



DREAMBOX LEARNING ACHIEVEMENT GROWTH in the Howard County Public School System and Rocketship Education

Background of the Study

By providing targeted instructional content and practice problems for students, educational software promises to help teachers work more productively. Software could allow teachers to reallocate their time to helping students one-on-one or in small groups and provide students with content and practice opportunities targeted at their current level of understanding. Unfortunately, there is little evidence yet that educational software is actually helping students progress more rapidly. Given the financial costs and the amount of time that students are spending on educational software, we need to identify more quickly what's working and what's not.

In 2014, the Center for Education Policy Research at Harvard University began working with the Howard County Public School System (HCPSS) and the Rocketship Education (Rocketship) charter school network to measure the impact of the use of DreamBox Learning software on student achievement in their schools. Our goal was to develop a streamlined, low-cost evaluation model that could be replicated easily. Accordingly, rather than conduct a teacher survey or perform classroom observations to measure the fidelity of implementation, we relied on student log files to measure how students were using the software, both in and out of school. We also assembled historical data on student achievement on state assessments and the Northwest Evaluation Association (NWEA) MAP assessment, as well as student characteristics.

This brief provides an overview of our findings. (For more details on our findings and methods, please read the technical appendix, which accompanies this summary.)

Summary of Key Findings

1. Most students did not reach the recommended levels of usage of the DreamBox software.

DreamBox recommends that students spend 60–90 minutes using their software each week.¹ However, usage in both HCPSS and Rocketship often fell far short of that recommendation. In 2014–2015, HCPSS students spent, on average, 35 minutes per week in the weeks they used DreamBox. Rocketship students spent an average of 44 minutes per week in the weeks they used DreamBox.

Figures 1a and 1b show the distribution of time spent per week using DreamBox in both sites in 2014–2015, relative to DreamBox recommendations. As the figures illustrate, only 5.8% of students in HCPSS and 12.5% of students in Rocketship used the product for the recommended number of minutes.

DreamBox also recommends that students complete 5 to 8 lessons per week. As shown in Figures 2a and 2b, in HCPSS and Rocketship, the majority of students did not meet this recommendation, completing on average 2.9 lessons and 3.1 lessons, respectively. Only 10.6% of students in HCPSS and 10.4% of students in Rocketship completed the recommended number of lessons per week.

2. Some schools used DreamBox software to target low-achieving students and after-school learning, while others did not.

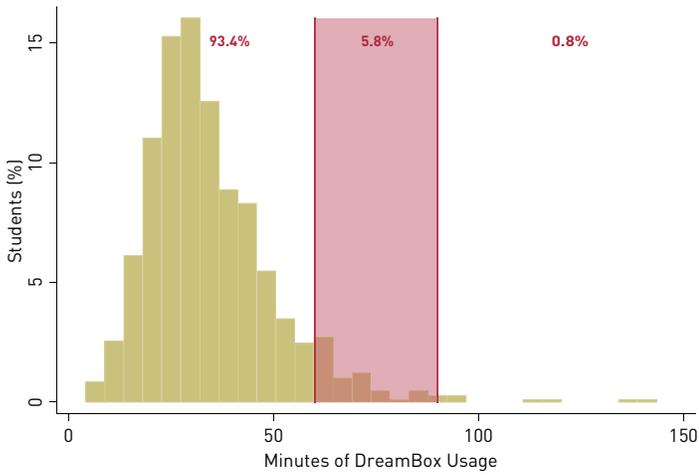
In HCPSS, usage was greater for students with weaker prior-year test performance, implying that the software was being used to help lower-achieving students catch up. In Rocketship, students' prior-year performance did not seem to be related to the level of usage.

In HCPSS, students who needed additional time were selected to work with DreamBox before or after school hours. In Rocketship, there were no formal expectations for out-of-school usage, and students had lower rates of usage outside of normal school hours.

3. The variation in DreamBox software use was driven largely by teacher- and school-level practices, as opposed to student preferences.

