Do Resources Matter? The Effects of a Classroom Library Project on Student Independent Reading Habits in Primary Schools in Rural China

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Abstract:

It is commonly believed that reading challenges should be addressed early to reduce the likelihood that developmental delays will impact students over the long term. However, students in developing countries often have limited access to reading resources. This study uses a randomized controlled trial to examine the causal effect of a classroom library program on student reading outcomes and academic achievement in schools with poor reading resources over an eight-month period. We find that the program significantly improved student reading habits (borrowing books, reading time, communication with friends on readings), and the degree to which students "like" reading. Furthermore, the heterogeneous analysis suggests that disadvantaged (male, low-income, low-performing at baseline) students benefited more in terms of reading time, communication with friends on reading, and affinity towards reading. However, we did not find any overall effect of the program on other variables such as student confidence in reading, reading achievement, creativity, or performance in math or Chinese class. The heterogeneous analysis shows that while students, in general, did not benefit, male students did benefit in terms of confidence in reading and performance in math. A follow-up evaluation of the program is suggested to examine whether the program improves student reading achievement or not in the longer run.

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Learning to achieve literacy is a fundamental goal in modern society. Reading literacy is defined by the Progress in International Reading Literacy Study (PIRLS) as "the ability to understand and use those written language forms required by society and/or valued by the individual" (Mullis et al., 2015). Reading not only impacts everyday life, but it is also at the heart of self-education and lifelong learning (Cox & Guthrie 2001; Slavin et al., 2009). Independent reading facilitates communication, expands general knowledge, and impacts academic success (Dent & Goodman 2015; Phasha et al., 2012).

For this reason, it is commonly believed that reading challenges should be addressed early to reduce the likelihood that developmental delays will impact students over the long term. The Matthew effect has been observed in reading development by which good readers get better while weak readers get weaker in relation to their peers with strong reading skills (Pretorius & Currin 2010; Stanovich 1986). Reading assessments in the United States show that the gap in reading scores between low-income students and middle-income students expanded from 25% of a standard deviation in Grade 4 to 65% of a standard deviation in Grade 8 (National Center for Education Statistics 2011). Those who do not succeed in reading, or who become reluctant readers, also face long odds in achieving success in school and life (Slavin et al., 2009).

Unfortunately, students in developing countries often have limited access to reading resources. School libraries in these countries are scarce and frequently in a dismal state. For example, less than eight percent of South African public schools have a functional library (Equal Education 2011). Even if there is a school library, it often lacks age-appropriate books for children (Wang 2012; Zhang 2014). Access to books at home is even worse, especially in disadvantaged families. Authors (2017) found that less than 10 percent

of primary school students in poor rural China reported that their parents ever bought any books for them, and around 70 percent of students have no more than 10 books at home.

Although providing books to students seems to be a primary intervention for improving student reading skills in developing countries, previous research has found mixed results of whether increasing resources is alone enough to improve student performance. Recent studies have found that merely increasing resources, such as course materials, is generally insufficient for improving student outcomes in general education (see, for example, Murnane & Ganimian, 2014; Glewwe et al., 2011; Hanushek, 1997). Other researchers, however, argue that reading skill development is related to the quantity of material that a student reads, especially age-appropriate readings (Bergen et al., 2017; Cheung et al., 2009; Houle & Montmarquette 1984; McTague & Abrams 2011; Morrow 2003; Oyegade 2003; Rosi 2005; Smith et al., 1997; Whitehead 2004). Although several recent studies demonstrate that reading programs that included the provision of books together with other interventions (for example, teacher training, provision of a librarian) significantly improved student reading performance (Abeberese et al., 2014; Borkum et al., 2012; Friedlander & Goldenberg 2016), we cannot identify whether reading materials alone can make a difference.

This paper aims to evaluate the causal effect of a classroom library program on student reading habits, reading achievement, and other educational outcomes in schools with poor reading resources. The classroom library program only provides age-appropriate books, without any other combined interventions, such as reading instruction, to the fourth and fifth grade classes in primary schools in rural China. We randomly assigned 40 schools out of a total of 120 schools to receive the intervention (the rest made up the control group). Both the estimates of intention to treat (ITT) and Local Average Treatment Effect (LATE) show that the program significantly improves student reading habits, including borrowing behavior, reading time, degree to which students like reading, and communication with peers about reading. In regards to these four variables, larger effects on male students, low-income students, and low-performing students in reading

are observed. However, we do not find any overall significant impact of the program on student confidence in reading, reading achievement, creativity, or grades in other school subjects (Chinese or math), though male students specifically did benefit in terms of confidence in reading and performance in math.

Although the program did not improve student reading skills or performance in other school subjects after an eight-month intervention, that does not mean that the change in student reading habits and the degree to which students like reading will not make a difference in the longer run. In fact, previous research suggests that throughout a child's development, the time devoted to literacy-related activities remains essential to the acquisition of reading literacy skills (Mullis et al., 2012), and the amount of time spent reading contributes to the long-term development of reading achievement (Leppänen et al., 2005). It is possible that in a longer run (more than eight months), we can expect that the program would not only help students learn to read (by shaping good reading habits) but it would also help students improve their reading achievement and other educational outcomes. In particular, the socioeconomically disadvantaged students benefited from this program the same as or even more so than their advantaged peers. If reading programs can reverse the vicious cycle brought on by early reading difficulties, they could, in turn, offer a mechanism through which countries can support future educational development. Such programs, however, may require a certain amount of time before the potential effects of educational achievement become visible.

The remainder of the paper is organized as follows. Section II presents the context of independent reading in primary schools in rural China. Section III introduces the methodology including research design, intervention, data collection, and statistical approach. Section IV first describes student reading habits and reading resources in primary schools in our sample schools, then estimates the impact of the intervention on student reading habits and other outcomes. Heterogeneous effects of the program on disadvantaged students are also examined in this section. Section V concludes.

Independent Reading and Reading Resources in Rural China's Primary Schools

The Chinese government has only begun to pay (close) attention to independent reading since the beginning of this century (Ministry of Education of China 2001). In the highly competitive schooling system in China, schools, teachers, and parents have frequently objected to independent reading because they believe it will negatively affect student academic performance (Deng 2006; Lin 2007; Liu & Tian 2014; Sheng 2014; Authors 2017; Zhang 2014; Zhuang & Du 2007). However, in each of the latest two versions of Standards on the Course of Chinese Language in Compulsory Education issued by the Ministry of Education of China (Ministry of Education of China 2001; Ministry of Education of China 2011), it stipulates that one of the main objectives of the course is to improve the reading ability of students by reading more, reading comprehensively, and reading independently. In the 2014 annual work report of the central government, it was announced that a new, national focus on reading was to be pursued in order to encourage people of all ages and professions to read (State Council of China 2014).

The existing literature, however, suggests that primary school students in rural China still perform poorly in independent reading. A recent study used test items from PIRLS to test more than 23,000 rural primary school students from 203 schools in the poor areas in western China, and it found that the Chinese rural primary school students ranked last in reading skills among a sample of students from the other 44 countries and regions (Authors 2017b). In fact, there is much evidence that indicates primary school students across rural China rarely read. For example, a case study conducted by Zhuang and Du (2007) found that around two thirds of rural primary school students in two schools in western China read for less than 15 minutes per day. Another small-scale survey in three counties in northeast China showed that around half read for less than half an hour per day, and 38 percent of students never participate in any reading activities (Li et al., 2014). Likewise, Liu and Tian (2014) found that only 25 percent of students said they read frequently in six schools in South China.

Although there are many reasons to explain poor reading performance and habits towards reading among primary school students in rural China, one of the most frequently cited reasons is the lack of resources for independent reading. Across China each year, each child only owns around 1.3 new children books on average (Liu 2014). In rural areas, the resources are scarcer. Libraries and bookstores are often absent—or unavailable—in remote rural areas (Li et al., 2014; Authors 2017). Anecdotal evidence showed that 40-70% of rural students had no books or less than ten books for independent reading at home (Deng 2006; Li et al., 2014; Sheng 2014; Authors 2017). Even among students who reported they read, the evidence is clear that the students, in fact, had few choices regarding accessible reading materials (Sheng 2014; Authors 2017; Zhuang & Du 2007).

To address this issue, the Chinese government has begun plans to promote independent reading in schools by providing more reading resources. In December 2016, the Chinese government issued its first National Development Plan for Reading during the 13th Five-Year Plan (XINHUANET 2016). This plan states that improving literacy among young children will be a national priority. In particular, efforts – including improving school libraries – will be made to meet the basic needs for reading of disadvantaged children, such as rural left-behind children and poor children. However, it is not clear whether providing more reading resources alone is enough to make a difference in student independent reading.

Methodology

Research Design

We conducted a randomized controlled trial in three counties in the southern part of Jiangxi province in China. The economic development in the three counties is lagging behind the average of China as well as of other areas in Jiangxi province. Per capita GDP in the three counties was less than 20,000 yuan in 2015, which is around 40 percent of the national average (Ganzhou Municipal Bureau of Statistics and Survey

Office of the National Bureau of Satistics in Ganzhou 2016; National Bureau of Statistics of China 2016). In addition, more than 80 percent of the population are rural residents, in comparison to 44 percent across China and 48 percent across Jiangxi province (Ganzhou Municipal Bureau of Statistics and Survey Office of the National Bureau of Satistics in Ganzhou 2016; National Bureau of Statistics of China 2016). About nine percent of the total population was enrolled in primary schools, which is higher than the national average (6%) (Ganzhou Municipal Bureau of Statistics and Survey Office of the National Bureau of Satistics in Ganzhou 2016; National Bureau of Statistics of China 2016). All three counties are nationally designated poor counties that were identified by the Chinese government in 2012 as areas with extreme poverty (State Council Leading Group Office of Poverty Alleviation and Development 2012).[1] In sum, to some extent, the three counties are representative of the 680 nationally designated poor counties, where nearly one fifth of China's population lives.

