

**Exploring the effect of supportive literature environment on children's academic
performance and psychological well-being**

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Highlights

- Book corners improve both test scores for Chinese and certain psychological outcomes.
- Raising parents' awareness of the importance of reading and training teachers on how to teach reading have additional beneficial effects on academic performance
- Adding reading classes to schools' curriculum has negative effects on both academic and psychological outcomes.
- The efficacy of these interventions depends on the characteristics of the students, such as their prior academic performance and age.

Abstract

This paper examines whether a classroom supportive literature environment can enhance children's academic performance and their psychological well-being. We conducted a large, longitudinal field experiment in rural China, and explore the separate effects of four factors in a classroom supportive literature environment, namely a well-designed classroom book corner, teacher training, parent involvement, and a reading class led by teachers. The results reveal that book corners improve both test scores for Chinese and certain psychological outcomes. Furthermore, raising parents' awareness of the importance of reading and training teachers on how to teach reading class have beneficial effects on academic performance, but not on psychological outcomes. We also demonstrate that the efficacy of these interventions depends on the characteristics of the students, such as their prior academic performance and age. Finally, adding reading classes to schools' curriculum has an unexpected negative effect on both academic and psychological outcomes. In sum, a well-designed classroom book corner can enhance children's academic performance and psychological outcomes. Importantly, the magnitude of such effects is closely related to implementation details and additional supports from parents and teachers.

JEL Classifications: I24, I25, I38, H52

Keywords: education, reading, book-corners, field experiment

1. Introduction

It is widely believed and documented that a literature-rich environment is a key factor in children's literacy development and academic achievement (e.g., Dowhower & Beagle 1998; Fuller, 1987; Morrow, 1992). Research in environmental psychology suggests that the environment we are in encourages, influences, or even determines our subsequent behaviors (Bell, Greene, Fisher, & Baum, 1996; Loughlin & Suina, 1982). Further, according to motivational and early literacy theory, a learning environment rich in literacy can stimulate children's interest and desire to read, interact, and learn (Gambrell 1996; Morrow & Weinstein, 1982).

In reality, however, large disparity exists in terms of accessing to such literature-rich environments both across and within countries (Morrow 1992; Sicular, Ximing, Gustafsson & Shi, 2007). Schools in poor areas still struggle to provide basic educational resources, such as textbooks, not to mention extracurricular books. As such, scholars have investigated whether setting up such supportive literature environment (e.g., installing classroom book corners, training teachers to lead literature-related activities) can affect children's reading development. A stream of research conducted by Morrow and her colleagues (e.g., Morrow & Weinstein 1982; Morrow 1987; Morrow 1992) found that a well-designed classroom literacy center can positively affect children's interest in reading, comprehension, as well as creation of original stories. Other studies also provided correlational support to the importance of having access to literature-rich environment and achievement (Fuller 1987; Fuller & Hua 1994; Fuller & Clarke 1994; Mol & Bus 2011).

While findings from these research are encouraging, they are not without limitations. Most of the above studies were done in the United States of America, and the scale of

experiments was relatively small. In addition, while setting up these classroom library corners, the experimenter might have varied other elements, such as training to teachers and/or parents (e.g., Morrow 1987), making it hard to separate the unique effect of classroom library corner from other factors in a literature environment. These limitations raise a series of questions. Can the beneficial effect of classroom library corner be replicated in other cultures? Can these effects survive in a large scale experiment? What are the unique effects or contributions of various important factors in a supportive literature environment, such as a well-designed book corner, teachers' involvement, and parents' participation? To what extent can classroom supportive literature environment affect children's academic performance as well as their psychological well-being?

In this paper, we attempt to answer these questions with a large, longitudinal field experiment conducted in rural areas in China. Specifically, we examine whether setting up a classroom supportive literature environment can enhance children's academic performance as well as their psychological well-being. We explore four factors in a classroom supportive literature environment, namely a well-designed classroom book corner, teacher training, parent's involvement, and addition of a reading class into schools' curriculum.

The findings reveal that book corners improve both test scores for Chinese and certain psychological outcomes. Furthermore, raising parents' awareness of the importance of reading and teacher training have beneficial effects on academic performance, but not on psychological outcomes. Finally, adding reading classes to schools' curriculum turns out to have a negative effect on both academic and psychological outcomes. We also demonstrate that the efficacy of the above interventions depends on the characteristics of the students, such as their prior academic performance and age.

This research contributes to the literature by demonstrating that a supportive literature-rich environment can benefit children's development. Specifically, a well-designed classroom book corner can enhance children's academic performance and psychological outcomes. However, the magnitude of such effects is closely related to implementation details and additional supports from parents and teachers. While most prior research related to this topic was conducted in North America, we demonstrate the causal relationship with a large field experiment conducted in a rural China. Detailed contribution is provided in the Discussion section in the end.

