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BookNook in Prince George's County Public Schools

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Abstract

In an effort to support student learning amidst the COVID-19 school closures, Prince George's County Public Schools (PGCPS) partnered with BookNook, an online platform focused on early literacy development. Families were provided the opportunity to participate in the implementation, which entailed a remote tutoring approach where professional tutors were organized to meet virtually with small groups of students for two, thirty-minute BookNook sessions per week. This report examined the link between BookNook participation and student literacy development during the initial November 2020 to January 2021 implementation period, when PGCPS schools exclusively offered remote instruction. Our findings suggest that third to fifth grade BookNook students with high levels of usage gained literacy skills at a somewhat faster rate compared to BookNook students who engaged the platform less frequently, and also compared to their peers who did not participate in the implementation. The study has a number of limitations, including the short implementation window, the considerable variability in usage among BookNook students, and the non-random and voluntary enrollment process.

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Introduction

As did most U.S. school districts, Prince George's County Public Schools (PGCPS) experienced dramatic disruptions to instruction due to the COVID-19 pandemic and related school closures. After shutting down in March 2020, PGCPS did not begin holding in-person classes again until mid-April 2021, making it the last school district in Maryland to re-open. In an effort to support student learning while schools were closed, PGCPS launched an initiative dubbed "PGCPS READS" with BookNook, an online reading platform aimed at improving literacy skills. During each BookNook session, students read stories and engage in games and activities that check for understanding. After the completion of each session, students receive feedback on the skills they have mastered and areas where they need more practice. The platform includes access to 800 different texts in English and Spanish that support instruction in basic skills, vocabulary development and reading comprehension. All BookNook instructional components are aligned to the Common Core and several state content standards.

The intended implementation of BookNook in PGCPS entailed a remote tutoring approach, in which professional tutors would meet virtually with small groups of students for two, thirty-minute BookNook sessions per week via Zoom. PGCPS families were provided the opportunity to opt into the program by signing up online. Students who were enrolled in the program were under no obligation to participate, and as we discuss below, actual participation rates varied widely. This study investigates the links between enrollment in BookNook and student literacy growth among PGCPS students in grades 3-5 between November 2020 and January 2021, when schools were exclusively remote. PGCPS provided access to student-level assessment and demographic data for both BookNook participants and non-participants. Using these data, this report addresses the following research questions:

1. **Participation.** To what extent did the academic and socio-demographic backgrounds of students who participated in the BookNook implementation differ from their peers who did not participate? And among BookNook students, were student characteristics associated with how often they engaged with the BookNook platform?
2. **Usage.** Among BookNook students, what is the relationship between software usage patterns and student literacy development?
3. **Impact.** Did BookNook students gain more literacy skills compared to their same-school peers who did not experience BookNook? And, did the intervention have a larger impact on BookNook students who engaged with the platform more frequently?

Data and Methods

Analytic Sample

Prince George's County Public Schools, located in suburban Washington D.C., enrolls 136,500 students attending one of 208 schools. District enrollment is 55% Black and 36% Hispanic, with two out of three students eligible for free/reduced-price lunch, and one out of five receiving English Language Learner services. Our analytic sample consists of 24,510 third through fifth grade PGCPS students who virtually attended one of 136 schools, including 751 students who opted to participate in the BookNook implementation.[1] Our analyses include students with complete iReady literacy assessment data, and who had full information on all demographic variables.

Measures

BookNook Usage

Our primary indicators of BookNook usage are the number of sessions completed between early-November 2020 and mid-January 2021. Vacations during this period left roughly 8 weeks in which students could reasonably have been expected to engage with the platform. Students were expected to participate twice per week, meaning that a full treatment would consist of roughly 16 sessions. Actual usage rates, however, were lower than expected, with the modal student completing only 6 sessions, and one-third of students completing 5 or fewer sessions. Only about 30% of students completed the expected BookNook "dosage." We urge readers to consider both the voluntary nature of the implementation as well as the modest usage rates as they interpret the results presented below.

