

ÜLLE SÄÄLIK

Reading literacy performance:
Metacognitive learning strategies matter,
schools have effect on student outcomes



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schools have effect on student outcomes



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LIST OF ORIGINAL PUBLICATIONS

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1. INTRODUCTION

The supreme goal of compulsory education is to prepare well-coping citizens. Reading literacy is an essential skill for different educational tasks as well as for future working life and active citizenship (Linnakylä, Välijärvi & Arffman, 2007). Students struggling with compulsory education are seen as a risk for the future labor market and generally for the society (Brink, Nissinen & Vettenranta, 2013; Friedman, 2007). The reading literacy has been stated to be “the foundation of education, as not being able to read, many other essential domains of education are hard to grasp” (Dunlosky & Metcalfe, 2009, p. 213). Therefore, how students cope with reading might affect their future success, and educators are expected to study this multifaceted and crucial aspect of our children’s education to develop improving interventions.

The reasons behind the success or failure in reading are continuously researched, but very often only single affecters are studied separately, or some imminent correlations are pointed out, such as low economic status being related to educational disadvantages, although this situation is hardly changeable with educational tools. At the same time there are certain factors contributing to student’s success that are relatively easily implemented by educators such as creating supportive learning environment or teaching certain skills and strategies to students. In the current study the effects of learning strategies, factors of learning environment and student’s background were studied together to see their relative importance or predicted influence among other factors, and to discover the pure effect of factors when others are controlled for. Thus it is possible to find important information for educators and educational policy makers which aspects of schooling in relation to reading should be paid more attention to, and which type of learning strategies are expected to give good results in reading comprehension.

In Estonia the study on students’ reading ability and language competence has its long history, and nowadays it has already been researched from different aspects. Several studies have concerned primary school age, when the basic skills are taught. Uibu and Tropp (2012, 2013) have studied different areas of language competence such as word recognition, grammar or semantic awareness among primary students in a longitudinal study, and the issue of students’ home language (monolingual and bilingual students) was included. Student’s reading skills alongside teacher judgements and several student-related factors such as mono- or bilingualism were studied by Soodla (2012), pointing out that the bilingual students tend to be at risk of being misestimated by their teachers, and that affects their results. Relations between teacher’s teaching approach and primary students’ reading comprehension were studied by Soodla and Kikas (2014), revealing that teacher’s child-centered approach has positive effect on student’s reading comprehension. Estonian adolescents’ reading proficiency was discussed in Puksand’s (2014) thesis, considering the impact of students’ self-reported reading preferences and habits on their reading proficiency,

including some data of an international PISA (Programme for International Student Assessment) study, yet, the implications of effect remained hypothetical, results of interviews related to the theoretical sources, and relation likelihood not proved by statistical methods. Therefore, there are still several aspects of reading research to discover in Estonia, for example the development of reading skills throughout different age groups, differences between schools are ought to be studied, and different aspects of reading comprehension at certain age levels should be determined.

While primary pupils' reading comprehension has been studied in several ways, the young students leaving compulsory education level have been studied less. Several large-scale international surveys such as PISA or PIRLS (Progress in International Reading Literacy Study) are initiated to monitor the level of 15-year-old students' abilities, and Estonia has started to participate in these researches. So far only PISA 2009 has included the variables of different learning strategies, giving some evidence on students' self-reported awareness and choice of learning strategies alongside the data of their reading literacy performance. The PISA 2009 data were chosen for the current analyses due to the representative samples, and a unique combination of reading proficiency tests and student responses on learning strategies together, including also data of student background. The current thesis is focused on finding out how reading proficiency could be related to and explained by student's awareness of different learning strategies and ability to recognize the useful learning strategies. Using multilevel modeling, the effect of several explanatory variables on reading test scores was observed both on student and school levels to detect, whether students' awareness of learning strategies appears purely individual or whether these individual differences partly depend on the differences between schools.

The international studies like PISA or PIRLS offer each country a possibility to study the outcomes of their educational system, its effectors, advantages and disadvantages. The current study was started with the analysis of PISA 2009 Estonian data. Estonia, being a fresh member of OECD at that time and involved in such large-scale studies for a few times only, such comprehensive educational research data appear a great opportunity to discover the state and relations in the Estonian educational system. Finland, a country with very good results, but with worrying situation of schools with different instructional language showing lower results, was chosen to be studied as well. To see if any effect patterns or similarities appear, the neighboring countries, often referred to as one common country group, were chosen for the further study: Latvia, Lithuania and Estonia as Baltic countries, and Sweden, Norway and Finland as Nordic countries.

The neighboring countries often tend to be similar in many ways, either in education policy or overall beliefs and attitudes in society, and so the country groups (Nordic and Baltic) might show some similar characteristics in educational outcomes. The three Baltic countries may be more similar due to shared historical background of rigid dictatorial Soviet rule for five decades. As, in the Soviet Union, the main (or even only) source of educational models and

resources to the Soviet republics was from the central political power in Russia (Takala & Piattoeva, 2012), the educators, therefore, were affected by similar traditional understanding of teaching. The Baltic countries, therefore, might supposedly differ from the Nordic countries, but do not necessarily oppose them. Certain society traits also have quite strong influence on education, whether it's the political situation just like common social democratic order in Nordic countries or by religion in which the Evangelical-Lutheran state church with its principles of diligence and individual responsibility are also common for the Nordic countries (Telhaug, Medias & Aasen, 2006). Yet, from the 90s particularly Sweden has drifted away from the 'Nordic tradition' by creating large private sector, and favoring competition between schools and parents' right to select schools (Wondratschek, Edmark & Frölich, 2014).

The studied countries have similar frame of compulsory education starting at the age of 6 or 7, and going up to the age of 15–16, available and equal for everyone, and obtaining that level of education as a norm (Klapp Lekholm, 2011; The Swedish National Agency for Education, 2009, 2010; OECD, 2011). Yet, no matter how close geographically or even despite some similar traits in society, the different countries still represent different educational systems with a load of unique affecting factors in each. It must be kept in mind that international studies only provide grounds for studying the relative importance of factors in different countries, which give researchers opportunity to discover if these factors affecting achievement might be 'universally' important in different countries (Beaton et al., 1999).

The risk of overvaluing similar results when studying several countries exists and it is acknowledged here. As Steiner-Khamsi (2013) or Nóvoa (2013) have critically brought forth, there is serious threat of fallacies in case of comparative studies and 'learning from best practices' might cause false conclusions or overvaluations of certain educational reform packages. It has to be stated that between-country comparisons seeking best practices were not the aim in the current study, the datasets of different countries were studied separately, and the results will be presented with caution and respect towards each country.

As most countries involved in the study have officially stated that educational equity and equal possibilities to obtain comprehensive education are the main goals and the norm in their education (Brink, Nissinen & Vettenranta, 2013; Education and Research 2011–2016, 2012; Eesti tegevuskava "Haridus kõigile", 2004; Haridus- ja Teadusministeeriumi..., 2014; The Swedish National Agency for Education, 2009), then the schools in one country are expected to perform more or less similarly, offering equal opportunities for learning. In case of severe differences between schools or students' results being dependent on differences between schools, the equality seems to be compromised. The current study is expected to reveal possible school effect on individual outcomes, which could be important for the educational policy makers. Analyzing several countries might help to broaden the understanding of the effect patterns, to find indications of whether certain affecting factors might appear similar among different populations.

1.1. Reading literacy

The understanding of reading literacy has changed during several decades from a view of a passive reader as a recipient of information in text up to a more complex notion of an active reader engaged in reading and generating meaning in response to texts (Dole et al., 2004; OECD, 2010a). Reading literacy is defined as person's ability to manage with printed or written information (Perfetti & Marron, 1998), the ability to read, write, understand and interpret, and discuss multiple texts across multiple contexts (International Reading Association, 2012), or as student's ability to understand, use and reflect on written texts, the proficiency in accessing and retrieving information, forming general understanding of the text, interpreting it and reflecting on its contents and features (OECD, 2010a).

Generally, the reading skills are identified as basic lower level reading skills such as word recognition, decoding print and encoding visual configuration etc., and higher level advanced syntactic, semantic, and text integration skills, ability of making inference, constructing meaning etc. (Bowey, 2007; Dole et al, 2004; Hannon & Daneman, 2001; Nassaj, 2003). In this study the more sophisticated and complex level of reading literacy competence is considered, because the used dataset of PISA 2009 studied the 15-year-old students and their higher order ability to comprehend, form general understanding and reflect on written texts.

As the PISA study uses the terms of reading literacy and reading comprehension concurrently, the definition of reading comprehension was also studied. Reading comprehension is defined as a mental model of the text, which occurs as a reader builds a mental representation of a text message, with word level, sentence level and text level (Perfetti, Landi & Oakhill, 2007, p. 228). Reading comprehension refers to a set of empirical phenomena (a perception of what is being read) and a theoretical construct (a reader constructs a mental image while reading), seen as a complex process or asset of several key processes underlying comprehension (decoding graphic symbols, word recognition and parsing, forming idea units, textbase formation, drawing inferences etc.), which cannot be seen separately but working together (Kintsch & Rawson, 2007).

As reading literacy implies on the ability to comprehend written information, and the manifestation of such literacy is only possible to measure when demonstrating the usage of certain comprehension processes, the issue of skills and strategies contributing to reading literacy performance will be discussed in the following chapters.

1.2. Learning strategies and metacognition can affect reading literacy performance

Learning skills are understood as automatic routines, while the notion of learning strategies emphasizes reasoning and implies metacognitive awareness that leads to regulation or repair if needed (Dole et al., 2004). The term learning strategies has been defined as “a set of one or more procedures that an individual acquires to facilitate the performance on a learning task, which may vary depending on the nature of the task” (Riding & Rayner, 2000, p. 80), or as “a routine that represents a specific mental processing action, a part of a larger, complex process executed toward a goal (McKeown & Beck, 2009, p. 11).

Emergent readers need to acquire initial associative skills, and more experienced readers need to acquire higher order strategies. When using strategies, such as making inferences, using analogies, predictions, and questioning, reading becomes more automatic, more proficient, and finally the strategy use becomes deliberate and conscious (Seidel, Perencevich & Kett, 2005). The successful students evaluate their learning needs to generate strategies that meet these needs, and then they implement useful strategies (Hacker et al., 2009). „Strategic readers have control over their strategy execution and are metacognitive about monitoring their comprehension and strategy use “(Seidel, Perencevich & Kett, 2005, p. 52).