2. Theoretical Background

We explore four factors in a classroom supportive literature environment on children's academic performance and psychological wellbeing, namely a well-designed classroom book corner, teacher training, parent's involvement, and addition of a reading class.

It is generally agreed that exposure to high-quality supplementary readings is crucial for learning and psychological development. For example, Mol and Bus (2011), in a meta-analysis, demonstrated that reading routines offer significant advantage for oral language skills and word recognition among children and adolescents, and benefited university students academically as well. Other scholars have shown that variations in supplemental reading materials and school library utilization help explain variations in achievement levels, given that basic text books are provided (Fuller & Hua 1994; Fuller & Clarke 1994). However, these studies are correlational in nature and they say little about the causality.

In this research, we set out a controlled field experiment to examine this causal relationship, that is, whether exposing young kids with quality books in a well-designed classroom book corner can improve their academic performance and psychological well-being.

We hypothesize that a well-designed classroom book corner with high-quality literature will attract interests among students, making them more interested in learning, and consequently better academic and psychological development. Our findings largely support this hypothesis. We show that installing classroom book corners with high-quality extracurricular books has a significantly positive effect on students' performance in Chinese (but not in other subjects), especially for those in lower grades and with better prior performance. Moreover, this effect is long-lasting, though the magnitude decreases over time.

Furthermore, we explore whether parents' involvement and teacher training, two other important factors in a supportive literature environment, can increase the beneficial effects of classroom library corner on students' academic performance and psychological well-being. Interpersonal support has been shown to be important for kids to grow academically (Deci & Ryan 2000; Wang & Eccles, 2012), particularly crucial for lower grade-level kids as well as academically challenged kids (Fuller & Clarke 1994). For example, research has shown that parental absence can have a negative effect on children's academic achievement (Lyle, 2006). This problem is particularly salient in rural areas in China, as many children are left behind when their parents migrant to cities to work (Zhang, Behrman, Fan, Wei & Zhang, 2014). In our study, we raise parents' awareness of the importance of reading by sending relevant articles to a subgroup of parents via WeChat. We expect that by raising parents' awareness, they would encourage their kids to read more. This intervention turned out to be highly effective, especially for students in lower grades and with poor prior academic performance. More important, the effect of parents' involvement is long-lasting, with a non-decreasing magnitude.

Another important player in children's learning environment are teachers. Good teachers exert a significant impact on students' achievement (Rockoff, 2004; Rivkin, Hanushek & Kain,

2005; Aaronson, Barrow & Sander, 2007; Kane & Staiger, 2008), but there is growing concern that teacher quality and aptitude have declined dramatically in the past 40 years (Corcoran, Evans, Schwab, 2004; Hoxby & Leign, 2004). The situation in rural China is likely to be worse because good teachers likely move to cities for better life and education for their own children. Of particular relevance to our investigation, the extent to which teachers help and encourage children to use the library corner is expected to make a big difference (Dowhower & Beagle 1998; McGill-Franzen et al., 1999). Thus, to quantify teachers' role in our experiment, we provide training to a subgroup of teachers and examine its effect on students' performance. The findings reveal that this manipulation is highly effective at improving students' performance in Chinese, especially in the short run.

Finally, as prior research suggests, the success of a literature environment also depends on the implementation of regularly scheduled literature activities (Morrow 1992). To this end, we explore whether adding a reading class to the curriculum can have additional beneficial effects. However, contrary to our expectations, this addition has a negative effect on students' performance in all subjects. One explanation may be that the reading class encroached on part of the lunch break and self-study time.

3. Method

3.1 Experimental design

Our field experiment took place in two counties in Gansu Province, China: Wudu and Jingning. Gansu Province had a population of 26.37 million and a gross domestic product (GDP) of 824.6 trillion RMB in 2018, ranked 27 of 31 provinces in China. Wudu and Jingning had populations of 568,100 and 487,500 and a regional GDP of 11.08 and 5.11 billion RMB (2017),

respectively, ranked 8 and 9 of 14 cities within Gansu Province. So economically, these two counties are comparable.

Our experiment consisted of three stages: pre-, during, and post-experiment stages. We collected data from students (i.e., academic performance and psychological well-being), teachers, and parents (i.e., attitudes toward reading). We collected pre- and post-experiment surveys from both students and teachers, and only pre-experiment survey from parents due to difficulty in reaching them at the post-experiment stage. In addition, we obtained students' test scores in Chinese, Math, and English to measure academic performance. We included only test scores in Wudu county in our analysis because schools in Wudu use the same exams, allowing fair comparison among the different treatment groups. In Jingning county, however, the exams are different across schools and, thus, incomparable. Next, we describe each of the three experimental stages.

Pre-experiment stage. In the pre-experiment stage, we issued surveys to students and teachers in Wudu (November 2017) and Jingning (March 2018) during class time. We surveyed teachers who teach Chinese, as they are usually the head teacher for each class and the most relevant party for our investigation. Students filled out their surveys in school. They took the parent survey home and had one of their parents complete it. The student survey consisted of 24 questions assessing six aspects of psychological well-being: fondness for school and reading, happiness, confidence, loneliness, altruism, and relationship with parents (see Appendix for details). The parent and teacher surveys asked their attitudes and behaviors toward reading, as well as their demographic information. We received 15,589 valid student surveys, 13,868 parent surveys, and 763 teacher surveys.

