

RESEARCH

Open Access



Promoting reading attitudes of girls and boys: a new challenge for educational policy? Multi-group analyses across four European countries

Sonja Nonte^{1*} , Lea Hartwich² and Ariane S. Willems¹

*Correspondence:
snonte@uni-goettingen.de
¹ University of Göttingen,
Göttingen, Germany
Full list of author information
is available at the end of the
article

Abstract

Background: Numerous studies have investigated the relationships between various student, home and contextual factors and reading achievement. However, the relationship between such factors and reading attitudes has been investigated far less, despite the fact that theoretical frameworks of large-scale assessments and school effectiveness research emphasize the importance of non-cognitive outcomes.

Methods: Based on a series of multi-group analyses using a structural equation modeling approach, we elucidate the relationships between student attitudes toward reading and student-, home- and context-related factors. In order to shed light on the role of different educational systems, we make use of the representative data from four national PIRLS samples (France, Germany, Italy and the Netherlands) from 2011 ($n = 16,622$). As gender differences are apparent in reading achievement and reading choices, we apply a multi-group comparative approach in order to control for potential gender-biased estimates caused by measurement non-invariance of the PIRLS instrument *Attitude toward Reading*.

Results: Our results reveal the importance of individual student and home characteristics for promoting students' reading attitudes, particularly the number of books at home and the amount of reading outside school. Our results also indicate that school- and classroom-related factors such as the time spent on reading and the availability of a classroom or school library show no or only little interrelation with students' reading attitudes. These findings are relatively stable in the cross-country comparison.

Conclusions: As expected, our results also support previous findings on gender differences in reading attitudes, as girls show more positive attitudes toward reading than boys. The implications of these results for researchers, politicians and practitioners are discussed.

Keywords: Attitudes toward reading, PIRLS, Multi-group analysis, Educational system

Introduction

The improvement in children's reading competencies is an important challenge for contemporary educators. Reading competency is a crucial skill students must acquire

to successfully navigate today's knowledge-societies and participate in civic life and the workplace (International Reading Association (IRA) 1999). Legislators and researchers have been increasingly aware of the importance of reading, especially but not exclusively for young children, and many countries have developed and implemented initiatives to improve children's reading competencies (Beste et al. 2012; Clark and Rumbold 2006; Lenkeit et al. 2012).

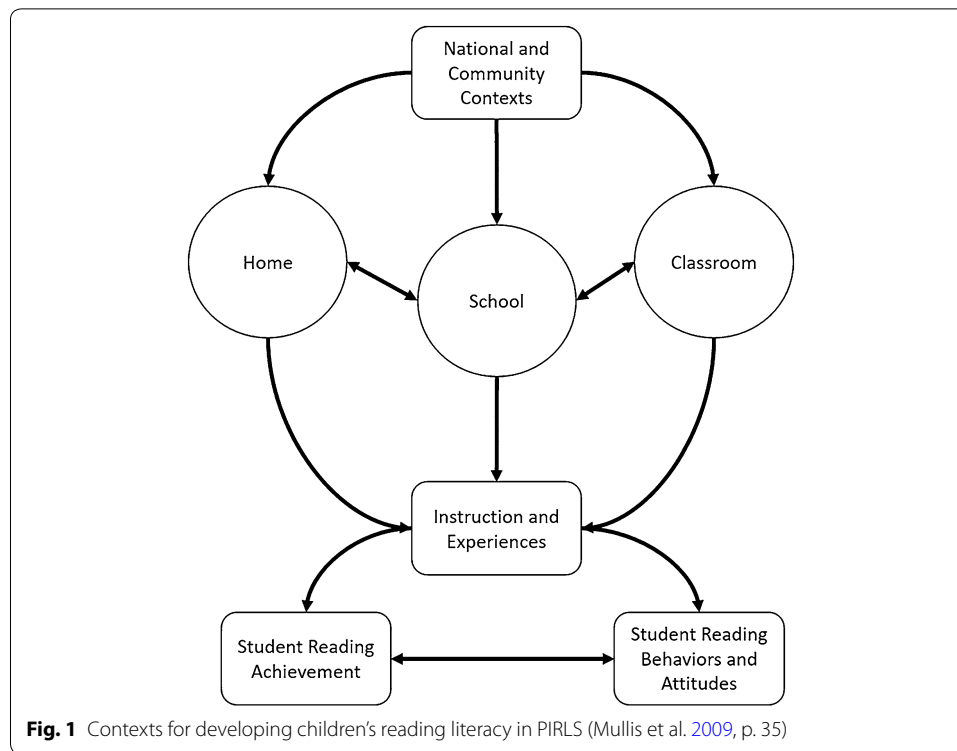
Much of the early educational and psychological research on reading competencies has focused on the cognitive dimension, including capacities such as decoding skills, vocabulary, and text comprehension (Gettys and Fowler 1996). More recent research however underlines the affective dimension of reading competence as well. This perspective is also inherited in the concept of *reading literacy* (Groeben and Hurrelmann 2004). According to Mullis et al. (2009) reading literacy is defined as "the ability to understand and use those written language forms required by society and/or valued by the individual. Young readers can construct meaning from a variety of texts. They read to learn, to participate in communities of readers in school and everyday life, and for enjoyment." (p. 11). Within this understanding, reading literacy is a multidimensional construct that stresses both cognitive and affective factors. In accordance with this conceptual understanding, empirical studies affirm that motivational and volitional factors are vital for developing reading competencies and fostering reading activities (Baker and Wigfield 1999; Guthrie et al. 2000; Petscher 2010; Wigfield et al. 2016).

The *Progress in International Reading Literacy Study* (PIRLS) is one of the most influential studies that utilizes the concept of reading literacy. As an international large-scale assessment study, PIRLS focuses on the reading competencies of students after 4 years of schooling in nearly 50 countries worldwide (Mullis et al. 2012). In PIRLS, three aspects of reading literacy are distinguished: (1) the process of *reading comprehension*, (2) the *purposes for reading*, and (3) individual *reading behaviors and attitudes*.

The major aim of PIRLS is to describe and compare the level of students' reading competencies in different countries and to *explain* the differences in reading competencies by so-called contextual factors. In the PIRLS framework (Mullis et al. 2009), students' reading achievement and students' reading attitudes are conceptualized as a result of students' experiences gained in a variety of contexts (Fig. 1): The most influential contexts are the students' home, school and class environments, all of which are embedded in and influenced by the broader national and community contexts.

Whereas most studies focus on the question of how different contextual factors influence students' reading achievement (Chiu and Chow 2015; Hoglebe and Strietholt 2016; Myrberg and Rosen 2009; Mullis et al. 2012; Wang and Guthrie 2004), the relation between reading attitudes of girls and boys with contextual factors—such as school, home and classroom factors—has not been analyzed in-depth.

Following this observation, the major aim of the present paper is to analyze the extent to which contextual factors are related to the reading attitudes of young readers. Current research reveals the relevance of individual and background characteristics for acquiring a positive attitude toward reading. Although nearly all of these studies highlight the differences between boys and girls as one of the most crucial factors for reading achievement and motivation (Lim et al. 2015; Hemmereichs et al. 2017), none of them controlled for potentially biased estimates due to gender differences in the underlying



survey instruments. Therefore, we not only investigate the impact of contextual factors for promoting students' reading attitudes in general, but we also account for gender differences in these interrelations thoroughly.

In the following, we outline central theoretical assumptions on the concepts of reading attitudes and systemize current research concerning the question on how much contextual factors are linked to reading attitudes—bearing in mind, gender differences. We then present, compare and discuss a series of multi-group analyses we conducted using representative cross-sectional data from four national PIRLS samples (France, Germany, Italy and the Netherlands). After presenting these analyses, we discuss the results, assign them to the theoretical framework, and compare them to research results from different studies to illuminate the role of classroom- and school-related factors for the acquisition of a positive attitude toward reading in conjunction with student (background) characteristics.

The concept of reading attitudes and their relation to reading behavior and reading achievement: an overview

In reading research, the concept of *reading attitudes* has attracted particular attention in the last two decades. In psychological research, an attitude is generally defined as a “pre-disposition to respond in a consistently favorable or unfavorable manner with respect to a given object” (Fishbein and Ajzen 1975, p. 6). Following Alexander and Filler (1976), reading attitudes can be defined as a “system of feelings related to reading which causes the learner to approach or avoid a reading situation” (Alexander and Filler 1976, p. 1). Similarly, Smith (1990) defines reading attitude as “a state of mind, accompanied by feelings and emotions, that makes reading more or less probable” (Smith 1990, p. 215). As

reading attitudes focus on an emotional or feeling-related aspect of reading, they are conceptually viewed as a substantial part of reading motivation (Conradi et al. 2013; Schiefele et al. 2012; Wigfield and Guthrie 1997; Zeinab et al. 2011).

Reading attitudes are assumed to be vitally important because they are likely to influence students' reading behavior—e.g., the amount and breadth of reading—and facilitate the development of reading competencies (Mol and Bus 2011; Sainsbury and Schagen 2004; Wigfield and Guthrie 1997). Early studies show that positive reading attitudes are linked to regular reading throughout the entire lifespan (Cullinan 1987).