The first step of our research design involved selecting a representative sample of schools from the three counties. We used official records from county education bureaus to create a population frame of all rural, public primary schools in the three counties. According to the records, there was a total of 458 schools. In each of the townships we randomly selected schools using a sampling fraction that is proportional to that of the total number of schools. Finally, we randomly selected 120 schools. Of these, 37 schools (30.8%) were in County A, 25 schools (20.8%) were in County B, and 58 schools (48.3%) were in County C.

After selecting schools, we next sampled classes and students. We conducted our study among classes and students from the fourth and fifth grades of each of the sample schools. Due to financial constraints, we randomly selected at most two classes in each grade in each school. Specifically, if there were one or two classes in a grade, all classes in this grade were selected. If there were more than two

[1] The indicators that were used to identify poor counties include per capita GDP, per capita general budgetary revenue, rural per capita net income (State Council Leading Group Office of Poverty Alleviation and Development, 2012).

classes in a grade, we randomly selected two classes. We surveyed all students in the sampled classes. Ultimately, we sampled a total of 11,083 students in 288 classes in these 120 schools.

After selecting the sample, we conducted a baseline survey of the fourth and fifth grade students in our sample at the end of the school year (in May 2015). The baseline survey of students included a 30-minute standardized reading test, a 30-minute standardized Chinese language test, a 30-minute standardized mathematics test, and an eight-page student survey questionnaire (described below in the data collection subsection). Due to time constraints, we randomly assigned students in each classroom into two groups, and the students in each group only took either the Chinese language test or the mathematics test. Due to this random assignment, approximately half of the students (5,519 students, 49.8%) took the standardized mathematics test and the other half (5,564 students, 50.2%) took the standardized Chinese language test.

Following the baseline survey, we randomly assigned the sample schools into either a treatment group or a control group (Figure 1). We conducted power calculations to determine the minimum sample size of schools we would need. In doing so, we assumed an intra-class correlation coefficient of 0.15 and an R-squared of 0.5. As is standard in much of the social science literature, we set alpha = 0.05 and beta = 0.8. We then calculated that we required at least 40 individuals per school and 40 schools per arm to detect a standardized effect size of 0.20 (a minimum effect size that is used in Kim et al. (2010)). In addition to 40 treatment and 40 control schools that is required by the experiment, we included an extra 40 schools in the control group. Therefore, the current stage of the experiment is over-powered (because there were 80 control schools instead of 40).

Randomization was carried out at a central location (in our office in Beijing) using R software. The random assignment successfully created a sample at the time of the baseline. Among the 23 variables, which measure individual student characteristics, family characteristics, available reading resources, student

reading habits, student reading attitude, student reading skills, student creativity, and performance in other subjects, the balance analysis suggests that there were no significant differences (Table 1).

The sampled classes within a treatment school all received a classroom library that was provided by a non-government organization (NGO) at the beginning of the next school year (September 2015). In contrast, the sampled classes within a control school were run in a business-as-usual manner (i.e., they did not receive any in-class, or any other, library provisions from the NGO). At the time of the baseline, neither schools nor enumerators were informed of either the overall design of the study or the nature of the treatment arm assignment.

In May 2016, eight months after the intervention, we conducted an evaluation survey. We revisited the students in the sampled classes. Among 11,083 students who attended our baseline survey, 10,345 students (93%) completed another round of testing and filled out a second set of questionnaires during the evaluation survey (Figure 1). Importantly, the attrition that occurred does not bias our sample. According to our analysis, there was balance across all 23 variables we examined between the treatment group and the control group among our "non-attrited" students who attended both the baseline and endline surveys (Appendix Table 1).

Intervention and Implementation

Each of the free classroom libraries installed into the treatment classrooms had one shelf and was stocked with 70 extracurricular books. These books were carefully selected by the NGO using several criteria. First, a comprehensive and detailed reading list was collected from a variety of different reputable sources, including the following: a.) the winning entries of children's literature awards both internationally (for example, the Hans Christian Anderson Award, the Kate Greenaway Medal, etc.) and domestically (for example, the Chen Bochui Children's Literature Award); b.) recommended readings by professional reading institutions (such as the General Administration of Press and Publication) and specialists (such as Anita

Silvey); and c.) reading lists that are used in well-known primary schools in China. Next, the reading list was further classified into subgroups according to their subject and topic. Finally, the final book list was selected by a specialist group that consisted of more than 20 educators, writers, publishers, and librarians. The books varied in content and difficulty based on the age and reading levels of students. In sum, the program provided books that reading specialists and educators believed would be interesting to students and that covered content beyond what was taught in school, such as literature and natural science books. As soon as the classroom library was established in the classroom, teachers and students took the responsibility of managing the classroom library on their own. In other words, the NGO's intervention was limited to selecting the books and installing the in-classroom library resources.

Several unexpected occurrences created complications while carrying out the intervention. First, two schools (2.5%) in the control group had received classroom libraries even though they were not supposed to. According to the NGO, this was purely due to a clerical error. Second, despite the planned library assembling date (all in-class libraries were supposed to, by treatment design, be completed by the end of the first month of class during the academic year, or by the end of September 2015), our evaluation survey shows that the sampled classes in 12.5 percent of treatment schools had not actually been equipped with a free classroom library. The reason for the delays in this subset of schools was because the school principals in those schools were initially reluctant to put the libraries provided by the NGO into the classrooms. Ultimately, the libraries were installed, but, the timing of the installations were delayed. In the subsequent analysis, we examine the impact of this non-compliance on the outcomes.

Data Collection

We collected two rounds of data. The first round of survey, or baseline survey, was conducted in the middle of the spring semester of the 2014-2015 academic year (April 2015). The intervention started at the beginning of the fall semester of the 2015-2016 academic year (September 2015). After eight months of the

intervention (May 2016, near the end of the Spring semester of 2015-2016 academic year), we conducted the second round of data collection through a follow-up survey.

Specifically, in the semester prior to the launch of the program (second semester of the 2015-2016 school year) we conducted a baseline survey of students and school principals in all sampled treatment and control schools. The student survey consisted of two parts. In the first part of the survey, we administered a 30-minute standardized test that evaluated reading skills and a 30-minute test in math or Chinese language. In the second part of the survey, we administered a four-block questionnaire to each student.

The standardized reading test questions were constructed by trained psychometricians by using test items from the Progress in International Reading Literacy Study (PIRLS) test, an international test of reading comprehension that is widely used throughout the world (Caygill & Chamberlain 2004; Cheung et al., 2009; Mullis et al., 2012; Mullis et al., 2004; Tunmer et al., 2013). The test questions were carefully translated according to the PIRLS translation guidelines (Foy & Drucker 2013) and reviewed by a panel of experts and local teachers with familiarity with China's education system. The translated reading tests then went through several rounds of pilot testing in Chinese rural schools. Following that, the psychometric properties of the test were then validated using data from the extensive pilot testing to ensure good distributional properties (no bottom or top-coding, for example). In the analyses, we normalized reading achievement scores using the mean and distribution in the control group. Estimated effects are therefore expressed in standard deviations.

The tests in math and Chinese language were carefully designed with assistance from educators in the local education bureau to ensure coherence with the national curriculum. We pre-tested the exam multiple times to ensure its relevance and that time limits were appropriate. When we administered the exam in the sample schools, it was timed carefully and closely proctored by trained enumerators. In our study, half

of the sampled students took the reading and Chinese language test, while the other half took reading and math tests. We normalized all test scores according to the distribution of scores in each grade.

In the second part of the student survey, the four-block questionnaire, we first collected individual student characteristics (such as each student's grade, age, gender, and boarding status) and family characteristics (including the education level of each student's parents, parental occupation, migration status, and family assets). Next, in the second block, we asked students questions about available reading resources at school, classroom, and home. In the third block, we asked a series of questions about student reading habits. Students were asked whether students ever borrowed books from the school library, whether students ever borrowed books from the classroom, whether students read for 30 minutes or more each day after class, whether students talked about readings with friends at least once a month, whether students read together with friends at least once a month, and whether students borrow books that friends read at least once a month. A series of questions were designed to evaluate the student reading confidence and the degree to which students like reading, which were based on questions asked in the PIRLS assessment (Mullis et al., 2012).

In the final block, students were asked to complete a Schaefer's creative attitude survey. Learning about patterns and connections through reading will increase thinking and creativity. The Schaefer's creative attitude survey assesses the subject's attitude associated with creativity, including confidence in one's ideas, appreciation of fantasy, theoretical and aesthetical orientation, openness to impulse expression, and use of novelty (Schaefer 1971). A higher score indicates more creativity. This survey has been suggested to be effective for evaluating programs designed to increase creativity in elementary school-age children (McKee 1985).

In May 2016 (eight months following the initiation of the intervention and one year after the baseline), we conducted our follow-up survey. In the follow-up survey, we revisited all the schools in our

baseline survey (both treatment and control) and asked the same students to participate in our follow-up survey. With a checklist, we carefully identified whether students in our baseline survey attended our follow-up survey or not. For students who did not participate in our follow-up survey, we asked their classmates and their homeroom teacher where he/she was (transferred, on leave, etc.) on the survey day. The follow-up survey instruments were similar to that of the April 2015 baseline survey, including two tests and a survey questionnaire for each student.

Statistical Approach

In this study, we have three sets of outcome variables. The first set of outcome variables includes the primary outcome variables that measure the reading habits of students. The second set of primary outcome variables measure the attitude of students toward reading and reading skills. The third set of outcome variables are secondary outcome variables, including scores on the Schaefer's creative attitude survey, standardized scores on the Chinese language exam, and standardized scores on the mathematics exam.