Independent student practice has appeared as one indicator of successful learning, and the highest influence on learning was attributed to comprehension monitoring, planning learning actions and evaluating the usefulness of strategies (Wang, Haertel and Walberg, 1994), which according to nowadays notion is referred to as metacognitive processes. The concept of metacognition was proposed by Flavell (1976, 1979) as the higher level advanced thinking ability, the cognition of one’s own cognitive processes. At first metacognition was associated with memory, but soon it was found to be very closely related to reading comprehension (Brown, 1980; Brown et al., 1983, Baker, 2002; Baker & Brown, 1984).

Metacognition consists of three main components:

- 1) knowledge – being aware of one’s own cognitive processes, how learning operates and how to improve it,
- 2) monitoring – judging about correctness and understanding, and,
- 3) control – the ability to use strategies to repair comprehension failures, deciding on a new tactic, or to spend more time to remember the answer (Dunlosky & Metcalfe, 2009; Roebbers, Krebs & Roderer, 2014; Seidel, Perencevich & Kett, 2005; Williams & Atkins, 2009).

The concept of metacognition might be difficult to comprehend due to its complexity, and interconnectedness. To sum it up, metacognition comprises a wider concept of awareness of one’s own thinking (as an umbrella of the concept), certain processes of executing learning tasks (strategies) as well as processes of evaluating these processes, and assessing whether the thinking and chosen

strategies are sufficient for the task. The metacognitive awareness mediates the choice among all known ways of learning, to identify the most useful one and to make a change if needed. Certain learning strategies are called metacognitive strategies if they contribute to such awareness, if they promote the understanding, if they include such monitoring attributes, if they are derived from or contributing to any of the aforementioned components of the metacognition.

Metacognition has been found to have a highly positive effect on improving learning results already at quite young age and in different academic domains, including reading (Hattie, 2009; Michalsky, Mevarech & Haibi, 2009; Roebers, Krebs & Roderer, 2014; van der Stel & Veenman, 2008, 2010). Reading as a complex of mental processes with various interacting sub-processes is believed to have many opportunities to intervene and help students develop more effective processes (McKeown & Beck, 2009, p. 8). First, learner must become aware of strategies and decision-making processes, and more strategic use appears when learner is able to select the best strategy for certain task (Fisher & Williams, 2002; Jones, 2007). In the current thesis, the student's awareness to recognize the best strategy for a certain reading task are in the spotlight to find out some evidence of best predictors improving reading comprehension.

In the PISA 2009 study the reading literacy was the main assessment component, and the study included questions on student's awareness and the preferred use of different learning strategies such as summarizing, understanding and remembering, memorization, elaboration, and control strategies (OECD, 2010a; OECD, 2010b. See also Appendix 1.). The students had a reading task, a choice of options how to approach the task, and they had to decide how useful each approach would be for the certain task. The options had been tested and analyzed with several researches, and the effectiveness of each option was determined. An index describing the awareness of metacognitive learning strategies as well as probable use of other learning strategies was then calculated according to a certain matrix (OECD, 2012, p. 282). For more precise explanation and matrixes, see Appendix 1.

The new data about students' awareness and choice of learning strategies give us an opportunity to analyze how such awareness relates to reading test results, whether the student awareness of certain learning strategies is able to predict better results or whether the student's choice on certain strategies would explain variation. When discovering a systematic variation in academic performance, it is possible to detect the possible sources of this variation (Malin, 2005, p. 22). One could argue that the ability to recognize and use learning strategies is rather innate and less likely improvable, just like the level of basic intelligence. Actually, it has been stated that learning style, having physiological basis, is fairly fixed for the individual, and by contrast, learning strategies can be learned and developed to cope with different educational tasks (Riding & Rayner, 2000, p. 11). Whether the differences between students are explained by learning strategies due to student's innate abilities, due to results of school contribution to student's learning habits or due to some other influences, needs to be studied carefully. If the between-school variation appears to

be explained by students' metacognitive awareness or their preference of other learning strategies, we can assume that this somehow indicates on school context playing role in it, either due to teaching practices in schools or how learning is handled or instructions are delivered.

1.3. Contextual factors must be taken into account

Even though the study is focused on learning strategies, several contextual factors were included in the analysis to see the pure effect of learning strategies when the effect of student's gender, socio-economic background and school instructional language has been taken into account, or in other words the effect of those factors has been controlled for.

Student's gender is considered a context in which children's learning and development occurs, because „within the classroom environment, whilst all children receive the same literacy instruction, differences in attention, interest and preference for different types of classroom activities may mean that boys and girls spend different amounts of time engaged in literacy activities” (Logan & Johnston, 2010, p. 177). Gender is a social and historical construct, referring to economic and cultural attributes and opportunities associated with being male or female (Desprez-Bouanchaud et al., 1987, p. 20–21). The school context is said to be changing more women-centered, causing certain gender-specific expectations or stereotypes influencing the student's performance and attitudes while learning (EACEA, 2010; Shek-kam, Xiao-yain & Wai-yip, 2013; Väljaots, 2013). Including gender in the effect analyses, it means recognizing that cultural, social and economic systems and institutions are not gender-neutral (Desprez-Bouanchaud et al., 1987, p. 21), and that was the case in the current study. Student's gender was included in the analysis as an explanatory variable to control for its effect, and to study how student awareness of learning strategies is related to gender.

Boys and girls performing differently in school subjects is generally known as well as the fact that reading is one of most distinguishing fields or subjects in that sense. Several reading literacy assessments have confirmed the existing gender gap in favor of girls (Lee, Grigg, & Donahue, 2007, Mullis et al, 2012; OECD, 2010b, 2014). The gender differences in reading have been investigated and handled from different aspects: girls' deeper engagement in reading activities (Lynn & Mikk, 2009), gender differences in abilities and attention, attitude and reading motivation, different neurological brain activation while reading etc. (Logan & Johnson, 2010; Prado & Plourde, 2011; Shek-kam, Xiao-yun & Wai-yip, 2013). Still, the problems seem to persist, although there have been studies showing boys outperforming girls when the learning environment was suited for boys, and more suitable reading strategy instruction of a systematic synthetic phonics teaching was adopted (Logan & Johnston, 2010).

The OECD analyses imply that students' approaches to learning actually mediate the gender gap in reading performance so that if the boys had the same

level of awareness in metacognitive skills as girls have, their results could be around 15 score points higher (OECD, 2010b, p. 88–91). It is possible that how boys and girls prefer to learn or how they obtain the necessary learning strategies also differs. Including the gender variable in the multilevel model together with learning strategies, the effect of gender on reading results will be controlled for and the specific effect of each learning strategy for the gender subgroups will appear.

The PISA tests and questionnaires are mostly translated into all main languages spoken in a country, except when the proportion of the minority instructional language among population is very small, it might cause exclusion from the sampling (OECD, 2012). In the PISA 2009 study in Estonia, the students in Russian-speaking schools performed on a statistically significant lower level in reading compared to their peers in Estonian-speaking schools (Mikk et al., 2012; Tire et al., 2010). Whether the school instructional language, reading literacy performance and learning strategies could be related, and the student's awareness of learning strategies might be playing role in explaining the differences between schools, the school language as an explanatory variable was decided to include in the analysis.

The issue of minority language schools performing on lower level than the schools with main language in the country has occurred not only in Estonia. In Finland the Swedish language is the second official language, and it is protected by laws and regulations. The students in Swedish-speaking schools performing on lower level in reading literacy has been a concern, as many students were not able to reach the minimum reading performance level (Brink, Nissinen & Vettenranta, 2013; Harju-Luukkainen & Nissinen, 2011; Hautamäki et al., 2008). What is actually different about the schools with different instructional language has remained unanswered so far. The current study attempts to find indications on whether the student awareness of useful learning strategies could explain those between-school differences.

The socio-economic background of students and schools may have some relatively strong influence on performance, although low socio-economic status does not necessarily result in poor performance (OECD, 2010a), or the effect of socio-economic status might even disappear, when school academic context is taken into account (Marks, 2010). Thus, the economic-social-cultural status was included in the study to reveal its explanatory power and control for its effect while studying other influencing factors.

Among many other important contributors to student academic performance school climate and classroom climate have been pointed out (Scheerens, Glas & Thomas, 2007; Wang, Haertel & Walberg, 1994). The classroom climate and management (safe, caring environment, teacher's attitude of welcoming errors etc.) were found to play role in student achievement (Hattie, 2009). Poor classroom discipline is related to low achievement (Lee & Bryk, 1989; Ma & Willms, 2004). In addition, when describing the struggling readers, a disruptive disciplinary climate was discovered to be relevant, and poor teacher-student relationships as well (Garbe et al., 2010; OECD, 2010b). In a large meta-study,

the teacher-student relationship factor had high effect on student academic performance, when teacher was perceived as empathetic and warm, non-directive while teaching, i.e. having more student-initiated and student-regulated activities, and encouraging higher order thinking (Hattie, 2009, p. 118–119).

The development of advanced metacognitive thinking ability goes through talk and dialogic teaching in the classroom, when students are allowed and encouraged to articulate ideas about what and how is learned. The teachers have an important role in developing metacognitive awareness through discussion, when helping students to learn self-reflection, planning the work, evaluating their own work etc., but the environment in the classroom has to be supportive, pupils should feel free to do so (Jones, 2007). This way the classroom environment appears to be related to the development of students' awareness of metacognitive strategies, as the dialogic teaching and articulating while learning might end up with more noise in the classrooms. Also the atmosphere, the learning environment appears to be related to teacher-student relations. Since the classroom climate and relations between teacher and students turn out to be naturally connected to the situation, in which students acquire the metacognitive learning strategies, these factors must be involved in the analysis.

Creating and maintaining suitable learning environment and teaching learning skills are seen as great tools in educators' hands. Once the students have been systematically instructed how to apply useful learning strategies, they become aware of them, and regular training of those strategies is expected to give the student the necessary skillfulness in managing with different reading tasks not only in the literacy lessons, but also in other subjects as well as one's future life.