In 2000, the International Reading Association (IRA) published a position statement that identified “the development and maintenance of a motivation to read” as a key factor for fostering reading literacy (IRA 2000). The 2011 PIRLS results—similar to the results of previous cycles—showed comparatively positive attitudes of fourth grade students toward reading; however, more than one-third of the students reported that they read only once or twice a month or less (Mullis et al. 2012). These results are particularly alarming considering recent research illustrating that reading attitude and reading behavior are significant predictors for the development of reading literacy (Becker et al. 2010; Guthrie et al. 2000). Seeking causal explanations, Wang and Guthrie (2004) argue that reading literacy is influenced by reading attitudes via the amount of reading. In a longitudinal study, Becker et al. (2010) provide empirical evidence for this assumption, showing that the amount of reading mediates the effect of intrinsic reading motivation on reading literacy.

Conceptually, different strands of research describe reading attitude as a multidimensional construct that is influenced by different factors (Baker and Wigfield 1999; Mathewson 1994). Following the work of Mathewson (1994) and Liska (1984), McKenna et al. (1995) developed a model in which the acquisition of individuals' attitudes toward reading is determined by three interrelated factors: normative beliefs (for example, the belief that reading has high or little value), beliefs on the outcomes of reading, and specific reading experiences. According to this model, an important influence is the social environment that affects people's intentions to read and their expectations concerning the outcomes of reading. Accordingly, researchers highlight the importance of school and classroom settings in the promotion of reading and suggest the implementation of programs that improve attitudes and beliefs by giving students successful reading experiences (McKenna et al. 1995). This argument, which draws upon psychological research, is in line with current school effectiveness research in which student achievement is no longer viewed as the sole or most important educational goal (Krapp and Ryan 2002; Mullis et al. 2006; Pfof et al. 2012). Attitudes are considered important non-cognitive outcomes, which—taking an empirical perspective—have been investigated far less (Teddlie et al. 2006).

From an empirical point of view and in educational practice, the importance of the interplay of individual, family and contextual factors has been emphasized. On the basis of empirical findings on reading, Anderson et al. (1985) proposed seventeen recommendations for becoming a “nation of readers” that are still relevant today and which illustrate that improvement in reading attitudes and achievement is subject to a complex interplay of mechanisms such as educational policy, teacher training, and informal learning at home. Accordingly, the recommendations contain advice for parents (e.g.,

informally teach their children reading and writing), teachers in preschool and kindergarten (e.g., reading readiness programs that focus on reading, writing, and oral language), teachers in schools (e.g., children should spend less time completing workbooks and more time doing independent reading), and schools in general (e.g., well-stocked and managed libraries). Furthermore, the authors argued that the quality of teacher-training programs should be improved and that schools should provide continuing professional development (Anderson et al. 1985, p. 117).

A more recent report issued by the *EU High Level Group of Experts on Literacy* (2012) examines the most effective and efficient ways to improve reading skills in Europe. Here the authors stress the importance of a co-operative approach in which a “broad co-ownership across sectors, policy areas and political groups, service providers, stakeholder organizations, and even ages” is crucial (p. 37). Also, the report offers insights into various country-specific programs for promoting reading skills and attitudes. The list of these country-specific programs is long, and more rigorous evaluation of their effects and the effects of individual-, home-, and school-related factors on reading attitude, motivation, and reading skills is needed to effectively improve children’s reading.

Current research on reading attitudes

Most research concerning reading attitudes focuses on the relationship between reading attitudes and reading achievement (Abu-Hilal 2000; Cheung et al. 2017; Chiu and Chow, 2015; Petscher 2010). According to a meta-analysis conducted by Petscher in 2010, the relationship between reading achievement and reading attitudes is quite moderate. However, it is strongest during the elementary school years and declines with age. Moreover, the relationship between attitudes and achievement appears to be reciprocal: positive attitudes result in higher levels of achievement, which lead to attitudes that are even more positive (Marsh et al. 2005; Mullis et al. 2006; Retelsdorf et al. 2011; Valentine et al. 2004).

A systematic and encompassing analysis that is based on both a solid theoretical framework and a representative database and that addresses the question of which contextual factors influence reading attitudes after controlling for gender differences in an adequate manner is lacking, but several individual studies help clarify the relationship between reading attitudes and student, home, school and classroom characteristics.

Student and home characteristics

Reading attitudes are subject to fluctuations over time throughout childhood. Younger children consistently report a more positive attitude toward reading than older children, and longitudinal studies have found a significant decline over the elementary school years (Alexander and Filler 1976; Kush and Watkins 1996; McKenna et al. 1995). Particularly for younger students, gender is an important predictor for reading attitudes: Girls usually report more positive reading attitudes than boys (Baker and Wigfield 1999; Downing and Leong 1982; Eccles et al. 1993; Kush and Watkins 1996; Logan and Johnston 2009; McKenna et al. 1995; Sainsbury and Schagen 2004; Smith 1990). In addition, girls and boys show differences in their reading choices (Coles and Hall 2002; Merisuo-Storm 2006), frequency of reading (Coles and Hall 2002), motivation to read (Baker and Wigfield 1999; Marinak and Gambrell 2010; Wigfield and Guthrie 1997), subjective

beliefs about reading competencies (Wigfield and Guthrie 1997), values attached to reading (Durik et al. 2006; Eccles et al. 1993; Marinak and Gambrell 2010; Wigfield and Guthrie 1997), and reading competencies (Chiu and McBride-Chang 2006).

It has been argued that the gender differences in reading can—at least to some extent—be explained by the fact that reading is considered a feminine activity (Brophy 1985; Cummings 1994; Sokal and Katz 2008) and is associated with females by both boys and girls from an early age (Millard 1997). This idea is supported by research showing that differences in reading attitudes are explained more appropriately by gender identity rather than sex (McGeown et al. 2012). This has led to the argument that the predominance of female role models and primary school teachers may have adverse effects on the development of boys' reading abilities and interests, which has been refuted (Hanover and Kessels 2011; Helbig 2010). Comparing the findings from PIRLS and the *Programme for International Student Assessment* (PISA), which are targeted at fourth graders respectively 15-year-olds, Shiel and Eivers (2009) discovered that gender differences in reading attitudes are larger for primary than for secondary school students. Regarding the relationship between reading attitudes and achievement, Kennedy (2008) found that girls express more positive attitudes toward reading regardless of their level of reading achievement. Logan and Johnston (2009) report that gender differences are larger for attitudes than achievement, while another study points out significant differences in attitudes but not in reading achievement (McGeown et al. 2012). Logan and Johnston (2009) argue that the crucial influence of gender is not on the factors but on the relationship between them. For example, they describe that boys' reading achievement is linked to their attitudes toward reading, whereas for girls, there is no such link. The relevance of studying the relationship between different factors that are related to reading attitude is emphasized by the inconsistent findings regarding gender differences in several countries. For example, girls outperformed boys in PIRLS 2011 reading tests in almost all participating countries but not in Colombia, Italy, France, Spain, and Israel (Mullis et al. 2012), suggesting that gender differences are widespread but not universal; however, a systematic study of cross-national gender differences in reading attitude is lacking.

Finding ways to engage children in reading and to foster their reading attitude is important because it may improve their reading competence to the extent that it has the potential to compensate for disadvantages in other areas. The influence of socio-economic status on reading achievement, for example, is a well-documented phenomenon and several studies indicate that it can be counteracted or outbalanced by reading engagement (Kirsch et al. 2002). Engagement in reading allows students to generate their own opportunities for learning that can compensate for low family income and educational background (Guthrie et al. 2000). A report by the OECD states that highly engaged students whose parents have the lowest occupational status obtain higher average PISA reading scores than less engaged students from higher socio-economic backgrounds. Therefore, engaging students in reading “may be one of the most effective ways to leverage social change” (OECD 2002). Few studies examined whether children from immigrant and ethnic minority families show different levels of reading attitudes and reading engagement. McKenna et al. (1995) found no effects of ethnic group membership on recreational or academic reading attitudes based on data from children in grades

1–6 in the United States. Based on a sample of fifth- and sixth-grade students in the United States, Baker and Wigfield (1999) found no relationship between family income and ethnicity on children's reading motivation and detected an effect for ethnicity, with African–American students reporting stronger reading motivation than other students.

In addition to individual student's characteristics, such as gender and age, the environment children grow up in also plays an important part in determining their reading attitude and competencies. Because children begin acquiring knowledge before the onset of formal education, it has been argued that the foundations for successful reading achievement are laid at home. "The more knowledge children are able to acquire at home, the greater their chance for success in reading" (Anderson et al. 1985, p. 22). Studies show that the number of books in the family's home positively affects children's reading attitude (Artelt et al. 2001; Schaffner et al. 2013), as do parental education, reading motivation, and home literacy practices (McElvany et al. 2009; Schaffner et al. 2013; Van Steensel 2006).

School and classroom characteristics

Whether in or outside children's immediate home environment, the availability of books is a major prerequisite to becoming an avid reader, making public and school libraries important places, particularly for children from disadvantaged homes (Anderson et al. 1985). Moreover, school libraries, especially if they are well equipped, have been strongly linked to both positive attitudes toward reading and student reading achievement (Lance et al. 1993; Lonsdale 2003) and have been identified as a major pillar of reading promotion at school (Beste et al. 2012).