In addition, we obtained test scores in the 2017 fall semester only in Wudu as the measure of pre-experiment academic performance. We collected test scores on Chinese and Math for all five grades and test scores on English only for grades 3 to 5 (due to unavailability in the other grades). We did not collect data from sixth-grade students, as after they graduate, we would not be able to track them. There were 9,772 student observations.

Experiment stage. In the experiment stage (March–August 2018), we conducted a nested design experiment and manipulated four factors. The first manipulated factor is the installation of in-class book corners. Such book corners were installed in more than half of the schools by December 2017. We conducted a randomization test to ensure that the treatment schools were comparable to the control schools in which no book corners were installed during the study. Next, in schools in which book corners were installed, we manipulated the second factor: reading class. Specifically, more than half of the randomly selected schools were required by the local education bureau to schedule a weekly reading class, beginning in the spring semester of 2018. During this class, students are supposed to read books of their choice, primarily from the book corner.

The third and fourth factors were nested within the reading class condition. Among schools that had installed book corners and implemented weekly reading classes, about half were provided with teacher training and the other half with parent education. For the teacher training manipulation, we provided two training sessions to Chinese teachers in the chosen schools between March and May of 2018. The purpose of the training was to provide teachers with knowledge and tools to help students read more effectively. For the parent education manipulation, we sent online articles to parents through WeChat to raise awareness that reading is important. From March to November 2018, we sent a total of 24 articles. To encourage parents

to read these articles, we offered monetary rewards to those who read the articles and answered two questions at the end correctly. Figure 1 presents the full design of our experiment and the number of schools in each treatment groups.

Post-experiment stage. In the post-experiment stage (November 2018 – July 2019), we distributed surveys in November 2018. We used the same survey for students and teachers and did not collect parent data at this stage. We received 15,595 valid student surveys, resulting 11,701 matched data points with both valid pre- and post-experiment student survey data. There were 650 valid teacher surveys.

In addition, we collected test scores in Chinese, Math, and English for the 2018 fall semester (i.e., a year later) and the 2019 spring semester (i.e., a year and half later) to measure the short- and long-term effects, respectively, of the aforementioned interventions. Our data included 9,772 (pre-experiment), 9,491 (post-experiment short-term), and 7,682 (post-experiment, long-term) student observations. We matched the data collected in the last two semesters with the first semester, resulting in 8,648 and 6,793 exact matches, respectively.

