Peer-reviewed article

The impact of Home Language and Home Resources on Reading Achievement in ten-year-olds in Norway; PIRLS 2016

Olaug Strand[1]* og Knut Schwippert[2]
[1]Norwegian Reading Centre, University of Stavanger and [2]University of Hamburg

Abstract
The aim of the current study was to examine the associations between a child's home language, home resources for learning to read and reading achievement. Whereas the role of a child's first language in second language learning and literacy skills has shown contradictory results, there is an established body of empirical evidence documenting the relationship between home resources and academic achievement. The study was conducted to extend existing knowledge on the relative contribution of home language and home resources on reading achievement. Using data from the Norwegian participation in Progress in International Reading Literacy Study (PIRLS) 2016, fifth grade, mean age 10.8 years (n = 4232), regression analysis reveals, overall, that home resources is more strongly related to reading achievement than a child's home language. In the search for extended knowledge about the complex mechanisms behind achievement differences, we argue that several factors in addition to home language need to be considered, so that any initiative that is identified as effective to compensate for diversity will be beneficial for all students who need additional support in their reading development.

Keywords: *Language Minority Learners; Reading Achievement; Home Resources for Learning to Read; Achievement gap*

Received: May, 2018; Accepted: January, 2019; Published: April, 2019

Introduction

Norway, a country with approximately 5.2 million inhabitants, is experiencing a demographic change. One main reason for this change in its population composition is the last decade's increase in immigration (Dzamarija, 2017). In 2016, children with an immigrant background[1] aged between 6 and 15 years formed 16% of the

[1]Including children born in the country with two parents born abroad, and children not born in the country with both parents born abroad.

*Correspondence to: Olaug Strand, Universitetet i Stavanger, Postboks 8600 Forus, 4036 Stavanger. Epost: olaug.strand@uis.no

Citation: O. Strand og K. Schwippert. "The impact of Home Language and Home Resources on Reading Achievement in ten-year-olds in Norway, PIRLS 2016" Nordic Journal of Literacy Research, Vol. 5(1), 2019, pp. 1–17. http://dx.doi.org/10.23865/njlr.v5.1260

student population enrolled in compulsory schools (Steinkellner, 2017) as compared to 10.4% in 2011 (Bakken & Elstad, 2012, p. 133). Moreover, the settlement patterns of immigrants have changed during the last five years. Whereas people with immigrant background were more likely to settle in urban areas, there is now a more equal immigrant settlement between urban and rural areas and in schools (Bakken & Elstad, 2012; Stambøl, 2013). In light of these demographic changes, it is worrying that large-scale school comparison studies indicate that language minority (LM) learners[2] in Norway demonstrate lower levels in reading achievement than their native Norwegian-speaking peers; for example, in PIRLS[3] (Strand, Wagner, & Foldnes, 2017), in PISA[4] (Kjærnsli & Jensen, 2016; Roe & Hvistendahl, 2009), and in National Tests in Reading, Math and English[5] (Statistics Norway, 2018). The Norwegian situation is far from unique. The achievement gap between LM learners and native-speaking students is an ongoing debate topic within educational science, not only in Norway but also in other European countries as well as in the U.S. and Canada. (Ladson-Billings, 2006; NCES, 2015; OECD, 2015; Kieffer, 2011; Lesaux, Koda, Siegel, & Shanahan, 2006).

Whereas research on the role of a child's first language in second language acquisition and literacy skills has shown contradictory results (for a review, see Melby-Lervåg & Lervåg, 2011b), there is an established body of empirical evidence arguing that a child's social background is strongly associated with educational achievement (e.g., Bakken, 2014; Kieffer, 2011; Lauglo, 2010; Sirin, 2005). However, the relative contribution of home language and social background on reading achievement is not all clear (e.g. Kistemaker & Broeder, 2014; Randen, 2015). Hence, the current study seeks to extend the existing research by providing a nuanced description of the relative importance of students' home language and student's home resources for learning to read on reading achievement in Norwegian ten-year-olds.

LM learners and the theory of discourses

It is well known that many LM learners; students who come from homes in which a language other than the societal language is primarily used, experience the dual challenge of developing sophisticated literacy skills while at the same time acquiring the language of instruction (August & Shanahan, 2006). Developmental views of reading suggest that reading growth is cumulative, that is, later skills build on earlier skills (e.g., Snow, Bruns, & Griffin, 1998). Developing fundamental precursors to reading in early childhood and before starting formal reading instruction facilitates learning to decode words, which further facilitates development of word reading (RAND Reading Study Group, 2002). Fluent word reading offers opportunities to gain language

[2]We define LM learners as those students who come from homes in which a language other than Norwegian is the primary language spoken. See next paragraph for further descriptions.
[3]Progress in International Reading Study.
[4]Programme for International Student Assessment.
[5]National tests assessing reading, math and English in Norwegian in grades 5, 8 and 9.

knowledge that is important for understanding texts (Kieffer, 2011; RAND Reading Study Group, 2002).

According to sociolinguistic approaches embedded in New Literacy Studies, the development of reading literacy skills is not only dependent on cognitive processes but also on social processes such as relationships in a child's home environment and social background (Cummins, 1991). Embodied in a New Literacy Study theoretical framework, "Literacy has no effect – indeed, no meaning – apart from particular cultural contexts in which it is used and it has different effects in different contexts" (Gee, 2015, p. 90). The term "discourse" is elaborated in, among others, Gee's epoch-making article *What is literacy?* (1989).

According to Gee's theory of discourses, a primary discourse refers to where we learn our first things and what these are, usually related to the social and cultural interactions happening in the home and in the family. A secondary discourse is what we develop outside our homes and primary discourses, e.g., the school (Gee, 1989). According to Gee, discourses are highly related to the distribution of social power and hierarchical structure in society. Mastering the dominant discourse can lead to the acquisition of benefits, e.g., academic results. Hence, a gap between primary and secondary discourses may be a useful theoretical approach to investigate achievement differences in school between LM learners and native-speaking students. A growing body of research indicates that the complex achievement gap between LM learners and native-speaking students is not only about the language background, but also intertwines with a student's social background (e.g., Bakken & Hyggen, 2018; Ladson-Billings, 2006; Lesaux & Kieffer, 2010).