In addition to libraries, computers are an important tool for acquiring and practicing reading skills in home and school environments. As our societies become increasingly centered around information and technology, digital reading is another reason why advanced literacy is an essential requirement for participation in the labor market and civic life in many regions (Genlott and Grönlund 2013). Studies have shown a positive link between reading literacy and ICT use in secondary school students (Acar 2015) and an improvement in primary school students' progress as a result of a computer-based programs for learning to read and write (Genlott and Grönlund 2013). As with reading, there is a gender gap in the knowledge of and affinity for computers and ICT; however, in this case, it is boys who seem to be at an advantage (Meelissen and Drent 2008). Girls' knowledge and confidence in the realm of technology are topics that should be addressed, but in the context of reading skills and attitude, boys' interest in this area may be used to help them catch up with girls.

Research interest

The aim of this study is to analyze the impact of individual- and home-related factors on reading attitude and investigate the relevance of school- and classroom-related factors, referring to the theoretical framework of PIRLS "Contexts for Developing Children's Reading Literacy" (Fig. 1). Because previous analyses of PIRLS data showed that there are sex differences in student reading achievement in most but not all countries (Mullis et al. 2012), we assume that gender differences in reading attitudes may also differ with high variability depending on their national and community factors. These factors

Table 1 Sample sizes by country (PIRLS 2011)

	Students	Parents	Teachers	Schools
Germany	4000	3210	222	197
France	4438	4126	276	174
Italy	4189	3908	239	202
Netherlands	3995	2284	207	138
Total	16,622	13,528	944	711

are part of the PIRLS *Contexts for Developing Children's Reading Literacy* Framework (Fig. 1) and are contributing to childrens' literacy development via cultural, social, political, and economic factors. To gain more knowledge about the stability of the interrelation between contextual factors and reading attitudes with a special focus on gender differences, four neighboring European countries are selected. It can be assumed that they only slightly differ concerning the above-mentioned factors, so that only minor variability in interrelations due to these factors are expected. Based on this assumption we try to gain a higher amount of validity through using a cross-country comparison.

Utilizing the PIRLS Framework, we analyze the interplay of student and home as well as classroom and school characteristics with students' reading attitude. Within these analyses, gender differences are addressed in the way that the variability in the respective response behavior does not result in gender-biased estimates of the interrelations we are interested in. Moreover, a cross-country comparison is used for further indication of the robustness of the observed effects. This novel approach enables us to gain deeper insights in the significance of context factors for students' reading attitudes. The results can be used as a starting point for policy makers, school administrators, and researchers for the development of programs that can positively affect students' reading attitude, which is fundamental for the improvement of reading literacy across Europe.

Methods

Sample

In our analyses, we use data from the 2011 *Progress in International Reading Literacy Study* (PIRLS 2011). PIRLS 2011 is an international assessment of reading comprehension of mostly fourth-grade students that has been conducted every 5 years (since 2001). The study was developed by the *International Association for the Evaluation of Educational Achievement* (IEA). PIRLS 2011 comprises representative samples of approximately 4000 students from 150 to 200 schools in 49 countries (Mullis et al. 2012). The sample sizes of the PIRLS 2011 data are documented in Table 1.

The data were collected using standardized so-called school, home, and curriculum questionnaires for students, parents, teachers, and principals (Martin and Mullis 2012). Student questionnaires were administered to all students in the sampled class. Data from France, Germany, Italy, and the Netherlands are used for the analysis of gender differences in reading attitude regarding home-, student-, class-, and school-related factors. These countries are members of the OECD and the European Union. They are chosen for a cross-country comparison because it can be argued that these neighboring countries commonly share a major intersection of cultural, political, social, and economic

factors. In France, Germany, Italy, and the Netherlands, school is compulsory at the elementary and lower secondary levels from age 5 or 6 to age 16. In the Netherlands, preprimary (Kindergarten) and primary education consists of 8 years and starts on the first day of the month following a child's fifth birthday (Meelissen and Punter 2015). In France, all children aged 3–5 attended a *maternelle* school, which is free of charge (Colmant 2015), whereas in Germany and Italy, preprimary education is not compulsory and serves children aged from three to six (Palmerio et al. 2015; Wendt et al. 2015). Mullis et al. (2012) provide detailed information about all participating countries in *PIRLS 2011 Encyclopedia*.

Measures

Outcome

Attitude toward reading Students' attitudes toward reading are measured by four statements "I read only if I have to" (reverse coded), "I think reading is boring" (reverse coded), "I would be happy if someone gave me a book as a present", and "I enjoy reading". Students answered each item on a four-point Likert-type rating scale ranging from 1 ('I agree a lot') to 4 ('I disagree a lot'). For the following analyses, the items are recoded in reverse order to indicate that low values refer to low approval.

Covariates

Reading behavior To assess students reading behavior, they were asked how often they read books outside school '*Reading Outside School*' (average of ASBR03A, ASBR03B, ASBR03C, ASBR03D; 1 = never or almost never, 2 = once or twice a month, 3 = once or twice a week; 4 = every day or almost every day) and whether they '*Borrow Books from a Library*' (ASBR04; 0 = no, 1 = yes).

Home context The students' background characteristics used in our analyses are (i) *Spoken Testlanguage at Home* (ASBG03; 0 = test-language is not the major language spoken at home, 1 = test-language is the major language spoken at home) and (ii) *Books at Home* (ASBG04; 1 = 0–10 books; 2 = 11–25 books, 3 = 26–100 books; 4 = 101–200 books; 5 = 200 books and more) from the student survey, as well as (iii) *Children's Books at Home* (ASBH15A; 1 = 0–10, 2 = 11–25, 3 = 26–50, 4 = 51–100, 5 = more than 100) and (iv) *Highest Parental Educational Status* (ASDHEDUP; 1 = some primary, lower-secondary or no school, 2 = finished lower secondary, 3 = finished upper secondary, 4 = finished post-secondary but not university, 5 = finished university or higher)¹ from the parental survey (home questionnaire). Moreover, three indices based on information from the home questionnaire were used to describe students' home environment (Martin and Mullis 2012): The *Parents Like Reading* (ASBHPLR) scale consists of eight items such as 'reading is an important activity in my home' (Cronbach's α .84 to .87). The *Early Literacy Activities Before Beginning Primary School* (ASBHELA) scale comprises nine items such as 'Tell stories' (Cronbach's α .70 to .73). For all indices, high values indicate high availability or high agreement (Martin and Mullis 2012).

¹ https://timssandpirs.bc.edu/timss2011/downloads/T11_UG_Supplement3.pdf.

School and classroom context Teachers were asked if there is a *Classroom Library* in the participating class (ATBR12A; 0=no, 1=yes) and about their sex (ATBG02; *Sex Female* 0=no, 1=yes). They were also asked how many years they have been teaching (ATBG01; *Years Teaching*), if they use *Software for Reading Instruction* (ATBR06G; 0=no, 1=yes), and how much time they spend on reading instruction or reading activities in hours per week (ATBR02A; *Time Spent Reading Instruction/Activities*). Moreover, school principals and department heads reported if the school has a *School Library* (ACBG09; 0=no, 1=yes).

Methods of data analysis

Descriptive analyses were conducted using the IDB Analyser (International Association for the Evaluation of Educational Achievement (IEA) 2013). This software program was developed by the IEA Data Processing and Research Center (DPC) for analyzing data from all IEA surveys. It calculates correct standard errors and uses optimized algorithms for computing means and percentages. Listwise deletion was used.

Additional analyses were conducted using Mplus 7.11 (Muthén and Muthén 1998–2013). First, the construct validity for each country was examined using confirmatory factor analyses. Based on multi-group confirmatory factor analysis (MGCFA) (Asparouhov and Muthén 2012; Steinmetz et al. 2009), the gender-specific measurement invariance for the instrument ‘students’ attitudes toward reading’ was assessed in a stepwise manner (Steenkamp and Baumgartner 1998). These analyses were conducted for each country individually. The data clustering was considered using the *type is complex* option in Mplus. For the non-normality and ceiling effects for the four items of *Students’ Attitudes toward Reading*, a robust estimator (WLSMV) was used (Li 2016). According to Hu and Bentler (1999), the following criteria are used for evaluation of the models: CFI and TLI $\leq .95$; RMSEA $\leq .06$. WRMR is also recommended for categorical data with a value less than or equal to 1.00 indicating a good fit (Hancock and Mueller 2010). Moreover, Cheung and Rensvold (2002) noted that the X^2 -statistic greatly depends on sample size. This also applies to the often-used Likelihood Ratio Test (ΔX^2) for testing nested models. The authors recommend using the difference between two CFIs for comparison of two nested models. “A value of Δ CFI smaller than or equal to .01 indicates that the null hypothesis of invariance should not be rejected” (Cheung and Rensvold 2002, p. 251). Meredith (1993) points out the need of strong factorial invariance as a minimum in order to achieve meaningful comparisons between groups.

Based on these multi-group models considering sex as a grouping variable, stepwise regression analysis was implemented to detect the interrelations between student, home and contextual predictors regarding students’ attitude toward reading. Subsequently, multi-group models were implemented separately for France, Germany, Italy, and the Netherlands.

