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Policy Brief

Using PIRLS Data to Investigate the Relationship of Teachers' Instruction with Students' Out-of-School Reading Behaviors

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Summary

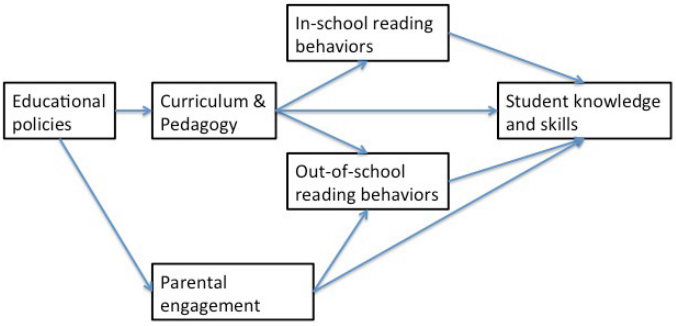
Research clearly demonstrates the importance of students' reading behaviors for predicting students' short- and long-term outcomes. While teachers' instruction might affect these reading behaviors (and therefore indirectly affect achievement), we know little about the association of in-school teacher practices with students' out-of-school behaviors. In this brief, we draw on data from IEA's 2011 Progress in International Reading Literacy Study (PIRLS) to examine the relationships of several instructional practices with multiple measures of students' out-of-school reading. Finding wide variation in instruction across countries and several significant associations, we conclude with policy implications for policymakers, teachers, parents, and researchers.

Introduction

Reading achievement at an early age is a strong predictor of future grades, educational attainment (Cunningham & Stanovich, 1997; Duncan et al., 2007; McGee, Prior, Williams, Smart, & Sanson, 2002), and even socioeconomic status in adulthood (Ritchie & Bates, 2013). One major contributor to children's reading achievement is the amount that children read (both frequency and variety of topics; see, for example, Cox & Guthrie, 2001). In addition to directly affecting reading achievement, amount of reading (in this case measured by familiarity with popular authors) benefits children by enriching their knowledge of the world (e.g., Stanovich & Cunningham, 1993).

Students' in-school reading activities are clearly directly affected by teachers' instruction, which is itself directly influenced by instructional policies such as school, district, state, regional, or national curriculum policies. In contrast, literature showing that education policies directly affect students' out-of-school reading behaviors is rare. However, educational policies could have indirect effects on students' out-of-school reading behaviors if educational policies influence teachers' instruction or parental behaviors, which in turn influence students' reading behaviors both in and out of school. Figure 1 provides a simplified conceptual model of these influences.

Figure 1: Simplified conceptual model for the influence of education policies on student reading knowledge and skills



In this study, we examine one path by which educational policies might influence students' reading achievement—through the influence of teachers' instruction (curriculum and pedagogy) on students' out-of-school reading behaviors (i.e., we test the relationship signified by the arrow connecting those two boxes in Figure 1). Our study uses data from fourth graders participating in the 2011 Progress in International Reading Literacy Study (PIRLS 2011).

Three research questions guide our work:

1. To what extent do students vary in their out-of-school reading, both within and between countries?
2. To what extent do countries vary in their instructional practices associated with reading?
3. What are the associations of in-school instructional practices with out-of-school reading behaviors?

Our findings suggest hypotheses to be tested using more rigorous designs regarding the influence of instruction on student reading behaviors, and thus their reading achievement. To the extent that instructional practices are affected by educational policies, the results also point the way toward policies that may positively influence students' reading behaviors.

Data and Methods

PIRLS 2011 surveyed over 50 education systems (Foy, 2013). Our sample excludes benchmarking regions[1] and countries that did not survey fourth graders[2]. Our final sample has 44 education systems and 244,411 students.

The dependent variables (four in total) that we use to measure out-of-school reading come from the PIRLS student surveys. Variable 1 is the amount that students read outside of school every day, measured in hours. The remaining three variables concern the purpose of reading outside of school, measured in per-day units (e.g., 1 = every day, 5 = every two days). Variable 2 is the frequency of reading for fun, Variable 3 is the frequency of reading self-chosen books, and Variable 4 is the frequency of reading to learn.

For in-class practices, we construct five variables based on the PIRLS teacher surveys. To assemble these scales, we used principal components analyses with varimax rotation in order to identify common factors. Each scale has a 0 to 1 range where 1 = every day. The five variables are 1) using fiction or nonfiction text (type of text), (2) reading aloud to the class or asking students to read out loud (reading aloud), (3) asking students to read self-chosen books or to read silently in class (independent reading), (4) conducting other reading activities (reading activity), and (5) developing reading strategies (reading strategies).