The role of home language in reading achievement

Differences between the child's home language and the required school language, are often seen as a source of problems with the linguistic diversity in second-language learners (e.g., August & Shanahan, 2006; Cummins, 1991; Rydland, 2007). Research interests concerning the role of the first language in second-language learning and literacy skills have produced a large number of cross-sectional studies providing ambiguous findings; hence there are disagreements in the literature on the magnitude of cross-linguistic transfer (for a review, see Melby-Lervåg & Lervåg, 2011a, 2011b).

Few longitudinal studies have been conducted with LM learners (Lesaux et al., 2006), so it is unclear how these learners grow in second-language reading as they move beyond the primary grades and through the educational system. However, Kieffer (2011) examined the roles of LM status and English proficiency in English reading development across the elementary (grade 1–3) and middle school (grade 3–8) years. One of his findings was that reading trajectories in LM learners with initially limited English proficiency remain below national averages but converge with the results of their peers from similar socioeconomic backgrounds during middle school. Kieffer and Vukovic (2012) conducted a longitudinal study to examine the relative

contributions of coding-related and linguistic comprehension skills through first, second and third grade. The results showed no significant differences between LM learners and native English speakers. Sikiö and colleges (Sikiö, Siekkinen, & Holopainen, 2015) examined literacy development from first to second grade in the Finnish language in native-speaking children, LM children and children at risk for developing reading difficulties. The main finding was that LM children's reading and writing skills development corresponded better with the development in Finnish-speaking children than the development in children in the at-risk group.

Home resources and reading achievement

Literacy acquisition practices and the impact of a child's home environment have been documented in numerous studies (Kieffer, 2011; Myrberg & Rosén, 2009; Sikiö et al., 2016; Sirin, 2005). In the USA as well as in most European countries, LM-learner status is closely intertwined with socioeconomic status (SES) (Bakken & Hyggen, 2018; Capps et al., 2005; OECD, 2015). LM learners are more likely to come from low-income families (Kieffer, 2011; OECD, 2015; Schnepf, 2004), raising the question of whether LM learners' low achievement can be explained by SES factors. This question is highly relevant in the case of Norway, first, because of the changing demographic situation and, second, because gaps between and across students from varying socioeconomic backgrounds tend to increase as students get older (Caro, McDonald, & Williams, 2009; Condron, 2007), insinuating an important issue into the debate about how the educational system can compensate for student inequality.

Research with nationally representative data sets show that controlling for SES at the student and school levels leads to more similar reading developmental trajectories (e.g., Kieffer, 2008; Lauglo, 2010). Since the 1990s, various studies have documented that in Norway, the effects of a child's SES level on academic achievement applies to some extent also to LM learners (Lauglo, 1996, 2010). In compulsory school (1–10 grade), LM learners perform almost equally to the majority of students when controlling for SES (for a review, see Lauglo, 2010). The relationship between SES and success in school in students with an immigrant background is confirmed in Bakken's recent study of 68,000 Norwegian students in upper secondary school (Bakken & Hyggen, 2018). Parental educational level is considered the most important proxy for socioeconomic influence on academic performance in general (e.g. Capps et al., 2005; Lauglo, 2010; Yang & Gustafsson, 2004) and on reading achievement (August & Shanahan, 2006; Hemmerechts, Kavadias, & Agirdag, 2016; Myrberg & Rosén, 2009). Additionally, a home library provides educational advantages for children independent of parents' educational level, occupation and economic class (Evans, Kelley, & Sikora, 2014; Kern & Friedman, 2008). Evans and her colleagues documented that the strong effect of the number of books at home ('home library') and the intellectual environment those volumes reflect- on academic achievement prevailed across 42 nations, and evidence of the benefits of a large home library is even greater for children who grow up in families with a low educational level and low-status

occupations (Evans et al., 2014). Moreover, the number of books at home is considered a robust factor for predicting reading achievements (e.g. Myrberg & Rosén, 2009; Van Bergen, Van Zuijen, Bishop, & De Jong, 2016).

In the modern Norwegian context, possessing a computer or tablet is considered absolutely natural among ten-year-olds. However, research on how home computer use exactly affects students' academic performance and reading achievement has yielded contradictory results (e.g., Ponzo, 2011; Rosén & Gustafsson, 2016).

The Norwegian language situation

In Norway, Norwegian and Sami are the official languages used as languages of instruction in schools. In 2017, only 849 out of 633 029 compulsory students (grades 1 to 10) were registered with Sami as their first language in school (Statistics Norway, 2017). In PIRLS, assessment students with Sami as their first language did not attend. In terms of Norwegian as a formal written language, the situation is unique because of its two very closely related variants, 'nynorsk' and 'bokmål'. Approximately 12% of the students enrolled in primary school having 'nynorsk' as their written language in 2017 (Statistics Norway, 2017). Language is one of the primary conditioning variables used in the psychometric scaling in PIRLS[6]. The procedure is described in Methods and Procedures (Martin, Mullis, & Hooper, 2017, Chapter 12).

The importance of LM learners enrolling in the ordinary Norwegian educational system and learning the Norwegian language has been a hallmark of the education policies in Norway. These policies include the rights and obligations of ten years' compulsory schooling for all children between 6 and 18 years of age staying in the country for longer than three months and, subsequently, the right to attend upper secondary school (18–24 years of age). In the case of Norway, it is quite common that LM learners receive language training for one or two years in separate schools, preparing them for ordinary Norwegian schools. When enrolled in a Norwegian compulsory school, according to the Education act (Opplæringslova, 1998, § 2–8), they are entitled to additional language training until they master the language of instruction at a level that makes ordinary tuition possible. As a consequence of this integrating system, none of the participating students in PIRLS assessment can be classified as absolute beginners in Norwegian, the language of the test.

