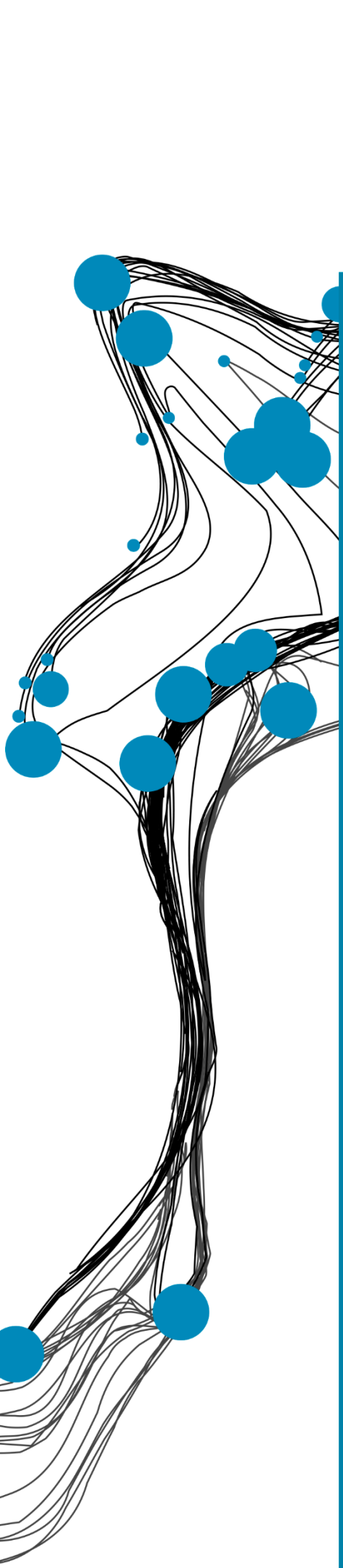

The Dutch decline in PISA reading performance explained: exploring ICT-use, reading motivation, reading frequency, and reading strategies, over time

MASTER THESIS

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Abstract

Reading performance of Dutch 15-year-olds has drastically declined between 2009 and 2018, so much so, that about a quarter of these students is insufficiently literate. Therefore, it is imperative to analyse which variables have contributed to this decline, in order for stakeholders to improve the Dutch reading performance. This study aims to analyse this decline and explores its possible relationships with the following four variables: reading motivation, reading frequency, reading strategies, and ICT-use. The relevance of the study lies with the fact that two separate points in time will be analysed, which allows for determining whether changes in one variable coincide with changes in another variable.

The results suggest that reading motivation, reading frequency, and online searching account for the Dutch decline in reading performance. Regression analyses reveal that reading motivation considerably accounts for this decline. Likewise, students' frequency of reading fiction explains the decline in reading performance as well, yet, to a small extent. Furthermore, employing reading strategies has a substantial positive effect on students' reading performance, but it does not explain the decline in reading. A remarkable finding of this study revealed that online searching explains the decline in reading scores to a large extent and it has a significant positive effect on reading performance. Surprisingly, the fact that students chat more online does not significantly explain their decline in reading performance.

This study provides insights into correlations that can explain the decline in reading scores in the Netherlands. However, it is essential for further research to explore causal relationships. As too many Dutch students are insufficiently literate, future research should research methods to improve reading performance in the Netherlands, supported by our findings.

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1. Introduction

Dutch reading performance has drastically declined during the past ten years and has caused concern regarding the quality of reading education in the Netherlands. Dutch 15-year-olds performed well above average in PISA's international large-scale assessments until 2015, when scores started to drop just above average (OECD, 2019a). In 2018, the Dutch score dropped even further, and went below both the European as well as the OECD average score (OECD, 2019a). In fact, 24% of Dutch 15-year-olds scored below the minimum level of reading proficiency in 2018. This is a cause for concern, as these students are insufficiently literate (OECD, 2019b) and they might therefore run the risk of not functioning well at school or in society. Therefore, it is essential to analyse the variables explaining this decrease, to be able to improve reading proficiency in the Netherlands.

There are several possible correlations with poor reading proficiency that will be explored in this study, including the increased use of Information Communication Technology (ICT), students' reading motivation, reading frequency, and the use of reading strategies. First, the increased use of ICT between 2009 and 2018 could explain students' plummeting reading results. It was demonstrated that having frequent and excessive amounts of use of and access to ICT-resources correlates with lower reading performance (Gubbels et al., 2020), especially ICT-use for school-related tasks (Agasisti, 2020; Netten, 2014). Second, the instruction and use of reading strategies, that had to adapt to reading from paper to paper-based and online sources, could also be correlated with the Dutch decline in reading performance, as knowledge of these strategies contributes to the understanding of reading (Muijselaar, 2016). Third, reading frequency, the amount of text that students read, is strongly related to reading performance (OECD, 2010; Baker & Wigfield, 1999; Cipielewski & Stanovich, 1992). The change of reading frequency between 2009 and 2018 might therefore explain the decrease in reading performance. Finally, reading motivation could also be an explaining factor, as reading motivation has steadily decreased in the Netherlands (Gubbels et al., 2019) and it was demonstrated to be a strong predictor of reading performance (Froiland & Oros, 2013; Habók et al., 2020; Taboada et al., 2008).

The goal of this study is to explore to what extent the Dutch decline in reading performance can be explained by the changes in the use of ICT, reading strategies, the change in reading frequency and motivation, using PISA data from 2009 and 2018. Most research on the decrease of the Dutch reading performance in PISA has focused on finding correlations with variables within the same dataset, whereas the current research will concentrate on the changes over time. These particular datasets have been chosen because PISA's focal domains included *reading* and *ICT* in these years. A secondary analysis will be conducted, analysing how the aforementioned variables affected reading performance over time between 2009 and 2018 in the Netherlands. Studying these effects over time will contribute to the scientific relevance of this study, as the study differentiates itself from the typical

cross-sectional methodology. In fact, by drawing on data from two cohorts, the current study presents a more convincing case into comprehending possible causes for the Dutch decline in reading performance.

2. Theoretical Framework

Important concepts of this study and their relations are addressed in this theoretical framework and underpinned with scientific literature. Each of the variables explored in this study that could explain the Dutch decline in reading performance are described, namely: reading motivation, reading frequency, reading strategies, and ICT-use, respectively. First, the concept of reading performance is outlined.

2.1 Reading Performance

The concept of reading performance, or reading literacy, was broadly defined by Bormuth (1973) as the competence to demonstrate behaviour necessary to respond appropriately to all reading tasks. As reading tasks have changed from paper-based reading to reading a large variety of sources, including digital sources, education had to adjust their reading approach accordingly. From a mere focus on collecting and memorising information, education is now concentrating on a wider and more comprehensive concept of knowledge, which includes skills that are necessary to wholly engage in the knowledge-based society, such as: finding, obtaining, comprehending and reflecting on a variety of information (Binkley et al., 2011). Similarly, PISA defines reading skills 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). For this study, the latter definition will be employed.

In the Netherlands, reading performance has decreased in the past decade. Initially, the Dutch scored above average in 2009 with a PISA reading score of 508 points, compared to the average of 494 of other OECD countries. While in 2018, the Dutch reading score plummeted below the OECD average score, to a meagre 485 points (OECD, 2019a). Even though the average PISA reading trend shows a slight decline, the Dutch reading trend significantly decreased with a 23 point difference, comparing data from 2009 with data from 2018 (Gubbels et al., 2019). What is most concerning, is the fact that, in 2018, 24% of Dutch 15-year-olds score below the minimum level of reading proficiency, which indicates that these students are insufficiently literate (OECD, 2019b).

Aside from the decrease in reading performance, there are factors that have clearly changed reading practice 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, 2019d). 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 tips (OECD, 2019d). Moreover, the Organisation for Economic Co-operation and Development, or OECD (2019d), show that overall, a greater amount of students consider reading a waste of time in 2018, compared to previous years. Clearly, next to the change of reading preference and online reading, students' reading motivation has decreased; the latter will be elaborated on in the following part.

2.2 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. Where extrinsic motivation decreases achievement (Becket et al., 2010), intrinsic reading motivation enhances reading performance (Froiland & Oros, 2013; Habók et al., 2020; Taboada et al., 2008).

PISA shows intriguing results that intrinsic reading motivation is decreasing internationally over time, and the Netherlands ranks the lowest in 2018 (Gubbels et al., 2019). To illustrate this, a third of Dutch adolescents does not enjoy reading in 2018, and about 50% of them never reads a book or a long story (Gubbels et al., 2019). Not surprisingly, it is boys that have the lowest level of reading motivation. Moreover, there is a clear gender gap: in all OECD countries girls show more motivation to read than boys (OECD, 2019e). Still, it is common that reading motivation steadily decreases between grades 5 and 10, regardless of gender, because students' reading performance does not increase as rapidly (Miyamoto et al., 2020; Becker et al., 2010). However, it is concerning and yet intriguing that the Netherlands scores exceptionally low.

Research is inconclusive about the exact relationship between motivation and reading performance, as possible confounders, such as reading frequency, could be at play, and the relation between the variables may even be reciprocal (Becker et al., 2010; Miyamoto et al., 2017; Schiefele et al., 2016). Still, intrinsic reading motivation is shown to be positively related to reading performance (e.g. Froiland & Oros, 2013). Retelsdorf et al. (2011) demonstrated that students' reading interest, which is part of intrinsic reading motivation, is a strong predictor of reading growth, despite initial levels. Moreover, Guthrie et al. (1999) found that reading motivation directly predicts text comprehension, among grade 10 pupils. However, Guthrie et al. (1999) established there was a need to control for covariates such as gender and SES. Immigration status and language at home should also be controlled for, as Miyamoto et al. (2017) established reading motivation affects immigrant students differently. In this study, it is therefore expected that the decline in reading motivation accounts for the decline in reading scores and gender, SES, language at home, and immigration status will be controlled for.

