Executive Summary

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Background

As has been shown in prior Osceola evaluations, a multitude of digital support tools exist for mathematics instruction and intervention. As part of the continuous evaluations of the various tools and resources that the School District of Osceola County spends money on, a program called DreamBox – which purports to help students grow by up to 2.5 years of learning in a single year – was evaluated do determine its effects on students learning, and the cost associated with that learning. Although DreamBox also provides DreamBox Reading Plus, this evaluation is solely on the math intervention aspect of the platform.

Digital platforms that provide differentiation through targeted interventions have become increasing common in recent years. Despite their popularity, however, the effects of these programs are often low. In 2009, John Hattie established a baseline for the expected effects a teacher can provide a student in their growth as $d = 0.40$, a solid baseline expectation for interventions to meet. In 2019, after reviewing 747 randomized control trials, Matthew Kraft at Brown University proposed a new means of interpreting d effect size, with less than $d = 0.05$ as a small effect, and greater than $d = 0.20$.

Evidence for ESSA reports that DreamBox has a "Strong" rating, based on the What Works Clearinghouse study (Wang & Woodworth, 2011) of 557 charter school K-1 students in San Jose, California, which found an effect size of $d = 0.11$ and was rated as "Promising". According to the National Center on Intensive Interventions, the largest effect size for a digital math intervention is Reflex Math, with an effect size between $d = 0.58$ and $d = 0.84$ (Sarrel, 2014; Rudel, 2016). Other math digital interventions within Osceola have been evaluated to find a range of effects, with the lowest coming from the Freckle platform ($f^2 = -0.06$; Maddock, 2020) and the highest coming from SuccessMaker ($d = 0.21$; Maddock, 2020). Considering the two seminal studies as a baseline, and adjusting based on effects from similar platforms, the expectation for a highly successful intervention should fall between the range of $0.20 < d > 0.30$.

DreamBox Learning was introduced as a pilot in the Fall of 2021 for K – 5 mathematics. Elementary teachers at Chestnut Elementary School and the Poinciana Academy of Fine Arts were trained to use the program with their students for mathematics. At the end of the 2020-2021 school year, 943 students had utilized the program to complete 113,158 lessons, (241,232 attempted) with 1,067,169 minutes (17,786 hours) spent on the platform.

Purpose

The purpose of this evaluation was to examine the effectiveness of various mathematics programs in the county for the cost per student.

The following evaluation questions were posed for each tool:

1) Is success on DreamBox associated with success on the Florida Standards Assessment?
2) What relationship, if any, exists between the implementation of the program and academic increases?
3) To what extent does the implementation of the digital tool impact student outcomes?
4) What is the cost per student of each digital tool?

Methodology

Quantitative methodologies via statistical analyses were utilized to examine the effects of each current program. For the evaluation of DreamBox, data were collected sent directly from DreamBox Learning with each students

individual data, including grade, school, lessons attempted, lessons completed, lessons passed, lesson minutes of usage, and their "progress in DreamBox", a percentage measure that shows students growth over expectations within the platform. Assessment data were collected from the Florida Standards Assessment INDV file for SY2021 and SY2022. Since the scales that are used to measure students are not interoperable between grade levels, a "distance from zero" score was calculated for each score (how many points "up the scale" each score was) and the change in this value was measured as growth (as compared to simply take the difference between scale scores, which sometimes results in a negative score despite a student showing improvement). The data related to platform costs were collected via quote. Statistical tests were performed to compare differences among students. All statistical analyses were performed using SPSS 27.0.

Key Findings

DreamBox-FSA Associations

DreamBox was started as a pilot study in the 2021-2022 school year. At the end of the 2020-2021 school year, 943 students had utilized the program to complete 113,158 lessons, (241,232 attempted) with 1,067,169 minutes (17,786 hours) spent on the platform. DreamBox utilizes predictive insights to determine what lessons and pathways a student should follow, and reports on the student progress towards completing their pathway. On average, students had 47% progress in DreamBox toward pathway completion, although 139 students did finish their pathway and progress past 100%. The highest percent a student completed was 273% progress in DreamBox, well past the expectations for a single school year.