The Current Study

To further investigate the association between a student's home language and reading achievement, we examined the relative contribution of a student's home language and home resources for learning to read on reading literacy. This study addresses the following research question: What are the relations between home language, the available resources for learning to read and reading achievement?

[6]In Norway's case, three primary conditioning variables are used: the class mean, gender and language.

Method

Our research question is addressed by secondary analysis using the Progress in International Reading Literacy Study (PIRLS) 2016 data for Norway. In this section, we describe the data and variables, followed by a description of the analytical procedures.

Data and sample

This study draws upon PIRLS -a cross-sectional survey assessing reading literacy and related factors in ten-year-olds in cycles of five years. For a design description, see PIRLS 2016 assessment framework (Mullis & Martin, 2015).

The analyses in the current study are based on the representative grade 5 sample (average age 10.8.years) of Norway. The instruments used in this study are reading tests, a parent questionnaire and a student questionnaire. Selected variables are described in Tables 1 and 2. In total, 4232 students in fifth grade participated in PIRLS for Norway. The respondent rate for the background questionnaires was 95% of students participating and 96% of parents participating. We omitted one student from the dataset because all background information was missing in the student and parent questionnaires. The applied sample size, including missing values, consist of 4231 cases.

The sample design and sampling implementations, including national characteristics, are described in detail in Methods and Procedures in PIRLS 2016 (Martin et al., 2017, Chapters 3 and 5 and Appendix 5A). Norwegian data collection procedures are documented in Gabrielsen & Strand (2017). Missing values was imputed based

Table 1. Indicators of student's home language, home resources for learning to read and reading achievement.

Variables	Question/Information	Source
Home language	How often do you speak Norwegian at home? Four alternatives: always, almost always, sometimes, never	Student
Parental educational level (either parent)	What is the highest level of education completed by the child's father (guardian) and mother (guardian)? Eight alternatives: Did not go to school, some primary education, primary education, upper secondary education, postsecondary education, university education less than 3 years, Bachelor's or equivalent, Master's or Doctor degree	Parent
Books at home	About how many books are there in your home? Five alternatives: 0–10, 11–25, 26–50, 51–100, more than 100	Parent
A computer or tablet at home	Do you have any of these things at home? Two alternatives: yes, no	Student
Students' reading achievement	Overall achievement on PIRLS 2016 scores (mean of five plausible values)	Student

Table 2. Valid N, range, item respondent rate (%) and missing (%) for the covariates and outcome variable used in the study.

Variables	N	Range	Item respondent rate (%) or pooled mean (standard error)	% imputed values for missing
1. Home language	4231			1
Sometimes or never speaking Norwegian at home		0–1	12.1	
2. Gender	4231			-
Male gender of the child		0–1	49.80	
3. Parental educational level of either parents	4231			10.56
Completed primary school		0–1	3.5	
Completed upper secondary school		0–1	34.2	
Completed bachelor's degree		0–1	28.3	
Completed master's or doctor's degree		0–1	34.1	
4. Books at home	4231			4.75
0–25 books		0–1	15.2	
26–100 books		0–1	27.8	
More than 100 books		0–1	57.00	
5. Child doesn't have a computer or tablet at home	4231	0–1	0.70	0.78
6. Students' reading achievement grade 5 (PV1–5)	4231		558.99 (1.96)	-
PV1		315.0–781.8		
PV2		277.8–764.0		
PV3		288.7–781.7		
PV4		291.2–789.6		
PV5		324.2–774.7		

Note. PV = Plausible value; variable 1–5 are contrast coded from the original variables.

on the multiple imputation (MI) approach (Rubin, 2008). In MI, the interrelations between the variables and the available information of cases are used to impute the missing data. All background variables which are used for the analysis (described in the next section) were included in the imputation process to generate five imputed datasets without missing values. Each of these datasets is combined with one of the five plausible values. The data on Reading Literacy, our only dependent variable, has no missing values. After using multiple imputation we got a total sample size of 4231 students without missing information for the analysis described below.

PIRLS uses a random stratified two-stage cluster sample design (LaRoche, Joncas, & Foy, 2017, Appendix 5A). In terms of Norway, for the first sample stage, schools were selected (150 in total) with a probability proportional to size (i.e., the selection probability of large schools is higher than for small schools). Within these schools 215

classes in the fifth year of formal schooling were selected randomly. Explicit stratification was implemented for the two variants of the Norwegian language, "bokmål" and "nynorsk" (Martin et al., 2017, Appendix 5A).

Variables

For a student's home language, we used the indicator frequency of Norwegian spoken at home from the student questionnaire with a 4-point response scale: always, almost always, sometimes or never. We dichotomized this variable (0 = Always or almost always 1 = Sometimes or never). For home resources for learning to read, we used the indicators highest educational level of either parent (i.e. highest level of education in the family), number of books at home and accessibility of child's own computer or tablet. The parental educational level (based on the International Standard Classification of Education (ISCED) classification) derived from parents' questionnaire was recoded from its original eight-response categories measured from not completed primary school to Doctor's degree down to four: completed primary school, completed upper secondary school, completed bachelor's degree and completed master's or doctor's degree. Books at home retrieved from parent's questionnaires were recoded from the original five categories (0–10, 11–25, 26–50, 51–100, 101–200 or more than 200) to three categories: 0–25 books, 26–100 books and more than 100 books. The accessibility of a computer or tablet at home was recoded as 0 (yes) and 1 (no). Gender was recoded as 0 (female) and 1 (male). Given that all covariates were binary or ordinal, we treated all covariates as categorical in the regression analysis and dummy coded in the data preparations (see Tables 1 and 2 for variable information).

