IEA PIRLS 2021

CHAPTER 2

# PIRLS 2021 Context Questionnaire Framework

Ina V.S. Mullis, Michael O. Martin, and Jenny Liu

In I.V.S. Mullis & M. O. Martin (Eds.), *PIRLS 2021 Assessment Frameworks*.

IEA
TIMSS & PIRLS International Study Center
Lynch School of Education
BOSTON COLLEGE

# CHAPTER 2

# PIRLS 2021 Context Questionnaire Framework

Ina V.S. Mullis, Michael O. Martin, and Jenny Liu

## Overview

In addition to measuring trends in students' achievement in reading comprehension, PIRLS has the important role of collecting information about students' home and school contexts for learning to read. Decades of educational research, including four assessment cycles of PIRLS, have found that the extent of students' opportunities to learn and the effectiveness of their learning environments substantially impact their reading achievement, with more opportunities and supportive environments associated with higher achievement.

In each PIRLS assessment to date (2001, 2006, 2011, and 2016), the high-quality measure of students' reading achievement together with extensive information about students' in- and out-of-school experiences while learning to read have provided an important resource for research into how to improve reading education. More recently, with trend data from the series of PIRLS assessments, relating changes in students' achievement to changes in educational policies or practices can be a powerful source of evidence for determining if the approaches are beneficial.

As with each previous assessment, the goal of PIRLS 2021 is to build on the existing research base and make PIRLS data even more useful in helping educational policymakers and practitioners raise students' levels of achievement. This involves assigning a high priority to continuing to collect some information to maintain and extend trends, but also means making sure to "keep up with the times" and address new areas of research and policy relevance.

The *PIRLS 2021 Context Questionnaire Framework* articulates the information to be collected via the PIRLS 2021 Questionnaires, providing brief rationales. The framework is organized according to five broad influences on students' reading development: home contexts, school contexts, classroom contexts, student attributes, and national contexts.

## The Data Collection Instruments

Consistent with prior assessments, PIRLS 2021 collects the data about students' contexts for learning to read through questionnaires administered to various participants in the education process, including the students' parents and caregivers, the principals of the students' schools, and their reading teachers. The students themselves also complete a questionnaire. Taken together, the information from these four questionnaires provides the data for learning about students' home, school, and classroom experiences. For national contexts, PIRLS 2021 will update the PIRLS encyclopedia that is published with each assessment to describe each country's approach to reading education. As with previous assessments, representatives from each participating country provide the contents of the *PIRLS 2021 Encyclopedia*. They complete a questionnaire about reading education policies at the national level and contribute a chapter to the encyclopedia describing the country's reading curriculum and instructional practices.

The four PIRLS 2021 questionnaires that provide data that can link to each student's reading achievement are described below.

- The Home Questionnaire, entitled the Learning to Read Survey, is addressed to the parents or primary caregivers of each student taking part in the PIRLS 2021 data collection. This short 10-to-15-minute questionnaire solicits information on the home context, such as languages spoken in the home, parents' reading activities and attitudes toward reading, and parents' education and occupation. The questionnaire also collects data on the students' early childhood education, early literacy and numeracy activities, and the child's reading readiness at the beginning of primary school.
- The Teacher Questionnaire, completed by students' reading teachers, gathers information about classroom contexts for reading instruction, such as characteristics of the class, reading instructional time, and instructional approaches. The questionnaire also asks about teacher characteristics, such as their career satisfaction, education, and recent professional development activities. This questionnaire requires about 35 minutes to complete.
- The School Questionnaire, completed by the principal of each participating school, asks about school characteristics, such as student demographics, the school environment, and the availability of school resources and technology. It is designed to take about 30 minutes.
- The Student Questionnaire, given to all students once they have completed the reading assessment, collects information on students' home environment, such as books in the home and other home resources for learning; student experiences in school, including feelings of school belonging and whether they are victims of bullying; and students' reading instruction. Students also are asked about their out-of-school reading habits and attitudes toward reading. The student questionnaire requires up to 30 minutes to complete.

## The Development Process

In characterizing students' educational contexts for learning to read, PIRLS focuses on policy relevant and malleable attributes of the home and school that can be used to help interpret differing levels of reading achievement across countries as well as trends from assessment to assessment.

To summarize questionnaire data more reliably, PIRLS has the practice of developing sets of questions related to a topic of interest and combining the results into scales rather than reporting the results of the questions one by one. This practice has evolved from the early assessments and PIRLS 2011 introduced using item response theory (IRT) methods to construct the scales.[1] A number of the PIRLS scales measure constructs that are positively related to student achievement, such as parents' attention to early literacy activities and school safety. First in PIRLS 2016, and now in PIRLS 2021, work continues on improving the content and measurement properties of the context questionnaire scales.

The TIMSS & PIRLS International Study Center works with the PIRLS Questionnaire Development Group (QDG) and National Research Coordinators (NRCs) from the participating countries to update the context questionnaire framework and the questionnaires for each successive PIRLS assessment. This includes addressing new topics, refining scales, and deleting topics that are no longer useful. Development for PIRLS 2021 began in February 2018, when the PIRLS 2021 NRCs from the participating countries made suggestions for updating the questionnaires. Staff at the TIMSS & PIRLS International Study Center drafted an updated context questionnaire framework and updated the home, school, teacher, and student questionnaires based on the NRCs' recommendations. The PIRLS 2021 QDG reviewed the updated framework and questionnaires at its first meeting in February 2019. Subsequently, the TIMSS & PIRLS International Study Center staff revised the framework for online review by the NRCs prior to publication. The questionnaires were revised and reviewed by the NRCs prior to field testing at their third meeting in June 2019. After the field test, the QDG and the NRCs will review and finalize the questionnaires for the PIRLS 2021 data collection.

The remaining sections of the chapter provide the specifications for the PIRLS 2021 context questionnaire data collection.

# Home Contexts

PIRLS has repeatedly shown the importance of home contexts for fostering children's reading achievement. PIRLS 2021 focuses on two major aspects of the home that have been found to be of particular importance: the environment for learning and the emphasis on children's literacy skills.

## Environment for Learning

### Home Resources for Learning

In educational research, the factors related to parents' or caregivers' socioeconomic status are consistently related to students' achievement.[2,3,4,5,6] Socioeconomic status is often indicated through proxy variables such as parental level of education, income, and occupational class. Since the first PIRLS cycle in 2001, PIRLS has reported data on socioeconomic status indicators. In 2011, PIRLS developed the *Home Resources for Learning* scale based on parent and student responses to items focusing on parental education and occupation as well as home resources (e.g., books in the home, children's books in the home, and home study supports). The *Home Resources for Learning* scale expands the classic conception of socioeconomic status to include home resources that have the potential to facilitate student learning.

### Parents Like Reading

Parents who like reading and read themselves provide important role models for their children. Promoting reading in the home can foster children's motivation to read as well as their reading achievement.[7,8,9] Parents own reading behaviors and beliefs about reading can shape their child's motivation to read.[10] Socialization can be subtle (e.g., young children seeing adults reading or using texts in different ways learn to appreciate and use printed material) and this process can have long term effects on a student academic performance.[11] PIRLS began collecting information on parents' reading habits and enjoyment in 2001, and in 2011, created the *Parents Like Reading* scale. Indicators of parents liking reading include considering reading an important activity and reading for enjoyment often.

### Language Spoken in the Home

It is common for some students to speak one language at home and another at school, especially among immigrant families. In addition, some parents prioritize multilingualism and make great efforts to ensure their child is exposed to more than one language in the home. Because learning to read is dependent on children's early language experiences, the language or languages spoken at home and how they are used are important factors in reading literacy development.[12] If students are not fluent in the language of instruction, often there is an initial learning gap because students must learn the concepts and content of the curricula through a new language.[13,14] PIRLS has collected data on student language background at home since the first PIRLS cycle.

## Emphasis on Literacy

### Early Literacy Activities

Considerable research, including results from PIRLS, has documented the importance of early childhood literacy activities in fostering higher student achievement in reading.[15,16,17,18,19] Examples of these activities include reading books, telling stories, playing with alphabet toys, talking with their children, helping children write letters or words, and reading aloud signs and labels. Perhaps the most common and important early literacy activity involves adults and older children reading aloud to their young children.[20,21,22] By being read aloud to, children are exposed to oral language, which also is important for literacy acquisition.[23,24,25] Beginning in PIRLS 2001, and in each cycle since then, PIRLS has asked parents about their child's early literacy activities. In 2011, when PIRLS and TIMSS were assessed together, the *Early Literacy Activities Before Beginning Primary School* scale was supplemented with questions about early numeracy activities. PIRLS 2021 asks parents how often they engaged their child in a range of early literacy as well as numeracy activities.

### Preprimary Education

Much research has detailed the importance of preprimary education (e.g., preschool, kindergarten, early childhood education programs) as an early start toward higher academic outcomes.[26] High-quality preprimary education and other early childhood interventions are especially beneficial for disadvantaged students because they can play an important role in breaking the generationally repetitive cycle of poverty and low achievement.[27,28] PIRLS always has gathered information from parents about their child's preprimary school attendance and duration of attendance.

