing us to assess whether differences in outcomes changed across years. The analysis also accounted for key student characteristics: race, ethnicity, gender, parent education, and family income. To address the second question and learn how (if at all) learning differences in FD4K and HD4K vary by where students started the academic year, we extended the model by conditioning on fall assessment quintiles. This approach helped discover whether students who started 4K with lower literacy, math, or socio-emotional skills experienced greater benefits from full-day instruction.

Findings

Do students in FD4K experience more growth than those in half-day in literacy, numeracy, or socio-emotional learning?

In literacy, in 2022-2023 school year students in full-day programs saw almost the same level of gains as those in half-day 4K: students in FD4K gained an average of 34.3 points, and students in half-day gained an average of 34.0 points from fall to spring. The results are dramatically different for the 2023-2024 academic year: the mean of gains in literacy was 43.5 points in the full-day program relative to 33.5 points in half-day program.

Figure 1 shows the distribution of literacy growth scores in the 2023–2024 academic year for students in full-day (red line) and half-day (blue line) 4K programs. The distribution for students in FD4K is shifted to the right, indicating higher overall growth in literacy relative to their peers in HD4K. While

both groups show a wide range of outcomes, the peak of the full-day curve occurs at a higher score (around 48 vs 30 points), and a greater share of students in FD4K achieved growth above the overall mean (37.4 points). The higher tail on the full-day curve also indicates that some students made exceptionally large gains that were not typical in the half-day program (the maximum gains in the full-day program is 135 compared to 98 points in half-day).

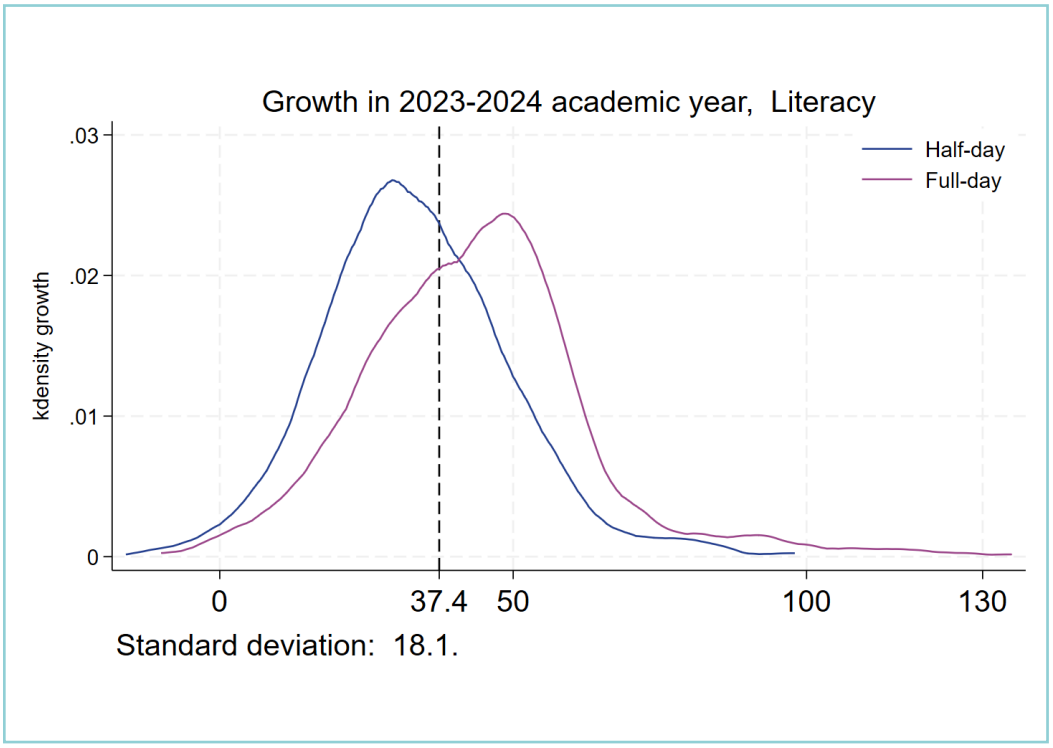

Figure 1.

