Sirli Mändmaa

FINANCIAL LITERACY IN PERSPECTIVE – EVIDENCE FROM ESTONIAN AND FINNISH STUDENTS

ACTA UNIVERSITATIS LAPPEENRANTAENSIS 1018

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Dissertation for the degree of Doctor of Science (Technology) to be presented with due permission for public examination and criticism in the Auditorium 1316 at Lappeenranta-Lahti University of Technology LUT, Lappeenranta, Finland on the 25th of March, 2022, at noon.

Acta Universitatis
Lappeenrantaensis 1018

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ISBN 978-952-335-796-9
ISBN 978-952-335-797-6 (PDF)
ISSN-L 1456-4491
ISSN 1456-4491

Lappeenranta-Lahti University of Technology LUT
LUT University Press 2022

Abstract

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Lappeenranta 2022
123 pages
Acta Universitatis Lappeenrantaensis 1018
Diss. Lappeenranta-Lahti University of Technology LUT
ISBN 978-952-335-796-9, ISBN 978-952-335-797-6 (PDF), ISSN-L 1456-4491, ISSN 1456-4491

Rapid evolution of the financial sector, and the shift of responsibility for long-term financial well-being from the states to the individuals, caused mainly by demographic changes, requires a deeper understanding and evidence-based solutions to improve financial literacy.

Findings from studies clearly suggest a need for financial education, where the needs of different target populations are taken into account while maintaining a delicate balance between increasing self-efficacy and creating potentially harmful overconfidence.

The main goal of this research was to find out gaps and needs in university students' financial literacy to develop the personal financial education.

The dissertation focused on the following research questions:

What is the level of financial literacy of students in Estonian and Finnish universities of technology?

What factors affect students' financial literacy levels?

Do students use financial services and plan their financial affairs, and is there a relationship between students' choices and financial literacy?

How to explain the differences in the financial knowledge and behaviour and factors influencing them of Finnish and Estonian students?

How do students evaluate the acquired financial knowledge and knowledge providers?

What changes should be made to promote financial education?

The thesis consists of five articles where the first describes the study that was conducted as pilot study to find out if there is the lack of financial knowledge among students. The first three articles used the data collected from Estonian universities students, the fourth used the data collected from Finnish students, and the fifth article addressed the data from the studies of both countries. In the pilot study, 522 Estonian students from different higher educational institutions were participated and results showed the Low level of financial literacy (overall mean of correct answers about 59%). In the continued study,

the Explanatory Sequential Mixed Methods design was used, where a quantitative part of the study was conducted among 1110 participants, followed by a qualitative part with a sample sized of 22 students. The data were collected in a quantitative part through a questionnaire survey and in a qualitative part in three focus groups.

Using the scale Low-Medium-High, the financial knowledge of students was assessed at the Medium level in both countries. However, Finnish results were slightly higher (FIN 74% and EST 68%) and there occurred some gender differences. In the results of the regression analysis of Estonian students' responses, the statistically significant factors were: Academic Discipline, Level of Education, Age and Nationality, which were not significant in the Finnish students' study, while Previous experience in using financial services was a significant factor in both. The findings showed that a significant factor in the Finnish study was income, which had no significant impact on Estonian students' financial literacy. The results of the study revealed a marked gap in financial literacy levels between self-esteem and tested results, referring to students' overconfidence. The collected data were analysed using the software Statistical Package for the Social Sciences (SPSS).

The directed approach of content analysis was chosen to analyse the collected qualitative data. By the opinions, in the transmission of financial education, the most important factor was the connection with real life - the use of interesting examples, tasks and practical advice. That, in turn, attracts attention to the need for knowledge and skills of teaching staff and to improvement of the level.

The objects of this study were students from technology universities, who highly appreciated the knowledge gained from the university. Their opinions expressed included suggestions to offer a preparatory financial course to the first-year students, which would contain the knowledge of saving, borrowing, budgeting, investing, as well about financial risks, and in the future, further more in-depth courses (what is happening in the financial markets; the current economic situation in different countries; evaluation of companies' value and economic activities, etc.).

The dissertation supports the need for additional studies and tools for enhancing the financial education programs. The present study highlights the gender differences as well the impact of mathematics (expressed in the choice of academic discipline) on financial literacy. Given the role of women in today's world, it is vital to continue the research and to use behavioural insights and tips from behavioural economics and economic psychology research in the future studies.

The results of the thesis are important for the university, as they present a proven need to improve teaching in the field of Personal Financial Education.

Keywords: Personal financial literacy, financial education, higher education students, gender differences, Mixed Methods Research (MMR)

Acknowledgements

This work was carried out in the Department of Industrial Engineering and Management at Lappeenranta-Lahti University of Technology LUT, Finland, between 2014 and 2021.

Writing a dissertation is a challenge where the support and encouragement seem essential. Fortunately, I have been surrounded by wonderful people who have dedicated their time and energy to me - offered moral support and advice or helped in practical issues. Therefore, I feel grateful and a need to repeat the words of my colleague: I have received more than I can ever give back.

I would like to express my gratitude to my supervisors Professor Asko Miettinen and Professor Tuomo Kässi for their assistance and valuable comments. It would not have been possible to undertake the study without their supervision and help.

My acknowledgement is due to Professor Janne Huiskonen and to the Department of Industrial Engineering and Management for an opportunity to carry out my doctoral study there.

Also, I would like to remember with thanks my first supervisor Jaan Vainu who gave me great support but lost his fight against the cancer.

My sincere thanks go to Professor Kaie Kerem, it would not have been possible for me to enrol the doctoral programme without her excellent advice.

Furthermore, I am cordially grateful to Professor Enn Listra for his attention and encouragement.

My gratitude is due to all professors who taught me during my doctoral studies, and thanks go to the Doctoral School in Economics and Innovation and the ESF DoRa program for their financial support, which enabled me to improve my knowledge at the Kiel Institute for the World Economy.

My thanks and bow to Estonian Centre for Engineering Pedagogy at Tallinn University of Technology, especially to associate professor Tiia Rüütmann for valuable pedagogical knowledge.