Even though there is a comparatively high variability of missing data in the home questionnaire (from 7% in Italy up to 43% in the Netherlands), Maximum Likelihood (ML)-based methods are described as adequate procedures for handling missing data (Collins et al. 2001; Peugh and Enders 2016). Particularly for large sample sizes, both ML and Multiple Imputation (MI) result in similar estimates (Dong and Peng 2013). Therefore missing data for all further analyses were handled using the full information maximum

Table 2 Descriptives of students’ (home) characteristics (by country)

Variable	Country							
	Germany		France		Italy		Netherlands	
	M	SE	M	SE	M	SE	M	SE
Spoken test language at home	.80	.01	.78	.01	.79	.01	.78	.01
Books at home***	3.17	.04	3.10	.03	2.74	.03	2.97	.04
Books for children at home***	3.46	.04	3.29	.04	2.68	.03	3.29	.04
Highest parental educational status***	3.47	.04	3.67	.04	3.25	.03	3.76	.04
Parents like reading ***	10.11	.06	9.51	.04	9.81	.05	10.42	.06
Early literacy activities before beginning primary school ***	10.17	.03	9.96	.03	10.47	.03	10.20	.03
Reading outside school***	2.87	.02	3.06	.02	3.10	.01	3.25	.02
Attended preschool	.99	.00	.99	.00	.99	.00	.97	.00
Borrow books from a library***	.75	.01	.84	.01	.71	.01	.83	.01

IDB-analyser: weight by student weight (tot weight)
 * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (results from ANOVAs)

likelihood (FIML) method. The weight is *house weight* (HOUWGT) (Rutkowski et al. 2010). All values apart from binary data were standardized (z-score).

Results

Descriptives

The differences in students’ characteristics are displayed per country (Table 2). The greatest differences between France, Germany, Italy, and the Netherlands can be observed for *Books for Children* at home. Students in Germany generally have more books for children available at home than in the other countries ($F = 22.33, df = 3; p \leq .001$) and ($F = 82.32, df = 3; p \leq .001$), respectively. In the Netherlands, parents obtain higher educational levels than parents in the other countries ($F = 36.03, df = 3; p \leq .001$). On average, parents in the Netherlands also show more positive attitudes toward reading than parents in France, Germany or Italy ($F = 56.04, df = 3; p \leq .001$). Compared to parents in the other countries, more parents in Italy spend time on early literacy activities before their child attends a primary school ($F = 50.21, df = 3; p \leq .001$). Students in Italy and the Netherlands read more often outside school than students in Germany or France ($F = 72.58, df = 3; p \leq .001$). Moreover, more students borrow books from a library in the Netherlands than in the other countries ($F = 39.97, df = 3; p \leq .001$). There was little or no difference in the spoken test language at home or in attendance at a preschool between these countries. Therefore, attendance at a preschool was not recognized in the following analyses. The spoken test language at home and the parents’ highest educational level were used in subsequent analyses to control for disadvantaged home environments.

The means and standard deviations for classroom characteristics are documented in Table 3. Work experience of teachers differ between Germany, France, Italy, and the Netherlands ($F = 27.36, df = 3; p \leq .001$). Italy has the highest number of teachers who have taught many years ($M = 24.06, SE = .27$), and the Netherlands the lowest ($M = 14.48, SE = .78$). In all four countries, teachers were mostly women with Italy having the highest number of female teachers (98%), closely followed by Germany with 91%,

Table 3 Descriptives of classroom and school characteristics (by country)

	Germany		France		Italy		Netherlands	
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Classroom characteristics								
Years teaching***	18.61	.89	16.39	.75	24.06	.72	14.48	.78
Female sex***	.91	.02	.76	.03	.98	.01	.75	.03
Software for reading instruction***	.58	.04	.15	.02	.31	.03	.62	.04
Time spent on reading instruction/activities***	2.39	.15	4.28	.23	3.51	.18	4.25	.34
Classroom library***	.82	.03	.87	.02	.73	.03	.86	.03
School characteristics								
School library*	.78	.04	.68	.04	.84	.04	.82	.04

IDB-analyser: weight by teacher weight

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (results from ANOVAs)

Table 4 Fit indices for confirmatory factor analyses for ‘Students’ Attitude Toward Reading’ (by country)

Model	χ^2	<i>df</i>	$p \leq$	<i>RMSEA</i>	<i>CFI</i>	<i>TLI</i>	<i>WRMR</i>
France	23.539	1	.001	.07	1.00	.98	.72
Germany	12.981	1	.001	.06	1.00	1.00	.52
Italy	10.309	1	.001	.05	1.00	.99	.47
Netherlands	24.856	1	.001	.08	1.00	.99	.66

Weight by house weight

and France and the Netherlands the lowest (74 and 75%, respectively). These country differences are significant ($F = 21.70$, $df = 3$; $p \leq .001$). Moreover, the use of computer software for reading instruction is different in France, Germany, Italy, and the Netherlands ($F = 49.92$, $df = 3$; $p \leq .001$). The most frequent use of computer software concerning reading instruction could be found in the Netherlands and Germany. In these countries, nearly 60% of the teachers use computer software for reading instruction. France show the scarcest use, where only 15% of the teachers use computer software. Moreover, the amount of time spent on reading instruction or activities also differs between these countries. The average time is 4.28 h/week in France ($SE = .23$) and 2.39 h a week in Germany ($SE = .15$). The amount of time spent on reading instruction differs significantly in all four countries ($F = 14.25$, $df = 3$; $p \leq .001$). Many teachers indicate having a classroom library, and the differences are significant ($F = 5.65$, $df = 3$; $p \leq .001$). The highest number can be found in France and the Netherlands, where an average of 87 and 86% of teachers report having a classroom library. In Italy, nearly 73% of the teachers indicate having a classroom library. Many schools have a school library as well, but the amount differs between the countries ($F = 3.42$, $df = 3$; $p \leq .05$). The highest number was in Italy (84%), and the lowest amount was in France (68%).

Empirical structure of ‘Students’ Attitude Toward Reading’

The empirical structure and configural equivalence of students’ attitude toward reading were analyzed using confirmatory factor analyses. The analyses were conducted separately per country. Modification indices indicate a better fit if a correlation for the two

Table 5 Estimated gender differences by country in ‘Students’ Attitude Toward Reading’ with and without considering strict measurement equivalence (ME) (reference group is girls)

	Basic model		Strict MI	
	ΔM (SE)	$p <$	ΔM (SE)	$p <$
France	-.21 (.08)	.01	-.43 (.05)	.001
Germany	-.57 (.07)	.001	-.62 (.05)	.001
Italy	-.57 (.07)	.001	-.62 (.05)	.001
Netherlands	-.64 (.06)	.001	-.58 (.05)	.001

reverse coded items ‘I read only if I have to’ and ‘I think reading is boring’ is specified. Nearly all models met the predetermined criteria regarding acceptable fits, excluding the RMSEA for the models of France and the Netherlands (Table 4). Little (2013) notes that a RMSEA of approximately .08 provides an acceptable model fit. The following analyses are based on these models.

Gender- and country-specific differences in ‘Students’ Attitude Toward Reading’

The measurement invariance was analyzed to detect gender differences using multi-group modeling. The results in Table 5 demonstrate a strict measurement equivalence ($\Delta CFI \leq .01$). Accordingly, the gender differences can be interpreted as meaningful. Gender differences in reading attitude are evident in all four countries. When controlling for measurement equivalence, gender differences are greatest in Germany and Italy and comparably lower in France and the Netherlands. In all four countries, girls show more positive attitudes than boys do.

Impact factors on ‘Students’ Attitude Toward Reading’ from an international perspective

In the next step, a multi-group model was used to investigate the relationship between reading attitude and contextual factors from a cross-country perspective. A multi-group regression model was conducted in a stepwise manner. Student and home background characteristics were included in the model before classroom and school characteristics. The grouping variable is the child’s sex and the weight is house weight. In Mplus 7.11, the factor loadings and intercepts in multi-group analysis are fixed by default.

Students’ (background) characteristics

The results of the multi-group regression model with student and home characteristics show gender differences in *Students’ Attitude Toward Reading* in all four countries (Table 6). The greatest gender differences were found in Italy and the Netherlands ($M\Delta = .77$; $SE_{Italy} = .13$, $SE_{Netherlands} = .17$), and the lowest, but still significant, in France ($M\Delta = .49$; $SE = .14$), revealing that boys showed less positive attitudes toward reading than girls.

The *Spoken Testlanguage at Home* or *Highest Parental Educational Status* were not significant predictors for boys or girls in any of the analyzed countries. There were commonly shared interrelations for *Books at Home* and the amount of *Reading Outside School* with *Attitudes Toward Reading* for both boys and girls. These predictors are

Table 6 Results of multi-group regression analyses of the impact of students’ and home characteristics on ‘Students’ Attitude Toward Reading’ in a cross-country comparison (unstandardized betas, significant effects in italic)