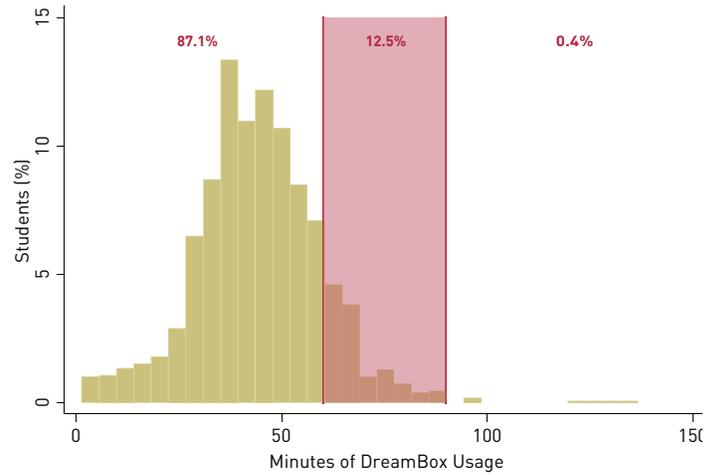
Even though the students differed from year to year, patterns of usage in a given teacher's classroom remained similar. Specifically, we examined the relationship between the average amount of time a given teacher's students used DreamBox in 2013–2014 and 2014–2015 (see Figure 3a). Among HCPSS schools with non-zero usage in both years,² the correlation in average log-in time for the typical student in each teacher's classroom was quite high, at 0.78 (see Figure 3b). More than half of the variance in usage from one student to another depended on the specific teacher working with them or the school they attended.

Figure 1a. HCPSS Average Weekly DreamBox Use in 2014–2015



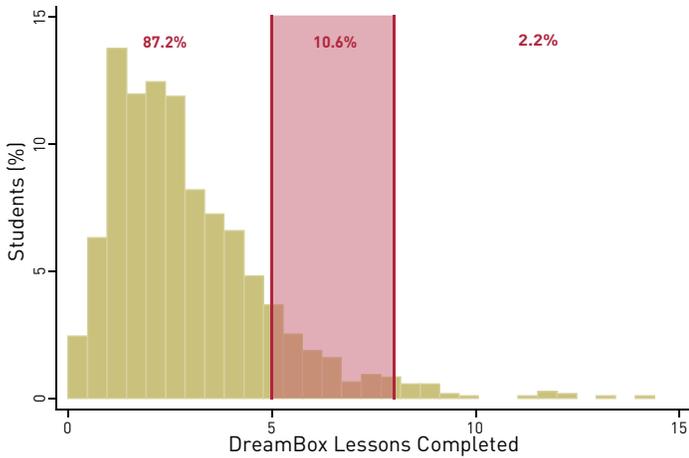
Note. Pink shading represents the DreamBox recommendation of 60–90 minutes of use per week.

Figure 1b. Rocketship Average Weekly DreamBox Use in 2014–2015



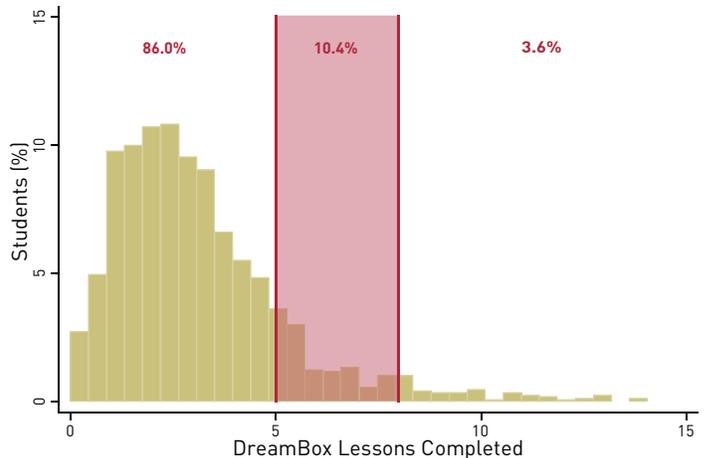
Note. Pink shading represents the DreamBox recommendation of 60–90 minutes of use per week.

Figure 2a. HCPSS Average Weekly DreamBox Lessons Completed in 2014–2015



Note. Pink shading represents the DreamBox recommendation of 5–8 completed lessons per week.

Figure 2b. Rocketship Average Weekly DreamBox Lessons Completed in 2014–2015



Note. Pink shading represents the DreamBox recommendation of 5–8 completed lessons per week.