We use two separate versions of the BookNook usage indicator in our analyses. The first is a simple continuous measure of the number of BookNook sessions each student completed. The second is a dichotomous indicator of high usage (coded 1, low usage coded 0), which we consider to be seven or more sessions. We tested several different thresholds, and the model estimates were not sensitive to different cut points.[2] We use these usage indicators in two ways, reflecting our research questions. We first explore the links between these usage indicators and student literacy development only among BookNook participants. We then estimate literacy development among low- and high-usage BookNook students, compared to non-BookNook participants.

Outcomes

As outcomes these analyses use student-level scores from the iReady reading assessment, which is managed by Curriculum Associates.[3] PGCPS administered the assessments virtually in September 2020 and January 2021. This computer-adaptive assessment adjusts test items for each student continually during test administration according to student patterns of correct and incorrect responses. The resulting test scores, which are calculated using IRT (Rasch) models, are on an equal interval scale. Scores are vertically equated, meaning a given score represents the same skill level across grades. We use the raw, unstandardized RIT scores in all analyses, with controls for grade level in the multivariate analyses.

Covariates

One concern is that students who opted to participate in the BookNook implementation, and BookNook users who participated in more BookNook sessions, may have differed socially and academically from their peers who did not participate or who

[1] We had originally planned on including all K-5 students in our analyses. Unfortunately, the K-2 literacy outcome administered by the district was not appropriate for these analyses.
[2] We ran analyses with a three level categorical variable (low, high and medium usage) of the total sessions completed, as well as a more granular categorical variable that divided usage levels into three-session intervals.
[3] For more information, see https://www.curriculumassociates.com/products/i-ready

participated to lesser degrees. To partially address these concerns, our multivariate models, which we describe below, account for student grade, sex, race/ethnicity (a series of dummy variables indicating whether the student identified as Asian, Hispanic, or white, with Black students serving as the comparison group), special education, and English language status.

Analytic Approach

The study includes three broad types of analyses. First, we conducted simple descriptive analyses of academic and socio-demographic differences between BookNook and non-BookNook users, and among BookNook users who engaged with the platform to varying degrees. Second, we explored the link between the number of BookNook sessions students completed and their literacy development. Given the non-random nature of assignment to BookNook, we accounted for associations between usage rates and student characteristics through a series of OLS regression models that included the baseline iReady baseline literacy assessment as a covariate. These analysis of covariance (ANCOVA) or lagged-score models took the form

$$Y_{ij} = b_0 + b_1(\text{BookNook}) + X_{ij} + \delta_k + e_{ij} \quad (1)$$

where Y_{ij} is the January iReady literacy test score for student i in school j. The models employ two separate indicators of BookNook usage: a continuous indicator of the number of sessions completed and the dichotomous measure of high session completion described above. A vector of student demographic characteristics (described above) as well as the September iReady assessment score is indicated by X_{ij}, δ_k represents school fixed effects, and e_{ij} is the error term for student i in school j.

Our third analytic approach was quite similar, but incorporated non-BookNook students as the comparison group. The BookNook indicators used in these models differ from those used with the BookNook only sample. We employ a dummy indicator of BookNook participation (1=yes; 0=no) and in separate models, two dummy indicators of low- and high-levels of BookNook usage, with non-BookNook students as the uncoded comparison group. The inclusion of school fixed effects allows us to compare BookNook and non-BookNook students enrolled in the same school.

Results

Descriptive Findings

We begin by exploring socio-demographic differences between students who did and did not choose to participate in the BookNook implementation. As indicated in Table 1, student grade and gender were unrelated to BookNook participation. However, there were important racial/ethnic differences across the two groups (p<.001). Specifically, BookNook students were more likely to be Black compared to their non-BookNook peers. BookNook students were also less likely to be Hispanic, and, relatedly, considerably less likely to receive English as a Second Language (ESL) services (p<.001). However, a higher proportion of BookNook students received special education services (p<.001).