	France		Germany		Italy		Netherlands	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Intercept	.00 <i>b</i>	-.49 (.14) <i>SE</i>	.00 <i>b</i>	-.66 (.16) <i>SE</i>	.00 <i>b</i>	-.77 (.13) <i>SE</i>	.00 <i>b</i>	-.74 (.17) <i>SE</i>
Student and home characteristics								
Spoken test language at home	-.00 (.08)	.02 (.07)	.05 (.09)	-.02 (.10)	.01 (.08)	.06 (.07)	-.01 (.10)	.05 (.08)
Books at home	.13 (.04)	.22 (.04)	.33 (.04)	.23 (.04)	.08 (.04)	.10 (.03)	.20 (.04)	.08 (.04)
Books for children at home	.03 (.04)	.02 (.05)	.07 (.05)	.16 (.04)	.08 (.05)	.04 (.04)	.05 (.05)	.06 (.04)
Highest parental educational status	.03 (.04)	.03 (.04)	.02 (.04)	.00 (.04)	-.01 (.03)	-.01 (.03)	.07 (.04)	-.03 (.04)
Parents like reading	.16 (.04)	.11 (.04)	.05 (.04)	.11 (.04)	.06 (.04)	-.02 (.04)	.04 (.05)	.10 (.04)
Early literacy activities	.06 (.04)	.07 (.04)	.04 (.04)	.00 (.04)	.11 (.03)	.02 (.03)	.04 (.04)	.07 (.03)
Reading outside school	.43 (.03)	.50 (.04)	.28 (.03)	.39 (.04)	.28 (.04)	.33 (.04)	.35 (.04)	.38 (.04)
Borrow books from a library	.14 (.10)	.24 (.08)	.23 (.09)	.37 (.08)	.24 (.08)	.31 (.07)	.26 (.11)	.36 (.09)
<i>R</i> ²	.26	.27	.26	.27	.14	.16	.20	.26
<i>X</i> ²	144.159		119.004		167.596		118.272	
<i>df</i>	60		60		60		60	
<i>p</i>	<.001		<.001		<.001		<.001	
RMSEA	.03		.03		.03		.03	
CFI	.98		.99		.98		.99	
TLI	.98		.99		.98		.99	
WRMR	1.50		1.25		1.54		1.27	

positively linked to attitudes toward reading. *Borrow Books from a Library* was a commonly shared predictor, except for girls in France. Boys and girls in all other analyzed countries benefit from borrowing books from a library with regard to their reading attitudes. Another predictor that shows a significant interrelation with reading attitudes is the *Parents Like Reading* scale for girls and boys in France and the Netherlands and for boys in Germany. *Early Literacy Activities* before primary school were relevant for students in the Netherlands and girls in Italy. There was an interrelation for *Books for Children at Home* with reading attitudes for boys in Germany.

The explained variance of the latent variable *Students’ Attitude Toward Reading* differs by 27% for boys in France and Germany and 14% for girls in Italy. Within all countries, the explained variance for boys was higher than that for girls in the respective country. The fit indices of the respective models reveal good model fits.

In the next step, the interrelation between classroom and school characteristics based on previous analyses was determined (Table 7).

Table 7 shows that the mean differences between boys and girls are constant compared to the model in Table 6, except for the values for France. Controlling for teacher and school characteristics, there is no significant difference between boys and girls in France. Girls in Germany, Italy and the Netherlands have significantly more favorable attitudes

Table 7 Results of multi-group regression analyses of the impact of students’ characteristics on ‘Students’ Attitude Toward Reading’ in a cross-country comparison (unstandardized betas, significant effects in italic)

	France		Germany		Italy		Netherlands	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Intercept	.00 <i>b</i>	-.36 (.21) <i>SE</i>	.00 <i>b</i>	-.66 (.16) <i>SE</i>	.00 <i>b</i>	-.77 (.13) <i>SE</i>	.00 <i>b</i>	-.74 (.24) <i>SE</i>
Student and home characteristics								
Spoken test language at home	-.01 (.08)	-.01 (.07)	.11 (.10)	-.11 (.10)	.03 (.09)	.08 (.07)	.05 (.12)	.02 (.10)
Books at home	.13 (.04)	.20 (.04)	.33 (.05)	.21 (.04)	.07 (.04)	.10 (.04)	.17 (.05)	.06 (.04)
Books for children at home	.00 (.05)	.02 (.05)	.06 (.05)	.18 (.04)	.08 (.04)	.04 (.04)	.07 (.05)	.10 (.05)
Highest parental educational status	.06 (.04)	.05 (.04)	.06 (.04)	.00 (.04)	-.01 (.04)	.00 (.03)	.06 (.04)	-.02 (.04)
Parents like reading	.17 (.04)	.10 (.04)	.02 (.05)	.11 (.04)	.05 (.04)	-.02 (.04)	.08 (.04)	.10 (.04)
Early literacy activities	.08 (.04)	.08 (.04)	.04 (.04)	-.01 (.04)	.11 (.04)	.02 (.03)	.06 (.04)	.06 (.04)
Reading outside school	.43 (.03)	.50 (.05)	.28 (.04)	.37 (.04)	.28 (.04)	.31 (.04)	.38 (.04)	.34 (.05)
Borrow books from a library	.11 (.11)	.26 (.09)	.24 (.10)	.35 (.09)	.25 (.09)	.24 (.07)	.11 (.11)	.44 (.10)
Years teaching	.00 (.04)	.03 (.04)	-.02 (.04)	.08 (.04)	.01 (.04)	.03 (.04)	-.01 (.05)	.01 (.04)
Female sex	-.08 (.13)	-.12 (.15)	-.15 (.15)	.11 (.14)	-.18 (.18)	-.05 (.23)	-.02 (.13)	-.12 (.10)
Software for Reading Instruction	.03 (.01)	.02 (.02)	-.00 (.02)	.03 (.02)	.01 (.02)	.01 (.02)	-.01 (.01)	-.01 (.02)
Time spent on reading instruction/activities	.07 (.04)	-.03 (.04)	.06 (.04)	.03 (.04)	.01 (.04)	.04 (.04)	.06 (.04)	.01 (.03)
Classroom library	.03 (.04)	-.02 (.04)	.06 (.04)	.01 (.04)	.03 (.04)	.07 (.03)	.11 (.03)	-.01 (.02)
School library	.09 (.09)	-.04 (.09)	-.15 (.10)	-.15 (.09)	-.13 (.10)	-.16 (.10)	.19 (.10)	.00 (.12)
R^2	.27	.27	.24	.31	.14	.17	.23	.26
X^2	170.52		146.277		167.596		118.272	
Df	96		96		60		60	
p	<.001		<.001		<.001		<.001	
RMSEA	.02		.02		.03		.03	
CFI	.98		.99		.98		.99	
TLI	.97		.99		.98		.99	
WRMR	1.31		1.10		1.54		1.27	

toward reading than boys. On a four-point scale, the difference for girls is $M\Delta = .66$ in Germany, $M\Delta = .77$ in Italy and $M\Delta = .74$ in the Netherlands. Compared to the model with only student and home characteristics, the explained variance (R^2) is higher for all models when considering classroom and school characteristics. This can also be observed in the models of the boys. The fit indices of the models show good model fits.

The interrelations for student and home characteristics with ‘Students’ Attitude Toward Reading’ remain nearly stable. Thus, the number of *Books at Home*, the amount of *Reading at Home* and the variable *Borrow Books from a Library* are overall significant predictors of reading attitudes, except for girls in France and girls in the Netherlands for the last variable. Moreover, nearly all boys’ models (except for Italy) and the model for girls in France reveal a positive interrelation with the variables *Parents Like Reading* and *Students’ Attitude Toward Reading*. When considering classroom- and school-related factors, there was no commonly shared interrelation for boys and girls in the four countries. The number of years a teacher has been teaching shows a significant linkage for boys in Italy and Germany. The availability of a *Classroom Library* is a relevant predictor for boys in Italy and girls in the Netherlands. Moreover, the availability of a *School Library* shows a significant interrelation only for girls in the Netherlands, whereas the *Use of Software for Reading Instruction* is relevant for girls in France regarding their attitude toward reading.

Discussion and conclusion

Our research identified relevant predictors of reading attitudes of fourth-grade students across four European countries, considering gender differences. The aim was to be able to make recommendations for positively influencing these attitudes, particularly in children with negative attitudes which might harm their educational achievement in the long term.

The initial multi-group comparison of boys’ and girls’ attitudes toward reading across the different countries showed considerable sex differences. Considering the measurement invariance for the instrument *Students’ Attitude Toward Reading*, gender differences in reading attitudes are apparent in all countries, with girls showing a significantly more positive attitude toward reading than boys. These findings are consistent with those reported in the literature (e.g. Baker and Wigfield 1999; Marinak and Gambrell 2010). Gender differences remain stable after considering covariates on student, class and school levels, in Germany, Italy, and the Netherlands—but not in France. The consideration of classroom and school characteristics in the full model leads to non-significant gender differences in France, although the explained variance hardly increases, and none of the predictors on the school level are significant for boys and girls. Only the indicator ‘usage of software for reading instruction’ shows a significant interrelation with reading attitudes for girls. This finding is contrary to our initial assumptions as we expected a positive relationship especially for boys who in general have a higher affinity towards ICT use in school than girls do (Acar 2015). For the other countries in which gender differences remain stable, it is possible that the gender gap was obscured or reduced by other student, classroom or school factors that were not considered.

These analyses are limited by the fact that the data used to evaluate our research question is part of a study that focuses on reading competencies in a cross-national perspective. For our analysis, country-specific characteristics and many process variables (e.g., teaching concepts, parental involvement) must remain unconsidered. Another limitation of this study is the operationalization of reading attitudes, which consists of comparatively few items and does not consider different dimensions of the concept like the

distinction between academic and recreational reading as research by Baker and Wigfield (1999) and Mathewson (1994) have done.

Nonetheless, this secondary analysis of PIRLS data on reading attitudes revealed several relevant predictors from student, home, classroom and school contexts. These findings will be compiled and discussed, and practical implementations will be addressed.