We conducted three types of analysis. Given our randomized experimental design, we first estimate the impact of intention to treat (ITT) effect. The ITT effect captures the effect of being offered the chance to participate in the program. However, as not all schools complied with the random assignment, we also present results from the local average treatment effect (LATE). The LATE scales up the treatment effect to take account of the fact that not everyone complied with the treatment assignment. To see whether the impact of the classroom library differs between different types of students, we further conducted heterogeneous effect analysis.

Intention to Treat Effect

We used ordinary least squares (OLS) regression to estimate the impact of the offering a classroom library on our outcome variables above. Our analysis took two forms. First, given randomization had created a well-balanced treatment group and control group on a wide range of variables, we ran analysis unadjusted

for covariates by regressing the outcome variables on a dummy treatment variable indicating whether the school received a classroom library or not. The basic specification of the model is:

$$Y_{ij} = \alpha + \beta T_j + \varepsilon_{ij} \quad (1)$$

where Y_{ij} represents any of the outcome variables of interest of student i in school j. T_j is a dummy variable that takes a value of 1 if the school was assigned to the treatment group (to offer the opportunity to receive a classroom library intervention) and 0 if the school was assigned to the control group. ε_{ij} is the random error term. We calculate robust standard errors to adjust for clustering by school. Specifically, β measures the ITT effect of the classroom library without bias.

Second, we also conducted adjusted analysis for the purpose of checking robustness with more statistical power by controlling for baseline individual student characteristics, family characteristics, and student performance in corresponding outcomes at baseline. The specification of the adjusted model is:

$$Y_{ij} = \alpha + \beta T_j + \gamma X_{ij0} + \delta Y_{ij0} + \varepsilon_{ij} \quad (2)$$

where X_{ij0} is a vector of variables that measure student and family characteristics of student i in school j at baseline. Y_{ij0} is a variable that corresponds to the outcome variable (Y_{ij}) at baseline. Specifically, the variables controlled on individual student characteristics are grade, age, male, and boarding status in the semester of spring 2015. The variables controlled on family characteristics are education, professional occupation, migration status of parents, and family economic status. In each regression, we also controlled for the outcome variable at baseline. A detailed description of these variables is presented in Table 1. The standard errors were adjusted at school level.

Local Average Treatment Effect

Although randomized controlled trials are the "gold standard" for impact evaluation, the ITT estimate above might not be equal to the effect of the treatment due to the existence of non-compliance. In our case, we are concerned about non-compliance since the actual assignment of the treatment differed slightly from the

initial assignment. To account for this, in the program evaluation literature, researchers use an instrumental variables (IV) approach to estimate the LATE, or, in other words, the treatment effect on the compliers (Sussman & Hayward 2010). The endogenous variable is the actual treatment status, and the instrumental variable is the initial random assignment of the treatment status. The estimated effects can only be interpreted as the treatment effects on compliers (that is, those individuals that would take the treatment if and only if they were assigned to the treatment group). The specification of the LATE model is just replacing the T_j in Equation (1) with C_j, actually receiving classroom library. Specifically, it is:

$$Y_{ij} = \alpha + \beta C_j + \varepsilon_{ij} \qquad (2)$$

where C_j is a dummy variable that takes a value of 1 if the school actually received a classroom library and 0 if the class did not receive a classroom library. However, C_j might be correlated with the unobservables, so we instrument C_j with the variable T_j. T_j is uncorrelated with ε_{ij} (and the baseline control) thanks to the randomization procedure, and it has strong predictive power for C_j. We calculate robust standard errors to adjust for clustering by school.

Similarly, we also conducted adjusted analysis to estimate the LATE regressions. The variables controlled were the same as those in the regression of ITT analysis.

Heterogeneous Intention-to-Treat Effect Analysis

To see whether the impact of the classroom library differs among different types of students, we further conducted heterogeneous effect analysis. Specifically, we use the following model to estimate heterogeneous effect:

$$Y_{ij} = \alpha + \beta T_j + \delta T_j D_{ij} + \gamma D_{ij} + \varepsilon_{ij} \qquad (3)$$

where D_{ij} is a dummy variable representing the particular baseline characteristics of a student. In the model above, the coefficient δ measures the different impact of having a classroom library on students with that baseline characteristic (as opposed to students that do not possess that baseline characteristic).

We measured the heterogeneous effects of a classroom library program across students that differ by gender (male versus female), reading achievement, and family economic status (poor versus non-poor). To examine the heterogeneous effect of the program across students that differ by level of reading achievement, we defined students with poor reading achievement at baseline if the student's reading score at baseline ranked in the lowest quintile.

In all of our analysis, we calculate robust standard errors to adjust for clustering by school.

Results

Student Reading Habits and Reading Resources in Rural Primary Schools: Evidence from Field Survey

Unsurprisingly, we find that students in our sample schools have poor reading habits. Our data show that 80 percent of students never borrowed books from the school library. The survey also finds that 81 percent of students never borrowed books from the classroom. Only 42 percent of students read for 30 minutes or more each day after class. Moreover, more than half of students never communicated with their friends about reading. Specifically, 49 percent of students reported that they have borrowed books that friends read to read, 41 percent of students reported that they have talked about reading with his/her friends, and even fewer students (38%) read together with their friends.

Similar with the findings of other studies that we described in Section II, we also find that reading resources for independent reading are very limited for primary students in our sample schools. Specifically, 24 percent of students attend schools without school libraries in the baseline survey. Three quarters of students live in classrooms where there are no books available for reading. Less than 10 percent of the families of the sample students have more than 25 children's books at home. Overall, we find that 19 percent of students did not have any available books to read in either school, classroom, or at home.

Furthermore, even if there are reading resources available to students, students often do not use them, sometimes because of accessibility issues. Among 8,405 students who attended a school with a school library, 74 percent reported that they never borrow books from it. Even among those who learn in a classroom with a library, more than one fifth (22%) reported that they never borrow books from that library. One of the explanations for this may be that school libraries are not open to students even if there is a library. Among students who never borrow books from the school library (conditional on there being one), 67 percent of them reported that students are not allowed to bring books from the school library to home.

Meanwhile, the fact that the available books are not age-appropriate for students also may explain why students do not want to read. Even if there are available reading books at school or the classroom, only 23 percent of students say that the books in which they are interested are usually available for them at school. Of those readers, 60 percent of them reported that they could not fully comprehend what they read. One of the most recent studies also indicated that the libraries in rural primary schools were providing students with books that are not always chosen with the needs of students in mind, such as books about how to code or how to repair computers (Auhtors 2017). This is consistent with our observations in the field survey.

According to our data, the authors also found that students in rural primary schools are in an environment where there is a lack of support for their independent reading. When we asked teachers how they expected the independent reading would affect students, 12 percent (of 576 teachers) said it would have no positive effect on student performance in Chinese, and 28 percent said it would have no positive effect on student performance in math. This might also be why some principals objected to installing the libraries. When we asked the same questions to the parents of students, 63 percent of them said independent reading would have no positive effects on students, in general; 56 percent said it would have no positive effects on student performance in Chinese, and 70 percent said it would have no positive effect on student performance in math.

In sum, according to our survey, there is a great need for age-appropriate reading materials in primary schools in rural China. Available reading resources are scarce. Even if they do exist, students often have limited access to books in school libraries. Most reading materials are not age-appropriate for primary school students. The provision of age-appropriate reading materials might be a good way to help break the myth about independent reading among teachers and parents of students in rural China.

Impact of In-class Library Resources: Results of the Randomized Controlled Trial

Effects on Student Reading Habits

The primary goal of the classroom library program was to provide children with the opportunity and means to read. As a result, we started by assessing whether the reading habits of students in schools assigned to the treatment group changed or not. Table 2 reports the results of the impact of the classroom library program on student reading habits. The estimates of ITT and LATE are respectively reported in Panel A and Panel B.

The first two columns report the effect of the classroom library program on student borrowing behaviors. The ITT estimate shows that the program significantly reduced the likelihood that students never borrow books from the classroom by 50 percentage points (78 percent). However, the intervention had no effect on student borrowing behavior from the regular school library (Row 1, Column 1&2, Panel A, Table 2). This is not a surprise because the program set up a library in the classroom rather than increasing resources in the school library. The LATE estimates are consistent with the ITT estimates, but the effect size is a bit larger (57 percentage points—Row 1, Column 2, Panel B, Table 2).

Accordingly, we find that students in the treatment schools are more likely to spend more time reading after class. Specifically, the results indicate that the classroom library program significantly increased the possibility that students read for 30 minutes or longer each day after class by 12 percentage points (24 percent—Row 1, Column 3, Panel A, Table 2). The LATE estimates are consistent with the ITT estimates but the effect size is a bit larger (14 percentage points—Row 1, Column 3, Panel B, Table 2). In

light of these results, it appears that the classroom library program not only resulted in students borrowing more often, but it also caused students to read more.

What is even more interesting is that the classroom library program significantly increased student communication about reading with their peers. Columns (4) to (6) report the impact of the program on whether students talk about readings with their friends, whether students read together with their friends, and whether students borrow books that their friends read. We find that the program significantly increased the possibility of students talking about readings with their friends by 15 percentage points (30 percent), reading together with their friends by 7 percentage points (17 percent), and borrowing books that their friends read by 8 percentage points (5 percent—Row 1, Column 4, 5&6, Panel A, Table 2). The LATE estimates show similar findings (Row 1, Column 4, 5&6, Panel B, Table 2).

The adjusted models show consistent results with the basic models. The results are reported in Appendix Table 3. Given there are no significant differences across a wide range of baseline characteristics between the treatment group and the control group, it is not a surprise that the size of the coefficient and statistical significance of treatment variables are almost the same as that in basic models.

