

KARIN TÄHT

The cross-cultural view
on students' motivation to learn



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Department of Psychology, University of Tartu, Estonia

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LIST OF ORIGINAL PUBLICATIONS

- I study** Täht, K., & Must, O. (2009). Relationship between the Educational Performance and Attitudes of Estonian students. In Mikk, J. (Ed.), *Teenagers in Estonia: Values and Behaviour* (pp. 45–63). Frankfurt am Main: Peter Lang.
- II study** Täht, K., & Must, O. (2010). Are the links between academic achievement and learning motivation similar in five neighbouring countries? *Trames: Journal of the Humanities and Social Sciences*, *14*, 271–281.
- III study** Täht, K., & Must, O. Comparability of educational achievement and learning attitudes across nations. *Educational Research and Evaluation* (in press).
- IV study** Täht, K., Must, O., Peets, K., & Kattel, R. Learning motivation from a cross-cultural perspective: A moving target? *Learning and Individual Differences* (submitted).
- V study** Mikk, J., Täht, K., & Must, O. (2011). Sex differences in educational attainment. *Personality and Individual Differences*, *53*, 132–136.

The author of the present dissertation contributed to these publications as follows:

- In Studies I, II, III, and IV formulated the research questions, conducted the analyses, and wrote the manuscript;
- In Study V conducted the analyses and presented results on the figures and wrote segments of the manuscript.

The aims of the dissertation were to:

- elaborate a model for describing basic associations between educational achievement and learning attitudes (Study I);
- investigate the comparability of the latent constructs *educational achievement* and *learning attitudes* across the PISA 2006 nations (Study II and Study III);
- confirm the previously observed negative relationship between educational achievement and motivation on the national-level using the latent variable approach (Study IV);
- show that the level of socioeconomic development is the variable which influences the sign and size of the correlation between educational achievement and motivation to learn at the national level (Study IV);
- clarify how the motivation to learn, gender differences in educational achievement, and the developmental level of a country are related to each other (Study V).

I. INTRODUCTION

Attending school and learning is a natural activity for most of the children nowadays. Adolescence is a time of especially rapid cognitive and personal development. This is the time children spend mostly in the school environment, acquiring knowledge, but also shaping behavioral habits, attitudes, and beliefs. Grades, examination results and results in educational achievement tests are considered as indicators of educational achievement. The construct very closely related to educational achievement is mental ability (the ability to solve problems and cognitive tasks). General mental ability is a construct explaining the consistent finding of positive correlations among different cognitive tasks, reflecting the fact that an individual's performance at one type of cognitive task tends to be comparable to their performance at other kinds of cognitive tasks. For the educational achievement it is also true that a student, who scores high on one subject test, tends to score high on other subjects tests too. Of course, students learn and develop according to their abilities, but educational psychologists have determined several other psychological factors that are important in the learning process. For instance, the process of learning depends on the time and attention that a student is ready to dedicate to learning. So far, executives in education have considered educational achievement to be the main outcome in education, but it is easy to understand that the values, belief system and attitudes towards themselves that students attain during the learning process are also important in education. "We have to take abstract problem solving seriously before we do much for solving it." (Flynn, 2007, pp. 53). So, students' attitudes and beliefs play an important role in the learning process.

A wide range of psychosocial constructs have been examined in order to find correlates with educational achievement – academic interest, academic goals, motivation, institutional commitment, perceived social support, social involvement, self-efficacy, general self-concept, self-esteem, academic-related skills, and coping styles (Bandura, 1997; DiPerna, Volpe, & Stephen, 2005; Eklöf, 2007; Le, Casillas, Robbins, & Langley, 2005; Multon, Brown, & Lent, 1991; Pajares, 1996; Pullmann & Allik, 2008; Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004; Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995; Shen & Pedulla, 2000; Tinto, 1993; Toomela, 2008). These factors are found to be similar to each other describing students' beliefs about themselves in the learning process. It would be natural to categorize them all under a general term – learning attitudes. A positive relationship between educational achievement and learning attitudes is a common finding in all the studies cited above. The label "learning attitudes" is used in the current dissertation as a general and relatively neutral term for uniting rather different constructs with historical traditions. Actually the main function of all those constructs is to explain the motivational side of learning.

There is no universal definition of motivation. One can think about motivation as a unitary construct. It means that motivation can vary from a little

motivation to act towards a great one. However, it is not difficult to realize that in addition to the level of motivation, the orientation of motivation could also be considered. Orientation of motivation can mean motivation to do different kinds of things, but also the source where the motivation comes from. One of the widely used approaches is to divide motivation into intrinsic and extrinsic. When intrinsically motivated, people feel the spontaneous experiences of interest, enjoyment, excitement, and satisfaction that accompany their behavior (Deci, Vallerand, Pelletier, & Ryan, 1991). In contrast to intrinsic motivation, being extrinsically motivated involves performing an activity with the intention of attaining some separable consequence such as receiving a reward, avoiding guilt, or gaining approval. An approach to human motivation that highlights the importance of humans' evolved inner resources for personality development and behavioral self-regulation is called Self-Determination Theory (STD; Ryan, Kuhl, & Deci, 1997). Similarity of all motivational theories is that they all attempt to answer questions about what makes individuals move toward certain activities or tasks. In the broad sense, motivation involves different internal processes that give energy and direction to one's actions. Modern theories of motivation explain how human behavior is related to cognition – beliefs, values, goals, and expectations (see Eccles & Wigfield, 2002). By using a meta-analytic approach, it has been shown that self-efficacy and motivation are the best predictors of grade point average at school (Robbins et al., 2004).

The construct self-efficacy is defined as one's belief in one's ability to succeed in specific situations. The academic aspect of this concept is called academic self-efficacy, and is described as an individual's belief that they can successfully achieve at a designated level on an academic task (Bandura, 1997). Bandura has pointed out that people have little incentive to act unless they believe the possibility that they can produce important effects by their actions. So, it is possible to see connections between Bandura's self-efficacy theory and the expectancy theory. According to the latter (Atkinson, 1957), individuals' performance can be explained by their beliefs about how well they will do on the activity (expectancies) and the extent to which they value the activity. Or, in other words, expectancy theory states that the relative value and probability of success are the key determinants of choice. Wigfield and Eccles (2000) have defined expectancies for success as individuals' beliefs about how well they will do on upcoming tasks, either in the immediate or longer-term future. Concept value has a rather broad meaning in the framework of this theory. It has attainment value (importance of doing well the task), intrinsic value, utility value, and cost. Intrinsic value as the enjoyment the individual gets from performing the activity is close to the concept of intrinsic motivation. Expectancy-value conceptions (Eccles & Wiegfeld, 2002) link achievement performance, persistence, and choice directly to expectancy-related and task-value beliefs. Schunk (2008) claims that the shift in psychological theory and research that took place in the 1960s to handle learners as active seekers and processors of information has now been expressed in several theories about cognitive control

processes in learning (e.g. metacognition, self-regulation, self-regulated learning). As educational process facilitates comparisons, it logical to assume that students may also apply the comparative schemes in the expression of their learning attitudes. Dweck and colleagues (Dweck, 2012; Dweck & Leggett, 1988; Molden & Dweck, 2006) have examined the role of self-conceptions (or mindsets) that people use to structure the self and guide their behavior, including achievement. They pinpoint the dynamic aspect of motivation, focusing on people's perception of themselves and their social world.

