Use of MAP Accelerator associated with improved mathematics outcomes during the COVID-disrupted 2020–21 school year

Implementation of MAP Accelerator

MAP Accelerator, developed jointly by Khan Academy and NWEA, aims to help school districts and teachers easily and effectively differentiate mathematics instruction for students based on MAP Growth results. MAP Growth, a computerized adaptive test developed by NWEA, is typically administered to students two or three times per year to measure student achievement and growth. MAP Growth math results are automatically imported into MAP Accelerator, and students receive personalized learning paths based on their test scores.

During the summer and early fall of 2020, teachers received virtual professional learning on how to implement MAP Accelerator in their classrooms. Teachers in 41 of the 99 districts were new to using the MAP Growth assessment and received professional learning on the assessment and MAP Accelerator. Across the districts, attendance requirements for professional learning and implementation of MAP Accelerator varied substantially based on each district's policies and preferences. Training and implementation were mandatory in some sites, while in others, they were optional. Additionally, teachers had to opt-in to receive access to MAP Accelerator in some districts. In other districts, all teachers received access regardless of their interest in using MAP Accelerator. Faithful implementation can be challenging to achieve for new educational interventions in general, given the complex interplay between time constraints and input from multiple stakeholders[1]. This implementation variation reflects a practical reality that informs our conclusions and may improve programmatic and delivery recommendations.

In the fall of 2020, students took the MAP Growth mathematics assessment, and their scores were automatically imported into MAP Accelerator. After teachers guided students through activating their MAP Accelerator accounts, students could log in to work through their

Key findings

Ninety-nine districts partnered with NWEA and Khan Academy to implement MAP Accelerator during the COVID-disrupted 2020–21 school year. Results indicate that students using MAP Accelerator for 30 or more minutes a week throughout the school year showed greater-than-expected growth, on average, from fall 2020 to spring 2021 on their MAP Growth tests compared to normative growth based on pre-pandemic trends.

- On average, students in classrooms that engaged with MAP Accelerator at the recommended dosage of 30 minutes per week exceeded growth projections by 9% to 43%, depending on grade.

- These trends were consistent across grades and student demographic subgroups, such as race/ethnicity, gender, and the proportion of students in a school eligible for free/reduced-price lunch.

[1] Fullan, M. (1983). Evaluating program implementation: What can be learned from follow through. Curriculum Inquiry, 13(2), 215-227.
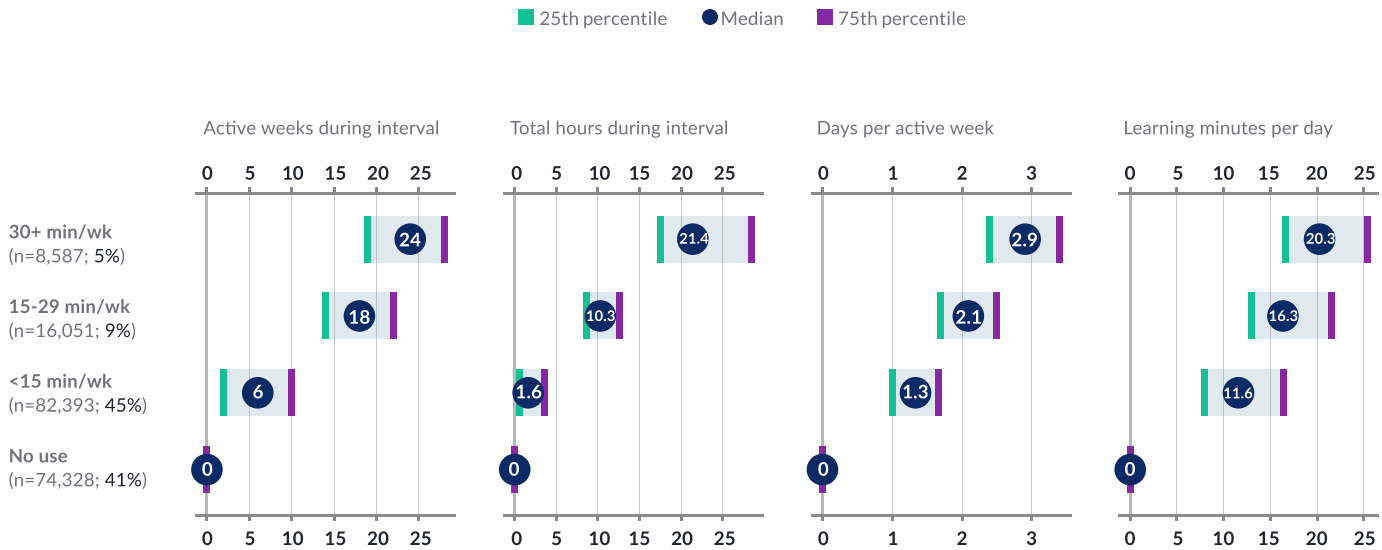
personalized mathematics learning paths based on their fall MAP Growth scores. The current recommended use of MAP Accelerator is for teachers to integrate MAP Accelerator into their mathematics lessons for one class period per week for at least 30 minutes of active learning time. Khan Academy and NWEA provided teachers with ongoing virtual support throughout the school year, including prioritized help-desk support.