1.4. Individual outcomes depend on context and group characteristics

In educational studies the question of accountability is permanently under examination, and yet it is the most intriguing issue, raising serious critics, because the influence in education is difficult to be identified or proved. Whether the child's performance in education is due to one's innate ability, the classroom environment, the school's contribution or other possible factors, is rather complicated and hard to distinguish. An individual in education is beyond doubt constantly influenced by the surrounding, by peers, by instructional practices etc., but to which extent it is possible to trace or how it might affect individual results, still needs to be discovered.

Arguably, the schools with more high-achieving students are more likely to have high-achieving cultures (Ma & Willms, 2004). Yet, another argument says that in low-achieving classrooms, an average ability student experiences favorability to his or her classmates and therefore develops a favorable self-concept, while in a high-achieving classroom the same student will be outperformed by many of his or her peers, obtaining rather negative effects on

academic self-concepts (Jonkmann et al., 2012). As for reading achievement, it was found that in high-achieving school context and context of more appropriate instructional practices, students still tend to have more positive attitudes towards reading, improved reading skills, and resulting in better reading attainment (Shek-kam, Xiao-yain & Wai-yip, 2013).

The presence of group effect is important to be acknowledged in educational researches. It must be carefully checked, whether the group effect exists, as students in schools tend to obtain more similar characteristics, beliefs and skills (Malin, 2005). If the group effect is present, the regular correlation or regression methods become unreliable, as the independency of measurements is compromised. In most PISA countries a great share of the variation in student performance has been attributable to differences between schools (Malin, 2005; OECD, 2010c, p. 26–27). Therefore, the existence of group effect in reading achievement was considered relevant to study, and the multilevel modeling was found necessary to be used.

1.5. The aim and research questions

The aim of the thesis was to study the role of learning strategies in explaining differences in reading literacy performance, discovering the sources of variation, and revealing the extent of school accountability for individual differences in reading literacy performance.

As student awareness of learning strategies contributes to one's reading performance, the current study aims to reveal the extent of contribution of different factors, including different learning strategies, to see which factors appear to have stronger effect on student's results, and which type of learning strategies are expected to give better results. The school level and individual student level are considered in the study due to the fact that hierarchically structured educational data assume a multilevel approach to be applied. It also enables to reveal the school accountability for individual differences, or in other words, to find out whether the individual reading comprehension test results appear to be dependent on differences between schools.

The research questions were stated as follows:

1. What is the effect of learning strategies, background factors and learning environment factors on PISA reading scores? (Paper I)
2. How much of the between-school and between-student variation in reading literacy performance is attributable to learning strategies, background factors and learning environment factors? (Papers I and III)

Paper I dealt with the Estonian data, and presented the results of single-variable models (each single factor's effect on the results). Paper III included the data of six countries, the analysis was developed to present full model results to see the combined explanatory power of all chosen variables.

3. How much variation in reading literacy performance is attributable to learning strategies, when the contextual factors (economical-social-cultural status, gender and school language) are controlled for? (Paper IV)
4. How student awareness of different learning strategies explains the variation in reading performance for boys and girls in schools with different instructional language? (Papers II and IV)

In Paper II the overall explanatory power of learning strategies was presented, and the nuance of controlling for the effect of background factors was used. In Paper IV the learning strategies were studied more thoroughly, the explanatory power of each strategy presented according to the gender and school language subgroups.

2. DATA AND METHODS

2.1. Sample and data collection

The PISA 2009 data were used in the analysis. The PISA 2009 study was conducted in 67 countries. Six countries were researched in the current study. The national sample sizes used in the current study are given in Table 1.

Table 1. Numbers of schools and students.

Country	N of schools	N of students
<i>Baltic</i>		
Estonia	175	4727
Latvia	184	4502
Lithuania	196	4528
<i>Nordic</i>		
Finland	203	5810
Sweden	189	4567
Norway	197	4660

The implemented sampling and data collection methods were the same in all countries. For sampling, all individual schools with 15-year-old students were sampled systematically from a comprehensive national list of schools with probabilities proportional to a measure of size – the number of PISA-eligible 15-year-old students enrolled in the school. Then, the students were randomly sampled within each sampled school (OECD, 2012). Each student filled in a pencil-and-paper reading literacy test booklet with either multiple-choice, closed-constructed response items or with open answers requiring students to develop their own responses designed to measure broader constructs. After the test the students answered a questionnaire about their personal background, their learning habits and choice of reading strategies (OECD, 2010a).

Table 2 shows the numbers of participants in the gender and school language subgroups used in Analysis 3. In case of Estonia, in some schools both Estonian and Russian languages are used, and students are taught in their mother tongue, but as there is very small proportion of such schools among the population, and their results were more similar to Russian-speaking schools, the results were presented by including them to the group of Russian-speaking schools.

Table 2. Numbers of schools and students in Estonia and Finland by school language and student gender.

School language	N of schools	Gender	N of students
Finnish	147	Female	2215
		Male	2188
		Total	4403
Swedish	56	Female	739
		Male	668
		Total	1407
Estonian	138	Female	1812
		Male	1922
		Total	3734
Russian + mixed	37	Female	485
		Male	508
		Total	993

2.2. Test scores and indices in PISA

In the PISA data the test scores have been derived from student responses using item-response methodology, the methodology known as plausible value, an estimate of the latent proficiency of a student who has attained a certain raw score in the test. The plausible values calculated for students take the role of test scores. The scale of the plausible values was originally set in the first PISA study in 2000 to have the international OECD average of 500 and standard deviation of 100, but for PISA 2009 with its wider range of OECD countries, the OECD mean was 493 with a standard deviation of 93 (OECD, 2009). The advantage of plausible value is that scores become more comparable, and differences and trends easier to interpret (Stoet & Geary, 2013, p. 2).

In determining the scores, PISA uses here the methodology known as plausible values (Wu, 2005). In the PISA study five plausible values are calculated for student's responses, which take the role of 'test score', to overcome the uncertainty in estimating unobserved proficiencies. All five plausible values are considered equally likely true proficiency estimates (OECD 2010a, p. 47; OECD 2012, p. 140). The simpler approach with using one of plausible values was adopted in the current analyses.

The indices in PISA were constructed through scaling of items from student questionnaires, and then standardized so that the mean of the index value for the OECD student population was 0 and the standard deviation was 1, countries being given equal weight in the standardization process (OECD, 2012, p. 280). The indices describing student's awareness and use of learning strategies used in the analysis were as follows: *Metacognition: Understanding and remembering, Metacognition: Summarizing, Control strategies, Memorization strategies*

and *Elaboration strategies*. The precise description of items and calculation of indices is given in Appendix 1.

School instructional language has also raised quite a lot of questions in educational researches. Unfortunately, it is not the subject of official PISA 2009 datasets, but only available from the national research centers. For the current study such data was only obtained from Finland and Estonia. The school language was used in case of Estonian and Finnish data to be controlled for as a background factor, and researched regarding population subgroups in the Analysis 3.

2.3. Statistical analyses

In educational studies single observations are usually not completely independent, as the data are hierarchically structured with two levels (students are nested within schools), and students in same school tend to perform more similarly, indicated as group effect (Hox, 2010; Steel, 2008). Average correlations between variables measured on pupils from the same school will be higher than the average correlation between variables measured on pupils from different schools, and in that case the estimates of the standard errors of conventional statistical tests appear much too small, resulting in spuriously ‘significant’ results (Hox, 2010; Steel, 2008).

In recent educational studies certain more complex and more accurate statistical methods are used for revealing the relations and liable influencing factors. Multilevel modelling approach has been found suitable for such studies. The main point in multilevel regression is that the researcher acknowledges the existence of higher-level units in which lower level units are nested. The classical regression model requires the independence of observations, but since all members of certain department or organization actually are dependent upon some shared characteristics, the classical approach would result in underestimation of standard errors, which ultimately yields a higher probability of rejecting a null hypothesis. Multilevel modelling allows examining the variation across units. A two-level model can be used to explore the effects of schools on individual student learning known as “school-effects” (Heck & Thomas, 2009).

The statistical analyses were carried out using multilevel modeling in which these dependencies are taken into account (e.g. Goldstein, 2011; Hox, 2010). As stated by Beaton et al. already in 1999 (p. 16), the hierarchical modelling is a suitable specialized technique for the international educational studies, providing a reply to the question, if other factors being equal, what is the impact of this particular factor on educational achievement?

The statistical analyses were conducted using MLwiN 2.29 software (Rasbash et al., 2013). Student weights were used in modeling. Separate analyses were conducted with the data of each country.

2.3.1. Regression-type analysis predicts the expected change in reading test scores

To find the effects of influencing factors on reading literacy performance, the multilevel modeling method was used, which allows to draw correct statistical inference for regression-type analyses under the hierarchical data structure. The regression coefficient estimates show the expected change in student's reading test score if the index value (the value of the explanatory variable) was increased by 1 unit.

Since the range of variables often varies widely, the centering or standardization may be necessary to reach convergence, it facilitates the interpretation of results when comparing different coefficients within one sample (Hox, 2010), and, showing the effect on reading literacy test scores, the data were standardized with MLwin application option- all the scores of all used variables in all datasets were changed into new variables (zscores) and new modelling analyses with zscores were conducted.

2.3.2. Explained part of variation detects the sources of variation and reveals the accountability for differences

The indicators of central tendency are often overused, and more attention should be paid on the variation of the results instead. By detecting the systematic changes in variation it is possible to find out the sources for this variation, and reductions in the variance after adding explanatory variables in the model could be observed and determined as possible sources of variation, and multilevel modelling is found to be an appropriate method for that (Malin, 2005; Steel, 2008).

To answer the research questions 2, 3 and 4, the multilevel modeling method of proportional reduction in variance components was used as a measure for the explained proportion of variance (Snijders & Bosker 2002, p. 99). The student-level variables are often able to explain variance on the group level as well when aggregated student level variables (such as school means) are used to explain individual outcomes, and that is due to the fact that individuals belonging to the same group appear more similar than individuals belonging to different groups, for example the effect of an individual pupil's intelligence might depend on the other pupils' intelligence in the group (Hox, 2010).