Some of these scales have relatively low reliabilities due to the small number of items for the scales. If the reliability of these scales is low due to measurement error, that will tend to depress the correlations of these measures with our outcomes. Thus, we view the results we identify in this paper as conservative estimates of what would be found if more comprehensive scales could be constructed. Regardless, the results are stronger than if we used single-item instructional indicators, which would of course have even less reliability than our scales.

For Research Questions 1 and 2, we use descriptive statistics to compare country-level averages. We also partition the variance in these measures within and between countries using a simple two-level model (students or classrooms nested in countries). For Research Question 3, we conduct multilevel regression analyses to examine the relationships between teachers' instruction and our four out-of-school reading outcome variables.

Regression analysis allows us to control for student, family, class, and school characteristics that can also affect students' reading habits. We use three-level models, with students nested within classes/schools nested within countries. Our models use random effects for classes because our focal independent variables (i.e., instructional practices), are class-level variables. We also use country fixed effects (i.e., dummy variables, one for each country) to control for all country-level predictors of students' out-of-school reading. Thus, our regression results are based on average within-country relationships of instruction with out-of-school reading.

Findings

To what extent do students vary in their out-of-school reading?

Table 1 (see Table 1; all tables are in appendix) shows the country-level averages of the four out-of-school reading variables. On average, fourth graders across the 44 countries report spending 0.84 hours (about 50 minutes) reading out of school every day. Country-level averages vary somewhat. Students in Iran report spending the most time—1.28 hours per day—reading outside of school, almost half an hour longer than the international average. In contrast, students from northern European countries such as Denmark, Norway, and Sweden, spend closer to 0.6 hours reading every day. Students from the U.S. spend 0.78 hours per day, slightly below the international average.

Fourth graders from most education systems report reading every other day for fun or to learn, and they read a book of their own choice on two out of every three days on average. We found some interesting exceptions to these averages, however. For instance, Azerbaijani students report reading outside of school for fun on just over one-quarter of days (0.28 times/day) and reading to learn on three-quarters of days (0.75 times/day). At the other extreme, students in northern European countries such as the Netherlands and Finland report reading to learn on just a third of days (0.32 and 0.33 times/day). Students from some eastern and southeastern Asian countries such as Hong Kong SAR, Chinese Taipei, and Singapore are also among those who read the least frequently for fun (0.44, 0.41, and 0.39 times/day, respectively). Students from the U.S. are slightly more likely than the international averages to read a book of their choice and slightly less likely to read to learn.

Table 2 partitions the variance in reading habits into within- and between-country sources based on a simple two-level model (students nested in countries). It shows that the majority of the variation in these outside-of-school reading measures occurs within countries (92% to 98%, depending on the measure). This means that students from different countries are not very different from one another in their reading habits outside of school. It also suggests that country-level variables are not likely main drivers of differences in out-of-school reading behaviors.

To what extent do countries vary in their reading instructional practices?

We now turn to a descriptive examination of reading instruction across countries. Table 3 shows the country-level averages of instructional variables. Variation in instructional practices across countries is much larger than the variation in students' out-of-school reading behaviors. For instance, Grade 4 teachers in Iran and Belgium report spending less than one day in six using fiction or nonfiction materials in reading instruction (both 0.15 times/day), while teachers in Sweden and the U.S. report using fiction or nonfiction texts roughly 150 percent more often (0.36 and 0.37 times/day).

Reading aloud is the most common instructional activity among those measured in our study. On average across the 44 countries, Grade 4 teachers report reading out loud in class four out of every five days (0.75 times/day). In half of the education systems, teachers read aloud almost every day (more than 0.75 times/day). Teachers in only a handful of countries (i.e., Austria, Chinese Taipei, and Denmark) report reading aloud less than every other day.

In terms of independent reading in class, teachers from Australia, Canada, New Zealand, and the U.S. report allowing students to read independently most often in class—roughly 9 out of every 10 days. In contrast, students in Iran and the Czech Republic have considerably less opportunity to read independently in class—less than two out of every five days.

Fourth-grade teachers from Denmark, Finland, Sweden, and Belgium are among those least likely to use other reading activities. They report conducting other reading activities only one out of every five days. At the other extreme, Azerbaijani students experience other reading activities nearly every day.

Finally, countries also vary in terms of in-class development of reading strategies. On average, teachers report helping their Grade 4 students develop reading strategies about every other day (0.56 times/day). However, on the high end, teachers from Georgia and Israel say they have students engage in activities designed to develop reading strategies on roughly 80 percent of teaching days; teachers from Sweden and Belgium, on the other hand, say they use such activities on between one-quarter and one-third ofdays (0.29 and 0.27 times/day).