Effects on Student Attitude toward Reading and Reading Skills

The results from PIRLS studies internationally suggest that there should be a strong positive relationship within countries between student attitude toward reading and their reading achievement (Mullis et al., 2012). We therefore estimate the effects of the classroom library program on student attitude toward reading. According to the analysis, we find that the program slightly increased the degree to which students like reading by 0.26 points (maximum score = 18) at a 10 percent significance level (Row 1, Column 1, Panel A, Table 3). The LATE estimate is consistent with the ITT estimate (Row 1, Column 1, Panel B, Table 3).

Although there was a positive effect of the program on the "student likes reading" variable, the program did not show any impact on student confidence in reading. Although the coefficient of the treatment

group is positive, the effect size is small (0.23 points, full score = 21 points) and insignificant at a 10 percent level (Row 1, Column 2, Panel A, Table 3). The LATE estimate shows similar results (Row 1, Column 2, Panel B, Table 3).

The ultimate goal of the classroom library program, of course, was to improve student reading achievement. Although we have found significant improvement in student reading habits, both the ITT estimate and LATE estimate indicate that the intervention did not improve student reading score after eight months of implementation. The coefficients are small and insignificant in the regression of the standardized reading exam score (Row 1, Column 3, Panel A&B, Table 3).

The adjusted models show consistent but more statistically significant results in comparison with the basic models. The results are reported in Appendix Table 4. They suggest that the program increased the degree to which students like reading by 0.29 points (ITT estimate, Row 1, Column 1, Panel A) at a 5 percent significance level (Row 1, Column 1, Panel A) and by 0.32 points (LATE estimate, Row 1, Column 1, Panel B) at a 5 percent significance level. In particular, it indicates that the program significantly improved student confidence in reading by 0.23 points (ITT estimate, Row 1, Column 2, Panel A) at a 10 percent significance level and 0.26 points (LATE estimate, Row 1, Column 2, Panel B) at a 5 percent significance level, while no significant effects are found in the basic models. Similarly, it suggests there is no significant effect of the program on student standardized reading score (Row 1, Column 2, Panel A and Panel B).

Effects on Student Creativity and Grades in Other Subjects

In this study, we examine the impact of the classroom library program on student standardized scores in the Chinese language test and in the math test during the eighth month after the intervention. However, according to the results, although the coefficients of the program on standardized Chinese score are positive in both the basic models (Row 1, Column 1, Panel A&B, Table 4) and the adjusted models (Row 1, Column

1, Panel A&B, Appendix Table 5), they are not statistically significant. As with our results for the Chinese language test, we find that the classroom library program has no impact on the performance of student standardized math score (Row 1, Column 2, Panel A&B, Table 4, & Appendix Table 5).

We further examine whether the classroom library program improved student creativity. According to the findings, however, no effect is found in both ITT and LATE estimates (Row 1, Column 3, Panel A&B, Table 4, and Appendix Table 5). The adjusted models show consistent results with those of basic models (Row 1, Column 3, Panel A&B, Appendix Table 5).

Why does the program fail to improve student grades in other subjects as well as creativity? Theoretically, when students read, they encounter new words, phrases, and idioms that can improve vocabulary and language skills. Student reading ability can improve student mathematics achievement because understanding the language contained in mathematics problems necessarily involves reading (Mullis et al., 2013). However, given that we did not find any effect of the program on reading achievement, which theoretically would be observed prior to or alongside any improvements in Chinese or math, these results are not surprising.

Heterogeneous Effect of the Program on Students

According to previous studies, male students, low-income students, and low-performance readers are more likely to underperform in reading (Mullis et al., 2012; Pretorius & Currin 2010; Stanovich 1986). Thus, we further explored whether the classroom library program reduced the achievement gaps between students. Tables 5-7 report the heterogeneous effects of the program on students from basic models. The Appendix Table 6-8 reports the results from adjusted models.

Our results show that when compared to their female peers, male students actually had larger improvements as a result of the classroom library program in terms of reading time, communication with friends on reading, and the degree to which they like reading. On average, male students perform worse than

female students in reading habits (Row 3, Column 1-6, Panel A, Table 5). However, the program significantly increases the rate at which male students read for 30 minutes or more each day after class by five percentage points (Row 1, Column 3, Panel A, Table 5). They are also six percentage points more likely than female students to talk about readings with their friends (Row 1, Column 4, Panel A, Table 5). The program also significantly increased the probability that male students in the treatment group borrow books that their friends read; this increase among male students was 9 percentage points greater than that of the increase among female students (Row 1, Column 6, Panel A, Table 5).

Although students did not benefit in general in terms of confidence in reading and performance in math class (See Section 4.2.2 and Section 4.2.3), we find that male students did benefit. The heterogeneous analysis shows that the program significantly increased the confidence of male students in the treatment group in reading by 0.28 points (Row 1, Column 2, Panel A, Table 6), as well as increased their standardized math score by 0.15 standard deviation more than that of female students (Row 1, Column 2, Panel A, Table 7).

The classroom library program also had a significant and positive heterogeneous impact for low-income students on the variables “talking about readings with friends” and “borrowing books that friends read”. The results suggest that low-income students in the treatment schools were 6 percentage points more likely to talk about readings with their friends (Row 1, Column 4, Panel B, Table 5). They are also 5 percentage points more likely than high-income students to borrow books that their friends read (Row 1, Column 6, Panel B, Table 5). However, there were no heterogeneous effects of the program on the attitude toward reading, reading achievement, performance in other school subjects, and creativity of low-income students (Row 1, Panel B, Table 6&7).

As with our results for low-income students, the classroom library program had a positive heterogeneous impact on low-performing students in terms of reading together with friends, borrowing

books that friends read, and affinity toward reading. Specifically, low-performing students (in reading) in the treatment group were five percentage points more likely than high-performing students to read together with their friends (Row 1, Column 5, Panel C, Table 5). They are also five percentage points more likely than high-performance students to borrow books that their friends read (Row 1, Column 6, Panel C, Table 5). Meanwhile, the program significantly increased the degree to which low-performance students in the treatment group like reading by 0.30 points at a 10% level (Row 1, Column 1, Panel C, Table 6).

Overall, the findings indicate that the classroom library program helped disadvantaged (male, low-income, low-performing) students more so than their comparatively well off counterparts. Male students, low-income students, and low-performing students who were provided a classroom library showed scores just as high or higher than their peers for variables including those related to cultivate good reading habits (including reading more and communicating more about reading with their friends), the degree to which they like reading, confidence in reading, and standardized math score. These results are robust in the adjusted models (Appendix Table 6). In light of these results, we conclude that such programs could potentially help reduce the gap between disadvantaged students and advantaged students in primary schools in rural China.

Conclusion with Discussion

It is commonly believed that reading challenges should be addressed early to reduce the likelihood that developmental delays will impact students over the long term. However, students in developing countries often have limited access to reading resources. There is no exception in rural areas in today's China. In accordance with the findings from other studies, we find that a majority of primary school students in rural China read less than 30 minutes each day after class and never communicate with their friends about reading. One major reason is that the available reading resources are scarce. Even if there are any, students often have limited access to books in school libraries, and most reading materials are not age-appropriate for primary

school students. In sum, there is great need for age-appropriate reading materials in primary schools in rural China.

We used a randomized controlled trial to demonstrate that a classroom library program that only provides students with age-appropriate books (without any combined interventions) can have a significant effect on student reading habits at the eighth month after the intervention. It not only encourages students to borrow books more, read more, and enjoy reading more, but it also increases the communication of students with their friends about readings. There is also evidence that indicates that the classroom library program can be a potential way to reduce the gap in reading time and communication of students with their friends about readings between male students and female students, between low-income students and other students, and between weak readers (low-performing students in reading achievement in the baseline survey) and good readers.

However, of equal importance is that the intervention—at least after 8 months—had no significant effect on student confidence in reading and reading achievement, in general. There are two possible reasons. One is that the program may need a longer time to take effect to improve student reading achievement, which was the ultimate goal of the program. According to the results of PIRLS, reading habits remain essential to the acquisition of reading literacy skills (Mullis et al., 2012). The fact that we do find a significant effect of the program in changing student reading habits in the short term (eight months) highlights the possibility that a significant effect on reading achievement may exist in the long term.

The other reason is that providing books alone might not be enough. Recent studies suggest that access to appropriate books is necessary but not sufficient for improving the reading ability of primary school children (Slavin et al., 2009). A classroom library program combined with the provision of reading instruction might be more effective in developing countries (Abeberese et al., 2014; Friedlander & Goldenberg 2016; Topping et al., 2007). In fact, a recent study (Authors 2017a) in rural China finds that only

effective teacher training (on how instruct students to read) can led to significant increases in student reading skills

Our results also show that the program had no effect on student performance in math or Chinese language tests in short term. This finding is consistent with those in the Philippines (Abeberese et al., 2014) and in India (Borkum et al., 2012), although the latter two programs provided reading instruction to students, as well as reading resources. However, we find the program did significantly improve confidence in reading of male students in comparison with female students. A previous study in rural China also showed that increased access to independent reading materials coupled with effective teacher training was associated with higher scores of standardized math/Chinese language tests after three years of the initiation of the program. To some extent, the non-negative effect of the program on the performance of students in school subjects provides evidence to break the myth in China's highly competitive educational system that independent readings will lower student scores in school subjects (Lin 2007; Wang 2012).

The results of short-term evaluation of the classroom library program highlight the importance of providing age-appropriate reading resources to primary school students in rural China. It will not only help cultivate good reading habits of students but also can reduce the gap in reading between disadvantaged students and more well off students. That is exactly what the Chinese government is trying to achieve with its first National Development Plan for Reading during the 13th Five-Year Plan (XINHUANET 2016). However, a follow-up impact evaluation of the classroom library program is needed to examine whether it improves student reading achievement in the long term.