It is easy to understand why many of researches consider achievement motivation as a prerequisite for educational achievement (e.g. Van der Sluis, Vinckuyzen, Boomsma, & Posthuma, 2010). The interest in motivation is partly inspired by the notion that students' motivation, operationalized, e.g. as their competency beliefs and value beliefs, could be more malleable than their cognitive ability, and as such could prove to be a potential lead for the educational system for improving learning and achievement processes in students (Spinath, Spinath, Harlaar, & Plomin, 2006). However, it is important to bring out that not all researches are in agreement with most educators' common belief about the crucial role of motivation as a determinant of educational achievement. For instance, Gagné and Pèrè (2001) have questioned this belief as they showed that correlation between motivation and educational achievement was not statistically significant when students' mental ability was controlled.

One controversial subject considering educational achievement and motivational constructs is gender differences. Some researchers believe that males have higher intelligence than females, this difference should imply differences in educational progress. For example, it has been found that in Progressive Matrices test, the male advantage is five IQ points (Lynn & Irwing, 2008). Although some IQ researchers are convinced that gender differences in mental ability should cause differences in educational achievement, empirical evidence rather supports the opposite. For instance, Lynn and Mikk (2009) found that females significantly outperformed males in reading. The difference was .23 d for 10 year olds and .42 for 15 year olds. The female advantage in reading was larger than the male advantage in science when considering the three PISA (Program for International Student Assessment) tests. The higher scores that females received in reading tests have been explained by their higher verbal abilities. But there is also the explanation that women show more dedication towards their academic work than men (Van der Sluis et al., 2010). It has been argued that one of the promising candidates to account for gender differences in educational achievement is motivation (Spinath, Freudenthaler, & Neubauer, 2010). In the last study researchers found that boys transfer their cognitive potential to a lesser extent into school achievement than girls. As researches claim, reasons for that are not fully understood, but one possible explanation would be that girls' personality and motivation fit better to the school context.

1.1. Approach with latent variables

As pointed out before, a student who scores high on one subject test tends to score high on other subjects tests, too. So, it is natural to assume that the educational achievement is a latent construct influencing different tests results and grades.

For the attitudinal constructs the same holds. Namely, different learning attitudes are similar and correlated with each other. This leads to the need of using the latent variables approach, which means holding the assumptions that behind several similar and correlated indicators there could be a latent construct influencing all observed indicators. The analyses carried out with latent variables allow concentrating on the basic ideas of motivation in a more general form and seeing more universal tendencies instead of details. Furthermore, when considering basic latent variables, it is possible to investigate the role and function of societal contextual influences at the national level. So, the integrative or latent variable approach is used in the studies of the current dissertation in order to explain the relationships between students' educational achievement and motivation at different levels of analyses and to check the contextual influences of countries on the students' achievement and learning motivation.

1.2. Social comparison

“People create social systems, and these systems, in turn, organize and influence people's lives” (Bandura, 2006). Researches of personality have indicated the need to figure out how cultural learning comes to shape the ways that people understand themselves and others (Heine & Buchtel, 2009). In education, it has been shown that social context can promote greater engagement, deeper and fuller learning, and enhanced personal adjustment in classrooms and beyond (Deci, Ryan, & Williams, 1996). Schools, where students spend their days, could be different in many ways. Or more widely, different countries have different cultural traditions, traditions for educational systems, rules of law, governments (who decide how to create social and political environment). Even in one country there can be many different subcultures with different value systems.

It is difficult to imagine that students' learning attitudes would be unalterable; it is much easier is to adopt the idea that students' attitudes are shaped in the learning process and are influenced by the environment. The educational system, like any other human institution, consists of organizations at different levels (grade, school, national educational system, etc.), and all these levels can add specific components to educational achievement variability. These different levels do not only influence students' educational achievement, they also provide a reference point for self-evaluations of motivation and attitudes.

The understanding that students in different schools may have different self-concept, according to schools they attend is not new. Davis (1966) has

described the Frog Pond effect suggesting that students in high-ability schools have lower grades, which negatively influence their self-evaluations and, subsequently, their career decisions. Almost twenty years later Marsh and Parker (1984) supported Davis' findings: with proving the Big Fish Little Pond Effect – equally able students have lower levels of academic self-concept in high-ability schools than in low-ability schools (Marsh, 1987). According to the social comparison theory proposed by Festinger (1954), there is a tendency for individuals to look to the outside world to evaluate their opinions and abilities. Although Festinger's idea is old, it is frequently used for understanding motivational processes in education. Dijkstra, Kuyper, van der Werf, Buunk, & van der Zee (2008) have written a detailed review about comparative processes in the classroom. They claim that classrooms provide an extensive source of forced social comparisons because the educational reward system, which is based on academic performance, facilitates it. A typical classroom has an evaluative atmosphere that evokes a strong interest in children to compare mutually.

Comparisons people use are not limited only to face-to-face situations. Decades ago Merton (1965) summarized the analogous ideas about the reference groups: people may compare themselves not only with the members of the groups they belong to, but with any group they perceive as important. Actually, very many constructs in social psychology implicitly involve comparisons (e.g. constructs of social norms, deviance, and roles).

Because social comparison is such an important feature of the classroom environment, it is not surprising that social comparison theory has been regularly applied to the classroom setting and that the classroom environment has been used to test hypotheses based on the social comparison theory. Just like different environments in different schools, a country's socioeconomic development, cultural values, and educational practices also have an impact on students' knowledge and learning attitudes. Several psychological theories claim that different contexts may imply differences in the level and sources of motivation. So, the question we need to ask is – are the measures of motivation used in different countries comparable?

I.3. Invariance of the measures used in international educational surveys

An important development in research dealing with the relationships between educational achievements and learning attitudes occurred in the years 2000–2006. International educational surveys conducted in the last few decades, such as PISA and TIMSS (Trends in International Mathematics and Science Study), have developed frameworks and established conditions for researching educational achievement together with students' attitudes based on vast data banks. These surveys systematically measure the educational achievement and learning attitudes of students. The estimation of measurement invariance of

measures used in international surveys has an important aim, which is to provide evidence that we really know the answer to the question: are the attributes measured or relationships found comparable in different educational contexts? Estimation of measurement invariance means carrying out several analytical steps for providing evidence of comparability of the measures. A measure is said to be invariant when members of different populations who have the same standing on the construct being measured receive the same observed score on the test. Unless measurement invariance is established, conducting cross-group comparisons of mean differences is meaningless (Schmitt & Kuljanin, 2008).