### Early Literacy Tasks When Beginning Primary School

Quality preprimary education and early literacy activities in the home help children develop foundational literacy skills that support higher achievement in later grades. PIRLS has shown that children whose parents reported that the children could do basic literacy tasks when beginning primary school had higher reading achievement in fourth grade. The *Could Do Early Literacy Tasks When Beginning Primary School* scale created in 2011 asks parents to report on how well their child could do certain literacy tasks, such as recognizing most of the letters of the alphabet and writing some words.

### Parental Expectations for Their Children's Education

Parents convey their expectations to their children and provide educational goals for them.[29,30] This includes parents and children talking about the value of education, discussing future educational and occupational expectations for the child, and helping children draw links between schoolwork and its real-world applications.[31,32] PIRLS asks parents about their expectations for their child's education.

# School Contexts

PIRLS 2021 collects data about important school contexts for learning. This includes school resources generally and specifically for reading instruction, the school climate for learning, the degree of discipline and safety in the school, and the school's emphasis on reading instruction.

## School Resources

### School Composition of Student Body

**Socioeconomic Background**—Since the Coleman report,[33] there has been sustained interest in how the socioeconomic composition of the student body is related to individual student achievement.[34,35,36] There is evidence that students from disadvantaged backgrounds may have higher achievement if they attend schools where the majority of students are from advantaged backgrounds. Some have attributed this association to peer effects—observing a strong student achievement relationship between classmates.[37] The higher achievement for students in socioeconomically advantaged schools also may be partially explained by such schools having better facilities and instructional materials. Additionally, in some countries, schools with high proportions of disadvantaged students have difficulty attracting highly qualified teachers.[38,39] PIRLS routinely collects information from schools about the socioeconomic composition of their student body, including the percentages of students from economically disadvantaged homes and from economically affluent homes.

**Languages Spoken in the School**—Schools where many students speak a language other than the primary language of instruction may need to have policies and resources that provide extra support for these students. Since 2001, PIRLS has asked principals to indicate the percentage of students in their school who have the language of the PIRLS assessment as their native language. In the majority of past PIRLS assessments, academic achievement was higher in schools where there was a higher percentage of students who speak the language of instruction as their native language.

**Literacy Skills of Entering Student Body**—Preprimary education as well as learning experiences in the home play important roles in promoting students' literacy skills in preparation for primary school. Students who enter the first grade well-equipped with literacy skills have a stronger foundation for formal reading instruction. Since 2001, PIRLS has collected data on student literacy skills upon entering primary school. The *Schools Where Students Enter the Primary Grades with Early Literacy Skills* scale was developed in PIRLS 2011 to determine the percentage of students who enter schools with literacy skills based on principals' reports. Skills in the scale include whether students can recognize most of the letters of the alphabet, read some words, and write letters of the alphabet. Similarly, as described under Home Contexts, parents also are asked to report on their child's early literacy skills through the *Could Do Early Literacy Tasks When Beginning Primary School* scale.

### Resources for Reading Instruction

Adequate working conditions and facilities as well as sufficient instructional resources are important for maintaining a favorable learning environment in schools.[40] Although "adequacy" in terms of resources can be relative, the extent and quality of school resources have been shown to be critical for quality instruction.[41,42,43,44] Based on principals' perceptions of school resource shortages that affect the school's capacity to provide instruction, PIRLS results since 2001 have consistently indicated that students in well-resourced schools generally have higher achievement than those in schools with resource shortages. PIRLS 2001 began collecting data on general school needs such as school supplies, adequate school buildings, and instructional space. In later cycles, PIRLS also asked about specific shortages affecting reading instruction such as library resources and educational software/applications (apps). Principals' reports about school resource shortages are summarized by the *Instruction Affected by Reading Resource Shortages* scale.

School resources also include having computers or tablets available for students for learning purposes. PIRLS regularly creates a student-to-computer ratio for schools. In PIRLS 2016, students in schools with available computers had higher achievement than students in schools with no computers.

### School Library or Media Center

The variety and richness of the reading material available to students form the core of students' reading experience in school. Schools with a well-resourced library or multi-media center may be well-positioned to promote student reading. Research has shown that students use the library when there are books that interest them; therefore, ensuring that there is a variety of current reading materials that would be of interest to the students at each grade is essential to promoting reading achievement.[45] Since 2001, PIRLS has collected information on school libraries, asking principals whether their schools have a library and for the number of books in the library. Because libraries also are becoming multi-media centers, students also can seek information on subjects of interest through access to ebooks, digital periodicals, and online resources. In 2016, PIRLS began gathering school information on the availability of digital learning resources.

While school libraries are common in most countries, some countries have moved toward classroom libraries, as discussed under Classroom Reading Instruction.

### Principals' Formal Education

Principals act as leaders in schools by overseeing school staff, students, and the school environment. Research has shown that strong principal leadership can foster student achievement by creating an atmosphere of collective efficacy through a positive school climate and trust among teachers.[46,47] Recognizing the crucial role school principals play and the importance of highly trained and well-prepared principals, PIRLS 2016 began collecting data on country requirements to become

a principal as well as principals' educational background, including their highest level of formal education and qualifications in educational leadership.

### Principals' Years of Experience

Principals' years of experience can contribute to their strength of leadership. PIRLS 2016 began asking principals how many years they have been a principal. Because rapid turnover can lead to dips in student achievement,[48,49] principals also are asked how many years they have been a principal in their current school.

### Size and Urbanicity of Schools

PIRLS provides data about school size and school urbanicity because these characteristics can impact student learning. Schools vary in the size of student enrollment and can be located in very different geographical areas (e.g., urban, suburban, rural). An advantage of small schools is that they can provide a more intimate learning environment, allowing for more adult support for students through meaningful staff and student relationships and individualized learning.[50] However, smaller schools also may have less supportive infrastructure such as libraries, laboratories, and gymnasia. Depending on the country, schools in urban areas may have access to more resources (e.g., museums, libraries, bookstores) than schools in rural areas.

## School Climate

### Parents' Perceptions of Child's School

Since 2001, PIRLS has asked parents about their perceptions of their child's school. In 2016, PIRLS created the *Parents' Perceptions of Their Child's School* scale. The scale summarizes parents' or caregivers' level of agreement with statements about school academics, school safety, and schools' efforts to include them in their child's education. The 2016 results showed that most parents tended to be satisfied with the school their child attended, which is consistent with results from other educational surveys.[51,52]

### School Emphasis on Academic Success

A school atmosphere of high expectations for academic excellence can contribute to school success. Research has shown that there is a positive association between a school's emphasis on academic success and academic achievement.[53,54] Academic emphasis, collective efficacy in promoting academic performance, and trust among school staff, parents, and students, are indicators of academic optimism in a school, a characteristic that fosters a positive academic environment.[55,56,57] Since PIRLS 2011, the *School Emphasis on Academic Success* scale has asked principals and teachers to characterize their school in terms of a series of teacher, parent, and student attitudes and actions that can contribute to academic success. In 2016, PIRLS expanded the scale to include more items to better capture the construct, asking principals and teachers the degree to which students respect their classmates who excel academically, and parental expectations for student achievement.

### Teacher Job Satisfaction

Fostering teacher job satisfaction through a favorable work environment is important in retaining qualified teachers in the classroom.[58] Collaboration and support, as well as other social factors such as a positive school culture and strong principal leadership can be essential for cultivating teacher job satisfaction and retaining teachers.[59,60,61] In contrast, emotional exhaustion from work stress has been found to be negatively related to teacher job satisfaction.[62] PIRLS began reporting data on teacher job satisfaction in 2006 and created the PIRLS *Teacher Job Satisfaction* scale in 2016.

### Students' Sense of School Belonging

Students' sense of school belonging, also referred to as school connectedness, has been found to contribute to their general well-being.[63,64] Students with a strong sense of school belonging feel safe at school, enjoy school, and have a good relationship with teachers. The *Students' Sense of School Belonging* scale was developed in PIRLS 2016, asking students to indicate the extent to which they like being in school, how much they feel they belong at the school, and whether teachers are fair to them. The 2016 results showed a positive association between school belonging and academic achievement, corroborating other research on the subject.[65,66,67] PIRLS 2021 improves the scale by including whether students have friends at this school to reflect the importance of positive student relationships within the school community for students' sense of school belonging.[68,69]

## School Discipline and Safety

### School Discipline

Schools with disciplinary issues can experience problems with bullying, classroom disturbance, and truancy. The sense of security that comes from having a stable school environment with few behavioral problems and little or no concern about student or teacher safety is conducive to student learning. Research shows that schools where rules are clear and enforced fairly tend to have atmospheres of greater discipline and safety.[70,71] In past PIRLS assessments, students in schools with hardly any discipline problems had higher reading achievement than students in schools with disciplinary problems. PIRLS has gathered data on school discipline since 2001, and now includes the *School Discipline* scale developed in 2011. The scale summarizes principals' reports on school discipline based on the degree to which schools have issues with student conduct ranging from intimidation or verbal abuse among students to student cheating.