Figure 3a. HCPSS Teachers' Average DreamBox Use, 2013–2014 vs. 2014–2015

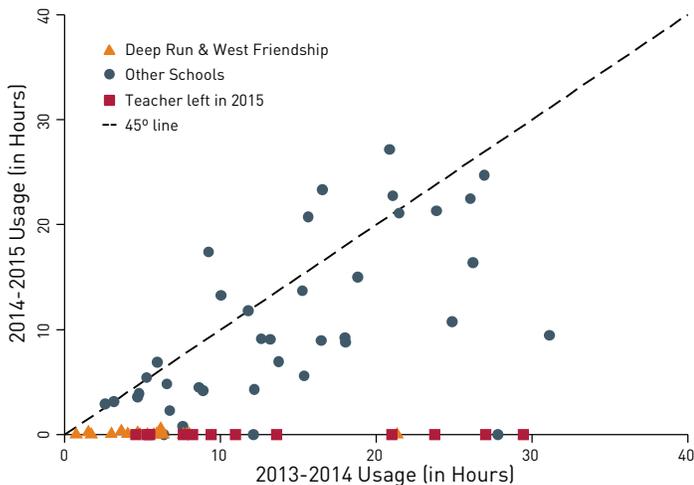
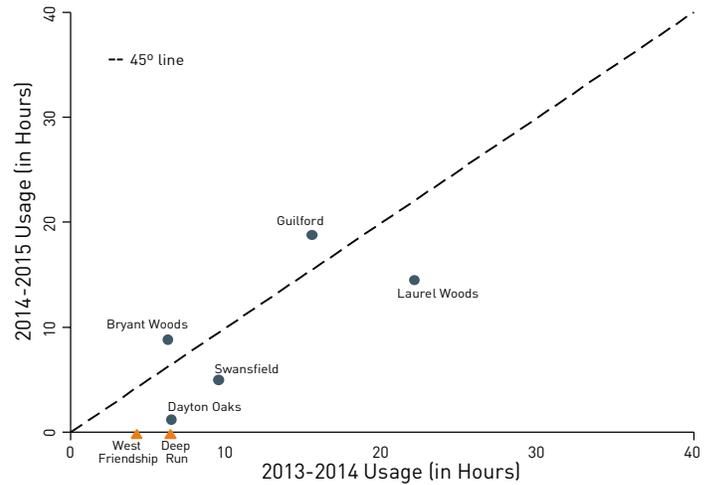


Figure 3b. HCPSS Schools' Average DreamBox Use, 2013–2014 vs. 2014–2015



4. Students who spent more time on the DreamBox software saw larger gains in achievement.

We saw positive relationships between the amount of student usage and the magnitude of student achievement gains on state tests and interim assessments in both sites.³ To give a sense of the magnitude of this relationship, a student in Rocketship who started at the 50th percentile on the fall California Standards Test (CST) and who used DreamBox 6.3 hours in 2013–2014 (the average for Rocketship) would, on average, end up at the 54th percentile at the end of the year. Likewise, in HCPSS, a student who started the year at the 50th percentile, and who used DreamBox at the average level of 7.1 hours in 2014–2015, could expect to be between the 54th and 55th percentiles on the Partnership for Assessment of Readiness for College and Careers (PARCC) test at the end of 2014–2015.

5. Students who followed the DreamBox lesson recommendations, as opposed to going back and repeating content, saw faster gains.

The DreamBox platform automatically recommends lessons to students; however, students did have freedom to go backwards and repeat lessons they had completed previously. (DreamBox has since made it more difficult for students to work on non-recommended lessons.) Our research suggests that the time spent on lessons recommended by the software resulted in faster student achievement gains. An average student in Rocketship or HCPSS who spent all of his or her time on recommended lessons was expected to gain 5.8 percentile points on the CST in 2013–2014 or 9.8 percentile points on the PARCC in 2014–2015, respectively. The gains were smaller, or even negative, for time spent on non-recommended lessons.

6. The DreamBox progress measure was positively associated with achievement gains on state tests and interim assessments.