Research design

In this correlational study, we explored the relationship between time spent on MAP Accelerator and observed growth in math achievement from fall 2020 to spring 2021 as measured by the MAP Growth assessment. We conducted this study in 99 districts with 5,818 teachers and 180,307 students in grades three through eight across 649 schools. Three of the districts in this study were also included as part of our covid-disrupted 2019–20 pilot. Ideally, we would randomly assign access to MAP Accelerator to students across classrooms, grades, and schools. However, several districts wanted to make this resource available to all grade three through eight students. As such, it is not possible to determine whether MAP Accelerator caused differentially higher achievement or growth with this design.

While we recommended that teachers integrate MAP Accelerator into their classroom practice for 30 minutes per week, teachers ultimately decided how much time students spent using MAP Accelerator, and we found substantial variation in the use of MAP Accelerator across classrooms. Since there was variation in MAP Accelerator usage, we could examine whether associations existed between usage and students' growth. In these analyses, we compared students in classrooms that used MAP Accelerator at the recommended dosage (30 or more minutes per week) to peers with similar demographics and starting levels of achievement who used MAP Accelerator for less time (no use, <15 minutes per week, and 15-29 minutes per week). We then contextualized the fall-to-spring Math RIT gains for each of these usage groups relative to NWEA's 2020 nationally representative norms, which reflect pre-pandemic normative growth trajectories.

Cadence of MAP Accelerator use by usage group

■ 25th percentile ● Median ■ 75th percentile

Active weeks during interval: 30+ min/wk (n=8,587; 5%) median 24; 15-29 min/wk (n=16,051; 9%) median 18; <15 min/wk (n=82,393; 45%) median 6; No use (n=74,328; 41%) median 0.

Total hours during interval: 30+ min/wk median 21.4; 15-29 min/wk median 10.3; <15 min/wk median 1.6; No use median 0.

Days per active week: 30+ min/wk median 2.9; 15-29 min/wk median 2.1; <15 min/wk median 1.3; No use median 0.

Learning minutes per day: 30+ min/wk median 20.3; 15-29 min/wk median 16.3; <15 min/wk median 11.6; No use median 0.

Results

Our analytic sample only includes students who took the fall 2020 and spring 2021 MAP Growth assessment. Only 5% (n=8,587) of students used MAP Accelerator for the recommended 30 or more minutes per week. Most students (45%, n=82,393) used MAP Accelerator for less than 15 minutes per week or not at all (41%). Students who followed our usage recommendations spent, on average, about three 20-minute sessions per week over 24 weeks on MAP Accelerator (see figure above).

We conducted a mixed-effect regression analysis with controls to evaluate the association between MAP growth gains and MAP Accelerator usage. The MAP Growth assessment measures student achievement on a vertical and equal-interval scale, with the results expressed as RIT scores. The properties of the RIT scale allow for an accurate measure of student growth over time. Our analysis controlled for fall 2020 RIT scores, grade, gender, race/ethnicity, the proportion of students in a school eligible for free/reduced-price lunch, district percent English language learner, and random effects for class, school, and district.

Our results indicate that students who used MAP Accelerator for 30 or more minutes per week showed test score gains that exceeded growth projections based on pre-pandemic norms by 9% to 43% (see figure on the next page). This general trend was consistently observed regardless of student race/ethnicity, gender, and school eligibility for free/reduced lunch (results not shown).