### Safe and Orderly School

School effectiveness research analyzing PIRLS/TIMSS 2011 data has shown that school safety is an important prerequisite for student achievement in many countries.[72] Respect for individual students and teachers, a safe and orderly environment, and constructive interactions among administrators, teachers, parents, and students all contribute to a positive school climate and are associated with higher student achievement.[73,74,75] Together the *School Discipline* scale reported by principals and the

*Safe and Orderly School* scale reported by teachers gather information on safe schools. Teachers are asked to indicate the extent to which they agree or disagree with various statements on school safety, including whether they feel safe at the school and if they believe school rules are enforced in a fair and consistent manner.

### Bullying

Bullying is repeated aggressive behavior that is intended to intimidate or harm the victim and takes a variety of forms, both mental and physical. Bullying causes distress to victims, leads to low self-esteem, and makes victims feel like they do not belong.[76,77,78] Previous PIRLS reports have shown that bullied students tend to have lower reading achievement, aligning with findings of other research.[79,80,81]

PIRLS began collecting data on student bullying in 2001. It developed the student bullying scale in 2011, based on students' reports of how often they experience various bullying behavior ranging from being made fun of to being physically hurt. With the prevalence of the internet and cyberbullying, the *Student Bullying* scale was expanded in 2016, and again for 2021. Cyberbullying behaviors include being sent nasty or hurtful messages or having nasty or hurtful information shared online. Like other forms of bullying, cyberbullying is associated with low self-esteem, distress, and poor achievement.[82,83]

## School Emphasis on Reading Instruction

### Emphasis in Early Grades on Reading Skills and Strategies

National and school level policies establish the reading curriculum. The extent to which the prescribed national reading curriculum is implemented in schools can be reflected in the school reading curriculum. In every assessment cycle, PIRLS collects data on schools' reading curricula through the fourth grade by asking principals which grades specific reading skills and strategies are first emphasized at their school. These skills range from knowing letters of the alphabet to more advanced skills such as determining the author's perspective or intention.

### Time Spent on Language and Reading Instruction

The amount of time that teachers have to teach the reading curriculum is a key factor in curriculum implementation. PIRLS results show countries vary in the intended instructional time prescribed by the curriculum and in the actual time of implementation in the classroom. Research has found instructional time to be related to student achievement,[84] although this relationship may depend on how efficiently and effectively instructional time is used.[85] Since 2001, PIRLS has collected data from teachers on the time spent on reading instruction across the curriculum, and began collecting data on language instruction in 2006. Additionally, instructional time at school and the instructional time prescribed by the language/reading curriculum are reported by principals and the PIRLS National Research Coordinators, respectively.

# Classroom Contexts

Because the classroom is the primary locus of instruction, PIRLS 2021 pays particular attention to classroom contexts associated with the teaching of reading. These include student engagement, teaching strategies for comprehension skills, types of texts assigned, organization for teaching, classroom library resources, and classroom assessment. Complementing the introduction of digitalPIRLS, PIRLS 2021 collects data on information technology in the classroom, including access to digital devices (including desktop computers, laptops, or tablets) for reading instruction, use of technology, and instruction in online reading. PIRLS 2021 also collects data on classroom climate and on teacher preparation, professional development, and experience.

## Classroom Reading Instruction

### Students Engaged in Reading Instruction

Student engagement focuses the student's "in-the-moment" cognitive interaction with the content.[86] Engagement can result from teacher instruction, text discussions with peers, or independent reading. The challenge for the teacher is to use effective methods of instruction that maintain/support student engagement with the content. Classroom support for engagement involves cognitive activation, a clear and well-structured instruction, teacher support through feedback, and teaching adapted to the students' needs and interests.[87,88] Clear instruction is particularly important to ensure students are engaged, including explaining the content in an accessible way and gauging student understanding of the topic.[89,90,91] Additionally, students who find the reading content interesting itself are more likely to be engaged during lessons.

PIRLS developed the *Students Engaged in Reading Lessons* scale in 2011, which includes items about whether the teacher is easy to understand, has clear expectations, gives students interesting things to read, supports students' autonomy, and does a variety of things to help them learn and enhance their reading skills.

### Teachers Develop Students' Reading Comprehension Skills and Strategies

Reading fluency has been shown to be related to reading comprehension with students having high achievement in reading comprehension also displaying high levels of reading fluency.[92] PIRLS collects data on the various ways teachers help students practice fluency, including how often teachers ask students to read aloud and silently on their own.

Students who also develop and utilize various comprehension skills and strategies can have a deeper understanding of the text they are reading.[93] Since the first PIRLS cycle, the teacher questionnaire has collected information on the types of reading comprehension skills and strategies taught to students including identifying main ideas and making predictions. Additional items have been added in subsequent cycles to reflect skills and strategies that are important in reading

comprehension, such as determining an author's perspective or intention and student ability to self-monitor their reading.

### Teachers Encourage and Motivate Students to Read

Fostering student motivation in reading is fundamental for reading teachers, because students who are motivated to read more, especially at a young age, become better readers.[94] Motivation can be facilitated, according to self-determination theory,[95] by creating a supportive environment that fosters a sense of *relatedness*, *competence*, and *autonomy.* A classroom environment that is overly controlling can stifle student motivation because it removes the student's sense of autonomy.[96] One way teachers can foster autonomy in reading instruction is by allowing students the opportunity to choose their reading material.[97] Additionally, supportive teacher-student relationships are important in fostering student motivation.[98] PIRLS asks teachers about how often they do various activities to encourage and motivate students to read such as giving students time to read books of their own choosing and encouraging student discussions of the text.

### Types of Texts Assigned

The reading materials teachers assign to students help shape students' reading experiences in school. With the burgeoning increase in readily accessible information on the internet, there has been a push for students to develop the skills to comprehend various forms of informational text. Literary texts also serve important purposes by engaging students through personal identification with characters in a story and encouraging students to think critically when making predictions or connections in the text.[99] Because PIRLS assesses student comprehension in both informational and literary texts, teachers are asked to report how often they assign various types of informational and literary reading materials to their students.

### Organizing Students for Reading Instruction

Teachers use a variety of ways of grouping students to maximize the effectiveness of their reading instruction. Generally, small-group instruction can improve reading ability.[100,101] For example, in the guided reading approach to small group reading instruction, teachers form small groups that are focused on instruction involving a specific skill or strategy rather than on reading ability in general. This type of flexible within-class grouping allows for differentiation in order to address the needs of each individual student. Homogeneous grouping by ability is another type of grouping thought to support students in learning at a pace that reflects their skills in the subject. However, research has found that grouping students according to the same reading ability in elementary school may benefit high achieving students but have negative consequences for low performing students.[102,103] The PIRLS teacher questionnaire has routinely collected information on various grouping practices, asking teachers the frequency that reading is taught as a whole-class activity, in groups of same- or mixed-ability students, or to students individually.

### Classroom Libraries

Students who have easy access to reading materials are more likely to read, and for this reason, some countries have moved to creating classroom libraries that provide a wide variety of text and text types, including digital resources, as well as a special place for independent reading. The presence of an organized and readily accessible classroom library encourages students to read[104] and can aid teachers in incorporating literature into instruction and fostering positive reading habits and attitudes. However, size and access to classroom libraries can vary depending on the socioeconomic composition of the school, with students from disadvantaged backgrounds having access to fewer books than students from advantaged backgrounds.[105]

In some countries classroom libraries replace school libraries, especially in smaller schools, and in others they complement school libraries. PIRLS began collecting information on the level of access and size of classroom libraries in 2001.

### Homework

Homework is one way teachers can extend instruction and evaluate student learning. The amount of homework assigned varies both within and across countries, with homework not assigned at all to fourth grade students in some countries. Although there are differences across countries, teachers who assign homework can discuss the homework in class and provide feedback to students. Since 2001, PIRLS has asked teachers about how often reading homework is assigned to students and the time they expect students to spend on homework. In 2011, PIRLS also began asking teachers how homework is used.

### Classroom Assessment

Teachers have a number of ways to monitor student progress and achievement, including direct assessments of what students have learned. PIRLS asks teachers about the types of assessments administered to students. Informal assessments such as observing students as they work, asking students to answer questions during class, and short written assessments help teachers identify needs of particular individuals, evaluate the pace of the presentation, and adapt instruction. Formal tests, both teacher-made and standardized, as well as long-term projects, typically are used to make important decisions about students' achievement (e.g., grades).

## Information Technology in the Classroom

### Classroom Access to Computers for Reading Instruction

Classroom access to computers for reading instruction is becoming increasingly important in developing students' online educational research skills and expanding their literacy competencies in online reading. Access to digital resources such as PCs and tablets allow teachers to provide instruction in online reading strategies.[106] Since 2001, PIRLS has asked teachers about the availability

and access of computers for student use in the classroom. For PIRLS 2021, access includes whether the school provides each student with a digital device, whether the class has digital devices that students can share, and whether students can bring their own digital devices to class.

### Use of Technology

Teachers' attitudes such as self-efficacy toward technology are related to the use of technology in the classroom.[107] Teachers who often use technology for instruction are more confident in using technology compared to teachers who are less frequent users.[108] PIRLS 2021 gathers information on teachers' level of confidence in using digital devices in instruction.