The outcome variable is the overall reading achievement score; for technical details, see Methods and Procedures in PIRLS 2016 (Martin et al., 2017). Not to overburden the students, the participants completed a selection of test blocks within a multimatrix design which increases the reliability of the overall scale. PIRLS uses item response theory; to receive appropriate estimates for the populations, the measurement of student proficiency is calculated by probabilistic scaling methods using a multiple imputation methodology: plausible values. Further, the achievement results are combined with students' background questionnaires (conditioning-procedure) to enhance the reliability of the scores (Foy & Yin, 2017; Laukaityte & Wiberg, 2017).

Analytical procedures

Approaching and operationalizing the research question relies on the theory of discourses (Gee, 1989). That is, the students' home language and home resources are seen as a part of children's primary discourse, whereas the reading outcome represents a part of the children's secondary discourse: the school. We used regression analysis in which we included covariates over different analytical stages (five stages).

The form of the equation used is:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \ldots + \beta_j X_{ji} + \varepsilon_i$$

Where in this study:

Y_i = Reading achievement (dependent variable) of student "i"
β_0 = Constant variable (intercept)
β_j = Regression coefficient of the controlled variable "j"
X_{ji} = Controlled variables "j" of student "i" (see Table 3)
ε_i = Residual (error) term of student "i"
i = index of students (1 to n)
j = index of control variables (1 to k)

We estimated five linear regression models with a random intercept. Variables were added step by step to provide information on additional variables explained when including a new variable into each model. In the first step (Model 1), home language was included as the only independent variable. Students who always or almost always speak Norwegian at home is the reference category. In the second step (Model 2), we included gender. Girls with Norwegian as their primary home language is the reference category. In the third step (Model 3), the highest educational level of either parents was added. The reference category is girls with Norwegian as their primary home language with parents with a master's or doctor's degree. In the fourth step (Model 4), the explanatory variable 'books at home' was added. The reference category is girls with Norwegian as their primary home language, with parents with a master's or doctor's degree and more than 100 books at home. In the fifth and final step, the full model, we included the independent variable computer or tablet at home. The reference category is girls with Norwegian as their primary home language with parents with a master's or doctor's degree and more than 100 books at home and who have access to a computer or tablet at home.

We used MPlus 8.1 for data analysis, IEA IDB Analyzer 4.0.21 for preparing the syntax for data preparation and analysis and, finally, SPSS 25 for conducting data preparations and descriptive analysis. To meet the requirements of the complex PIRLS data structure MPlus was used to take into account sampling weights (called TOTWGT in the PIRLS data-set). The hierarchical nature of the data was handled in Mplus by indicating complex model specifications.

The calculation of the regression parameters is based on the robust maximum likelihood estimation approach. All five plausible values (PVs) of reading literacy were included in the calculations using an imputation file in MPlus with all five measurements that provided a single joint result. Analysis with plausible values was repeated for each plausible value (five times); the point-estimates are the mean of the five results, and the standard errors are combined using the formula of Rubin (2008), which takes the variance of the estimates and the between PV-variance into account.[7]

[7]Since only manifest variables are used in the model the model fit indicate show as: Root Mean Square Error of Approximation (RMSEA) = 0.00, Comparative Fit Index (CFI) = 1.00, Tucker-Lewis Index (TLI) = 1.00.

Results

Intraclass correlation

In the data, students are clustered in classes and classes in schools. The intraclass correlation coefficient (ICC) for the overall reading achievement was on class-level 0.11. This means that 11% of the observed variance of the reading achievement is based on systematic differences between classes. However, our research question focuses on the general effects in the observed population and not on average classroom effects. Hence, we chose a one-level model.

Correlations and regression analysis

Table 3 shows the Pearson correlations between the variables in the study: home language, computer or tablet at home, books at home, highest educational level of either parents, gender and reading achievement. The correlation between books at home and highest educational level of the parents (r = 0.44) indicates a medium effect size. Nevertheless, the correlation is not so high that the variables should be interpreted as redundant. Both variables have enough specific variance, which is interesting to consider in the following analysis.

Table 3. Means (M), standard deviations (SD) and intercorrelations for the study variables (n = 4231).

Variable	M	SD	1	2	3	4	5
1. Home language	0.12	0.33					
2. Computer or tablet at home	0.01	0.08	0.04*				
3. Books at home	1.42	0.74	–0.15***	–0.02			
4. Highest educational level of either parent	1.93	0.90	–0.09***	–0.03	0.44***		
5. Gender	0.50	0.50	0.06***	–0.01	–0.01	–0.01	
6. Reading achievement (overall reading PVs 1–5)	558.99	65.50	–0.11***	–0.07*	0.27***	0.26***	–0.16***

Note. *p < 0.05, **p < 0.01, ***p < 0.001 Two-tailed significance test; weighted coefficients (weight = totwgt).

Table 4 shows the results from the regression analysis, with students' reading achievement as the dependent variable.

In the following we focus on the regular (unstandardized) regression coefficient, however the standardized coefficient is included in the table for comparative purposes. In the first step (Model 1), shown in Table 4, the significant regression coefficient for home language (B = –20.90, p <0.001) solely reflects the achievement differences between students with Norwegian as their primary home language and students who 'sometimes' or 'never' speak Norwegian at home. This result indicates that students who do not have Norwegian as their primary home language are on average 21 score points behind students with Norwegian as their primary home language in reading achievement. Home language only accounts for 1% of the variance in reading (R^2 = 0.011, p = 0.010).

Table 4. Regression analysis in five analytical steps for prediction of reading achievement with a random intercept: parameters and standard errors.

