

# CHANGE IN READING LITERACY ACROSS 2009-2018 IN EIGHT EUROPEAN COUNTRIES

ASSESSING THE CONTRIBUTION  
OF CHANGING SOCIAL CONTEXT,  
EDUCATIONAL FACTORS, ICT USE,  
READING STRATEGIES, READING  
MOTIVATION AND READING  
FREQUENCY

HANS LUYTEN

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UNIVERSITY OF TWENTE.

# COLOPHON

MANAGEMENT

Faculty of Behavioural, Management and Social Sciences (BMS)  
Department of Learning, Data-analytics and Technology (LTD)  
Section Cognition, Data and Education (CODE)

DATE

12 January 2022

AUTHOR

Hans Luyten

EMAIL

[j.w.luyten@utwente.nl](mailto:j.w.luyten@utwente.nl)

POSTAL ADDRESS

P.O. Box 217  
7500 AE Enschede

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# TABLE OF CONTENT

	Summary	3
1	Introduction	4
2	Theoretical Background	5
2.1	Reading Literacy	5
2.2	ICT use	5
2.3	Reading Behavior and Motivation	6
2.3.1	Reading Frequency	6
2.3.2	Reading Strategies	6
2.3.3	Reading Motivation	6
2.4	Societal and Educational Context	6
3	Research Questions	7
4	Method	8
4.1	Data	8
4.2	Variables in the Analysis	8
4.2.1	Dependent Variable: Reading Literacy	8
4.2.2	Independent variables	8
4.3	Data Analysis	10
5	Findings	11
5.1	Description of Differences between 2009 and 2018	11
5.1.1	Changes in Reading Performance per Country	11
5.1.2	Changes in Responses to Questionnaire Items on Reading Strategies and Reading Enjoyment	12
5.1.3	Changes in Independent Variables	17
5.2	Regression Analysis	21
5.3	Contributions of Independent Variables to Change in Reading Literacy	23
6	Summary and Discussion	26
	Literature	28
	Appendix	29

# SUMMARY

The present study addresses the contribution of changes in ICT use, educational variables, societal factors and reading related variables (motivation, frequency and strategies) to changes in reading literacy between 2009 and 2018 among 15-year-olds as assessed in the PISA-surveys for eight different countries. The focus is on developments in the Netherlands in comparison to seven other countries. Two comparison countries have, like the Netherlands, witnessed a decline in reading literacy (Flanders and Finland). In four countries reading literacy has improved (Sweden, Ireland, Poland and Estonia). In Germany reading literacy averages hardly differ between 2009 and 2018.

It was established that ICT use, educational variables and societal factors made positive contributions to the changes over time in the Netherlands. In the absence of change in these respects, the reading decline had probably been even larger. Two categories of reading related variables have contributed negatively to the change in reading literacy in the Netherlands, namely reading motivation and reading frequency. Both variables correlate positively with reading literacy, but have declined strongly between 2009 and 2018.

Given their negative contribution, reading frequency and motivation may seem the most likely candidates to serve as levers for a restoration of Dutch reading literacy. Still, it seems a serious challenge to restore past levels of reading motivation and frequency. Declines in reading frequency and motivation seem mainly due to an enduring digitalization of modern-day life. It seems dubious that past levels of reading frequency and motivation will ever return. Devising interventions that can withstand the impact on our lives of organizations like Google, Apple and Facebook is a daunting task. In addition to encouragement of reading frequency and motivation, effective stimulation of useful reading strategies seems helpful as well. These strategies consistently show positive relations with reading literacy.

# 1. INTRODUCTION

The most recent PISA survey, conducted in 2018, has shown that Dutch reading literacy has drastically declined during the past ten years. Dutch 15-year-olds performed well above average in PISA's international large-scale assessments until 2015. In 2018, the Dutch score fell below the OECD average score (OECD, 2019a, Verdegaal, 2021). A recent study (Luyten, 2022) points to the increased use of digital media (especially online chatting) as a cause for declining reading literacy. For the 2009-2018 period, it reports a strong correlation of per country increase in online chatting among 15-year-olds with declines in both reading literacy and awareness of useful reading strategies. The analysis focuses exclusively on aggregated data at the national level, covering 63 countries. It shows that countries with strong increases in online chatting, also tend to show strong declines in reading literacy. To some extent, the negative relation between online chatting and reading literacy is mediated by reading strategies.

It is important to note that correlations may vary considerably across different aggregation levels (Robinson, 1950). The relation between wealth and obesity may serve as an instructive illustration. When a country's wealth increases, so does the prevalence of obesity (Sturm & An, 2014). Within countries, however, the least wealthy individuals are the ones with the highest risks (Lamerz et al., 2005). Hence, it would be a major mistake to draw conclusions about the individual level from country-level correlations. Even when national aggregates show a strong and negative relation between online chatting and reading literacy, it is still possible that the relation is absent or even positive at the individual level within countries. The correlations between country aggregates indicate that when the prevalence of online chatting in a country increases, the reading literacy of *all students* decreases.

The present study addresses the question to what extent *individual student characteristics* may account for changes in reading literacy in eight European countries. For three of these countries (Netherlands, Finland and Flanders) reading literacy has declined substantially between 2009 and 2018. Four others have witnessed considerable improvement (Ireland, Sweden, Estonia and Poland). In the eighth country (Germany) the PISA reading averages hardly differ between 2009 and 2018.

For each country, two cohorts of students (2009 and 2018) are compared. The data analysis will start with a comparison of the mean reading literacy scores in 2009 and 2018 and a comparison of the mean scores on the explanatory variables. By means of multiple regression analysis it will be assessed to what extent the difference in reading literacy can be explained by the changes in explanatory variables such as use of information and computer technology (ICT), reading frequency, reading strategies and reading motivation. Per country, it will be assessed to what extent differences with regard to the explanatory variables between the 2009 and 2018 cohorts have contributed to the changes in reading literacy between both years.

The data analysis may reveal for some countries that the difference in reading literacy between both years is largely reduced if the effect of the explanatory variables is taken into account. For example, declining reading frequency may account for declining reading scores. But, it is also conceivable that the findings present a very different picture. In case a country with declining reading frequency still shows improved reading literacy, the findings indicate that the national average would have advanced even further in the absence of declining reading frequency. This focus on change over time differentiates this study from a straightforward cross-sectional methodology. By drawing on data from two cohorts, the current study presents a more convincing case into our understanding of the causes for change in reading literacy (Verdegaal, 2021).

## 2. THEORETICAL BACKGROUND

This section discusses the main variables in this study. Reading literacy is the dependent variable. The data-analysis focuses on the impact of two main categories of variables, namely ICT use and reading behavior/reading motivation. In addition, the research design takes into account that changes in reading literacy may also be due to changes in the educational context (e.g. disciplinary school climate) and the societal context in general (e.g. parents' education level). Variables from these latter categories will serve as controls in the data analysis. The next subsections describe in further detail the dependent variable (reading literacy) and what variables are subsumed in the categories ICT use, reading behavior/motivation, societal context and educational context

### 2.1. READING LITERACY

This study follows the definition employed in the PISA surveys. Reading literacy is defined as “finding, selecting, interpreting, integrating and evaluating information from the full range of texts associated with situations that extend beyond the classroom” (OECD, 2019a, p. 22).

Reading practices have clearly changed during the past decade. First, students have changed their reading preference. Instead of reading for leisure, students now more often read for practical purposes (OECD, 2019b). Secondly, students read more information online, on their computers or on their phones. For instance, they read chat-messages or look up online information about specific practical topics (OECD, 2019b).

### 2.2 ICT USE

There can be no doubt that the use of various types of information and computer technology (ICT) has expanded tremendously in recent decades. This goes both for educational settings and non-educational settings. The present study focuses on the ICT use out of school. Some studies have reported that frequent and excessive use of and access to ICT-resources correlates with lower reading performance (Gubbels et al., 2020). Moreover, recent research (Luyten, 2022) shows an unmistakable correlation of per country rise in online chatting with declining reading literacy. An important contribution of the present study is that it addresses the relation between ICT use and reading literacy at the individual level from a long-term perspective. The data-analysis will show to what extent increased ICT use has contributed to changes in reading literacy. ICT use may be related to the Dutch decline in reading performance, as it has drastically increased over time. Compared to other European Countries, the Netherlands has one of the highest number of inhabitants that are proficient at using ICT (OECD, 2021).

Wolf and Barzillai (2009) argue that ICT use can negatively impact *deep reading*. Deep reading is necessary for acquiring new information and it refers to the processes that drive reading comprehension, including “inferential and deductive reasoning, analogical skills, critical analysis, reflection, and insight” (Wolf & Barzillai, 2009, pp. 32). Online reading makes deep reading more difficult due to the fact that it presents the students with information that distracts their attention and lessens the time to be able to read deeply.

However, the relationship between ICT use and reading performance is not straightforward, as it could be following an inverted U-curve (Gubbels et al., 2020; Steffens, 2014). This would imply that reading scores improve in line with ICT use, but only up to a certain extent. After it reaches a critical point, reading achievements decrease as ICT use increases (Steffens, 2014).

## 2.3 READING BEHAVIOR AND READING MOTIVATION

Reading behavior and reading attitudes present the second category of explanatory variables that make up the focus of this study. It comprises three subcategories, namely reading frequency, reading strategies and reading motivation. These are discussed in more detail in the subsequent sections.

### 2.3.1 Reading frequency

Reading frequency, the amount of text that students read, is argued to be strongly related to reading performance (OECD, 2010; Baker & Wigfield, 1999; Cipielewski & Stanovich, 1992). Dutch newspapers reported that the amount that Dutch adolescents read, is declining (e.g. Chaudron, 2019). It seems plausible that a decrease in reading frequency can account for declining reading scores.

### 2.3.2 Reading strategies

Reading strategies are described by the OECD (2019a) as the ability to understand and interpret texts by analyzing, synthesizing, integrating and interpreting information from relevant texts from different domains. Reading strategies can be described as “deliberate, goal-directed attempts to control and modify the reader’s efforts to decode text, understand words, and construct meanings of text” (Afflerbach et al., 2008, pp. 368). In PISA 2009 and earlier tests, reading strategies demonstrated to be robust predictors of reading performance, when controlling for gender and socioeconomic status (Lee & Wu, 2013; OECD, 2010).

Assuming there is a clear relationship between reading strategies and reading literacy, it is important to explore whether changes in reading strategies can account for changes in reading literacy. This study will examine whether there is a difference in the use of reading strategies over time and explore whether this explains changes in reading literacy as observed in PISA between 2009 and 2018.

### 2.3.3 Reading Motivation

Reading motivation was defined by Guthrie and Wigfield (2000) as the “individual’s personal goals, values, and beliefs with regard to the topics, processes, and outcomes of reading” (Guthrie & Wigfield, 2000, pp. 405). Ryan and Deci (2000) distinguish between intrinsic and extrinsic motivation, where intrinsic motivation refers to actively being engaged because of inherent enjoyment or interest, and extrinsic motivation refers to actively being engaged because of external stimuli, i.e. rewards or penalties. Whereas extrinsic motivation decreases achievement (Becker et al., 2010), intrinsic reading motivation enhances reading performance (Froiland & Oros, 2013; Habók et al., 2020; Taboada et al., 2008).

The OECD reports that in 2018 a greater amount of students consider reading a waste of time, compared to previous years (OECD, 2019b). Research is inconclusive about the exact relationship between motivation and reading performance, as the relation between the variables may be reciprocal (Becker et al., 2010; Miyamoto et al., 2017; Schiefele et al., 2016).