Classroom technology can be used to create individualized instruction. While technology use in primary grades is often used for remedial purposes, technology also can provide challenging enrichment activities for more advanced students.[109] Also new to PIRLS 2021 are data on how often teachers use digital devices to support learning for low-performing students, high-performing students, students with special needs, and for the whole class.

### Instruction in Online Reading

Reading instruction includes specific instruction in online reading strategies.[110,111,112] Compared to print media, reading on the internet poses numerous additional challenges as readers need to navigate non-linearly to locate information, evaluate the credibility of online information, and synthesize information across websites and modes. Since 2001, PIRLS has collected information on how often teachers ask students to perform various computer activities such as read texts on the computer or use the computer to write stories. With the development of ePIRLS in 2016, additional items were included to gather information on online reading instructional practices and strategies, such as whether teachers taught students how to be critical when reading on the internet and strategies for reading digital text.

## Classroom Climate

### Classroom Management

Teachers who are strong classroom managers are able to minimize disruptions to instruction and focus instructional time on teaching the curricular content. Research has shown a positive association between effective classroom management and student achievement.[113,114,115] Measures of classroom management examine whether class lessons are disrupted, whether students respect the teacher, and whether students behave according to teacher instructions.[116,117] New for PIRLS 2021, information on classroom management is gathered through a series of items asking students to indicate the frequency with which various threats to effective classroom management such as disruptive noise and student interruption occur during reading lessons.

### Classroom Instruction Limited by Student Attributes

Student attributes such as hunger or lack of sleep can limit the impact of classroom instruction and make some classes more challenging to teach than others. Developed for PIRLS 2016, the *Classroom Instruction Limited by Student Attributes* scale summarizes teachers' reports about student absences, hungry or tired students, and students who do not have the prerequisite foundation of content knowledge to learn the reading content. Students also are asked to report whether they feel tired and hungry, and how often they are absent from school.

## Teachers' Preparation

### Teachers' Formal Education

Teacher education is critical for effective teaching,[118,119] with prospective teachers needing coursework to gain knowledge in the subjects that they will teach, to understand how students learn, and to learn about effective pedagogy for teaching reading. Analysis conducted using PIRLS data showed a relationship between teachers' reading coursework and PIRLS reading achievement.[120] Additionally, as reported by PIRLS 2016, many countries have increased their educational requirements for primary school teachers and almost all countries now require fourth grade teachers to have a four-year degree from a university. In every assessment cycle, PIRLS has collected information on teachers' formal education, areas of study, and national policies and practices on teacher education. Teachers are asked about their highest level of schooling completed, main areas of study such as primary/elementary education or secondary education, and the extent to which they studied specific areas of reading (e.g., literature, education psychology, reading theory). National Research Coordinators report information on national policies and practices on teacher education and the requirements to become a teacher.

### Teachers' Years of Experience

In addition to teacher education and training, teaching experience is important for teacher development, especially in the first years of teaching.[121,122,123] Research also has found that teachers continue to develop pedagogical skills after five years of experience, and that this development can positively affect student achievement.[124,125,126] PIRLS routinely collects data on teachers' years of experience.

### Teachers' Professional Development

The *PIRLS 2016 Encyclopedia* indicates that many countries are increasing efforts to provide teachers with professional development opportunities. Professional development can help teachers increase their effectiveness and broaden their knowledge and is especially important for exposing teachers to recent developments such as curricular changes or new technology for classroom instruction. For example, professional development is crucial for training teachers on how to incorporate online

reading into their classroom practices.[127] Additionally, for professional development to be effective, professional development opportunities should engage teachers through concrete tasks, be sustained and ongoing, and provide teachers the space to reflect on their teaching.[128,129] Support systems also should be in place to encourage teachers to partake in professional development.[130] Since 2001, PIRLS has asked teachers about their professional development. For PIRLS 2021, the teacher questionnaire builds on the professional development topic area and collects information on teacher participation and demand in specific areas of professional development (e.g., teaching reading comprehension skills and strategies, instruction related to digital literacies). PIRLS 2021 also gathers data on the type of professional development (e.g., workshops, seminars, mentor access) that is most useful to teachers, and on barriers to teacher participation in professional development activities.

## Student Attributes

PIRLS 2021 collects data on important student attributes including student reading attitudes and student demographics. Students who are motivated to read and have a strong reading self-concept tend to have better reading comprehension,[131] and cultivating these attitudes also may support students in becoming lifelong readers. Results from PIRLS have shown relationships between positive reading attitudes and reading achievement. It is noted that achievement and attitudes can be mutually reinforcing of one another. Better readers may enjoy and value reading more than poorer readers, thus reading more and further improving their skills. Because student demographics are important for analyzing reading achievement, PIRLS also collects data on student gender and age.

### Student Reading Attitudes

#### Students Like Reading

Student readers who are intrinsically motivated find reading interesting and enjoyable for its own sake. Intrinsic motivation is the "energizer of behavior,"[132] and research has shown that intrinsic motivation is more closely related to reading achievement than extrinsic motivations such as praise and money.[133,134] PIRLS has recognized the importance of collecting data on students' attitudes toward reading since its inception. In 2011, PIRLS developed the *Students Like Reading* scale to measure students' intrinsic motivation to read. Students are asked how much they agree with statements about liking more time to read, reading for fun, and learning a lot from reading. The scale was revised in 2016 and additional items were included to better measure the construct.

#### Students Confident in Reading

Students tend to have distinct views of their own reading ability, and their self-appraisal is often based on their past experiences and how they see themselves compared with their peers.[135] Students who are confident in their ability persevere in completing a school task because they believe they can be

successful.[136] PIRLS has asked about students' self-concept as readers from the beginning. Since 2011, reading self-concept has been measured using the *Students Confident in Reading* scale. Students are asked to indicate the extent to which they agree with statements such as "reading is easy" and "I usually do well in reading."

### Familiarity in Using Digital Devices

According to the *PIRLS 2016 Encyclopedia*, PIRLS countries are working toward integrating technology into instruction across the curriculum to help students develop Information and Communications Technology (ICT) and digital literacy skills. With the introduction of ePIRLS in 2016, PIRLS began asking students about using digital devices. Students were asked how well they could use the computer, type, and find information online. Results from 2016 showed a positive association between students' computer use and their achievement in online informational reading, which aligned with other similar research.[137,138] PIRLS 2021 includes a new scale measuring students' familiarity with using computers or tablets as well as their confidence in finding information on the internet.[139]

### Students Liking of Assessment Passages

Students who enjoy the reading content are more interested and engaged with the text than students who do not enjoy the reading content. PIRLS aims to develop a variety of texts that are interesting to a wide range of students. In PIRLS 2016, most students (over 80%) participating in PIRLS liked the PIRLS passages and ePIRLS tasks.

## Student Demographics

### Gender

Over the last four cycles of PIRLS, the gender gap in reading achievement has favored girls over boys in the majority of participating countries. In PIRLS 2016, girls outperformed boys in 48 out of the 50 countries, reflecting a pattern seen in research.[140] Similar results favoring girls were found in the ePIRLS assessment of online informational reading.

### Age

Students at different ages may perform differently on PIRLS depending on their academic history. In countries where students are admitted to primary school strictly on the basis of age, older students may be more skilled in reading comprehension compared to younger peers because of greater maturation. However, depending on retention policies, older students who have been held back may struggle more with reading comprehension than students who have not been held back.

# National Contexts

In every country, the educational system is embedded in a unique configuration of historical, economic, and language factors that combine to determine priorities in how the system is organized for teaching and learning. Countries participating in PIRLS 2021 contribute information on many of these factors through their chapter in the *PIRLS 2021 Encyclopedia* and by way of the curriculum questionnaire. More specifically, countries provide information about the organization of the education system and the reading curriculum.

## Organization of Education System

### Country Language(s) of Instruction

The historical background of language and literacy in a country can influence the challenges and instructional practices in teaching students to read. For example, some countries have one commonly spoken language, while others are historically multilingual. Immigration also can increase language diversity. Multilingual countries across the world have different policies for educating their population and specifically for language literacy. Thus, decisions about the language(s) of instruction and how to implement those decisions can be very complicated.

### System for Preprimary Education

Even before children begin formal primary school, they receive considerable exposure to literacy as part of their preprimary educational experience (e.g., preschool, kindergarten). Preprimary education is an area of investment for many countries. Research findings indicate that attendance in preprimary programs can have a positive effect on academic outcomes.[141] The PIRLS curriculum questionnaire gathers information on countries' provisions of early childhood education and preprimary education detailing the degree of universal coverage. In PIRLS 2016, almost all participating countries provided universal preprimary education for children age 3 or older, and a number of countries also sponsored universal programs for children younger than 3 years old. Additionally, the European Union recently legislated that member countries should provide universal access to preprimary education[142] and Norway recently began universal access to early childhood education starting at age 1.[143]

It is also becoming increasingly clear that the effect of preprimary education on later academic and life outcomes is dependent on the quality of the preprimary program.[144,145,146] PIRLS gathers data on any associated curriculum for early childhood and preprimary education. As described in the *PIRLS 2016 Encyclopedia*, preprimary education programs often have curricula that focus on children's physical and socioemotional development and incorporate literacy and numeracy pedagogy as well as experiential science activities.