In the 2021-2022 school year, Dreambox was purchased at Chestnut Elementary School for $8000 for the school (718 students, or $11.14 per student), and for $3500 at Poinciana Academy of Fine Arts to cover 175 students ($20 per student) and $500 for a webinar training to implement the program. DreamBox has stated that this cost with bulk purchasing would be $15.50 per student, a $4.50 discount from the cost paid at Poinciana Academy of Fine Arts. For the purposes of calculating return on investment, the direct student cost of $11,500 will be used as a minimum baseline.

An analysis was conducted to determine if DreamBox was associated with increases in scores on the Florida Standards Math 3 – 8 assessment. Since the scales change with each grade band, a direct comparison of scores is not an accurate representation of student growth. While reported growth scores can be utilized as a categorical variable, the scale scores were instead recalculated based on their distance from the lowest possible score to instead get a continuous variable with a true zero. Since the scales the distance from the base to the proficient score increases with each grade level (for example, 57 points are needed in grade 3, 59 points in grade 4, and 64 points in grade 5), this scale exaggerates the needed score, yet minimizes the differences between grade levels and years, resulting in a more conservative, yet more accurate, representation of student growth. While instead using a RIT score change from NWEA would likely yield even high accuracy, students did not complete the Spring assessment in 2022, resulting in an incomplete dataset and preventing the use of that assessment.

Out of the 943 students who used DreamBox in SY2022, only 252 students were 1) tested in grade 3 or above in SY2021, and 2) present for the test in SY2022 and therefore had the required data needed to complete the measure. Additionally, the platform usage was, particularly at Poinciana Academy, was specifically targeted at students in need of intervention. For this reason, more delicate analysis is needed than simply examining wholistic differential results.

To examine the first research question, correlative measures were drawn between the data provided by DreamBox and the scores from the Florida Standards Assessment. 499 students who used DreamBox during SY2022 were assessed on the FSA, and were included in the correlative analysis. Completing and passing lessons on DreamBox is weakly correlated with the FSA Math, and the "progress in DreamBox" measure is moderately correlated to the student scale score, $r = .54$, $p < .001$. When looking at achievement level categorical variable, the relationship is even stronger, $r = .67$, $p < .001$. Lessons passed and completed were also moderately correlated when considered achievement scores rather than scale scores. All relationships were highly statistically significant, $p < .001$, indicating that this relationship is not due to random chance. The following table shows the correlation between the vital statistics from DreamBox and the SY2022 FSA Math 3-8.

Assessment	2022 FSA Math Scale Score Correlation	2022 FSA Math Achievement Correlation	Significance
DreamBox Lessons Completed	.390**	.539**	<.001
DreamBox Lessons Passed	.462**	.616**	<.001
DreamBox Minutes	.304**	.419**	<.001
Progress in DreamBox	.544**	.669**	<.001

This suggests that progressing in DreamBox is associated with higher FSA scores – and that a lack of progress in DreamBox is associated with lower FSA scores. DreamBox's internal measures of student success are moderately aligned with measures of success on the FSA.

One other point of note: while DreamBox Learning encourages schools to consider lessons passed and progress in DreamBox as the key indicators for student learning, rather than minutes on the platform, there was a very stron prelationship between the minutes spent on the platform and the number of lessons passed ($r = .821$, $p < .001$) and the DreamBox progress ($r = .693$, $p < .001$). While it is not a direct relationship (some students grew faster than other while spending less time on the platform), the general trend was that students who spent more time in DreamBox were associated with higher scores, and students who spent less time were associated with lower scores.

DreamBox User Growth

While correlations are useful for examining whether the platform is measuring students in the same manner as the FSA, we must use differential analyses to isolate the effects. Does the growth come from DreamBox, or from some other intervention? And if so, how much growth occurred? To that end, a differential analysis was completed. It was not possible to do within-school comparisons since the overwhelming majority of tested students at the two sites used the DreamBox platform (with exception to PAFA's 4th grade, where 0 students utilized the platform since they were a different pilot project). Instead, a like-schools analysis was conducted between the two schools in the Poinciana region that used the program – Chestnut Elementary and Poinciana Academy – and the two neighboring schools that did not use the program – Deerwood Elementary and Koa Elementary.