Model	Variables	Unstandardized Coefficients		Standardized Coefficients		
		B	S.E	Beta	t-value	Two-tailed P-value
0	Intercept	558.99	1.96			<.001
	(n = 4231)					
1	Intercept	561.43	2.04			<.001
	Sometimes or never speaking Norwegian	–20.90	4.09	–0.32	–5.11	<.001
	R^2	0.011				.010
	(n = 4231)					
2	Intercept	571.55	2.33			<.001
	Sometimes or never speaking Norwegian	–19.41	4.08	–0.30	–4.76	<.001
	Gender (boy)	–20.67	2.43	–0.32	–8.50	<.001
	R^2 (ΔR^2)	0.035 (0.024)				<.001
	(n = 4231)					
3	Intercept	590.36	2.84			<.001
	Sometimes or never speaking Norwegian	–14.32	4.12	–0.22	–3.47	<.001
	Gender (boy)	–20.45	2.48	–0.31	–8.25	<.001
	Parental edu. level: primary school	–56.05	7.51	–0.86	–7.46	<.001
	Parental edu. level: upper secondary school	–36.70	3.14	–0.56	–11.68	<.001
	Parental edu. level: Bachelor's degree	–13.85	3.78	–0.21	–3.66	<.001
	R^2 (ΔR^2)	0.100 (0.065)				<.001
	(n = 4231)					
4	Intercept	593.67	2.81			<.001
	Sometimes or never speaking Norwegian	–10.16	4.29	–0.16	–2.37	.020
	Gender (boy)	–20.46	2.44	–0.31	–8.38	<.001
	Parental edu. level: primary school	–42.10	7.57	–0.64	–5.56	<.001
	Parental edu. level: upper secondary school	–27.90	3.36	–0.43	–8.30	<.001
	Parental edu. level: Bachelor's degree	–10.52	3.82	–0.16	–2.75	<.001
	0–25 books at home	–25.55	3.94	–0.39	–6.48	<.001
	26–100 books at home	–15.70	3.10	–0.24	–5.06	<.001
	R^2 (ΔR^2)	0.119 (0.02)				<.001
	(n = 4231)					

(*Continued*)

Table 4. (*Continued*)

Model	Variables	Unstandardized Coefficients		Standardized Coefficients		
		B	S.E	Beta	t-value	Two-tailed P-value
5	Intercept	593.77	2.81			<.001
	Sometimes or never speaking Norwegian	–9.77	4.30	–0.15	–2.27	.023
	Gender (boy)	–20.51	2.45	–0.31	–8.37	<.001
	Parental edu. level: primary school	–41.49	7.45	–0.63	–5.57	<.001
	Parental edu. level: upper secondary school	–27.76	3.38	–0.42	–6.92	<.001
	Parental edu. level: Bachelor's degree	–10.39	3.78	–0.16	–2.75	.006
	0–25 books at home	–25.53	3.98	–0.39	–6,41	<.001
	26–100 books at home	–15.50	3.12	–0.24	–4.97	<.001
	Don't have a computer/tablet at home	–42.74	17.73	–0.65	–2.41	.016
	R^2 (ΔR^2)	0.122 (0.003)				<.001
	(n = 4231)					

Note. Weighted coefficients (totwgt); Reading achievement (Intercept) consists of 5 imputed data sets; Model 1: 'Always or almost always speaking Norwegian' is the reference category (ref.cat.); Model 2: Girls with Norwegian as their primary home language is the ref.cat.; Model 3: Girls with Norwegian as their primary home language with parents with a master's or doctor's degree; Model 4: Girls with Norwegian as their primary home language, with parents with a master's or doctor's degree and more than 100 books at home; Model 5: Girls with Norwegian as their primary home language with parents with a master's or doctor's degree and more than 100 books at home and who have access to a computer or tablet at home.

In the next step (Model 2), we included gender as a variable. Reflected in the regression coefficient, we see that gender has an impact on achievement (B = –20.67, $p < 0.001$). Gender accounts for a significant proportion of variance in reading ($R^2 = 0.035$ $p < 0.001$).

In the third step (model 3), we added the first of three indicators for home resources for learning to read: parents' educational level (three levels: completed primary school, completed upper secondary school and completed bachelor's degree). Reflected in the standardized coefficients, it is clear that parental educational level is significantly related to reading achievement. When the level of parental education increases, the level of points scored on reading achievement also increases. The unstandardized coefficient of the home-language-variable was altered from B = -19.41 in model 2 to B = -14.32 in model 3 after controlling for the highest educational level of the parents and gender. Parental education accounts for a significant proportion of variance in reading ($R^2 = 0.100$ $p < 0.001$ in model 3).

In the fourth step (Model 4), we added the second indicator of the home resources of learning to read: books at home. When controlling for books at home, parents' educational level and gender, the relationship between not having Norwegian as the primary home language and reading achievement is still negative and significant but

clearly altered (B = –14.32 in model 3 to B = –10.16, p = 0.20, R^2 = 0.119 p < 0.001 in model 4).

In the fifth and final step (Model 5), a child's accessibility to a computer or tablet at home, is introduced as the third indicator of home resources for learning to read. The regression coefficient of the variable sometimes or never speaking Norwegian at home, when controlling for computer or tablet at home, books at home, parents' educational level and gender was barely altered B = –10.16, p = 0.02 in model 4, B = –9.77, p = 0.023 in model 5).

Due to the change in the reference groups between the different models, the intercept altered from 558.99 (0-model) to 593.77 (model 5) when controlling for home language, gender and home resources for learning to read. The final model indicates that, overall, home resources is more strongly related to reading achievement than a student's home language. In total, the independent variables explained, lower than expected, only 12.2% of the variance in reading achievement (R^2 = 0.122, p<0.001).

Discussion and conclusion

The current study was conducted to extend existing research and provide a nuanced description of some of the complexities in the persistent achievement differences in reading literacy between LM learners and native Norwegian speakers in Norwegian ten-year-olds. We examined the relations between a student's home language, home resources for learning to read (indicators: parental educational level, number of books in the home and access to a computer or tablet) and reading achievement on student level. A related goal was to investigate changes in the relationship between frequency of Norwegian spoken at home and reading achievement when gender and home resources for learning were taken into account.