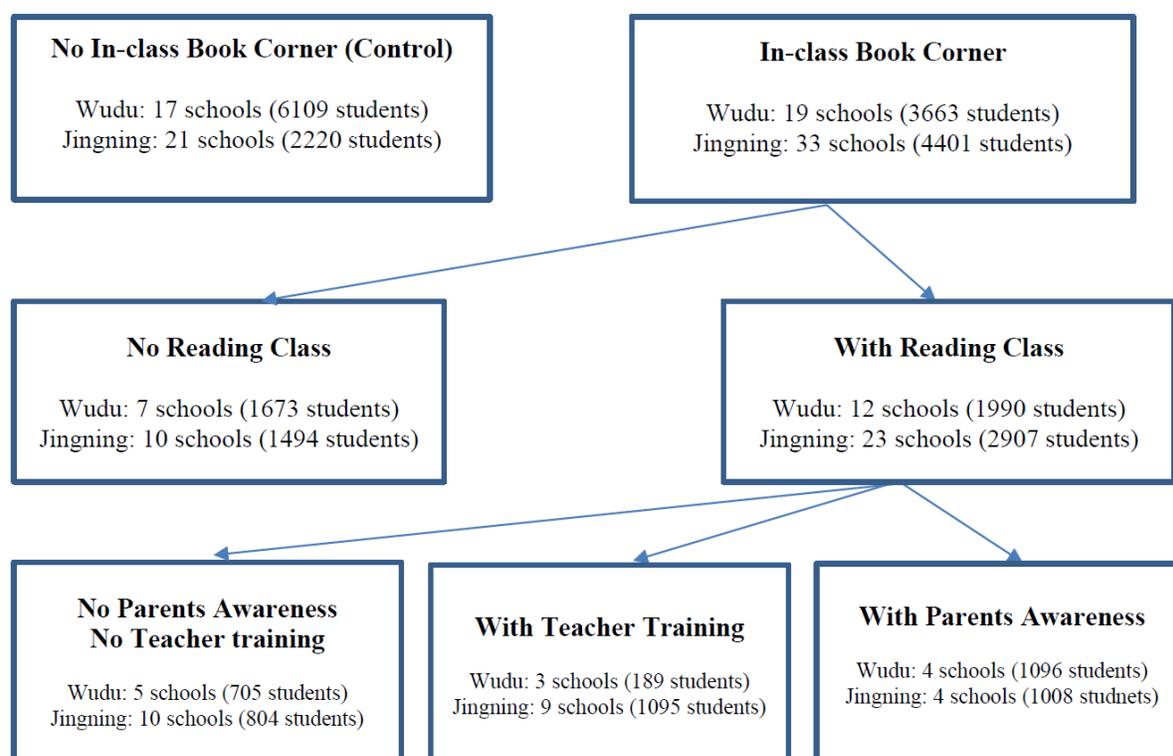


Figure 1 Experimental Designs

3.2 Randomization test and sample statistics

We conducted pairwise two-tailed Wilcoxon rank-sum tests between the control and treatment groups for the key indicators of education quality and resources (i.e., test scores, average number of students per class, and average number of classes per school). All tests were run on the school level. Our classification of these groups passed the randomization test. In other words, the students' characteristics are not significantly different between groups ($p > 0.1$, rank-sum tests). Appendix B shows detailed test results and other summary statistics.

3.3 Hypotheses and empirical models

Informed by the literature, we expected that book corner, reading class, parents' awareness, and teacher training would all have positive effects on children's academic

performance and psychological well-being, though we are agnostic about the size of each factor's impact. We use the following empirical model to test our hypothesis:

$$y_i = \alpha + \gamma_1 \text{BookCorner}_i + \gamma_2 \text{ReadingClass}_i + \gamma_3 \text{ParentAwareness}_i + \gamma_4 \text{TeacherTraining}_i + \beta \text{Controls}_i + e_i,$$

where the dependent variable y is either students' post-experiment test scores in Chinese, Math, or English or indices measuring their psychological well-being; BookCorner , ReadingClass , ParentAwareness , and TeacherTraining are the four dummy variables representing each of the four manipulated factors; and Controls indicate our control variables, including each student's gender; test scores in Chinese, Math, and English before intervention; family income; and parents' education level.

4. Results

Next, we report two sets of results. The first examines the treatment effects on students' academic performance, for which only data from Wudu are used. The second set of analyses employs the full sample (both Wudu and Jingning counties) and examines the treatment effects on students' psychological well-beings.

4.1 Results on academic performance

Table 1 reports regression results of the model with students' test scores in Chinese, Math, or English in fall 2018 and spring 2019 as the dependent variable to examine the short- and long-term effects, respectively, of the four interventions on students' academic performance. We report five main findings here. First, book corner significantly improves students' academic performance in Chinese, but not in Math or English, in the short run (2018 fall semester). The

coefficient on BookCorner is 0.18 and significant at the 5% level for test scores in Chinese.

Given the standard deviation (19.95) and the average score (66.99), this implies 5.4% increase on average.

Second, the improvement in Chinese scores is long-lasting as the estimated coefficient of BookCorner is 0.12 and is significant at the 5% level for test scores in Chinese in the 2019 spring semester, though the magnitude of the improvement decreases over time.

Third, adding a reading class has a significantly negative effect on academic performance in all subjects, indicated by the negative and significant coefficients on ReadingClass. This result is opposite to our expectation. In post-experiment interviews, we discovered that schools reduced the lunch break or cancelled other classes to fit in the reading class. These arrangements might have contributed to the negative consequences of that class.

Fourth, raising parents' awareness about the importance of reading significantly improves students' performance in both Chinese and English in the short and long run. The coefficient on ParentAwareness is 0.27 (significant at the 5% level) for test scores in Chinese and 0.25 (significant at the 5% level) in English in the 2018 fall semester; these coefficients are 0.25 (significant at the 1% level) and 0.58 (significant at the 5% level) in the 2019 spring semester. These results indicate that parents' involvement is crucial; raising their awareness has a lasting positive effect on their children's academic performance. Strikingly, this positive effect becomes stronger over time.

Fifth, teacher training improves performance in Chinese in both the short and long run and in English in the long run. The coefficient on TeacherTraining for test scores in Chinese is 0.48 (significant at the 5% level) in the 2018 fall semester and 0.22 (significant at the 1% level) in the 2019 spring semester. However, teacher training hurts Math performance in the short run

(−0.25, significant at the 1% level), which might be because Chinese classes now take up more time during the school day. In the long run, however, the negative effect on Math disappears and the positive effect of teacher training on reading seems to spill over to performance in English. The coefficient on TeacherTraining for test scores in English in the 2019 spring semester is 0.30 (significant at the 10% level).