| Grade	DreamBox Mean	Non-DreamBox Mean	Mean Difference	t	Significance	Effect Size
Grade 3	289	284	4.49	1.729*	.042	0.19*
Grade 4	298	302	-3.39	-1.221	.223	-0.14
Grade 5	303	304	-1.25	-0.464	.643	-0.04

The analysis was only statistically significant at one grade level (that is, the difference is not due to random chance). In 3rd grade, students who used DreamBox scored five scale score points higher than students who did not, an effect size of $d = 0.19$. The analysis in 4th grade was compromised due to the fact that students at PAFA did not participate in the study, and were instead part of another pilot, the Osceola Numeracy Project, which also resulted in solid effects for the grade level, potentially obscuring the effects from DreamBox for the grade level. In fifth grade, students who used DreamBox scored marked similar to students who did not, but consider this in light of the fact that students in 3rd grade had an average of 31% progress in DreamBox, while students in 5th grade had an average

of 19% progress in DreamBox. Students had smaller improvement on the FSA, but the data indicated that they also had smaller improvement on the platform.

DreamBox recommends that students complete at least five lessons per week. To further examine the effect that completing lessons in DreamBox had (completion was used rather than passing as it was a less tautological variable), students were clustered into groups based on the number of lessons they completed in the platform (groups: fewer than 10 lessons, 11-50 lessons, 51-100 lessons, 101-250 lessons, greater than 250 lessons), which results in groups large enough to analyze via standard analysis of variance procedures. When grouped in this manner, it became clear that students who completed more lessons in DreamBox scored better than students who completed fewer lessons (only in comparison to students who used DreamBox). Grade Three ($F(4, 175) = 25.79$, $p < .001$, $\eta^2 = 0.37$) again had the largest range and effects, but Grade Four ($F(3, 101) = 8.67$, $p < .001$, $\eta^2 = 0.21$) and Grade Five ($F(4, 200) = 21.67$, $p < .001$, $\eta^2 = 0.30$) both had positive ranges and effects. The following figures depicts how student scores increased with greater lesson completion, both grouped and ungrouped. It can be seen that meeting the recommend lesson completion rate does have an effect of student achievement.
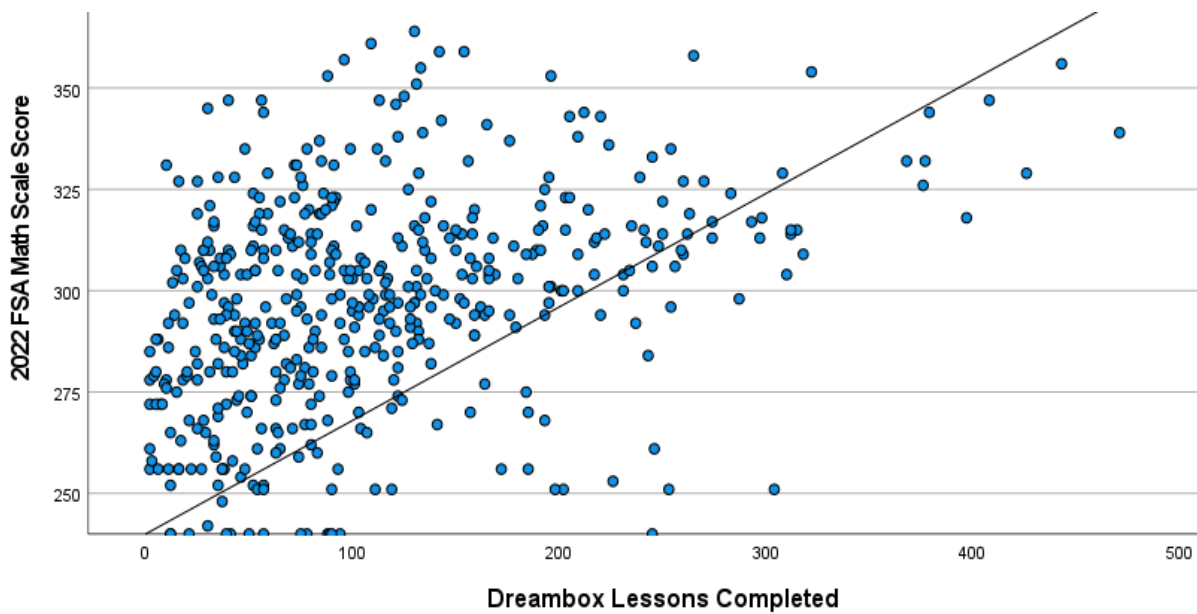
Scale Score Based on Lesson Completion
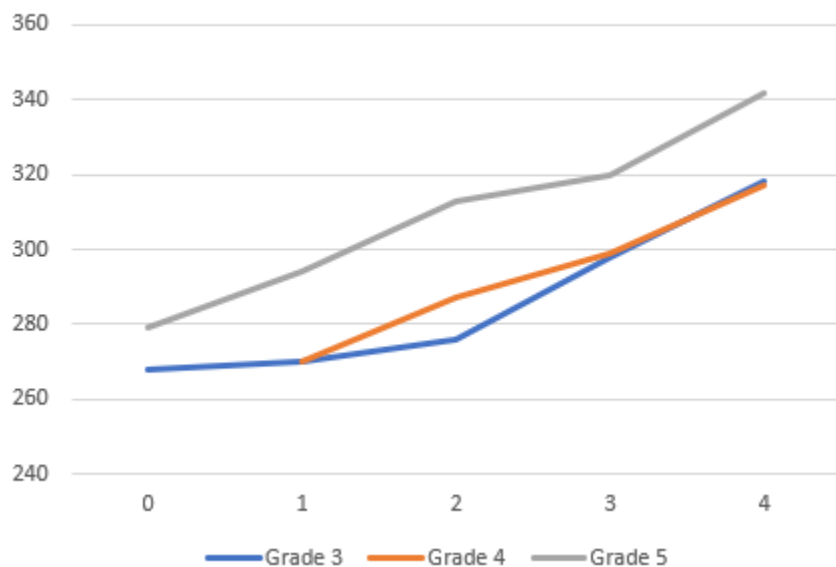
This suggests that usage of the DreamBox platform has an impact on Florida Standards Assessment scores when students are properly using the digital platform; the fewer lessons a student completes, the lesser the effect of the intervention.