### Age of Entry and Retention

Policies about the age of entry into formal education (first year of primary school, ISCED Level 1) are important for understanding achievement differences as well as the variation in students' ages across countries at the fourth grade.[147] Students who enter school at an older age are more mature at school entry and may be able to cope more easily with complex reading materials from the first grade onward. Data on country's age of entry to primary school are reported by National Research Coordinators.

Additionally, because PIRLS is a grade-based study, PIRLS also gathers information on countries' student promotion and retention policies, an important factor to consider when evaluating achievement results. Research has shown that grade retention does not have a positive relationship with student achievement or the emotional well-being of the student and is overall inefficient.[148,149] For these reasons, many PIRLS countries practice automatic promotion, especially in the primary grades.[150]

### Number of Years of School

More years of required schooling allow more time for students to learn and become more educated individuals with higher educational attainment. PIRLS collects data on nationally mandated compulsory years of education. In PIRLS 2016, most countries reported beginning compulsory education around age 6 and ending compulsory education around age 16.

## Reading Curriculum

### Reading Curriculum in the Primary Grades

Whether formulated at the national, community, or school level, countries have curricula that define what students should be taught, providing expectations for students in terms of the knowledge, skills, and attitudes to be developed or acquired through their formal reading instruction.

Curricular aspects and governing policies particularly relevant to the acquisition of reading literacy include the standards or benchmarks established for reading development. A coherent progression of instruction and comprehension strategies for reading development includes a change in emphasis from decoding to comprehension strategies, and access to a wide variety of reading materials, as well as sensible differentiation policies for accelerated readers and struggling readers.

Especially relevant to the ePIRLS assessment of online informational reading is the extent to which a country's curriculum emphasizes online reading and new media. As documented in the *PIRLS 2016 Encyclopedia*, some countries have transformed their standards, curriculum, and assessments in order to address teaching elementary school students digital reading strategies such as how to navigate and retrieve online information.[151,152]

In every assessment cycle, PIRLS National Research Coordinators report on their country's reading curriculum through the PIRLS encyclopedia. Data gathered about the reading

curriculum from the curriculum questionnaire has evolved over the cycles to also include how the implementation of the curriculum is evaluated, the use of technology in reading instruction, and the degree of emphasis placed on digital reading in the curriculum.

### Students with Reading Difficulties

Countries have taken initiatives to ensure that education is inclusive of all students, providing equal educational opportunities to all students, including those with reading difficulties.[153] In order for appropriate accommodations to be made to student learning and assessment, it is important to identify students who need these accommodations. Identification of reading difficulties such as dyslexia early in students' education can help educators determine the best course of action for these students and prevent students from falling further behind in their reading development.[154] PIRLS 2021 gathers information on national provisions regarding diagnostic testing for reading difficulties and instruction for children with reading difficulties.

## References


1 Martin, M.O., Mullis, I.V.S., Foy, P., & Arora, A. (2012). Creating and interpreting the TIMSS and PIRLS 2011 context questionnaire scales. In M.O. Martin & I.V.S Mullis (Eds.), *Methods and Procedures in TIMSS and PIRLS 2011* (pp.1–11). Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

2 Dahl, G.B., & Lochner, L. (2012). The impact of family income on child achievement: Evidence from the earned income tax credit. *American Economic Review*, *102*(5), 1927–1956.

3 Davis-Kean, P.E. (2005). The influence of parent education and family income on child achievement: The indirect role of parental expectations and the home environment. *Journal of Family Psychology*, *19*(2), 294–304.

4 Martin, M.O., Foy, P., Mullis, I.V.S., & O'Dwyer, L.M. (2013). Effective schools in reading, mathematics, and science at the fourth grade. In M.O. Martin & I.V.S. Mullis (Eds.), *TIMSS and PIRLS 2011: Relationships among reading, mathematics, and science achievement at the fourth grade—Implications for early learning*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

5 Sirin, S.R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research, 75*(3), 417–453.

6 Willms, J.D. (2006). Learning divides: Ten policy questions about the performance and equity of schools and schooling systems. Montreal, Canada: UNESCO Institute for Statistics.

7 Baker, L., & Scher, D. (2002). Beginning readers' motivation for reading in relation to parental beliefs and home reading experiences. *Reading Psychology, 23*(4), 239–269.

8 Kloosterman, R., Notten, N., Tolsma, J., & Kraaykamp, G. (2010). The effects of parental reading socialization and early school involvement on children's academic performance: A panel study of primary school pupils in the Netherlands. *European Sociological Review, 27*(3), 291–306.

9 Notten, N., & Kraaykamp, G. (2010). Parental media socialization and educational attainment: Resource or disadvantage? *Research in Social Stratification and Mobility*, *28*(4), 453–464.

10 Baker, L., & Scher, D. (2002). Beginning readers' motivation for reading in relation to parental beliefs and home reading experiences. *Reading Psychology*, 23(4), 239–269.

11 Kloosterman, R., Notten, N., Tolsma, J., & Kraaykamp, G. (2010). The effects of parental reading socialization and early school involvement on children's academic performance: A panel study of primary school pupils in the Netherlands. *European Sociological Review*, 27(3), 291–306.

12 Bialystok, E. (2006). Second-language acquisition and bilingualism at an early age and the impact on early cognitive development. In R.E. Tremblay, M. Boivin, & R.D. Peters (Eds.), *Encyclopedia on early childhood development*. Retrieved from http://www.child-encyclopedia.com/second-language/according-experts/second-language-acquisition-and-bilingualism-early-age-and-impact

13 Entorf, H., & Minoiu, N. (2005). What a difference immigration policy makes: A comparison of PISA scores in Europe and traditional countries of immigration. *German Economic Review*, 6(3), 355–376.

14 Trong, K. (2009). *Using PIRLS 2006 to measure equity in reading achievement internationally* (Doctoral dissertation, Boston College). Retrieved from https://dlib.bc.edu/islandora/object/bc-ir:101608

15 Gustafsson, J.-E., Hansen, K.Y., & Rosén, M. (2013). Effects of home background on student achievement in reading, mathematics, and science at the fourth grade. In M.O. Martin & I.V.S. Mullis (Eds.), *TIMSS and PIRLS 2011: Relationships among reading, mathematics, and science achievement at the fourth grade—Implications for early learning* (pp. 181–287). Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

16 Hart, B., & Risley, T.R. (2003). The early catastrophe: The 30 million word gap by age 3. *American Educator, 27*(1), 4–9.

17 Hooper, M. (2017a). Applying the pseudo-panel approach to international large-scale assessments: A methodology for analyzing subpopulation trend data (Doctoral dissertation, Boston College).

18 Melhuish, E.C., Phan, M.B., Sylva, K., Sammons, P., Siraj-Blatchford, I., & Taggert, B. (2008). Effects of the home learning environment and preschool center experience upon literacy and numeracy development in early primary school. *Journal of Social Issues, 64*(1), 95–114.

19 Sénéchal, M., & LeFevre, J. (2002). Parental involvement in the development of children's reading skill: A five-year longitudinal study. *Child Development, 73*(2), 445–460.

20 Dickinson, D.K., Griffith, J.A., Golinkoff, R.M., & Hirsh-Pasek, K. (2012). How reading books fosters language development around the world. *Child Development Research*, *2012*, 1–15.

21 Mol, S.E., Bus, A.G., de Jong, M.T., & Smeets, D.J.H. (2008). Added value of dialogic parent-child book readings: A meta-analysis. *Early Education and Development*, *19*(1), 7–26.

22 Raikes, H., Pan, B.A., Luze, G., Tamis-LeMonda, C.S., Brooks-Gunn, J., Constantine, J., Tarullo, L.B., Raikes, H.A., & Rodriguez, E.T. (2006). Mother–child bookreading in low-income families: Correlates and outcomes during the first three years of life. *Child Development*, *77*(4), 924–953.

23 Dickinson, D.K., Griffith, J.A., Golinkoff, R.M., & Hirsh-Pasek, K. (2012). How reading books fosters language development around the world. *Child Development Research*, *2012*, 1–15.

24 Hart, B., & Risley, T.R. (2003). The early catastrophe: The 30 million word gap by age 3. *American Educator, 27*(1), 4–9.

25 Raikes, H., Pan, B.A., Luze, G., Tamis-LeMonda, C.S., Brooks-Gunn, J., Constantine, J., Tarullo, L.B., Raikes, H.A., & Rodriguez, E.T. (2006). Mother–child bookreading in low-income families: Correlates and outcomes during the first three years of life. *Child Development*, *77*(4), 924–953.

26 Duncan, G.J., & Magnuson, K. (2013). Investing in preschool programs. *Journal of Economic Perspectives*, *27*(2), 109–132.

27 Duncan, G.J., & Sojourner, A.J. (2013). Can intensive early childhood intervention programs eliminate income-based cognitive and achievement gaps? *Journal of Human Resources*, *48*(4), 945–968.