As achievement and attitudinal tests used in international surveys are translated into different languages, the invariance of test results can become a problem (OECD, 2007). In addition to language differences, subpopulations vary culturally and socioeconomically as well (Turmo & Lie, 2007). This leads to the necessity of establishing the degree to which the instruments measure the same construct across different cultural and language groups, or in different socioeconomic environments. On the one hand, empirical differences between groups may be artificial, as they may be the result of the impact of some systematic unknown group parameters (Wicherts & Wilhelm, 2007). On the other hand, controlling for group differences may have a substantial effect on the interpretation of the results.

The data collected by the PISA survey, starting from 2000, have been used for the estimation of the comparability of learning attitudinal scales as well as for models of the relationships between educational achievement and learning attitudes (Marsh & Hau, 2004; Seaton, Marsh, & Craven, 2009). The main conclusion from this set of studies is the following: comparison of learning attitudes across nations is possible, but only up to the level of invariance of factor loadings.

I.4. A multilevel approach

In educational settings it is natural to look at the situation on different levels (student, grade, school, and national) simultaneously. The data from international educational surveys (like PISA and TIMMSS) are used for researching educational achievement and learning attitudes simultaneously and cross-culturally. For instance, Artelt, Baumert, Julius-McElvany, and Pechar (2003), Marsh, Hau, Artelt, Baumert, and Peschar (2006), and Shen and Tam (2008) have all shown that, at the level of the nations, the relationships between national aggregated scores of educational achievement scales and indicators of learning attitudes may be negative: in countries where students achieve objectively higher academic results, students report being less motivated in their learning. These results have been found difficult to explain. It is a common belief that aggregation of individual scores can reveal nothing beyond what is

already in the individual scores themselves. When researchers use national or group averages of achievement test scores and learning attitudes, they actually use the constructs that have been defined at the individual level. Artelt (2005) and Marsh et al. (2006) have proposed the need to avoid comparisons using averages of attitudinal scales across nations, as this can lead to the ecological fallacy – i.e., group averages do not reflect individual differences (Robinson, 1950). The spurious correlation between variables representing country-level educational achievement and learning attitudes could be influenced by some third variable. One example of this third variable approach is Maehr's (2008) conception of the cultural mediation of motivation. According to Maehr (1974), whether or not people will invest themselves in a particular activity depends on what the activity means to them, and the meaning of the activity can be related to the context. Inglehart (1997) have argued that, in the process of societal development, values of nations change; they are not constant, but functionally related to the global development of societies. The changes in value systems of societies may also be interpreted as changes in reference criteria or social norms, guiding students' self-reports about their learning goals, motives, interests, and self-descriptions (Frank, 1997). Educational achievement standards can function as specific reference criteria for students' self-evaluations. Those standards may function differently across nations.

2. METHODS

2.1. Data: PISA 2006

All of the studies in the thesis used PISA 2006 as a sample. The general sample of the PISA 2006 survey consists of around 400,000 students, representing about 20 million 15-year-olds in the schools of the 57 participating countries. The principles for forming the samples are described in the PISA 2006 manual (OECD, 2007). The PISA 2006 framework used 13 different attitudinal scales in addition to the main educational attainment scales (reading, science, and mathematics).

In Study I the data from Estonian sample was analyzed. In Study II we used data from Estonian, Finnish ($n = 4545$), Swedish ($n = 4110$), Latvian ($n = 4584$) and Russian ($n = 5539$) samples. In studies III and IV the data from 55 countries (the average sample size was 6,440) were analyzed. Two countries were excluded from the analysis: USA due to their missing values on reading scores and Liechtenstein because their sample size ($n = 321$) was approximately ten times smaller than the average sample size of the other countries. The data with missing values were deleted and the final sample size was approximately 350,000. The average age of the sample was 15.8 years, and the sample was approximately equally distributed across gender. In the study V the average values of PISA 2006 countries were used.

2.2. Measures

2.2.1. Measures at the individual level

Educational achievement tests were implemented in mathematics, reading and science. PISA students' achievement dataset provides the so-called plausible values for secondary analysis. Plausible values are multiple imputations of unobservable latent achievement for each student (Wu, 2005). There were five plausible values for all three subjects within the framework of the PISA 2006 (OECD, 2006). We used the first of the plausible values of each subject (Wu, 2005) for analysis. Besides answering the achievement test items, participants were also asked to answer a Student Questionnaire containing questions about various topics including their learning motivation towards science and beliefs about academic self-efficacy. Each non-cognitive question required students to express their level of agreement on a four-point scale. Non-cognitive indices in the PISA data-set had been formed by using item response theory methods (OECD, 2007). Each index is based on 4–7 questions. Non-cognitive indices in the PISA 2006 framework are divided into four sections: motivational factors, science self-beliefs, value beliefs regarding science and scientific literacy and environment. The non-cognitive PISA 2006 measures used in the current

analysis are the following: general interest in science (INT), enjoyment of science (JOY), future-oriented motivation to science (FUT), self-efficacy in science (EFF), self-concept in science (SEC), science activities (ACT), personal value of science (PER), awareness of environmental issues (AWA). The indices mentioned above were related to student selves, not to general themes such as the environment.

2.2.2. Measures at the national level

Index of democracy

There is no consensus about how to measure democracy, as definitions of democracy can be contested. The Economist Intelligence Unit democracy index uses a relatively common approach made up of five parts: 1. Electoral process and pluralism, 2. Functioning of government, 3. Political participation, 4. Political culture, and 5. Civil liberties (Kekic, 2009).

Index of innovation

There are other factors besides economic and political indicators which describe a country's level of development. Innovation is a novel factor in international comparisons. Innovation is usually defined as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OECD & Eurostat, 2005, p. 46). The Global Innovation Scoreboard (GIS, 2009) comprises five sets of indicators that capture both codified (narrow) and tacit (broad) aspects and the cumulative nature of innovation.

The Human Development Index (HDI)

The Human Development Programme (2009) elaborated the HDI as a composite indicator for describing the developmental level of societies. The HDI combines three different factors: a long and healthy life (life expectancy at birth), education (mean years of schooling and expected years of schooling), and economic well-being (Gross National Income per capita).

3. RELATIONSHIPS BETWEEN EDUCATIONAL ACHIEVEMENT AND ATTITUDINAL-MOTIVATIONAL CONSTRUCTS

3.1. Development of the initial model

There are several studies, published in the international scientific journals, done on the Estonian data for researching different correlates of educational achievement. For instance, Pullmann and Allik (2008) have found that the students' academic self-esteem was related to their academic achievement, with the mean correlation of .53. In the research on representative sample of Estonian young men it was found that the level of education is positively related with coping style and self-esteem (Toomela, 2008). The aim of the first study (Study 1) was to investigate the structure of educational achievement and learning attitudes on the Estonian sample, specifically what indicators are influenced by the same attitudinal constructs. We tested the structure of educational achievement, assuming that the three observed achievement tests scores (math, reading and science) are influenced by one latent variable. The correlations between achievement test scores were high (from .84 to .92), so it was obvious to assume that there was one influencing factor behind them. When considering the attitudinal indicators, the best model from the theoretical and empirical point of view was a model with two latent variables: one related with students' self-efficacy beliefs and another related with learning motivation. This solution corresponded also to the initial idea about of the structure of learning attitudes in the PISA survey (Pechar, 2004). The main aim of Study I was to examine the structural relationships between educational achievement and learning attitudes on the Estonian data. The structural model for these relationships (call it initial model for next studies) is given in Figure 1 (Study I).