Accounting for differences in student demographics across full- and half-day settings, we see the same pattern of success in 2023-2024 compared to the year before. Over the 2022-2023 school year, students in a full-day program gained about three-quarters of a point more on literacy than those in half-day, which is not statistically significant. Figure 2 shows the estimated full-day advantage (y-axis) for the two school years we observed (x-axis), along with 95% confidence intervals around those estimated advantages. The dashed line at y=0 indicates no difference in learning between students attending full- and half-day 4K. In 2023-2024, FD4K was associated with an average gain of 11 additional points in literacy on the TS GOLD assessment compared to HD4K, representing about a third of a year more growth. This indicates a substantial improvement in the full-day advantage compared to the previous year.

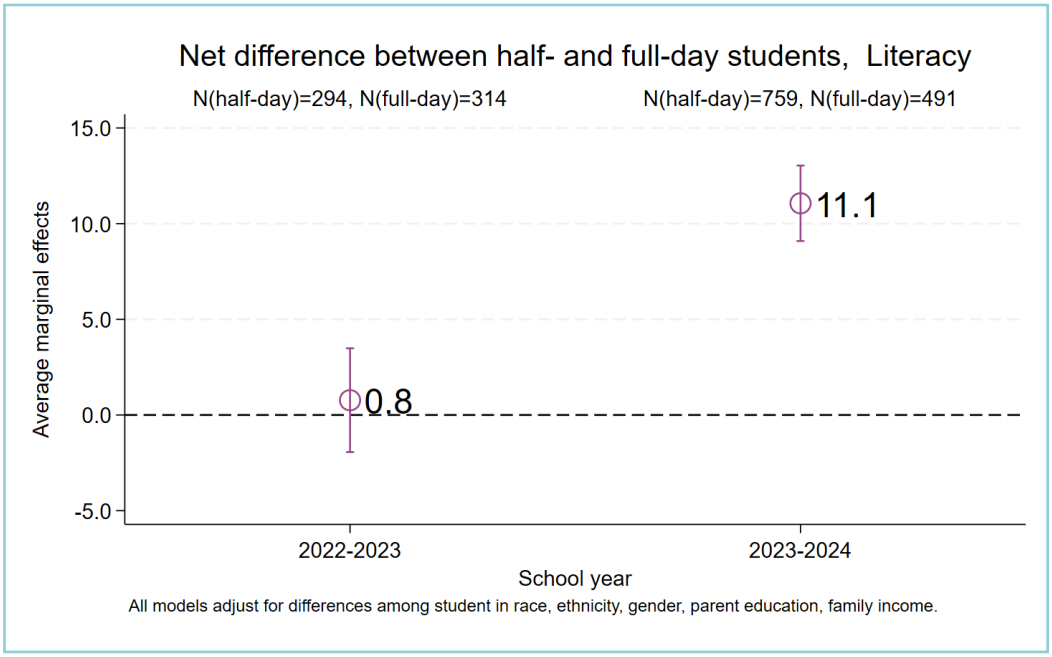

Figure 2.