2.3 Reading frequency

Reading frequency, the amount of text that students read, is also argued to be strongly related to reading performance (OECD, 2010; Baker & Wigfield, 1999; Cipielewski & Stanovich, 1992). Dutch newspapers alarmed us that the amount that Dutch adolescents read, is declining (e.g. Chaudron,

2019). Research supports this, although Wennekers et al. (2018) established that it is mainly the amount of people who read for leisure that has decreased, in particular the amount of teenagers. Wennekers et al. (2018) show that there were less people that read for leisure in the Netherlands between 2006 and 2016, but the people that did read for leisure, did not spend any less time on reading during this period. Dutch secondary teachers fear that reading education focusses too much on performing, and less so on reading for enjoyment, which causes students to read less (Dujardin & Goudsmit, 2019). This could explain why Dutch students' reading frequency is rapidly decreasing, and consequently their reading scores.

Cipielewski and Stanovich (1992) establish that students who read more frequently in their leisure time, demonstrate higher results on reading performance tests, even when cognitive abilities are controlled for. McGeown (2014) found that only the amount of fiction texts predicts reading performance, but not other types of texts. Interestingly, Stanovich (1986) explains that there is a circular association between the variables reading performance and reading frequency: more proficient readers will read more, as they are more motivated to read. This will lead to increased reading performance. Schaffner et al. (2013) found the amount that fifth grade students read to be confounding the relationship between reading motivation and reading achievement (Schaffner et al., 2013; Schaffner & Schiefele, 2016). Several researchers (Baker & Wigfield, 1999; Becker et al.,2010; Mol & Bus, 2011) confirm this and demonstrate that the more motivation a student has, the more they read, and the better their achievement will be.

Nevertheless, Troyer et al. (2018), who attempted to replicate research by Schaffner et al. (2013), challenge their outcomes, as they did not find significant relations with time spent on reading and reading achievement. This is in line with both Netten et al. (2014), who researched Dutch 10-year-olds, and Wang and Guthrie (2004), who studied American and Chinese students of a similar age. Additionally, the latter researchers did not find reading frequency to be confounding the relationship between intrinsic reading motivation and reading comprehension. All in all, research is inconclusive about the relationship between reading frequency and reading performance. Still, as reading frequency is expected to have decreased over time, it is expected that this decrease in reading frequency accounts for the decline in reading scores.

2.4 Reading strategies

Reading strategies were described by the OECD (2019a) as the ability to understand and interpret texts by analysing, synthesising, 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). Zhang and Sheepo (2013) divide reading strategies into three categories. First, planning or pre-reading; for example, determining a reading goal, or elaborating on

prior knowledge related to the text. Second, monitoring; which concerns analysing one's understanding of the text. Third, evaluating; for instance, evaluating whether one has reached the reading goal, or used appropriate reading strategies (Zhang & Sheepo, 2013). Strategies that students use during internet reading are of growing importance and include navigating through webpages, selecting hyperlinks, examining information sources, and choosing relevant texts (Cho & Afflerbach, 2015).

In PISA 2009 and earlier tests, reading strategy awareness demonstrated to be a robust predictor of reading performance, with gender and socioeconomic status (SES) confounding achievement gaps (Lee & Wu, 2013; OECD, 2010). Muijselaar (2016) and Säälik et al. (2015) agree that knowledge of reading strategies contributes to the understanding of reading, and especially the awareness and knowledge of reading strategies plays an important role. Okkinga et al. (2018) stress that teaching reading strategies is especially beneficial for students from grade 3 to 8, i.e. children up to 15 years of age. Their research is based on whole-classroom settings, compared to most other studies which employ controlled experiments (Okkinga et al., 2018). Muijselaar et al. (2017) state that the relations between reading proficiency and reading strategies may be reciprocal. So, the higher students' reading scores are, the more proficient they are at applying reading strategies. Still, Afflerbach et al. (2008) point out that explicit teaching of reading strategies is important when the overarching aim for students is to learn to read fluently and proficiently. So, even though reading strategies demonstrate to be robust predictors of reading performance, research is inconclusive about the exact relationship between the two variables.

Assuming there is a clear relationship between reading strategies and reading performance, it would be interesting to explore the relationship between the decrease in the Dutch reading performance and the possible change in reading strategies over time. Especially when there is currently a growing need for reading strategies for internet reading, as it is evident students are increasingly deploying online reading sources. Even though there are certain strategies that are unique to internet reading, such as strategies that help choose relevant online texts, internet strategies are similar to traditional reading strategies (Cho & Afflerbach, 2015). This study will examine whether there is a difference in the awareness and understanding of reading strategies over time and explore whether this explains the Dutch reading performance decrease that PISA portrays between 2009 and 2018.

2.5 ICT-use

The current study explores the use of ICT of Dutch 15-year-olds in both a supervised environment in the classroom and in an informal environment, such as at home. This includes the frequency, the manners and types of ICT-use (OECD, 2019c). According to SLO (2018), Dutch secondary vocational education (VMBO), students are expected to be able to be digitally literate,

which includes the mastery of basic skills such as operating and being knowledgeable of the possibilities and the limitations of digital technology. In the current study, the emphasis will be on ICT-habits and skills related to online searching and chatting, as these variables were measured in both Dutch PISA waves 2009 and 2018.

ICT-use is expected to be related to the Dutch decline in reading performance, as ICT-use has drastically increased over time and many new technological advances have caused Dutch inhabitants to increase their internet use. Indeed, compared to other European Countries, the Netherlands has one of the highest number of inhabitants that are proficient at using ICT (CBS, 2020). Still, researchers are inconclusive about the effect ICT-use has on reading performance.

For instance, Vigdor et al. (2014) demonstrate that the increase in ICT-use can have negative effects on students' reading grades. They established that students that gain access to a digital device at home between 5th and 8th grade, subsequently observe a steady decrease in their reading grades (Vigdor et al., 2014). Netten et al. (2014) confirm that students' ICT-use at home is negatively related to reading achievement. Agasisti et al. (2020) stress that this is especially the case with ICT-use for school-related tasks. Gubbels et al. (2020) established that excessive ICT-use and ICT-use for leisure, such as chatting online, is negatively related to reading performance. In contrast, Hu et al. (2018) state that ICT-use for entertainment has a positive impact on reading performance. Skryabin et al. (2015) confirm this, and found that the more access students have to ICT, the more positive the effect is on their reading performance. However, it should be taken into account that the amount and productivity of students' ICT-use at home is dependent on the effectiveness of parental supervision (Vigdor et al, 2014). This, in turn is dependent on the SES of the student (Harris et al., 2017). In fact, Harris et al. (2017) show that, even when computer access is comparable, there is a digital divide in *how* ICT is being used. Therefore, students' SES will be controlled for in this study.

Delving deeper into how ICT-use decreases students' reading performance, Wolf and Barzillai (2009) explain how online reading has a negative influence on *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 (Wolf & Barzillai, 2009). Liu and Gu (2019) show that this increased interruption by ICT-use, can lead to fragmented reading. They found that fragmented reading materials, such as pop-ups and social media invites, lead to fragmented reading, which in turn leads to lower reading performance in fifth grade students (Wolf & Barzillai, 2009). Mayer (2014) explains this, using the coherence principle, which states that extraneous material – anything that distracts the learner from the learning (or reading) process – e.g. pop-ups, should be made redundant.

As students have limited cognitive capacity in their working memory, an overload of information should be avoided in order to learn and read deeply (Sweller, 1994). Thus, students' use of ICT and reading online may lead to fragmented reading, it may negatively affect deep reading, and it consequently may decrease reading performance.

Furthermore, the relationship between ICT-use and reading performance is not straightforward, as it could be following an inverted U-curve, according to Gubbels et al. (2020), studying Dutch PISA 2018 results, and Steffens (2014), studying multinational PISA 2009 results. In other words, reading achievements increase in proportion to ICT-use, but only up to a certain extent. After it reaches a critical point, reading achievements decrease as ICT-use increases (Steffens, 2014). This could explain the negative effects of high ICT-use on reading scores that were found by Vigdor et al. (2014), Netten et al. (2014), and Agisisti et al. (2018). Other prior findings show that there may be confounders at play. Lee and Wu (2013), who studied individual aspects of online reading, demonstrate that metacognitive reading strategies confound the positive effect that online searching and reading has on reading performance, and the negative effect online entertainment activities have on reading performance. So, research is inconclusive about the effect of ICT-use and its facets and there may not be a straightforward relationship between the two variables.

However, these aforementioned studies employed earlier data. Meanwhile, there have been many changes in ICT-use at schools and in children's homes, which might have increased the frequency of ICT-use and the level of fragmented reading. A simple example of the ICT-changes is the emergence of the smartphone, but also fact that Dutch secondary school students are now expected to own a personal laptop or tablet to use for school purposes (Huisman, 2020). These changes may have negatively impacted PISA's reading achievement. It is therefore expected that the results from the current study, explaining the Dutch reading performance decrease between 2009 and 2018, will demonstrate that we have reached the 'negative' side of the inverted U-curve of ICT-use, meaning that we have reached the point where ICT-use proves counterproductive regarding reading performance.

3. Research questions and models

The theoretical framework above demonstrates that reading motivation, reading frequency, reading strategies, and ICT-use may be influential determinants of reading proficiency scores. Therefore, the aim of the current study is to explore to what extent these four variables explain the decrease in PISA reading scores in Dutch 15-year-old students between 2009 and 2018. Ensuing from the literature and the aim are the following research questions and hypotheses.