The focus of this study are the test score patterns among BookNook and non-BookNook students, which are displayed at the bottom of Table 1. BookNook students began the academic year with somewhat lower scores on the fall iReady assessment (p<.05). The 4.9 point initial gap equates to a roughly .081 *SD* difference. Note, however, that by the winter, the difference between groups was statistically non-significant. On average, BookNook students gained ten points while non-BookNook students gained just under six points. In short, BookNook students gained literacy skills at a slightly faster rate than did non-BookNook students during the eight-week implementation period.

Table 1. Academic and Socio-Demographic Characteristics of BookNook and non-BookNook Students

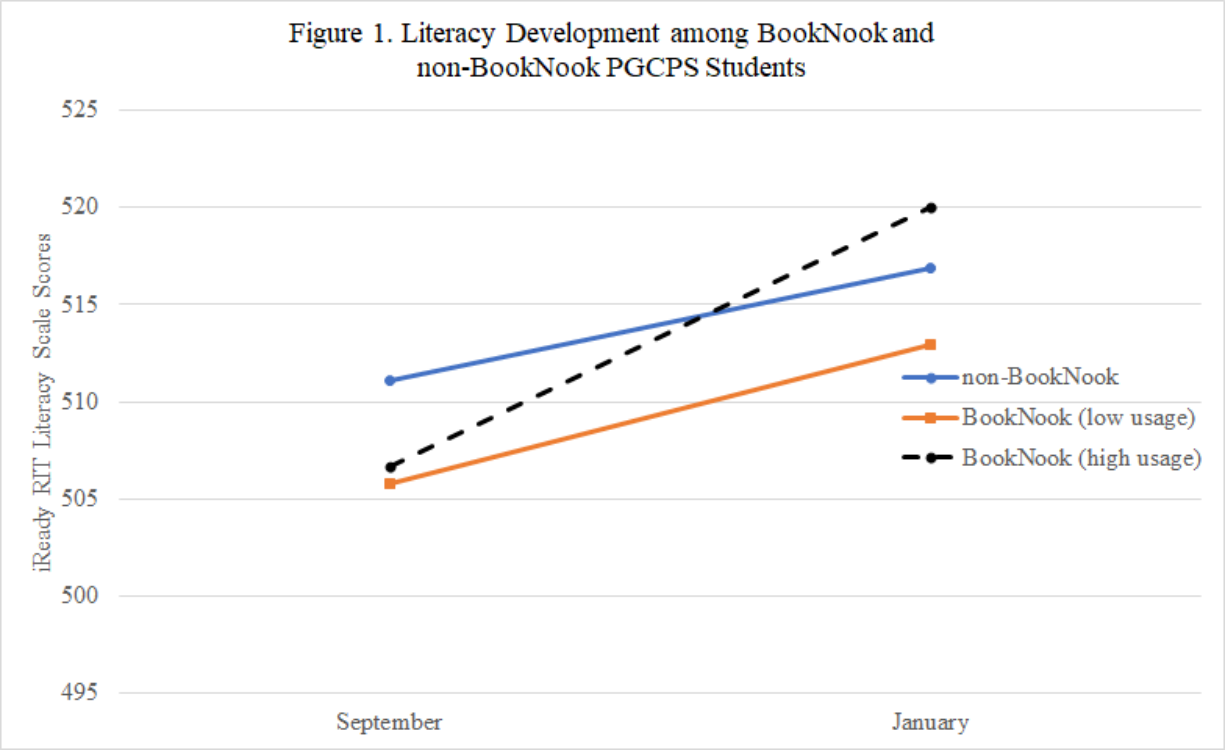
	BookNook (n=751)	Non-BookNook (n=23,759)
Grade		
% Third	36.6	33.4
% Fourth	32.9	33.0
% Fifth	30.5	33.6
Race/Ethnicity***		
% American Indian	0.3	0.4
% Asian	3.5	3.0
% Black	79.5	54.2
% Hispanic	13.5	37.7
% Native Hawaiian	0.4	0.2
% White	2.9	4.4
% Female	47.7	49.4
% English as Second Language***	7.3	25.4
% Special Education***	13.5	9.2
September iReady score, mean*	506.2	511.1
SD	(56.4)	(61.0)
January iReady score, mean	516.2	516.9
SD	(60.1)	(64.3)

*p<.05; ***p<0.001.