In an effort to find a more precise effect, a propensity score match was conducted with a threshold of 0.10 to identify students who were similar in profile to DreamBox users. The match model considered students school, gender, language learner status, primary exceptionality, and prior year FSA math scores. All elements of the model were found to be statistically significant with the exception of gender ($p = .679$). The model rendered 252 students in DreamBox and 178 students not in DreamBox who met the propensity of at least 90%. The mean FSA scores for students in the model was 303, and for students not in the model was 298, with a statistically significant difference, $t(428) = 3.113$, $p = 0.024$, $d = 0.22$.

This suggests that the DreamBox platform, has an effect in intervening in student growth that is not seen in similar interventions at other schools for students not on the DreamBox platform.

DreamBox Return on Investment

The final question in the evaluation was related to cost per student and the potential return on investment from DreamBox. As explained earlier, 943 students used the platform at an initial cost load of $11,500 for user licenses ($12.20 per student). In order to provide the most conservative ROI calculation as possible, the cost loading process provided by the ROI Institute was followed. For digital interventions, the expectation for ROI is at least 0%, that is, the amount of money spent on increasing student learning returns at least as much value as it cost. In addition to the $11,500 direct cost, $500 were spent to provide training to teachers, bringing the cost to $12,000.

DreamBox is traditionally operated during intensive, immediate, intervention time, which is scheduled during the student day and requires a teacher to at least be present in the classroom with the students to ensure that they can log on to the platform, to answer questions as needed, and to provide supervision for student safety. While the teacher is often able to provide more intensive interventions to other students during this time, their salary cost must still be operationalized into the model. The average hourly salary for teachers in Osceola County is $35 per hour, with a benefits rate of 19.79%, or a fully-loaded cost of $41.93 per hour of teaching (regardless of the quantity of students in a classroom). Eleven teachers at PAFA and 34 teachers at CNES (45 teachers total) worked with students this intervention time, although half of those teachers worked on English interventions. While 23 teachers time being operationalized may be an overestimation, that only works to increase confidence in the ROI calculation. At a rate of $41.93 per hour for 23 teachers for one hour per day for 182 school days, the instructional cost of DreamBox was $175,519 in unavoidable employee wages and benefits (that is to say, there is no option to provide DreamBox but *not* pay employees while students utilize it). The monthly cost of internet for last year was $336 at each site, for a total cost of $6,720 for both schools combined. This brings an all-in cost for providing the intervention to a maximum cost of $194,239, not counting unavoidable sunk costs such as facilities usage and technology.