1. To what extent does the decline in reading motivation affect the decline in reading scores in Dutch 15-year-old students using PISA 2009 and 2018 data?

   Hypothesis 1 (H1): it is expected that the decline in reading motivation accounts for the decline in reading scores.

2. How does the decline in reading frequency affect the decline in reading scores in Dutch 15-year-old students using PISA 2009 and 2018 data?

   Hypothesis 2 (H2): it is expected that the decline in reading frequency accounts for the decline in reading scores.

3. To what extent do the awareness and understanding of reading strategies affect PISA reading performance in Dutch 15-year-olds between 2009 and 2018?

   Hypothesis 3 (H3): it is expected that the awareness and understanding of reading strategies show a positive correlation with reading performance.

4. To what extent does the increase in ICT-use account for the decline in PISA reading scores of Dutch 15-year-olds between 2009 and 2018?

   Hypothesis 4 (H4): it is expected that the increase in ICT-use has a negative effect on the decline in reading scores.

The variables gender, SES, and students' immigration status will be controlled for as it is known that these are related to reading performance (Guthrie et al., 1999; Harris et al., 2017; Lee & Wu, 2013; Miyamoto et al., 2017; OECD, 2010); however it is not expected that these variables have greatly changed between 2009 and 2018.

3.1 Scientific and Practical Relevance

This study provides substantial and valuable information about the relationship regarding the Dutch decrease in reading performance over time and the variables ICT-use, reading motivation, reading frequency and reading strategies. First, most secondary PISA analyses have focused on finding correlations with variables within the same dataset, whereas the current research will concentrate on the changes over time. This contributes to the scientific relevance of this study, as it

fills the gap in research studying the Dutch decline in reading performance. Whereas studies exploring merely one dataset can solely establish correlations, the current study differentiates itself from the typical cross-sectional methodology. In fact, by drawing on data from two cohorts, the current study presents a more convincing case into comprehending possible causations.

Secondly, most research exploring reading motivation, or the amount students read, concerns participants in middle or upper primary grades, whereas students in this study are secondary education students. As such, this study adds to the scientific research as it provides an insight into the further development of reading motivation and reading frequency, and their relationship with reading performance over time. Thirdly, the current study fills the scientific gap, articulated by Skryabin et al. (2015), of exploring the different types of ICT use and their effect on reading performance, and the direction of this effect.

Next to contributing to science, this study has practical relevance. Indeed, this study aims to provide substantial information for stakeholders, such as researchers and educational policy makers but also school boards and teachers, to be able to undertake the task of improving reading performance in the Netherlands. This is crucial, as nearly a quarter of Dutch adolescents is insufficiently literate (OEDC, 2019b). Moreover, this study contributes to research by providing suggestions for further research. This, consequently, would also aid stakeholders to improve reading education in the Netherlands.

4. Method

4.1 Research design

As the present study is a secondary analysis of PISA data from 2009 and 2018, analysing the Dutch decrease of reading performance, the research design of this study is of a quantitative nature. Furthermore, the design of the study has aspects of a cross-sectional study, as it uses datasets that were collected at one point in time. However, as data from two cohorts will be employed, the study design differentiates itself from the typical cross-sectional methodology. By drawing on two cohorts, effects of changes in the explanatory variables are directly assessed. This stands in contrast to strictly cross-sectional research, which draws on a variation in scores at a single point in time. In the current approach, any assessment of a relationship between variables gains credibility. It therefore allows for a more sound and solid foundation to suggest possible causations.

This study will be carried out by conducting quantitative regression analyses using data from PISA surveys from 2009 and 2018. Possible relationships will be analysed between the decline in reading performance, i.e. the dependent variable, and the change in the independent variables ICT-use, reading motivation, reading frequency, and reading strategies, from 2009 to 2018. Potential threats of the study design are effects of confounding variables. Therefore any possible relationships will be controlled for by gender, language spoken at home, SES, and students' immigration status.

4.2 Respondents

Participants of the PISA 2009 and 2018 questionnaires were sampled according to OECD standards: students were sampled from grade 7 and higher from both public and private schools aged 15 years and 3 months to 16 years and 2 months at the start of the test (OECD, 2012). To select these participants, a two-stage stratified sample design was applied. The total number of sampled Dutch schools that participated was 155 and the total number of Dutch participating students was 4760. More information on methods used for the sampling of students can be found in the technical report of OECD (2012).

First, for the present study, Dutch students were specifically chosen out of the respondents from 2009 and 2018, as there is a palpable and noteworthy decline in their reading scores between 2009 and 2018. In fact, this decrease has been a topical issue in the Netherlands as well as a concern for many stakeholders (e.g. Althuisius, 2020; Copier, 2020; Remie & Veldhuis, 2020). Secondly, the study did not include the total amount of Dutch students from PISA 2009 and 2018 (N= 4759; N= 4765, respectively). When analysing the amount of missing cases for each variable that were employed in the present study, it appeared that not all Dutch students responded to items related to the variable reading strategies. This can be explained, as 18% of Dutch students, which include PRO students and students with learning support (LWOO), participated in a shorter PISA 2018 questionnaire, to adapt to their regular testing (Meelissen et al., 2020). Additionally, in 2009, only

PRO students participated in the shorter PISA questionnaire (Gille et al., 2010). In this shorter questionnaire, questions about reading strategies were omitted. Consequently, it was determined that not all Dutch students should be included in the current study. Therefore, educational programmes that included 35% or more missing cases for the variable reading strategies in 2009 and 2018 were excluded from this study (N = 1312; N = 1481, respectively), i.e. students from the tracks VMBO 1 and 2, VMBO PRO, VMBO BB, and VMBO KB. Thus, the current study employs data from Dutch respondents from 2009 and 2018 (N = 3447; N = 3284, respectively), that were enrolled in the following educational programmes: VMBO KB/TL, HAVO 1-3, HAVO 4-5, VWO 1-3, VWO 4-6 and mixed 1-2, no tracking, preparing for VMBO or HAVO or VWO.

4.3 Instrumentation

For the present study, data from the 2009 and 2018 PISA student questionnaires and assessments were used. The purpose of PISA assessments is to measure the abilities of 15-year-olds around the world at the end of their compulsory schooling. Reading, mathematics and science are assessed by students answering multiple choice questions that are based upon real-life situations, in a two-hour lasting computer-based test. Additionally, students answer multiple choice questions about their backgrounds in the computer-based student background questionnaires, which last 30 minutes. The PISA cycles 2009 and 2018 were chosen for this study as they portray a clear decrease in the Dutch reading scores, and because their focal domains include reading and ICT.

The PISA assessments 2009 and 2018 are developed from a vast amount of previous cycles of PISA questionnaires. Therefore, they allow for observing trends that could explain student results. For this study, both the PISA reading assessment from 2009 and 2018 were used, to measure the dependent variable reading performance. The independent variables ICT-use, reading motivation, reading frequency, and reading strategies, were measured with the student questionnaire 2009 and the similar 2018 version 'Student Common Part Questionnaire'. These questionnaires were also used to measure the control variables of students' gender, language spoken at home, SES, and immigration status. To compare the two PISA cycles in a valid manner, the two datasets, including the assessments and the questionnaires, were merged together.

4.3.1 PISA reading assessment.

The three main characteristics upon which PISA built the reading assessment, include: processes, which refers to cognitive strategies to navigate through a text; text, which refers to the variety of texts that students read; situation, which refers to the variety of broad contexts in which the reading takes place. Not only the characteristics of the assessment, but also the items of the PISA reading assessment, are comparable over time; as reading items are repeatedly used in each cycle of PISA's reading assessments (OECD, 2012).

The format of the PISA reading assessment questions needs to cover the ranges in ability in a variety of countries, to make sure that the assessment is valid. Therefore, PISA reading assessment covers both open constructed response items, as well as multiple choice questions (OECD, 2012). The tasks related to the questions included reading material such as texts, figures and graphs, and the tasks included all assessed cognitive processes: retrieving and accessing, interpreting and integrating, and evaluating and reflecting on information. Students were given 60 minutes to complete the reading assessment. More information about PISA reading assessment can be found in the technical report of OECD (2012).

4.3.2 Background questionnaires.

The student questionnaire 2009 and the similar 2018 version 'Student Common Part Questionnaire' were employed to measure the independent variables ICT-use, reading motivation, reading frequency, and reading strategies, and the control variables gender, SES, students' immigration status, and language at home.

For the variable *ICT-use*, two items of the construct *online reading* (ONLNREAD) were used: *Searching information online to learn* (ST176Q05IA) and *Searching practical information online* (ST176Q07IA). Additionally, the separate item *online chatting* (ST176Q02IA) was analysed. Students answered using a five-point Likert scale. The first two items (ST176Q05IA and ST176Q07IA) were chosen as the construct *online reading* was only present in 2009. However, these two items were both included in each PISA wave and both correlated in 2009 and 2018 with a Cronbach's Alpha of .60 and .62, respectively. The item *online chatting* was not correlated to these two items, but present in both PISA waves. As a significant change in this item is expected, it is included as a separate part of the variable ICT-use.

The variable *reading motivation* was measured with the construct JOYREAD, which was constructed by PISA, using five items (ST24) from the 2009 questionnaire which were also used for the 2018 questionnaire. The scores were transformed so they could be compared with one another. The items that were measured were of an ordinal nature. An example of an item from both the 2009 and 2018 questionnaire is: "How much do you agree or disagree with these statements about reading?" Students answered, by using one of the answer options, e.g.: "I read only to get information that I need" (OECD, 2009 pp. 17), using a 4-point Likert scale.