The structural model obtained in this study shows that the variable educational achievement is related both to the student's self-evaluation in science (SE) with a correlation of .60 and to the science learning motivation (SM) with correlation .20. These two attitudinal factors correlated at $r = .58$, which was not surprising considering the previous theory and findings about motivation and self-efficacy. Previously it has been found that self-efficacy and motivation are positively related to each other (Schunk, 1991). The self-evaluation factor has a much stronger relationship with the latent educational achievement than the intrinsic motivational factor. The last result is in accordance with the literature pointing out that self-efficacy is a construct that is most closely related to educational achievement (Robbins et al., 2004).

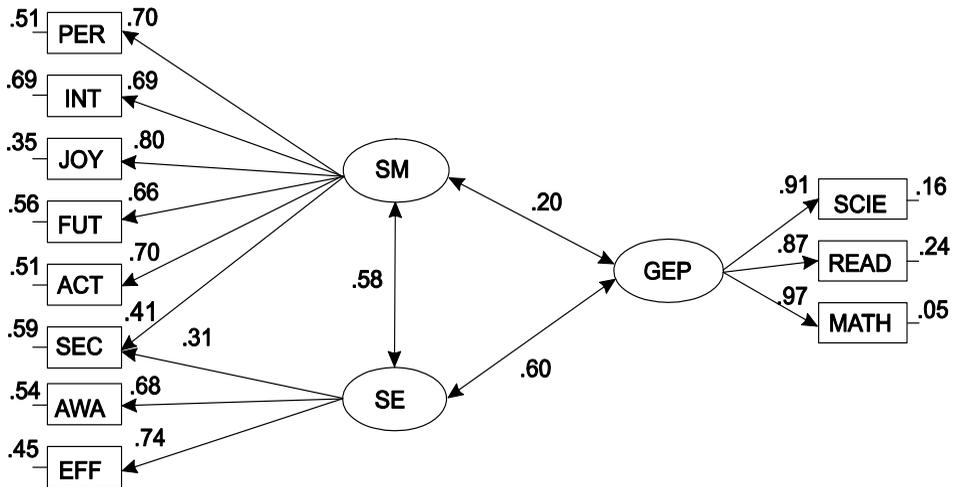


Figure 1. The model of the relationships of two attitudinal factors – science learning motivation (SM) and self-evaluation in science (SE) – with educational achievement (GEP).

Notes. Fit indices of the model: $RMSEA = .055$, $SRMR = .04$, $CFI = .99$. All statistics are significant at the level $p < .01$. Attitudinal indices: INT – general interest in science, JOY – enjoyment of science, PER – personal value of science, FUT – future oriented motivation to science, ACT – science activities, EFF – self-efficacy in science, SEC – self-concept in science, AWA – awareness of environmental issues. MATH – indicator of mathematics achievement, READ – indicator of reading achievement, SCIE – indicator of science achievement.

3.2. Are the relationships between educational achievement and learning attitudes similar in five neighboring countries?

The purpose of Study II was to check whether the relationships between educational achievement and learning attitudes found on Estonian data are similar when comparing the data of the neighboring countries. We supposed that in neighboring countries the similarity and comparability of characteristics of students would be plausible. The analyses showed that the initial model worked out on Estonian data fitted on the Finnish, Latvian, Russian and Swedish data. Students' self-evaluation has a relatively strong and stable relationship (.55–.64) with their educational achievement in all five countries. Students' learning motivation has moderate or even no relationship with their educational achievement (.05–.42). The relationship between the two latent attitudinal variables self-evaluation in science and learning motivation was also rather stable (.54–.74). The multi group confirmatory factor analysis confirmed that all five models are invariant up to the level of factor loadings. This means that variables in the models have a similar meaning and structure but different levels

expressed by students (intercepts). There was remarkable cross-cultural variability in the relationships between learning motivation and educational achievement. Five neighboring countries are ordered by the size of the last relationship as follows: Russia ($r = .05$), Latvia ($r = .1$), Estonia ($r = .2$), Sweden ($r = .41$) and Finland ($r = .42$).

3.3. Are the structural relationships between educational achievement and learning attitudes universal?

Study III continued the inspection of our initial model. The aim was to estimate in what sense and precision students' achievements and leaning attitudes are comparable in a broad international perspective. A multi-group confirmatory factor analysis was used to estimate the invariance of educational achievement and learning attitudes across the 55 PISA nations. The relationship between motivation and educational achievement varied from $-.41$ to $.48$ (being the lowest in the Kyrgyz Republic and the highest in Iceland). The relationship between the self-evaluation factor and educational achievement varied from $.22$ to $.67$ (being the lowest in the Kyrgyz Republic and the highest in Poland).

The similarities and differences in students' educational achievement and learning attitudes were determined across nations. Similarities exist in a functional sense – latent constructs used for describing educational achievement and learning attitudes have the same meaning across nations. Differences do exist in the scalar sense – achievement tests have different levels of difficulty and attitudinal scales have different emotionality for the students in different nations. The lack of scalar invariance or different intercepts means that students with the same latent score did not get the same test score in different countries. This finding means that the relationships between educational achievement and learning attitudes may have a different meaning at the level of nations and at the student level within countries. Our finding about the lack of scalar invariance of educational achievement and learning attitudes scales has a high practical and theoretical significance. It is common to believe that nationally aggregated test scores or national means have properties that are similar to the individual scores. So, the analysis at the level of national means is frequently used for practical and research purposes. However, the official PISA reports (e.g., OECD, 2007, p. 126) do not recommend using several attitudinal scales for comparisons across countries. Our analyses supported and explained the latter suggestion – as PISA measures are not invariant in the scalar sense; the comparisons across countries with nationally aggregated scores are not justified. Significant differences in regression intercepts indicate that students' scores from different nations include specific national components, both in achievement tests and in attitudes' scales. Therefore the correlations between components that do reflect national contexts may have a different meaning when compared with the correlations between variables describing individual differences between students.

The main finding in Study III, indicating that the model of relationships between educational achievement and learning attitudes does not have scalar measurement invariance is in accordance with other findings demonstrating that, in several cases, measurements are not invariant across nations or ethnic groups (Artelt et al., 2003; Marsh & Hau, 2004; Marsh et al., 2006).

3.4. Motivation and educational achievement at the individual and contextual national level

Study IV continued Study III, with the aim to provide a more detailed insight into the consequences of the lack of scalar invariance. The main approach in Study IV was to model the relationship between educational achievement and learning attitudes on the student and national level, simultaneously. The aim was also to investigate the role of national developmental level on the relationships between group means.