	2018 Fall Semester			2019 Spring Semester		
	Chinese	Math	English	Chinese	Math	English
BookCorner	0.18** (0.09)	-0.02 (0.04)	0.12 (0.10)	0.12** (0.06)	0.04 (0.05)	0.062 (0.10)
ReadingClass	-0.27** (0.13)	-0.05 (0.07)	-0.28*** (0.09)	-0.29*** (0.05)	-0.10** (0.05)	-0.47*** (0.15)
ParentAwareness	0.27** (0.10)	0.03 (0.08)	0.25** (0.12)	0.25*** (0.09)	0.10 (0.07)	0.58** (0.24)
TeacherTraining	0.48** (0.21)	-0.25*** (0.08)	-0.01 (0.23)	0.22*** (0.06)	-0.08 (0.12)	0.30* (0.17)
Observations	4,250	4,251	2,664	3,093	3,092	1,612
Adjusted. R2	0.65	0.66	0.56	0.60	0.61	0.60

Table 1. Regression Results on the Academic Performance to Educational Treatments

Note. The regressions control for baseline test scores in Chinese, Math, and English student’s gender (Gender); household education level (Household Education); household income level (Household Income); and student’s current grade (Grade). Standard errors in parentheses are adjusted using the Huber–White estimator, allowing within school clusters to avoid potential heteroskedasticity. Coefficients significant at the 10%, 5%, and 1% levels are marked with *, **, and ***, respectively.

In addition, we examine treatment heterogeneity between students. Specifically, do students in lower versus higher grades respond to our treatments differently? Do students with better or poorer baseline academic scores respond to our treatments differently? We aim to

answer these questions in the next two sets of analyses. We focus on the 2018 fall data because not all treatment effects lasted to 2019 spring semester.

Table 2 reports the coefficients in the regression model, with test scores in Chinese and Math in the 2018 fall semester for students in lower grades (grades 2 and 3) and in higher grades (grades 4, 5, and 6) as the dependent variable. In general, our treatments are more effective for students in the low grade. The results show that book corner and parents' awareness have significantly positive effects on students in the low grade (coefficients on BookCorner and ParentAwareness are 0.28 and 0.39, with significance at the 5% and 10% levels, respectively). However, for students in higher grades, the effect of book corner loses its significance, and the effect of parents' awareness is halved, albeit still significant at the 10% level. Reading class continues to have a negative effect on academic performance. The effect of teacher training is still positive but nonsignificant for students in both lower and higher grades, likely due to limited statistical power. In addition, we find no significant treatment heterogeneity for students' performance in English.

Table 2 also reports the estimated coefficients in the regression model, with test scores in Chinese in the 2018 fall semester as the dependent variable, for students whose baseline Chinese scores (i.e., in the 2017 fall semester) are in the bottom, middle, and upper terciles, respectively. The results are notable. First, the book corner only has a positive effect on students with median and high prior academic performance (coefficients on BookCorner are 0.35 and 0.32, respectively, and significant at the 10% level). This finding is consistent with Kremer (2003) as well as Mol & Bus (2011), in that students who presumably have higher reading proficiency will benefit more from these books. Second, parents' awareness has a positive effect on students with low and median prior performance (coefficients on ParentAwareness are 0.30 and 0.55,

respectively, and significant at the 1% level) but not on students with high prior performance. Third, teacher training is effective only for students with low prior performance (coefficient on TeacherTraining is 1.06 and significant at the 1% level). In addition, we find no significant difference in performance in English and Math.

	Panel A: Separating Students by Grade				Panel B: Separating Students by Performance on Baseline Chinese Test		
	Low Grade		High Grade		Bottom	Middle	Top
	Chinese	Math	Chinese	Math			
Book Corner	0.28** (0.14)	0.02 (0.07)	0.13 (0.08)	-0.04 (0.05)	0.17 (0.10)	0.35* (0.19)	0.31* (0.16)
Reading Class	-0.52** (0.22)	-0.19 (0.13)	-0.07 (0.07)	0.02 (0.06)	-0.33*** (0.11)	-0.56** (0.22)	-0.31 (0.31)
Parents Awareness	0.39* (0.21)	0.10 (0.13)	0.15* (0.08)	-0.005 (0.06)	0.30*** (0.09)	0.55*** (0.16)	0.42 (0.30)
Teacher Training	0.33 (0.31)	-0.06 (0.15)	0.42 (0.26)	-0.30*** (0.11)	1.06*** (0.24)	0.34 (0.24)	0.29 (0.29)
Observations	1,582	1,583	2,668	2,668	1,219	1,510	1,521
Adjusted R2	0.52	0.51	0.73	0.64	0.49	0.24	0.24

Table 2. Regression Results on the Academic Performance to Educational Treatments on Different Subgroups

Note. The dependent variables for Panel A are test scores in Chinese and Math for 2018 fall semester; for Panel B the dependent variable is test score for Chinese for 2018 fall semester. The regressions control for baseline test scores in Chinese and Math, student's gender (Gender), household education level (Household Education), and household income level (Household Income). Standard errors in parentheses are adjusted using the Huber–White estimator, allowing within school clusters to avoid potential heteroskedasticity. Coefficients significant at the 10%, 5%, and 1% levels are marked with *, **, and ***, respectively.