## 2.4 SOCIETAL AND EDUCATIONAL CONTEXT

Both societal and educational changes may have an impact on reading literacy in addition to changes in ICT use, reading behavior and reading motivation. Effects of socioeconomic background on educational performance in general and on reading literacy in particular are well documented. It therefore seems plausible that change across years in these respects

might affect educational outcomes as well. Two important factors in this respect are the educational level of the parents and the availability of educational resources at home (e.g. a desk to study at, a computer that can be used for schoolwork, dictionaries). Also the language spoken at home may have a substantial impact on reading literacy. It is also well documented that gender shows a strong relation with reading literacy. Female students tend to score higher on reading tests than their male counterparts. Finally, student age is also likely to correlate with reading literacy.

Note however, that these variables do not necessarily account for changes in reading literacy, even though they usually show a strong relation with reading literacy. For example, one would expect the gender and age distributions of students to be stable across years. A data-analysis may show substantial correlations of age and gender with reading literacy, but it seems unlikely that these variables can account for changes in literacy. Only variables that show both a substantial effect on reading literacy and a considerable change over time can account for changes in reading literacy. It remains to be seen, if changes over time in parents' educational levels, educational resources, home language or age and gender distributions are large enough to account for changes in reading literacy.

With regard to educational changes the following variables will be included as control variables. Grade, learning time, disciplinary school climate and teacher stimulation of reading engagement. It seems likely that students in higher grades perform at a higher level than the ones in lower grades. Changes over time in the average grade of students in a given age range may account for change in student achievement across years (Aloisi & Tymms, 2017). If children start their school career at a younger age (e.g. due to a change in entry age), they are likely to be in a higher grade at a later age. Learning time has also been reported as a factor that stimulates student achievement (Scheerens et al., 2013). The same goes for disciplinary school climate. This variable featured as one of the main characteristics of effective schools in the seminal paper by Edmonds (1979). Finally, it also seems plausible that stimulation of reading engagement by their teacher may affect reading literacy among students.

Empirical evidence for the impact of variables that relate to teaching and educational policy seems less compelling than research findings that support the importance of factors like gender, age and family background. However, these educational variables may be more likely to change over time. Thus, it seems relevant to include them as control variables in the research design. In the end, it is the combination of change over time and relation with reading literacy can make a difference. Only variables that show both a substantial impact on reading literacy and a considerable change over time may account for the changes that are the focus of this study.

### **3. RESEARCH QUESTIONS**

The main research questions this study aims to answer are:

To what extent are changes in reading literacy over the 2009-2018 period among Dutch 15-year-olds related to ICT use, reading motivation, reading frequency and reading strategies, controlling for changes in the societal and educational context?

To what extent are these findings similar to results in other European countries? (Flanders, Estonia, Finland, Germany, Ireland, Poland and Sweden)

## 4. METHOD

### 4.1 DATA

The study is based on data collected in the PISA surveys of 2009 and 2018. PISA is issued by the Organisation for Economic Cooperation and Development (OECD). Its primary aim is to measure students' knowledge and skills needed for participation in today's societies with regard to reading, mathematics and science. PISA makes use of age-based samples to obtain information from 15-year-olds across the globe. Data collection through tests and questionnaires is standardized, allowing for cross-country comparison. The focal subject rotates every three years. In 2009 and 2018 the main part of the test items measured reading literacy (OECD, 2019a). The background questionnaires provide information on various aspects of students' lives.

### 4.2 Variables in the analysis

#### 4.2.1 Dependent variable: Reading literacy

Reading literacy is the dependent variable in this study. It is measured by means of the PISA reading score. The PISA tests assess to what extent 15-year-old students master the knowledge and skills needed for participation in modern societies. It includes both multiple choice items and open-ended questions. While in 2009, students still took a classic paper-and-pencil test, in 2018 the default mode was a computer assessment (OECD, 2019b). In 2018 the assessment focused more strongly on reading in digital environments, placing more emphasis on the use of multiple sources. Still, the study design allows for the assessment of trends in reading literacy over time (Schleicher, 2019). The average test score across OECD countries equals about 500. The standard deviation in student scores is approximately 100.

#### 4.2.2 Independent variables

The list of independent variables includes a variable denoting whether students belong to the 2009 or 2018 cohort. In addition, four categories of independent variables are included in the data-analysis. These are: variables that relate to ICT use, variables that relate to reading (including three subcategories: reading strategies, reading motivation and reading frequency), variables with regard to the societal context and variables regarding the educational context.

##### 4.2.2.2 Year

For the analyses, data from 2009 and 2018 are combined. A binary variable ("dummy") was constructed to denote whether the students are from 2009 or 2018. This variable takes on two values. The 2009 students get a zero score. The ones from 2018 get the score equal to one. In a multiple regression analysis, the year coefficient denotes the difference between both years when controlling for the additional explanatory variables. If no additional variables are included, the year coefficient is exactly equal to the difference between 2018 and 2009. A positive value implies improvement over time, a negative value implies deterioration.

##### 4.2.2.3 ICT use

Six types of ICT use are included in the data analysis. These are the frequency of:

- reading emails
- chatting online
- reading online news
- searching info online about a particular topic
- taking part in online group discussions/forums
- searching for practical information online

In 2009 and 2018 the PISA student questionnaires included questions on online reading activities of 15-year-olds. The respondents were asked to indicate how often they were involved in the activities listed above. The answer categories ranged from 1 to 5 (I don't know what it is – several times a day).

#### 4.2.2.3 Reading behavior and motivation

This includes three subcategories (reading strategies, reading motivation, reading frequency). Two variables relate to reading strategies. Students were asked to rate the usefulness of six strategies for understanding and memorizing a text. They were also asked to rate the usefulness of five strategies for summarizing at text. The responses were used to construct two distinct variables. The scores express to what extent the ordering of the strategies is in agreement with the preferred ordering according to reading experts (OECD, 2012). More details on the exact questionnaire items are provided in table 2 and 3 (see section.5.1.2).

Two variables relate to reading motivation. The first one is based on a single item from the student questionnaire, namely “About how much time do you usually spend reading for enjoyment?”. The response categories range from 1 to 5 (I do not read for enjoyment – More than 2 hours a day). The second variable on reading motivation is based on students responses to five different statements which tap how much they enjoy reading. Higher values imply that a student enjoys reading to a greater extent. See table 4 (section 5.1.2) for more details on the specific items.

Reading frequency is addressed by five different variables. Students were asked to indicate how often they read any of the following materials:

- magazines
- comic books
- fiction (novels, narratives, stories)
- non-fiction books (informational, documentary)
- newspapers

The exact question was as follows: “How often do you read these materials because you want to?”. The response options range from 1 to 5 (never or almost never – several times a week)

#### 4.2.2.4 Societal context

Five variables with regard to the societal context were included as control variable in the data-analysis. The first two (student gender and age) are likely to be related to reading literacy, but are less likely to show a change between 2009 and 2018. As PISA collects age-based samples, change across years in this respect would mainly reflect sampling error. This also goes for changes in gender distributions across years. Gender is coded as a binary variable (zero for female students, one for male students). The other three variables on societal context are more likely to reflect genuine change over the 2009-2018 period.

The first one relates to the availability of educational resources at home. Students reported the availability of several household items at home. Educational resources include (among other things) a quiet place to study, a computer you can use for school work, a dictionary. Student responses to questions regarding their parents' education were classified in accordance with the ISCED 1997 framework (OECD, 1999) The highest level of either parent (mother/father) determined the score on the variable that measures the parents' education level. The scores on this variable range from 1 to 6 (primary education – tertiary education). The third variable relates to the students' home language. This is a binary variable. A zero score implies that the language a student speaks at home most of the time is the same as the test language. In other cases, the score on this variable equals one.

#### 4.2.2.5 Educational context

Four variables on educational context are included as control variables. First of all the student's grade. The second variable relates to learning time in minutes per week for the test language. The third variable reflects the disciplinary school climate. This variable is based on student responses to items like “Students don't listen to what the teacher says”, “The teacher has

to wait a long time for students to quiet down”. Positive values indicate a better disciplinary climate. The final variable taps teacher stimulation of reading engagement. To construct this variable student responses were used to a number of items on the language of instruction lessons. Students were asked to indicate how often certain things occurred (e.g. “The teacher helps students relate the stories they read to their lives”; “The teacher shows students how the information in texts builds on what they already know”).

### 4.3 DATA ANALYSIS

To answer the research questions:

1. The changes between 2009 and 2018 in reading literacy, ICT use, reading motivation, reading frequency and reading strategies per country are reported.
2. By means of multiple regression it is assessed to what extent ICT use, reading motivation, reading frequency and reading strategies show a relation with reading literacy, controlling for societal and educational context characteristics.
3. The contribution of each variable to change in reading literacy over 2009-2018 is determined by combining (multiplying) both above results.

For the Netherlands the results are reported for two different datasets. Questions on reading strategies were not administered in 2018 to a large part of the students in some of the pre-vocational education tracks (VMBO-kb, VMBO-bb, VMBO alg., PRO). In 2009 these tracks included 33.6% of all students in the Dutch PISA survey. In 2018 the percentage is 27.6%. Results with regard to the Netherlands are reported for both the entire surveys and for a dataset that does not include these tracks. The entire Dutch data set provides the most complete picture when it comes to descriptive comparisons between 2009 and 2018 on most variables, with the exception of reading strategies. However, with regard to the estimation of regression coefficients, the dataset that does not include some pre-vocational tracks provides a more valid picture. As information on reading strategies is absent for a large number of students from the vocational tracks in 2018, the regression outcomes probably present a biased picture.

Note that an independent variable can only contribute to a change in reading literacy if two conditions are met. First, the variable in question must be related to reading literacy. Second, it must show change over the 2009-2018 period. It seems plausible that the reading habits of the 15-year-olds have changed substantially between 2009 and 2018. But, one can only conclude that such changes have contributed to changes in reading literacy if a relationship between reading habits and reading literacy can be established. Likewise, it is conceivable that a variable (e.g. the gender distribution) does show an effect on reading literacy, but remains constant over time. Such a variable cannot contribute to change in reading literacy either. Also note that there are two distinct routes toward a positive contribution. First, if a variable with a positive effect increases over time (e.g., if the parents' educational level shows a substantial increase). Second, if a variable with a negative effect decreases over time. Negative contributions may arise in two ways as well. A variable with a positive effect may decrease (e.g. reading motivation) or a variable with a negative effect may increase.

## 5. FINDINGS

The next section (5.1) presents a description of the per country changes between 2009 and 2018 in reading literacy and the independent variables. Section 5.2 reports the findings of the regression analysis. Information on the contributions of the explanatory variables to the changes in reading literacy is reported in section 5.3.

### 5.1 DESCRIPTION OF DIFFERENCES BETWEEN 2009 AND 2018

Subsection 5.1.1 reports per country changes in reading literacy. The next subsection (5.1.2) presents details on the responses to the questionnaire items with regard to reading strategies and reading motivation. Subsection 5.1.3 focuses on changes in the independent variables (ICT use, reading strategies, reading motivation, reading frequency, societal and educational context). In addition to the straightforward differences between average scores in 2009 and 2018, the differences are also reported in terms of Cohen's D (Aka effect size; Cohen, 1988). Thus, differences that relate to different scales are readily comparable. The differences are expressed in terms of their standard deviation. An effect size equal to one implies that the average score in 2018 exceeds the 2009 average by one standard deviation. Differences this large are generally considered (extremely) large. Effect sizes equal to .80 or more are considered large. Effect size around .50 are considered medium and effect size close to .20 or below are considered small. Note that these rules of thumb are primarily based on research experience in tightly controlled psychological experiments.