Due to their significance in my work, I would like to acknowledge:
Associate professor Laivi Laidroo, associate professor Ako Sauga and associate professor Ants Aasma whose instruction and tips have been really beneficial; associate professor Oliver Parts for his enthusiasm and extraordinary support; associate professor Marina Järvis and associate professor Mike Franz Wahl, and my fellow students for their valuable moral support; Linda Heinsaar for her kind help with all kind of practical matters.
I am greatly indebted to many people who, in addition to those named above, have supported me during my research: academic staff and students from Lappeenranta-Lahti University of Technology, Tampere University of Technology and Tallinn University of Technology for the great contribution in the data collection process; LUT Doctoral School

particularly Saara Merritt and Sari Damsten-Puustinen for practical help and advice; Mare-Anne Laane for proofreading the manuscript; my parents and my friends, especially small ones – Mia-Henrica, Nora Lovisa and Ronja Brigitta, who often have had to accept my absence.

And last but definitely not least, my sincere gratitude goes to my family, especially to my dear children - daughter Lotte-Triin and son Priit for their wise comments and tremendous support during my doctoral studies.

Sirli Mändmaa
June 2021
Lappeenranta, Finland

To Marii Dorothy

my beloved daughter -
little girl with a golden heart who was always by my side

Contents

List of publications

This dissertation is based on the following papers. The rights have been granted by publishers to include the papers in dissertation.

I. Mändmaa, S. (2019). Financial literacy – what and why should we improve. *Eurasian Journal of Social Sciences* 7(2), pp. 12-28. DOI:10.15604/ejss.2019.07.02.002

II. Mändmaa, S. (2020). Empirical study on personal financial literacy of university students for develop the financial education. *International Journal of Business and Applied Social Science* 6(6), pp. 8-25. DOI:10.33642/ijbass.v6n6p2

III. Mändmaa, S. (2020). Personal financial literacy among university students studying engineering. *International Journal for Innovation Education and Research* 8(8), pp. 669-692. DOI:10.31686/ijier.vol8.iss8.2575

IV. Mändmaa, S. (2021). How to Promote Personal Financial Education - Findings from Finnish University Students' Financial Literacy Study. *International Journal of Educational Technology and Learning* 10 (1), pp. 8-25. DOI:10.20448/2003.101.8.25

V. Mändmaa, S. (2021). Financial education from the perspective of university students: comparative study. *Eurasian Journal of Social Sciences* 9(3), pp. 150-175. DOI:10.15604/ejss.2021.09.03.003

Author's contribution

Author Mändmaa Sirli is the principal author and investigator in papers I - V.

Nomenclature

Abbreviations

ANOVA	Analysis of Variance
BLI	Better Life Index
EST	Estonia/Estonians
EU	European Union
FIN	Finland/Finnish
GDP	Gross Domestic Product
INFE	International Network on Financial Education
IOSCO	The International Organization of Securities Commissions
MMR	Mixed Methods Research
OECD	Organisation for Economic Co-operation and Development
OÜ	Osaühing (Private Limited Company)
PISA	Programme for International Student Assessment
SA	Sihtasutus (Foundation)
SPSS	Statistical Package for the Social Sciences
USA	The United States of America

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1 Introduction

In the modern society, the existence of every person with active legal capacity is related to the consumption of financial services. Depending on the individual, this can be limited to having a bank account and a debit card or may include mortgages, investment transactions, stock exchange trading, and other services. Rapid economic developments, expansion of markets combined with e-commerce, overabundance of supply for goods and services, including the abundance of financial services, offer an unlimited opportunities to the consumers.

Due to its limited resources, an economic subject addressed in microeconomics applies the principle of optimality, that is, it tries to choose from various behavioural options the one that best satisfies its needs (Eamets et al., 2005). However, in everyday life, the behavioural options chosen by people are not always sustainable and the mismatch between limited resources and personal desires can lead to critical situations - to high debt burdens or even bankruptcy.

Additionally, a transfer of financial responsibility away from states and firms towards households has emerged, firstly, through the decline of public welfare policies and corporate social programmes, and secondly, through the shift from defined benefit to defined contribution public and private pension schemes (OECD, 2005). The burden on households is even more crucial in the light of growing life expectancy and long-term health care costs (OECD, 2013).

Given these challenges, consumer skills to make intelligent and responsible short- and long-term financial decisions are even more critical than ever.

A basic knowledge of financial concepts, and the ability to apply numeracy skills in a financial context, ensures that consumers can act independently, to manage their financial affairs and react to news and events that may have implications for their financial well-being. OECD has defined the Financial knowledge as an important component of financial literacy for individuals, to help them compare financial products and services and make appropriate, well-informed financial decisions. (OECD, 2016)

If people have insufficient knowledge for making financial decisions, there can be consequences for the individuals themselves and for the economy as a whole (Lusardi et al., 2010).

Over the past few decades, numerous surveys have been conducted around the world to assess people's financial literacy. Professor Lusardi (2017) pointed out that worldwide, only 33% of the population is financially literate. The results of the 2015 international survey of financial literacy, with thirty countries and economies participating, indicated that the overall levels of financial literacy mentioned by combining scores on knowledge, attitudes and behaviour were relatively low. The average score across all participating countries was just 13.2 out of a possible 21 and the average levels of financial knowledge

showed room for improvement, whilst on average just 56% of adults across participating countries and economies achieved a minimum target score, i.e., the score of at least five out of seven. (OECD, 2016)

Findings from studies clearly suggest a need for financial education where the needs of different target populations - their requirements, interests and baseline skills are taken into account while maintaining a delicate balance between increasing self-efficacy and creating potentially harmful overconfidence.

The main goal of this research was to find out gaps and needs in university students' financial literacy to develop the personal financial education.

The dissertation focuses on the following research questions:

1. What is the level of financial literacy of students in Estonian and Finnish universities of technology?

2. What factors affect students' financial literacy levels?

3. Do students use financial services and plan their financial affairs, and is there a relationship between students' choices and financial literacy?

4. How to explain the differences in the financial knowledge and behaviour and factors influencing them of Finnish and Estonian students?