28 Heckman, J.J., & Masterov, D.V. (2007). *The productivity argument for investing in young children* (No. w13016). National Bureau of Economic Research.

29 Hong, S., & Ho, H.–Z. (2005). Direct and indirect longitudinal effects of parental involvement on student achievement: Second-order latent growth modeling across ethnic groups. *Journal of Educational Psychology*, *97*(1), 32–42.

30 Jeynes, W.H. (2005). A meta-analysis of the relation of parental involvement to urban elementary school student academic achievement. *Urban Education*, *40*(3), 237–269.

31 Hill, N.E., & Tyson, D.F. (2009). Parental involvement in middle school: A meta-analytic assessment of the strategies that promote achievement. *Developmental Psychology, 45*(3), 740–763.

32 Taylor, L.C., Clayton, J.D., & Rowley, S.J. (2004). Academic socialization: Understanding parental influences on children's school-related development in the early years. *Review of General Psychology*, *8*(3), 163–178.

33 Coleman, J.S., Campbell, E.Q., Hobson, C.J., McPartland, J., Mood, A.M., Weinfeld, F.D., & York, R.L. (1966). *Equality of educational opportunity*. Washington, DC: National Center for Educational Statistics, US Government Printing Office.

34 Martin, M.O., Foy, P., Mullis, I.V.S., & O'Dwyer, L.M. (2013). Effective schools in reading, mathematics, and science at the fourth grade. In M.O. Martin & I.V.S. Mullis (Eds.), *TIMSS and PIRLS 2011: Relationships among reading, mathematics, and science achievement at the fourth grade—Implications for early learning*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

35 Sirin, S.R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research, 75*(3), 417–453.

36 Willms, J.D. (2006). Learning divides: Ten policy questions about the performance and equity of schools and schooling systems. Montreal, Canada: UNESCO Institute for Statistics.

37 Sacerdote, B. (2011). Peer effects in education: How might they work, how big are they and how much do we know thus far? In E.A. Hanushek, S.J. Machin, & L. Wößmann, *Handbook of the economics of education* (pp. 249–277). San Diego, CA: Elsevier.

38 Akiba, M., LeTendre, G.K., & Scribner, J.P. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries. *Educational Researcher, 36*(7), 369–387.

39 Goldhaber, D., Lavery, L., & Theobald, R. (2015). Uneven playing field? Assessing the teacher quality gap between advantaged and disadvantaged students. *Educational Researcher*, *44*(5), 293–307.

40 Cohen, J., McCabe, L., Michelli, N.M., & Pickeral, T. (2009). School climate: Research, policy, practice, and teacher education. *Teachers College Record, 111*(1), 190–213.

41 Glewwe, P.W., Hanushek, E.A., Humpage, S.D., & Ravina, R. (2011). School resources and educational outcomes in developing countries: A review of the literature from 1990 to 2010. In P. Glewwe (Ed.), *Education policy in developing countries* (pp. 13–64). Chicago: University of Chicago Press.

42 Hanushek, E.A. (1997). Assessing the effects of school resources on student performance: An update. *Educational Evaluation and Policy Analysis, 19*(2), 141–164.

43 Hanushek, E.A., & Wößmann, L. (2017). School resources and student achievement: A review of cross-country economic research. In M. Rosén, K.Y. Hansen, & U. Wolff (Eds.), *Cognitive abilities and educational outcomes* (pp. 149–171). Methodology of Educational Measurement and Assessment. Switzerland: Springer International Publishing.

44 Lee, J.-W., & Barro, R.J. (2001). Schooling quality in a cross-section of countries. *Economica, New Series, 68*(272), 465–488.

45 Nielen, T.M.J., & Bus, A.G. (2015). Enriched school libraries: A boost to academic achievement. *AERA Open*, 1(4), 1–11.

46 Goddard, R., Goddard, Y., Kim, S.E., & Miller, R. (2015). A theoretical and empirical analysis of the roles of instructional leadership, teacher collaboration, and collective efficacy beliefs in support of student learning. *American Journal of Education*, *121*(4), 501–530.

47 Tschannen-Moran, M., & Gareis, C. (2015). Faculty trust in the principal: An essential ingredient in high-performing schools. *Journal of Educational Administration, 53*(1), 66–92.

48 Azaiez, H., & Slate, J.R. (2017). Student achievement differences as a function of principal longevity. *Journal of Advances in Education Research*, *2*(3), 157–162.

49 Miller, A. (2013). Principal turnover and student achievement. *Economics of Education Review*, *36*(3), 60–72.

50 Center for Disease Control and Prevention. (2009). *School connectedness: Strategies for increasing protective factors among youth*. Atlanta, GA: U.S. Department of Health and Human Services; 2009.

51 Cheng, A., & Peterson, P.E. (2017). How satisfied are parents with their children's schools? *Education Next*, *17*(2), pp. 21–27.

52 Stacer, M.J., & Perrucci, R. (2013). Parental involvement with children at school, home, and community. *Journal of Family and Economic Issues*, *34*(3), 340–354.

53 Martin, M.O., Foy, P., Mullis, I.V.S., & O'Dwyer, L.M. (2013). Effective schools in reading, mathematics, and science at the fourth grade. In M.O. Martin & I.V.S. Mullis (Eds.), *TIMSS and PIRLS 2011: Relationships among reading, mathematics, and science achievement at the fourth grade—Implications for early learning*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

54 Nilsen, T., & Gustafsson, J.-E. (2014). School emphasis on academic success: Exploring changes in science performance in Norway between 2007 and 2011 employing two-level SEM. *Educational Research and Evaluation, 20*(4), 308–327.

55 Hoy, W.K., Tarter, C.J., & Hoy, A.W. (2006). Academic optimism of schools: A force for student achievement. *American Educational Research Journal, 43*(3), 425–446.

56 McGuigan, L., & Hoy, W.K. (2006). Principal leadership: Creating a culture of academic optimism to improve achievement for all students. *Leadership and Policy in Schools, 5*(3), 203–229.

57 Wu, J.H., Hoy, W.K., & Tarter, C.J. (2013). Enabling school structure, collective responsibility, and a culture of academic optimism: Toward a robust model of school performance in Taiwan. *Journal of Educational Administration, 51*(2), 176–193.

58 Johnson, S.M., Kraft, M.A., & Papay, J.P. (2012). How context matters in high-need schools: The effects of teachers' working conditions on their professional satisfaction and their students' achievement. *Teachers College Record*, *114*(10), 1–39.

59 Johnson, S.M., Kraft, M.A., & Papay, J.P. (2012). How context matters in high-need schools: The effects of teachers' working conditions on their professional satisfaction and their students' achievement. *Teachers College Record*, *114*(10), 1–39.

60 Kelly, S., & Northrop, L. (2015). Early career outcomes for the "best and the brightest": Selectivity, satisfaction, and attrition in the beginning teacher longitudinal survey. *American Educational Research Journal*, *52*(4), 624–656.

61 Skaalvik, E.M., & Skaalvik, S. (2011). Teacher job satisfaction and motivation to leave the teaching profession: Relations with school context, feeling of belonging, and emotional exhaustion. *Teaching and Teacher Education: An International Journal of Research and Studies*, *27*(6), 1029–1038.

62 Skaalvik, E.M., & Skaalvik, S. (2011). Teacher job satisfaction and motivation to leave the teaching profession: Relations with school context, feeling of belonging, and emotional exhaustion. *Teaching and Teacher Education: An International Journal of Research and Studies*, *27*(6), 1029–1038.

63 Joyce, H.D., & Early, T.J. (2014). The impact of school connectedness and teacher support on depressive symptoms in adolescents: A multilevel analysis. *Children and Youth Services Review*, *39*, 101–107.

64 Renshaw, T.L., Long, A.C.J., & Cook, C.R. (2015). Assessing adolescents' positive psychological functioning at school: Development and validation of the student subjective wellbeing questionnaire. *School Psychology Quarterly*, *30*(4), 534–552.

65 Cohen, J., McCabe, L, Michelli, N.M., & Pickeral, T. (2009). School climate: Research, policy, practice, and teacher education. *Teachers College Record, 111*(1), 190–213.

66 Hooper, M. (2017b). *Explaining the relationship between bullying victimization and student achievement: An analysis of TIMSS 2011 data*. Paper presented at the annual meeting of the American Educational Researchers Association, San Antonio, Texas.

67 McMahon, S.D., Wernsman, J., & Rose, D.S. (2009). The relation of classroom environment and school belonging to academic self-efficacy among urban fourth- and fifth-grade students. *The Elementary School Journal, 109*(3), 267–281.

68 Goodenow, C. (1993). The psychological sense of school membership among adolescents: Scale development and educational correlates. *Psychology in the Schools*, 30(1), 70–90.

69 Hamm, J.V. & Faircloth, B. (2005). The role of friendship in adolescents' sense of belonging. *New Directions for Child and Adolescent Development*, 2005(107), 61–78.