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Table 1 Baseline Characteristics of Students, by Treatment Group

Definition	Control group	Treatment group	Difference	P-value
Individual Student Characteristics				
Fifth grade student, yes = 1	0.52(3831/7395)	0.51(1870/3688)	-0.01(0.01)	0.2937
Age, year	11.09(0.91)	11.07(0.95)	-0.02(0.05)	0.7003
Male, yes = 1	0.52(3850/7395)	0.52(1912/3688)	0.00(0.01)	0.8506
Were you boarding at school in the semester of spring 2015? yes =1	0.11(827/7393)	0.06(228/3687)	-0.05(0.03)	0.1486
Family Characteristics				
At least one parent with a university degree or higher, yes =1	0.17(1164/6926)	0.18(621/3486)	0.01(0.01)	0.3579
At least one parent in a professional occupation, yes = 1	0.21(1451/6927)	0.20(692/3482)	-0.01(0.01)	0.3072
Left-behind children, both parents migrated away for work = 1	0.46(3404/7395)	0.48(1764/3688)	0.02(0.02)	0.3850
Low-income students, have no refrigerator at home = 1	0.12(885/7393)	0.12(457/3688)	0.00(0.01)	0.7571
Reading Resources				
Have library or reading room at school, yes = 1	0.75(5535/7395)	0.78(2871/3688)	0.03(0.08)	0.7136
Have some kinds of books available in the classroom, yes = 1	0.22(1633/7395)	0.30(1114/3688)	0.08(0.10)	0.4263
Have more than 25 children's books at home, yes = 1	0.09(596/6816)	0.09(308/3453)	0.00(0.01)	0.8189
Student Reading Habits, Attitudes, and Reading Skills				
Never borrow books from school library, yes =1	0.82(6029/7395)	0.78(2888/3687)	-0.03(0.07)	0.6602
Never borrow books from classroom, yes =1	0.83(6117/7395)	0.76(2813/3688)	-0.06(0.08)	0.4412
Read for 30 minutes or more each day after class, yes = 1	0.42(3129/7389)	0.42(1539/3684)	-0.01(0.03)	0.8402
Talk about readings with friends, yes = 1	0.40(2936/7363)	0.43(1594/3669)	0.04(0.04)	0.3454
Read together with friends, yes = 1	0.37(0.48)	0.39(0.49)	0.02(0.03)	0.5913
Borrow books that friends read, yes =1	0.49(0.50)	0.50 (0.50)	0.02(0.04)	0.6783
Students like reading, 0-18	12.53(92662/7395)	12.44(45889/3688)	-0.09(0.14)	0.5461
Students confident in reading scale, 0-21	13.46(99570/7395)	13.52(49857/3688)	0.05(0.17)	0.7533
Standardized reading score	-0.01(-39.11/7395)	0.01(39.11/3688)	0.02(0.07)	0.8149
Student Creativity and Performance on Other Subjects				
Score on Schaefer's creative attitude survey, 0-20	11.13(2.50)	11.16(2.49)	0.03(0.14)	0.8309
Standardized Chinese score	0.00(1.01)	-0.01(0.99)	-0.01(0.08)	0.8604
Standardized math score	0.00(1.00)	-0.00(1.00)	-0.01(0.07)	0.9221

Data source: Authors' survey.

Standard errors are adjusted at school level; * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 2. Impact of Classroom Library on Student Reading Habits at Eight Months after Intervention

	Never borrow books from school library (1)	Never borrow books from classroom (2)	Read for 30 minutes or more each day after class (3)	Talk about readings with friends (4)	Read together with friends (5)	Borrow books that friends read (6)
Panel A. Intention to Treat Effect						
Treatment group	-0.07	-0.50***	0.12***	0.15***	0.07**	0.08***
	0.3436	0.0000	0.0000	0.0000	0.0263	0.0021
Constant	0.71***	0.64***	0.51***	0.48***	0.39***	0.58***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	10343	10341	10332	10307	10323	10325
R^2	0.01	0.22	0.01	0.02	0.00	0.01
Panel B. Local Average Treatment Effect						
Actually receiving a free classroom library	-0.08	-0.57***	0.14***	0.16***	0.08**	0.09***
	0.3336	0.0000	0.0000	0.0000	0.0199	0.0008
Constant	0.72***	0.67***	0.50***	0.48***	0.39***	0.58***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	10343	10341	10332	10307	10323	10325
R^2	0.02	0.32	0.02	0.02	0.01	0.01

Notes: 1) Cluster-robust standard errors adjusted for clustering at the school level. 2) P values are reported. 3) No covariates were controlled. 4) The regressions of local average treatment effect instrument whether the school actually receive a free classroom library (or takeup) with treatment. 5) * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 3. Impact of Classroom Library on Students Like Reading and Reading Skills at Eight Months after Intervention

	Student likes reading (1)	Student confidence in reading (2)	Standardized reading score (3)
Panel A. Intention to Treat Effect			
Treatment group	0.26*	0.23	0.02
	0.0567	0.1238	0.7602
Constant	12.81***	13.61***	-0.01
	0.0000	0.0000	0.8470
Observations	10345	10345	10345
R^2	0.00	0.00	0.00
Panel B. Local Average Treatment Effect			
Actually receiving a free classroom library	0.29*	0.26	0.02
	0.0508	0.1163	0.7582
Constant	12.79***	13.60***	-0.01
	0.0000	0.0000	0.8312
Observations	10345	10345	10345
R^2	0.00	0.00	0.00

Notes: 1) Cluster-robust standard errors adjusted for clustering at the school level. 2) P values are reported. 3) No covariates were controlled. 4) The regressions of local average treatment effect instrument whether the school actually receives a free classroom library (or takeup) with treatment. 5) * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 4. Impact of Classroom Library on Student Creativity and Performance in Chinese and Math at Eight Months after Intervention

	Standardized Chinese score (1)	Standardized math score (2)	Score on Schaefer's creative attitude survey (3)
Panel A. Intention to Treat Effect			
Treatment group	0.02	0.06	0.11
	0.8264	0.4361	0.3468
Constant	-0.01	-0.02	11.86***
	0.8944	0.6504	0.0000
Observations	5166	5165	10345
R^2	0.00	0.00	0.00
Panel B. Local Average Treatment Effect			
Actually receiving a free classroom library	0.02	0.07	0.13
	0.8252	0.4290	0.3411
Constant	-0.01	-0.02	11.85***
	0.8834	0.6184	0.0000
Observations	5166	5165	10345
R^2	0.00	0.00	0.00

Notes: 1) Cluster-robust standard errors adjusted for clustering at the school level. 2) P values are reported. 3) No covariates were controlled. 4) The regressions of local average treatment effect instrument whether the school actually receives a free classroom library (or takeup) with treatment. 5) * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 5. Heterogeneous Effect of Classroom Library on Student Reading Habits at Eight Months after Intervention—Intention to Treatment Effect

	Never borrow books from school library (1)	Never borrow books from classroom (2)	Read for 30 minutes or more each day after class (3)	Talk about readings with friends (4)	Read together with friends (5)	Borrow books that friends read (6)
Panel A. Male Students						
Interaction of Treatment group and Male	0.00	-0.02	0.05**	0.06**	0.02	0.09***
	0.8462	0.4018	0.0415	0.0205	0.4308	0.0008
Treatment group	-0.07	-0.49***	0.10***	0.11***	0.06	0.04
	0.3865	0.0000	0.0014	0.0002	0.1037	0.1813
Male	0.03**	0.04***	-0.11***	-0.14***	-0.12***	-0.16***
	0.0301	0.0058	0.0000	0.0000	0.0000	0.0000
Constant	0.70***	0.62***	0.57***	0.56***	0.45***	0.67***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	10343	10341	10332	10307	10323	10325
R^2	0.01	0.22	0.02	0.04	0.02	0.03
Panel B. Low-income Students						
Interaction of Treatment group and Low-income students	0.00	-0.03	0.05	0.06*	0.02	0.05*
	0.9870	0.3630	0.1718	0.074	0.6362	0.0775
Treatment group	-0.07	-0.50***	0.12***	0.14***	0.07**	0.08***
	0.3510	0.0000	0.0001	0.0000	0.0329	0.0054
Low-income students	0.07***	0.04*	-0.04**	-0.09***	-0.05***	-0.06***
	0.0005	0.0917	0.0231	0.0000	0.0023	0.0006
Constant	0.70***	0.63***	0.51***	0.49***	0.40***	0.59***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	10341	10339	10330	10305	10321	10323

R^2	0.01	0.22	0.01	0.02	0.00	0.01
Panel C. Low-performance Students in Reading Skills						
Interaction of Treatment group and Low Performance Students in Reading	0.01	0.06	0.00	0.02	0.05*	0.05*
	0.8600	0.1252	0.9830	0.5130	0.0769	0.0504
Treatment group	-0.08	-0.51***	0.12***	0.14***	0.06*	0.07***
	0.3363	0.0000	0.0000	0.0000	0.0686	0.0087
Low-performance Students in Reading	0.02	0.00	-0.14***	-0.13***	-0.08***	-0.11***
	0.5193	0.9892	0.0000	0.0000	0.0001	0.0000
Constant	0.71***	0.64***	0.54***	0.51***	0.41***	0.61***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	10343	10341	10332	10307	10323	10325
R^2	0.01	0.22	0.03	0.03	0.01	0.01

Notes: 1) Cluster-robust standard errors adjusted for clustering at the school level. 2) P values are reported. 3) No covariates were controlled. 4) * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 6. Heterogeneous Effect of Classroom Library on Students Like Reading and Reading Skills at Eight Months after Intervention—Intention to Treat Effect