5. How do students evaluate the acquired financial knowledge and knowledge providers?

6. What changes should be made to promote financial education?

The selection of the theme of doctoral dissertation was based on the professional interest of the author. Teaching future professionals as a lecturer at the Department of Finance and Economics, she experienced many questions related to the Personal finance topic. Together with the students, she conducted the first survey to assess the financial literacy of Estonian university students.

In that pilot study, 522 Estonian students from 13 different higher educational institutions attended and results showed the Low level of financial literacy. The average score of the correct answers was 59%, and noticeable differences in scores appeared among gender, nationality and academic disciplines.

Figure 1 describes the differences in financial literacy levels by gender and the field of study, where the science and mathematics-based study fields are presented as separate groups, and an "Other" section includes data about participants whose study field was education, art, social work, aviation, nursing or medicine.

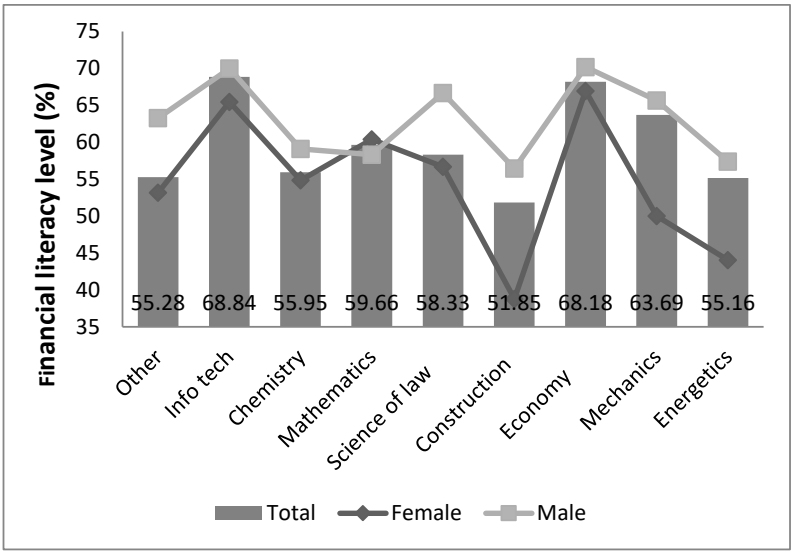


Figure 1 Differences in financial literacy levels depending on gender and the field of study

Source: Composed by the author. Results from the Mändmaa's (2019) study.

Differences in the levels of students' financial knowledge raised the author's interest. Previous research have found evidences about the insufficient financial knowledge of students from USA (for example Chen and Volpe, 1998, 2002) and Turkey (Altintas, 2011). Several studies (Chen and Volpe, 1998, 2002; Goldsmith, E. B. and Goldsmith, R. E., 1997, 2006; et al.) have highlighted differences in women's and men's financial literacy levels and pointed to women's lower level of financial literacy. Earlier studies among Estonian population have shown such differences neither for adults (Faktum & Ariko, 2010; Atkinson and Messy, 2012) nor for students who participated in the PISA 2012 test (OECD, 2014). The results of the pilot study (Publication I) have exhibited the impact of academic discipline on students' financial literacy level, that has similar with results of earlier studies (Chen and Volpe, 1998, 2002; Goldsmith, E. B. and Goldsmith, R.E., 2006; Mandell 2008), where among others the importance of the mathematical skills has emphasized.

A desire to understand these differences, to find affecting factors and solutions for promoting the field of financial education, led the author to expand the study. As important guideline there became Lusardi and Mitchell (2013) paper in which, among others, have expressed the view that careful field experiments and cross-national research could be useful in obtaining more information about financial illiterates. Thus, the study continued with the questioning, hearing and evaluating of university students from two neighbouring countries, Finland and Estonia, where the students from universities of technology formed a sample with 1110 participants, of whom 574 studied in Finland and 536 in Estonia.

Three approaches and methods were used in the dissertation.

First, the study focused on the students' financial literacy by assessing the level and taking a close look at positive and negative factors influencing the levels. A questionnaire survey was used to collect the data. The cross-tabulations, analysis of variance (ANOVA), and logistic regression analysis were used in the analyses.

Second, the analysis examined how students evaluate acquired financial knowledge and knowledge providers. The data were collected by a questionnaire and assessed at the five-point Likert scales.

Third, the study explored how personal financial education can be promoted by gathering students' opinions, assessments, and recommendations. For data collection, the focus groups and semi-structured questions were used, which were constructed based on the results of the quantitative study.

Quantitative, qualitative, and mixed methods were used in this research to obtain the best possible results.

The thesis consists of five articles, of which all have been published. The articles focus on university students' financial literacy and personal financial education, more specifically, on the assessment of financial knowledge and acquired knowledge providers and finding factors influencing the levels. The first three articles use the data collected from Estonian university students, the fourth uses the data collected from Finnish students, and the fifth article analyses the data from the studies of both countries.

Limits of the research:

The current study had its limitations, as the questionnaire was anonymous, it was not possible to contact participants in person later. For better outcomes, the question about participant's contact data - phone number or e-mail address (individually encoded or created special temporary e-mail address) should be added, to clarify later the answers if needed or let the respondent express their perspectives on (participate in focus group or interview).

The participation of Finnish students in the focus groups was small partly because of the termination of the Tampere University of Technology as an independent unit.

The time and volume limits hindered a more comprehensive study of gender differences affecting students' financial literacy. The topic definitely needs further research, both in terms of academic knowledge and attitudes and behaviour related to financial education.

It is not possible to promote personal financial awareness successfully in a situation where there is only common knowledge - opinions. As Lusardi and Michell pointed out, the promotion of financial education cannot take place according to a single program for all, i.e., "one-size-fits-all" but must be based on a specific target group (2007b, p. 43). In the

current thesis, the target group was students and more specifically, students at the universities of technology.

The value of the doctoral thesis lies in the scientific knowledge about:

1. the level of financial literacy of technical university students that has not been assessed before, but that is of a critical need regarding the experience of other countries and international organizations.