The results from our two-level model also confirm substantial variation in the teachers' reported instructional variables between countries—far more than for the students' reported out-of-school reading behaviors. Grade 4 teachers from different education systems differ markedly in terms of helping students develop reading strategies, with 31.53 percent of the variation in this variable coming from country-level differences (see Table 4). For the other instructional variables,the proportion of the variance found at the country level ranges from 16.55 percent to 26.72 percent.

What are the associations of in-school instructional practices with out-of-school reading behaviours?

Table 5 shows the coefficients of teachers' instructional practice variables from multi-level regression analyses. The full results appear in the online supplement.[3,4] In this section, we briefly discuss the statistically significant results ($p<0.05$).

With respect to time spent on reading, only one of the five variables is a statistically significant predictor. Fourth graders in classes where teachers report using fiction or nonfiction texts are the students who are likely to spend more time reading outside of school. These coefficients are quite small, however. The difference between the highest and the lowest countries on using fiction or nonfiction texts in class is 22 percentage points. Our model predicts that this difference would be associated with about a five-minute-per-week difference in the amount of time students in those countries spend reading outside of school.

Two statistically significant instructional predictors are evident with regard to the outcome variable 'frequency of fourth graders reading for fun'. Specifically, reading fiction and nonfiction texts in class is positively associated with students reading for fun outside of school, but developing reading strategies in class is negatively associated with reading for fun outside of school. For reading fiction and nonfiction texts, the difference between the highest and lowest countries of 22 percentage points predict a 0.4 percent difference in the frequency of reading for fun. The coefficient for reading strategies is roughly the same size but in the opposite direction.

When the outcome variable is 'frequency of reading a book of one's choice', the only one statistically significant predictor is, not surprisingly, the frequency of students' independent reading in class. Indeed, this is the strongest predictor (in terms of statistical significance) of any in our models. The difference between the highest and lowest countries on independent reading in school is about 53 percentage points, so our model predicts that this difference is associated with about a 1.1 percentage-point difference in the frequency of reading chosen books outside of school.

For the final outcome, 'reading to learn outside of school', the only statistically significant predictor is the frequency of reading activities in class. Again, the coefficient is of a similar magnitude. Given that the difference between the highest and lowest countries on this measure was quite large—67 percentage points—the coefficient suggests this difference predicts a 1.1 percentage-point difference in the frequency of reading to learn between these two countries.

In summary, our regression results suggest several intuitive relationships of in-class instructional behaviors with out-of-school reading behaviors among fourth graders. For instance, students reported more frequently reading chosen books outside of class when their teachers more frequently incorporate independent reading in class. This finding is consistent with previous research in the U.S. (Gambrell, 1996; Guthrie, Wigfield, & Perencevich, 2004; Wigfield & Guthrie, 2000). Also, students are more likely to report reading to learn when they are exposed to more reading activities in class. On the other hand, teaching reading strategies is associated with less frequent reading for fun among fourth graders.

Discussion

Our study finds overall that the PIRLS 2011 fourth graders around the world do not dramatically differ in terms of their out-of-school reading habits. In contrast, the Grade 4 teachers across the 44 countries in our sample differ considerably with respect to their reported instructional practices. This finding suggests policies have a stronger influence on teachers' instruction than on students' behaviors. Still, most of the variation in both instruction and student reading behaviors lies within countries, suggesting a possible source of inequality that policymakers interested in equity should carefully consider.

We also find several associations between teachers' instructional behaviors and students' out-of-school reading behaviors. These associations should be investigated further using more rigorous designs, but they suggest that educational policies may be able to influence students' out-of-school reading behaviors if they can affect teachers' instruction. If we believe that out-of-school reading is important, this work might lead to hypotheses as to how to improve students' reading in that context.

In addition to the above findings, our work also demonstrates a novel use of the PIRLS data. By combining the rich student- and teacher-level data offered through the PIRLS database, we were able to answer an interesting question that is not answerable through use of many other data sources, and we were able to do so in an international context that may promote hypotheses for future research. While these datasets have various limitations (e.g., the absence of student-level longitudinal data and the relative coarseness of the instructional measures), they often include a wealth of important variables that researchers could use for descriptive analyses and for developing and then testing hypotheses via more rigorous designs.



Endnotes

1 Benchmarking entities included Alberta, Ontario, Quebec, Southern Africa, Malta (Maltese), Abu Dhabi(UAE), Dubai(UAE), and Spain(Andalucía).