	Students like reading (1)	Student confidence in reading (2)	Standardized reading score (3)
Panel A. Male Students			
Interaction of Treatment group and Male	0.23	0.28*	0.04
	0.1210	0.0860	0.3231
Treatment group	0.13	0.08	0.00
	0.2596	0.5659	0.9655
Male	-1.18***	-0.79***	-0.17***
	0.0000	0.0000	0.0000
Constant	13.42***	14.02***	0.08**
	0.0000	0.0000	0.0249
Observations	10345	10345	10345
R^2	0.04	0.01	0.01
Panel B. Low-income Students			
Interaction of Treatment group and Low-income students	0.08	0.08	-0.02
	0.6777	0.704	0.7933
Treatment group	0.25*	0.22	0.02
	0.0748	0.1598	0.7234
Low-income students	-0.48***	-0.47***	-0.30***
	0.0000	0.0011	0.0000
Constant	12.87***	13.67***	0.03
	0.0000	0.0000	0.4052
Observations	10343	10343	10343
R^2	0.01	0.00	0.01
Panel C. Low-performing Students in Reading Skills			
Interaction of Treatment group and Low Performance Students in Reading	0.30*	0.27	0.05
	0.0774	0.1905	0.3707
Treatment group	0.20	0.18	0.01
	0.1016	0.2491	0.8114
Low-performing Students in Reading	-1.80***	-2.07***	-1.41***
	0.0000	0.0000	0.0000
Constant	13.19***	14.05***	0.29***
	0.0000	0.0000	0.0000
Observations	10345	10345	10345
R^2	0.07	0.06	0.33

Notes: 1) Cluster-robust standard errors adjusted for clustering at the school level. 2) P values are reported. 3) No covariates were controlled. 4) * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Table 7. Heterogeneous Effect of Classroom Library on Student Creativity and Performance in Chinese and Math at Eight Months after Intervention—Intention to Treat Effect

	Standardized Chinese score (1)	Standardized Math score (2)	Score on Schaefer's creative attitude survey (3)
Panel A. Male Students			
Interaction of Treatment group and Male	-0.01	0.15**	-0.05
	0.8900	0.0337	0.7122
Treatment group	0.01	-0.03	0.14
	0.8736	0.7578	0.3050
Male	-0.30***	0.15***	-0.04
	0.0000	0.0001	0.5050
Constant	0.15***	-0.10**	11.88***
	0.0005	0.0196	0.0000
Observations	5166	5165	10345
R^2	0.02	0.01	0.00
Panel B. Low-income Students			
Interaction of Treatment group and Low-income students	-0.03	0.05	0.05
	0.8091	0.5806	0.8068
Treatment group	0.02	0.05	0.11
	0.7807	0.4976	0.4023
Low-income students	-0.23***	-0.21***	-0.36***
	0.0001	0.0002	0.0008
Constant	0.02	0.01	11.90***
	0.5662	0.8868	0.0000
Observations	5164	5165	10343
R^2	0.01	0.00	0.00
Panel C. Low-performing Students in Reading			
Interaction of Treatment group and Low Performance Students in Reading	0.13	0.07	0.13
	0.1531	0.3068	0.3390
Treatment group	0.00	0.04	0.09
	0.9529	0.5600	0.4273
Low-performing Students in Reading	-1.40***	-1.08***	-1.78***
	0.0000	0.0000	0.0000
Constant	0.28***	0.22***	12.23***
	0.0000	0.0000	0.0000
Observations	5166	5165	10345
R^2	0.31	0.19	0.07

Notes: 1) Cluster-robust standard errors adjusted for clustering at the school level. 2) P values are reported. 3) No covariates were controlled. 4) * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

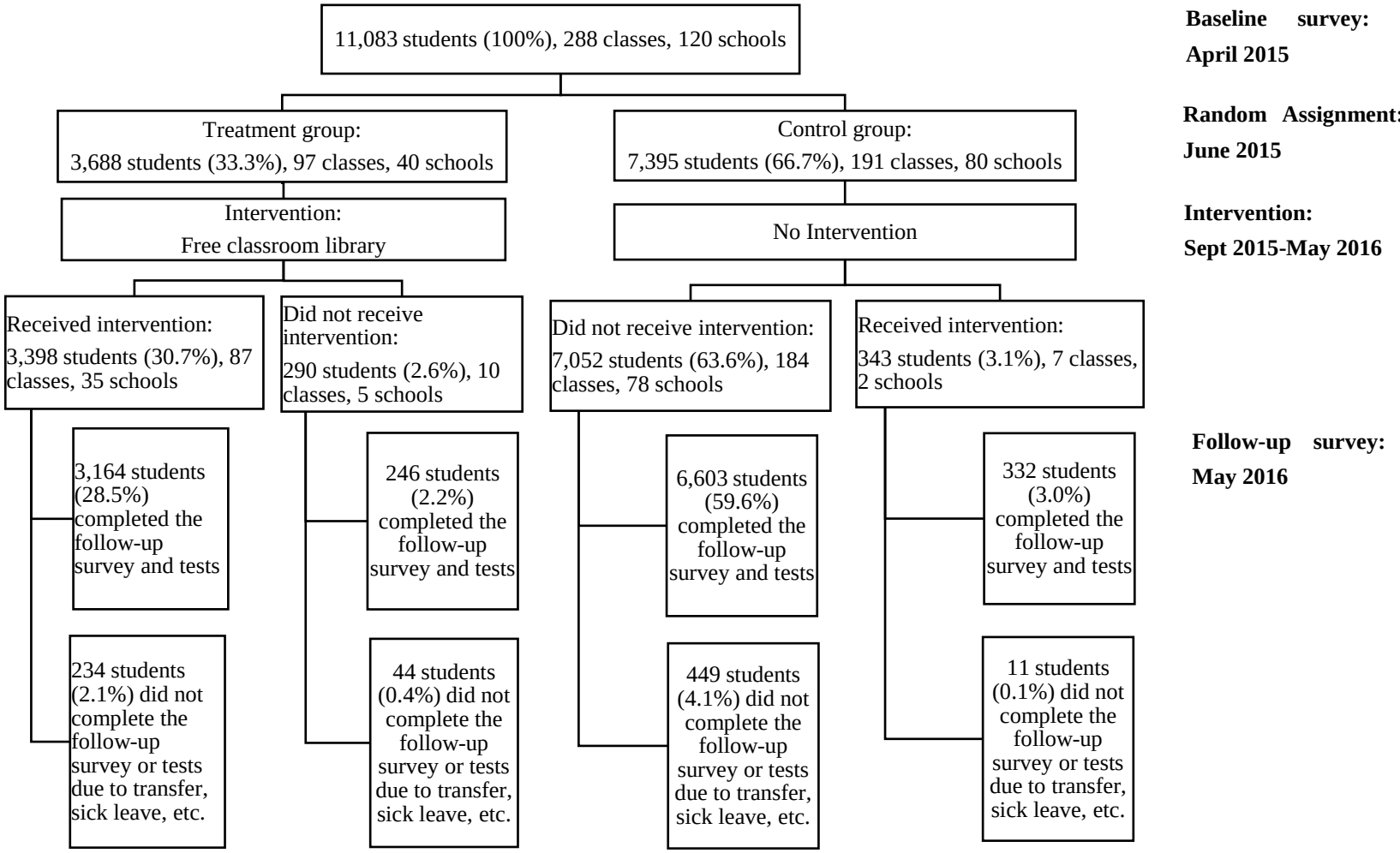

Figure 1. Research design of classroom library program in 120 schools

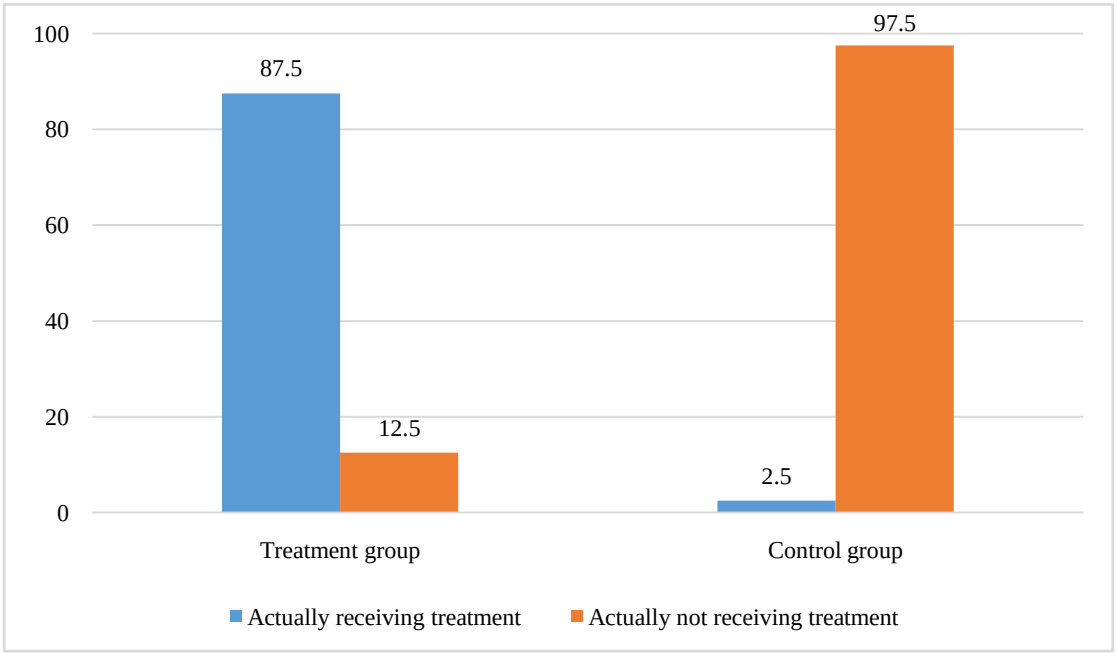

Figure 2. Compliance of the Random Assignment at Seven Months after Intervention, by Treatment Group

Appendix Table 1 Baseline Characteristics of Non-Attrited Students, by Treatment Group