#### 5.1.1 Changes in reading performance per country

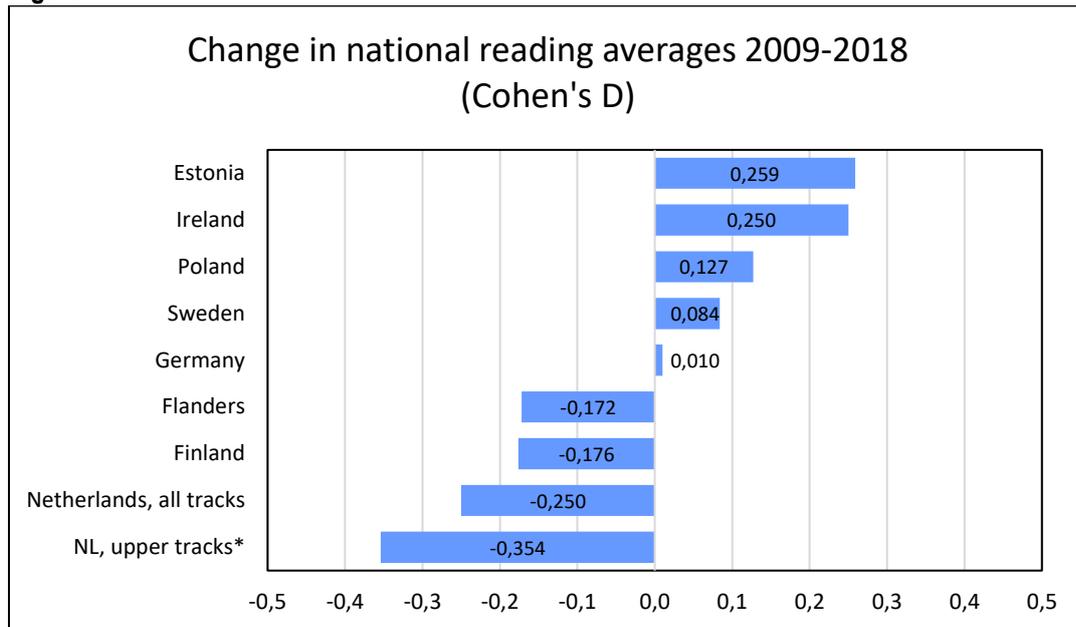
Table 1 lists the average reading scores per country and year. Figure 1 presents a graphical illustration. Estonia and Ireland show the largest improvements (Cohen's D = .259 and .250 respectively). In contrast, the Netherlands shows the largest decline (Cohen's D = -.250). Cohen's D is -.354 for the Dutch dataset that does not include a number of pre-vocational tracks. For Germany, the change in reading literacy is not statistically significant ( $p > .05$ ; in a two-tailed test). All changes for the other countries are significant.

**Table 1 Changes in national averages on reading literacy between 2009 and 2018**

	Average 2009 (SD)	Average 2018 (SD)	Decline/Improvement	Cohen's D
Flanders	518,6 (93,8)	502,2 (104,0)	-16,4	-,172
Germany	497,3 (94,8)	498,4 (105,5)	1,1	,010
Estonia	501,0 (83,3)	523,2 (93,4)	22,3	,259
Finland	535,9 (86,4)	520,2 (99,7)	-15,7	-,176
Ireland	495,6 (95,1)	518,1 (90,8)	22,5	,250
Poland	500,5 (89,2)	511,9 (97,4)	11,5	,127
Sweden	497,4 (98,6)	505,9 (107,5)	8,4	,084
Netherlands, all tracks	508,4 (88,6)	484,9 (104,6)	-23,5	-,250
NL ,upper tracks*	549,7 (71,5)	521,9 (90,2)	-27,8	-,354

\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.

Figure 1



\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.

### 5.1.2 Changes in responses to questionnaire items on reading strategies and reading enjoyment

Tables 2 and 3 provide a detailed account on the changes regarding the responses to the questionnaire items that were used to construct variables that measure awareness of reading strategies. Table 2 relates to items on strategies for understanding and memorizing a text. Students were asked to respond to the following question:

You have to understand remember the information in a text. How do you rate the usefulness of the following strategies for understanding and memorizing the text?

The response categories range from 1 to 6 (not useful at all – very useful).

The items listed in table 2 were used to construct a variable that expresses awareness of reading strategies for understanding and memorizing a text. High scores on this variable imply that the responses are in line with the preferred ordering of reading experts (3-4-5-1-2-6).

Table 2 shows that nearly all strategies were rated less useful in 2018 than in 2009. In the large majority of cases the differences are statistically significant ( $p < .05$ ; in a two-tailed test). The largest difference relates to item 5 in Flanders (Cohen's  $D = -.468$ ). The table includes 48 significant declines and only two positive changes that reach statistical significance (Item 2, Estonia and Ireland). Figure 2 presents a graphical display of the findings for item 3. In this case the largest differences relate to Germany and Flanders. The change in the Netherlands is fairly modest ( $-.203$  for the entire dataset;  $-.150$  for the dataset without most pre-vocational tracks), but still larger than in most other countries.

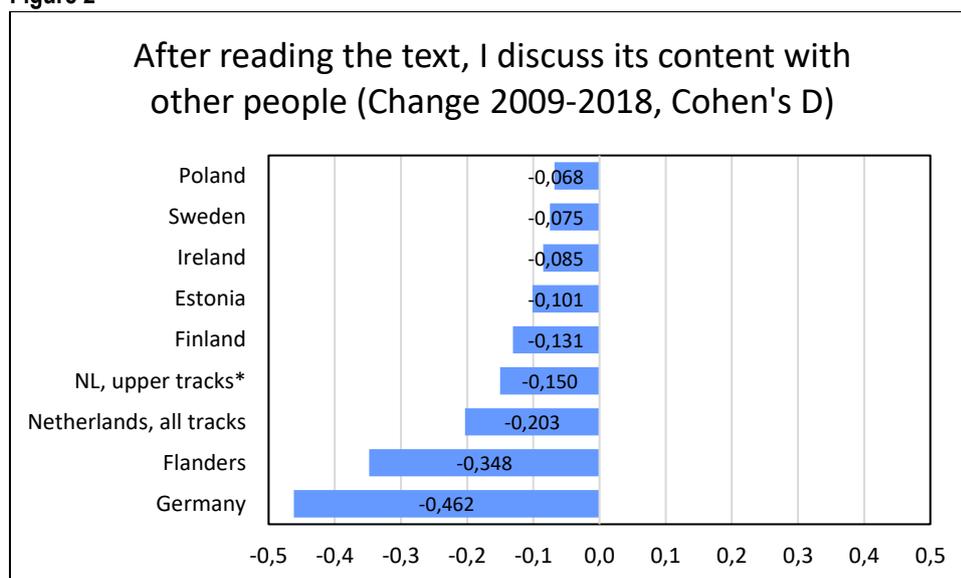
**Table 2: Items on strategies for understanding and memorizing a text**

	Flanders	Germany	Estonia	Finland	Ireland	Poland	Sweden	Netherlands	
								all tracks	upper*
<b>1 - I concentrate on the parts of the texts that are easy to understand</b>									
Average 2009	3,624	3,931	3,565	3,668	3,697	3,778	3,822	3,314	3,071
Average 2018	3,327	3,168	3,226	3,442	3,431	3,385	3,165	2,816	2,793
Cohen's D	-0,240	-0,448	-0,241	-0,163	-0,171	-0,255	-0,437	-0,346	-0,212
<b>2- I quickly read through the text twice</b>									
Average 2009	3,042	3,284	2,761	2,734	2,983	3,307	3,114	3,080	2,870
Average 2018	3,039	2,846	2,882	2,651	3,233	3,087	2,782	2,890	2,886
Cohen's D	-0,002	-0,236	0,084	-0,059	0,151	-0,137	-0,216	-0,129	0,012
<b>3 - After reading the text, I discuss its content with other people</b>									
Average 2009	3,566	4,562	4,151	3,793	3,562	3,704	3,818	3,473	3,508
Average 2018	2,987	3,772	3,993	3,586	3,417	3,588	3,691	3,145	3,279
Cohen's D	-0,348	-0,462	-0,101	-0,131	-0,085	-0,068	-0,075	-0,203	-0,150
<b>4 - I underline important parts of the text</b>									
Average 2009	4,665	5,067	4,345	4,240	4,850	4,182	4,146	4,291	4,428
Average 2018	3,952	4,531	4,130	3,931	4,324	4,087	3,887	4,175	4,319
Cohen's D	-0,446	-0,329	-0,138	-0,193	-0,338	-0,056	-0,153	-0,210	-0,072
<b>5 - I summarise the text in my own words</b>									
Average 2009	4,778	4,885	4,685	4,223	4,749	4,395	4,309	4,638	4,783
Average 2018	4,055	4,166	4,242	3,827	4,199	4,261	4,032	4,240	4,366
Cohen's D	-0,468	-0,439	-0,304	-0,236	-0,344	-0,083	-0,169	-0,071	-0,294
<b>6 - I read the text aloud to another person</b>									
Average 2009	2,916	3,608	3,369	3,206	3,215	3,113	3,325	2,948	2,862
Average 2018	2,640	2,846	3,139	3,133	2,864	3,057	3,070	2,813	2,876
Cohen's D	-0,167	-0,408	-0,144	-0,044	-0,201	-0,032	-0,151	-0,083	0,009

\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB

Most differences between 2009 and 2018 are statistically significant ( $p < .05$ ; two-tailed). The non-significant differences are printed in grey

**Figure 2**



\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB

Table 3 relates to items on strategies for summarizing a text. Students were asked to respond to the following question:

You have just read a long and rather difficult two-page text about the fluctuations in the water level of a lake in Africa. You have to write a summary. How do you rate the usefulness of the following strategies for writing a summary of this two-page text?

The responses were used to construct a variable measuring awareness of strategies for summarizing a text. High scores on this variable imply that the responses are in line with the preferred ordering of reading experts. The preferred ordering in this case is 4-5-1-3-2.

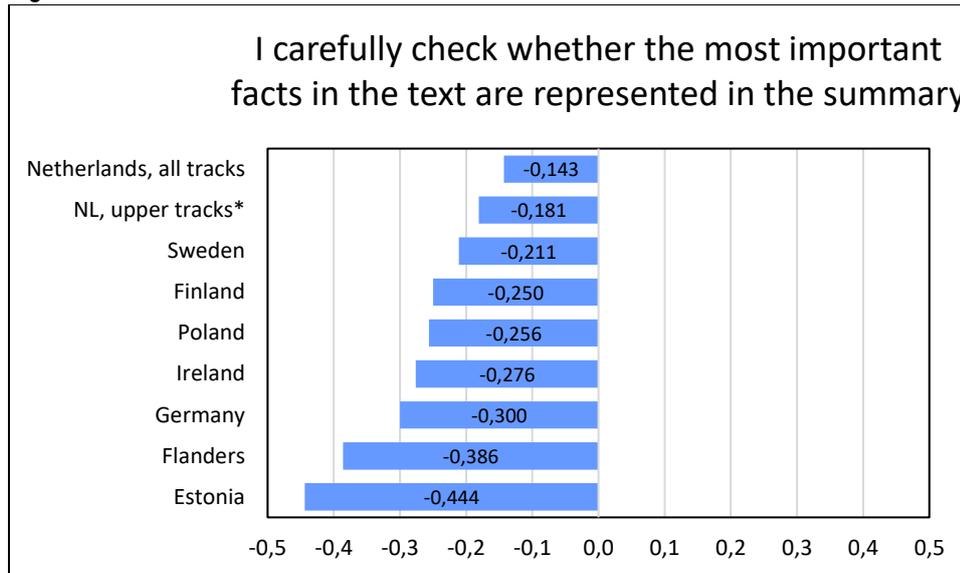
In this case, each and every strategy was rated less useful in 2018 than in 2009 in all countries. In each case the differences are statistically significant ( $p < .05$ ; two-tailed). The largest difference relates to item 3 in Germany (Cohen's  $D = -.541$ ). Figure 3 presents a graphical display of the findings for item 4. The largest differences relate to Estonia. The change in the Netherlands is modest (-.143 for the entire dataset; -.181 for the dataset without most pre-vocational tracks), and smaller than those in other countries.