2. the gender differences in the financial literacy levels of university students in the two neighbouring countries with different political history and financial market development levels, which is the knowledge necessary for future research in order to advance the effectiveness of financial education.

3. students' assessments about acquired financial knowledge and knowledge providers, which is necessary for the promotion of financial education.

4. the factors influencing financial literacy and the extent of the assessed impact, both in numerical and verbal form, which together with the students' proposals help to shape the education policy and supply evidence for future research.

In addition, the study findings pointed out the importance of mathematics knowledge, as the students in the courses of mathematics-based academic disciplines compared to others had higher level of financial literacy. This knowledge could be important for education policy makers and educators at different levels of education.

The results of the thesis are important for the university, presenting a proven need to improve teaching in the field of Personal Financial Education. At the same time, the study is an example for students who will be using mixed methods of research in the future studies.

The rest of the thesis is organized as follows:

The next section presents the theoretical dimensions of the research in financial literacy, financial education, financial well-being, and behavioural insights, and looks at the empirical evidence. Section 3 discusses the Methodology used in the research. Section 4 contains an overview of the five publications of the thesis. Section 5 concludes the thesis with the final comments, summarizing the contributions of the articles and presenting possible avenues for future research. Section 6 presents the reference list. The dissertation ends with the author's publications I-V added to the end of the work.

2 Research framework and background

Financial literacy gives individuals the ability to make informed financial choices. Just as without basic literacy - the ability to read and write - it was not possible to contribute to and thrive in an industrialized society, it is not possible successfully navigate without financial literacy today's world (Lusardi, 2017).

The financial literacy is defined by OECD (2012) as a combination of awareness, knowledge, skills, attitude and behaviour necessary to make sound financial decisions and ultimately achieve individual financial wellbeing.

Today, more than fifty countries have launched national strategies for financial education to empower individuals to manage their finances more effectively by improving their financial literacy, to increase financial well-being in society. Financial education providers place emphasis on the improvement of financial knowledge by teaching financial concepts. Braunstein & Welch (2002) and Perry & Morris (2005) have suggested that knowledge alone is insufficient to ensure better financial behaviour. In their study, Robb and Woodyard (2011) have addressed the impact of financial knowledge on financial behaviour and found that objective knowledge is not a dominant factor. Knowledge is clearly an important component in financial decision-making, but other factors such as income, financial satisfaction, financial confidence (subjective knowledge), and education play an important role as well (Robb and Woodyard, 2011).

2.1 Financial literacy

In financial literacy research, a terminological discussion is prevailing, with two schools of thought (Figure 2). The first school sees and defines financial literacy as knowledge and skills and assumes that better knowledge together with sufficient financial resources will lead to sensible behaviour (Lusardi and Mitchell, 2011; Klapper et al., 2015). The second approach interprets financial literacy as the necessary core competence to make sound financial decisions and improve financial well-being, being of the combination of knowledge, skills, attitudes, and behaviours (OECD, 2014).

The different interpretations in terminology complicate discussions between researchers and may enable inappropriate comparisons. As only few researchers are making their approaches explicit, the comparison of findings may be misleading. Despite the fact that several researchers have pointed out the problem (Schuchardt et al., 2009; Huston, 2010; Nicolini et al., 2013), there is no solution, i.e., a generally accepted agreement on terminology is still missing.

In the present study, no straightforward comparisons have been made with the results of other researchers, where the definition of financial literacy is missing or is defined differently, but some responses have been compared with answers to similar specific questions. The results of previous surveys that reflect assessments of financial literacy

levels and knowledge in different countries and segments of the population have been presented to describe the general background.

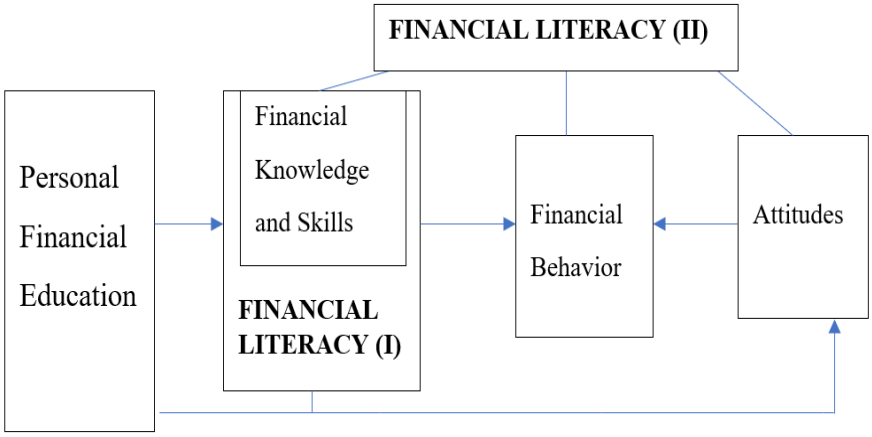


Figure 2 Conceptual model of the study
Source: Composed by the author

In the current dissertation, the concept of financial literacy has been used in the light of the approaches of both schools of thought (Figure 2). Students' knowledge has been assessed based on the views of the first school of thought where the financial literacy is defined as knowledge and skills that direct to the corresponding behaviour. Substantiating that, based on the aim of the research, to promote financial education, it was important to determine the level of students' actual financial knowledge. Secondly, taking into account the age composition of the sample used, which refers to the beginning of the financial life cycle and thus to the stage in which experience and habits are only in the developing phase, it was not practical to study financial behaviour or attitudes in depth.

However, in the context of the promotion of financial education, the second and broader approach of thought was addressed, which is defined as follows: “Financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life“ (OECD, 2014, p. 33). At this school of thought, the financial attitude is deemed as an important element of financial literacy, given that individual preferences are determinants of financial behaviour (OECD, 2013, 2016). Schrader and Lawless (2004) explain that that attitude covers three components: cognitive (belief or ideas), affective (feelings) and conative (behavioural). Therefore, attitudes relate with preferences that may influence behaviours.

Even in the case of people with sufficient knowledge and skill to behave in a certain way, their attitude will influence the decision on whether to act (OECD, 2016).