First, the null models were built, the total variance was divided describing the variation between schools (group level, school level) and between students within schools (individual level). Adding explanatory variables into the model, the changes in the variation components were observed, because by adding the explanatory variables into the model and observing the reduction of unexplained variation, we can trace the sources of the variation.

The research question 4 of how student awareness of different learning strategies explains the variation in reading performance for boys and girls in schools with different instructional language was discovered when using separate intercepts for each gender and language subgroup, controlling for the variation in reading literacy performance due to mean differences between gender and language subgroups. Two-level models were built, observing the changes in variation.

3. RESULTS

3.1. Descriptive statistics as basis for the analysis

According to the mean scores in reading performance (Table 3) students in Sweden, Estonia, and Norway performed close to the OECD average level of 493 points, Finland obtained the highest 536, Lithuania the lowest 468 among the six studied countries, thus the difference between the highest and the lowest being 68 points. The Nordic countries performed at an averagely higher level. The reading performance in Latvia appeared to be slightly more homogeneous as the standard deviation was the smallest. In Sweden, quite the opposite, the differences in reading performance appeared larger than in other countries.

Table 3. Plausible value 1 mean scores and standard deviations in PISA 2009.

Area	Country	Plausible value 1 mean scores	SD
Baltic	Estonia	502	82
	Latvia	488	79
	Lithuania	467	86
Nordic	Finland	531	86
	Sweden	498	98
	Norway	503	91

Note: ^a OECD, 2010d, p.196.

The gender and school language subgroups in Finland and in Estonia were studied to answer the research question 4. Table 4 shows the samples, mean reading scores and standard deviations of Estonian speaking schools and schools with instructional language of Russian or other in Estonia, and Finnish or Swedish speaking schools in Finland. According to the mean scores, girls do outperform boys in each school language group, but the gender groups in Estonia appear to be more homogeneous, as the differences between standard deviations are smaller than in Finland.

The data of each country were checked for the group effect (school effect), and it was detected in all countries. Table 5 presents the discovered group effects, which show how much of the differences between students could be attributable to the differences between schools in each studied country.

The countries are listed increasingly by the group effect: Finland with the smallest 9% among them, and Lithuania with 32% as the highest. In Nordic countries, the group effect was smaller than in Baltics with 9% in Finland, 10% in Norway and 16% in Sweden, and 21% in Estonia, 23% in Latvia and 32% in Lithuania (Table 5). It means that in Baltic countries child's reading test results were more dependent on the school he or she attended. In Nordic countries,

especially in Finland and Norway, the students' results appeared less dependent on the school.

Table 4. Numbers of students, mean reading literacy scores and standard deviations according to the gender and school language subgroups in Estonia and Finland.

School language	Gender	N	Mean	SD
Finnish	Female	2215	565	76
	Male	2188	510	86
Swedish	Female	739	538	76
	Male	668	479	87
Estonian	Female	1812	532	72
	Male	1922	489	78
Russian + mixed	Female	485	499	74
	Male	508	459	76

Table 5. Variance components in null model and group effects.

Country	Variance components in null model			Group effect
	Between schools	Between students	Total	
Finland	651	6920	7571	9%
Norway	863	7475	8338	10%
Sweden	1550	8219	9769	16%
Estonia	1408	5364	6772	21%
Latvia	1470	4963	6433	23%
Lithuania	2352	5072	7424	32%

3.2. Which factors have effect on reading literacy performance and explain the differences?

Answering the research question 1, what the effect of influencing factors on reading literacy performance is, the multilevel modeling method was applied, revealing the regression coefficient estimates, which show the expected change in reading test scores if the value of the explanatory variable was increased by 1 unit.

An earlier analysis of the PISA 2009 Estonian data showed that low-performing students tend to report lower awareness level and less probable use of metacognitive strategies than well-performing students with low-performers preferring more traditional methods such as memorizing (reading texts several times, trying to memorize as many details as possible) (Mikk et al., 2012). A

single variable multilevel model of PISA 2009 Estonian data showed that student's awareness of metacognitive strategies plays important role in achieving better results in reading (Paper I), but whether the effect remained when combined with other possible variables added to the model, still needed to be studied.

When the data of Finland and Estonia were studied for the effect of learning strategy variables on reading proficiency, the result was that the awareness of both metacognitive strategies would raise student's performance. At the same time, the memorization strategy appears to work differently: the harder the student claims to be using this learning strategy, the lower the reading literacy test score (Säälik, 2015), which means that a student insisting on applying memorization strategies on presented reading tasks would achieve lower reading test results.

To study several countries and to analyze the relative importance of different variables of one country, it was found necessary to standardize the data to make the regression coefficients as comparable as possible. The MLwin application option was used for standardizing all the scores of all used variables in all datasets, generating new variables (zscores) and then conducting new modelling analyses with zscores.

When looking at the standardized regression coefficient estimates in full models (Table 6), the background variables of gender and ESCS showed rather strong effect on reading literacy test scores. A girl is expected to gain 0.13–0.25 standardized score points higher scores than a boy. According to the regression coefficients, the students in schools with minority language are expected to obtain lower scores: in Estonia the students of Russian-speaking schools or schools with mixed language would estimably obtain 0.07 standardized score points less than the students in Estonian-speaking schools, in Finland the students of Swedish-speaking schools scored 0.10 standardized score points lower than the students in Finnish-speaking schools. In Baltic countries, the economic-social-cultural status appeared to be weaker predictor of reading proficiency than in Nordic countries. In Baltic countries, the standardized regression coefficients lay between 0.15–0.19, while in Nordic countries they lay between 0.18 in Finland and Norway, and 0.22 in Sweden.

The awareness of summarizing strategies would enhance students' reading results the most compared to the other variables: in Lithuania 0.16, in Estonia 0.22 and Latvia 0.24, in Norway 0.23, in Sweden 0.25, and in Finland 0.28. The understanding and remembering strategies showed rather similar regression coefficients in all countries (0.14–0.18 standardized score points). In addition, the control strategies showed positive and statistically significant effect: Estonia 0.06, Lithuania 0.10 and Latvia 0.11, Sweden 0.07, Norway 0.12 and Finland 0.13. Memorization strategies systematically resulted in negative coefficients between –0.11 and –0.16 standardized score points with the exception of Sweden, where the negative coefficient was not statistically significant. It means that students who report frequent use of memorization strategies tend to fail in reading comprehension rather than succeed in it.

Table 6. Standardized regression coefficient estimates and variation reduction of full two-level models with all predictors.

Variable	Estonia	Latvia	Lithuania	Finland	Sweden	Norway
Gender ^a	0.17* (0.01)	0.19* (0.01)	0.25* (0.01)	0.17* (0.01)	0.13* (0.01)	0.16* (0.01)
School language ^b	-0.07* (0.03)	n/a ^c	n/a	-0.10* (0.01)	n/a	n/a
Economic-social-cultural status	0.15* (0.01)	0.16* (0.01)	0.19* (0.01)	0.18* (0.01)	0.22* (0.01)	0.18* (0.01)
Metacognition: summarizing	0.22* (0.01)	0.24* (0.01)	0.16* (0.01)	0.28* (0.01)	0.25* (0.01)	0.23* (0.01)
Metacognition: understanding and remembering	0.17* (0.01)	0.18* (0.01)	0.14* (0.01)	0.16* (0.01)	0.17* (0.01)	0.15* (0.01)
Memorization	-0.16* (0.02)	-0.12* (0.01)	-0.14* (0.01)	-0.11* (0.01)	-0.02 (0.01)	-0.13* (0.02)
Elaboration	0.06* (0.01)	-0.02 (0.01)	-0.02 (0.01)	0.02 (0.01)	-0.01 (0.01)	0.04* (0.02)
Control strategies	0.06* (0.01)	0.11* (0.01)	0.1* (0.01)	0.13* (0.01)	0.07* (0.01)	0.12* (0.02)
Disciplinary climate	0.06* (0.01)	0.08* (0.01)	0.07* (0.01)	-0.001 (0.01)	0.02 (0.01)	0.03* (0.00)
Teacher-student relations	0.10* (0.01)	0.05* (0.01)	0.06* (0.01)	0.08* (0.01)	0.10* (0.01)	0.14* (0.01)
<i>Variation reduction</i>						
Student level	29%	32%	34%	37%	37%	36%
School level	63%	56%	58%	67%	66%	56%

Notes. Standard errors in brackets. * Statistically significant $p < .05$. ^a Male gender is the reference. ^b Main language in the country (Estonian, Finnish) is the reference. ^c Data not available. For explanations of the variable names see Appendix A.

How students perceived the relationships with teachers showed small positive effect on reading literacy scores with the standardized coefficients between 0.05 and 0.14. The students' perceptions of classroom discipline had small, but clearly significant positive effects 0.03–0.08 in Baltic countries and Norway, but appeared not statistically significant in Finland or Sweden.

To answer the research questions 2 and 3 the multilevel modeling method of proportional reduction in variance components was used to measure the explained proportion of variance. It becomes evident that the proportion of variance explained by all chosen explanatory variables is actually rather large and quite similar in all the studied countries, as shown in table 6. The explained part of variation varies around 50–60% on school level and about 29–37% on student level. It means that the differences in students' reading literacy performance are partly due to differences between schools, and these between-school

differences are attributable to contextual factors and students' awareness of learning strategies. About one third of differences between students are dependent on the contextual factors and student's awareness of learning strategies.

3.3. Are the boys and girls from schools with different instructional language performing differently due to the awareness of learning strategies?

To answer the research question 4 of how student awareness and choice of different learning strategies explains the variation in reading performance for boys and girls in schools with different instructional language, separate intercepts for each gender and language subgroup were fitted to control for the variation in reading literacy performance due to mean differences between gender and language subgroups, and the same multilevel modelling methods were applied. For setting the intercepts the dummy variables were constructed, i.e. the Estonian-speaking schools as the reference category with the value of 0, and Russian-speaking and mixed language schools with the value of 1, and similarly with gender. The separate explanatory dichotomous variables for each student group were included. This way the main effects and the possible interaction effects of gender and school language were taken into account.