Two of the most influencing factors with regard to home characteristics are the number of books at home and the amount of time students spent on reading outside school. These findings are in line with findings from several studies which address determinants of reading literacy (e.g., Artelt et al. 2001; Schaffner et al. 2013) and highlight the reciprocal effect of reading engagement and reading attitudes (e.g., Marsh et al. 2005; Mullis et al. 2006). Another important activity that is linked to the acquisition of a positive attitude toward reading is borrowing books from a library. Again, this result is consistent with findings from research which figured out that libraries play an important role in students' reading (e.g., Lance et al. 1993; Lonsdale 2003). All these effects are mainly valid for boys and girls so that there is no differential functioning of these considered variables. The amount of books at home, the time students spend on reading at home and borrowing books from a library are important predictors for reading attitudes for boys and girls, also in a cross-country comparison.

The fact that the highest level of educational attainment among parents only plays a minor role in the acquisition of a positive attitude toward reading leads us to the assumption that families with a low income, even with comparable few books at home, can nevertheless support their child by encouraging it to borrow books from a state, school or classroom library to read outside school. This approach is promising and many state libraries already implement different reading programs like reading clubs etc.

Moreover, all these aspects are evident from gender and cross-national perspectives. Only the amount of explained variance in the respective full models that consider student (background), classroom, and school characteristics differ by 14% for girls in Italy and 27% for boys and girls in France. It can be argued that this is due to relevant aspects that have not been considered. Drawing from previous research, other important predictors may be how often parents (for boys especially their fathers) read books to their child (e.g., EU High Level Group of Experts on Literacy, 2012) and reading- and gender-related stereotypes (McGeown et al. 2012). These aspects should receive more detailed attention in the future. Scientists should analyze the intertwining of parental gender role orientations and students' gender roles with students' reading achievement and reading attitudes explicitly to gain more knowledge about mechanisms of gender inequality.

Another interesting aspect is that students' socio-economic background appears to play a minor role in the acquisition of reading attitudes. As noted above earlier, several studies indicate that the socio-economic status can be counteracted or outbalanced by reading engagement (Guthrie et al. 2000; Kirsch et al. 2002). There are no findings in our results that support this assumption and nothing that indicates a social gap regarding reading attitudes, despite the fact that the number of books at home (which is one of the most stable and highly relevant predictors, in particular also in connection with reading achievement) is viewed as an indicator of home literacy resources and is also highly correlated with SES (Krashen et al. 2017; Lim et al. 2015). Nevertheless, parental educational status shows no interrelation with students' attitude toward reading. Despite of

this, for girls and boys in France and for boys in the Netherlands, early literacy activities as well as their parents' likeliness of reading to their child have also been found as important predictors in the home context. This is contrary to findings from current research (e.g. McElvany et al. 2009; Schaffner et al. 2013) and shows different interrelations with respect to sex and country grouping variables. There may be other aspects in the student, home, classroom or school contexts which we have not yet included. Regarding differences in the respective educational systems as explanatory, there is no mandatory preprimary education in the respective countries, except for the Netherlands. Thus this may not be a sufficient explanation for the observed variability in the interrelation of early literacy activities and parents positive attitude toward reading with students' reading attitude.

Surprisingly, the classroom and school characteristics considered appear to be less relevant or not relevant for students' attitudes toward reading. The explained variance for the full model and the model that considers only student (background) characteristics hardly differ from each other. The question of which factors are associated with students' reading attitude if we consider all relevant aspects on the school level still remains. For example, the amount of all-day schools may play an important role, particularly if the schools offer reading activities and reading experiences that can improve students' attitudes and beliefs (McKenna et al. 1995). Thus, the high availability of classroom and/or school libraries in the respective countries shows no interrelation with students' attitude on reading, only the individual use of a library ("borrow books from a library") does. The concept of the availability of a library at school should be extended to offer students significant reading activities and experiences. Policy makers and school administrators may use these findings to expend the availability of a library and to spend more personal and financial resources and effort to make them a suitable place for gaining reading experiences, particularly focusing on extracurricular reading activities. Furthermore, findings from a Dutch longitudinal study with a quasi-experimental design point out the importance of involving students' parents in library programs (Kleijnen et al. 2015).

Although there are significant differences between the respective countries, the time a teacher spends on reading instruction and activities and the usage of computer software for reading instruction do not play important roles for students' reading attitude (so far). Drawing from previous research, it can be argued that boys in particular may profit from reading activities based on computer programs (Genlott and Grönlund 2013; Meelissen and Drent 2008). In our analyses, we did not find any general gender differences regarding the interplay of reading attitude and reading software usage in class. This may be due to only a small number of teachers using computer software for reading instruction, as our results indicate, or a lack of knowledge regarding the implementation level of reading software as a tool to satisfy students' reading interests. Further analyses are needed to close this research gap.

These aspects might indicate an untapped potential for students' acquisition of a positive attitude toward reading, especially regarding the suggested method of the EU High Level Group of Experts on Literacy (2012) to improve reading skills in Europe. In this manner, a co-operative approach of different sectors, policy areas, service providers and stakeholder organizations is needed. Our results reveal the high relevance of individual students' and home characteristics and classroom and school characteristics appear to

be of minor relevance, although theoretical models (e.g., McKenna et al. 1995; Mathewson 1994) note the importance of the social environment (particularly school and classroom settings; McKenna et al. 1995) for acquiring a positive attitude toward reading. The interplay of contextual factors, especially from classroom and school contexts, on reading attitudes of poor readers should be investigated, as this can be a promising approach for engaging students in reading to leverage social change (OECD 2002). Finally, future research should employ more longitudinal studies with representative samples to gain empirical evidence on how to foster students' reading attitudes to promote students reading achievement and enable their cultural and social participation.

Authors' contributions

Manuscript was jointly drafted by SN, LH and ASW. All authors read and approved the final manuscript.

Author details

¹ University of Göttingen, Göttingen, Germany. ² University of Osnabrück, Osnabrück, Germany.

Acknowledgements

Not applicable.

Competing interests

Not applicable.

Availability of data and materials

PIRLS 2011 (<https://timssandpirls.bc.edu/pirls2011/international-database.html>).

Ethics approval and consent to participate

Not applicable.

Funding

Not applicable.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 5 December 2017 Accepted: 16 May 2018

Published online: 28 May 2018

References

- Abu-Hilal, M. M. (2000). A structural model of attitudes towards school subjects, Academic Aspiration and Achievement. *Educational Psychology*, 20(1), 75–84. <https://doi.org/10.1080/0144341001103399>.
- Acar, T. (2015). Examination of the PISA 2009 reading skills and information and communication technology (ICT) use skills of Turkish students. *Educational Research and Reviews*, 10(13), 1825–1831. <https://doi.org/10.5897/ERR2015.231>.
- Alexander, J. E., & Filler, R. C. (1976). *Attitudes and reading*. Newark: International Reading Association.
- Anderson, R. C., Hiebert, E. H., Scott, J. A., & Ian Wilkinson, A. G. (1985). *Becoming a nation of readers: The report of the Commission on Reading*. Washington, D.C.: National Academy of Education.
- Artelt, C., Schiefele, U., & Schneider, W. (2001). Predictors of reading literacy. *European Journal of Psychology of Education*, 16(3), 363–383. <https://doi.org/10.1007/BF03173188>.
- Asparouhov, T., & Muthén, B. O. (2012). *Multiple Group Multilevel Analysis*. Retrieved from <https://www.statmodel.com/examples/webnotes/webnote16.pdf>. Accessed 21 November 2017.
- Baker, L., & Wigfield, A. (1999). Dimensions of children's motivation for reading and their relations to reading activity and reading achievement. *Reading Research Quarterly*, 34(4), 452–477. <https://doi.org/10.1598/RRQ.34.4.4>.
- 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. <https://doi.org/10.1037/a0020084>.
- Beste, G., Franke, C., Gutzmann, M., Hattendorf, E., Hoppe, I., Pilz, A., et al. (2012). *Handreichung zur Förderung von Lesekompetenz in der Schule: Für die Jahrgangsstufen 1 bis 10 in Grundschulen und allen weiterführenden Schulen*. Berlin: Ludwigsfelde-Struveshof: LISUM.
- Brophy, J. (1985). Interactions of male and female students with male and female teachers. In C. B. Marrett (Ed.), *Wilkinson LC* (pp. 115–142). Educational psychology. Gender influences in classroom interaction. Orlando: Academic Press.
- Cheung, W. M., Lam, J. W. I., Au, D. W. H., So, W. W. Y., Huang, Y., & Tsang, H. W. H. (2017). Explaining student and home variance of Chinese reading achievement of the PIRLS 2011 Hong Kong. *Psychology in the Schools*, 54(9), 889–904. <https://doi.org/10.1002/pits.22041>.
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 9(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5.