Definition	Control group	Treatment group	Difference	P-value
Student Individual Characteristics				
Fifth grade student, yes = 1	0.52(3587/6935)	0.51(1751/3410)	0.00(0.01)	0.7462
Age, year	11.09(0.90)	11.08(0.95)	-0.01(0.06)	0.8580
Male, yes = 1	0.52(3592/6935)	0.51(1750/3410)	0.00(0.01)	0.6892
Were you boarding at school in the semester of spring 2015? yes =1	0.11(775/6933)	0.06(213/3409)	-0.05(0.03)	0.1562
Family Characteristics				
At least one parent with a university degree or higher, yes =1	0.17(1082/6510)	0.17(564/3224)	0.01(0.01)	0.4438
At least one parent in a professional occupation, yes = 1	0.21(1351/6511)	0.20(642/3221)	-0.01(0.01)	0.4259
Left-behind children, both parents migrated away for work = 1	0.46(3175/6935)	0.48(1638/3410)	0.02(0.02)	0.2790
Low-income students, have no refrigerator at home =1	0.12(828/6933)	0.12(422/3410)	0.00(0.01)	0.7615
Reading Resources				
Have library or reading room at school, yes =1	0.75(5193/6935)	0.79(2677/3410)	0.04(0.08)	0.6557
Have some kinds of books available in the classroom, yes = 1	0.22(1552/6935)	0.31(1061/3410)	0.09(0.10)	0.4003
Have more than 25 children's books at home, yes = 1	0.08(533/6404)	0.09(281/3194)	0.00(0.01)	0.5469
Student Reading Habits, Attitudes, and Reading Skills				
Never borrow books from school library, yes = 1	0.82(5653/6935)	0.78(2664/3409)	-0.03(0.07)	0.6488
Never borrow books from classroom, yes = 1	0.82(5719/6935)	0.75(2573/3410)	-0.07 (0.09)	0.4123
Read for 30 minutes or more each day after class, yes = 1	0.42(2920/6929)	0.42(1416/3406)	-0.01(0.03)	0.8432
Talk about readings with friends, yes = 1	0.40(2756/6903)	0.43(1473/3391)	0.04(0.04)	0.3524
Read together with friends, yes = 1	0.37(0.48)	0.39(0.49)	0.01(0.03)	0.6656
Borrow books that friends read, yes =1	0.49(0.50)	0.50(0.50)	0.01(0.04)	0.7373
Students like reading, 0-18	12.53(86918/6935)	12.41(42331/3410)	-0.12(0.15)	0.4275
Students confident in reading scale, 0-21	13.46(93371/6935)	13.49(46003/3410)	0.03(0.18)	0.8782
Standardized score of reading	-0.01(-76.35/6935)	0.00(11.26/3410)	0.01(0.07)	0.833
Student Creativity and Performance in Other Subjects				
Score on Schaefer's creative attitude survey, 0-20	11.12(2.49)	11.16(2.48)	0.05(0.14)	0.7528
Standardized Chinese score	0.00(1.00)	-0.01(0.99)	-0.01(0.08)	0.8639
Standardized math score	-0.01(1.00)	-0.01(1.00)	-0.01(0.07)	0.9309

Data source: Authors' survey.

Standard errors are adjusted at school level; * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Appendix Table 2 Summary Statistics of Student Outcomes at Eight Months after Intervention

	Mean	Standard Deviation	Min	Max
Student Reading Habits, Attitudes, and Reading Skills				
Never borrow books from school library, yes =1	0.69	0.46	0	1
Never borrow books from classroom, yes = 1	0.47	0.50	0	1
Read for 30 minutes or more each day after class, yes = 1	0.55	0.50	0	1
Talk about readings with friends, yes = 1	0.53	0.50	0	1
Read together with friends, yes = 1	0.41	0.49	0	1
Borrow books that friends read, yes = 1	0.61	0.49	0	1
Students like reading, 0-18	12.89	2.68	2	17
Students confident in reading scale (0-21)	13.69	3.26	0	21
Standardized reading score	0.00	1.00	-2.70	3.29
Student Creativity and Performance in Other Subjects				
Score on Schaefer's creative attitude survey, max score=20	11.89	2.66	0	20
Standardized Chinese score	0.00	1.00	-5.03	2.05
Standardized math score	0.00	1.00	-3.02	2.32

Data source: Authors' survey.

Appendix Table 3. Impact of Classroom Library on Student Reading Habits at Eight Months after Intervention—Results from Adjusted Model

	Never borrow books from school library (1)	Never borrow books from classroom (2)	Read for 30 minutes or more each day after class (3)	Talk about readings with friends (4)	Read together with friends (5)	Borrow books that friends read (6)
Panel A. Intention to Treat Effect						
Treatment group	-0.07	-0.49***	0.12***	0.14***	0.06**	0.08***
	0.3275	0.0000	0.0000	0.0000	0.0279	0.0016
Student characteristics at baseline	YES	YES	YES	YES	YES	YES
Family characteristics at baseline	YES	YES	YES	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES	YES	YES	YES
Constant	0.25	0.06	0.59***	0.59***	0.49***	0.64***
	0.1048	0.6847	0.0000	0.0000	0.0000	0.0000
Observations	9683	9681	9667	9609	9653	9656
R^2	0.07	0.27	0.05	0.06	0.04	0.05
Panel B. Local Average Treatment Effect						
Actually receiving a free classroom library	-0.08	-0.56***	0.14***	0.16***	0.07**	0.09***
	0.3193	0.0000	0.0000	0.0000	0.0224	0.0007
Student characteristics at baseline	YES	YES	YES	YES	YES	YES
Family characteristics at baseline	YES	YES	YES	YES	YES	YES
Lagged outcome variables (at baseline)	YES	YES	YES	YES	YES	YES
Constant	0.27*	0.2	0.57***	0.56***	0.48***	0.63***
	0.0738	0.1631	0.0000	0.0000	0.0000	0.0000
Observations	9683	9681	9667	9609	9653	9656
R^2	0.08	0.36	0.06	0.07	0.04	0.05

Notes:

1. Student characteristics include whether student was in fifth grade (yes =1), student age (year), student gender (male=1), and whether student was boarding at school in the semester of spring 2015 (yes =1). The variables on family characteristics are whether at least one parent was with a university degree or higher (yes =1), whether at least one parent had a professional occupation (yes =1), whether the student was a left-behind child (both parents migrated away for work=1), and whether the student was from low-income families (having no refrigerator at home =1). We also controlled the lagged form of the outcome

variable. Specifically, the lagged outcome variable from Model (1) to (6) is respectively whether student never borrowed books from the school library at baseline, whether student never borrowed books from the classroom at baseline, whether student read for 30 minutes or more each day after class at baseline, whether student talked about readings with friends at baseline, whether student read together with friends at baseline, and whether student borrowed books that friends read at baseline.

2. Cluster-robust standard errors adjusted for clustering at the school level.
3. P values are reported.
4. The regressions of local average treatment effect instrument whether the school received a free classroom library (or takeup) with treatment.
5. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Appendix Table 4. Impact of Classroom Library on Students Like Reading and Reading Skills at Eight Months after Intervention—Results from Adjusted Model

	Students like reading (1)	Student confidence in reading (2)	Standardized reading score (3)
Panel A. Intention to Treat Effect			
Treatment group	0.29**	0.23*	-0.01
	0.0122	0.0545	0.8458
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	10.70***	10.98***	0.42***
	0.0000	0.0000	0.0001
Observations	9685	9685	9685
R^2	0.19	0.15	0.54
Panel B. Local Average Treatment Effect			
Actually receiving a free classroom library	0.32***	0.26**	-0.01
	0.0097	0.0481	0.8450
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	10.64***	10.92***	0.42***
	0.0000	0.0000	0.0000
Observations	9685	9685	9685
R^2	0.19	0.15	0.54

Notes:

1. Student characteristics include whether student was in fifth grade (yes =1), student age (year), student gender (male=1), and whether student was boarding at school in the semester of spring 2015 (yes =1). The variables on family characteristics are whether at least one parent was with a university degree or higher (yes =1), whether at least one parent was in a professional occupation (yes =1), whether student was a left-behind child (both parents migrated away for work=1), and whether student was from a low-income family (having no refrigerator at home =1). We also controlled the lagged form of outcome variable. Specifically, the lagged outcome variable from Model (1) to (3) is respectively score of students like reading at baseline survey, score of student confidence at reading at baseline, and student standardized reading score at baseline.
2. Cluster-robust standard errors adjusted for clustering at the school level.
3. P values are reported.
4. The regressions of local average treatment effect instrument whether the school actually received a free classroom library (or takeup) with treatment.
5. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Appendix Table 5. Impact of Classroom Library on Student Creativity and Performance in Chinese and Math at Eight Months after Intervention —Results from Adjusted Model

	Standardized Chinese score (1)	Standardized math score (2)	Score on Schaefer's creative attitude survey (3)
Panel A. Intention to Treat Effect			
Treatment group	0.02	0.07	0.07
	0.6539	0.1167	0.4846
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	0.34**	0.65***	8.91***
	0.0202	0.0004	0.0000
Observations	4820	4851	9685
R^2	0.54	0.45	0.13
Panel B. Local Average Treatment Effect			
Actually receiving a free classroom library	0.02	0.07	0.08
	0.6514	0.1083	0.4798
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	0.34**	0.64***	8.90***
	0.0205	0.0003	0.0000
Observations	4820	4851	9685
R^2	0.54	0.45	0.13

Notes:

1. Student characteristics include whether student was in fifth grade (yes =1), student age (year), student gender (male=1), and whether student was boarding at school in the semester of spring 2015 (yes =1). The variables on family characteristics are whether at least one parent was with a university degree or higher (yes =1), whether at least one parent was in a professional occupation (yes =1), whether student was a left-behind child (both parents migrated away for work=1), and whether student was from a low-income family (having no refrigerator at home =1). We also controlled the lagged form of outcome variable. Specifically, the lagged outcome variable from Model (1) to (3) is respectively student standardized Chinese score at baseline, student standardized math score at baseline, and student score of Schaefer's creative attitude survey at baseline.
2. Cluster-robust standard errors adjusted for clustering at the school level.
3. P values are reported.
4. The regressions of local average treatment effect instrument whether the school actually receive a free classroom library (or takeup) with treatment.
5. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Appendix Table 6. Heterogeneous Effect of Classroom Library on Student Reading Habits at Eight Months after Intervention—Intention to Treat Effect from Adjusted Models