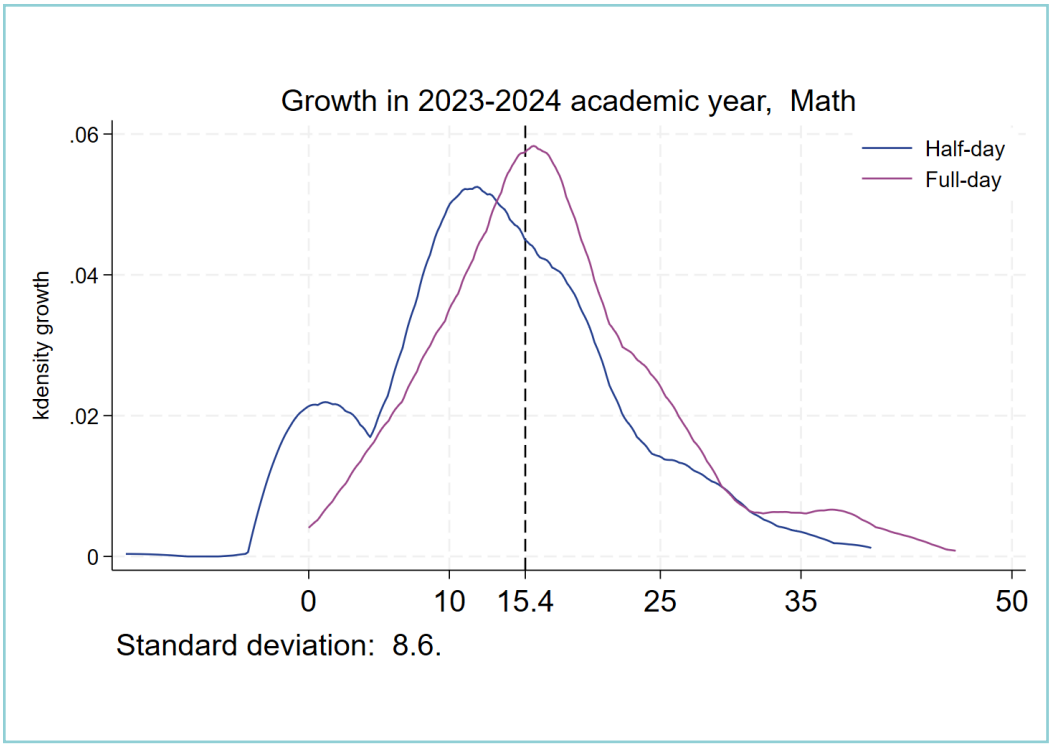

Figure 3.

In math, we see a big change in growth for students in FD4K relative to HD4K in 2023-2024 in contrast to no difference in the previous school year. In 2022-2023, the mean growth was 12.7 points on average in FD4K and 12.8 points in HD4K. In contrast, in 2023-2024, the mean growth is 17.3 points in full-day and 13.5 points in half-day programs. Figure 3 shows the distribution of math growth scores in the 2023–2024 academic year for students enrolled in full-day and half-day 4K programs. The density peak for students in HD4K occurs slightly below the mean, while the full-day peaks slightly above the mean. The rightward shift of the full-day curve indicates that students in FD4K were more likely to achieve higher growth scores (the range of growth in the full-day program is from 0 to 46 compared to growth from -13 to 40 in half-day settings). Additionally, the half-day distribution shows a small secondary bump near zero, indicating a subset of students experienced minimal growth.

Once accounting for differences in student demographics across full- and half-day settings, over the 2022-2023 school year, students in full-day gained about a third of a point more on math than those in half-day, a difference not statistically distinguishable from zero as indicated by the error bars in Figure 4. In 2023-2024, students in FD4K gained an average of 4 additional points in math skills compared to those in HD4K. This represents a