We also explored the extent to which test score patterns among BookNook students varied depending on the degree of usage (see Table 2). Note first that low- and high-use BookNook students had comparable baseline iReady score. And although we reported a significant fall difference between BookNook and non-BookNook students above in Table 1, the differences here between low-use BookNook and non-BookNook students, and between high-use BookNook and non-BookNook students, are non-significant due to the split (and thus smaller) BookNook samples. Importantly, Table 2 suggests that the fall-to-winter BookNook advantage in literacy development displayed in Table 1 was driven largely by high-usage students, who gained 13.3 points. Low-usage BookNook students gained only 7.1 points, similar to the 5.8 points gained on average by non-BookNook students. Figure 1 provides a visual display of these patterns, with relatively rapid development rates among high-usage BookNook students.

Table 2. iReady Assessment Scores among BookNook and Non-BookNook Students

	BookNook		Non-BookNook
	Low Usage (*n*=409)	High Usage (*n*=342)	(*n*=23,759)
September Score, mean	505.8	506.7	511.1
SD	(56.0)	(57.0)	(61.0)
January Score, mean	512.9	520.0	516.9
SD	(59.1)	(61.1)	(64.3)



Analytic Results

The descriptive findings above may obscure links between BookNook participation and student literacy development given differences in the types of students who opted to engage with BookNook versus those who did not. To address this, the analyses in the sections below employ approaches that seek to adjust these descriptive patterns for student characteristics and the schools in which they were enrolled.

Usage

Before turning to our impact analyses, we first explore the link between BookNook usage and literacy development only among BookNook students, with all comparisons made to other BookNook students enrolled in the same school. Model 1 in Table 3 indicates the unadjusted relationship between BookNook usage rates and literacy growth during the fall period. We find that each additional BookNook session completed was associated with a 0.8 point (or 0.013 *SD*) increase in literacy development ($p<.10$); equivalently, the completion of 10 additional sessions was associated with an eight-point (0.13 *SD*) advantage. The usage estimate is slightly larger in Model 2, which accounts for student demographic characteristics (0.929 points [0.015 *SD*]; $p<0.05$). Rather than the continuous usage measure, Model 3 uses a categorical measure that compares literacy growth between low- and high-usage BookNook students. We find that students who completed seven or more sessions during the fall-to-winter period gained, on average, 5.72 points (or 0.095 *SD*) more than their peers attending the same school who used BookNook less frequently ($p<0.05$). As in Model 2, the usage estimate becomes slightly larger in Model 4 when we adjust for student demographics (6.35 points [0.106 SD]; $p<.05$). Note that these estimates closely mirror the fall findings presented above in Table 2, with higher average literacy rates among high-use compared to low-use BookNook students.

Table 3. BookNook Usage and Literacy Development among BookNook Students (*n*=751)

	(1) Unadjusted	(2) Adjusted	(3) Unadjusted	(4) Adjusted
Sessions completed	0.800~	0.929*	--	--
	(0.471)	(0.463)		
High BookNook Usage	--	--	5.72~	6.35*
			(2.99)	(2.93)
Constant	123.98***	168.71***	127.14***	171.89***
	(14.10)	(17.26)	(13.71)	(17.02)

~$p<.10$; *$p<.05$; ***$p<.001$. Standard errors are in parentheses. High BookNook usage refers to students who completed 7 or more sessions. Outcome is the January iReady RIT score; all models include the September iReady RIT score as a covariate. Fully adjusted models further account for student grade, sex, race/ethnicity, and special education and language status. All models include school fixed effects.