	Never borrow books from school library (1)	Never borrow books from classroom (2)	Read for 30 minutes or more each day after class (3)	Talk about readings with friends (4)	Read together with friends (5)	Borrow books that friends read (6)
Panel A. Male Students						
Interaction of Treatment group and Male	-0.02	-0.01	0.04*	0.06**	0.02	0.07***
	0.4620	0.545	0.0807	0.019	0.4819	0.0084
Treatment group	-0.06	-0.49***	0.10***	0.11***	0.06*	0.04*
	0.4029	0.0000	0.0010	0.0002	0.0877	0.0779
Male	0.03**	0.04***	-0.09***	-0.13***	-0.10***	-0.13***
	0.0401	0.0047	0.0000	0.0000	0.0000	0.0000
Student characteristics at baseline	YES	YES	YES	YES	YES	YES
Family characteristics at baseline	YES	YES	YES	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES	YES	YES	YES
Constant	0.24	0.06	0.60***	0.60***	0.49***	0.66***
	0.1096	0.6947	0.0000	0.0000	0.0000	0.0000
Observations	9683	9681	9667	9609	9653	9656
R^2	0.07	0.27	0.05	0.06	0.04	0.05
Panel B. Low-income Students						
Internaction of Treatment group and Low-income students	-0.01	-0.03	0.05	0.05	0.01	0.05
	0.8677	0.3106	0.1649	0.1109	0.6948	0.1161
Treatment group	-0.07	-0.49***	0.11***	0.13***	0.06**	0.07***
	0.3561	0.0000	0.0001	0.0000	0.0344	0.0044
Low-income students	0.07***	0.04	-0.03	-0.08***	-0.04**	-0.05***
	0.0004	0.1452	0.1226	0.0000	0.0132	0.0027
Student characteristics at baseline	YES	YES	YES	YES	YES	YES

Family characteristics at baseline	YES	YES	YES	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES	YES	YES	YES
Constant	0.25**	0.06	0.60***	0.59***	0.49***	0.65***
	0.1057	0.6959	0.0000	0.0000	0.0000	0.0000
Observations	9683	9681	9667	9609	9653	9656
R^2	0.07	0.27	0.05	0.06	0.04	0.05
Panel C. Low-performing Students in Reading Skills						
Interaction of Treatment group and Low Performance Students in Reading	-0.01	0.05	0.00	0.02	0.06**	0.05*
	0.8515	0.2235	0.9859	0.5408	0.0492	0.0705
Treatment group	-0.07	-0.50***	0.12***	0.14***	0.05*	0.07***
	0.3363	0.0000	0.0000	0.0000	0.0795	0.0073
Low-performing Students in Reading	0.02	0.00	-0.12***	-0.11***	-0.08***	-0.09***
	0.5010	0.9447	0.0000	0.0000	0.0002	0.0000
Student characteristics at baseline	YES	YES	YES	YES	YES	YES
Family characteristics at baseline	YES	YES	YES	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES	YES	YES	YES
Constant	0.25	0.07	0.60***	0.59***	0.49***	0.65***
	0.1058	0.6780	0.0000	0.0000	0.0000	0.0000
Observations	9683	9681	9667	9609	9653	9656
R^2	0.07	0.27	0.06	0.07	0.04	0.05

Notes:

1. Student characteristics include whether student was in fifth grade (yes =1), student age (year), student gender (male=1), and whether student was boarding at school in the semester of spring 2015 (yes =1). The variables on family characteristics are whether at least one parent was with a university degree or higher (yes =1), whether at least one parent was in a professional occupation (yes =1), whether student was a left-behind child (both parents migrated away for work=1), and whether student was from low-income families (having no refrigerator at home =1). We also controlled the lagged form of outcome variable. Specifically, the lagged outcome variable from Model (1) to (6) is respectively whether student never borrowed books from school library at baseline, whether student never borrowed books from classroom at baseline, whether student read for 30 minutes or more each day after class at baseline, whether student talked about readings with friends at baseline, whether student read together with friends at baseline, and whether student borrowed books that friends read at baseline.
2. Cluster-robust standard errors adjusted for clustering at the school level.

3. P values are reported.
4. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Appendix Table 7. Heterogeneous Effect of Classroom Library on Students Like Reading and Reading Skills at Eight Months after Intervention—Intention to Treatment Effect from Adjusted Models

	Students like reading (1)	Student confidence in reading (2)	Standardized reading score (3)
Panel A. Male Students			
Interaction of Treatment group and Male	0.13	0.21	-0.03
	0.3590	0.1593	0.3808
Treatment group	0.22**	0.13	0.02
	0.0488	0.2902	0.6858
Male	-0.71***	-0.42***	-0.09***
	0.0000	0.0000	0.0000
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	10.73***	11.01***	0.99***
	0.0000	0.0000	0.0000
Observations	9685	9685	9685
R^2	0.19	0.15	0.32
Panel B. Low-income Students			
Interaction of Treatment group and Low-income students	0.06	0.05	-0.07
	0.7082	0.7665	0.1932
Treatment group	0.28**	0.23*	0.01
	0.0163	0.0738	0.8066
Low-income students	-0.32***	-0.24*	-0.13***
	0.0003	0.0595	0.0002
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	10.71***	10.98***	0.99***
	0.0000	0.0000	0.0000
Observations	9685	9685	9685
R^2	0.19	0.15	0.32
Panel C. Low-performing Students in Reading Skills			
Interaction of Treatment group and Low Performance Students in Reading	0.17	0.17	0.00
	0.274	0.4345	0.9613
Treatment group	0.25**	0.20	0.00
	0.0167	0.1187	0.9601
Low-performing Students in Reading	-1.17***	-1.39***	-1.35***

	0.0000	0.0000	0.0000
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	NO
Constant	11.19***	11.55***	0.99***
	0.0000	0.0000	0.0000
Observations	9685	9685	9685
R^2	0.22	0.18	0.32

Notes:

1. Student characteristics include whether student was in fifth grade (yes =1), student age (year), student gender (male=1), and whether student was boarding at school in the semester of spring 2015 (yes =1). The variables on family characteristics are whether at least one parent was with a university degree or higher (yes =1), whether at least one parent was in a professional occupation (yes =1), whether student was a left-behind child (both parents migrated away for work=1), and whether student was from a low-income family (having no refrigerator at home =1). We also controlled the lagged form of the outcome variable. Specifically, the lagged outcome variable from Model (1) to (3) is respectively score of student affinity toward reading at baseline survey, score of student confidence in reading at baseline, and whether student is low-performing in reading at baseline.
2. Cluster-robust standard errors adjusted for clustering at the school level.
3. P values are reported.
4. * Significant at 10%, ** Significant at 5%, *** Significant at 1%.

Appendix Table 8. Heterogeneous Effect of Classroom Library on Student Creativity and Performance in Chinese and Math at Eight Months after Intervention—Intention to Treat Effect from Adjusted Models

	Standardized Chinese score (1)	Standardized Math score (2)	Score on Schaefer's creative attitude survey (3)
Panel A. Male Students			
Interaction of Treatment group and Male	-0.02	0.06	-0.02
	0.6618	0.2131	0.8574
Treatment group	0.03	0.03	0.08
	0.5255	0.4976	0.4912
Male	-0.10***	0.04	-0.07
	0.0011	0.1372	0.3014
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	0.34**	0.67***	8.91***
	0.0209	0.0004	0.0000
Observations	4820	4851	9685
R^2	0.54	0.45	0.13
Panel B. Low-income Students			
Interaction of Treatment group and Low-income students	-0.08	0.06	0.08
	0.2935	0.357	0.6554
Treatment group	0.03	0.06	0.06
	0.5007	0.1755	0.5687
Low-income students	-0.02	-0.07*	-0.26**
	0.6360	0.0556	0.0156
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	0.34**	0.66***	8.92***
	0.0226	0.0004	0.0000
Observations	4820	4851	9685
R^2	0.54	0.45	0.13
Panel C. Low-performing Students in Reading			
Interaction of Treatment group and Low Performance Students in Reading	0.03	0.03	-0.01
	0.7039	0.6428	0.9522
Treatment group	0.01	0.06	0.07
	0.7106	0.204	0.4175

Low-performing Students in Reading	-0.54***	-0.35***	-1.40***
	0.0000	0.0000	0.0000
Student characteristics at baseline	YES	YES	YES
Family characteristics at baseline	YES	YES	YES
Lagged outcome variable (at baseline)	YES	YES	YES
Constant	0.38***	0.70***	9.30***
	0.0080	0.0002	0.0000
Observations	4820	4851	9685
R^2	0.57	0.47	0.17

Notes:

6. Student characteristics include whether student was in fifth grade (yes =1), student age (year), student gender (male=1), and whether student was boarding at school in the semester of spring 2015 (yes =1). The variables on family characteristics are whether at least one parent was with a university degree or higher (yes =1), whether at least one parent was in a professional occupation (yes =1), whether student was a left-behind child (both parents migrated away for work=1), and whether student was from a low-income family (having no refrigerator at home =1). We also controlled the lagged form of outcome variable. Specifically, the lagged outcome variable from Model (1) to (3) is respectively student standardized Chinese score at baseline, student standardized math score at baseline, and student score on Schaefer's creative attitude survey at baseline.
7. Cluster-robust standard errors adjusted for clustering at the school level.
8. P values are reported.

* Significant at 10%, ** Significant at 5%, *** Significant at 1%.