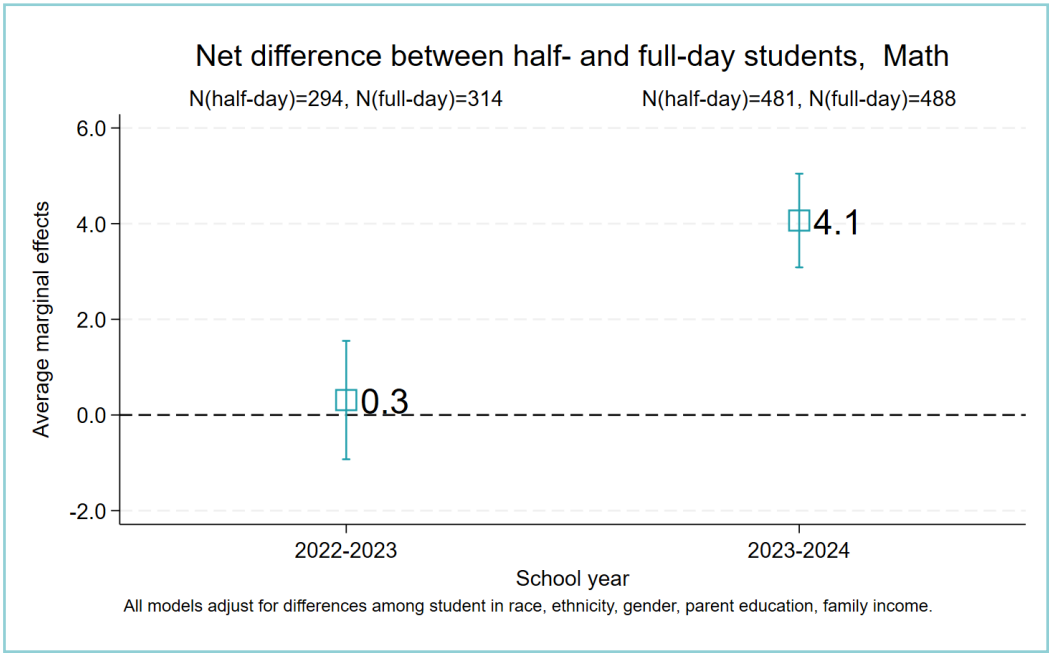

Figure 4.

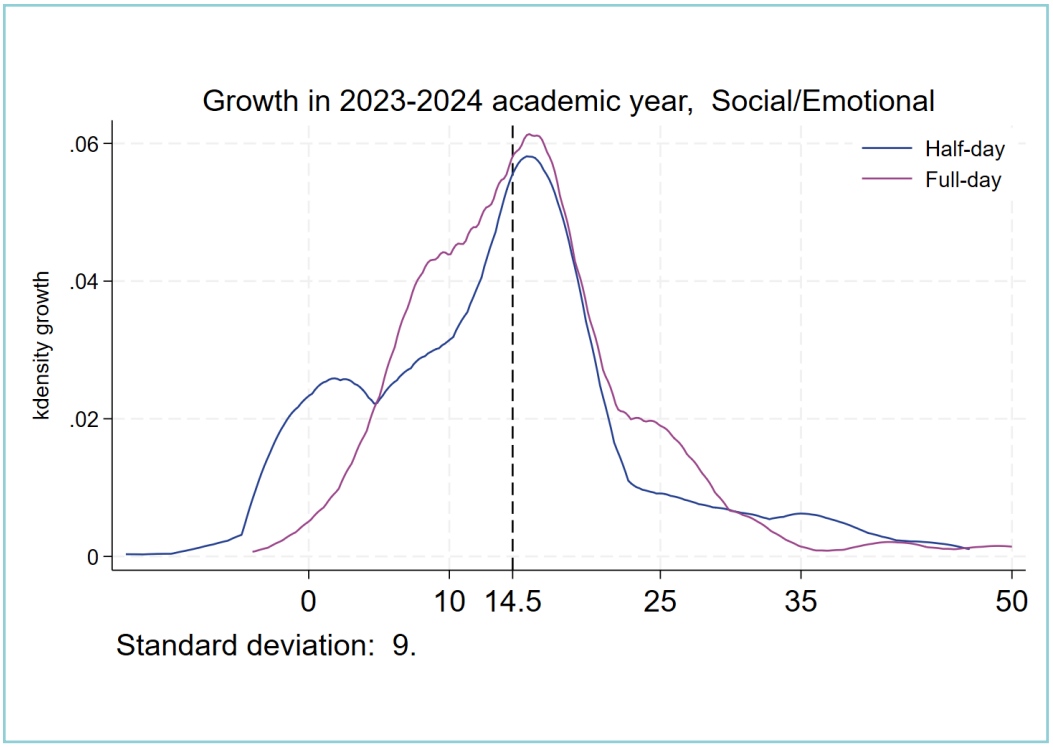

Figure 5.

little less than a third of a year more growth and is statistically significant.

Social-Emotional Learning. In the 2022-2023 school year, students in FD4K experienced less growth of social-emotional skills than students in HD4K: the mean of growth in FD4K was 12.7 points relative to 14.5 points in HD4K. The situation reversed in the 2023-2024 school year with more growth, on average, in FD4K: the mean of growth was 15.4 points relative to 13.6 in HD4K. Figure 5 shows the distribution of growth in social-emotional learning during the 2023–2024 academic year for students in FD4K and HD4K. Both curves show similar patterns. Additionally, the left tail of the half-day distribution suggests that a subset of students in HD4K experienced very low or negative growth in SEL, whereas such cases are less common among students in FD4K.