The variable *reading strategies* was measured with reading tasks *summarising* and *understanding and remembering* (METASUM and UNDREM), measuring the extent to which students were aware of using (in)effective strategies to summarise, remember or understand information in texts. This was measured with ordinal items, such as to what extent they agreed with: "I underline important parts of the text" or "I read the text aloud to another person" (OECD, 2010, pp. 42) with a 6-point Likert scale. Both reading tasks were present in the 2009 and 2018 dataset. For each

of the PISA cycles, one construct was made out of METASUM and UNDREM for the variable *reading strategies* (READSTRAT). First, however, a reliability test was performed to test the correlation between METASUM and UNDREM in both datasets. The Cronbach's Alpha was acceptable for both 2018 and 2009: .65 and .63, respectively. Finally, both new constructs were merged together.

The variable *reading frequency* was measured with the items RFS1Q04 (2009) and ST150Q02IA (2018), which both measured the amount which students had to read fiction for school during the last month. Both items had four response categories that included "Many times", "Two or three times", "Once", or "Not at all". After merging the items, the response categories were recoded, as the codes were in an opposite order compared to the other variables.

Gender, SES, students' immigration status, and language at home will be control variables in this study. Gender was based on a question in the PISA 2009 and 2018 questionnaire. SES (ESCS) was based on IRT-scaling which was computed by PISA. The variables immigration status and language at home were recoded into binary variables, as this provided for a clear distinction between non-natives and natives, and speakers of Dutch and speakers of other languages.

4.4 Data Analysis and Procedure

The data analysis will be based on the existing PISA 2009 and 2018 data sets and will be conducted, employing SPSS (IBM statistics version 26) and IEA IDB Analyser (version 4.0.39). The IDB Analyser was developed to perform large-scale assessment surveys, as this application allows for the sampling and assessment design of PISA test-rotation design that was applied. The latter signifies that students do not answer all items; instead, they answer questions from randomly allocated booklets.

The data analysis will start with a comparison of the mean reading scores in 2009 and 2018 and a comparison of the mean scores on the explanatory variables. Multiple regression will then be performed to explore whether this difference in reading achievement can be explained by the changes in ICT-use, reading motivation, reading frequency, and reading strategies, with gender, SES, students' immigration status, and language at home as control variables.

5. Results

To answer to what extent reading motivation, reading frequency, reading strategies, and ICT-use explain the decrease in PISA reading scores in Dutch 15-year-old students between 2009 and 2018, first, a mean comparison was performed by means of regression analysis with a dummy variable. In this way, more insight was gained into the change of these variables over time. Subsequently, to determine the effect of each of the independent variables on the reading scores, a series of bivariate regression analyses was performed for reading performance and each separate independent variable. Finally, an ensuing multiple regression analysis demonstrated the total effect of all independent variables on reading performance, controlled for by gender, SES, students' immigration status, and language at home.

5.1 Mean differences 2009 - 2018

Results of the mean comparison show, by means of a dummy variable, whether there is a decrease in a variable between PISA 2009 and PISA 2018, showing a negative *b*, or an increase, showing a positive *b*. These results, shown in Table 1, differ slightly from the PISA reports, as the aforementioned Dutch participant group was employed for this study.

The results show that there is a decrease in reading performance between 2009 and 2018, demonstrating a mean difference of -27.83 points between 2009 and 2018 (β = -.17). When interpreting the results for the independent variables, a decrease is visible in both reading motivation (β = -.14) and reading frequency (β = -.10). This indicates that Dutch students both demonstrate significantly less reading motivation and they read less fiction in 2018 than in 2009. The independent variable ICT-use was measured with the construct online searching, which demonstrated an increase (β = .25), and the item online chatting, which also demonstrated an increase (β = .27). This indicates that Dutch students both search more online information and chat more online in 2018 than in 2009. The independent variable reading strategies does not display a significant change (β = .02, p = .363). Moreover, the results demonstrate no significant changes in any of the control variables gender, language at home, immigration status, and SES (β = <.01, p = .638; β = .03, p = .201; β <.01, p = .952; β = -.01, p = .697, respectively).

Table 1

IDB Mean differences PISA 2009 and 2018 per variable (N=6731)

Variable	Model	*b*	*SEb*	β	*t*	*p*
Reading performance	(constant)	549.71	3.49			
R^2 = .03	Dummy	-27.83	4.53	-.17	-6.29	<.001
Reading motivation	(constant)	-.18	.03			
R^2 = .02	Dummy	-.30	.04	-.14	-8.28	<.001
Reading strategies	(constant)	.21	.03			
R^2 = <.01	Dummy	.03	.03	.02	.91	.363
Reading frequency	(constant)	2.67	.03			
R^2 = .01	Dummy	-.20	.04	-.10	-4.82	<.001
ICT-use: online search	(constant)	3.26	.02			
R^2 = .06	Dummy	.38	.02	.25	16.70	<.001
ICT-use: chat	(constant)	4.53	.02			
R^2 = .07	Dummy	.37	.02	.27	23.63	<.001
Control var. gender	(constant)	1.49	.001			
R^2 = <.01	Dummy	<.01	.001	<.01	-.47	.638
Control var. language	(constant)	1.05	.01			
at home	Dummy	.01	.01	.03	1.28	.201
R^2 = <.01						
Control var. immig.	(constant)	1.10	.01			
stat.	Dummy	<.01	.02	<.01	.06	.952
R^2 = <.01						
Control var. SES	(constant)	.46	.03			
R^2 = <.01	Dummy	-.01	.04	-.01	-.39	.697

Note: dummy = difference PISA 2009 – PISA 2018

5.2 Reading motivation

To determine the effect of the decrease of reading motivation on the decrease of reading performance, a regression analysis was performed. The results, shown in Table 2, demonstrate a strong and significant positive effect of reading motivation on reading performance (β = .39, $p < .001$). Furthermore, 14% of the variance in reading performance is explained by reading motivation, as the dummy variable explains 3% (see Table 1). In fact, the difference in reading performance between 2009 and 2018, which is 27.83 points, is reduced to 18.90 points when reading motivation is added. This signifies that the decrease reading motivation accounts in large part for the decline in reading performance.

5.3 Reading frequency

To determine the effect of the decline in reading frequency on the decline of reading performance, a regression analysis was performed. The results, shown in Table 2, demonstrate that the decline of reading frequency has a significant positive effect on the decline of reading performance ($\beta = .14$, $p < .001$). However, only 2% of the variance in reading performance can be explained by reading frequency, as the dummy variable explains 3% (see Table 1). Moreover, the difference in reading performance between 2009 and 2018, which is 27.83 points, is reduced to 25.54 points when reading frequency is accounted for. This signifies that the decrease in reading frequency accounts for a minor portion of the decrease in reading performance.

5.4 Reading strategies

To determine the effect of the awareness and understanding of reading strategies on the decrease of reading performance, a regression analysis was performed. The results, shown in Table 2, indicate that reading strategies has a strong and significant positive effect on reading performance ($\beta = .47$, $p < .001$). Furthermore, 22% of the variance in reading performance is explained by reading strategies, as the dummy variable explains 3% (see table 1). The difference in reading performance between 2009 and 2018, which is 27.83 points, is increased to 29.33 points when reading strategies is accounted for. This indicates that the decline in reading performance would have been only slightly greater, had it not been for reading strategies. In fact, as reading strategies has not changed considerably over time (see Table 1), the effect on the decline of reading performance is marginal. Thus, the positive effect of reading strategies explains the decline in reading performance only to a negligible extent.

5.5 ICT-use

To determine the effect of ICT-use on the decrease of reading performance, a regression analysis was performed for both the construct online searching and online chatting.

5.5.1 Searching information online

The results, shown in Table 2, show that the increase of online searching positively affects reading performance ($\beta = .19$, $p < .001$). However, only 3% of the variance of reading performance is explained by online searching, as the dummy variable explains 3% (see Table 1). The difference in reading performance between 2009 and 2018, which is 27.83 points, is increased to 35.84 points when online searching is accounted for. This indicates that the decline in reading performance would have been even greater, had it not been for the increase of online searching. Thus, the positive effect of the increase in online searching explains the decline in reading performance.

5.5.2 Chatting online

The results, shown in Table 2, show that the increase of online chatting has an insignificant negative effect on reading performance ($\beta = -.01$, $p = .697$). Moreover, the difference of reading

performance, which is 27.83 points, is not significantly changed when online chatting is accounted for (b = -27.56). This signifies that the negative effect of online chatting remains trivial and it does not explain the decline in reading performance. For this reason, the variable online chatting will be left out of the multiple regression analysis below.

Table 2

Regression analysis results for reading performance and independent variables (N=6731)

Variable	Model	*b*	*SE*	β	*t*	*p*
Reading performance	(constant)	555.16	3.17			
R^2 = .17	Dummy	-18.90	4.22	-.11	-4.52	<.001
	Reading motivation	30.21	1.14	.39	29.67	<.001
Reading performance	(constant)	518.71	6.24			
R^2 = .05	Dummy	-25.54	4.46	-.15	-5.83	<.001
	Reading frequency	11.60	1.63	.14	7.29	<.001
Reading performance	(constant)	539.32	2.84			
R^2 = .25	Dummy	-29.33	3.77	-.18	-8.01	<.001
	Reading strategies	49.12	1.64	.47	38.12	<.001
Reading performance	(constant)	479.96	6.59			
R^2 = .06	Dummy	-35.84	4.76	-.22	-7.73	<.001
	Online search	21.37	2.05	.19	10.74	<.001
Reading performance	(constant)	552.98	10.14			
R^2 = .03	Dummy	-27.56	4.35	-.17	-6.54	<.001
	Online chat	-.72	1.82	-.01	-.39	.697

5.6 Total effect of variables

To determine the total effect of reading motivation, reading frequency, reading strategies and online searching on reading performance, a multiple regression analysis was performed. The difference in reading performance between 2009 and 2018, which is 27.83 points, is reduced to 25.85 when all independent variables are included in the analysis (see Table 3). Furthermore, the results imply that the total of these variables explain 30% of the variance of reading performance, as the dummy variable explains 3% (see table 1).