- Chiu, M. M., & Chow, B. W.-Y. (2015). Classmate characteristics and student achievement in 33 countries: Classmates' past achievement, family socioeconomic status, educational resources, and attitudes toward reading. *Journal of Educational Psychology, 107*(1), 152–169. <https://doi.org/10.1037/a0036897>.
- Chiu, M. M., & McBride-Chang, C. (2006). Gender, context, and reading: A comparison of students in 43 countries. *Scientific Studies of Reading, 10*(4), 331–362. https://doi.org/10.1207/s1532799xssr1004_1.
- Clark, C., & Rumbold, K. (2006). *Reading for Pleasure: A Research Overview*. Retrieved from National Literacy Trust website: <files.eric.ed.gov/fulltext/ED496343.pdf>. Accessed 21 November 2017.
- Coles, M., & Hall, C. (2002). Gendered readings: Learning from children's reading choices. *Journal of Research in Reading, 25*(1), 96–108. <https://doi.org/10.1111/1467-9817.00161>.
- Collins, L. M., Schafer, J. L., & Kam, C. M. (2001). A comparison of inclusive and restrictive strategies in modern missing-data procedures. *Psychological Methods, 6*(4), 330–351.
- Colmant, M. France. In *TIMSS 2015 Encyclopedia*. Retrieved from <http://timssandpirls.bc.edu/timss2015/encyclopedia/countries/france/>. Accessed 21 November 2017.
- Conradi, K., Jang, B. G., Bryant, C., Craft, A., & McKenna, M. C. (2013). Measuring adolescents' attitudes toward reading: A classroom survey. *Journal of Adolescent & Adult Literacy, 56*(7), 565–576. <https://doi.org/10.1002/JAAL.183>.
- Cullinan, B. E. (1987). *Children's literature in the reading program*. Newark: International Reading Association.
- Cummings, R. (1994). 11th graders view gender differences in reading and math. *Journal of Reading, 38*(3), 196–199.
- Dong, Y., & Peng, C.-Y. J. (2013). Principled missing data methods for researchers. *SpringerPlus, 2*(1), 222. <https://doi.org/10.1186/2193-1801-2-222>.
- Downing, J., & Leong, C. K. (1982). *Psychology of reading*. New York: Macmillan.
- Durik, A. M., Vida, M., & Eccles, J. S. (2006). Task values and ability beliefs as predictors of high school literacy choices: A developmental analysis. *Journal of Educational Psychology, 98*(2), 382–393. <https://doi.org/10.1037/0022-0663.98.2.382>.
- Eccles, J., Wigfield, A., Harold, R. D., & Blumenfeld, P. (1993). Age and gender differences in children's self- and task perceptions during elementary school. *Child Development, 64*(3), 830–847. <https://doi.org/10.1111/j.1467-8624.1993.tb02946.x>.
- EU high level group of experts on literacy. (2012). *Final Report, September 2012*. Luxembourg. Retrieved from European Commission website: ec.europa.eu/education/policy/school/doc/literacy-report_en.pdf. Accessed 21 November 2017.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Addison-Wesley series in social psychology. Reading: Addison-Wesley.
- Genlott, A. A., & Grönlund, Å. (2013). Improving literacy skills through learning reading by writing: The iWTR method presented and tested. *Computers & Education, 67*, 98–104. <https://doi.org/10.1016/j.compedu.2013.03.007>.
- Gettys, C. M., & Fowler, F. (1996). *The Relationship of Academic and Recreational Reading Attitudes: School Wide: A Beginning Study*. Annual Meeting of the Mid-South Regional Education Association, Tuscaloosa. Retrieved from <http://files.eric.ed.gov/fulltext/ED402568.pdf>.
- Groeben, N., & Hurrelmann, B. (Eds.). (2004). *Lesesozialisation in der Mediengesellschaft: Ein Forschungsüberblick*. Lesesozialisation und Medien. Tübingen: Niemeyer.
- Guthrie, J. T., Wigfield, A., & VonSecker, C. (2000). Effects of integrated instruction on motivation and strategy use in reading. *Journal of Educational Psychology, 92*(2), 331–341. <https://doi.org/10.1037/0022-0663.92.2.331>.
- Hancock, G. R., & Mueller, R. O. (Eds.). (2010). *The reviewer's guide to quantitative methods in the social sciences*. New York: Routledge.
- Hannover, B., & Kessels, U. (2011). Sind Jungen die neuen Bildungsverlierer? Empirische Evidenz für Geschlechterdisparitäten zuungunsten von Jungen und Erklärungsansätze. *Zeitschrift für Pädagogische Psychologie, 25*(2), 89–103. <https://doi.org/10.1024/1010-0652/a000039>.
- Helbig, M. (2010). Sind Lehrerinnen für den geringeren Schulerfolg von Jungen verantwortlich? *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie, 62*(1), 93–111. <https://doi.org/10.1007/s11577-010-0095-0>.
- Hemmerechts, K., Agirdag, O., & Kavadias, D. (2017). The relationship between parental literacy involvement, socio-economic status and reading literacy. *Educational Review, 69*(1), 85–101. <https://doi.org/10.1080/00131911.2016.1164667>.
- Hogrebe, N., & Strietholt, R. (2016). Does non-participation in preschool affect children's reading achievement? International evidence from propensity score analyses. *Large-scale Assessments in Education, 4*(1), 3083. <https://doi.org/10.1186/s40536-016-0017-3>.
- Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. <https://doi.org/10.1080/10705519909540118>.
- International Association for the Evaluation of Educational Achievement (IEA) (2013). IDB analyzer (Computer Software).
- International Reading Association. (1999). Adolescent literacy: A position statement. Retrieved from http://www.insinc.com/ministryofeducation/20041007/assets/International_Reading_Association.pdf. Accessed 21 February 2018.
- International Reading Association. (2000). Excellent Reading Teachers. A Position Statement of the International Reading Association. Newark, Del. Retrieved from https://www.literacyworldwide.org/docs/default-source/where-we-stand/excellent-reading-teachers-position-statement.pdf?sfvrsn=d44ea18e_6. Accessed 21 February 2018.
- Kennedy, A. (2008). *Examining Gender and Fourth Graders' Reading Habits and Attitudes in PIRLS 2001 and 2006*. Chestnut Hill, MA. Retrieved from <citeaserx.ist.psu.edu/viewdoc/download?doi=10.1.1.431.7242&rep=rep1&type=pdf>. Accessed 21 February 2018.
- Kirsch, I., de Jong, J., Lafontaine, D., McQueen, J., Mendelovits, J., & Monseur, C. (2002). *Reading for change: Performance and engagement across countries: Results from PISA 2000*. Paris: Organisation for Economic Co-operation and Development.
- Kleijnen, E., Huysmans, F., Ligtoet, R., & Elbers, E. (2015). Effect of a school library on the reading attitude and reading behaviour in non-western migrant students. *Journal of Librarianship and Information Science, 49*(3), 269–286. <https://doi.org/10.1177/0961000615622560>.