These subgroup variables were used to estimate student level variance components separately for each subgroup. First, the baseline model was built to control for the effect of contextual factors: the four separate intercepts of gender and school language subgroups were used, and the indices of economic-social-cultural status (ESCS). Then, the five explanatory variables of learning strategies were added to see how much of the total variation could be explained by student awareness and use of learning strategies. The variance components of models were compared to the variance components of null model to find out the reduction of the variation due to the added explanatory variables. It means, if the added explanatory variables reduce the variation, they are considered the source of this variation or in other words these factors are accounted for the differences in reading literacy test results.

As the two variables of metacognitive learning strategies (summarizing, understanding and remembering) showed the strongest explanatory power and would predict the highest raise in student's reading test results, they were studied more carefully in these gender and language subgroups as well (Table 7). In Finland the variables of learning strategies reduced about 22–27% of the student level variation, while in Estonia it was about 16–20% (Paper II). In Finland the girls' reading results appeared to depend on the learning strategies more than boys' in both Finnish- or Swedish-speaking schools, as for the girls the reduction in variance component was larger than that for boys. In Estonia, quite the opposite, the learning strategies explained more of boys' variance than that of girls' with about 16–17% reduction of the variance for girls' and 20% for boys'.

Table 7. Reduction in variance in gender and school language subgroups by metacognitive learning strategies and by all the learning strategies together in Finland and Estonia.

School language and gender	Reduction in variance		
	by summarizing ^a	by understanding and remembering ^a	by all learning strategies together ^b
<i>Finland</i>			
<i>Finnish speaking</i>			
Boys	16.1%	10.4%	21.7%
Girls	16.2%	14.6%	23.6%
<i>Swedish speaking</i>			
Boys	22.4%	8.2%	22.8%
Girls	23.0%	16.3%	27.3%
<i>Estonia</i>			
<i>Estonian speaking</i>			
Boys	12.9%	11.2%	20.1%
Girls	10.9%	9.1%	17.5%
<i>Russian or mixed language</i>			
Boys	14.3%	13.9%	20%
Girls	15.9%	5.7%	16%

Notes. ^a Metacognitive learning strategy added in the model, when gender, school language and economic-social-cultural status are controlled for. ^b All learning strategies added in the model, when gender, school language and economic-social-cultural status are controlled for.

The students' awareness and use of metacognitive summarizing skills showed the greatest influence of all studied variables. It explained about 16% of the variation of Finnish speaking school students' results, 22–23% of the variation of Swedish-speaking school students' results, 11–13% of the variation of Estonian-speaking school students' results and 14–16% of the variation of Russian or mixed language school students' results. In both countries the differences among students' reading test results in schools with instructional language other than the majority appeared to be explained by the summarizing skills to a rather large extent, giving a reason to believe that differences in students' reading literacy performance depend on the students' awareness of summarizing strategies.

The metacognitive learning strategy of understanding and remembering, however, showed different explanatory power regarding gender and school language subgroups. In Finland the girls' results in both types of school were more dependent on the metacognitive understanding and remembering strategy than boys (15–16% of girls' and 8–10% of boys' variation explained). In Estonia, quite the opposite, the boys' results in both types of schools were more dependent on the student awareness and preferred use of understanding and remembering strategies (11–14% of boys' and 6–9% of girls' variation explained).

4. DISCUSSION

The aim of the thesis was to study the role of learning strategies in explaining differences in reading literacy performance, to reveal possible sources of variation, and the extent of school accountability for individual differences in reading literacy performance.

It became evident that metacognitive learning strategies are highly important in improving reading comprehension. The study revealed that the metacognitive strategies are strong predictors of reading literacy achievement, coinciding several earlier studies (Delclos & Harrington, 1991; Hattie, 2009; Pennequin et al., 2010; Wu, 2014), but furthermore, it was found that the strong explanatory power remains even after the group effect was taken into account, and when the effect of several other influential variables was controlled for.

It is essential to acknowledge the group effect in educational studies, and to reveal how much the individual results might depend on the group to which they belong. The Nordic countries have generally followed the same course (Telhaug, Medias & Aasen, 2006), the compulsory schools both in Finland and Sweden appearing mostly equal with only small between-school variations around 4–6% (Malin, 2005; Ministry of Education and Culture, 2013; The Swedish National Agency for Education, 2009). Now, the analysis revealed Sweden having the highest group effect among Nordic countries, and the between-school differences tend to be increasing in Finland, and therefore the claim of equality turns out to be compromised. There is no common practice of selecting students, and the school systems are rather characterized by a low level of differentiation in selecting and grouping students (OECD, 2010c). Therefore, the student selection cannot be the plausible cause of differences between schools.

4.1. Student awareness of metacognitive learning strategies matters to reading literacy performance

The effect of influencing factors on reading literacy performance could be discovered in many ways. The regression coefficient estimates of multilevel modelling can show the expected change in reading test scores, standardized regression coefficients give a chance to see the relative importance of different influencing factors.

It was proved that among several other important explanatory factors the student's awareness of metacognitive summarizing strategy can improve one's reading test results more than others, and therefore it can be considered having the strongest effect on reading proficiency. Lee (2014) also found that summarizing was a much stronger predictor of reading performance than control strategies, apparently operating as a universal characteristic for all students irrespective of their cultural background, and according to the results of the current

analysis the metacognitive summarizing strategy had the highest effect of all explanatory variables for all studied countries as well.

As for the effect proportions of different learning variables in PISA 2009, it could be that one reason for the variables of metacognition showing stronger relations with reading results, is due to these variables being more specifically related to reading tasks, while the use of memorizing, elaboration and control strategies were asked in a more general learning context. Therefore, the two variables of metacognition might show somewhat stronger associations with reading test results than the other three variables of learning strategies did. In addition, the more complex way of asking about the student's choice of different ways for approaching certain reading task and weighing student's choices with tested pattern of usefulness, as it was done for metacognitive strategies, appears more reliable. It cannot be faked or forced, as, for example, giving all the six options equally good rate of usefulness, the student's result index might end up being 0, because half of the choices were actually proved to be useful, and the other half not so much at all. Therefore, these variables are rather trustful and worth being studied even more in further studies.

Although in several studies student perceptions of good teacher-student relations have been proved to predict better student achievement (Gehlbach et al., 2011; Hughes et al., 2008; Roorda et al., 2011), the variables of learning environment did not show much effect or explanatory power in this PISA 2009 study. Relatively small regression coefficients and proportion of explained variation do refer on good disciplinary climate and teacher-student relations having positive effect on students' results, though. Unfortunately, PISA does not give data about the real teaching situation, but only student and headmaster self-reported indirect allusions about it. How students perceive good teacher-student relations or good disciplinary climate could also differ among different cultures (Chunyan, et al., 2013), and that might influence the PISA data, and therefore bias results of relation or effect analyses, ending up in low correlation or regression coefficients.

The research question 2 of how much of between-school and student variation in reading literacy performance is attributable to learning strategies, background factors and learning environment factors, was answered by single variable models of the multilevel modeling, revealing the proportional reduction in variance components to track the systematic variation, and to detect the source of this variation. The research question 3, how much variation in reading literacy performance is attributable to learning strategies, when the background factors are controlled for, was discovered with multilevel modeling method of proportional reduction in variance components with all explanatory variables included in the model (which is also called controlling for the effect of those variables).

The student's awareness and use of metacognitive summarizing or understanding and remembering strategies was strongly related to both between-school and between-student differences in reading literacy in every country, indicating how closely such awareness of useful ways of learning relates to

reading proficiency, just like earlier studies have shown (Pennequin et al., 2010; Wang, Haertel & Walberg, 1994). Now the importance of metacognitive strategies was confirmed as the effect remained strong after the group effect was taken into account and the effect of other variables was controlled for.

All the learning strategy variables together explained a great part of differences between schools and between students. About one third of the variation is due to differences between schools and that variation was to a large extent explained by the students' awareness of metacognitive learning strategies, therefore appearing one of the strongest sources of systematic variation. It leads to conclusions that student's learning skills and metacognitive awareness are not purely individual ability, but schools do have part in developing these higher level thinking skills. In Finland the leading principle in educational policy is to promote equality (Linnakylä, Välijärvi & Arffman, 2007; Malin, 2005), therefore the between-school differences are seen as serious issue both for the government and parents as it threatens the demand for equal and equally good education for the children (Malin, 2007). As from this study, one aspect of between-school differences is students being aware of metacognitive learning strategies.

4.2. Learning strategies mediate the gender differences and explain the issue of school instructional language

The study on research question 4 revealed that student awareness and choice of different learning strategies can also explain why students from schools with different instructional language perform differently. The never-ending issue of boys underperforming girls in reading may have its roots in learning strategy awareness. Lundeberg and Mohan (2009, p. 228) found that females appear more accurate in judging their confidence in using suitable learning strategies, and that females' metacognition is more aligned with their actual academic performance, therefore the girls' results vary less, as small standard deviations in Table 4 show.

How learning strategies explain reading performance of different gender and school language subgroups appeared to work differently in Estonia and Finland. Teaching how to learn successfully might be differently handled in Estonia and Finland, also from the gender aspect of boys' or girls' needs. In Estonia the reading results of girls appeared to be more difficult to explain, as the reduction in the variance component due to the useful learning strategies was smaller (as was shown in Table 7). There should be something else affecting their rather good results, whether they are simply more diligent or putting more effort into the attempt to solve the tasks, even if they are not aware of the usefulness of strategies. At the same time variation of boys' results was more related to the learning strategies, giving the reason to believe that by developing their awareness and skills of useful learning strategies their results are improved.

There have been findings suggesting that student's self-control actually contributes to one's academic achievement (Duckworth et al., 2015, Stadler et al., 2016). Metacognitive skillfulness seems to be closely related to the self-control issue, as it also includes elements of self-control, in case some extra effort needs to be put into monitoring one's learning, re-reading the unclear parts of texts etc. The self-control study by Duckworth et al. (2015, p. 21) suggested that while improving academic results, boys would benefit from improving their self-control, and converting positive thoughts and images about a desired future into self-regulated behavior change.

As for the gender differences, it has been said that the differences appear in the performance on information processing tasks as males process faster, but to a more superficial level than females, while females are more thorough (Riding & Rayner, 2000, p. 113). That could be one of the explanations to the question why the metacognitive strategy of understanding and remembering appeared working rather differently for boys and girls, as the questionnaire includes the notions of 'reading fast' and 'reading easy parts', which might seem rather natural for boys, but which are actually not that helpful for a certain task, and therefore could be recognized only when taught to be recognized as a useful way of learning.