70 Cohen, J., McCabe, L, Michelli, N.M., & Pickeral, T. (2009). School climate: Research, policy, practice, and teacher education. *Teachers College Record, 111*(1), 190–213.

71 Gottfredson, G.D., Gottfredson, D.C., Payne, A.A., & Gottfredson, N.C. (2005). School climate predictors of school disorder: Results from a national study of delinquency prevention in schools. *Journal of Research in Crime and Delinquency, 42*(4), 412–444.

72 Martin, M.O., Foy, P., Mullis, I.V.S., & O'Dwyer, L.M. (2013). Effective schools in reading, mathematics, and science at the fourth grade. In M.O. Martin & I.V.S. Mullis (Eds.), *TIMSS and PIRLS 2011: Relationships among reading, mathematics, and science achievement at the fourth grade—Implications for early learning*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

73 Cohen, J., McCabe, L, Michelli, N.M., & Pickeral, T. (2009). School climate: Research, policy, practice, and teacher education. *Teachers College Record, 111*(1), 190–213.

74 Konishi, C., Hymel, S., Zumbo, B. D., & Li, Z. (2010). Do school bullying and student-teacher relationships matter for academic achievement? A multilevel analysis. *Canadian Journal of School Psychology, 25*(1), 19–39.

75 Kutsyuruba, B., Klinger, D.A., & Hussain, A. (2015). Relationships among school climate, school safety, and student achievement and well-being: A review of the literature. *Review of Education*, *3*(2), 103–135.

76 Glew, G.M., Fan, M., Katon, W., & Rivara, F.P. (2008). Bullying and school safety. *The Journal of Pediatrics, 152*(1), 123–128.

77 Hooper, M. (2017b). *Explaining the relationship between bullying victimization and student achievement: An analysis of TIMSS 2011 data*. Paper presented at the annual meeting of the American Educational Researchers Association, San Antonio, Texas.

78 Konishi, C., Hymel, S., Zumbo, B. D., & Li, Z. (2010). Do school bullying and student-teacher relationships matter for academic achievement? A multilevel analysis. *Canadian Journal of School Psychology, 25*(1), 19–39.

79 Glew, G.M., Fan, M., Katon, W., & Rivara, F.P. (2008). Bullying and school safety. *The Journal of Pediatrics, 152*(1), 123–128.

80 Konishi, C., Hymel, S., Zumbo, B. D., & Li, Z. (2010). Do school bullying and student-teacher relationships matter for academic achievement? A multilevel analysis. *Canadian Journal of School Psychology, 25*(1), 19–39.

81 Rothon, C., Head, J., Klineberg, E., & Stansfeld, S. (2011). Can social support protect bullied adolescents from adverse outcomes? A prospective study on the effects of bullying on the educational achievement and mental health of adolescents at secondary schools in East London. *Journal of Adolescence, 34*(3), 579–588.

82 Kowalski, R.M., & Limber, S.P. (2013). Psychological, physical, and academic correlates of cyberbullying and traditional bullying. *Journal of Adolescent Health*, *53*, S13–S20.

83 Tokunaga, R.S. (2010). Following you home from school: A critical review and synthesis of research on cyberbullying victimization. *Computers in Human Behavior, 26*(3), 277–287.

84 Hanushek, E.A., & Wößmann, L. (2017). School resources and student achievement: A review of cross-country economic research. In M. Rosén, K.Y. Hansen, & U. Wolff (Eds.), *Cognitive abilities and educational outcomes* (pp. 149–171). Methodology of Educational Measurement and Assessment. Switzerland: Springer International Publishing.

85 Mullis, I.V.S., Martin, M.O., & Loveless, T. (2016). *20 years of TIMSS: International trends in mathematics and science achievement, curriculum, and instruction*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

86 McLaughlin, M., McGrath, D.J., Burian-Fitzgerald, M.A., Lanahan, L., Scotchmer, M., Enyeart, C., & Salganik, L. (2005, April). Student content engagement as a construct for the measurement of effective classroom instruction and teacher knowledge. Paper presented at the annual meeting of the American Educational Researchers Association, Montreal, Canada.

87 Klieme, E., Pauli, C., & Reusser, K. (2009). The Pythagoras study— Investigating effects of teaching and learning in Swiss and German mathematics classrooms. In T. Janik & T. Seidel (Eds.), *The power of video studies in investigating teaching and learning in the classroom.* (pp. 137–160). Münster: Waxmann.

88 Lipowsky, F., Rakoczy, K., Pauli, C., Drollinger-Vetter, B., Klieme, E., & Reusser, K. (2009). Quality of geometry instruction and its short-term impact on students' understanding of the Pythagorean Theorem. *Learning and Instruction*, *19*, 527–537.

89 Ferguson, R.F. (2012). Can student surveys measure teaching quality? *Phi Delta Kappan*, *94*(3), 24–28.

90 Nilsen, T., Gustafsson, J.-E., & Blömeke, S. (2016). Conceptual framework and methodology of this report. In T. Nilsen & J.-E. Gustafsson (Eds.), *Teacher quality, instructional quality and student outcomes* (pp. 1–19). Amsterdam, The Netherlands: IEA.

91 Scherer, R., & Nilsen, T. (2016). The relations among school climate, instructional quality, and achievement motivation in mathematics. In T. Nilsen & J.-E. Gustafsson (Eds.), *Teacher quality, instructional quality and student outcomes* (pp. 51–80). Amsterdam, The Netherlands: IEA.

92 Klauda, S.L. & Guthrie, J.T. (2008). Relationships of three components of reading fluency to reading comprehension. *Journal of Educational Psychology, 100*(2), 310–321.

93 Duke, N. K., & David Pearson, P. (2009). Effective Practices for Developing Reading Comprehension. *Journal of Education*, *189*(1–2), 107–122.

94 Lewis, M. & Samuels, S.J. (2003). *Read more—Read better? A meta-analysis of the literature on the relationship between exposure to reading and reading achievement.* Minneapolis, MN: University of Minnesota.

95 Deci, E.L. & Ryan, R.M. (1985). Intrinsic motivation and self-determination in human behavior. New York: Plenum Press.

96 Niemiec, C.P. & Ryan, R.M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and Research in Education, 7*(2), 133–144.

97 Guthrie, J.T., McRae, A., & Klauda, S.L. (2007). Contributions of concept-oriented reading instruction to knowledge about interventions for motivations in reading. *Educational Psychologist, 42*(4), 237–250.

98 Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research, 77*(1), 113–143.

99 Alsup, J. (2015). A case for teaching literature in the secondary school: Why reading fiction matters in an age of scientific objectivity and standardization. New York, NY: Routledge.

100 Lou, Y., Abrami, P.C., & Spence, J.C. (2000). Effects of within-class grouping on student achievement: An exploratory model. *The Journal of Educational Research*, *94*(2), 101–112.

101 Puzio, K. & Colby, G. (2010). *The effects of within class grouping on reading achievement: A meta-analytic synthesis.* Evanston, IL: Society for Research on Educational Effectiveness. Retrieved from ERIC database (ED514135).

102 Catsambis, S., & Buttaro, A. (2012). Revisiting "Kindergarten as academic boot camp": A nationwide study of ability grouping and psycho-social development. *Social Psychology of Education*, *15*(4), 483–515.

103 Lleras, C., & Rangel, C. (2009). Ability grouping practices in elementary school and African-American/Hispanic achievement. *American Journal of Education*, *115*(2), 279–304.

104 Fractor, J.S., Woodruff, M.C., Martinez, M.G., & Teale, W.H. (1993). Let's not miss opportunities to promote voluntary reading: Classroom libraries in the elementary school. *The Reading Teacher, 46*(6), 476–484.

105 Duke, N.K., (2000). For the rich it's richer: Print experiences and environments offered to children in very low- and very high-socioeconomic status first-grade classrooms. *American Educational Research Journal, 37*(2), 441–478.

106 Hsu, H.-Y., Wang, S.-K., & Runco, L. (2013). Middle school science teachers' confidence and pedagogical practice of new literacies. *Journal of Science Education and Technology*, *22*(3), 314–324.

107 Ertmer, P.A., & Ottenbreit-Leftwich, A.T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255–284.

108 Fraillon J., Ainley J., Schulz W., Friedman T., & Gebhardt, E. (2014). Teaching with and about information and communication technologies. In *Preparing for life in a digital age*. Springer, Cham.

109 McKnight, K., O'Malley, K., Ruzic, R., Horsley, M.K., Franey., J.J., & Bassett, K. (2016). Teaching in a digital age: How educators use technology to improve student learning. *Journal of Research on Technology in Education*, *48*(3), 194–211.

110 Coiro, J. (2011). Predicting reading comprehension on the internet: Contributions of offline reading skills, online reading skills, and prior knowledge. *Journal of Literacy Research*, *43*(4), 352–392.

111 Coiro, J. (2012). The new literacies of online reading comprehension: Future directions. *The Educational Forum*, *76*(4), 412–417.

112 Leu, D.J., Zawilinski, L., Castek, J., Banerjee, M., Housand, B.C., Liu, Y., & O'Neil, M. (2007). What is new about the new literacies of online reading comprehension? In L.S. Rush, A.J. Eakle, & A. Berger (Eds.), *Secondary school literacy: What research reveals for classroom practice* (pp. 37–68). Urbana, IL: National Council of Teachers of English.