Empirical evidence refers to the positive impact of financial literacy on financial behaviour and financial status in many of behavioural domains. Financially literate individuals do better at budgeting, saving money, and controlling spending (Moore, 2003; Perry and Morris, 2005); handling mortgage and other debt (Campbell, 2006; Lusardi and Tufano, 2009); participating in financial markets (Van Rooij et al., 2011; Christelis et al., 2010; Yoong, 2010); planning for retirement (Lusardi and Mitchell, 2007a; Lusardi and Mitchell, 2008); and ultimately, successfully accumulating wealth (Stango and Zinman, 2009). The other studies have demonstrated the connection between the financial status and other important aspects of household well-being, including also the notably low financial status that correlates with poorer physical, mental, and emotional health outcomes for all household members and lower educational attainment of children (Kessler and Neighbors, 1986; Seccombe, 2000; Lorant et al., 2003; Hammack, et al., 2004; Mackenbach, et al., 2008; Marmot, 2005; Shanks and Danziger, 2010).

Huston (2010) argues that a financial literacy measure only identifies the human capital required to engage in appropriate financial behaviour; it does not ensure this will occur. Thus, educators cannot expect that people with less-than-optimal financial situations are necessarily financially illiterate. It should be taken into account that other characteristics such as impulsiveness, behavioural biases, unusual preferences or external circumstances also contribute to what may appear to be poor financial decision making.

In everyday life, the behavioural options chosen by people are not always sustainable, especially among younger population. Researchers in the United States have conducted a number of studies and highlighted serious problems associated with young people.

The need of lenders for more profitable market instruments has resulted in increased availability of consumer credit in the form of credit cards, particularly among younger consumers aged 18–25 (Jones, 2005; Manning and Kirshak, 2005). Credit card companies find college students attractive because they have potential to earn much higher incomes in the near future and the college student lifestyle offers many opportunities to use credit cards—both as a convenience and as a short-term loan—for things such as a weekend trip, car repair, and internet purchases, etc. (Robb, 2011) The data from Sallie Mae (2009) indicate that 84% of US undergraduates have a credit card.

Reed (2008) described the financial situation of increasingly indebted young people, as the average student debt in the United States increased from $ 9,250 to $ 19,200 in 1997–2007 (increase of 58% after inflation). Roberts and Jones (2001) warned of the risk of bankruptcy associated with a large debt burden, and Lusardi et al. (2010) noted that in 2002, the fastest growing group of bankruptcy filers in the United States was those aged 25 and under.

Resulting from their findings, Cole, Paulson and Shastry (2012) argued that financial education improves credit scores, and dramatically reduces the probability of declaring bankruptcy, as well as significantly increases investment income and retirement savings.

Over the past few decades, numerous surveys have been conducted around the world to assess people's financial literacy. The results of 2015 International Survey of Adult Financial Literacy Competencies, where thirty countries and economies participated, indicated that the overall levels of financial literacy combining scores on knowledge, attitudes and behaviour were relatively low (average just 13.2 out of a possible 21) and the gender differences in financial knowledge were noteworthy, with 61% of men achieving the minimum target score compared with only 51% of women across the participating countries. (OECD, 2016)

Scientists have expressed their concern about insufficient financial literacy among different segments of population, including students in universities and colleges. Several studies have shown that females tend to display lower level on personal financial literacy than males, both among the adults (Lusardi and Mitchell, 2006; Fonseca, et al., 2012; Monticone, 2010; OECD, 2016) and students and adolescents (Atkinson et al., 2006; Chen and Volpe, 1998, 2002; Goldsmith and Goldsmith, 1997, 2006; Lusardi et al., 2010; Mändmaa, 2019). These results refer to an increasing problem, as in the developed countries, the responsibility for the family's budget and daily coping has largely fallen on women's shoulders.

Despite the significance of financial literacy, recent international studies suggest that levels of financial literacy are low, on average, across countries. The typical consumer has limited objective as well as perceived subjective understanding of financial issues, and many consumers express lack of ability/motivation to gain and understand financial information and knowledge (OECD, 2016; Yoong, 2010).

2.1.1 **Financial knowledge**

Financial literacy helps to orientate in financial services and make deliberate decisions. If people lack sufficient knowledge for making financial decisions, there can be consequences for the individuals themselves and for the economy as a whole (Lusardi et al., 2010).

There are many different definitions of financial literacy available; but their important component is knowledge, which must be passed on to humans. OECD set of policy conclusions based on high-level findings from International Survey of Adult Financial Literacy Competencies of 2015, points out several important trends that are related to the topic of this dissertation:
First, the overall low level of financial literacy stresses the importance of starting financial education early and, ideally, in schools. Effective financial education could ensure that future generations have the knowledge, skills, and attitudes to strengthen their well-being and build positive financial habits from a young age.

Second, the positive correlations between financial knowledge and goal setting and between financial knowledge and retirement planning indicate potential benefits how knowledge may reinforce positive behaviours.
Third, the low level of understanding and skills relating to basic principles such as compound interest and diversification indicates that there are many aspects of knowledge that could be improved among the general population.
Fourth, differences in financial knowledge by gender should also be more systematically measured, and where appropriate, address them through targeted programs. (OECD, 2016)

Understanding how and why male and female students have different levels of financial literacy allows for better improvement in financial education. Goldsmith and Goldsmith (1997; 2006) have suggested that females have lower level in financial literacy than males as their general interest in investment and personal finance is usually lower. Chen and Volpe have found that women generally have not only less knowledge about personal finance, but also have less enthusiasm for, lower confidence in, and less willingness to learn about personal finance topics than men. As Personal Finance is mostly a number-oriented subject, it is not attractive to women, as women prefer courses with less mathematics and other number-oriented science. (Chen and Volpe, 2002)

Mandel and Klein have expressed a similar opinion that low levels of financial literacy can be explained by the lack of motivation to learn or to retain new insights. Thus, as the emergence of new financial products and the rapid development of financial markets is continuous, it is necessary that individuals have been predisposed to educate themselves towards achievement of better results. (Mandell and Klein, 2007, 2009)