4.2 Results on psychological well-being

Table 3 reports the coefficients in the regression model, with measurement of students' post-intervention psychological well-being, including fondness for school and reading, happiness, confidence, loneliness, altruism, and relationship with parents, as the dependent

variable. The results show that the only significant treatment effect is book corner. Providing a book corner significantly increases students' fondness for school and reading and, surprisingly, their feeling of loneliness as well, with coefficients on BookCorner being 0.11 and -0.09 (both significant at the 10% level), respectively. The increase in loneliness is unexpected, and we speculate that the additional time spent reading might have been a contributing factor. However, we do not know whether this effect is short-lived or not, as we collected only one post-experiment survey (in November 2018).

To explore whether fondness for school and reading mediated the beneficial effect of in-class book corner on Chinese test score, we conducted mediation analysis following bootstrapping procedures. We selected students in the control group and students with only book-corner treatment for the mediation analysis. In this model, IV was the presence or absence of the in-class book corner, DV was the post-experiment Chinese test score in 2018 fall semester, and mediator was the difference between post- and pre- experiment scores in fondness for school and reading index. In addition, we controlled gender and pre-experiment Chinese test score. Mediator and DV were both standardized. The regression coefficients between book-corner treatment and mediator (0.10 , $p = 0.006$) and between mediator and Chinese test score (0.03 , $p = 0.003$) were both significant. The indirect effect was $(0.10) \times (0.03) = 0.003$. We tested the significance of this indirect effect using bootstrapping procedures. Indirect effects were computed for 1000 bootstrapped samples. The bootstrapped indirect effect was 0.003 with 95% bootstrapped confidence interval ranged from 0.001 to 0.01 , while the direct effect was 0.16 with 95% confidence interval ranged from 0.13 to 0.20 . Because neither interval included 0, we concluded that both the direct and the indirect effects were significant. In other words, the effect

of book-corner on Chinese test score was partially mediated via student's fondness for school and reading.

	Fondness for School and Reading	Happiness	Confidence	Less Loneliness	Altruism	Relationship with Parents
BookCorner	0.11* (0.06)	0.07 (0.07)	0.08 (0.06)	-0.09* (0.04)	0.05 (0.03)	0.06 (0.06)
ReadingClass	-0.06 (0.08)	0.08 (0.09)	0.05 (0.07)	0.12* (0.06)	-0.08** (0.03)	0.07 (0.07)
ParentAwareness	0.02 (0.09)	-0.11 (0.08)	-0.10 (0.06)	-0.03 (0.07)	0.05 (0.06)	-0.01 (0.10)
TeacherTraining	0.05 (0.07)	0.04 (0.08)	-0.04 (0.06)	-0.03 (0.07)	0.02 (0.04)	0.01 (0.06)
Observations	7,856	7,854	7,867	7,854	7,858	7,839
Adjusted. R2	0.29	0.11	0.20	0.05	0.29	0.08

Table 3. Regression Results on the Psychological Outcomes to Educational Treatments

Note. The dependent variable is the post-intervention psychological outcomes. The regressions also control for baseline psychological characteristics measured with the same survey, student's gender (Gender), student's current grade (Grade), household education level (Household Education), and household income level (Household Income). Standard errors in parentheses are adjusted using the Huber–White estimator, allowing within school clusters to avoid potential heteroskedasticity. Coefficients significant at the 10%, 5%, and 1% levels are marked with *, **, and ***, respectively.

5. Discussion

In this 21-month-long field experiment involving more than 16,000 elementary students in rural China, we demonstrate that a supportive literature-rich environment can benefit children's development. First, we show that a well-designed classroom book corner can not only increase children's interest in reading, but also their test scores. It is worth noting that the book corner effect is more salient among students in lower grades, as well as among students whose baseline academic performance was above average. Simply put, younger kids as well as better

academic performers benefit more from these classroom book corners. These findings echo Mol and Bus's (2011) argument that the relationship between book exposure and reading comprehension as well as academic success is likely to be reciprocal; that is, more exposure to books leads to higher reading development, and this enhanced reading ability prompts more reading. Given this, we suspect that the intellectual and psychological gaps between students with different accessibility to book resources in their early school years are likely to widen as they grow older. As such, getting quality books into the hands of rural children in elementary schools might be a promising way to help them academically and psychologically.

Second, our findings reveal that a supportive literature environment include not only book corners, but also two other important elements, parent involvement and teacher training (Mooney, Winter & Connolly, 2016). Higher parental awareness of the importance of reading and better teaching skills are shown to significantly boost the effect of book corners. More importantly, these interpersonal support, from parents or teachers, benefited kids with low prior performance more. This implies that for academically challenged kids, getting help from parents and/or teachers are particularly crucial before they can really benefit from the in-class book corners. In our field experiment, we used a very simple strategy to increase parents' awareness of the importance of reading, by sending them relevant articles through a popular messaging app (i.e., WeChat, similar to WhatsApp). These articles talked about importance of reading and encouraged parents to read with their kids, buy books for their kids, and support their kids to read. To increase teachers' skills, we collaborated with an NGO to provide two training sessions to some teachers. These sessions were aimed to inspire the teachers to love children and love reading, provide guidelines on how to establish a reading environment in class, and share experiences on how to help school children to read more. These involvements of parents and

teachers are practical, cost efficient, and more importantly, effective. Thus, we recommend regions with scarce educational resources to place more emphasis on parents and teacher involvements to extract maximum benefits from these resources.