More specifically, when looking at individual variables, it is apparent that reading performance is especially positively affected by reading strategies and reading motivation (β = .39; β = .26, respectively). However, it was observed that reading strategies only explains the decline in reading performance to a slight extent and it had not changed considerably over time (see Table 4 and Table 1). ICT-use (online searching) and reading frequency explain the difference in reading performance to a lesser extent (β = .09; β = .05, respectively), however, online searching was

observed to considerably explain the decline in reading performance (see Table 2). The total effect of all independent variables are suggested to explain the decline in reading performance to a modest extent when looking at the dummy variable in Table 3. However, it must be noted that this is influenced by the opposite effects each of the variables have. For instance, it is apparent that the effect of reading motivation, increasing the decline in reading performance, offsets the effect of online searching, reducing the decline in reading performance. In fact, reading motivation and reading frequency increase the decline in reading performance, and online searching and reading strategies decrease the decline in reading performance. This explains the rather small total effect of all variables on the decline of reading performance.

Table 3

Multiple regression analysis results for reading performance (N=6731)

Variable	Model	*B*	*SE b*	β	*t*	*p*
Reading performance	(constant)	503.70	6.89			
R^2 = .33	Dummy	-25.85	3.98	-.16	-6.57	<.001
	Reading motivation	20.13	1.08	.26	19.09	<.001
	Reading frequency	3.94	1.36	.05	2.93	.003
	Reading strategies	40.09	1.54	.39	30.92	<.001
	ICT: online search	9.39	1.65	.09	5.79	<.001

When adding the control variables into the regression analysis, there is a slight difference visible. The variables gender, SES, students' immigration status, and language at home are added in the regression in Table 4. The difference in reading performance between 2009 and 2018, which is 27.83 points, is reduced to 24.05 when all independent variables and control variables are added in the analysis. More specifically, when comparing these results to the regression analysis without the control variables (see Table 3), it becomes apparent that the control variables do account for a small portion of the decrease in reading performance. Still, the effect of language at home and SES on reading performance ($\beta = -.03$, $p = .150$; $\beta < .01$, $p = .390$, respectively) remains insignificant. The control variables gender and immigration status demonstrate a significant effect on reading performance ($\beta = .07$, $p < .001$; $\beta = -.13$, $p < .001$, respectively), however, the mean differences of these variables (see Table 1) indicate no significant change over time. Still, because of their significant effect on reading performance, gender and immigration status were taken into account in the current study.

Table 4

Multiple regression analysis results for reading performance: with control variables (N=6731)

Variable	Model	*b*	*SE*	β	*t*	*p*
Reading performance	(constant)	503.45	6.65			
R^2 = .36	Dummy	-24.05	4.04	-.15	-6.05	<.001
	Reading motivation	22.74	1.23	.29	18.81	<.001
	Reading frequency	4.29	1.26	.05	3.43	<.001
	Reading strategies	38.77	1.47	.38	32.06	<.001
	ICT: online search	9.30	1.74	.09	5.40	<.001
	Gender	11.39	2.32	.07	4.90	<.001
	Language at home	-9.43	6.50	-.03	-1.44	.150
	Immigration status	-37.26	4.92	-.13	-7.21	<.001
	SES	-30.31	30.48	<.01	-.86	.390

5.7 Reading motivation and reading frequency

As reading motivation and reading frequency both show a decline between 2009 and 2018 and demonstrate a positive effect on reading performance, it would be intriguing to determine the combined effect of these variables on the decline in reading performance. To establish this effect, a multiple regression analysis was performed (see Table 5). The results reveal that the difference in reading performance between 2009 and 2018, which is 27.83 points, is reduced to 17.67 when reading motivation and reading frequency are accounted for. This means that, the combined effect of reading motivation and reading frequency ($\beta = .37$, $p < .001$; $\beta = .09$, $p < .001$, respectively) substantially account for the decline in reading performance.

Table 5

Multiple regression results for reading performance, reading motivation, and reading frequency (N=6731)

Variable	Model	*b*	*SE*	β	*t*	*p*
Reading performance	(constant)	534.75	5.92			<.001
R^2 = .18	Dummy	-17.67	4.21	-.11	-4.23	<.001
	Reading motivation	29.29	1.14	.37	28.45	<.001
	Reading frequency	7.58	1.54	.09	5.00	<.001

5.8 Effect of changes in variables motivation, frequency, and online searching

To determine the effect of the three independent variables that affect reading performance considerably and demonstrate significant change over time, each independent *effect* was calculated, taking into account all variables. For each variable, the difference between 2009 and 2018 (see Table 1) was multiplied by the *b* of the total effect of all variables (see Table 4). As a result, reading motivation, reading frequency, and online searching reveal an effect of -6.82, -0.86, and 3.53, respectively. Thus, the decline in reading motivation and reading frequency, combined, account for 7.68 points of the *decline* in reading performance; and online searching accounts for an *increase* of 3.53 points for reading performance. Taking into account the total decline of reading performance between 2009 and 2018 is 27.83 points, reading motivation, reading frequency and online searching have a substantial effect on this decline.

6. Discussion

This study demonstrates how reading motivation, reading frequency, reading strategies, and ICT-use may explain the decrease in PISA reading scores in Dutch 15-year-old students between 2009 and 2018. Below, findings from this study are further discussed and interpreted, supported with existing literature, to answer and elaborate on each of the presented research questions.

6.1 Reading motivation

Results demonstrated that reading motivation positively affects reading performance, as expected. In fact, the hypothesis (H1) was supported, as reading motivation accounts for the Dutch decline in reading scores. This builds on prior research, which refers to reading motivation as a predicting variable for reading performance (Froiland & Oros, 2013; Habók et al., 2020; Retelsdorf et al., 2011; Taboada et al., 2008). It must be noted that this study identified relations based on two datasets that were collected at separate points in time. The findings indicate at what level the 2018 cohort would have performed, if their scores on the explanatory variables had not changed between 2009 and 2018. Still, as Wang and Guthrie (2004) stress, the absence of intrinsic reading motivation results in poor reading performance. So, if there is a causal correlation indeed, improving the intrinsic reading motivation would improve reading performance significantly.

This would make the decline in reading motivation all the more a cause for concern. An explanation for this decline is that students' reading performance between grade 5 and 10 does not increase as rapidly as it did in the earlier years of education, thus resulting in a steady decrease of intrinsic reading motivation (Miyamoto et al., 2020; Becker et al., 2010). Yet, the exceptionally low Dutch intrinsic reading motivation scores of the current study are alarming, and there may be other factors involved. For instance, the decline in reading frequency could be explaining the decline in reading motivation, as Schaffner et al. (2013) found reading frequency to fully confound the relationship. However, Guthrie et al. (1999) found reading motivation to directly predict text comprehension. Therefore, future research should explore variables that might affect the decrease of reading motivation. Moreover, further research could reinforce our causal suggestions and confirm a causal relationship.

Assuming reading motivation does enhance reading performance, Dutch educators and researchers should improve reading motivation of Dutch secondary students. Prior research demonstrated that reading motivation can be promoted by teaching (Guthrie et al., 2012b; Guthrie et al., 2013; Reeve, 2012). De Naegel et al. (2014) identified means of improving intrinsic reading motivation for adolescents, by having teachers employ structured, autonomy-supportive, and demonstrating involved teacher behaviour. Guthrie et al. (2012a) state that employing Concept-Oriented-Reading-Instruction (CORI) can promote reading motivation. Using CORI, educators teach reading strategies in a content domain, such as science, while promoting students' autonomy by

providing them with choice, among other things (Guthrie et al., 2012a). Ryan and Deci (2000) underpin this and explain how autonomy, competence and relatedness are critical factors in supporting reading motivation. Additionally, educators and researchers could stimulate parents' encouragement in order to enhance reading motivation, as Klauda (2009) identified that pupils' reading motivation is directly influenced by their parents' encouragement to read. All in all, this implies that there are different approaches to enhancing students' reading motivation, which future research could further explore.

In short, the current study showed that reading motivation accounts for the Dutch decline in reading performance and its substantial positive effect on reading scores should be taken into account when improving reading performance in the Netherlands.

6.2 Reading frequency

Reading frequency has an expected positive effect on reading performance. Moreover, the hypothesis (H2), stating that the decline in reading frequency accounts for the decline in reading performance, is supported. Still, the current study established that reading frequency explains this decline only to a small extent. As such, it does not seem to play a large part in explaining the decline in reading performance. Interestingly, these results contradict Netten et al. (2014), Troyer et al. (2018), and Wang and Guthrie (2004), who found no significant relationship between reading frequency and reading performance. It must be noted that the current study specifically found a significant relationship between the amount of *fiction* students read and reading performance, whereas these authors focus on different types of texts instead (Netten et al., 2014; Troyer et al., 2018; Wang & Guthrie, 2004).