- Krapp, A., & Ryan, R. M. (2002). Selbstwirksamkeit und Lernmotivation. In M. Jerusalem & D. Hopf (Eds.), *Zeitschrift für Pädagogik, Beiheft. Selbstwirksamkeit und Motivationsprozesse in Bildungsinstitutionen* (Vol. 44, pp. 54–82). Weinheim: Beltz.
- Krashen, S. D., Lee, S., & Lao, C. (2017). *Comprehensible and compelling: The causes and effects of free voluntary reading*. Santa Barbara: Libraries Unlimited, an imprint of ABC-CLIO LLC.
- Kush, J. C., & Watkins, M. W. (1996). Long-term stability of children's attitudes toward reading. *The Journal of Educational Research*, 89(5), 315–319. <https://doi.org/10.1080/00220671.1996.9941333>.
- Lance, K. C., Welborn, L., & Hamilton-Pennell, C. (1993). *The impact of school library media centers on academic achievement*. Castle Rock: Hi Willow Research and Pub.
- Lenkeit, J., Goy, M., & Schwippert, K. (2012). The Impact of PIRLS in Germany. In K. Schwippert & J. Lenkeit (Eds.), *Studien zur International und Interkulturell Vergleichenden Erziehungswissenschaft* (Vol. 13, pp. 85–105). Progress in reading literacy in national and international context. The impact of PIRLS 2006 in 12 countries Münster: Waxmann.
- Li, C.-H. (2016). Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares. *Behavior Research Methods*, 48(3), 936–949. <https://doi.org/10.3758/s13428-015-0619-7>.
- Lim, H. J., Bong, M., & Woo, Y.-K. (2015). Reading attitude as a mediator between contextual factors and reading behavior. *Teachers College Record*, 117(1), 1–36.
- Liska, A. E. (1984). A critical examination of the causal structure of the Fishbein/Ajzen attitude-behavior model. *Social Psychology Quarterly*, 47(1), 61–74. <https://doi.org/10.2307/3033889>.
- Little, T. D. (2013). *Longitudinal structural equation modeling*. New York: Guildford.
- Logan, S., & Johnston, R. (2009). Gender differences in reading ability and attitudes: Examining where these differences lie. *Journal of Research in Reading*, 32(2), 199–214. <https://doi.org/10.1111/j.1467-9817.2008.01389.x>.
- Lonsdale, M. (2003). *Impact of school libraries on student achievement: A review of the research: report for the Australian school library association*. Camberwell Victoria: School Library Association.
- Marinak, B. A., & Gambrell, L. B. (2010). Reading motivation: Exploring the elementary gender gap. *Literacy Research and Instruction*, 49(2), 129–141. <https://doi.org/10.1080/19388070902803795>.
- Marsh, H. W., Trautwein, U., Lüdtke, O., Köller, O., & Baumert, J. (2005). Academic self-concept, interest, grades, and standardized test scores: Reciprocal effects models of causal ordering. *Child Development*, 76(2), 397–416. <https://doi.org/10.1111/j.1467-8624.2005.00853.x>.
- Martin, M. O., & Mullis, I. V. S. (Eds.). (2012). *Methods and procedures in TIMSS and PIRLS 2011*. Chestnut Hill: International Study Center.
- Mathewson, G. C. (1994). Toward a comprehensive model of affect in the reading process. In H. Singer & R. B. Ruddel (Eds.), *Theoretical models and processes of reading* (3rd ed., pp. 841–856). Delaware: International Reading Association.
- McElvany, N., Becker, M., & Lüdtke, O. (2009). Die Bedeutung familiärer Merkmale für Lesekompetenz, Wortschatz, Lesemotivation und Leseverhalten. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, 41(3), 121–131. <https://doi.org/10.1026/0049-8637.41.3.121>.
- McGeown, S., Goodwin, H., Henderson, N., & Wright, P. (2012). Gender differences in reading motivation: Does sex or gender identity provide a better account? *Journal of Research in Reading*, 35(3), 328–336. <https://doi.org/10.1111/j.1467-9817.2010.01481.x>.
- McKenna, M. C., Kear, D. J., & Ellsworth, R. A. (1995). Children's attitudes toward reading: A national survey. *Reading Research Quarterly*, 30(4), 934–956. <https://doi.org/10.2307/748205>.
- Meelissen, M. R. M., & Drent, M. (2008). Gender differences in computer attitudes: Does the school matter? *Computers in Human Behavior*, 24(3), 969–985. <https://doi.org/10.1016/j.chb.2007.03.001>.
- Meelissen, M. R. M., & Punter, A. Netherlands. In *TIMSS 2015 Encyclopedia*. Retrieved from <http://timssandpirls.bc.edu/timss2015/encyclopedia/countries/netherlands/>. Accessed 21 November 2017.
- Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika*, 58(4), 525–543. <https://doi.org/10.1007/BF02294825>.
- Merisuo-Strom, T. (2006). Girls and Boys Like to Read and Write Different Texts. *Scandinavian Journal of Educational Research*, 50(2), 111–125. <https://doi.org/10.1080/00313830600576039>.
- Millard, E. (1997). Differently literate: Gender identity and the construction of the developing reader. *Gender and Education*, 9(1), 31–48. <https://doi.org/10.1080/09540259721439>.
- Mol, S. E., & Bus, A. G. (2011). To read or not to read: A meta-analysis of print exposure from infancy to early adulthood. *Psychological Bulletin*, 137(2), 267–296. <https://doi.org/10.1037/a0021890>.
- Mullis, I. V. S., Kennedy, A. M., Martin, M. O., & Sainsbury, M. (2006). *PIRLS 2006 assessment framework and specifications: Progress in international reading literacy study* (2nd ed.). Chestnut Hill: TIMSS & PIRLS International Study Center, Boston College.
- Mullis, I. V. S., Martin, M. O., Foy, P., & Drucker, K. T. (Eds.) (2012). *PIRLS 2011 international results in reading*. Chestnut Hill: TIMSS & PIRLS International Study Center, Boston College.
- Mullis, I. V. S., Martin, M. O., Kennedy, A. M., Trong, K., & Sainsbury, M. (2009a). *PIRLS 2011 assessment framework*. Chestnut Hill: TIMSS & PIRLS International Study Center, Boston College.
- Mullis, I. V. S., Martin, M. O., Minnich, C. A., Drucker, K. T., & Ragan, M. A. (2009b). *PIRLS 2011 encyclopedia: education policy and curriculum in reading*. Chestnut Hill: TIMSS & PIRLS International Study Center, Boston College.
- Muthén, B. O., & Muthén, L. K. (1998–2013). *Mplus (Computer Software)*. Los Angeles: Muthén & Muthén.
- Myrberg, E., & Rosen, M. (2009). Direct and indirect effects of parents' education on reading achievement among third graders in Sweden. *The British journal of educational psychology*, 79(4), 695–711. <https://doi.org/10.1348/000709909X453031>.
- Organisation for Economic Co-operation and Development (OECD). (2002). *OECD reports emphasise reading skills, teacher supply as keys to educational success*. Retrieved from http://www.oecd.org/education/school/oecdreportsemphasise_readingskillsteachersupplyaskeystoeducationalsuccess.htm. Accessed 21 February 2018.
- Palmerio, L., Codella, S., Felici, C., & Pietracci, R. Italy. In *TIMSS 2015 Encyclopedia*. Retrieved from <http://timssandpirls.bc.edu/timss2015/encyclopedia/countries/italy/>. Accessed 21 November 2017.
- Petscher, Y. (2010). A meta-analysis of the relationship between student attitudes towards reading and achievement in reading. *Journal of Research in Reading*, 33(4), 335–355. <https://doi.org/10.1111/j.1467-9817.2009.01418.x>.

- Peugh, J. L., & Enders, C. K. (2016). Missing data in educational research: A review of reporting practices and suggestions for improvement. *Review of Educational Research*, 74(4), 525–556. <https://doi.org/10.3102/00346543074004525>.
- Pfost, M., Dörfler, T., & Artelt, C. (2012). Reading competence development of poor readers in a German elementary school sample: An empirical examination of the Matthew effect model. *Journal of Research in Reading*, 35(4), 411–426. <https://doi.org/10.1111/j.1467-9817.2010.01478.x>.
- Retelsdorf, J., Köller, O., & Möller, J. (2011). On the effects of motivation on reading performance growth in secondary school. *Learning and Instruction*, 21(4), 550–559. <https://doi.org/10.1016/j.learninstruc.2010.11.001>.
- Rutkowski, L., Gonzalez, E., Joncas, M., & von Davier, M. (2010). International large-scale assessment data: issues in secondary analysis and reporting. *Educational Researcher*, 39(2), 142–151. <https://doi.org/10.3102/0013189X10363170>.
- Sainsbury, M., & Schagen, I. (2004). Attitudes to reading at ages nine and eleven. *Journal of Research in Reading*, 27(4), 373–386. <https://doi.org/10.1111/j.1467-9817.2004.00240.x>.
- Schaffner, E., Schiefele, U., & Schmidt, M. (2013). Die Bedeutung des familiären Hintergrundes für die Lesemotivation und Lesehäufigkeit von Gymnasialschülern. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, 45(3), 131–141. <https://doi.org/10.1026/0049-8637/a000085>.
- 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. <https://doi.org/10.1002/RRQ.030>.
- Shiel, G., & Eivers, E. (2009). International comparisons of reading literacy: What can they tell us? *Cambridge journal of education*, 39(3), 345–360. <https://doi.org/10.1080/03057640903103736>.
- Smith, M. C. (1990). A longitudinal investigation of reading attitude development from childhood to adulthood. *Journal of Educational Research*, 83(4), 215–219. <https://doi.org/10.1080/00220671.1990.10885958>.
- Sokal, L., & Katz, H. (2008). Effects of technology and male teachers on boys' reading. *Australian Journal of Education*, 52(1), 81–94. <https://doi.org/10.1177/000494410805200106>.
- Steenkamp, J.-B. E. M., & Baumgartner, H. (1998). Assessing measurement invariance in cross-national consumer research. *Journal of Consumer Research*, 25(1), 78–107. <https://doi.org/10.1086/209528>.
- Steinmetz, H., Schmidt, P., Tina-Booh, A., Wieczorek, S., & Schwartz, S. H. (2009). Testing measurement invariance using multigroup CFA: Differences between educational groups in human values measurement. *Quality and Quantity*, 43(4), 599–616. <https://doi.org/10.1007/s11135-007-9143-x>.
- Teddlie, C., Reynolds, D., & Sammons, P. (2006). The methodology and scientific properties of school effectiveness research. In C. Teddlie & D. Reynolds (Eds.), *The international handbook of school effectiveness research* (pp. 55–132). London: Routledge.
- Valentine, J. C., DuBois, D. L., & Cooper, H. (2004). The relation between self-beliefs and academic achievement: A meta-analytic review. *Educational Psychologist*, 39(2), 111–133. https://doi.org/10.1207/s15326985ep3902_3.
- van Steensel, R. (2006). Relations between socio-cultural factors, the home literacy environment and children's literacy development in the first years of primary education. *Journal of Research in Reading*, 29(4), 367–382. <https://doi.org/10.1111/j.1467-9817.2006.00301.x>.
- Wang, J. H.-Y., & Guthrie, J. T. (2004). Modeling the effects of intrinsic motivation, extrinsic motivation, amount of reading, and past reading achievement on text comprehension between US and Chinese students. *Reading Research Quarterly*, 39(2), 162–186. <https://doi.org/10.1598/RRQ.39.2.2>.
- Wendt, H., Smith, D. S., & Bos, W. Germany. In: *TIMSS 2015 Encyclopedia*. Retrieved from <http://timssandpirls.bc.edu/timss2015/encyclopedia/countries/germany/>. Accessed 21 November 2017.
- Wigfield, A., Gladstone, J., & Turci, L. (2016). Beyond cognition: Reading motivation and reading comprehension. *Child Development Perspectives*, 10(3), 190–195. <https://doi.org/10.1111/cdep.12184>.
- Wigfield, A., & Guthrie, J. T. (1997). Relations of children's motivation for reading to the amount and breadth or their reading. *Journal of Educational Psychology*, 89(3), 420–432. <https://doi.org/10.1037/0022-0663.89.3.420>.
- Zeinab, M., Habibah, E., & Rosnaini, M. (2011). A comparison of the reading motivation and reading attitude of students with dyslexia and students without dyslexia in the elementary schools in Ilam, Iran. *International Journal of Psychological Studies*, 3(1), 17. <https://doi.org/10.5539/ijps.v3n1p17>.

Submit your manuscript to a SpringerOpen® journal and benefit from:

- Convenient online submission
- Rigorous peer review
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

Submit your next manuscript at ► springeropen.com