113 Baumert, J., Kunter, M., Blum, W., Brunner, M., Voss, T., Jordan, A., Klusmann, U., Krauss, S., Neubrand, M., & Tsai, Y-M. (2010). Teachers' mathematical knowledge, cognitive activation in the classroom, and student progress. *American Educational Research Journal, 47*(1), 133–180.

114 Lipowsky, F., Rakoczy, K., Pauli, C., Drollinger-Vetter, B., Klieme, E., & Reusser, K. (2009). Quality of geometry instruction and its short-term impact on students' understanding of the Pythagorean Theorem. *Learning and Instruction*, *19*, 527–537.

115 Scherer, R., & Nilsen, T. (2016). The relations among school climate, instructional quality, and achievement motivation in mathematics. In T. Nilsen & J.-E. Gustafsson (Eds.), *Teacher quality, instructional quality and student outcomes* (pp. 51–80). Amsterdam, The Netherlands: IEA.

116 Baumert, J., Kunter, M., Blum, W., Brunner, M., Voss, T., Jordan, A., Klusmann, U., Krauss, S., Neubrand, M., & Tsai, Y-M. (2010). Teachers' mathematical knowledge, cognitive activation in the classroom, and student progress. *American Educational Research Journal, 47*(1), 133–180.

117 Ferguson, R.F. (2012). Can student surveys measure teaching quality? *Phi Delta Kappan*, *94*(3), 24–28.

118 Darling-Hammond, L. (2000). How teacher education matters. *Journal of Teacher Education, 51*(3), 166–173.

119 Hill, H.C., Rowan, B., & Ball, D.L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal, 42*(2), 371–406.

120 Myrberg, E., Johansson, S., & Rosén, M. (2018). The relation between teacher specialization and student reading achievement. *Scandinavian Journal of Educational Research*.

121 Harris, D.N., & Sass, T.R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics, 95*(7–8), 798–812.

122 Ladd, H.F., & Sorensen, L.C. (2017). Returns to teacher experience: Student achievement and motivation in middle school. *Education Finance and Policy*, *12*(2), 241–279.

123 Papay, J.P., & Kraft, M. (2015). Productivity returns to experience in the teacher labor market: Methodological challenges and new evidence on long-term career improvement. *Journal of Public Economics*, *130*, 105–119.

124 Harris, D.N., & Sass, T.R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics, 95*(7–8), 798–812.

125 Ladd, H.F., & Sorensen, L.C. (2017). Returns to teacher experience: Student achievement and motivation in middle school. *Education Finance and Policy*, *12*(2), 241–279.

126 Papay, J.P., & Kraft, M. (2015). Productivity returns to experience in the teacher labor market: Methodological challenges and new evidence on long-term career improvement. *Journal of Public Economics*, *130*, 105–119.

127 Coiro, J. (2012). The new literacies of online reading comprehension: Future directions. *The Educational Forum*, *76*(4), 412–417.

128 Capps, D.K., Crawford, B.A., & Constas, M.A. (2012). A review of empirical literature on inquiry professional development: Alignment with best practices and a critique of the findings. *Journal of Science Teacher Education, 23*(3), 291–318.

129 Darling-Hammond, L., & McLaughlin, M.W. (2011). Policies that support professional development in an era of reform. *Phi Delta Kappan Magazine, 92*(6), 81–92.

130 Darling-Hammond, L., & McLaughlin, M.W. (2011). Policies that support professional development in an era of reform. *Phi Delta Kappan Magazine, 92*(6), 81–92.

131 De Naeghel, J., Van Keer, H., Vansteenkiste, M., & Rosseel, Y. (2012). The relation between elementary students' recreational and academic reading motivation, reading frequency, engagement, and comprehension: A self-determination theory perspective. *Journal of Educational Psychology*, *104*(4), 1006–1021.

132 Deci, E.L., & Ryan, R.M. (1985). Intrinsic motivation and self-determination in human behavior. New York: Plenum Press.

133 Becker, M., McElvany, N., & Kortenbruck, M. (2010). Intrinsic and extrinsic reading motivation as predictors of reading literacy: A longitudinal study. *Journal of Educational Psychology*, *102*(4), 773–785.

134 Schiefele, U., Schaffner, E., Möller, J., & Wigfield, A. (2012). Dimensions of reading motivation and their relation to reading behavior and competence. *Reading Research Quarterly*, *47*(4), 427–463.

135 Marsh, H.W., & Craven, R.G. (2006). Reciprocal effects of self-concept and performance from a multidimensional perspective: Beyond seductive pleasure and unidimensional perspectives. *Perspectives on Psychological Science, 1*(2), 133–163.

136 Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W.H. Freeman and Company.

137 Hatlevik, O. E., Throndsen, I., Loi, M., & Guðmundsdóttir, G.B. (2015). Students' ICT self-efficacy and computer and information literacy: Determinants and relationships. *Computers & Education*, *118*, 107–119.

138 Rohatgi, A., Scherer, R., & Hatlevik, O. (2016). The role of ICT self-efficacy for students' ICT use and their achievement in a computer and information literacy test. *Computers & Education*, *102*, 103–116.

139 Van Deursen, A.J.A.M., Helsper, E.J., & Eynon, R. (2014). Measuring digital skills. From *Digital Skills to Tangible Outcomes Project Report*. Retrieved from http://www.lse.ac.uk/media-and-communications/assets/documents/research/projects/disto/Measuring-Digital-Skills.pdf

140 Voyer, D., & Voyer, S.D. (2014). Gender differences in scholastic achievement: A meta-analysis, *Psychological Bulletin*, *140*(4), 1174–1204.

141 Duncan, G.J., & Magnuson, K. (2013). Investing in preschool programs. *Journal of Economic Perspectives*, *27*(2), 109–132.

142 European Commission. (2018). Proposal for a council recommendation on high quality early childhood education and care systems. Brussels.

143 Dearing, E., Zachrisson, H., Mykletun, A., & Toppelberg, C. (2018). Estimating the consequences of Norway's national scale-up of early childhood education and care (beginning in infancy) for early language skills. *AERA Open, 4*(1).

144 Broekhuizen, M.L., Mokrova, I.L., Burchinal, M.R., & Garrett-Peters, P.T. (2016). Classroom quality at pre-kindergarten and kindergarten and children's social skills and behavior problems. *Early Childhood Research Quarterly*, *36*, 212–222.

145 Duncan, G.J., & Magnuson, K. (2013). Investing in preschool programs. *Journal of Economic Perspectives*, *27*(2), 109–132.

146 Mashburn, A.J., Pianta, R.C., Hamre, B.K., Downer, J.T., Barbarin, O.A., Bryant, D., Burchinal M., Early D.M., & Howes, C. (2008). Measures of classroom quality in prekindergarten and children's development of academic, language, and social skills. *Child Development, 79*(3), 732–749.

147 Martin, M.O., Mullis, I.V.S., & Foy, P. (2011). Age distribution and reading achievement configurations among fourth-grade students in PIRLS 2006. *IERI Monograph Series: Issues and Methodologies in Large-scale Assessments, 4*, 9–33.

148 García-Pérez, J., Hidalgo-Hidalgo, M., & Robles-Zurita, J.A. (2014). Does grade retention affect students' achievement? Some evidence from Spain. *Applied Economics*, *46*(12), 1372–1392.

149 Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. New York: Routledge.

150 Mullis, I.V.S., Martin, M.O., Goh, S., & Prendergast, C. (Eds.). (2017). *PIRLS 2016 encyclopedia: Education policy and curriculum in reading.* Retrieved from http://timssandpirls.bc.edu/pirls2016/encyclopedia/

151 Mejding, J., Neubert, K., & Larsen, R. (2017). Denmark. In I.V.S. Mullis, M.O. Martin, S. Goh, & C. Prendergast (Eds.), *PIRLS 2016 encyclopedia: Education policy and curriculum in reading.* Retrieved from http://timssandpirls.bc.edu/pirls2016/encyclopedia/

152 Wendt, H., Walzebug, A., Bos, W., Smith, D.S., & Bremerich-Vos, A. (2017). Germany. In I.V.S. Mullis, M.O. Martin, S. Goh, & C. Prendergast (Eds.), *PIRLS 2016 encyclopedia: Education policy and curriculum in reading.* Retrieved from http://timssandpirls.bc.edu/pirls2016/encyclopedia/

153 Mullis, I.V.S., Martin, M.O., Goh, S., & Prendergast, C. (Eds.). (2017). *PIRLS 2016 encyclopedia: Education policy and curriculum in reading.* Retrieved from http://timssandpirls.bc.edu/pirls2016/encyclopedia/

154 Torgesen, J. K. (1998). Catch them before they fall: Identification and assessment to prevent reading failure in young children. *American Educator,* (22) 32–39.


BOSTON
COLLEGE

pirls.bc.edu

IEA

TIMSS & PIRLS
International Study Center
Lynch School of Education
BOSTON COLLEGE