In order to understand the nature of educational achievement and learning attitudes it is important to consider the differences between individual and group level variability. The existence and level of group level variability can be described via intra-class correlations (ICC). The ICC value usually describes the similarity of individuals in groups; in the current research it describes the similarity of students in countries. Intra-class correlations ranged from .04 to .31 (in other words, 4 to 31% of the variance in our study variables was due to the differences between the countries). Achievement-related indicators had the highest intra-class-correlations, ranging from .26 to .31; attitudinal indices had lower ICC estimates ranging from .04 to .19. All this means that the main source of variability in educational achievement and learning attitudes lies differences between students and not in differences between countries. The lowest amount of between-countries variability described students beliefs about their learning self-efficacy (ICC = .04). Hox (2010) suggests interpreting intra-class correlations of .10 as reasonable in educational studies and those of .15 as high. So, although the influence of the national factors in the analyzed constructs is small, it is worth paying attention to. Nations differ not only by the results of their achievement tests, but also by their students' learning attitudes.

The relationships between the observed variables and the corresponding latent variables were very close: at the national level the latent learning motivation (SMb) had a strong negative correlation with educational achievement at the national level ($r = -.82$). The latent self-evaluation (SEb) also correlated with achievement (EAb), having a positive correlation at the national level ($r = .67$). The main contribution from the analysis with latent variables is that the solutions are more parsimonious and the associations found on the data are a little stronger. The signs of correlations are the same.

As a next, we found that developmental factors of countries explained more than 80% of variation in educational achievement and motivational constructs at

the group level, and when controlling for the development of a society, the negative correlation between achievement and motivation disappeared (Figure 2, Study IV). Consequently, the developmental context is highly influential on students' achievement and motivation.

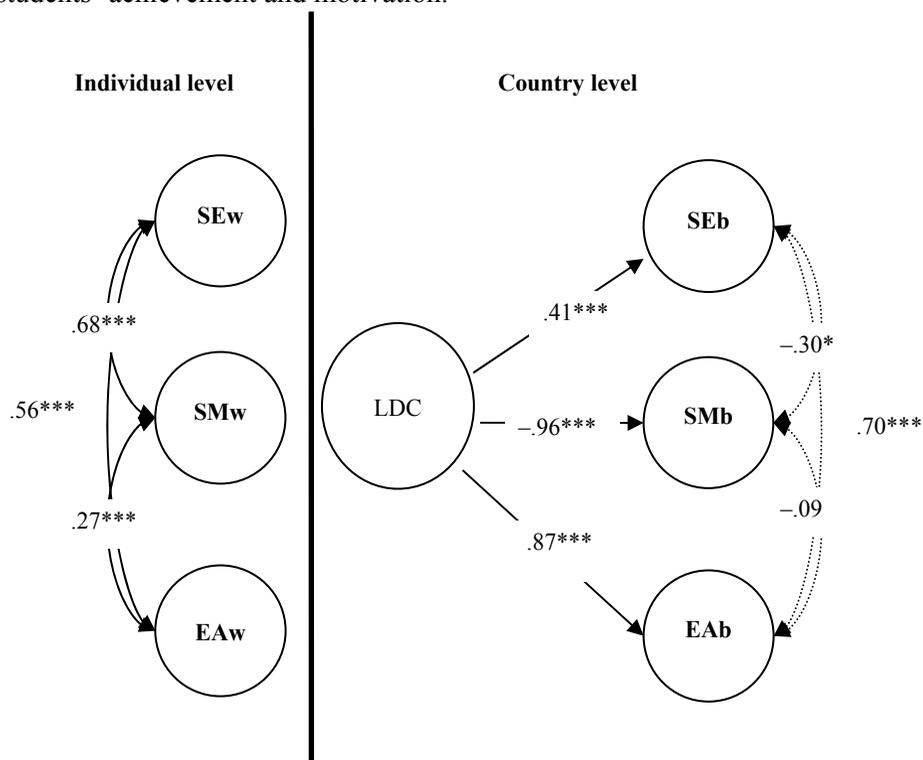


Figure 2. Model with the national developmental covariate at the individual and national levels. Latent variables: SE – Self-Evaluation in Science Learning, SM – Science Learning Motivation and EA – Educational Achievement. The additional abbreviations b and w were used to indicate latent factors at the between (national) and at the within (individual) levels, respectively. Associations among between-level endogenous factors represent correlations between the disturbance terms. The abbreviation LDC is for the latent variable on the national level influencing the observed variables democracy, innovation and HDI.

*** $p < .001$.

Students from developed societies may show high educational results, but they may be rather critical when describing their learning motivation, and vice versa: students from developing countries do not have the best educational results, but their motivation, as declared on self-report questionnaires, is high. Motivation means readiness to overcome barriers and obstacles. In developing countries, education is not as accessible as in welfare countries. In this sense, in developing countries, learning needs more motivation, concentration, and devotion.

In countries providing greater opportunities for learning, students feel safe as they do not need to worry about access to learning. Indeed, this may be the reason why students' answers to motivational questions in self-report surveys in developed countries do not reflect directly on levels of aspiration or motivation. When thinking about possible reasons that might lessen the motivation of student in more developed countries, we have to remember that in these countries the educational systems work more effectively. More effective educational system means that schools order for students "mature" answers, and unfortunately, before the questions within students have arisen. Last could lead the lessening the levels of students motivation.

3.5. Gender differences in the educational achievement and motivation

The aim of Study V was to search the covariates with gender differences in educational achievement, in order to show which characteristics may cause the differences in achievement for boys and girls. We showed that gender differences in PISA test results were larger in the countries with higher development measured using the Index of Democracy, National Intelligence and Gross National Income. We hypothesized that in developed countries everyone has the freedom to develop his/her abilities and that there can be a restriction of range in scores among poorly developed countries. The finding about larger differences when considering gender is in accordance with the results of former study (Schmitt, Realo, Voracek, & Allik, 2008) where it was found that gender differences in personality traits are larger in prosperous, healthy, and egalitarian cultures in which women have more opportunities equal with those of men. The comparison of personality traits and educational achievement could seem arbitrary, but it will become clearer when considering our second result in his study. Namely, the second correlate of gender differences in educational achievement was students' average motivation of a country. In the countries with more motivated students, the gender differences in PISA scores were smaller. High motivation may lead to the achievement of educational standards by most of the students. This result gives more ground for the claim of Spinath, Freudenthaler, and Neubauer (2010) that one of the promising candidates to account for gender differences in educational achievement is motivation. In spite of having a negative correlation with the average educational achievement in different countries, motivation is a covariate of gender differences in educational achievement on the country level.