McGeown et al. (2014) clarifies this, by establishing that the amount of fiction texts predicts reading performance better than other types of texts. A methodological difference, that might explain our contradicting findings, is that both the current study and McGeown (2014) focus on secondary education students, whereas Netten et al. (2014) and Wang and Guthrie (2004) studied mostly 10-year-old primary education students. So, the role of reading frequency in explaining reading performance may differ for secondary or tertiary students, as opposed to primary education pupils. Further research would be needed to confirm this.

Additionally, the current study explored the relationship between reading frequency and reading performance, not any possible confounders. Several researchers (Baker & Wigfield, 1999; Becker et al.,2010; Mol & Bus, 2011) found that motivation influences reading frequency, which in its turn can lead to higher reading scores. If this is the case, the decline in motivation could explain the decline in frequency. Furthermore, the possible effect of motivation on reading frequency could explain why reading frequency accounts for reading performance only to a small extent. Finally, the reciprocal relationship that reading frequency and performance might have should preferably be taken

into account, as it was established by prior research (Baker & Wigfield, 1999; Becker et al., 2010; Mol & Bus, 2011; Schaffner et al., 2013; Schaffner & Schiefele, 2016). The current study could only reveal that reading more fiction explains the decline in reading performance in Dutch 15-year-olds to a small extent.

6.3 Reading strategies

As expected, reading strategies revealed a positive effect on reading performance, supporting the hypothesis (H3). These results confirm prior research (Lee & Wu, 2013; OECD, 2010), which demonstrated awareness and understanding of reading strategies to be a robust predictor of reading performance. However, the current study established that there was no difference in the awareness and understanding of reading strategies between 2009 and 2018 for Dutch students. This could be a reason why our results reveal that reading strategies does not considerably explain the decline in reading performance; as only significant increases in the knowledge of reading strategies will foster relevant effects in reading performance, according to Muijselaar et al. (2017). An explanation for the lack of difference in strategy awareness could be that reading strategy education lacks means of formative testing, that a teacher would need to adapt their instruction and improve strategy education (Afflerbach et al., 2018). Okkinga et al. (2018) confirm this, and add that Dutch education on reading strategies does not line up with the standardised tests that are given.

Still, the current study reveals that reading strategies explains nearly a quarter of the variance in reading. Moreover, with its positive effect on reading performance, the results emphasise the importance of the awareness and understanding of reading strategies to improve reading proficiency, in line with prior research (Lee & Wu, 2013; Muijselaar, 2016; Säälik et al., 2015). In fact, if there is a causal relation, the current results indicate that the reading scores would drastically improve if awareness and understanding in reading strategies increased. Further research could apply an experimental study design to reinforce our causal suggestions. Moreover, future research could analyse the reasons behind the stagnating awareness and understanding of reading strategies.

Stakeholders could promote reading strategy education by, for instance, enhancing teacher instruction. Previous research has already established that teachers can enhance awareness of reading strategies by, for instance, scaffolding and promoting autonomy (Guthrie et al., 2012; Guthrie et al., 2013). Even though 15-year-olds are not taught explicit reading strategies in Dutch language lessons anymore, strategy instruction could still be incorporated in content domains, such as science (OECD, 2019a).

In short, because of reading strategies showing similar scores between 2009 and 2018, it does not account for a great portion of the current Dutch decline in reading performance. Nonetheless, its substantial positive effect on reading performance needs to be taken into account when improving reading performance in the Netherlands.

6.4 ICT-use

6.4.1 Online searching

A remarkable and unexpected finding was that online searching, as part of ICT-use, has a positive effect on reading performance. This finding is both contradictory to the hypothesis (H4) as well as contradicting Agasisti et al. (2020), Gubbels et al. (2020), Netten et al. (2014), and Vigdor et al (2014), who state that students' increase of ICT-use has a negative effect on their reading scores. In fact, the current study reveals that online searching considerably explained the decline in reading scores. Namely, the decline of reading performance would have been substantially greater, had it not been for the increase of online searching. Furthermore, our results challenge Wolf and Barzillai (2009), who state that online reading, of which searching online is a part (OECD, 2009), negatively influences deep reading, one of the driving forces of reading comprehension. It must be noted that most research focused on ICT-use to a much broader extent, whereas this study addressed the facet online searching. This could explain our contradicting results. Our findings are in line with Lee and Wu (2013), who established that online searching and reading positively impacts reading performance; however, they found this effect to be confounded by metacognitive strategies.

The current findings suggest that improving online searching skills may increase the reading performance of Dutch 15-year-olds, assuming there is a direct causal relation. Future research could apply an experimental study design to reinforce our suggestions. Moreover, educators could be looking at ways to improve online searching skills. Caccia et al. (2019) have already put forward a screening tool to diagnose children that are in need of extra lessons to improve these skills. Additionally, further research could look at studying which types of interventions improve online searching skills, and explore effects on reading performance.

6.4.2 Online chatting

Remarkably, even though online chatting greatly increased between 2009 and 2018, it has a surprisingly insignificant effect on reading performance, nor does it have a significant effect on the decline in reading scores. In other words, the fact that 15-year-old Dutch students chat substantially more online in 2018 than in 2009, does not account for their declining reading performance. These findings do not support the hypothesis (H4) which stated that ICT-use has a negative effect on the Dutch decline in reading. Furthermore, the findings are inconsistent with prior research, which either found ICT-use for entertainment to have a significant positive impact (Hu et al., 2018; Skryabin et al., 2015) or a significant negative impact on reading performance (Gubbels et al., 2020; Lee & Wu, 2013). One explanation for the incongruence between our findings and prior research, is that the current study addressed the facet of online chatting, as opposed to the broader perspective of ICT-use for entertainment that aforementioned studies applied. Further research could explore whether our findings can be found in other countries as well.

In short, based on the findings regarding ICT-use, it can be concluded that some facets of ICT-use appear to promote reading performance. Searching online information could enhance students' reading performance, and it accounts for the Dutch decline in reading. If there had not been an increase in online searching, the decline of reading performance would, presumably, have been substantially greater. The increase in students' online chat behaviour, however, does not have a significant effect on their reading scores.

7. Limitations

Even though this study offers a valuable insight into the extent to which reading motivation, reading frequency, reading strategies, and ICT-use explain the decrease in PISA reading scores in Dutch 15-year-old students between 2009 and 2018, this study has several limitations. Any significant relationships that were revealed in this study, must be interpreted with caution. There is always the possibility that confounding variables which were not taken account might account for the observed effects. Moreover, reciprocal relationships were not taken into account in this study, which may very well be present for some variables, e.g. reading motivation. However, by drawing on two cohorts, the design of the study allows for determining whether changes in one variable coincide with changes in another variable. This makes the research considerably stronger, and it takes into account spuriousness. Still, even though it allows for a more sound and solid foundation to suggest possible causations, it must be interpreted with caution as the study is of an observational nature.

Another limitation is the self-report methods that were employed in the PISA student questionnaires. This can limit the study in three different ways. First, students might interpret the questions incorrectly, and therefore giving an incorrect answer. Second, using self-report questionnaires can create recall bias. For instance, students' self-reported times of reading a specific type of text for enjoyment are dependent on their memory of reading these types of text. Third, students might report socially desirable answers, creating response bias.

Furthermore, it must be noted that different constructs were created for this study, employing the original PISA data from 2009 and 2018. Consequently, this makes it difficult to compare the findings to prior research. Additionally, only students from educational tracks VMBO KB/TL, HAVO 1-3, HAVO 4-5, VWO 1-3, VWO 4-6, and mixed 1-2 (no tracking), were employed for this study, as not all Dutch students from all educational tracks answered the questions related to reading strategies; especially the students from vocational tracks omitted these questions. Therefore, it may be more difficult to generalise these results for all Dutch 15-year-old students. Also, slightly more students from 2009 than from 2018 were included in this study, thereby confining the representativeness of the findings to some extent. Finally, this study selected two facets of ICT-use that were measured, namely, online searching and online chatting. Employing these separate variables gave insight into the individual effect of these variables on reading performance. However, there are other relevant ICT-related variables and constructs that could impact the decline in reading performance. Unfortunately, these questions were not answered by any of the Dutch students from across all educational tracks.

8. Conclusion

The current study contributed to the understanding of the Dutch decline in reading performance between 2009 and 2018. This decline is a cause for concern, as nearly a quarter of Dutch 15-year-olds are insufficiently literate. Four possible explanatory variables are explored in this study. As expected, students' decline in reading motivation was found to considerably account for the decline in reading performance. Likewise, students' decline in fiction reading explains the decline in reading performance as well, yet, to a small extent. Interestingly, the awareness and understanding of reading strategies has a substantial positive effect on students' reading performance, but it does not explain the decline in reading. This could possibly be due to the fact that there was no difference found in students' reading strategy awareness and understanding between 2009 and 2018. A remarkable finding was that online searching also explained the change in reading scores to a large extent, while having a significant positive effect on reading performance. So, when students considerably searched more online, the higher their reading scores were. Finally, another unexpected finding was that students' increased online chatting habits do not significantly explain their decline in reading performance.

Even though this study provided insight into correlations that can explain the decline in reading scores in the Netherlands, it is essential for further research to explore its causal relationships. Additionally, we urge stakeholders to explore and employ methods to improve reading performance in the Netherlands, supported by our findings. This is crucial, as too many students are insufficiently literate and may consequently face problems with their functioning at school and in society.