Impact

We turn now to analyses that compare literacy development among BookNook users to their same-school peers who did not participate in the implementation. Separate models employ a dichotomous indicator of BookNook participation (regardless of usage rate), and low- and high-usage indicators, both compared to non-BookNook students. The non-significant estimate in Model 1 indicates that BookNook students and their non-BookNook, same-school peers developed literacy skills at statistically comparable rates. This finding holds in Model 2 when we adjust for other student characteristics. Model 3, which organizes BookNook students into two groups by usage rates, indicates that students who completed seven or more BookNook gained 4.85 points (0.08 *SD*s) more than their non-BookNook peers during the fall ($p<.05$). In contrast, BookNook students who completed six or fewer sessions experienced literacy gains that were comparable to those of non-BookNook students. The positive high-usage estimate is reduced somewhat in the adjusted Model 4, but remains significant.

Table 4. BookNook Usage and Literacy Development (*n*=24,510)

	(1) Unadjusted	(2) Adjusted	(3) Unadjusted	(4) Adjusted
BookNook	1.74	0.91	--	--
	(1.34)	(1.31)		
Low BookNook Usage	--	--	-0.85	-1.76
			(1.80)	(1.75)
High BookNook Usage	--	--	4.85*	4.12*
			(1.96)	(1.92)
Constant	84.25***	127.79***	85.25***	127.79***
	(2.13)	(2.68)	(2.13)	(2.68)

*p<.05; ***p<.001. Standard errors are in parentheses. High BookNook usage refers to students who completed 7 or more sessions. Outcome is the January iReady RIT score; all models include the September iReady RIT score as a covariate. Fully adjusted models further account for student grade, sex, race/ethnicity, and special education and language status. All models include school fixed effects.

Conclusion and Discussion

This report explored the implementation of BookNook in Prince George's County Public Schools between November 2020 and January 2021, when schools were closed due to the COVID-19 pandemic. We found that usage rates among BookNook students were lower than expected, with fewer than one in three participating students experiencing the full BookNook exposure. However, third to fifth grade students with relatively higher levels of BookNook usage experienced stronger literacy development, compared to both non-BookNook students and low-usage BookNook participants.

These findings should be interpreted in light of several limitations with the implementation in PGCPS. Foremost is the fact that student participation was voluntary. Descriptive statistics suggest that BookNook participants differed from non-BookNook students across several measured characteristics. Although our multivariate approaches adjusted for these differences, one concern is that other *unmeasured* differences may bias our estimates in unknown directions. A second consideration is the very short implementation period, which included several vacations. Third, session completion rates varied dramatically among BookNook users, and very few participants experienced the twice-weekly recommended dosage. One might not expect dramatic changes to student literacy ability given both the limited implementation window and the variable levels of engagement among participants. It is unclear what the platform's impact might have been had students engaged BookNook for the full academic year and to the extent expected. Fourth, the form and quality of instruction provided by the tutors certainly varied, but we have no information or data in this regard.

Finally, the implementation occurred during one of the most disruptive periods in the history of U.S. education. Not only were students engaging BookNook during a time of considerable stress to families and communities, the implementation occurred when these students were not receiving direct, in-person schooling. In other words, they were engaging with BookNook virtually after a full day of virtual instruction from their regular PGCPS teacher. There are potential implications of this for student attention spans, motivation, interest, and capacity to absorb information and to develop the new skills that BookNook aims to provide.

Directions for Future Research

Additional research on BookNook should seek to establish the causal impact of the platform on student outcomes using implementation approaches that differ somewhat from those employed in PGCPS. First and foremost, student assignment should be random or based on clear metrics such as student baseline literacy test scores. Second, the implementation might be longer to allow the development of more skills and also include efforts to increase the likelihood that students will participate to the degree expected. Third, we strongly urge that a large-scale implementation occur when students are also receiving direct instruction and in-class supports once schools are fully reopened. BookNook has many compelling and promising elements. A stronger implementation and evaluation strategy would increase the likelihood of identifying its full potential.