4. SUMMARY AND CONCLUSIONS

The main finding of the dissertation is the theoretical, methodological and empirical explanation to the confusing empirical finding in cross-cultural educational research. Four studies of the dissertation help to explain why the aggregated national means of educational achievement tests are strongly negatively correlated with the aggregated motivation to learn. This strange finding is reported in literature and has not been answered yet. In order to answer this question we investigated:

- the basic structure of educational achievement and learning attitudes; and their structural relationships (Study I, initial model);
- functioning of the established model on the samples of 5 neighboring countries (Study II);
- methodological properties of the model – we estimated the invariance of measures across nations (Study III);
- associations between educational achievement and learning attitudes at the individual and national level simultaneously with the implementation covariates (Study IV);
- the role of gender differences in learning attitudes across nations (Study V).

The structure of motivational beliefs is dynamic, adaptive and influenced by several factors, including students' individual differences, their learning experiences and surrounding environment both in classroom and in the broader societal context. The process of education, primarily the grading system and external pressure to perform well, facilitates different comparisons: with classmates, with educational standards, with alternative activities and values outside school. Education forces students regularly to compare themselves with high criteria or with high-level classmates. As a result of those comparisons, students experience implicit pressure to be better. They feel deprivation and their self-concept obtains some negative elements. Big-Fish-Little-Pond-Effect framework provides conceptual background to understand the main psychological processes here. Motivational beliefs seem to be extremely vulnerable and the expression of learning attitudes is essentially an adaptive process.

It is a widespread belief among researchers that aggregated group means reflect adequately relationships at the individual level. But the usage of aggregated means is approved only if the individuals' belonging to some group (nation) does not add anything qualitatively new to the individual properties of this group member. Several works have shown that aggregation of measures may involve errors. Students equal in some latent attribute do not get the same measured score in different contexts. Classical test theory claims that every observed score consists of two components: true score and random error. Measurements that use multi-group data with the aim to make conclusions for individual group members should consider an additional element in the observed score, namely a group-specific component. To estimate the nature of biases

from group belongings, the estimation of measurement invariance is needed. In study III, we showed that PISA basic measures are invariant across nations in the configural and metric sense (same structure and functional relationships). But the measurements did not have equal intercepts – students equal in latent trait do not get the same observed test scores. Or in other words, the difference between the observed score and the true score is not only a random error, but something else. And this “something else” could play an important role in the calculations of group means.

Of course, belonging to some group and the possibility that the observed score includes something from group-belongings is not a reason for the negative correlations between group means. For a negative correlation the values of one variable should increase and the values of the other variable should decrease. And really, if average tests scores rise and the expression of learning motivation decreases across nations, the correlation will be negative.

We found a factor responsible for this strange relationship. The unexpected negative association disappears if you consider the developmental level of a society. Why? One explanation could be that students’ motivation to learn is not static. When expressing their motivational beliefs, students may use for reference the broad surrounding context. Environment, rich and full of opportunities, could suppress students’ motivation to learn. So, the motivation to learn seems to be a moving target when societies develop.

The difference in educational achievement by gender was greater in the countries whose indicators of development rank higher than those of other countries in the survey. In other words, the more developed a country was, the bigger the differences in educational achievement test results by gender were.

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REFERENCES

- Atkinson, J. (1957). Motivational determinants of risk-taking behavior. *Psychological Review*, 64, 359–372.
- Artelt, C. (2005). Cross-cultural approaches to measuring motivation. *Educational Assessment*, 10, 231–255.
- Artelt, C., Baumert, J., Julius-McElvany, N., & Peschar, J. (2003). Learners for life: Student approaches to learning. *Results from PISA 2000*. Paris: Organization for Economic Co-operation and Development.
- Bandura, A. (1997). *Self-efficacy. The exercise of control*. New York: W. H. Freeman and Company.
- Bandura, A. (2006). Towards a Psychology of Human Agency. *Perspectives on Psychological Science*, 1, 164–180.
- Davis, J. A. (1966). The campus as a Frog Pond: An application of the Theory of Relative Deprivation to career decisions of collage men. *American Journal of Sociology*, 72, 17–31.
- Deci, E., Ryan, R., & Williams, G. (1996). Need satisfaction and self-regulation of learning. *Learning and Individual Differences*, 8, 165–183.
- Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation in Education: The Self-Determination Perspective. *Educational Psychologist*, 26, 325–346.
- Dijkstra, P., Kuyper, H., van der Werf, G., Buunk, A., & van der Zee, Y. (2008). Social Comparison in the Classroom: A Review. *Review of Educational Research*, 78, 828–879
- DiPerna, J. C., Volpe, R. J., & Stephen, N. E. (2005). A model of academic enablers and mathematics achievement in the elementary grades. *Journal of School Psychology*, 43, 379–397.
- Dweck, C. (2012). *Mindset: How You Can Fulfill Your Potential*. Robinson Publishing.
- Dweck, C. & Leggett, E. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95, 256–273.
- Eccles, J. & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, 53, 109–132.
- Eklöf, H. (2007). Self-Concept and Valuing of Mathematics in TIMMSS 2003: Scale structure and relation to performance in a Swedish setting. *Scandinavian Journal of Educational Research*, 51, 297–313.
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7, 117–140.
- Frank, R. (1997). The Frame of Reference as a Public Good. *The Economic Journal*, 107, 1832–1847.
- Flynn, J. R. (2007). *What is intelligence? Beyond the Flynn Effect*. New York: Cambridge University Press.
- Gagnè, F., & St Pére, F. (2002). When IQ is controlled, does motivation still predict achievement? *Intelligence*, 30, 71–100.
- GIS. (2009). [Statistical database]. Retrieved from http://www.proinno-europe.eu/ScoreBoards/Scoreboard2006/pdf/eis_2006_global_innovation_report.pdf.
- Heine, S. J., & Buchtel, E. E. (2009). Personality: the universal and culturally specific. *Annual Review of Psychology*, 60, 369–354.
- Hox, J. (2010). *Multilevel Analysis. Techniques and Application*. New York: Routlege.