**Table 3: Items on strategies for writing a summary of a two-page text**

	Flanders	Germany	Estonia	Finland	Ireland	Poland	Sweden	Netherlands	
								all tracks	upper*
<b>1 - I write a summary. Then I check that each paragraph is covered in the summary because the content of each paragraph should be included</b>									
Average 2009	3,830	4,076	3,955	3,988	4,025	3,773	3,962	3,873	3,956
Average 2018	3,277	3,302	3,527	3,699	3,427	3,376	3,538	3,572	3,678
Cohen's D	-0,342	-0,437	-0,287	-0,189	-0,368	-0,238	-0,265	-0,186	-0,182
<b>2 - I try to copy out accurately as many sentences as possible</b>									
Average 2009	2,871	3,215	2,821	2,540	3,010	2,961	2,955	3,116	2,786
Average 2018	2,499	2,419	2,605	2,268	2,772	2,568	2,518	2,569	2,499
Cohen's D	-0,236	-0,431	-0,152	-0,205	-0,149	-0,249	-0,275	-0,358	-0,208
<b>3 - Before writing the summary, I read the text as many times as possible</b>									
Average 2009	3,663	4,468	4,294	3,850	4,174	3,573	3,971	3,645	3,516
Average 2018	3,113	3,572	3,657	3,360	3,626	3,026	3,307	3,163	3,184
Cohen's D	-0,353	-0,541	-0,434	-0,333	-0,350	-0,331	-0,433	-0,323	-0,238
<b>4 - I carefully check whether the most important facts in the text are represented in the summary</b>									
Average 2009	4,843	5,150	5,078	4,731	4,966	4,803	4,673	4,638	4,852
Average 2018	4,270	4,706	4,500	4,370	4,571	4,421	4,359	4,428	4,613
Cohen's D	-0,386	-0,300	-0,444	-0,250	-0,276	-0,256	-0,211	-0,143	-0,181
<b>5 - I read through the text, underlining the most important sentences. Then I write them in my own words as a summary</b>									
Average 2009	4,848	5,155	4,752	4,503	5,088	4,561	4,515	4,503	4,651
Average 2018	4,155	4,630	4,326	4,108	4,492	4,154	4,126	4,273	4,441
Cohen's D	-0,443	-0,330	-0,289	-0,248	-0,392	-0,249	-0,238	-0,146	-0,144

\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB  
All differences between 2009 and 2018 are statistically significant ( $p < .05$ ; two-tailed)

Figure 3



\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.

Table 4 reports the changes on the items that relate to enjoyment of reading. Students were asked to respond to the following question:

How much do you agree or disagree with these statements about reading? Please take into account diverse kinds of reading material, such as books, magazines, newspapers, websites, blogs, emails...)

The response categories range from 1 to 4 (strongly disagree, disagree, agree, strongly agree)

Three items (1, 4, 5) express a negative attitude toward reading. For these items, agreement is nearly always higher in 2018 than in 2009. For the two positively worded items, agreement is usually lower in 2018. In comparison to the items on reading strategies, the proportion of statically significant differences is somewhat smaller. In general, the differences in table 4 (in terms of Cohen's D) are smaller than the ones that relate to reading strategies. The largest change (Cohen's D = .365) relates to item 1 (I only read if I have to) in Sweden.

Figure 4 presents a graphical display of the findings for item 1. The change in the Netherlands is modest (.237 for the entire dataset; .194 for the dataset without most pre-vocational tracks). Most other countries show a stronger increase. Still, the differences are statistically significant. Moreover, they indicate a decrease in reading enjoyment. Estonia does not show a significant change. Poland even shows a very small, but statistically significant improvement with regard to this item.

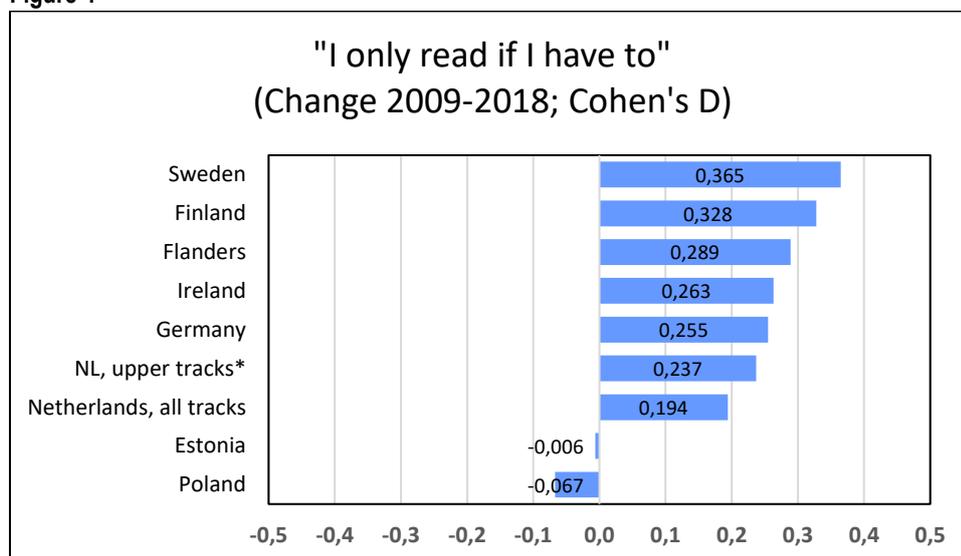
**Table 4: Items on reading enjoyment - Comparison between 2009 and 2018**

	Flanders	Germany	Estonia	Finland	Ireland	Poland	Sweden	Netherlands	
								all tracks	upper*
<b>1 - I only read if I have to</b>									
Average 2009	2,525	2,204	2,360	2,217	2,273	2,319	2,299	2,600	2,506
Average 2018	2,815	2,488	2,354	2,537	2,524	2,250	2,662	2,791	2,743
Cohen's D	0,289	0,255	-0,006	0,328	0,263	-0,067	0,365	0,194	0,237
<b>2 - Reading is one of my favourite hobbies</b>									
Average 2009	1,758	2,059	2,098	2,142	2,164	2,223	2,001	1,758	1,829
Average 2018	1,685	1,901	2,115	1,950	2,123	2,319	1,921	1,715	1,766
Cohen's D	-0,086	-0,152	-0,020	-0,204	-0,044	0,096	-0,088	-0,049	-0,071
<b>3 - I like talking about books with other people</b>									
Average 2009	1,826	2,031	2,155	2,089	2,161	2,257	2,066	1,756	1,853
Average 2018	1,777	1,852	2,220	2,029	2,134	2,367	2,058	1,711	1,783
Cohen's D	-0,057	-0,181	-0,073	-0,065	-0,030	0,113	-0,008	-0,053	-0,082
<b>4 - For me, reading is a waste of time</b>									
Average 2009	2,364	1,965	1,941	2,040	1,964	1,992	2,075	2,244	2,089
Average 2018	2,544	2,115	2,053	2,280	2,035	1,987	2,293	2,417	2,289
Cohen's D	0,170	0,140	0,121	0,239	0,076	-0,005	0,221	0,168	0,201
<b>5 - I read only to get information that I need</b>									
Average 2009	2,467	2,363	2,517	2,246	2,409	2,531	2,336	2,467	2,368
Average 2018	2,627	2,564	2,401	2,522	2,514	2,361	2,624	2,636	2,558
Cohen's D	0,173	0,184	-0,135	0,305	0,118	-0,173	0,306	0,184	0,206

\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB

Most differences between 2009 and 2018 are statistically significant ( $p < .05$ ; two-tailed). The non-significant differences are printed in grey

**Figure 4**



\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.  
Change in Estonia not significant

### 5.1.3 Changes in independent variables

Table 5 reports to what extent the 24 independent variables considered in this study changed between 2009 and 2018 per country. The differences between both years are expressed in term of Cohen's D. The changes on reading literacy are included in table 5 as well. The original ("raw") differences are reported in Appendix A. Nearly all independent variables show significant change over time in most countries (i.e. in at least five countries). The exceptions are student age, student gender and learning time in the test language per week.

With regard to ICT use, the results indicate significant increases in (nearly) every country for chatting, reading online news, searching information online about a particular topic and searching for practical information. In a number of cases, the changes are extremely large (e.g. the increase of chatting and reading online news in Ireland), but in other cases the changes are very small or not even statistically significant (e.g. the change on chatting and reading online news in Estonia). Figure 5 present a graphical illustration of the per country change in online chatting. With regard to reading emails, the findings consistently show significant declines for all countries. Relatively moderate changes can be observed for taking part in online group discussions and forums. Four countries show a significant decrease (Germany, Estonia, Finland and the Netherlands), while the opposite goes for three other countries (Ireland, Poland and Sweden).

The findings on reading strategies a show mixed pattern. For both understanding/remembering and summarizing table 5 shows modest, but statistically significant changes in seven countries. However, for summarizing the changes indicate improvement in four countries and decline in three other countries. For understanding and remembering, table 5 reports significant improvement in four countries. In three countries there is a decline on this measure. Also note that these measure are based on the *ordering* of the items listed in tables 2 and 3. The fact that the importance of nearly all strategies is considered to be lower in 2018 is not reflected in these variables.

The variables that pertain to reading motivation (reading enjoyment and reading time for enjoyment) show a significant decline in most countries. In general, the changes are quite modest. For both variables, two countries deviate from the general pattern. Estonia and Poland show a small increase on both reading enjoyment and reading time for enjoyment.

With regard reading frequency three variables out of five show significant decreases in each and every country. For two other variables, table 5 shows a few exceptions to the general pattern. With regard to reading fiction, significant increases are found for Estonia and Poland. Flanders and Sweden show significant increases for non-fiction. With regard to reading magazines, comic books and newspapers all countries show significant and in many cases extremely strong declines (with values for Cohen's D that exceed one). This is illustrated in figure 6, which shows the changes for reading magazines. For every country, the decline is extremely large. Taking this into account, the decline in the Netherlands is relatively moderate. Most countries show an even stronger decline.

With respect to societal developments, the following patterns emerge. All countries show a significant increase in the educational levels of the students' parents. In most countries the increase is fairly small (Cohen's D is closer to .20 than to .50). The two exceptions are Poland and the Netherlands. In these countries Cohen's D exceeds .50. Thus, for Poland and the Netherlands the increases qualify as changes of medium size. Figure 7 presents a graphical display of the changes in parents' educational level. The percentage of students speaking another language at home than the test language has increased significantly in all countries except Flanders. For all countries, the size of the changes qualifies as small. The pattern is different with regard to educational resources at home. In four countries a significant decrease can be observed for this variable, whereas three other countries show a significant increase (Flanders, Ireland and the Netherlands). The size of the changes appears to be small in every case. For two other variables that relate to the societal context (student gender, student age), the changes are non-significant in most countries.