In the first regression model (step 1), the result indicates, without taking any other background variables into account, that students who do not have Norwegian as their primary home language are on average 21 score points behind students with Norwegian as their primary home language in reading achievement. In a Norwegian school context, this can be interpreted as these students being approximate half a school year behind their peers in formal reading skills (Gabrielsen & Lundetræ, 2017). However, home language only explains (surprisingly low in Model 1) 1% of the variance in reading achievement, meaning that a student's home language, as defined in this study, constitutes a very small part of what could explain achievement differences between LM learners and native-Norwegian speakers. In the fifth and final regression model (step 5), the 21 score points the non-native speaking students are behind the native speaking students, are reduced to approximately ten points. However, not surprisingly, we found a strong relationship between home resources for learning to read and reading achievement. Taking all indicators of home resources for learning to read, and gender into account, approximately 12% of the variance in reading achievement is explained.

We used the theory of discourses to approach our research question. Central to this theory is that a gap between a child's first discourse and second discourse may lead to literacy-related challenges (Gee, 2015, Chapter 9). Our findings support sociolinguistic views on second language acquisition suggesting that the challenges LM learners experience using the school language, are not merely influenced by the child's language background but also by the child's social background (Cummins, 1991; Gee, 2015, Chapter 9). This study shows that there are other important factors in addition to LM learners' second language status that may cause problems with school language. Our findings is in accordance with a significant number of recent studies that investigated the achievement gap between LM learners and native speaking students in school performance (e.g. see Bakken & Hyggen, 2018; Caro et.al, 2009; Kieffer, 2011). Hence, it can be discussed whether growing up in home environments offering less support for learning to read is a higher risk for an unsatisfactory reading development than growing up in home environments not speaking the language of instruction, in this case Norwegian. In addition, a supportive school-home collaboration could benefit from this acquired knowledge. Our findings allow schools and educators to better understand which factors can be important for students' reading achievements. This knowledge may lower the risk of overgeneralizing the effects of home language and – as a consequence – prejudices students for whom the described effects do not apply.

We acknowledge the diversity in Norwegian schools and the systematic differences in performance between LM learners and native-speaking students. We argue that the key to understanding the complexity of diversity is not only to use a student's second language background as a premise for difference in reading performance. It seems reasonable that family characteristics affect all students, and each initiative that is found to be effective to compensate for diversity in reading performance will be beneficial for students in general. We suggest that the polarized view grounded in constructed student groups may not be the best way to shed light on the disparities in school performance; what could be the consequences of applying undercomplex exploratory models. Further, it can be argued whether the findings in this article challenge the principle of a unitary school system in Norway, which has existed for more than 100 years, with its main goal of promoting equal opportunities for all.

Our results indicate that the challenges related to language use at school that are restricted to LM Learners' home language status, do not capture the complexity of why LM learners tend to have lower performance in reading achievement than native Norwegian speakers. The final model only explained 12% of the variance in reading achievement. This indicate that there is a need for exploring the relative contribution of other factors like school climate, teachers' support and parental support in addition to student's social background and home language on reading achievement.

The current study, is based on cross-sectional data, which do not allow for establishing causality. Longitudinal studies are needed to investigate how these learners grow in Norwegian reading over time. Another limitation is that unfortunately, the data do

not provide individual characteristics like for example individual linguistic skills or different language backgrounds. We do acknowledge that there is still much research to be done in this research area.

References

August, D., & Shanahan, T. (Eds.). (2006). *Developing literacy in second-language learners*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bakken, A. (2014). Sosial ulikhet i skoleresultater – en oppsummering av NOVAs forskning [Social Inequality in School Performances- a summary of NOVA's research]. Retrieved from Regjeringen.no website: https://nettsteder.regjeringen.no/fremtidensskole/files/2014/05/NOVAs-forskning-p%C3%A5-ulikhet-i-skolen-en-oppsummering.pdf

Bakken, A., & Elstad, J. I. (2012). *For store forventninger? Kunnskapsløftet og ulikhetene i grunnskolekarakterer* [*To big expectations? The Knowledge Promotion Reform and inequality in Primary school grades*] (Vol. nr. 7/12). Oslo: Norsk institutt for forskning om oppvekst, velferd og aldring.

Bakken, A., & Hyggen, C. (2018). *Trivsel og utdanningsdriv blant minoritetselever i videregående. Hvordan forstå karakterforskjeller mellom elever med ulik innvandrerbakgrunn?* [*Well-being and educational aspirations among minority students in upper secondary school. How to understand grade differences between students with different migration backgrounds?*]. (NOVA rapport 1/2018). Retrieved from http://www.hioa.no/Om-HiOA/Senter-for-velferds-og-arbeidslivsforskning/NOVA/Publikasjonar/Rapporter/2018/Trivsel-og-utdanningsdriv-blant-minoritetselever-i-videregaaende

Capps, R., Fix, M., Murray, J., Ost, J., Passel, J. S., & Herwantoro, S. (2005). *The new demography of America's schools: Immigration and the No Child Left Behind Act*. Washington DC: The Urban Institue.

Caro, D. H., McDonald, T. J., & Williams, J. (2009). Socio-economic Status and Academic Achievement Trajectories from Childhood to Adolescence. *Canadian Journal of Education, 32*(3), 558–559.

Condron, D. J. (2007). Stratification and Educational Sorting: Explaining Ascriptive Inequalities in Early Childhood Reading Group Placement. *Social Problems, 54*(1), 139–160. doi:10.1525/sp.2007.54.1.139.

Cummins, J. (Ed.) (1991). *Interdependence of first- and second-language proficiency in bilingual children*. Cambridge, UK: Cambridge University Press.