2 Botswana, Honduras, Morocco, and Kuwait surveyed sixth graders.

3 Despite the large number of independent variables, there is little evidence that multicollinearity is an issue, especially for our focal independent variables. For instance, the variance inflation factor (VIF) for our five instructional variables is no greater than two. A common rule of thumb is that the VIF must be above 10 before multicollinearity is a concern. The only independent variables with high VIFs are those indicating school location (urban, suburban, town, mid-city, and rural). This is not surprising since sets of dummy variables are often highly correlated among themselves, and the effect of multicollinearity on estimates should only be seen on the variables that are multicollinear

4 Additional regression table can be found in Supplement 1 online at: http://www.iea.nl/fileadmin/user_upload/Policy_Briefs/IEA_Policy_Brief_Oct2015_Supplement.pdf

Recommendations

We conclude with brief and non-exhaustive recommendations for researchers, policymakers, teachers, interested citizens, parents, and others.

Policy Makers

- Consider the ways in which instructional policies might influence outcomes other than reading achievement, or consider the ways that policies might indirectly affect desired outcomes.
- Design data collections to gauge the extent of inequality in both in-school and out-of-school behaviors that might contribute to student achievement.

Teachers

- To the extent that these results are supported by more rigorous research, consider incorporating more independent reading in class to help students to establish the habit of reading independently.
- Conduct instructional activities that stimulate students' interest in reading and make in-class reading a more enjoyable activity that encourages out-of-class reading.

Researchers

- Consider building more comprehensive measures of theoretically important instructional behaviors into future national and international studies.
- Explore more complete conceptual/theoretical models of the influence of policy or instruction on student behaviors and outcomes, perhaps using structural equation models or other sophisticated modeling approaches.
- Design studies to test the associations identified here, using more rigorous methodologies that can identify causal relationships

Parents and interested citizens

- Ensure students have access to the materials (e.g., books, technology) they need in order to have equal opportunity to read at home.
- Consider the ways that parents and nonschool agencies can support the educational efforts that schools take to improve student reading behaviors.

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Appendix

Table 1: Average extent of student reading outside school by country

Country	Time spent on reading outside school (hours/day)	Read for fun (times/day)	Read to learn (times/day)	Read book of one's choice (times/day)
Azerbaijan, Republic of	0.89	0.28	0.75	0.63
Australia	0.79	0.54	0.43	0.70
Austria	0.95	0.60	0.61	0.73
Bulgaria	0.99	0.52	0.65	0.64
Canada	0.78	0.54	0.46	0.73
Chinese Taipei	0.82	0.41	0.38	0.51
Colombia	0.84	0.57	0.77	0.68
Croatia	0.81	0.42	0.55	0.49
Czech Republic	0.88	0.55	0.54	0.65
Denmark	0.64	0.55	0.42	0.58
Finland	0.80	0.56	0.32	0.64
France	0.83	0.56	0.51	0.70
Georgia	1.08	0.51	0.85	0.74
Germany	0.97	0.59	0.52	0.71
Hong Kong SAR	0.79	0.44	0.40	0.50
Hungary	0.88	0.51	0.58	0.61
Indonesia	0.65	0.65	0.77	0.66
Iran, Islamic Republic of	1.28	0.50	0.67	0.59
Ireland	0.87	0.56	0.51	0.71
Israel	0.95	0.57	0.58	0.67
Italy	0.70	0.46	0.60	0.60
Lithuania	0.88	0.54	0.60	0.71
Malta	0.81	0.56	0.64	0.72
Oman	0.82	0.59	0.63	0.60
Netherlands	0.80	0.52	0.33	0.63
New Zealand	0.82	0.58	0.49	0.73
Norway	0.61	0.45	0.42	0.64
Poland	0.84	0.50	0.57	0.53
Portugal	0.60	0.59	0.69	0.74
Qatar	0.91	0.57	0.63	0.62
Romania	0.94	0.58	0.71	0.68
Russian Federation	0.91	0.58	0.63	0.68
Saudi Arabia	0.80	0.56	0.56	0.59
Singapore	0.93	0.39	0.54	0.66
Slovak Republic	0.84	0.45	0.55	0.57
Slovenia	0.84	0.50	0.59	0.69
Spain	0.79	0.56	0.66	0.70
Sweden	0.62	0.52	0.43	0.65
Trinidad and Tobago	0.87	0.50	0.70	0.66
United Arab Emirates	0.91	0.56	0.66	0.64
United States	0.78	0.49	0.49	0.69
England	0.81	0.49	0.38	0.67
Northern Ireland	0.88	0.52	0.43	0.69
Belgium (French)	0.84	0.58	0.55	0.70
Average	**0.84**	**0.52**	**0.56**	**0.65**