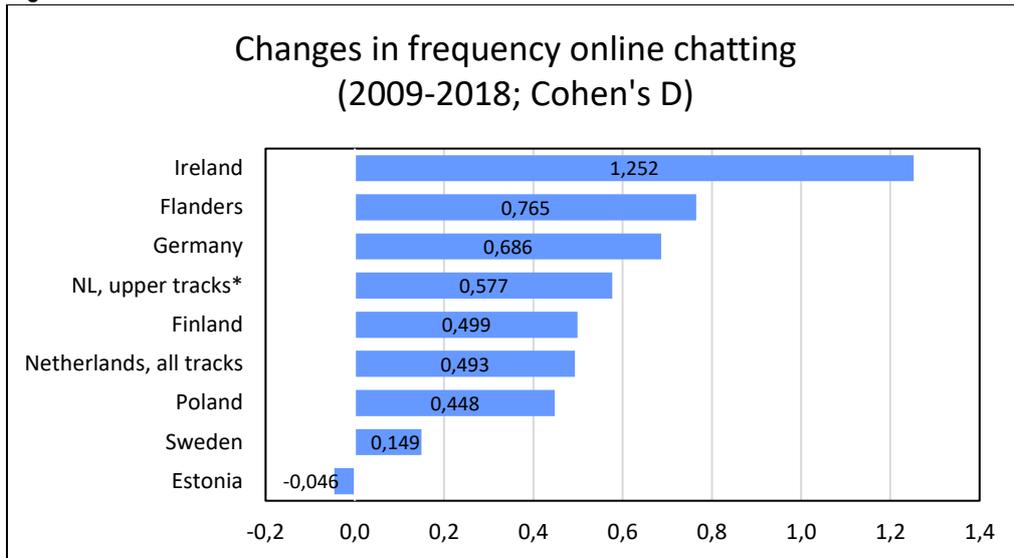
For educational factors, the findings indicate that in most countries the 2018 students are in a higher grade than their 2009 counterparts. In six countries, a significant increase is observed. Finland and Ireland are the exceptions to the general pattern. The findings in table 5 indicate that the changes qualify as small. Disciplinary school climate also shows a small but significant improvement in six countries. In this case, Flanders and Germany are the deviating countries. Figure 8 presents a graphical illustration. Teacher stimulation of reading engagement shows a significant increase in four countries and a significant decrease in two countries. In every case, these changes can be considered small. Finally, learning time in the test language per week shows a small but significant increase in four countries (Germany, Estonia, Ireland and the Netherlands).

**Table 5: Changes on reading and independent variables (expressed as Cohen's D)**

	Flanders	Germany	Estonia	Finland	Ireland	Poland	Sweden	Netherlands	
								all tracks	upper*
Reading literacy	<b>-0,172</b>	0,010	<b>0,259</b>	<b>-0,176</b>	<b>0,250</b>	<b>0,127</b>	<b>0,084</b>	<b>-0,250</b>	<b>-0,354</b>
Frequency reading emails	<b>-0,671</b>	<b>-0,662</b>	<b>-0,550</b>	<b>-0,511</b>	<b>-0,194</b>	<b>-0,509</b>	<b>-0,471</b>	<b>-0,866</b>	<b>-0,878</b>
Frequency chatting online	<b>0,765</b>	<b>0,686</b>	-0,046	<b>0,499</b>	<b>1,252</b>	<b>0,448</b>	<b>0,149</b>	<b>0,493</b>	<b>0,577</b>
Frequency reading online news	<b>0,727</b>	<b>0,119</b>	<b>-0,044</b>	<b>0,508</b>	<b>1,118</b>	<b>0,161</b>	<b>0,178</b>	<b>0,256</b>	<b>0,244</b>
Frequency searching info online about a particular topic	<b>0,815</b>	<b>0,335</b>	<b>0,313</b>	<b>0,568</b>	<b>0,742</b>	<b>0,460</b>	<b>0,383</b>	<b>0,484</b>	<b>0,474</b>
Frequency taking part in online group discussions/forums	-0,028	<b>-0,181</b>	<b>-0,486</b>	<b>-0,325</b>	<b>0,345</b>	<b>0,266</b>	<b>0,088</b>	<b>-0,075</b>	<b>-0,105</b>
Frequency searching for practical info online	<b>0,838</b>	<b>0,354</b>	<b>0,323</b>	<b>0,474</b>	<b>0,528</b>	<b>0,398</b>	<b>0,273</b>	<b>0,435</b>	<b>0,398</b>
Reading strategies: summarising	<b>-0,082</b>	<b>0,139</b>	<b>-0,080</b>	<b>-0,061</b>	-0,040	<b>0,059</b>	<b>0,050</b>	<b>0,201</b>	<b>0,099</b>
Reading strategies: understanding and remembering	<b>-0,274</b>	0,006	<b>-0,040</b>	<b>-0,121</b>	<b>-0,110</b>	<b>0,176</b>	<b>0,165</b>	<b>0,076</b>	-0,036
Reading enjoyment	<b>-0,258</b>	<b>-0,294</b>	<b>0,040</b>	<b>-0,277</b>	0,006	<b>0,154</b>	<b>-0,197</b>	<b>-0,242</b>	<b>-0,281</b>
Reading time for enjoyment	0,033	<b>-0,139</b>	<b>0,084</b>	<b>-0,103</b>	<b>-0,101</b>	<b>0,097</b>	<b>-0,155</b>	0,003	0,011
Frequency reading magazines	<b>-1,248</b>	<b>-0,972</b>	<b>-1,302</b>	<b>-1,306</b>	<b>-1,373</b>	<b>-1,212</b>	<b>-1,031</b>	<b>-0,997</b>	<b>-1,107</b>
Frequency reading comic books	<b>-0,506</b>	-0,026	<b>-0,266</b>	<b>-1,047</b>	<b>-0,158</b>	<b>-0,089</b>	<b>-0,155</b>	<b>-0,309</b>	<b>-0,308</b>
Frequency reading fiction	<b>-0,085</b>	<b>-0,196</b>	<b>0,063</b>	<b>-0,271</b>	<b>-0,090</b>	<b>0,071</b>	<b>-0,266</b>	<b>-0,166</b>	<b>-0,186</b>
Frequency reading non-fiction books	<b>0,116</b>	<b>-0,078</b>	<b>-0,158</b>	<b>-0,122</b>	<b>-0,057</b>	-0,023	<b>0,425</b>	-0,035	<b>-0,089</b>
Frequency reading newspapers	<b>-0,594</b>	<b>-0,777</b>	<b>-1,334</b>	<b>-0,942</b>	<b>-1,034</b>	<b>-1,338</b>	<b>-1,251</b>	<b>-0,726</b>	<b>-0,778</b>
Percentage male students	-0,020	<b>0,054</b>	<b>-0,034</b>	0,017	-0,018	-0,001	0,015	0,008	-0,009
Student age	-0,005	-0,001	<b>0,046</b>	-0,026	0,004	0,024	<b>-0,092</b>	<b>0,073</b>	<b>0,109</b>
Home educational resources	<b>0,141</b>	<b>-0,169</b>	<b>-0,168</b>	-0,015	<b>0,164</b>	<b>-0,294</b>	<b>-0,116</b>	<b>0,244</b>	<b>0,263</b>
Highest educational level parents	<b>0,194</b>	<b>0,080</b>	<b>0,219</b>	<b>0,237</b>	<b>0,341</b>	<b>0,564</b>	<b>0,159</b>	<b>0,537</b>	<b>0,581</b>
Home language is not test language	<b>-0,184</b>	<b>0,212</b>	<b>0,135</b>	<b>0,171</b>	<b>0,124</b>	<b>0,109</b>	<b>0,292</b>	<b>0,122</b>	0,054
Grade	<b>0,058</b>	<b>0,257</b>	<b>0,084</b>	-0,064	<b>-0,104</b>	<b>0,120</b>	<b>0,058</b>	<b>0,188</b>	<b>0,216</b>
Learning time test language per week	0,001	<b>0,199</b>	<b>0,339</b>	0,014	<b>0,082</b>	0,033	0,034	<b>0,082</b>	<b>0,060</b>
Disciplinary school climate	-0,053	<b>-0,209</b>	<b>0,154</b>	<b>0,194</b>	<b>0,063</b>	0,028	<b>0,096</b>	<b>0,087</b>	<b>0,108</b>
Teacher stimulation reading engagement	<b>0,089</b>	<b>0,075</b>	<b>-0,189</b>	<b>0,153</b>	0,000	<b>-0,180</b>	<b>0,107</b>	-0,011	-0,026

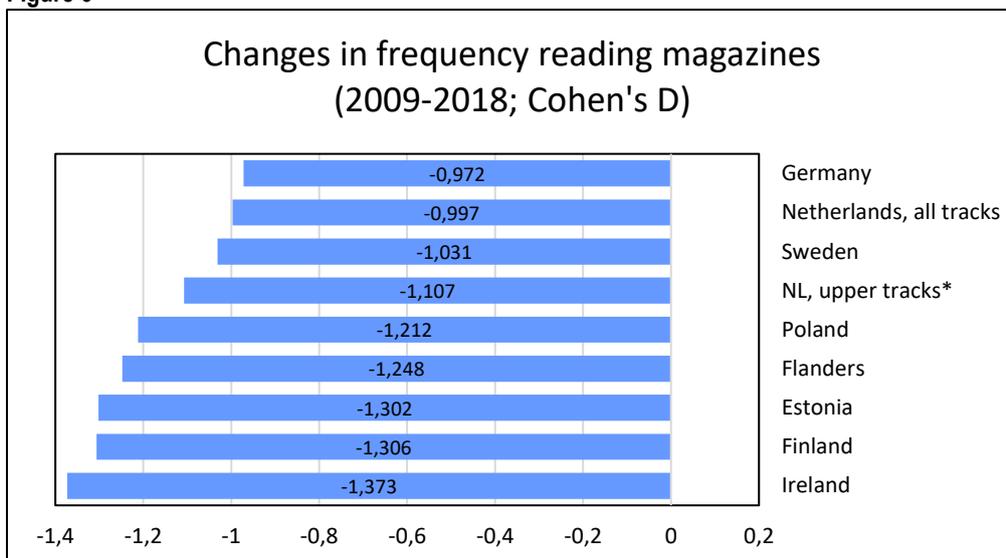
\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB  
Significant differences ( $p < .05$ ; two-tailed) are printed **bold**.