Dzamarija, T. M. (2017). Innvandrere og deres norskfødte barn- gruppens sammensetning [Immigrants and their Norwegian-born children- The group's compostition] In T. Sandnes (Ed.), *Innvandrere i Norge, 2017* (pp. 16–35). Oslo-Kongsvinger: Statistics Norway.

Evans, M. D. R., Kelley, J., & Sikora, J. (2014). Scholarly Culture and Academic Performance in 42 nations. *Social Forces, 92*(4), 1573–1605. doi:10.1093/sf/sou030

Foy, P., & Yin, L. (2017). Scaling the PIRLS 2016 Achievement Data. In M. O. Martin, I. V. S. Mullis, & M. Hooper (Eds.), *Methods and procedures in PIRLS 2016* (pp. 1–38). Boston: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

Gabrielsen, E., & Lundetræ, K. (2017). Indikerer de norske PIRLS-resultatene et behov for å justere retningslinjene for skolestartsalder? [Do the Norwegian PIRLS-results indicate a need for ajusting age for school start?]. In E. Gabrielsen (Ed.), *Klar Framgang! Leseferdighet på 4. og 5. trinn i et femtenårsperspektiv* (Vol. 1, pp. 204–221). Oslo: Universitetsforlaget.

Gabrielsen, E., & Strand, O. (2017). Rammer og metoder for PIRLS 2016 [Framework and methods in PIRLS 2016]. In E. Gabrielsen (Ed.), *Klar framgang! Leseferdighet på 4. og 5. trinn i et femtenårsperspektiv* (pp. 13–31). Oslo: Universitetsforlaget.

Gee, J. P. (1989). What is Literacy. *Journal of Educational Psychology, 171*(1), 18–25.

Gee, J. P. (2015). *Social Linguistics and Literacies Ideology in Discorses* (5 ed.). New York: Routledge.

Hemmerechts, K., Kavadias, D., & Agirdag, O. (2016). The relationship between parental literacy involvement, sosio-economic status and reading literacy. *Educational Review, 69*(1), 85–101. doi:10.1080/00131911.2016.1164667

Kern, M. L., & Friedman, H. S. (2008). Early educational milestones as predictors of lifelong academic achievement, midlife adjustment, and longevity. *Journal of Applied Developmental Psychology, 30*(4), 419–430. doi:10.1016/j.appdev.2008.12.025

Kieffer, M. J. (2008). Catching up or falling behind? Initial English profiency, concentrated poverty, and the reading growth of language minority learners in the United States. *Journal of Educational Psychology, 100*, 851–868.

Kieffer, M. J. (2011). Converging trajectories: Reading Growth in Language Minority Learners and their Classmates, Kindergarten to Grade 8. *American Educational Research Journal, 48*(5), 1187–1225. doi:10.3102/0002831211419490

Kieffer, M. J., & Vukovic, R. K. (2012). Components and Context: Exploring Sources of Reading Difficulties for Language Minority Learners and Native English Speakers in Urban Schools. *Journal of Learning Disabilities, 45*(5), 433–452. doi:10.117/0022219411432683

Kistemaker, M., & Broeder, P. (2014). School language and the role of multilingualism in class. In T. Tinnefeld (Ed.), Fremdsprachenunterricht im Spannungsfeld zwischen Sprachwissen und Sprachkönnen: htw saar Saarbrûcken.

Kjærnsli, M., & Jensen, F. (Eds.). (2016). *Stø kurs. Norske elevers kompetanse i naturfag, matematikk og lesing i PISA 2015* [*Steady course. Norwegian students' competence in science, math and reading in PISA 2015*]. Oslo: Universitetsforlaget.

Ladson-Billings, G. (2006). From the Achievement Gap to the Education Debt: Understanding Achievement in U.S. Schools. *Educational Researcher, 35*(7), 3–12.

LaRoche, S., Joncas, M., & Foy, P. (2017). Sample design in PIRLS 2016. In M. O. Martin, I. V. S. Mullis, & M. Hooper (Eds.), *Methods and Procedures In PIRLS 2016* (pp. 1–34). Boston: TIMSS & PIRLS International Study Center Lynch School of Education, Boston College.

Lauglo, J. (1996). *Motbakke, men mer driv? Innvandrerungdom i norsk skole* [*Immigrant youth in Norwegian school*]. (NOVA rapport 6/96). Oslo: Norges Forskningsråd.

Lauglo, J. (2010). *Unge fra innvandrerfamilier og sosial kapital for utdanning* [*Young people from immigrant families and social capital for education*]. Retrieved from https://www.nb.no/items/URN:NBN:no-nb_digibok_2013042906050

Laukaityte, I., & Wiberg, M. (2017). Using plausible values in secondary analysis in large-scale assessments. *Communications in statistics-Theory and Methods, 46*(22), 11341–11357. doi:10.1080/03610926.2016.1267764

Lesaux, N. K., & Kieffer, M. J. (2010). Exploring Sources of Reading Comprehension Difficulties Among Language Minority Learners and Their Classmates in Early Adolescence. *American Educational Research Journal, 47*(3), 596–632. doi:10.3102/0002831209355469

Lesaux, N. K., Koda, K., Siegel, L. S., & Shanahan, T. (2006). Development of literacy in language-minority students. In D. August & T. Shanahan (Eds.), *Developing literacy in second-language learners: Report of the National Literacy Panel on Language-Minority Children and Youth*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Martin, M. O., Mullis, I. V. S., & Hooper, M. (Eds.). (2017). *Methods and Procedures in PIRLS 2016*. Boston: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

Melby-Lervåg, M., & Lervåg, A. (2011a). Cross-linguistic transfer of oral language, decoding, phonological awareness and reading comprehension. *Journal of Research in Reading, 1*, 114–135.

Melby-Lervåg, M., & Lervåg, A. (2011b). Hvilken betydning har morsmålsferdigheter for utviklingen av leseforståelse og dets underliggende komponenter på andrespråket? – En oppsummering av empirisk forskning [Implications of mother tongue skills for second language reading comprehension and its underlying components-A summary of emperical research]. *Norsk pedagogisk tidsskrift, 95*(05), 330–343.