Finally, we discuss the limitations to our experiment. First of all, we collected data in Gansu province, China. Whether the effect will replicate in other rural areas in China or other parts of the world deserves future research. Secondly, we acknowledge that the effects of books and reading in general should be examined in the long-run. A 21-month-long experiment might be able to detect changes in test scores, but might be too short for psychological effects to emerge. Future research is needed to examine the longitudinal effects of having in-class book corners. Last, but not the least, the finding that adding a reading class actually hurts test scores is a bit alarming. If the negative effect indeed stems from the reduced time for lunch break and other subjects as we suspect, it is better to let students decide when to read extracurricular materials. Forcefully squeezing a reading class in the already-busy schedule might be detrimental. In other words, a supportive literature environment needs not only good intention, but also practical considerations.

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Appendix A:

Questions included in the student survey to assess the six aspects of psychological well-being:

1. *Fondness for school and reading*: Students responded to three questions (i.e., “Do you like reading?”, “Do you like your school?”, and “Do you like to study?”) on 7-point scales with 1 indicating not at all and 7 indicating very much. Responses to these questions were averaged to form “fondness for school and reading” index.
2. *Happiness*: Students responded to two questions (i.e., “Do you feel happy recently?” and “Do you feel happy when thinking about your future?”) on 7-point scales with 1 indicating not at all and 7 indicating very much. Responses to these two questions were averaged to form a “happiness” index.
3. *Confidence*: Students responded to three questions (i.e., “Do you think you have progressed in school performance?” “How confident are you that you can perform well in academic tests?” and “How confident are you that you can achieve anything you want?”) on 7-point scales with 1 indicating not at all and 7 indicating very much. Responses to these three questions were averaged to form a “confidence” index.
4. *Less Loneliness*: Students responded to two questions (i.e., “Do you often feel that no friend wants to play with you?” and “Do you often feel that no classmate wants to play with you?”) on 7-point scales with 1 indicating not at all and 7 indicating very much. These responses were reverse-coded and then averaged to form a “less loneliness” index. Higher values indicate feeling less lonely.
5. *Altruism*: Students responded to the following three questions: 1) “Your classmate’s family is going through difficulties, are you willing to help them?” (from 1-not at all to 7 - very much), and 2) “You are given 10 candies, and you can choose to give some of them to a friend. How many candies do you want to give away?” (answers range from 0 to 10), and 3) “You are given 100 Chinese yuan, and you can choose to give some to a friend. How much do you want to give away?” (answers range from 0 to 100). All answers were first converted to a scale ranging from 0-1 (i.e. answer for the first question was divided by 7, answer for the second one divided by 10, and answer for the third one divided by 100). Responses to these three questions were averaged to form an “altruism” index. Higher values indicate more altruism.
6. *Relationship with parents*: Students responded to two questions (i.e., “Do you think your parents are helpful?” and “Do you think your parents love you?”) on 7-point scales, with 1 indicating not at all and 7 indicating very much. Responses to these questions were averaged to form a “relationship with parents” index.

Appendix B:

1. Balance Test

Table 1 presents the p-values of pairwise two-tailed Wilcoxon rank-sum tests between each pair of control and treatment groups. The tests were run on the school level (i.e., each school represents one observation). All variables are defined as previously. Groups 1 - 5 refer to the following: 1 as the control group; 2 as the treatment group with only book corner; 3 as the treatment group with book corner and reading class; 4 as the treatment group with book corner, reading class, and parents' awareness; and 5 as the treatment group with book corner, reading class, and teacher training.

Panel A: Wudu								
Groups	Mean			Median			# of classes	# of students per class
	Chinese	Math	English	Chinese	Math	English		
2 vs. 1	0.66	0.66	0.42	0.61	0.70	0.36	0.65	0.90
3 vs. 1	0.82	0.59	0.88	0.91	0.67	0.72	0.39	0.70
3 vs. 2	0.76	0.20	0.43	1.00	0.76	0.43	0.14	0.88
4 vs. 1	0.32	0.41	0.36	0.30	0.37	0.53	0.63	0.46
4 vs. 2	0.53	0.53	0.53	0.34	0.41	0.34	0.47	0.41
4 vs. 3	0.29	0.29	0.41	0.41	0.33	0.33	1.00	0.56
5 vs. 1	1.00	0.62	0.76	0.79	0.53	0.75	0.51	0.92
5 vs. 2	1.00	0.52	0.38	0.82	0.52	0.38	0.26	0.52
5 vs. 3	0.57	0.79	1.00	1.00	0.57	1.00	1.00	0.14
5 vs. 4	0.23	0.86	0.40	0.37	0.63	0.63	1.00	0.11