- Human Development Programme. (2009). *Human Development Report 2009. Overcoming barriers: Human mobility and development*. New York: United Nations Development Programme.
- Inglehart, R. (1997). *Modernization and postmodernization. Cultural, economic and political change in 43 societies*. Princeton: Princeton University Press.
- Kekic, L. (2009). The Economist Intelligence Unit's Index of Democracy. Retrieved from http://www.economist.com/media/pdf/Democracy_Index_2007_v3.pdf.
- Le, H., Casillas, A., Robbins, S.B., & Langley, R. (2005). Motivational and Skills, Social and Self-Management Predictors of College Outcomes: Constructing the Student Readiness Inventory. *Educational and Psychological Measurement, 65*, 482–508.
- Lynn, R., & Irwing, P. (2008). Sex differences in mental arithmetic, digit span, and g defined as working memory capacity. *Intelligence, 36*, 226–235.
- Lynn, R., & Mikk, J. (2009). Sex differences in reading achievement. *TRAMES: Journal of the Humanities and Social Sciences, 13*, 3–13.
- Maehr, M. (2008). Culture and achievement motivation. *International Journal of Psychology, 43*, 917–918.
- Maehr, M. (1974). Culture and achievement motivation. *American Psychologist, 29*, 887–896.
- Marsh, H. (1987). The big-fish-little-pond effect on academic self-concept. *Journal of Educational Psychology, 79*, 280–295.
- Marsh, H., & Hau, K. (2004). Explaining paradoxical relations between academic self-concepts and achievements: Cross-cultural generalizability of the internal/external frame of reference predictions across 26 countries. *Journal of Educational Psychology, 96*, 56–67.
- Marsh, H., Hau, K., Artelt, C., Baumert, J., & Pechar, J. (2006). OECD's brief self-report measure of educational Psychology's most useful affective constructs: Cross-cultural, psychometric comparisons across 25 countries. *International Journal of Testing, 6*, 311–360.
- Marsh, H., & Parker, J. (1984). Determinants of student self-concept: Is it better to be a relatively large fish in a small pond even if you don't learn to swim as well? *Journal of Personality and Social Psychology, 47*, 213–231.
- Merton, R. (1965). *Social theory and social structure*. New York: Free Press.
- Molden, D. & Dweck, C. (2006). Finding “Meaning” in Psychology. A Lay Theories Approach to Self-regulation, Social Perception, and Social Development. *American Psychologist, 61*, 192–203.
- Multon, D. K., Brown, S. D., & Lent, R. W. (1991). Relation of Self-Efficacy Beliefs to Academic Outcomes: A Meta-Analytic Investigation. *Journal of Counselling Psychology, 38*, 30–38.
- OECD. (2006). *Assessing Scientific, Reading and Mathematical Literacy: A Framework for PISA 2006*. Paris: OECD.
- OECD. (2007). *PISA 2006 Science Competencies for Tomorrow's World* (Vol. 1). Paris: OECD.
- OECD & Eurostat. (2005). *Innovation in science, technology and industry. Oslo Manual*. Paris: OECD.
- Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543–578.
- Peschar, J. (2004). Cross-Curricular Competencies. Development in a New Area of Education Outcome Indicators. In: J. H. Moskowitz and M. Stephens (Eds.).

- Comparing Learning Outcomes: International Assessment and Educational Policy*. London: Routledge, 45–67.
- Pullmann, H., & Allik, J. (2008). Relations of academic general self-esteem to school achievement. *Personality and Individual Differences, 45*, 559–564.
- Robbins, S.B., Lauver, K., Le, H., Davis, D., & Langley, R. (2004). Do Psycho-Social and Study Skill Factors Predict College Outcomes? A Meta-Analysis. *Psychological Bulletin, 130*, 261–288.
- Robinson, W. S. (1950). Ecological correlations and the behavior of individuals. *American Sociological Review, 15*, 351–357.
- Rosenberg, M., Schooler, C., Schoenbach, C., & Rosenberg, F. (1995). Global Self-Esteem and Specific Self-Esteem: Different Concepts, Different Outcomes. *American Sociological Review, 60*, 141–156.
- Ryan, R., Kuhl, J., & Deci, E. (1997). Nature and autonomy: An organizational view of social and neurobiological aspects of self-regulation in behavior and Development. *Development and Psychopathology, 9*, 701–728.
- Schmitt, N., & Kuljanin, G. (2008). Measurement invariance: Review of practice and implications. *Human Resource Management Review, 18*, 210–222.
- Schmitt, D. P., Realo, A., Voracek, M., & Allik, J. (2008). Why Can't a Man Be More Like a Woman? Gender Differences in Big Five Personality Traits Across 55 Cultures. *Journal of Personality and Social Psychology, 94*, 168–182.
- Schunk, D. H. (1991). Self-Efficacy and Academic Motivation. *Educational Psychologist, 26*, 207–231.
- Schunk, D. H. (2008). Metacognition, self-regulation, and self-regulated learning: research recommendation. *Educational Psychology Review, 20*, 463–467.
- Seaton, M., Marsh, H., & Craven, R. (2009). Earning its place as a pan-human theory: universality of the big-fish-little-pond effect across 41 culturally and economically diverse countries. *Journal of Educational Psychology, 101*, 403–419.
- Shen, C., & Pedulla, J. (2000). The Relationship between Students' Achievement and their Self-Perception of Competence and Rigour of Mathematics and Science: a cross-national analysis. *Assessment in Education, 7*, 237–253.
- Shen, C., & Tam, H. (2008). The paradoxical relationship between student achievement and self-perception: a cross-national analysis based on three waves of TIMSS data. *Educational Research and Evaluation, 14*, 87–100.
- Spinath, B., Freudenthaler, H. H., & Neubauer, A. C. (2010). Domain-specific school achievement in boys and girls as predicted by intelligence, personality and motivation. *Personality and Individual Differences, 48*, 481–486.
- Spinath, B., Spinath, F. M., Harlaar, N., & Plomin, R. (2006). Predicting school achievement from intelligence, self-perceived ability, and intrinsic value. *Intelligence, 34*, 363–374.
- Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.
- Toomela, H. (2008). Noncognitive Correlates of Education. *Learning and Individual Differences, 18*, 19–28.
- Turmo, A., & Lie, S. (2007). Cross-country comparability of students' self-reports: Evidence from the PISA 2003 study. *Nordisk Pedagogik, 27*, 343–356.
- Van der Sluis, S., Vinkuyzen, A., Boomsma, D., & Posthuma, D. (2010). Gender differences in adult motivation to achieve. *Intelligence, 38*, 433–446.

- Wicherts, J., & Wilhelm, O. (2007). What is the national g-factor? *European Journal of Personality, 21*, 763–765.
- Wigfield, A., & Eccles, J. S. (2000). Expectancy – Value Theory of Achievement Motivation. *Contemporary Educational Psychology, 25*, 68–81.
- Wu, M. (2005). The Role of Plausible Values in Large-Scale Surveys. *Studies in Educational Evaluation, 31*, 114–128.

SUMMARY IN ESTONIAN

Õpilaste õpimotivatsioon erinevates kultuurides

Käesolev väitekiri käsitleb õpilaste õpitulemuste seost õpihoiakutega. Mõiste õpihoiakud tähendab erinevaid õppimisega seotud enesekohaseid uskumusi motivatsioonist, minapildist, enesetõhususest, võimekusest, väärtustest ja huvidest. Käesoleva uurimuse põhifookuses on õpilaste õpimotivatsioon. Tänapäevased motivatsiooniteooriad pööravad erilist tähelepanu motivatsiooni kognitiivsetele aspektidele – kuidas inimesed näevad, mõistavad ja seletavad oma käitumise eesmärgi ja põhjusi. Hariduses toimivate protsesside kujundamisel on oluline silmas pidada, et soodsad motivatsioonilised uskumused on üks võtmetest paremate õpitulemuste saavutamisel.