Financial literacy is important for sound financial decision-making, and many young people wish they had more financial knowledge. In a 2009 survey of Credit Card use among US bachelor students, 84% of students reported that they needed more education on financial management topics. 64% of respondents would have liked to receive this information in high school and 40% as college freshmen. (Sallie Mae, 2009)

Courchane and Zorn (2005) argued that consumers generally do not have a precise understanding of their own level of financial knowledge. The reason is that if objective and subjective (or self-assessed) knowledge is measured comparatively, of those who thought they know a “fair amount”, nearly 60% knew "very little" or "some". Evidence of biased subjective knowledge was also shown by the results of a survey conducted among students acquiring higher education in Estonia in 2012, where 33% of respondents overestimated their knowledge (Mändmaa, 2019). Courchane and Zorn (2005) suggested that objective knowledge may not be the most important factor in determining whether individuals make good financial decisions or not. The analysis supported the findings as financial knowledge (objective) and financial confidence (subjective) displayed a low level of correlation and both have a significant impact on behaviour. The study results showed that consumer financial knowledge is affected by learning experiences, formal

education, counselling, as well as Credit Card usage/payment patterns, income, net worth, having a financial safety net. At the same time, the key explanatory variable for behaviour was financial knowledge but also psychological factors had a substantial impact on financial behaviours (a respondent behaves "better" if more optimistic, taking fewer risks, not worrying too much about money, and being able to cope).

Robb and Woodyard (2011) admitted as well that despite the notable impact, objective knowledge is not the dominant factor on financial behaviour. Based on their study results, the most significant impact factor was income, followed by financial satisfaction, financial confidence (subjective knowledge), and education.

It can be argued that today Financial Education mainly contains objective knowledge - financial concepts, whereas the subjective knowledge (i.e., self-assessed knowledge) of people who participated in the surveys were strongly biased and previous studies have shown that subjective knowledge is an important factor in financial decision making (at financial behaviour). Thus, the versatile replenishment of financial knowledge, i.e., improving Personal Financial Education, is extremely important.

2.1.2 Financial behaviour

Consumers' financial situation and wellbeing in both the short- and longer-term are ultimately shaped by their actions and behaviour. Based on psychology and cognitive science, the quickly growing field of behavioural economics states that financial decision making, as well as other types of behaviour, may be driven by systematic biases and heuristics beyond the scope of purely rational decision making.

Altman (2011; 2012) explains the impact factors on people financial behaviour through the two approaches of behavioural economics:
1. Kahneman-Tversky's (1979) approach maintains that individuals make systematic errors and biases in decision making that are largely rooted in the hard-wiring of the brain. Errors and biases occur when individuals deviate from conventional (neoclassical) decision-making rules. Education can have little effect on such behaviour and this approach is much more supportive of government policy that nudges[1] consumers into making decisions.

[1] A nudge is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives (Thaler and Sunstein, 2009, p. 6). For example, government can nudge individuals towards saving more for their retirement by using default options. To take account ethical constraints in altering people´s behavior, Thaler and Sunstein suggest the golden rule of libertarian paternalism: "nudges that are most likely to help and least likely to inflict harm" (Thaler and Sunstein, 2009). Another approach is to nudge only those that need it, which is known as cautious paternalism (O'Donoghue and Rabin, 1998, 1999).

2. Simon-March's[2] approach argues that individuals are physiologically incapable of behaving as prescribed and predicted by conventional economic wisdom. As a result, they develop heuristics or experience-based decision-making shortcuts to make choices that are rational even though often inconsistent with the conventional behavioural norms. It is also recognized that the typical choice of the environment is characterized by asymmetric information, incomplete information, and even false information and poor education. Both physiological and environmental constraints can, but need not, result in errors in decision making.

In the literature, three major approaches are found for use in the studies of financial behaviour; however, this is a rough classification and these approaches have not been formalized clearly and in detail in the financial literacy research.
The first approach uses the neoclassical economic perspective, which emphasizes the importance of financial knowledge and availability of resources. They use mostly quantitative studies for measuring and comparing financial knowledge across countries and between different groups within countries. Researchers suggest that knowledge of financial concepts and socio-economic status are the main factors influencing financial behaviours. The most cited and well-known researcher in that direction is Annamaria Lusardi.
The second approach of financial behaviour studies is based on behavioural sciences, i.e., on behavioural economics and economic psychology (Ferreira, 2011). Representatives of that line of thought argue that individuals have bounded rationality and limited self-control. Moreover, they maintain that, unlike the assumption of neoclassical economic models, individuals do not act only to maximize their own welfare (Kahneman, 2003; Thaler and Sunstein, 2009), but they can be altruistic, optimize someone else´s well-being, or they may have no clear reason to behaviour at all. They suggest that knowledge and socio-economic status have minor impact on behaviour, i.e., are of lower importance than is assumed by the first line of thought.
The third approach of financial behaviour research is more pluralistic, using findings from both of the abovementioned lines of thought. They acknowledge the importance of sound knowledge but use also behavioural insights to improve financial well-being of individuals and society at large (OECD, 2013).
Although provision of knowledge alone is not likely to have massive effect on behaviour, especially in the long term, relying merely on choice architecture is not a solution either, as it lessens the individual´s responsibility for increasing personal financial well-being. A pluralistic approach enables sustainable improvements in financial behaviour by providing behaviourally designed financial education that helps individuals also to acknowledge their limited understanding of personal finances and their bounded rationality.

[2] This perspective is well reflected in the research of Shiller (2001, 2009), a leading behavioural finance scholar.

Research results have shown that some types of behaviour, such as putting off bill payment, failing to plan future expenditures or choosing financial products without shopping around, may have negative impact on an individual's financial situation and well-being.

Findings from the results of the Behaviour part of the 2015 OECD Financial Literacy study showed the following:

- For many people, budgeting is not a priority, despite its clear advantages in terms of financial control and planning; a budget existed only in 60% of households across all participating countries and economies and in 57% across OECD countries.
- Only one of two participants on average had longer-term financial goals that they strived to meet (51% across all participating countries and economies and 50% across OECD countries).
- Relatively few people were making regular, informed financial product choices, and only 12% of the respondents on average across all participated countries and economies did so with the support of independent information and advice.