Once accounting for differences in student demographics across full- and half-day settings, we confirm this pattern. Over the 2022-23 school year, students in a full-day program gained about two points less on socioemotional skills than those in half-day (Figure 6). In 2023–2024, students in FD4K gained on average 2 more points in social-emotional skills compared to their half-day peers. This is about a seventh of a year more growth.

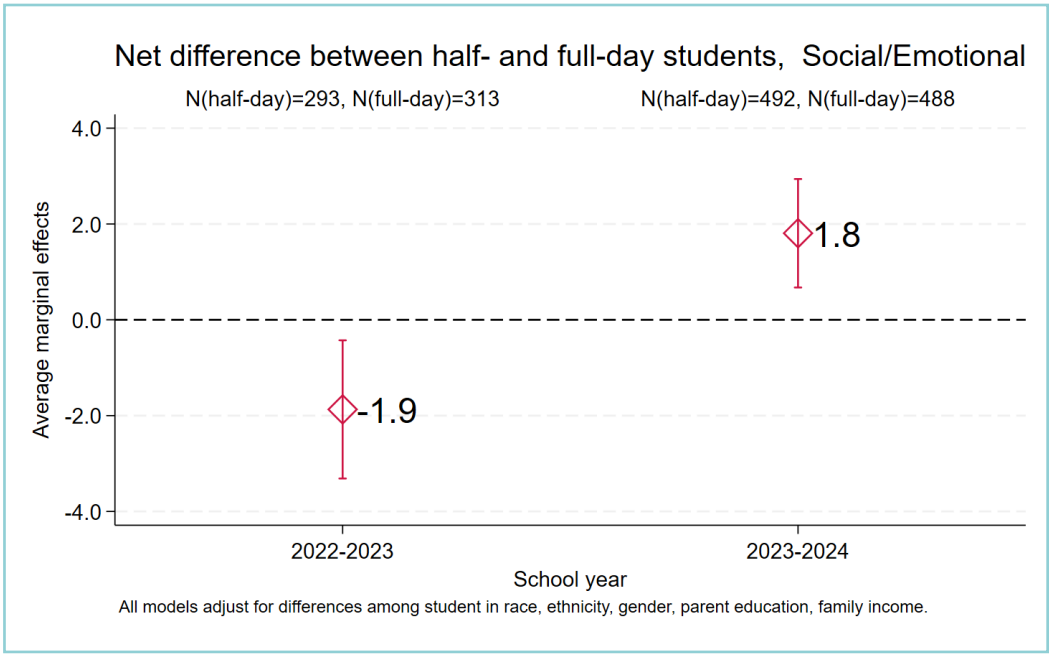

Figure 6.

Do differences in learning across full- and half-day programs vary by where students started the year in literacy, numeracy, and/or socio-emotional learning?

Literacy. Figure 7 illustrates the difference in literacy growth between students in FD4K and HD4K by students' initial skill levels (grouped into quintiles based on TS GOLD fall scores). Positive values on the vertical axis indicate an average advantage for students in FD4K, while negative values suggest greater gains, on average, among students in HD4K (adjusting for differences in student demographics). The dashed lines show results from the 2022–2023 school year, and the solid lines represent the 2023–2024 school year.