DreamBox reports progress as the percentage of the DreamBox curriculum completed in a student's own grade level. Educators often wonder whether "progress" as measured by educational software translates into student progress on interim and state assessments. As a result, we examined whether the amount of progress students made through the DreamBox curriculum was related to achievement gains on state tests and interim assessments. Perhaps because of low usage, students did not typically make large amounts of progress during the year, with students in Grades 3 through 5 in 2014–2015 completing only 10.2% of the curriculum on average in HCPSS and 12.5% of the curriculum on average in Rocketship.

Since DreamBox is often used with students who are behind, we also looked at student progress in the grade level below their current grade. In 2014–2015, students in Grades 3 through 5 completed, on average, 30.7% of the curriculum one grade level below in HCPSS and 29.4% of the curriculum one grade level below in Rocketship.

On both the MAP and the PARCC assessments, progress at grade level was associated with test score growth. In HCPSS, completing 10% of the curriculum was related, on average, to an increase of 1.5 percentile points on the MAP and 3.5 percentile points on the PARCC. Completing 12.5% of the curriculum, on average, was related to an increase of 3 percentile points on the MAP in Rocketship in 2014–2015. Importantly, we also found that progress below grade level was related to increased performance on both assessments in HCPSS.

7. The evidence for the causal impact of DreamBox on student achievement is encouraging but mixed.

The relationship between student use and achievement gains may reflect more than the effect of the software; it could reflect students' motivation and/or the effectiveness of their teacher. Students who spend more time on the software may also be inclined to spend more time studying in general. Their use of DreamBox may not be a cause of their rate of learning, but merely a reflection of their desire to learn. Moreover, as we noted above, much of the variation in students' DreamBox usage was associated with their teacher and their school. If the teachers who would have been more effective without the software were also more successful in getting their students to solve a lot of problems with the software, then we might be falsely attributing the relationship between student usage and achievement gains to the software, rather than to the teacher.

To address this concern, we generated several additional analyses. HCPSS used DreamBox in only a subset of elementary schools, providing a type of "natural experiment." As such, we were able to compare the gains of students in classrooms using DreamBox to the gains of students in similar classrooms in schools that did not use DreamBox. (We chose the comparison classrooms by matching on student baseline test scores, peers' test scores, and demographics.) We learned that the classrooms using DreamBox outperformed the matched classrooms in other schools. A student at the 50th percentile gained about 2 percentile points on the MAP assessment relative to those who did not use DreamBox.⁴

The above approach controlled for variation in student traits. However, it did not control for variation in teacher effectiveness, which could be correlated with student software use. As such, we performed a second test. We compared differences in DreamBox usage during semesters when a given student was working with the same teacher against changes in their achievement. If their achievement grew more during the semesters when they were using the software more heavily, that would suggest that software usage, as opposed to fixed student or teacher traits, was driving the relationship with achievement. Using this approach, we found evidence in HCPSS and Rocketship that individual students saw larger gains on the MAP assessment during the semesters that they used DreamBox more frequently.

Conclusion

The above results are encouraging but not conclusive. Students who used DreamBox Learning software at the average level witnessed a 2 percentile point gain on the MAP in HCPSS over similar students who did not use the software at all. However, as noted above, we could not rule out the possibility that the relationship we estimated was due to student motivation or teacher effectiveness, rather than to the availability of the software.

Furthermore, the overall usage of DreamBox across both sites was substantially less than what was recommended by DreamBox. It is unclear to us what level of usage would yield the highest return on student achievement.

Endnotes

¹ All references to recommended usage of DreamBox software retrieved from <https://support.dreambox.com/hc/en-us/articles/205591537-How-To-Get-The-Most-Out-Of-DreamBox-Learning>

² Two schools in Howard County (Deep Run and West Friendship) stopped using DreamBox in 2014–2015 for Grades 3–5.

³ The only exception to this was in HCPSS in 2013–2014. That year we did not see a significant relationship between DreamBox usage and student growth on the Maryland School Assessment.

⁴ We were unable to use this analytical method to determine a causal relationship in Rocketship schools because all Rocketship schools used DreamBox.

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Center for Education Policy Research
HARVARD UNIVERSITY

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Center for Education Policy Research at Harvard University
cepr.harvard.edu | cepr@gse.harvard.edu | @HarvardCEPR
50 Church Street | Floor 4 | Cambridge, MA 02138 | P: 617-496-1563 | F: 617-495-3814