Figure 5



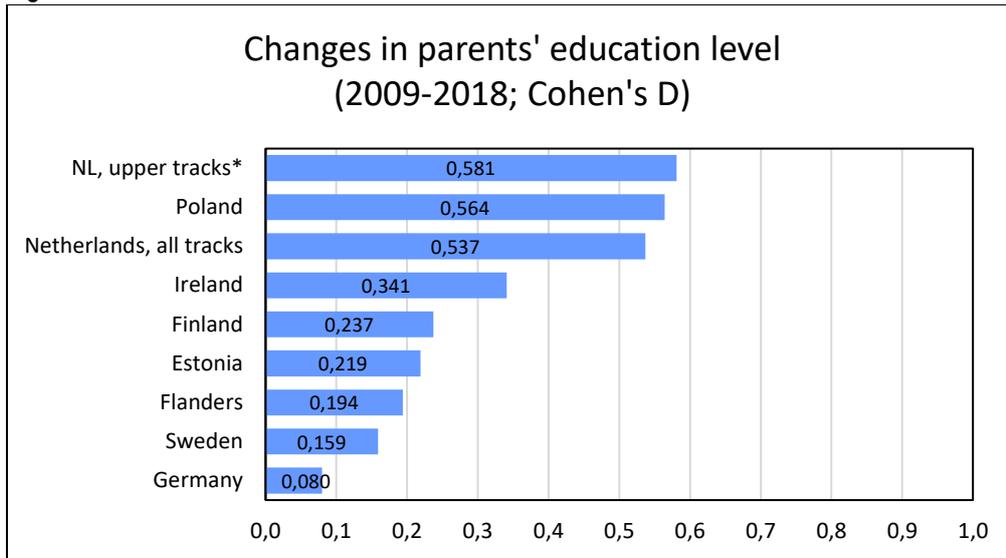
\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.  
The change for Estonia is not significant

Figure 6



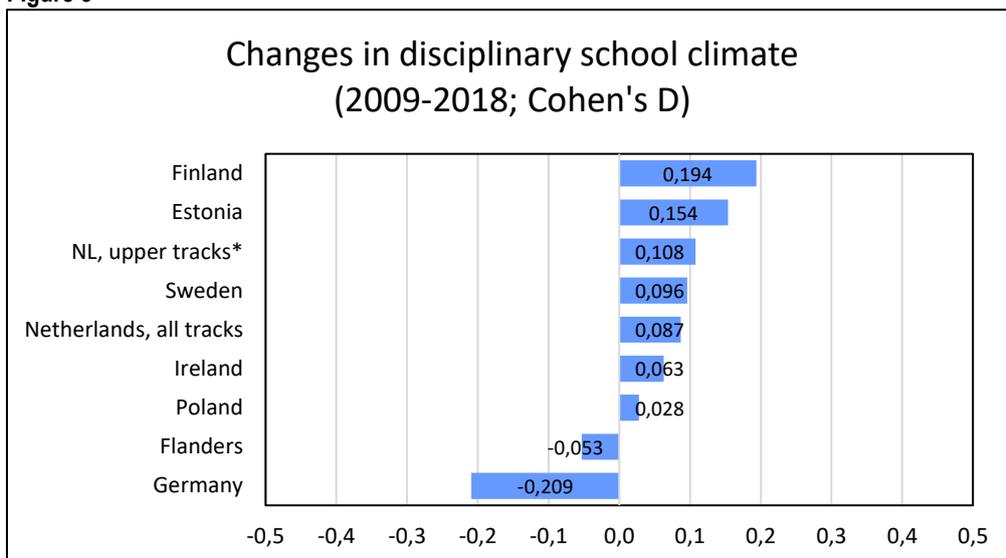
\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.  
All changes are significant ( $p < .05$ ; two-tailed)

Figure 7



\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.  
All changes are significant

Figure 8



\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.  
Changes for Flanders and Poland not significant

## 5.2 Regression analysis

The results from the regression analyses are reported in table 6. For every country, the proportion of explained variance ( $R^2$ ) is quite high. Flanders shows the highest value ( $R^2 = .538$ ). The lowest value (.372, Estonia) still indicates that the independent variables account for a considerable part of the variance in reading literacy scores. The proportion of explained variance for the Netherlands is .492 for the entire sample and .413 when a number of pre-vocational tracks are excluded.

In nearly every country, the year effect is still significant. Finland is the sole exception. In that case, the explanatory variables account for the entire decline in reading literacy scores between 2009 and 2018 (16.4 points, see table 1). For Germany the regression analysis shows a small, but significant and negative year effect, whereas the raw difference between year did not indicate a significant change. This implies that, when taking all independent variables into account, the predicted German results in 2018 are slightly less than actually observed. This is expressed by the negative year coefficient in table 6.

In four countries, the regression analysis produces a year effect closer to zero than the raw difference between years (as reported in table 1). These are Flanders, Finland, Ireland and Poland. In these cases, the independent variables account (to some extent) for the change in reading literacy across years. In four other countries (Germany, Estonia, Sweden and the Netherlands), the results are different. In these cases, the year coefficients are larger than the observed differences between 2009 and 2018. Apparently, supplementary variables are needed to account for the change over time in addition to the ones included in the analysis. The year effect indicates a 39.7 decline for the Netherlands (entire dataset). This clearly exceeds the raw difference between years (-23.5, see table 1). In other words: when taking into account the independent variables, the decline would even be larger than actually observed. Note, however, that when a number of pre-vocational tracks are not taken into account, the regression analysis produces a year effect slightly closer to zero than the difference actually observed (-26.7 vs. -27.8). Pre-vocational tracks were excluded as information on reading strategies is absent for a large percentage of students in these tracks. It seems that this has important implications for the findings.

The regression findings in table 6 show consistently significant effects for only a handful of independent variables. First of all, the effect of grade is significantly positive in seven out of eight countries (Ireland presenting the exception). Both variables that relate to reading strategies produce significant and positive effects in (almost) each and every country. The only exception relates to Ireland with regard to strategies for understanding and remembering a text. Parents' educational level gives significant and positive effects in six countries (The Netherlands and Germany are the exceptions). Reading enjoyment produces significant and positive effects in four countries (Germany, Ireland, Poland and the Netherlands). The same goes for reading fiction, although not in exactly the same set of countries (Germany, Finland, Sweden and the Netherlands). All other independent variables only produce a significant effect in one or two countries.

**Table 6: regression analyses, incl. year effects (2018 vs. 2009) controlling for independent variables**

	Flanders	Germany	Estonia	Finland	Ireland	Poland	Sweden	Netherlands	
								all tracks	upper *
Intercept	-56,298	<b>572,812</b>	<b>402,740</b>	<b>321,902</b>	368,571	<b>-167,694</b>	-76,025	<b>371,596</b>	<b>348,658</b>
Year coefficient	<b>-11,115</b>	<b>-3,105</b>	<b>26,961</b>	-1,161	<b>11,148</b>	<b>-7,031</b>	<b>12,998</b>	<b>-39,696</b>	<b>-26,736</b>
Frequency reading emails	-0,577	0,773	3,261	1,021	2,832	3,220	2,328	-1,696	1,336
Frequency chatting online	-2,122	5,529	7,092	-1,492	-0,271	3,255	1,693	2,513	1,071
Frequency reading online news	-1,434	-1,206	-1,322	1,397	2,667	-0,038	-3,056	1,893	-0,391
Frequency searching info online about a particular topic	2,723	3,091	-0,071	2,525	4,903	7,206	6,446	4,351	-0,009
Frequency taking part in online group discussions/forums	-2,272	-2,015	-1,761	0,066	-4,184	-2,280	-6,130	-3,332	-1,813
Frequency searching for practical info online	3,425	1,171	2,715	5,152	2,310	0,262	6,908	7,854	5,801
Reading strategies: summarising	<b>25,143</b>	<b>23,650</b>	<b>20,564</b>	<b>23,450</b>	<b>21,605</b>	<b>23,798</b>	<b>24,119</b>	<b>26,813</b>	<b>20,178</b>
Reading strategies: understanding and remembering	<b>15,196</b>	<b>13,663</b>	<b>15,903</b>	<b>11,619</b>	11,710	<b>9,107</b>	<b>15,440</b>	<b>17,003</b>	<b>15,109</b>
Reading enjoyment	9,240	<b>10,485</b>	22,589	16,278	<b>22,723</b>	<b>15,504</b>	13,637	11,430	<b>15,303</b>
Reading time for enjoyment	3,621	3,893	0,376	1,116	4,504	3,651	2,365	2,262	2,874
Frequency reading magazines	1,846	-0,940	0,665	3,321	-2,156	<b>6,031</b>	0,277	1,718	2,297
Frequency reading comic books	0,274	-1,511	<b>-5,634</b>	1,713	<b>-6,277</b>	-4,144	-2,062	2,107	2,205
Frequency reading fiction	5,801	<b>7,494</b>	0,114	<b>9,093</b>	6,310	2,528	<b>7,909</b>	7,897	<b>5,184</b>
Frequency reading non-fiction books	0,497	-1,505	5,832	-0,176	-3,380	2,042	1,582	1,303	-0,722
Frequency reading newspapers	2,310	-0,164	2,430	-1,072	-1,883	-5,380	1,052	-0,232	0,833
Male student	4,459	7,039	-0,569	-6,897	-0,888	-6,776	-3,237	10,823	13,553
Student age	-4,530	<b>-31,665</b>	-14,376	-8,655	0,884	7,450	3,679	<b>-20,982</b>	-13,991
Home educational resources	8,479	<b>5,866</b>	3,656	0,104	4,028	1,414	5,246	<b>7,215</b>	-0,667
Highest educational level parents	<b>7,097</b>	7,559	<b>4,676</b>	<b>8,546</b>	<b>9,150</b>	<b>13,563</b>	<b>6,738</b>	5,749	5,222
Home language is not test language	-17,699	-39,974	<b>-42,358</b>	-59,322	-29,482	-44,244	<b>-65,405</b>	-31,263	-20,245
Grade	<b>59,826</b>	<b>41,637</b>	<b>30,310</b>	<b>35,463</b>	10,688	<b>56,638</b>	<b>56,882</b>	<b>42,052</b>	<b>36,727</b>
Learning time test language per week	0,054	-0,095	0,057	-0,037	-0,119	-0,055	-0,062	-0,069	-0,088
Disciplinary school climate	-0,793	4,166	<b>3,872</b>	1,622	4,286	1,840	3,745	3,135	2,494
Teacher stimulation reading engagement	0,309	-3,841	-6,132	-0,839	-0,956	1,141	-1,543	<b>-5,054</b>	-2,294
R squared	<b>0,538</b>	<b>0,498</b>	<b>0,372</b>	<b>0,428</b>	<b>0,387</b>	<b>0,414</b>	<b>0,428</b>	<b>0,492</b>	<b>0,413</b>

\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB. Significant results are printed **bold**.

### 5.3 Contributions of independent variables to change in reading literacy

By combining the results about the effects of independent variables (table 5.2) and the changes in the independent variables (appendix) the contribution of each independent variable to the change in reading literacy has been assessed. For example, the appendix shows a decrease of reading enjoyment in the Netherlands (including all tracks) that equals .296 (this corresponds to a Cohen's of -.281; see table 5). When this information is combined with the effect of reading enjoyment on reading literacy as obtained in the regression analysis (15.303; see table 6), the contribution of this variable to change in reading literacy can be assessed through a multiplication of both numbers. The outcome is equal to -4.530 ( $-.296 \times 15.303$ ). In other words: the decline in reading enjoyment contributes about 4.5 points to the decrease in reading literacy over the 2009-2018 period. The contributions per country for all 24 independent variables are listed in table 7. Table 8 presents a more condensed overview. The contributions of the independent variables have been summed per category (ICT use, Reading behavior/motivation, Societal factors and Educational factors). This produces a summary of the contribution to the change in reading literacy of all variables per category. For reading behavior/motivation a breakdown by subcategories (reading strategies, reading motivation, reading frequency) is reported. Figures 9 and 10 present graphic representations of these findings.

The factors related to reading show the largest contributions. In six countries this is a negative contribution. The effects of reading related variables are nearly always positive. However many of these variables have declined dramatically between 2009 and 2018. Hence, these variables have made a negative contribution to the changes in reading literacy. There are two exceptions to this general rule. In Ireland and Poland moderately positive contributions of reading variables were found.

In contrast, the other categories mostly shows positive contributions. ICT use shows a positive contribution in all countries except Estonia. Similar to reading, the ICT related variables show (modestly) positive effects on reading literacy, but these variables also show dramatic increases. The reading related variables, on the other hand, mostly show substantial decreases. As a result, ICT related variables have contributed positively to changes in reading literacy in seven countries. Estonia is the only exception to this trend, showing a very small but negative contribution.