In this dissertation, the financial behaviour is a set of students' different choices and actions that has been analysed to assess the influence on the financial literacy level (on financial knowledge) to improve financial education and future well-being of individuals and society. Based on earlier studies (Pires and Quelhas, 2015; Mändmaa, 2019), the use of financial services has a positive impact on students' financial literacy.

2.2 The need and effectiveness of financial education

"Financial education deals with information – and learning. It is undeniably essential to help citizens of any country to better manage their financial life and hopefully make favourable choices that will contribute to increasing their well-being too." (OECD, 2013, p. 51)

Different approaches to the economy mean a different attitude to the potential for education and learning to influence choice behaviour. Conventional economics suggests that financial education is able to do little substantively, since individuals are behaving neoclassically, making choices consistent with neoclassical behaviour, or are forced into behaving neoclassically by market forces quickly. Behavioural economics, on the other hand, has provided an abundance of evidence that individuals do not behave neoclassically (For example: Shiller, 2001; Wärneryd, 2001; Shefrin, 2002; Kahneman, 2003; Altman, 2006; Gigerenzer, 2007; de Meza et al., 2008; Akerlof and Shiller, 2009; Roubini and Mihm, 2010).

Altman (2012) discusses the implications of the two approaches of behavioural economics for possible improvements to financial literacy through financial education and therefore, to financial decision making.

The “old” behavioural economics school led by scholars like Herbert Simon (1978) argues that intelligent people can make decisions that appear irrational from the perspective of conventional economic wisdom. Errors in decision making can be made if rationality is bounded - the quality of information is poor or is framed in a misleading fashion, or the decision-making environment might be without right incentives to make ideal choices, or individuals may not have the knowledge base to make ideal choices in finance-related matters. Therefore, financial decision making can be improved by providing people with better quality information in a noncomplex fashion, an institutional environment conducive to good decisions, and financial education which facilitates the best use of available information in a specific decision-making environment. (Altman, 2012)

The “new” behavioural economics, which builds on the work of Daniel Kahneman and Amos Tversky and is best exemplified by Richard Thaler and Cass Sunstein’s book Nudge, is more focused on nudging or even legislating rules that drive choices in the desired directions as defined by experts, as opposed to educating the decision maker. This approach, often referred to as libertarian paternalism or light paternalism, holds that decisions may be inconsistent with conventional economic wisdom norms for rational decision-making because they are based on how the brain is hardwired. Because it is difficult to modify hardwired behaviour, decisions are often error-prone, biased, and irrational and financial education plays a smaller role in improving choice behaviour in this approach. (Altman, 2012)

Altman points out that, in general, behavioural economics opens the door for public policy to improve the overall decision-making environment and helps to understand why it is critically important to improve financial literacy. Referring to Simon's approach, he notes that the improved financial education allows decision makers to take advantage of an improved decision-making environment. (2012)

The aim of financial education should be enhancing awareness and empowering individuals to take responsibility for their financial well-being, and not to make choices for them.

There are several approaches to conceptualizing financial education. Some determine it just as classroom-based training (Xiao and Porto, 2017), others use a broader approach that includes a wide range of modern learning methods by attending online courses, using mobile applications, reading blogs, or simply searching online.

Although according to the author’s evaluation, the second option is important, as that means an easy access to information for the consumer of services, the potential dangers of misunderstanding should not be ignored here. The abundance and growing complexity

of financial services has been much debated and complained about; but thinking of the great economic crisis of the current century first decade, it must be admitted that it has a clear reason. Therefore, the author of this dissertation considers it necessary to pay attention (emphasis) to changes that would be happening in the classroom or lecture hall to improve students' financial literacy in a closely guided way.

“Financial education is the process by which financial consumers/investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become aware of (financial) risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being and protection.” (OECD 2006, p. 118).

The approach of the OECD emphasizes the role and responsibility of the individual. So, if motivated individuals have basic understanding of financial concepts and skills, they are able to search for information, use online tools and ask for advice, and are more likely to make sound financial choices. A number of studies have focused on the limitations of financial education (Willis, 2008; Fernandes et al., 2014; Miller et al., 2015; Kaiser and Menkhoff, 2017). Drexler et al. (2014) expressed an opinion that participating in a mandatory financial education course using the traditional approach is less likely to lead to any behavioural improvements.

To increase the likelihood of behavioural change, financial education should be connected to concrete actions as far as possible. For example, it is reasonable to involve a bank employee in the lecture or seminar, to present financial products and give options for filling in the application forms in current use in the bank, in both online and on paper as well as for the provision of information about the conditions and risks involved. The positive effects of a bank representative’s involvement have been described in the research of Bertrand, Mullainathan, and Shafir (2006). Similar actions have been suggested by many scholars based on Bloom's taxonomy and interaction of knowledge, attitudes, and behaviours (see Section 2.2.1). Nevertheless, such strategies should be carefully examined prior to implementation in order to avoid inducing conflicts of interest or other such problems.

Evidence has been found that Financial education is effective in certain groups and is influencing certain behaviours (Atkinson et al., 2015; Bernheim and Garrett, 2003; Kaiser and Menkhoff, 2017; Lusardi, 2004; Lusardi and Mitchell, 2007; O´Prey and Shephard, 2014; Clark et al., 2017). Atkinson et al.’s (2015) study results showed that for financial education to have an effect on long-term saving and investing, the programme needs to be of sufficient duration and frequency, provided at workplaces, delivered alongside opportunities and incentives to save, be strategically timed and technology based. They concluded that there is “mixed evidence” about the effectiveness of financial education programmes on long-term saving and investing.

However, it is not possible to promote personal financial awareness successfully in a situation where there is only common knowledge – opinions. The history of rigorous research about the actual impact of various financial education programmes on knowledge and behaviour is short and current results suggest that successful financial education is a challenge not to be taken lightly.

Lusardi and Michell stated that the promotion of financial education cannot take place according to a single programme for all, i.e., "one-size-fits-all" but must be based on a specific target group (2007b, p. 43).