In SY2022, the School District of Osceola County received a base per-pupil expenditure of $8,629 (FLDOE, 2021). For simplicity, weighted FTE will not be used during the analysis to increase confidence in the ROI measure. After removing time for transition, recess, and lunch, students in elementary classrooms receive 1,183 hours of education per year. This means that one hour of learning is worth approximately $7.29 at its base level (students with greater need garner greater dollars to meet their needs). This metric means that one student, learning for one hour, is worth approximate $7.29 of a teacher's time, and can be used in calculating the costs avoided in interventions. For example, a student who was 100 hours behind, by this measure, would cost $729 in teachers' time to remediate back to Tier 1. For the purposes of this calculation, students spend approximately 180 hours a year in Tier 1 mathematics instruction, so a student who was "a year behind" would cost $1,312 in employee wages to remediate.

DreamBox provides a measure that can be roughly translated to the number of hours saved in remediation. The program determines what a student needs in their instructional pathway, and assigns approximately a year worth of growth (this may be a combination of both growth and enrichment, depending on student needs). Then, it reports

progress toward that metric as a percentage. In this manner, 100% can be approximated to one year of growth, or 180 hours of teacher time (providing interventions) costs avoided.

Based on the progress reported for students in DreamBox, the students at CNES and PAFA gained an approximate 80,202 hours of learning. At the rate of 7.29 per hour of learning, $584,673 of costs in teacher intervention time were avoiding (assuming that DreamBox's progress measurement is an accurate representation of student learning). With a benefit of $584,673 and a cost of $194,239, the benefit-cost ratio for DreamBox was 3.01:1, or a return on investment of 201%. Using the proposed $15.50 cost per student (SY2023) would instead yield a total cost of $197,355, a BCR of 2.96:1, and an ROI of 196%.

This suggests that the DreamBox platform provides a valuable return on investment *when measured on growth metrics provided by DreamBox*. It is highly likely that the ROI would be lower if measured on a platform such as NWEA, however we currently lack the data to conduct such a measure.

Additionally, there are intangible benefits to the program, such as student and teacher sentiment toward the platform (it was reported as well-liked at Chestnut Elementary), and teacher time saved by having a ready-made intervention platform, which reduces planning time needed and allows the teacher to focus on more intensive intervention needs. The benefits are intangible and incalculable, but they exist all the same.

Conclusion

Based on the quantitative results, it appears that the utilization of DreamBox is associated with student growth higher than average student growth measures, particularly when students utilize the platform at the recommend rate of five lessons per week or more. Students making progress on their pathway in DreamBox is moderately correlated with increases in FSA achievement, $r = .669**$, and the platform has measured effect sizes of $d = 0.22**$ and $0.21 < \eta^2 > 0.37$. These measures exceed Kraft's (2019) recommendations for a strong effect from academic interventions ($d > 0.20$), and approach Hattie's hinge-point ($d = 0.40$). This is a similar effect to that measured on SuccessMaker, but otherwise exceeds other examined digital interventions such as Freckle, iReady, and Penda. It is worth noting that other programs, such as iReady and SuccessMaker, have shown similarly positive effects in the past when implemented at a single site with a staff that cares about and supports the program, but show diminished effects once rolled out to the larger district population. As it stands now, DreamBox had a strong ROI in the pilot, indicating that spending $15 per student now on the platform could avoid up to $45 in intervention costs per student later in their academic career.

While the cost of DreamBox is relatively high in comparison iReady ($6 per student in Osceola) it is lower than SuccessMaker ($20 per student) and similar to the cost of Freckle ($14 per student). The fact that the platform provides a return on the investment, at least in as far as the measurements available, is also an indicator that the platform has an effect in increasing student achievement. Given the cost of the DreamBox platform, the relatively high effect sizes within the field of interventions, and the return on investment measure, it is recommended that schools be allowed to use DreamBox if they choose.