Logan and Johnston (2010) suggest the ways of reading instruction and learning environment favoring boys, referring to a specific synthetic phonics method which suits boys' learning style (Johnston & Watson, 2005), and whilst boys benefitted from this particular approach, it did not disadvantage girls. In addition, there is often a discrepancy between a child's competence (i.e. cognitive abilities) and performance (i.e. reading comprehension scores), and this difference may lie in their motivation or attitudes towards the task (Logan & Johnston, 2010). The classroom settings only provide possibilities for action, resources and opportunities that each student would experience differently, and it is teachers' work to use gender as a resource for students' participation (Ivinson & Murphy, 2007).

The greater variation in boys' than girls' cognitive ability could possibly be combined with gender differences in sensitivity to living conditions: improvements in living conditions would benefit boys' achievement across the continuum more than girls' achievement, whereas deteriorating conditions would adversely affect boys more than girls (Stoet & Geary, 2013, p. 7). The fact that in the current study the metacognitive understanding and remembering strategy showed clear gender difference (in Finland it explained greater part of variation for girls, in Estonia for boys), could be partly connected to this speculative conclusion stated by Stoet and Geary (2013), as boys in Finland performed on higher level in reading compared to the boys in Estonia, and at the same time the Finnish boys' results were less influenced by the level of learning strategies.

There have been indications on girls' and boys' motivation-related beliefs and behaviors continuously following gender role stereotypes: boys' stronger ability and interest beliefs in mathematics and science, girls' confidence and interest in language arts and writing. Gender effects are thereat moderated by

ability, ethnicity, socioeconomic status, and classroom context, and the gender differences in motivation increase over the course of school (Meece et al., 2006). Several researches about the differences in confidence related to gender and culture found that context matters with regard to gender and cultural differences in confidence (Lundberg & Mohan, 2009). It is important because confidence is closely related to achievement as well as metacognition (Kleitman & Stankov, 2007). The issue of gender and metacognitive abilities therefore needs to be studied further with motivation and confidence aspects included.

The issue of schools with different instructional language in Estonia and Finland probably have somewhat similar causes of different educational practices, but the deeper background of the education given in certain language might have its influence as well. In that matter the challenges in Estonia cannot be compared with most other European countries, and many explanations for ethnic stratification formulated for Western European societies are not relevant for the situation in Estonia. The Soviet period offered two parallel educational systems based on the language of instruction (Russian or Estonian), which contributed to the segmentation of Estonian society, offering all levels of education in Russian. Nowadays, Russian language secondary schools have become almost as educational dead ends because main higher education institutions provide instruction mainly in Estonian, the Russians appear rather disadvantaged while accessing these schools (Lindemann & Saar, 2011).

Have the changes in educational system caused Russian-speaking teachers and students being less motivated, putting less effort into improvements so that it somewhat affected the attitudes in the following years? Although the 2008 monitoring showed the Russian population being even slightly more oriented towards tertiary education compared to Estonians when not taking into account their socio-economic position (Saar, 2008), the 2009 PISA questionnaires revealed lower learning motivation among students of Russian-speaking schools (Mikk et al., 2012).

The students of Baltic countries reported greater use of traditional learning method such as memorization, but according to the regression analysis, they would less likely succeed in reading tasks when trying to apply the memorization methods on more complex reading tasks of summarizing or understanding and remembering. Practical learning methods such as elaboration and control strategies explained more of the variance in Nordic countries than in the Baltic countries.

Elliot and Tudge (2007) have stated that many teachers in Russia still continue to rely on traditional practices and values despite the Western influence of more contemporary teaching practices. According to Loogma et al. (2009) the teachers of Russian-speaking schools report their preference to more traditional methods in the classroom than their colleagues in Estonian-speaking schools, applying more direct instruction and valuing factual knowledge. The study of teaching practices in Estonia revealed that great majority of teachers in Russian-speaking schools had graduated from educational institutions in Russia (Suviste, 2015, p. 27). Therefore, there is reason to believe that the Russian-speaking

teachers in former Soviet republics such as Estonia, Latvia, and Lithuania might still have influence from the Soviet time educational practices, and accordingly their students report greater use of traditional memorization strategy as well. The pedagogical materials from Soviet period do put more stress on learning alone, learning by heart and memorizing facts, importance of order and silence, repetition etc. (Bardin, 1987; Koemets, 1979; Kulko & Cehmistrova, 1983), which also turned out to be characterizing Russian-speaking schools in Estonia in a PISA 2009 study (Mikk et al., 2012).

4.3. Practical suggestions

The theory and practice of teaching useful reading strategies is not new. It has been researched and developed for several decades, which is compactly combined in several articles and books, presenting the ideas of reading comprehension instruction, both cognitive and metacognitive, psychomotor, affective and interpersonal domains, and suggesting how metacognitive processes could be encouraged in readers through making predictions, identifying general ideas that incorporate more specific ideas, group discussions, verbal retelling, monitoring comprehension etc. (Dole et al., 2004; Riding & Rayner, 2000; Seidel, Perencevich & Kett, 2005; Weinert & Kluwe, 1987).

Learning skills and metacognitive strategies can and must be taught consistently. Teaching learning skills “enhances the quality, complexity and intensiveness of children’s thinking, develops creativity and therefore helps them how to respond to a rapidly changing world where the ability to make sense of new information, to think creatively and to solve problems are becoming more and more valuable, as well as promoting lifelong learners, ready to face the uncertainty” (Simister, 2007, p. 8–9). When teachers practiced teaching both cognitive and meta-cognitive strategies continuously, encouraging reasoning for learning, thinking aloud, allowing and even encouraging struggling readers to work in pairs or groups together with more skilled peers, it was successful and helped everyone to become a more fluent reader (Steklàcs, 2010). “Strategy instructions make students active, they bring about active processing by way of bringing processes to conscious awareness” (McKeown & Beck, 2009, p. 22).

To improve students’ academic performance, teachers have many ways: developing learning skills, dialogic teaching using open questions more than seeking for “right” answers, developing their skills by self-reflective talk, instructing others *etc.* (Jones, 2007; Mercer & Howe, 2012; Pennequin et al., 2010; Simister, 2007; Steklàcs, 2010; van der Stel & Veenman, 2010). When teachers encourage their students to put the main ideas in their own words, asking more “why” and “how did you know that”, the students’ reading comprehension skills are developed (Mercer & Howe, 2012). “Once students develop a repertoire of routines associated with being a strategic learner, they will achieve far higher levels of effective and efficient learning” (Riding &

Rayner, 2000, p. 89). The dialogic teaching and encouragement of classroom discussions has also been pointed out by Reznitskaya and Glina (2013) as a useful tool for enhancing the enjoyment of assigned readings, resulting in improved thinking skills, contrasting that kind of dialogic teaching to traditional setting, although pointing out that teachers actually need to be educated about the theory and implementing that kind of practice in their classrooms.

Children with learning disabilities do not or cannot develop the type of task-planning and task-execution strategies that some schoolwork requires, they tend to have rather low self-concept leading to fewer attempts to plan the education task successfully, and high external control, low motivation and low attention as self-monitoring which is a part of metacognitive skillfulness. These children need to think about and plan their thinking and their activities in order to complete a complex educational task, which is conceptualized as metacognition (Bender, 2004, p. 26–27). Yet, the metacognitive skillfulness can be developed with training, even independent of student's intellectual ability, compensating somewhat for low learning ability and insufficient prior knowledge, helping to achieve better results (Jones, 2007; Pennequin et al., 2010; van der Stel & Veenman, 2008, 2010). Another facet of metacognition is confidence in one's knowledge, which is also highly important in academic settings, as the inappropriate judgements of confidence affect student's effort in learning, and there, again, the teachers need to be aware of it and ready to give suitable instruction (Lundeberg & Mohan, 2009).

According to a large meta-analysis by Zimmermann and Moylan (2009), the pedagogical interventions based on social-cognitive/constructivist theoretical backgrounds had effect on primary students' academic performance, while the interventions based on metacognitive theoretical backgrounds had effect on secondary students' academic performance. The interventions based on motivational theoretical backgrounds were less effective for both, but the inclusion of motivational strategies in self-regulated learning interventions enhanced the overall academic performance of both primary and secondary students.

Teachers need to be instructed and mentored about learning strategy instruction. The theory of teaching useful reading strategies has been on hand for several decades. Yet, the questions of whether or how the educators have actually adopted it, appears open to debate. As discovered by the analyses of the current thesis, the students' awareness of learning strategies has powerful effect on their reading test results, but at the same time not all students appear to have the necessary knowledge or experience in recognizing the useful strategies. There might be lack of acknowledging the importance of it among teachers, or lack of skills how to teach metacognitive learning strategies. The studies in Norway (OECD, 2011) pointed out that their teachers might need help for teaching more student oriented practices and involving students in the planning of their work.

Yet, the teacher training alone might not be sufficient for implementing the necessary changes in students' metacognitive skills, as was found by Bergstra (2015) when studying how training teachers about instruction of effective

learning strategies could affect students' reading test results. Bergstra (2015) concluded that teachers' motivation to implement new interventions as well as their confidence to do so needs to be monitored and supervised during longer period to achieve truly effective interventions. The changes might not be automatically delivered and obtained, the interventions cannot be implemented without support and mentoring throughout the intervention. Even if teachers are taught about metacognition and how to instruct students about them, it is relevant to keep in mind that any kind of changes or innovations take time and more careful systematic actions to be fully implemented.

Already in 1908 Huey (reprinted in 1968) suggested some principles for the teaching of reading, saying that "the child should never read for just the sake of reading, but always for the intrinsic interest or value, always for meaning, according to the needs arising in a child's life, reading the real literature e.g. books, papers, records" (p. 380). According to that the motivation and raising the interest in a child becomes essential when considering the reading performance and improving reading literacy achievement. The essence of meta-cognitive summarizing strategy also holds comprehending the general meaning of what has been read as main component.