Mullis, I. V. S., & Martin, M. O. (Eds.). (2015). *PIRLS 2016 Assessment Framework* (2 ed.). Boston: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (Eds.). (2016). *TIMSS 2015 International Results in Mathematics*. Boston TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (Eds.). (2017). *International Results in Reading*. Boston: TIMSS & PIRLS International Study Center Lynch school of Education, Boston College.

Myrberg, E., & Rosén, M. (2009). Direct and indirect effects of parent's education on reading achievement among third graders in Sweden. *British Journal of Educational Psychology, 79*, 695–711.

NCES. (2015). *School Composition and the Black-White Achievement gap*. (9/2015). USA: U.S Department of Education. Retrieved from https://nces.ed.gov/nationsreportcard/subject/studies/pdf/school_composition_and_the_bw_achievement_gap_2015.pdf

OECD. (2015). *Immigrant Students at School- Easing the Journey towards Integration*. Paris: OECD Publishing.

OECD. (2016). *PISA 2015 Results (Volume I): Exellence and Equity in Education* (Vol. 1). Paris: OECD Publishing.

Opplæringslova. (1998). *Lov om grunnskolen og den vidaregående opplæringa* [*Education Act*]. Retrieved from https://lovdata.no/dokument/NL/lov/1998-07-17-61?q=opplæringslova

Ponzo, M. (2011). Does the Way in which Students Use Computers Affect their Performance? *MPREA Munich Personal RePEc Archive*.

RAND Reading Study Group. (2002). Reading for understanding: Toward an R&D program in reading comprehension. In. Santa Monica, CA: RAND Education.

Randen, T. G. (2015). Vurdering av minoritetselevers språkferdigheter i grunnskolen [Assessing minority students language skills in compulsory school]. *NOA norsk som andrespråk, 1*(2), 350–372.

Roe, A., & Hvistendahl, R. (2009). Leseprestasjoner, lesevaner og holdninger til lesing blant elever fra språklige minoriteter [Reading achievement, reading habits and attitudes towards reading in minority students]. *Norsk pedagogisk tidsskrift, 93*(04), 250–262.

Rosén, M., & Gustafsson, J.-E. (2016). Is computer avaialability at home causally related to reading achievement in grade 4? A longitudinal difference approach to IEA data from 1991–2006. *Large-scale Assessments in Education a Springer Open Journal, 4*(4). doi:10.1186/s40536-016-0020-8

Rubin, B. D. (2008). *Multiple Imputation for Nonresponse in Surveys*. New York City: John Wiley & Sons.

Rydland, V. (2007). Minoritetsspråklige elevers skoleprestasjoner: Hva sier empirisk forskning? [Minority students' academic achievement: What does empirical research tells us?]. *Acta Didactica Norge, 1*(1), 1–21. doi:http://dx.doi.org/10.5617/adno.1016

Schnepf, V. S. (2004). How Different Are Immigrants? A Cross-Country and Cross-Survey Analysis of Educational Achievement. In I. f. t. S. o. labor (Ed.), *IZA Discussion Paper Series* (Vol. 1398). Bonn, Germany: Institute for the Study of labor (IZA).

Sikiö, R., Holopainen, L., Siekkinen, M., Silinskas, G., Lerkkanen, M.-K., & Nurmi, J.-E. (2016). Maternal literacy teaching, causal attributions and children's literacy skills in Finnish-speaking and language minority families. *International Journal of Educational Research, 77* (2016), 99–108.

Sikiö, R., Siekkinen, M., & Holopainen, L. (2015). Literacy Development Among Language Minority Background and Dyslexic Children in Finnish Ortography Context. *Reading Psychology, 37*(5), 706–727.

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

Snow, C. E., Bruns, S. M., & Griffin, P. (1998). Preventing Reading Difficulties in Young Children. In C. E. Snow, S. M. Bruns, & P. Griffin (Eds.), *Preventing Reading Difficulties in Young Children*. Washington, DC: National Research Council.

Stambøl, S. L. (2013). Flere arbeidsinnvandrere gir større regional sperdning av innvandrere viser ny forskning [Increased employment immigration generate regional spread of immigrants, research unveils. *46*. https://www.ssb.no/befolkning/artikler-og-publikasjoner/bosettings-og-flyttemonster-blant-innvandrere-og-deres-norskfodte-barn

Statistics Norway. (2017). Elevar i grunnskolen [Students in Upper Secondary School]. Retrieved from https://www.ssb.no/utdanning/statistikker/utgrs/aar

Statistics Norway. (2018). Nasjonale Prøver [National tests]. https://www.ssb.no/utdanning/statistikker/nasjprov

Steinkellner, A. (2017). Hvordan går det med innvandrere og deres barn i skolen? [Immigrants' and their children, how are they coping in school?]. In T. Sandnes (Ed.), *Innvandrere i Norge 2017* (pp. 78–94). Oslo-Kongsvinger: Statistics Norway.

Strand, O., Wagner, Å. K. H., & Foldnes, N. (2017). Flerspråklige elevers leseresultater [Multilingual students' reading results]. In E. Gabrielsen (Ed.), *Klar framgang! Leseferdighet på 4. og 5. trinn i et femtenårsperspektiv* (pp. 75–95). Oslo: Universitetsforlaget.

Van Bergen, E., Van Zuijen, T., Bishop, D., & De Jong, P. F. (2016). Why Are Home Literacy Environment and Children's Reading Skills Associated? What Parental Skills Reveal. *Reading Research Quarterly, 52*(2), 147–160. doi:10.1002/rrq.160.

Yang, Y., & Gustafsson, J.-E. (2004). Measuring socioeconomic status at individual and collective levels. *Educational Research and Evaluation, 10*, 259–288.