Table 2: Partitioning the variance in out-of-school reading behaviors

	Between-Country Variation (%)	Within-Country Variation (%)
Reading time	2.91	97.41
Read for fun	2.64	97.78
Read chosen book	2.70	97.46
Read to learn	8.84	92.29

Table 3: Average extent of use of reading-related instructional practices by country (times/day)

Country	Use Fiction or Nonfiction	Read Aloud	Read Self-Chosen Book	Reading Activity	Develop Reading Strategy
Azerbaijan, Republic of	0.22	0.89	0.43	0.86	0.75
Australia	0.35	0.72	0.89	0.47	0.49
Austria	0.23	0.45	0.60	0.31	0.37
Bulgaria	0.21	0.96	0.58	0.59	0.76
Canada	0.33	0.71	0.88	0.37	0.51
Chinese Taipei	0.19	0.40	0.56	0.33	0.34
Colombia	0.28	0.72	0.41	0.53	0.54
Croatia	0.17	0.89	0.42	0.51	0.67
Czech Republic	0.18	0.60	0.38	0.43	0.43
Denmark	0.24	0.38	0.65	0.23	0.36
Finland	0.24	0.62	0.58	0.19	0.35
France	0.22	0.79	0.66	0.31	0.38
Georgia	0.18	0.86	0.42	0.69	0.83
Germany	0.18	0.55	0.53	0.31	0.41
Hong Kong SAR	0.16	0.74	0.52	0.54	0.48
Hungary	0.25	0.73	0.57	0.46	0.71
Indonesia	0.23	0.62	0.41	0.41	0.55
Iran, Islamic Republic of	0.15	0.72	0.37	0.48	0.45
Ireland	0.28	0.82	0.72	0.41	0.55
Israel	0.31	0.86	0.68	0.68	0.79
Italy	0.24	0.82	0.44	0.59	0.59
Lithuania	0.19	0.76	0.50	0.73	0.76
Malta	0.23	0.79	0.57	0.39	0.43
Oman	0.17	0.92	0.44	0.50	0.60
Netherlands	0.35	0.75	0.83	0.38	0.34
New Zealand	0.33	0.64	0.90	0.46	0.56
Norway	0.31	0.70	0.73	0.29	0.36
Poland	0.35	0.87	0.49	0.63	0.70
Portugal	0.30	0.89	0.64	0.66	0.75
Qatar	0.27	0.84	0.50	0.54	0.61
Romania	0.18	0.87	0.61	0.55	0.72
Russian Federation	0.31	0.82	0.64	0.75	0.76
Saudi Arabia	0.19	0.90	0.48	0.46	0.58
Singapore	0.20	0.60	0.69	0.35	0.51
Slovak Republic	0.20	0.72	0.44	0.51	0.61
Slovenia	0.25	0.64	0.52	0.39	0.47
Spain	0.32	0.90	0.60	0.50	0.56
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Trinidad and Tobago	0.32	0.89	0.79	0.51	0.58
United Arab Emirates	0.25	0.83	0.42	0.49	0.58
United States	0.37	0.77	0.89	0.53	0.71
England	0.26	0.64	0.77	0.37	0.45
Northern Ireland	0.27	0.74	0.72	0.46	0.43
Belgium (French)	0.15	0.69	0.58	0.19	0.27
Average	**0.26**	**0.75**	**0.61**	**0.49**	**0.56**

Table 4: Partitioning the variance in reading instructional practices

	Between-Country Variation (%)	**Within-Country Variation (%)**
Use fiction or nonfiction	16.55	83.45
Read aloud	22.66	77.34
Read self-chosen book	24.94	75.06
Reading activity	26.72	73.28
Develop reading strategy	31.52	68.48

Table 5: Multilevel regressions of instructional practices on reading habits outside school

	Time Spent on Reading	Read for Fun	Read Book of One's Choice	Read to Learn
Use fiction or nonfiction	0.053*	0.019*	0.012	0.013
Read aloud	-0.009	-0.003	-0.004	-0.002
Read self-chosen book	-0.011	0.003	0.021***	-0.008
Reading activity	0.001	0.010	-0.002	0.016**
Develop reading strategy	0.009	-0.016*	0.001	-0.004

Note: p = *< 0.05, **< 0.01, ***< 0.001. Values are coefficients from multilevel regressions.

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The International Association for the Evaluation of Educational Achievement, known as IEA, is an independent, international consortium of national research institutions and governmental agencies, with headquarters in Amsterdam. Its primary purpose is to conduct large-scale comparative studies of educational achievement with the aim of gaining more in-depth understanding of the effects of policies and practices within and across systems of education.

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