The societal factors considered in this study show positive contributions in four countries, namely Flanders, Ireland, Poland, and the Netherlands. Estonia and Finland show negative contributions, albeit very modest ones. For Germany and Sweden, the negative contributions are more sizeable. The improved education level of the students' parents is the main contributing variable for the societal category.

Educational factors produce a positive contribution in six countries. In this case Finland and Ireland are the exceptions. The negative contributions found for these contributions are very modest. The main variable that accounts for the contribution of educational factors is the increased grade level of the 15-year-olds in most countries.

Taking a closer look at subcategories of the reading related variables, reveals that changes in reading strategies have contributed negatively in four countries but positively in four other countries. Negative contributions relate to Flanders, Estonia, Finland and Ireland. In the other four countries (Germany, Poland, Sweden and the Netherlands) the contribution has been positive. In nearly all countries the effect of reading strategies on reading literacy have been found to be positive (both for summarizing and remembering/understanding). The contribution to change across years is positive in a country if the reading strategies have improved. If the reading strategies have declined, this amounts to a negative contribution. With regard to the Netherlands, the findings that relate to the upper tracks (i.e. excluding several prevocational tracks) are probably the most valid. In 2018, a large part of the students in the prevocational tracks did not fill in the questionnaire items on reading strategies.

Reading motivation shows a negative contribution in six countries. The exceptions are Estonia and Poland. Reading enjoyment shows a positive relation with reading literacy in each and every country. In most countries reading enjoyment has decreased, which results in negative contributions.

Variables related to reading frequency contribute negatively to changes in reading literacy in six countries. The two exceptions in this case are Ireland and Poland. In general, reading frequency is positively related to reading literacy. In most cases, a decrease in reading literacy has occurred. This explains its negative contribution. However, deviations from this general pattern can also be discerned (e.g. a negative effect of reading comic books in Estonia; together with a decline in frequency this results in a positive contribution).

**Table 7: Contributions of independent variables to reading change 2009-2018 (detailed)**

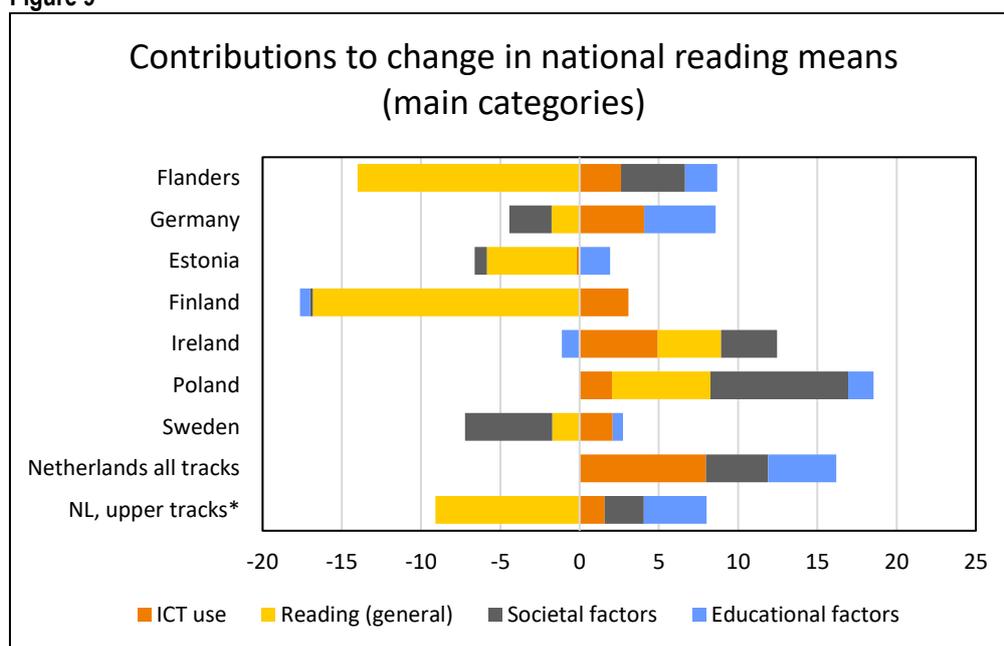
	Flanders	Germany	Estonia	Finland	Ireland	Poland	Sweden	Netherlands	
								all tracks	upper *
Frequency reading emails	0,359	-0,516	-1,689	-0,453	-0,549	-1,607	-1,055	1,265	-0,986
Frequency chatting online	-1,292	3,096	-0,277	-0,649	-0,311	1,448	0,232	0,854	0,403
Frequency reading online news	-1,078	-0,170	0,061	0,739	2,976	-0,006	-0,568	0,536	-0,102
Frequency searching info online about a particular topic	1,969	0,927	-0,019	1,257	3,285	2,832	2,211	1,840	-0,003
Frequency taking part in online group discussions/forums	0,059	0,353	0,935	-0,022	-1,636	-0,720	-0,576	0,247	0,179
Frequency searching for practical info online	2,606	0,391	0,812	2,210	1,162	0,103	1,851	3,236	2,088
Reading strategies: summarising	<b>-2,062</b>	<b>3,216</b>	<b>-1,522</b>	<b>-1,430</b>	<b>-0,821</b>	<b>1,404</b>	<b>1,278</b>	<b>5,443</b>	<b>1,877</b>
Reading strategies: understanding and remembering	<b>-4,057</b>	<b>0,082</b>	<b>-0,620</b>	<b>-1,441</b>	-1,183	<b>1,576</b>	<b>2,656</b>	<b>1,292</b>	<b>-0,499</b>
Reading enjoyment	-2,504	<b>-3,733</b>	0,836	-4,835	<b>0,136</b>	<b>2,543</b>	-2,782	-2,823	<b>-4,530</b>
Reading time for enjoyment	0,130	-0,666	0,039	-0,134	-0,536	0,460	-0,400	0,007	0,032
Frequency reading magazines	-2,760	1,078	-0,968	-4,952	3,363	<b>-8,884</b>	-0,361	-2,117	-3,004
Frequency reading comic books	-0,174	0,045	<b>1,685</b>	-2,205	<b>0,954</b>	0,414	1,619	-0,839	-0,867
Frequency reading fiction	-0,609	<b>-2,113</b>	0,009	<b>-3,083</b>	-0,764	0,225	<b>-2,863</b>	-1,177	<b>-1,239</b>
Frequency reading non-fiction books	0,067	0,144	-1,120	0,024	0,223	-0,057	0,808	-0,053	0,074
Frequency reading newspapers	-2,037	0,185	-4,007	1,217	2,636	8,527	-1,691	0,249	-0,940
Student gender (male vs. female)	-0,045	0,190	0,010	-0,055	0,008	0,000	0,026	0,043	-0,068
Student age	0,005	<b>0,032</b>	-0,187	0,061	0,001	0,052	-0,096	<b>-0,441</b>	-0,434
Home educational resources	1,068	<b>-0,915</b>	-0,515	-0,001	0,640	-0,341	-0,561	<b>1,551</b>	-0,137
Highest educational level of parent	<b>1,668</b>	0,945	<b>1,052</b>	<b>2,145</b>	<b>3,843</b>	<b>9,467</b>	<b>1,348</b>	3,823	3,384
Home language is not test language	1,327	-2,918	<b>-1,144</b>	-2,314	-0,973	-0,487	<b>-6,213</b>	-1,063	-0,263
Grade	<b>1,974</b>	<b>7,203</b>	<b>1,243</b>	<b>-0,816</b>	-0,802	<b>1,926</b>	<b>0,683</b>	<b>4,500</b>	<b>4,113</b>
Learning time test language per week	0,005	-1,563	-0,936	-0,021	-0,614	-0,081	-0,216	-0,493	-0,446
Disciplinary school climate	0,042	-0,883	<b>0,589</b>	0,298	0,300	-0,052	0,333	0,245	0,232
Teacher stimulation reading engagement	0,023	-0,265	1,030	-0,111	0,000	-0,202	-0,156	0,045	0,050

\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB  
Contributions based on significant (.05; two-tailed) regression coefficients are printed **bold**.

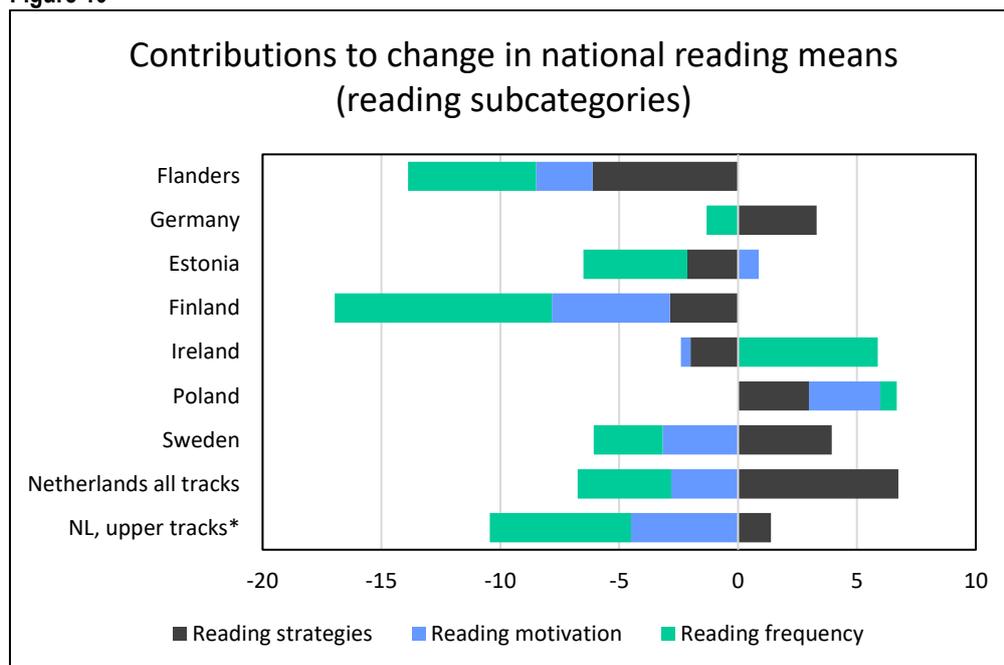
**Table 8: Contributions of independent variables to reading change 2009-2018 per (sub)category**

	Flanders	Germany	Estonia	Finland	Ireland	Poland	Sweden	Netherlands	
								all tracks	upper*
ICT use	2,622	4,082	-0,177	3,082	4,927	2,051	2,095	7,978	1,579
Reading (general)	-14,006	-1,761	-5,669	-16,838	4,010	6,208	-1,735	-0,017	-9,096
Reading strategies	-6,119	3,298	-2,142	-2,871	-2,004	2,980	3,934	6,735	1,378
Reading motivation	-2,374	-4,398	0,875	-4,968	-0,400	3,003	-3,182	-2,816	-4,498
Reading frequency	-5,383	-1,327	-4,362	-9,132	5,877	0,686	-2,887	-3,930	-5,944
Societal factors	4,024	-2,667	-0,784	-0,165	3,519	8,692	-5,497	3,914	2,482
Educational factors	2,045	4,492	1,925	-0,649	-1,116	1,591	0,644	4,297	3,950

**Figure 9**



**Figure 10**



\* Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB, VMBO alg.