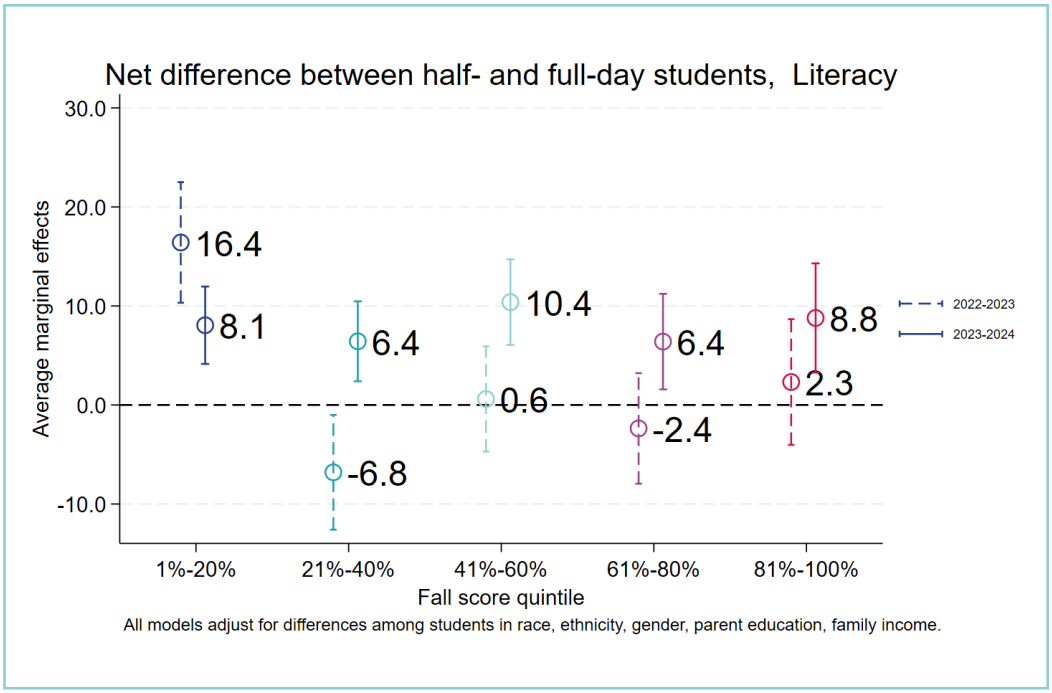

Figure 7.

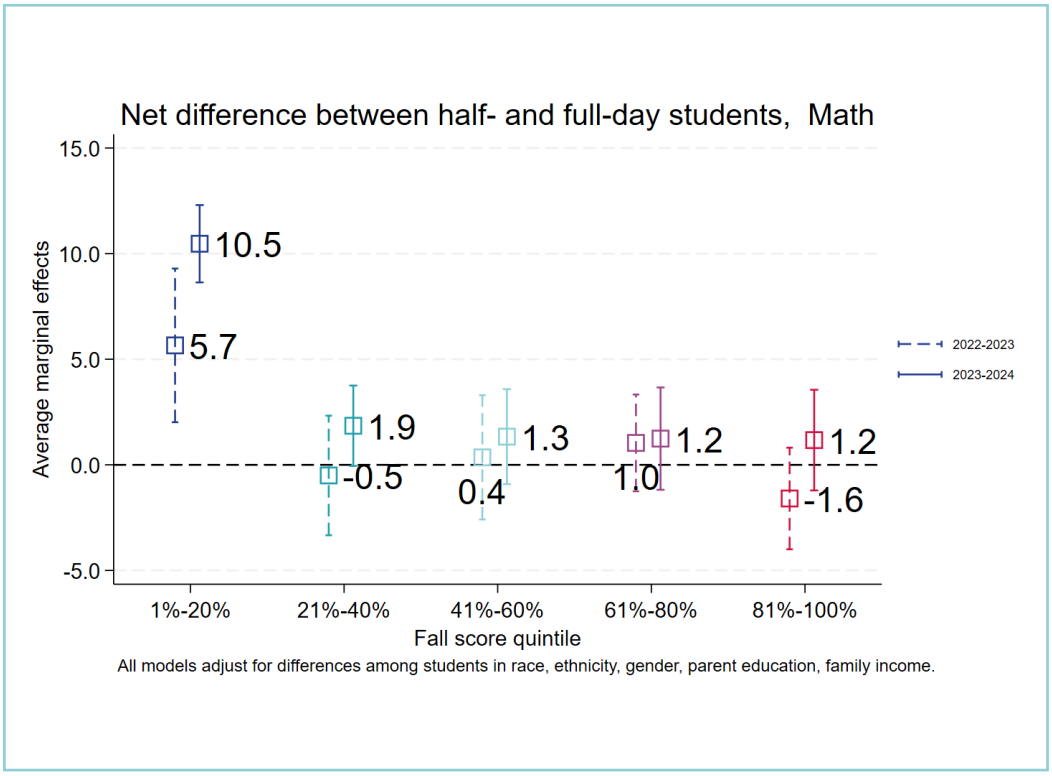

Figure 8.

While students with the lowest initial literacy skills (blue lines) saw substantial gains in FD4K in 2022–2023, the following year showed sustained literacy growth across all students in FD4K, with gains ranging from 6.4 to 10.4 points compared to half-day peers with similar TS GOLD scores in the fall of 4K.