Olen koos kolleegidega püüdnud leida vastust küsimusele, kas erinevates riikides on õpitulemused seotud õpihoiakutega sarnaselt või erinevalt. Meie tööd on näidanud, et õpilaste õppimises ja õpihoiakutes on riigiti väga olulisi sarnasusi, ent on ka erinevusi. Väitekiri hõlmab tööde seeriat, millest ilmneb, et riikidevaheliste erinevuste mitteametamine või vastupidi kontsentreerumine üksnes erinevustele riikide vahel, ei ole piisav õppimise ja õpimotivatsiooni seose olemuse mõistmiseks. Viies väitekirja artiklis on kasutatud rahvusvahelise haridusuuringu PISA 2006 materjale. Viimased koondavad enam kui 350 000 õpilase andmeid 55 riigist.

Esimeses ja teises uurimuses näitasime, et nii teoreetiliselt kui ka andmeanalüütiliselt on võimalik õpilaste tulemusi kirjeldada ühe põhilise näitajaga, võttes kokku erinevate ainetestide tulemused üheks koondnäitajaks – õpitulemus. Õppimisega seotud motivatsioonilised tegurid võib jagada kaheks: õpilaste uskumused oma isiklikust suutlikkusest õppetööga toime tulla (enesetõhusus) ja õpilaste ettekujutused sellest, miks nad õpivad (õpimotivatsioon). Esimesest uuringust ilmnis, et Eesti andmetel on õpitulemused seotud õpimotivatsiooniga nõrgemini ($r = 0,2$) kui enesetõhususega ($r = 0,6$).

Õpilaste enesekohaste hoiakute struktuur on sarnane kõigis uuritud 55-s riigis (III uurimus). Need õpilased, kes ütlesid, et tunnevad õppimisest rohkem rõõmu, väitsid end olevat ka õppimise suhtes enesekindlamad, suurema enesuse ning positiivsema minapildiga. Ka õpimotivatsiooni ja enesetõhususe seose muster on riigiti sarnane, enamasti on õpilaste enesetõhusus ja õpitulemused mõõdukas positiivses korrelatsioonis. Õpimotivatsiooni ja õpitulemuste vaheline positiivne korrelatsioon on aga nõrk, mõnes riigis nullilähedane.

Rahvusvahelised võrdlusuuringud erinevates valdkondades on näidanud, et riikide võrreldavuse oluliseks eelduseks on võrreldavate parameetrite sarnasuse kontrollimine ehk mõõtmise invariantsuse hindamine. Kolmas analüüs näitas, et kuna rahvusvahelistes haridusuuringutes kasutatavad õpitulemusi ja õpihoiakuid mõõtvad skaalad ei ole täielikult invariantsed, siis riikide võrdlemisel nende näitajate alusel tuleb olla ettevaatlik. Nimelt, nii õpitulemused, õpimotivatsioon kui ka enesetõhusus erinevad riigiti oma avaldumise tasemelt. Kui rääkida

õpitulemustest, siis võrdvõimekad õpilased ei saaks sama testitulemust erinevates riikides. Õpihoiakutest rääkides aga on oluline meie leid, et kuigi erinevate maade õpilased saavad küsimustest ühtmoodi aru, erinevad nende hinnangud suuresti emotsionaalsuse astmelt. Sellel leiul on oluline tähtsus, sest ta osutab otseselt asjaolule, et kui õpilaste näitajaid koondada riigiti keskmisteks näitajateks, siis neid riikide keskmiste erinevusi ei saa tõlgendada analoogselt õpilastevaheliste erinevustega. Seega kolmas uuring kinnitas, et konkreetse õpilase testiskoor ei näita üksnes tema individuaalset omapära või võimekust, vaid teatud määral ka seda, et ta on just mingi konkreetse riigi õpilane.

Haridusalased andmed nõuavad oma hierarhilise iseloomu tõttu ka vastavat lähenemist. Neljandas uuringus vaatasimegi õpitulemuste ja õpihoiakute seoseid hierarhiliselt nii õpilase kui riigi tasandil. Skalaarse invariantsuse puudumise tõttu riikidevahelises võrdluses võib üksnes riikide keskmiste näitajate kasutamine anda põhimõtteliselt eksitava tulemuse. Kui kasutada analüüsis riikide keskmisi näitajaid, siis võiks ekslikult jääda mulje, et õpilaste kõrged saavutused ja madal õpimotivatsioon on omavahel seotud. Neljas uuring näitas, et nii õpitulemuste kui õpimotivatsiooni võrdlemisel riikide vahel on oluline arvestada asjaoluga, et konkreetsetes mõõtmistulemustes avalduvad samaaegselt nii õpilastevahelised kui ka riikidevahelised erinevused. Õpitulemuste ja õpimotivatsiooni vaheline seos pole üksnes kitsalt psühholoogiline või haridusalane probleem, vaid ka valdkond, milles on oluline laiema sotsiaalse keskkonna ja riikide erinevuste arvestamine. Näitasime, et kui võtta arvesse riikide majandusliku ja poliitilise arengu indikaatorid, siis negatiivne seos õpilaste motiveerituse ja õpitulemuste vahel kaob. Antud leidu võib tõlgendada järgmiselt: arenenumate riikide haridussüsteemid toimivad paremini ning õpilased pääsevad haridusele kergemini ligi ega arva seetõttu, et peaksid õppimisel palju pingutama.

Soolised erinevused õpitulemustes on suuremad poliitiliselt ja majanduslikult arenenumates riikides (V uuring). Samaaegselt nende riikide õpilased väljendasid oma õpimotivatsiooni tagasihoidlikumalt. Ka varasemalt on leitud, et inimeste soolised erinevused ilmnevad selgemalt sotsiaalmajanduslikult arenenud riikides. Taoline erinevuse tõus võib saada alguse asjaolust, et arenenud riigid tagavad suurema soolise võrdõiguslikkuse.

Viies uuring näitas, et arenenud riikide koolides õpilaste sugude vahelised erinevused tervikuna ei vähene, vaid pigem suurenevad. Sooliste erinevuste suurenemine võib tuleneda asjaolust, et tingituna oma loomulikest eeldustest on poisid paremad matemaatika ja tüdrukud verbaalsete ülesannete lahendamisel. Soodsas arengukeskkonnas tähendabki antud asjaolu, et koondnäitajate tasandil näeme koos riigi arenguga sooliste erinevuste selgemat avaldumist, aga mitte vähenemist. Meie leid osutab vajadusele arvestada so erinevuste tasakaaluga koolihinnete koondamisel üheks näitajaks.

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Mikk, J., **Täht, K.**, & Must, O. (2011). Sex differences in educational attainment. *Personality and Individual Differences*, 53, 132–136.
Täht, K., & Must, O. (2010). Are the links between academic achievement and learning motivation similar in five neighbouring countries? *Trames: Journal of the Humanities and Social Sciences*, 14, 271–281.
Täht, K., & Must, O. (2009). Relationship between the Educational Performance and Attitudes of Estonian students. In Mikk, J. (Ed.), *Teenagers in Estonia: Values and Behaviour* (pp. 45–63). Frankfurt am Main: Peter Lang.
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