To demonstrate how to interpret the figure on the next page, consider the results for grade five in the figure. The purple lines depict pre-pandemic norms for fall-to-spring growth. A grade five student who scored at the 50th percentile during the fall is projected to grow 9.6 RIT points from fall to spring. However, grade five students who were at the 50th percentile for fall and used MAP Accelerator for 30+ minutes per week (see green bar) on average grew 11.3 points, which is 18% more than projected based on pre-pandemic growth norms.
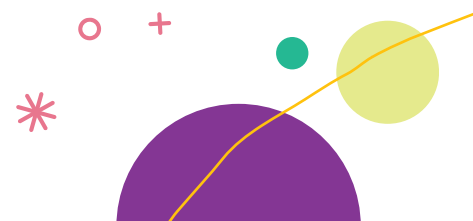
Association between MAP Growth math gains and MAP Accelerator usage

Note: Growth norms for each MAP Accelerator usage group vary slightly within grade due to differences among groups in baseline (Fall 2020) RIT score.
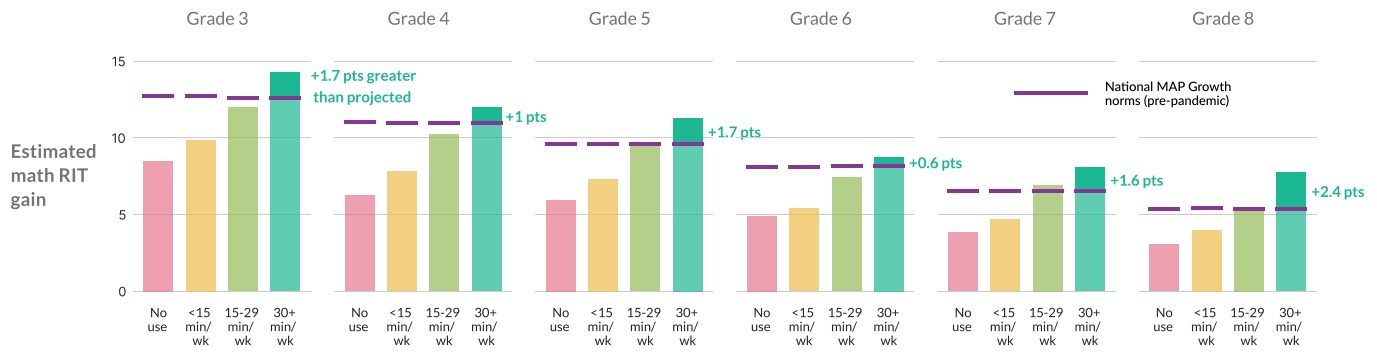
Source: Khan Academy/NWEA

Grade five students who had access to, but did not use MAP Accelerator (see pink bar), also showed test score gains; however, the average growth for this group fell short of pre-pandemic growth norms (consistent with national trends for unfinished learning due to pandemic disruptions that have been well documented by NWEA researchers)[2].

Conclusion

These results suggest a positive and significant relationship between MAP Accelerator usage and gains on MAP Growth. Students who used MAP Accelerator at the recommended dosage showed gains that exceeded normative growth based on pre-pandemic trends. This bucks national trends of lower normative growth during the covid-disrupted 2020-21 school year, suggesting that MAP Accelerator may be a potentially effective supplement to help mitigate unfinished learning due to the pandemic. However, given the correlational research design, we cannot conclude that MAP Accelerator usage specifically caused these results. There could have been factors that we could not account for in our analyses that may have contributed to these differences, such as differences in teacher experience, leadership support of the implementation, or differences in students' motivation.

We explore this possibility in additional detail in our technical report by examining MAP Growth Reading scores. It is also important to note that districts new to MAP Growth may see unusual growth patterns during their first year as students and teachers become familiar with the assessments. Consequently, further analyses on longer-term MAP Growth outcomes are needed to evaluate if patterns observed in the first year persist in subsequent years. Another point to note is that these results are from a COVID-19 disrupted school year, meaning most students received virtual or hybrid instruction for at least part of the school year. Whether these results hold when most students are learning in person remains to be seen. Future studies on the efficacy of MAP Accelerator would benefit from a randomized-control design to understand how much MAP Accelerator usage causes differential outcomes for participating students.

Want to learn more?

This research brief provides an overview of high-level findings from examining the relationship between MAP Accelerator usage and MAP Growth outcomes. A more comprehensive technical report with additional details is available at http://khan.co/MATechReport2022.

[2]Lewis, K., Kuhfeld, M., Ruzek, E., & McEachin, A. (2021). Learning during COVID-19: Reading and math achievement in the 2020-21 school year. https://www.nwea.org/content/uploads/2021/07/Learning-during-COVID-19-Reading-and-math-achievement-in-the-2020-2021-school-year.research-brief-1.pdf