## 6. SUMMARY AND DISCUSSION

This study aimed to assess the contribution of four categories of variables to the changes in reading literacy between 2009 and 2018 in eight European countries. This discussion describes the findings from the Dutch perspective and focuses on the findings that do not include all pre-vocational tracks. In 2018 information on reading strategies is missing for a large part of the students from these tracks.

The analyses show that within countries ICT use has made moderately positive contributions to change in reading literacy across 2009 and 2018. ICT use shows fairly small, but mostly positive effects. At the same time ICT use, increased dramatically. Hence, moderately positive contributions can be observed for the Netherlands and nearly every other country included in the present study. Also, the general societal context and educational factors show a positive contribution in the Netherlands. This overall pattern is very similar in Flanders. In both countries, the educational and societal variables show only small increases over time. Still they produce noticeable contributions, because their effects are quite large. The contributions of educational factors is mainly due to the fact that the 2018 students are in higher grades than their counterparts in 2009. The increased level of parents' education levels is the main cause for the positive contribution of societal factors.

Like the Netherlands, Flanders also shows positive contributions of ICT use. Furthermore, both countries show a large and negative contribution of reading related variables. Other countries included in this study show negative contributions of reading related variables as well. For Germany, Estonia and Sweden this contribution is smaller than it is in the Netherlands. Finland and Flanders show even larger contributions than the Netherlands. Ireland and Poland are the only countries with a positive contribution of reading related variables. Like the Netherlands, most countries show a positive contribution of educational variables. Only Finland and Ireland show modestly negative contributions in this respect. Together with the Netherlands, three other countries (Flanders, Ireland and Poland) show a positive contribution of societal factors, mainly because the levels of parents' education increased. This does not apply to Germany, Estonia, Finland and Sweden.

Focusing more closely on the contributions of reading related variables, it becomes clear that both reading motivation and reading frequency show negative contributions to the Dutch change in reading literacy. The contribution of reading strategies was found to be modestly positive (when focusing on the dataset that does not include all pre-vocational tracks). Three other countries show a positive contribution of reading strategies as well: Germany, Poland and Sweden. In these countries the contribution is larger than it is in the Netherlands. Four other countries show a negative contribution of reading strategies (especially Flanders and to a lesser extent Estonia, Finland and Ireland). Reading strategies show consistently positive effects across countries. They contribute either positively or negatively, depending on whether the strategies improved or deteriorated in a country.

Reading motivation and reading frequency show negative contributions to change in reading literacy among Dutch 15-year-olds. Finland, Sweden and Flanders show negative contributions of reading motivation that are comparable in size. Ireland shows a negative contribution as well, but a very modest one. Estonia and Poland show positive contributions of reading motivation. Together with the Netherlands, Flanders Germany, Sweden, Estonia and Finland show negative contributions of reading frequency. Only Poland and Ireland show negative contributions of reading frequency. The negative contribution in Poland is very small. The effects of both reading frequency and reading motivation on reading literacy are positive in the Netherlands. However, both types of variables shows positive effects and a decline between 2009 and 2018.

It is important to note an important limitation of the present study. The only effects addressed are the ones that come to the fore through comparing students within countries. The estimated effects of, e.g. reading frequency, reflect the finding that frequent readers tend to get higher reading scores. It is also conceivable that a variable affects all students within a country to the same extent. Such effects can only be detected through a comparison of country aggregates. For example, if a data analysis would show that reading literacy is lower in countries with high frequencies of ICT use. In this respect, online chatting has been shown to affect reading literacy adversely (Luyten, 2022). In countries with strong increases in chatting between 2009 and 2018, reading literacy has tended to decline most strongly as well. The present study, however, focuses on variation between students within each country. A statistical analysis of country aggregates requires a larger number of countries than the limited total included in the present study.

The present study reveals that ICT use, educational factors and the general societal context have contributed *positively* to the change in reading literacy between 2009 and 2018. The negative effects are due to reading related variables. However, within this category, reading strategies show a modestly positive contribution. This leaves reading motivation and frequency

as the two main factors with a negative contribution to the Dutch decline in reading literacy. It should also be noted that a large part of the decline cannot be accounted for by the changes addressed in the present study.

Given their negative contribution, reading frequency and motivation may seem the most likely candidates to serve as levers for a restoration of reading literacy. Still, it seems a serious challenge to return to the past levels of reading motivation and reading frequency. The relation between motivation and reading literacy is probably reciprocal and the effect of reading literacy on motivation may be larger than the effect of motivation on reading literacy. The decline of both reading frequency and reading motivation seems largely determined by the ongoing digitalization of modern-day societies worldwide. It seems dubious that past levels of reading frequency and motivation will return. Realizing a halt to the decline may already be a serious challenge. Devising educational policies that are strong enough to withstand the impact of organizations like Google, Apple and Facebook seems a daunting task. In addition to efforts that aim at increasing reading frequency and motivation, stimulation of reading strategies seems a useful option as well. These strategies consistently show positive relations with reading literacy. Further study into reading strategies is needed as well. The indices that are constructed to measure awareness of reading strategies do not show a consistent trend over time. But, the findings reported in table 2 and 3 indicate that nearly every separate reading strategy is considered less useful by the 15-year-olds in 2018 compared to 2009.

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## APPENDIX: CHANGES ON READING AND INDEPENDENT VARIABLES

	Flanders	Germany	Estonia	Finland	Ireland	Poland	Sweden	Netherlands	
								all tracks	upper *
Reading literacy	<b>-16,409</b>	1,107	<b>22,263</b>	<b>-15,714</b>	<b>22,484</b>	<b>11,464</b>	<b>8,445</b>	<b>-23,544</b>	<b>-27,826</b>
Frequency reading emails	<b>-0,622</b>	<b>-0,667</b>	<b>-0,518</b>	<b>-0,444</b>	<b>-0,194</b>	<b>-0,499</b>	<b>-0,453</b>	<b>-0,746</b>	<b>-0,738</b>
Frequency chatting online	<b>0,609</b>	<b>0,560</b>	-0,039	<b>0,435</b>	<b>1,148</b>	<b>0,445</b>	<b>0,137</b>	<b>0,340</b>	<b>0,376</b>
Frequency reading online news	<b>0,752</b>	<b>0,141</b>	<b>-0,046</b>	<b>0,529</b>	<b>1,116</b>	<b>0,159</b>	<b>0,186</b>	<b>0,283</b>	<b>0,262</b>
Frequency searching info online about a particular topic	<b>0,723</b>	<b>0,300</b>	<b>0,272</b>	<b>0,498</b>	<b>0,670</b>	<b>0,393</b>	<b>0,343</b>	<b>0,423</b>	<b>0,387</b>
Frequency taking part in online group discussions/forums	-0,026	<b>-0,175</b>	<b>-0,531</b>	<b>-0,332</b>	<b>0,391</b>	<b>0,316</b>	<b>0,094</b>	<b>-0,074</b>	<b>-0,099</b>
Frequency searching for practical info online	<b>0,761</b>	<b>0,334</b>	<b>0,299</b>	<b>0,429</b>	<b>0,503</b>	<b>0,395</b>	<b>0,268</b>	<b>0,412</b>	<b>0,360</b>
Reading strategies: summarising	<b>-0,267</b>	0,006	<b>-0,039</b>	<b>-0,124</b>	<b>-0,101</b>	<b>0,173</b>	<b>0,172</b>	<b>0,076</b>	-0,033
Reading strategies: understanding and remembering	<b>-0,082</b>	<b>0,136</b>	<b>-0,074</b>	<b>-0,061</b>	-0,038	<b>0,059</b>	<b>0,053</b>	<b>0,203</b>	<b>0,093</b>
Reading enjoyment	<b>-0,271</b>	<b>-0,356</b>	<b>0,037</b>	<b>-0,297</b>	0,006	<b>0,164</b>	<b>-0,204</b>	<b>-0,247</b>	<b>-0,296</b>
Reading time for enjoyment	0,036	<b>-0,171</b>	<b>0,105</b>	<b>-0,120</b>	<b>-0,119</b>	<b>0,126</b>	<b>-0,169</b>	0,003	0,011
Frequency reading magazines	<b>-1,495</b>	<b>-1,147</b>	<b>-1,456</b>	<b>-1,491</b>	<b>-1,560</b>	<b>-1,473</b>	<b>-1,303</b>	<b>-1,232</b>	<b>-1,308</b>
Frequency reading comic books	<b>-0,635</b>	-0,030	<b>-0,299</b>	<b>-1,287</b>	<b>-0,152</b>	<b>-0,100</b>	<b>-0,785</b>	<b>-0,398</b>	<b>-0,393</b>
Frequency reading fiction	<b>-0,105</b>	<b>-0,282</b>	<b>0,075</b>	<b>-0,339</b>	<b>-0,121</b>	<b>0,089</b>	-0,362	<b>-0,149</b>	<b>-0,239</b>
Frequency reading non-fiction books	<b>0,134</b>	<b>-0,096</b>	<b>-0,192</b>	<b>-0,136</b>	<b>-0,066</b>	-0,028	<b>0,511</b>	-0,041	<b>-0,103</b>
Frequency reading newspapers	<b>-0,882</b>	<b>-1,125</b>	<b>-1,649</b>	<b>-1,135</b>	<b>-1,400</b>	<b>-1,585</b>	<b>-1,607</b>	<b>-1,073</b>	<b>-1,129</b>
Percentage male students	-0,010	<b>0,027</b>	<b>-0,018</b>	0,008	-0,009	0,000	-0,008	0,004	-0,005
Student age	-0,001	-0,001	<b>0,013</b>	-0,007	0,001	0,007	<b>-0,026</b>	<b>0,021</b>	<b>0,031</b>
Home educational resources	<b>0,126</b>	<b>-0,156</b>	<b>-0,141</b>	-0,014	<b>0,159</b>	<b>-0,241</b>	<b>-0,107</b>	<b>0,215</b>	<b>0,206</b>
Highest educational level parents	<b>0,235</b>	<b>0,125</b>	<b>0,225</b>	<b>0,251</b>	<b>0,420</b>	<b>0,698</b>	<b>0,200</b>	<b>0,665</b>	<b>0,648</b>
Home language is not test language	<b>-0,075</b>	<b>0,073</b>	<b>0,027</b>	<b>0,039</b>	<b>0,033</b>	0,011	<b>0,095</b>	<b>0,034</b>	0,013
Grade	<b>0,033</b>	<b>0,173</b>	<b>0,041</b>	-0,023	<b>-0,075</b>	<b>0,034</b>	<b>0,012</b>	<b>0,107</b>	<b>0,112</b>
Learning time test language per week	0,100	<b>16,448</b>	<b>-16,423</b>	0,569	<b>5,163</b>	1,481	3,491	<b>7,141</b>	<b>5,070</b>
Disciplinary school climate	-0,053	<b>-0,212</b>	<b>0,152</b>	<b>0,184</b>	<b>0,070</b>	-0,028	<b>0,089</b>	<b>0,078</b>	<b>0,093</b>
Teacher stimulation reading engagement	<b>0,076</b>	<b>0,069</b>	<b>-0,168</b>	<b>0,132</b>	0,000	<b>-0,177</b>	<b>0,101</b>	-0,009	-0,022

\*Includes: VMBO-GT, HAVO, VWO; excluded tracks: PRO, VMBO-BB, VMBO-KB  
Significant differences (.05; two-tailed) are printed **bold**.



UNIVERSITY OF TWENTE  
Drienerlolaan 5  
7522 NB Enschede

P.O.Box 217  
7500 AE Enschede

P +31 (0)53 489 9111

[info@utwente.nl](mailto:info@utwente.nl)  
[www.utwente.nl](http://www.utwente.nl)