Panel B: Jingning								
Groups	Mean			Median			# of classes	# of students per class
	Chinese	Math	English	Chinese	Math	English		
2 vs. 1	0.69	0.85	0.79	0.75	1.00	0.54	0.78	0.21
3 vs. 1	0.79	0.52	0.11	0.74	0.63	0.21	0.51	0.39
3 vs. 2	0.91	0.63	0.17	0.85	0.73	0.02	0.50	0.97
4 vs. 1	0.91	0.18	0.69	0.60	0.39	0.66	0.67	0.28
4 vs. 2	0.95	0.45	1.00	0.94	0.44	0.29	0.77	0.54
4 vs. 3	0.95	0.95	0.19	0.89	1.00	0.44	0.49	0.64
5 vs. 1	0.62	0.53	0.28	0.59	0.95	0.21	0.82	0.20
5 vs. 2	0.72	0.84	0.40	0.39	1.00	0.04	0.95	0.60
5 vs. 3	0.84	0.60	0.66	0.97	0.51	0.87	0.44	0.46
5 vs. 4	0.71	0.60	0.33	0.94	0.70	0.59	0.83	0.94

Table 1. Balance Test

2. Summary Statistics

Panel A of Table 2 lists the summary statistics of the variables used in our analysis, and Panel B reports the correlation matrix. We code student gender as 1 for female and 0 for male. Household education level is the highest education level between the two parents and is an integer between 1 and 7 (no formal education, primary school, junior secondary school, senior secondary school, three-year college, bachelor's degree, and graduate degree, respectively). Household income is the total monthly income of the family and is an integer between 1 and 10 (below 2,000, 2,000–2,999, 3,000–3,999, 4,000–4,999, 5,000–5,999, 6,000–7,999, 8,000–9,999, 10,000–19,999, 20,000–49,999, and above 50,000 RMB, respectively). As Panel A shows, the average household income in our sample is 3.60, implying a monthly income of between 3,000 to 4,000 RMB per month. The average education level is between primary and junior secondary schools. Our sample is gender balanced, indicated by the zero mean of gender.

In terms of test scores, students' scores in Chinese, Math, and English are highly correlated (all r 's > 0.5 , $p < 0.01$). Girls outperformed boys in all subjects, most notably Chinese and English (r 's = 0.22 and 0.28, $p < 0.01$), and they also exhibited better psychological measures, especially fondness for school and reading ($r = 0.15$, $p < 0.01$) and confidence ($r = 0.11$, $p < 0.01$). Household education level is positively correlated with household income ($r = 0.16$, $p < 0.01$) and with academic performance and psychological well-being in general. Household income is correlated with neither academic performance nor the child's psychological well-being.

Panel A: Mean, standard deviation, and percentiles

	Mean	σ	5th	25th	50th	75th	95th
Chinese	66.99	19.95	24.00	58.50	72.00	82.00	90.00
Math	65.93	24.30	16.00	51.00	72.00	85.00	95.00
English	65.62	24.17	22.00	47.00	70.00	86.00	97.00
Fondness for school and reading	6.28	0.99	4.33	5.67	6.67	7	7
Happiness	5.88	1.42	3.5	5	6.5	7	7
Confidence	5.58	1.29	3	5	5.67	7	7
Less Loneliness	5.02	2.20	1	3.5	6	7	7
Altruism	0.68	0.14	0.47	0.62	0.67	0.75	0.93
Relationship with parents	6.52	1.01	4	6.5	7	7	7
Gender	0.51	0.50	0	0	1	1	1
Household income	3.60	2.67	2	2	3	4	9
Household education	2.77	1.09	1	2	3	3	5

Panel B: Correlational Table

	Chinese	Math	English	Fondness for School and Reading	Happiness	Confidence	Less Loneliness	Altruism	Relation with Parents	Gender	Household Income
Math	0.59										
English	0.60	0.58									
Fondness for school and reading	0.18	0.29	0.25								
Happiness	0.07	0.15	0.09	0.35							
Confidence	0.17	0.24	0.21	0.45	0.42						
Less Loneliness	0.14	0.11	0.13	0.05	0.10	0.05					
Altruism	0.02	0.02	0.06	0.21	0.12	0.16	0.02				
Relationship with parents	0.12	0.14	0.13	0.29	0.30	0.29	0.10	0.12			
Gender	0.22	0.07	0.28	0.15	0.04	0.11	0.01	0.06	0.05		
Household income	0.01	-0.02	-0.03	-0.02	0.00	0.02	-0.02	0.00	0.00	0.00	
Household education	0.06	0.09	0.06	0.05	0.05	0.07	0.03	0.00	0.02	0.01	0.16

Table 2. Summary Statistics