The meeting point of student's, teacher's and school's possibilities to contribute to student's academic achievement seems to lie in the intensive promotion of student's activeness in learning, and development of more advanced thinking abilities in a friendly learning climate and supporting environment. Everyone would gain, if teachers in schools, and schools in the country shared their educational goals as well as developed their teaching and learning methods simultaneously.

4.4. Limitations and further suggestions

There are some limitations to the study and further proposals to following studies. It must be kept in mind that PISA data are based on self-reported questionnaires. Although the issue of learning strategies is studied with more complex measures (student responses of usefulness are calculated according to the actual usefulness on those, as shown in Appendix 1), it still represents student's theoretical recognition of useful strategies, and does not necessarily coincide with student's actual choice in real learning situation.

PISA questionnaires measure broad variety of variables that presumably are related to PISA results. This enables to study the variables together and to find the contribution of one variable if the other variables are controlled for. However, due to the limited number of questions aimed at measuring one variable, it could be that not all aspects of the variable are engaged, and therefore only general tendencies could be found.

Although there have been studies showing the relations between meta-cognitive learning strategies with maths and science results as well, and some longitudinal studies have proved metacognitive skills having domain-

independent effect, still, the PISA 2009 student questionnaire items of metacognitive learning strategies were composed referring to reading tasks. Therefore, the results of this study cannot be fully generalized on other subjects or domains.

The PISA study is carefully designed and made as comparable as possible, but there is always a possibility that among different cultural groups same terms might be understood differently which might bias the self-reported findings, especially the perceptual variables such as disciplinary climate or teacher-student relations.

Also the populations, beliefs and educational practices change, thus it must be kept in mind that the results of this study represent the sight to the 2009 situation, and the generality or persistence of certain effects for certain population groups needs to be checked with longitudinal studies.

The extent of school accountability for individual students' academic results, known as compositional effect, could be studied further with additional multilevel analyses, including school means of variables in the explanatory models.

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**Appendix A. Description of student background questionnaire indices
for the PISA study used in the paper**

Name of the index	Acronym	Sample questions
Economic, social and cultural status	ESCS	The index is calculated relying on the highest occupational status of the parents (HISEI), highest educational level of the parents in years of education (PARED), and home possessions (HOMEPOS)
Metacognition: Summarizing	METASUM	<p>You have just read a long and rather difficult two-page text about 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? (Answers on a six-point scale)</p> <p>A) 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) I try to copy out accurately as many sentences as possible; C) Before writing the summary, I read the text as many times as possible; D) I carefully check whether the most important facts in the text are represented in the summary; and E) I read through the text, underlining the most important sentences, then I write them in my own words as a summary.</p> <p>The experts' agreed order of the five items consisting this index is DE>AC>B (OECD, 2010b, p.113)</p>
Metacognition: Understanding and remembering	UNDREM	<p>Reading task: You have to understand and remember the information in a text.</p> <p>How do you rate the usefulness of the following strategies for understanding and memorizing the text? (Answers on a six-point scale)</p> <p>A) I concentrate on the parts of the text that are easy to understand; B) I quickly read through the text twice; C) After reading the text, I discuss its content with other people; D) I underline important parts of the text; E) I summarize the text in my own words; and F) I read the text aloud to another person.</p> <p>The experts' agreed order of the six items consisting this index is CDE > ABF (OECD, 2010b, p.113).</p>
Memorization strategies	MEMOR	<p>When you are studying, how often do you do the following? (Answers on a four-point scale)</p> <p>When I study, I try to memorize everything that is covered in the text</p> <p>When I study, I read the text so many times that I can recite it</p> <p>When I study, I try to memorize as many details as possible</p> <p>When I study, I read the text over and over again</p>

Name of the index	Acronym	Sample questions
Elaboration strategies	ELAB	<p>When you are studying, how often do you do the following? <i>(Answers on a four-point scale)</i></p> <p>When I study, I try to relate new information to prior knowledge acquired in other subjects</p> <p>When I study, I figure out how the text information fits in with what happens in real life</p> <p>When I study, I try to understand the material better by relating it to my own experiences.</p> <p>When I study, I figure out how the information might be useful outside school</p>
Control strategies	CSTRAT	<p>When you are studying, how often do you do the following? <i>(Answers on a four-point scale)</i></p> <p>When I study, I start by figuring out what exactly I need to learn</p> <p>When I study, I check if I understand what I have read</p> <p>When I study, I make sure that I remember the most important points in the text</p> <p>When I study, I try to figure out which concepts I still haven't really understood</p> <p>When I study and I don't understand something, I look for additional information to clarify this</p>
Disciplinary climate	DISCLIMA	<p>How often do these things happen in your test language lessons? <i>(Answers on a four-point scale)</i></p> <p>Students don't listen to what the teacher says</p> <p>There is noise and disorder</p> <p>The teacher has to wait a long time for the students quieten down</p> <p>Students cannot work well</p> <p>Students don't start working for a long time after the lesson begins</p>
Teacher-student relations	STUDREL	<p>To what extent do you agree or disagree with the following statements? <i>(Answers on a four-point scale)</i></p> <p>I get along well with most of my teachers</p> <p>Most of my teachers are interested in my well-being</p> <p>Most of my teachers really listen to what I have to say</p> <p>If I need extra help, I will receive it from my teachers</p> <p>Most of my teachers treat me fairly</p>

SUMMARY IN ESTONIAN

Õpilaste lugemistulemuste selgitamine: metakognitiivsed õpistrateegiad on olulised, õpilase tulemused sõltuvad koolist

Lugemisoskust loetakse hariduse alustalaks, sest puuduliku lugemisoskuse tõttu on ka teisi valdkondi raske omandada. Tegureid, mis seostuvad õpilase lugemisoskusega, on leitud mitmeid, kuid kõige rohkem kooli ja õpetajatööga seonduvaks võib pidada õpioskuste arendamist. Mitmed rahvusvahelised haridusuuringud pakuvad võimalust selgitada õpilaste lugemisoskuste taset (PIRLS-Progress in International Reading Literacy Study ja PISA- Programme for International Student Assessment). Seni on vaid PISA 2009 uuring sisaldanud muutujaid õpilase poolt eelistatavate õpistrateegiade kohta, sh. metakognitiivsete õpistrateegiade kohta, millel on leitud oluline positiivne seos õpitulemuste paranemisega mitmetes valdkondades juba küllalt varases eas ning seda osaliselt isegi sõltumata õpilase eelnevast akadeemilisest võimekusest (Hattie, 2009; Michalsky, Mevarech & Haibi, 2009; Roebbers, Krebs & Roderer, 2014; van der Stel & Veenman, 2008, 2010).

Käesolev väitekirjandus käsitleb õpistrateegiade rolli õpilaste lugemisoskust mõõtvate testitulemuste erinevuste selgitamisel. Doktoritöö eesmärgiks oli uurida, millised tegurid võivad olla lugemistulemuste erinevuste allikaks ja mil määral sõltuvad individuaalsed õpilase lugemistulemused koolidevahelistest erinevustest.

Püstitati järgmised uurimisküsimused:

1. Milline on õpistrateegiade, taustategurite ning õpikeskkonna tegurite efekt PISA 2009 lugemistulemustele? (Artikkel I)
2. Kui suure osa koolidevahelisest ja õpilastevahelisest lugemistulemuste variatiivsusest võib omistada õpistrateegiatele, taustateguritele ning õpikeskkonna teguritele? (Artiklid I ja III)
3. Kui suure osa koolidevahelisest ja õpilastevahelisest lugemistulemuste variatiivsusest võib omistada õpistrateegiatele, kui taustategurite efekt on kontrollitud? (Artikkel IV)
4. Kui võrd õpilase teadlikkus erinevatest õpistrateegiatest ning otsus nende kasulikkuse üle selgitab erineva õppekeele koolide poiste ja tüdrukute lugemistulemust? (Artiklid II ja IV)

Metakognitsiooni all mõistetakse kõrgema taseme mõtlemis- ja õppimisvõimet, oma kognitiivsete protsesside tunnetamist (Flavell, 1976, 1979). Metakognitsioon koosneb kolmest peamisest komponendist:

- 1) teadmine – teadlik olemine enda kognitiivsetest protsessidest, sellest, kuidas õppimine toimib ja kuidas seda parandada;
- 2) jälgimine – arusaamise ja protsessi õigsuse üle otsustamine;
- 3) kontroll – võime kasutada strateegiaid, et korrigeerida arusaamise vigu, et otsustada uue taktika kasutuselevõtu üle või vastuse leidmiseks pikema aja kulutamise üle (Dunlosky & Metcalfe, 2009, Roebbers, Krebs & Roderer, 2014, Seidel, Perencevich & Kett, 2005, Williams & Atkins, 2009).

On leitud, et haridusuuringute analüüsimisel tuleks keskmiste näitajate kõrval varasemast enam tähelepanu pöörata variatiivsusele, selgitades välja muutujaid, mis põhjustavad variatiivsust (Malin, 2005; Steel, 2008). Individuaalsete tunnuste uurimisel tuleks silmas pidada võimalikku grupi efekti, ehk siis üksikisiku tulemused ei pruugi olla täies ulatuses sõltumatud, kuivõrd ümbritsev keskkond võib muuta inimeste arvamusi, suhtumist ning oskusi sarnasemaks (Hox, 2010; Shek-kam, Xiao-yain & Wai-yip, 2013; Steel, 2008). Seetõttu kasutati analüüsiks mitmetasandilist modelleerimist, mille puhul võetakse arvesse andmete hierarhilist struktuuri ja üksikisiku kuulumist gruppi. Mitmetasandilise modelleerimisega on võimalik vaadelda erinevate muutujate rolli variatiivsuse selgitamisel ning ennustada, kuivõrd muutuja suurendaks või vähendaks uuritavat õpitulemust, käesoleva töö puhul lugemistesti tulemust. Statistiline analüüs teostati programmiga MLwiN 2.29 (Rasbash et al., 2013). Lisaks õpistrateegiatele ning lugemistestide tulemustele lisati analüüsi ka õpilase ja kooli konteksti andmeid, millel võib olla oluline seos õpitulemustega: sotsiaalmajanduslik-kultuuriline taust, õpilase sugu ja kooli keel (OECD, 2010a; Marks, 2010; Mikk et al., 2012; Tire et al., 2010) ning ka õpikeskkonda kirjeldavad näitajad nagu õpilase-õpetaja suhted ja distsipliin (Hattie, 2009; Scheerens, Glas & Thomas, 2007; Wang, Haertel & Walberg, 1994). Kuivõrd metakognitiivsete õpistrateegiate arendamine käib läbi klassiruumis toimuva dialoogilise õpetamise, kus õpilased saavad vabalt väljendada oma mõtteid seoses õppimise planeerimisega ning oma õppimisprotsessi põhjendamisega, siis võib sellega tekkiv lärmakam õpikeskkond olla seotud metakognitiivsete õpistrateegiate arendamisega (Jones, 2007).