References

Afflerbach, P., Cho, B. J., & Kim, J. Y. (2018). Best Practices in Reading Assessment. In H. K. Casey, L. B. Gambrell & L. M. Morrow (Eds.), *Best Practices in Literacy Instruction* (6th ed., pp. 309–333). The Guilford Press. https://www.researchgate.net/profile/Byeong-young_Cho/publication/326760482_Best_practices_in_reading_assessment/links/5fce051892851c00f858b1d9/Best-practices-in-reading-assessment.pdf

Afflerbach, P., Pearson, P. D., & Paris, S. G. (2008). Clarifying Differences Between Reading Skills and Reading Strategies. *The Reading Teacher*, *61*(5), 364–373. https://doi.org/10.1598/rt.61.5.1

Agasisti, T., Gil-Izquierdo, M., & Han, S. W. (2020). ICT Use at home for school-related tasks: what is the effect on a student's achievement? Empirical evidence from OECD PISA data. *Education Economics*, *28*(6), 601–620. https://doi.org/10.1080/09645292.2020.1822787

Althuisius, J. (2020, October 27). Als dit de manier is waarop de leesvaardigheid in leven gehouden moet worden, kan die misschien liever dood willen [If this is the way to keep reading skills alive, it might rather want to die]. *Volkskrant.* https://www.volkskrant.nl/cultuur-media/als-dit-de-manier-is-waarop-de-leesvaardigheid-in-leven-gehouden-moet-worden-kan-die-misschien-liever-dood-willen~b7bc37e2/

Baker, L., & Wigfield, A. (1999). Dimensions of Children's Motivation for Reading and Their Relations to Reading Activity and Reading Achievement. *Reading Research Quarterly*, *34*(4), 452–477. https://doi.org/10.1598/rrq.34.4.4

Becker, M., McElvany, N., & Kortenbruck, M. (2010). Intrinsic and extrinsic reading motivation as predictors of reading literacy: A longitudinal study. *Journal of Educational Psychology*, *102*(4), 773–785. https://doi.org/10.1037/a0020084

Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2011). Defining Twenty-First Century Skills. In P. Griffin, B. McGaw & E. Care (Eds.), *Assessment and Teaching of 21st Century Skills* (pp. 17-66). Springer. https://doi.org/10.1007/978-94-007-2324-5_2

Bormuth, J. (1973). Reading Literacy: Its Definition and Assessment. *Reading Research Quarterly, 9*(1), 7-66. https://doi.org/10.2307/747227

Caccia, M., Giorgetti, M., Toraldo, A., Molteni, M., Sarti, D., Vernice, M., & Lorusso, M. L. (2019). ORCA.IT: A New Web-Based Tool for Assessing Online Reading, Search and Comprehension Abilities in Students Reveals Effects of Gender, School Type and Reading Ability. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.02433

CBS. (2020). *Individuals' level of digital skills* [Data set]. Eurostat. https://appsso.eurostat.ec.europa.eu/nui/show.do?query=BOOKMARK_DS-601368_QID_-6A0D7467_UID_-3F171EB0&layout=TIME,C,X,0;GEO,L,Y,0;INDIC_IS,L,Z,0;IND_TYPE,L,Z,1;UNIT,L,Z,2;INDICATORS,C,Z,3;&zSelection=DS-601368IND_TYPE,IND_TOTAL;DS-601368INDIC_IS,I_DSK_AB;DS-601368INDICATORS,OBS_FLAG;DS-601368UNIT,PC_IND;&rankName1=UNIT_1_2_-1_2&rankName2=INDICATORS_1_2_-1_2&rankName3=INDIC-IS_1_2_-1_2&rankName4=IND-TYPE_1_2_-1_2&rankName5=TIME_1_0_0_0&rankName6=GEO_1_2_0_1&sortC=ASC_-1_FIRST&rStp=&cStp=&rDCh=&cDCh=&rDM=true&cDM=true&footnes=false&empty=false&wai=false&time_mode=NONE&time_most_recent=false&lang=EN&cfo=%23%23%23%2C%23%23%23.%23%23%23

Chaudron, J. (2019, June 24). Nederlandse jongeren lezen veel te weinig, dat heeft op termijn vervelende gevolgen [Dutch youth read far too little, which has unpleasant consequences in the long term]. *Trouw*. https://www.trouw.nl/nieuws/nederlandse-jongeren-lezen-veel-te-weinig-dat-heeft-op-termijn-vervelende-gevolgen~b0fdd2a8/

Cho, B.-Y., & Afflerbach, P. (2015). Reading on the Internet. *Journal of Adolescent & Adult Literacy*, *58*(6), 504–517. https://doi.org/10.1002/jaal.387

Cipielewski, J., & Stanovich, K. E. (1992). Predicting growth in reading ability from children's exposure to print. *Journal of Experimental Child Psychology*, *54*(1), 74–89. https://doi.org/10.1016/0022-0965(92)90018-2

Copier, J. (2020, September 30). Kinderen én leraren moeten weer plezier in lezen krijgen [Children and teachers need to enjoy reading again]. *Trouw*. https://www.trouw.nl/opinie/kinderen-en-leraren-moeten-weer-plezier-in-lezen-krijgen~bf4e155c/

Dujardin, A. & Goudsmit, R. (2019, December 13). Hoe krijgen we scholieren weer aan het lezen, al is het maar een pizzafolder? [How do we get students to read again, even if it's just a pizza folder?] *Trouw*. https://www.trouw.nl/nieuws/hoe-krijgen-we-scholieren-weer-aan-het-lezen-al-is-het-maar-een-pizzafolder~b28362ca/

Froiland, J. M., & Oros, E. (2013). Intrinsic motivation, perceived competence and classroom engagement as longitudinal predictors of adolescent reading achievement. *Educational Psychology*, *34*(2), 119–132. https://doi.org/10.1080/01443410.2013.822964

Gille, E., Loijens, C., Noijons, J., & Zwitser, R. (2010). *Resultaten PISA-2009: Praktische kennis en vaardigheden van 15-jarigen* [Results PISA-2009: Practical knowledge and skills of 15-year-olds]. CITO. https://www.cito.nl/-/media/files/kennis-en-innovatie-onderzoek/pisa/cito_pisa_2009.pdf?la=nl-NL

Gubbels, J., Swart, N.M., & Groen, M.A. (2020). Everything in moderation: ICT and reading performance of Dutch 15-year-olds. *Large-scale Assessments in Education, 8(*1). https://doi.org/10.1186/s40536-020-0079-0

Gubbels, J., van Langen, A. M. L., Maassen, N. A. M., & Meelissen, M. R. M. (2019). *Resultaten PISA-2018 in vogelvlucht* [Results PISA 2018 in a nutshell]. Universiteit Twente. https://doi.org/10.3990/1.9789036549226

Guthrie, J. T., Klauda, S. L., & Ho, A. N. (2013). Modeling the Relationships Among Reading Instruction, Motivation, Engagement, and Achievement for Adolescents. *Reading Research Quarterly*, *48*(1), 9–26. https://doi.org/10.1002/rrq.035

Guthrie, J. T., & Wigfield, A. (2000). Engagement and motivation in reading. In M. L. Kamil, P. B. Mosenthal, P. D. Pearson & R. Barr (Eds.), *Reading research handbook* (3rd ed., pp. 403-422). Erlbaum. https://www.researchgate.net/publication/313240033_Handbook_of_Reading_Research_Volume_III

Guthrie, J. T., Wigfield, A., & Klauda, S. L. (2012a). *Adolescents' engagement in academic literacy.* http://www.cori.umd.edu/research-publications/2012_adolescents_engagement_ebook.pdf

Guthrie, J. T., Wigfield, A., & You, W. (2012b). Instructional Contexts for Engagement and Achievement in Reading. In S. L. Christenson, A. L. Reschly & C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 601-634). Springer Science. https://doi.org/10.1007/978-1-4614-2018-7_29

Guthrie, J. T., Wigfield, A., Metsala, J. L., & Cox, K. E. (1999). Motivational and Cognitive Predictors of Text Comprehension and Reading Amount. *Scientific Studies of Reading, 3*(3), 231–256. https://doi.org/10.1207/s1532799xssr0303_3

Habók, A., Magyar, A., Németh, M. B., & Csapó, B. ő. (2020). Motivation and self-related beliefs as predictors of academic achievement in reading and mathematics: Structural equation models of longitudinal data. *International Journal of Educational Research*, *103*, 101634. https://doi.org/10.1016/j.ijer.2020.101634

Hu, X., Gong, Y., Lai, C., & Leung, F. K. (2018). The relationship between ICT and student literacy in mathematics, reading, and science across 44 countries: A multilevel analysis. *Computers & Education*, *125*, 1–13. https://doi.org/10.1016/j.compedu.2018.05.021

Huisman, C. (2020, September 9). Een tablet of laptop eisen van leerlingen − het mag niet, maar scholen komen ermee weg [Demanding a tablet or laptop from students − it is not allowed, but schools can get away with it]. *De Volkskrant*. https://www.volkskrant.nl/nieuws-achtergrond/een-tablet-of-laptop-eisen-van-leerlingen-het-mag-niet-maar-scholen-komen-ermee-weg~b7b3b812/

Klauda, S. L. (2009). The Role of Parents in Adolescents' Reading Motivation and Activity. *Educational Psychology Review*, *21*(4), 325–363. https://doi.org/10.1007/s10648-009-9112-0

Lee, Y. H., & Wu, J. Y. (2013). The indirect effects of online social entertainment and information seeking activities on reading literacy. *Computers & Education*, *67*, 168–177. https://doi.org/10.1016/j.compedu.2013.03.001

Liu, Y., & Gu, X. (2019). Media multitasking, attention, and comprehension: a deep investigation into fragmented reading. *Educational Technology Research and Development*, *68*(1), 67–87. https://doi.org/10.1007/s11423-019-09667-2