Numeracy. The full-day advantage in math growth seems to be almost entirely due to those with the lowest levels of math skill

in the fall of 4K: these students in FD4K have on average 10.5 point growth advantage in 2023-24 compared to students with similar fall scores in HD4K (Figure 8). We see some indications of increasing advantage for students with higher initial level of skills in the distribution, but they are not reliable.

Social-Emotional Learning. Similar to math results, the full-day advantage in social-emotional growth seems to be almost entirely due to those with the lowest levels of social-emotional skills in the fall of 4K (Figure 9). Students in FD4K who started in the bottom fifth of the SEL distribution improved, on average, by 8 points more than comparable students in the half-day program. We see no evidence of differences for students with higher initial level of skills.

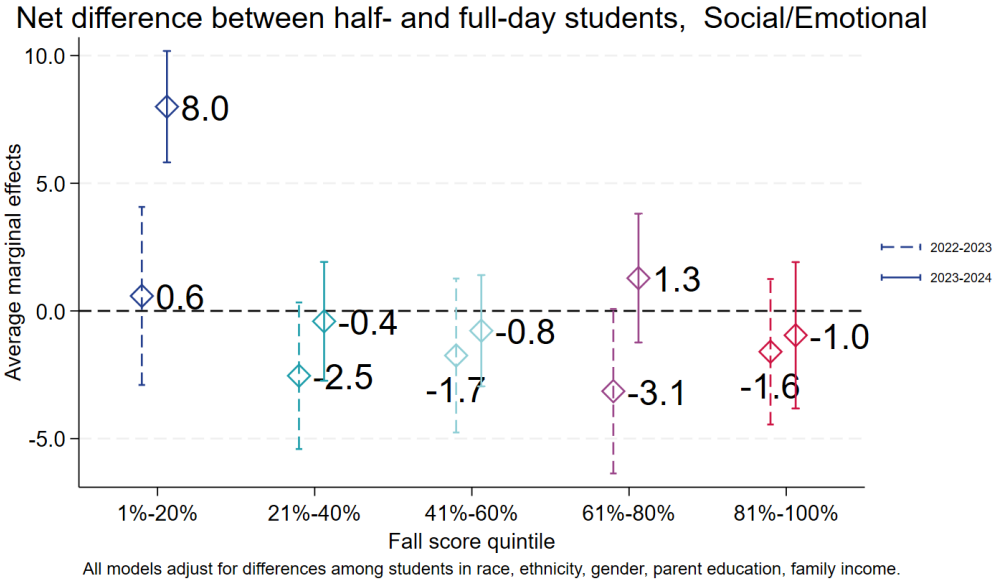

Figure 9.

Conclusion

We confirmed Culleen Witthuhn's initial observations of 2023-2024 outcomes in 4K: TS-GOLD results show strong evidence that FD4K is associated with significantly greater student growth than HD4K, especially in literacy and for students with lower levels of academic skills in the fall of 4K. Gains in literacy were consistently higher for students in FD4K relative to HD4K. While the evidence for math and social-emotional learning is less robust, it appears that FD4K offers greater benefits for students with lower starting skills in those areas as well. In this way, FD4K is a promising strategy to achieve equity, as it provides significant benefits to students with lower initial achievement levels and level of social-emotional skills. Since these results mark a change from earlier MEP analyses, which found only minimal differences between FD4K and HD4K, MMSD and MEP should continue to investigate these outcomes in future cohorts to understand if these differences continue to hold or if the results described in this paper are unique to this 2023-24 cohort.

Madison Education Partnership

MEP brings together the Madison Metropolitan School District (MMSD) and the Wisconsin Center for Education Research (WCER) at the University of Wisconsin-Madison in a locally based, nationally relevant, research-practice partnership. MEP joins research and practice by engaging in mutually defined, high-quality, problem-based research that contributes to policy, builds capacity, and strengthens practice.

Collaborating on MEP are UW Madison researchers and faculty; MMSD administration, teachers and staff; and stakeholders from the broader Madison community. The partnership enables research to be conducted more quickly and results released more efficiently—to advance strategies that benefit Madison students, families, and schools.

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