Uurimiseks võeti PISA 2009 kuue riigi andmed: Eesti, Läti, Leedu, Soome, Rootsi ja Norra. Kooli õppekeele uuringusse kaasamist peeti vajalikuks, kuna nii Eestis kui ka Soomes on erineva õppekeelega koolide õpilaste nõrgemad tulemused muret tekitanud (Brink, Nissinen & Vettenranta, 2013; Harju-Luukkainen & Nissinen, 2011; Hautamäki et al., 2008; Tire et al., 2010; Mikk et al., 2012). Uuringust selgus, et sellised erinevused on seotud õpilaste teadlikkusega erinevate õpistrateegiate kohta. Õpilase oskus ära tunda, milline strateegia oleks antud lugemisülesande jaoks efektiivsem, ennustab tema lugemisoskuste testi tulemuste tõusu. Metakognitiivsetel õpistrateegiatel on suur ennustusjõud lugemistulemuste suhtes, nagu ka varasemad uurimused on leidnud (Delclos & Harrington, 1991; Hattie, 2009; Pennequin et al., 2010; Wu, 2014), kuid selle uurimusega sai kinnitust, et ennustusjõud on jätkuvalt suur ka siis, kui grupi efekti arvesse võtta ning konteksti tegurite efekti kontrollida. Grupi efekt ilmnis kõikide uuritud riikide puhul, mis näitab, et kõikides riikides tulenevad õpilastevahelised erinevused mingil määral koolidevahelistest erinevustest. Soomes oli see väikseim 9%, Norras 10%, Rootsis 16%, Eestis 21%, Lätis 23% ja Leedus 32%. Kõigis neis riikides kehtib 15-aastastele kohustuslik kooliharidus, mis peaks hariduspoliitikakohaselt olema võrdne ja ühesugune kõigile, kuid koolidevaheliste erinevuste ulatus seab selle võrdsuse väite kahtluse alla.

Kõikide muutujatega mitmetasandiline mudel selgitas kokku 56-67% koolidevahelisest variatiivsusest ning umbes 30% õpilastevahelisest variatiivsusest. Seejuures katab metakognitiivsete õpistrateegiatega poolt selgitatav sellest suurima osa, mis näitab, et nende kõrgema taseme õpistrateegiatega rolli õpilase lugemisoskuse edendamisel võib pidada väga oluliseks. Balti riikides eelistasid õpilased sagedamini traditsioonilisi õpistrateegiaid (nagu näiteks mäluhõlmimise) võrreldes Põhjamaade õpilastega. Eesti puhul võis täheldada, et venekeelsete koolide õpilaste hulgas oli see eelistus suurem kui eestikeelsete koolide õpilaste vastustes. Samas aga näitavad regressioonikoefitsiendid, et mäluhõlmimisele rõhudes õpilase lugemistulemus pigem langeb, kui kasvab.

Erineva õppekeelega koolide poiste ja tüdrukute lugemistulemuste selgitamisel oli metakognitiivsel üldistamise strateegial kõige suurem osa. Kui taustategurite efekt oli kontrollitud, selgitasid õpistrateegiad siiski veel 22–27% õpilastevahelisest variatiivsusest. Soomes ilmnes tüdrukute lugemistulemus enam õpistrateegiatega seotumat, samas aga Eestis hoopis vastupidi – õpistrateegiad selgitasid poiste lugemistulemuste variatiivsust rohkem kui tüdrukute puhul.

Teaduskirjanduse põhjal võib väita, et mõtlemisoskuseid ja õpioskuseid on võimalik õpetada ning nende kaudu on võimalik aidata lapsel oluliselt paremaid akadeemilisi tulemusi saavutada (Jones, 2007; Pennequin et al., 2010; van der Stel & Veenman, 2008, 2010). Selleks on õpetajatel mitmeid võimalusi, nagu näiteks dialoogiline õpetamine, klassiruumi diskussioonid, avatud küsimuste kasutamine “õige-vale” küsimusetüüpide asemel, võimaldades õpilastel teisi õpilasi juhendada, arendades neil enesereflektiivset mõtlemist ja kõnet jpm. (Jones, 2007; Mercer & Howe, 2012; Pennequin et al., 2010; Simister, 2007; Steklács, 2010; van der Stel & Veenman, 2010). Kognitiivsete ja metakognitiivsete strateegiatega järjekindla õpetamisega – julgustades õppimise üle arutlemist, valjusti oma õppimist puudutavate plaanide väljendamist jms – on saavutatud paremaid lugemistulemusi (Steklács, 2010). Õpetades õpistrateegiaid on võimalik õpilasi aktiveerida, aidata neil saada teadlikuks oma õppimisprotsessidest (McKeown & Beck, 2009, lk. 22). Õpetajal on võimalik õpilasi õpetada ise oma õppimist reguleerima, korduvalt vastavaid õpivõtteid demonstreerides ja kujundades kasulikke strateegiaid (Steklács, 2010). Küsides õpilastelt “miks” ja “kuidas sa seda teada said” ning julgustades õpilasi loetu põhiideed oma sõnadega selgitama, saab loetust arusaamise oskusi arendada (Mercer & Howe, 2012).

Reznitskaya ja Glina (2013) on juhtinud tähelepanu sellele, et edukaks õpistrateegiatega õpetamiseks ning mõtlemise täiustamiseks on vaja, et õpetajad oleksid haritud nii sellealase teooria kui ka praktika rakendamise osas. Norras läbi viidud uuringute kohaselt on sealsetel õpetajatel jätkuvalt vajadus õpilasele orienteeritud õpetamispraktika osas, mis võimaldaks kaasata õpilast oma töö planeerimisse, nagu on vaja metakognitiivsete oskuste arendamiseks. Bergtra (2015) leidis, et ainult õpetajatele metakognitiivsete õpistrateegiatega juhendamise võtete info edastamisega õpilaste tulemuslikkus olulist tõusu ei näita, vaid vaja

on järjepidevat juhendamist, et uudse õpistrateegiate omandamise võtete edastamine tõesti toimiks.

On tõenäoline, et õpistrateegiate õpetamisest võidaksid ka madalamate võimetega õpilased. Õpiraskustega õpilased ei ole sageli võimelised rakendama ülesande planeerimise või ülesande lahendamise strateegiaid, mida kool nõuab. Neil on sageli madal mina-käsitlus, mis viib selleni, et ta kas üldse ei üritagi ülesannet lahendada või proovib vähe. Õpiraskustega õpilasi iseloomustab kõrge välise kontrolli osakaal, madal motivatsioon ja madal enese jälgimise oskus, mis on metakognitsiooni osad. Neil lastel on vaja, et neid õpetataks mõtlema oma mõtlemisest, planeerima oma tegevusi, et ülesanne lõpule viia (Bender, 2004, lk. 26–27).

Kokkuvõtteks võib öelda, et metakognitiivsete õpistrateegiate roll lugemistulemuste erinevuste selgitamisel on väga suur, neid on võimalik vastava järjepideva treeningu ja harjutamisega õpetada ning nende tulemusena võib oodata lugemistulemuste olulist paranemist. Õpilaste tulemused ei peaks sõltuma koolidevahelistest erinevustest, vaid kohustuslik kooliharidus peaks pakkuma võrdseid võimalusi.

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ORIGINAL PUBLICATIONS

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The Role of Learning Strategies in PISA 2009 in Estonia: Metacognitive Skillfulness Giving Readers a Head Start

Ülle Säälik, Antero Malin, Kari Nissinen

The role of learning strategies in predicting and explaining PISA reading test results in Estonia at both school and student level was analyzed alongside common background and learning environment factors using multilevel modeling. The most effective explanatory variables were metacognitive learning strategies: summarizing alone explained 33% of the variation between schools and 16% of the variation between students within schools, understanding and remembering alone explained 29% and 13% respectively. The effect of the aforementioned metacognitive skills, associated with 1 OECD standard deviation increase in the index value, enhanced performance by 33 and 28 score points respectively. On the contrary, memorization strategies caused a decrease in reading literacy performance by 6 points. About one third of the differences between schools in the PISA reading literacy results in Estonia could be explained by differences between schools in using metacognitive learning strategies. Assuming the educational goals is to offer everyone equal opportunity to cope and succeed, it is highly relevant to follow such instructional practice in schools raising student awareness and promoting their skills of learning strategies.

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Traditional and Advanced Learning Strategies Explaining the Reading Proficiency of Boys and Girls in Schools with Different Instructional Language

Ülle Säälik, Jaan Mikk

Abstract

Reading is considered an important life skill, and as such it is highly relevant to monitor how learners cope with it. Traditional methods of learning, such as memorizing or control strategies might have their uses, but more complicated reading tasks demand more advanced approaches. Advanced thinking and learning skills, known as metacognition, have been proved to increase reading proficiency. Schools can contribute to this through offering appropriate instruction in the classroom. Several international student reading and literacy assessments have continuously reported gender differences in reading performance in favor of girls. In some countries, schools with different instructional language are often in focus. Due to drastic differences in performance, the issue of gender and school language were taken into account in this analysis. The aim of the current paper was to discover how student awareness and choice of different learning strategies explains the variation in reading proficiency in PISA 2009. The two-level modeling method was used, with separate intercepts for the subgroups (boys and girls in schools with different instructional language) to examine the effect of each learning strategy for each subgroup. The proportional reduction in variance components was used to measure the explained variation. The advanced metacognitive learning strategies explained the variation in student reading test results more than other strategies (up to 23%), and that was true in all subgroups, both in Finland and Estonia. Traditional learning strategies, such as memorization, had no explanatory power.

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