Mayer, R.E. (2014). *Cambridge handbook in psychology. The Cambridge handbook of multimedia learning* (2nd ed.). Cambridge University Press. https://doi.org/10.1017/CBO9781139547369

McGeown, S. P., Duncan, L. G., Griffiths, Y. M., & Stothard, S. E. (2014). Exploring the relationship between adolescent's reading skills, reading motivation and reading habits. *Reading and Writing*, *28*(4), 545–569. https://doi.org/10.1007/s11145-014-9537-9

Meelissen, M.R.M., Weijn, L.X.F., & Maassen, N.A.M. (2020). *PISA-2018 De verdieping: Het welbevinden van 15-jarigen* [PISA-2018 in depth: The well-being of 15-year-olds]. Universiteit Twente. https://www.pisa-nederland.nl/wp-content/uploads/2020/10/PISA-2018-De-verdieping-Welbevinden.pdf

Miyamoto, A., Murayama, K., & Lechner, C. M. (2020). The developmental trajectory of intrinsic reading motivation: Measurement invariance, group variations, and implications for reading proficiency. *Contemporary Educational Psychology*, *63*, 101921. https://doi.org/10.1016/j.cedpsych.2020.101921

Miyamoto, A., Pfost, M., & Artelt, C. (2017). Reciprocal relations between intrinsic reading motivation and reading competence: A comparison between native and immigrant students in Germany. *Journal of Research in Reading*, *41*(1), 176–196. https://doi.org/10.1111/1467-9817.12113

Muijselaar, M. M. L. (2016). *How to assess and improve children's reading comprehension?* (Publication No. 9789402801590) [Doctoral Dissertation, University of Amsterdam]. University of Amsterdam. https://dare.uva.nl/search?identifier=14bfcfce-1704-4e5d-9e16-9b54433e2f23

Muijselaar, M. M. L., Swart, N. M., Steenbeek-Planting, E. G., Droop, M., Verhoeven, L., & de Jong, P. F. (2017). Developmental Relations Between Reading Comprehension and Reading Strategies. *Scientific Studies of Reading*, *21*(3), 194–209. https://doi.org/10.1080/10888438.2017.1278763

Netten, A., Voeten, M., Droop, M., & Verhoeven, L. (2014). Sociocultural and educational factors for reading literacy decline in the Netherlands in the past decade. *Learning and Individual Differences*, *32*, 9–18. https://doi.org/10.1016/j.lindif.2014.02.002

OECD (2009a). *PISA 2009 Assessment Framework: Key competencies in reading, mathematics and science.* OECD Publishing. https://www.oecd.org/pisa/pisaproducts/44455820.pdf

OECD (2009b). *OECD Program for International Student Assessment 2009: Student Questionnaire.* OECD. https://nces.ed.gov/surveys/pisa/pdf/quest_pisa_2009_student.pdf

OECD (2010). *PISA 2009 Results: Learning to Learn: Student Engagement, Strategies and Practices.* OECD Publishing. http://doi.org/10.1787/9789264083943-en

OECD (2012). *PISA 2009 Technical Report.* OECD Publishing. https://doi.org/10.1787/9789264167872-en

OECD (2019a). *PISA 2018 Assessment and Analytical Framework.* OECD Publishing. https://doi.org/10.1787/b25efab8-en

OECD (2019b). *Programme for International Student Assessment (PISA): Results from PISA 2018.* OECD. https://www.oecd.org/pisa/publications/PISA2018_CN_NLD.pdf

OECD (2019c). *PISA 2021 ICT Framework.* OECD Publishing. https://www.oecd.org/pisa/sitedocument/PISA-2021-ICT-framework.pdf

OECD (2019d). *PISA 2018 Results (Volume I): What Students Know and Can Do.* OECD Publishing. https://doi.org/10.1787/5f07c754-en

OECD (2019e). *PISA 2018 Results (Volume II): What Students Know and Can Do.* OECD Publishing. https://doi.org/10.1787/5f07c754-en

Okkinga, M., van Steensel, R., van Gelderen, A. J. S., van Schooten, E., Sleegers, P. J. C., & Arends, L. R. (2018). Effectiveness of Reading-Strategy Interventions in Whole Classrooms: a Meta-Analysis. *Educational Psychology Review*, *30*(4), 1215–1239. https://doi.org/10.1007/s10648-018-9445-7

Reeve, J. (2012). A Self-determination Theory Perspective on Student Engagement. In S. L. Christenson, A. L. Reschly & C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 601-634). Springer Science. https://doi.org/10.1007/978-1-4614-2018-7_29

Remie, M., & Veldhuis, P. (2020, January 31). Hoe we kinderen weer aan het lezen krijgen [How to get kids reading again]. *NRC*. https://www.nrc.nl/nieuws/2020/01/31/hoe-we-ze-weer-aan-het-lezen-krijgen-a3988900

Retelsdorf, J., Köller, O., & Möller, J. (2011). On the effects of motivation on reading performance growth in secondary school. *Learning and Instruction*, *21*(4), 550–559. https://doi.org/10.1016/j.learninstruc.2010.11.001

Säälik, Ü., Nissinen, K., & Malin, A. (2015). Learning strategies explaining differences in reading proficiency. Findings of Nordic and Baltic countries in PISA 2009. *Learning and Individual Differences*, *42*, 36–43. https://doi.org/10.1016/j.lindif.2015.08.025

Schaffner, E., & Schiefele, U. (2016). The contributions of intrinsic and extrinsic reading motivation to the development of reading competence over summer vacation. *Reading Psychology, 37*(6), 917–941. https://doi.org/10.1080/02702 711.2015.11334 65.

Schaffner, E., Schiefele, U., & Ulferts, H. (2013). Reading amount as a mediator of the effects of intrinsic and extrinsic reading motivation on reading comprehension. *Reading Research Quarterly, 48*(4), 369–385. https://doi.org/10.1002/rrq.52

Schiefele, U., Stutz, F., & Schaffner, E. (2016). Longitudinal relations between reading motivation and reading comprehension in the early elementary grades. *Learning and Individual Differences*, *51*, 49–58. https://doi.org/10.1016/j.lindif.2016.08.031

Skryabin, M., Zhang, J., Liu, L., & Zhang, D. (2015). How the ICT development level and usage influence student achievement in reading, mathematics, and science. *Computers & Education*, *85*, 49–58. https://doi.org/10.1016/j.compedu.2015.02.004

SLO. (2016). *Karakteristieken en kerndoelen: Onderbouw voortgezet onderwijs* [Characteristics and core objectives: Lower secondary education]. https://slo.nl/publish/pages/4881/karakteristieken-en-kerndoelen-onderbouw-vo.pdf

SLO. (2018). *Digitale geletterdheid – Inhoudslijn po-vo Mediawijsheid* [Digital literacy – Po-vo content guide Media Literacy]. https://www.slo.nl/publish/pages/6124/slo-2018-03-05-leerlijn-digitale-geletterdheid-po-vo.pdf

Stanovich, K. E. (1986). Matthew Effects in Reading: Some Consequences of Individual Differences in the Acquisition of Literacy. *Reading Research Quarterly*, *21*(4), 360–407. https://doi.org/10.1598/rrq.21.4.1

Steffens, K. (2014). ICT Use and Achievement in Three European Countries: What Does PISA Tell Us? *European Educational Research Journal*, *13*(5), 553–562. https://doi.org/10.2304/eerj.2014.13.5.553

Sweller, J. (1994). Cognitive load theory, learning difficulty, and instructional design. *Learning and Instruction*, *4*(4), 295–312. https://doi.org/10.1016/0959-4752(94)90003-5

Taboada, A., Tonks, S. M., Wigfield, A., & Guthrie, J. T. (2008). Effects of motivational and cognitive variables on reading comprehension. *Reading and Writing*, *22*(1), 85–106. https://doi.org/10.1007/s11145-008-9133-y

Troyer, M., Kim, J. S., Hale, E., Wantchekon, K. A., & Armstrong, C. (2018). Relations among intrinsic and extrinsic reading motivation, reading amount, and comprehension: a conceptual replication. *Reading and Writing*, *32*(5), 1197–1218. https://doi.org/10.1007/s11145-018-9907-9

Vigdor, J.L., Ladd, H.F., & Martinez, E. (2014). Scaling the Digital Divide: Home Computer Technology and Student Achievement. *Economic Inquiry*, *52*(3), 1103–1119. https://doi.org/10.1111/ecin.12089

Wang, J. H. Y., & Guthrie, J. T. (2004). Modeling the effects of intrinsic motivation, extrinsic motivation, amount of reading, and past reading achievement on text comprehension between U.S. and Chinese students. *Reading Research Quarterly*, *39*(2), 162–186. https://doi.org/10.1598/rrq.39.2.2

Wennekers, A., Huysmans, F., & de Haan, J. (2018). *Lees Tijd: Lezen in Nederland* [Reading Time: Reading in the Netherlands]. Sociaal en Cultureel Planbureau. https://www.scp.nl/binaries/scp/documenten/publicaties/2018/01/18/lees-tijd/LeesTijd.pdf

Wolf, M., & Barzillai, M. (2009). The importance of deep reading. In M. Scherer (Ed.), *Challenging the Whole Child: Reflections on Best Practices in Learning, Teaching, and Leadership*. (pp. 130-140). ASCD. http://www.ascd.org/publications/books/109114e4.aspx

Zhang, L. A., & Sheepo, S. (2013). Metacognitive strategy use and academic reading achievement: Insights from a Chinese context. *Electronic Journal of English Language Teaching, 10*(1), 54-69. https://www.researchgate.net/publication/289005641_Metacognitive_strategy_use_and_academic_reading_achievement_Insights_from_a_Chinese_context