Yoong pointed, as a result of improved technology and financial innovation, consumers have experienced an unprecedented expansion of access to a growing array of sophisticated products and services (OECD, 2011).

The complexity of the financial marketplace has introduced new traps for the investor as well as greater potential for financial fraud and mismanagement. But the burden on households is even more remarkable as the financial responsibility is transferred away from states and firms to people, and the growing life expectancy brings long-term health care costs. These trends may have distributional implications - if only the wealthy and well-educated have the financial skills to take advantage of these changes, the poor may disproportionately lose more than they gain, exacerbating existing inequalities in wealth and well-being. (OECD 2013, p. 12)

Financial education is a common problem in the whole world. Financial education allows people to be more financially independent and those with higher levels of financial education are more likely to be better prepared for handling financial uncertainty. There are study results confirming that often financial education starts at home, but not all parents are capable of forwarding financial topics to children and the rapid development of the financial sector makes it even more difficult.

Financial education that effectively supports consumers' ability to make intelligent and responsible short- and long-term financial decisions has potential benefits for multiple stakeholders. There is strong evidence for consumers that greater financial literacy links to welfare-improving behaviour - planning, appropriate use of credit, and successful wealth accumulation lead to better financial well-being. For the financial services sector, greater participation and more informed actors would increase the demand for financial products, raise competitiveness, promote market transparency, and boost efficiency. Policy makers would benefit from a lighter regulatory and supervisory burden related to monitoring, intervention, and redress in financial markets as well as a more successful environment for reforms. For the economy as a whole, more financially secure households with higher saving rates should promote better-functioning markets, increased economic stability and development and a decreased need for future public expenditures. (OECD 2011, 2013)

2.2.1 Interaction of Knowledge, Attitudes, and Behaviour

The complex aspects of learning correspond to more than one outcome measure. Already in 1956, Bloom began developing a taxonomy of instructional objectives in three domains - the cognitive, affective, and psychomotor (Bloom et al., 1956; Bloom et al., 1971; Bloom, 1976). Research has confirmed the importance of these constructs as outcomes of learning and describes a relationship among the cognitive, affective, and behavioural dimensions (Woolfolk, 1998). Researchers (Ajzen and Fishbein, 1977; Kim and Hunter, 1993) have reported that while it is not the sole indicator, attitude is a factor in determining behaviour. Alexander (2003) in her results has shown strong ties between the cognitive and affective attributes of the learner and their impact on the acquisition and comprehension of information. Schrader and Lawless (2004) noted that, with these arguments in mind, a large number of scientists from different areas have ventured to adapt Bloom's taxonomy of instructional objectives into a multi-construct approach to the assessment that evaluates not only knowledge, but attitude and behavioural change as well.

Knowledge Regarding to Bloom's taxonomy, the cognitive domain of learning is concerned with knowledge and understanding. Within a domain, knowledge embodies all information that a person possesses or accrues related to a particular field of study (Alexander, and Dochy, 1995; Alexander et al., 1995; Alexander and Jetton, 2000). Knowledge is generally defined as comprising three forms: (1) declarative, or knowing what, (2) procedural, or knowing how, and (3) conditional, or knowing when and why. (Schrader and Lawless, 2004)

Attitudes The concept of attitude has multiple meanings to researchers. Historically, the literature reveals two separate frameworks in which attitude is defined: behavioural and cognitive (see Ajzen & Fishbein, 1977, for a review). Allport (1967) and LaPiere (1967) define attitude in a behavioural sense, as a mental and neural state of readiness conditioned by stimuli directing an individual's response to all objects that it is related to. More contemporary psychologists have further expanded the understanding and definition of attitude (Albert et al., 1989; Ajzen, 1993; Gable & Wolf, 1993; Erwin, 2001) to include three components: cognitive, affective, and conative. The cognitive component is a belief or an idea associated with a particular psychological object. The affective component represents the individual's evaluation of the psychological object as well as the emotion associated with that object. The conative—or behavioural—component represents the overt action or predisposition toward action directed toward that object. (Schrader and Lawless, 2004, pp. 10-11)

Behaviour The behaviour is an observable action and the definition used by researchers is the way in which a person, organism, or a group responds to a certain set of conditions. Although this understanding is simple, researchers have defined a multitude of assessment techniques to record and measure behaviour.

What an individual knows may inform the attitude about that topic, and how a person feels about that topic may influence behaviour. Alternatively, attitudes can also be aligned with behaviour. Accordingly, attitudes can impact what an individual perceives and therefore impacts knowledge gains. Schrader and Lawless (2004) concluded that the relationship between these three dimensions—knowledge, attitude, and behaviour—is dynamic and sometimes reciprocal.

2.3 Financial Literacy in context - Estonian and Finnish background

There are a number of factors whose effect we cannot assess yet. Good knowledge cannot always result in wise financial behaviour. For instance, there is proof from a study undertaken in 14 countries by OECD (2012), where Estonians are ranked in the second group in financial knowledge and last in behaviour; Estonians exhibited significantly lower levels of behaviour than people in all other countries, except Albania (Atkinson & Messy, 2012).

Earlier studies in Estonia among adults (Faktum & Ariko, 2010; Kann, 2010) have shown that elementary level of financial literacy was not a problem, because it was compensated by Estonians conservative behaviour of the money matters. Problems were raised together with a need for using long-term financial services and calculations. Study results from 2015 showed that the financial literacy level of the Estonian population indicates an upward trend. People's perception of interest and its calculation, as well as investment awareness have been improved over the previous five years and the amount of families who account their incomes and expenses, i.e., draw up a household budget (2010 33%, 2012 39% and 2015 44% of participants) have been on a steady increase. (Saar Poll, 2015)

In 2012, Estonian students participated in the first large-scale international study to assess the financial literacy of young people, PISA 2012[3], which was taken in 18 countries and economies. 1088 students took the test and achieved a mean score of 529 points, which was significantly above the OECD mean (500 points) score. A disturbing fact in the results was the gap between the groups with different languages spoken at home, as students who spoke Estonian at home had the mean score 46 points higher than students with other languages spoken at home. There were no remarkable differences in girls' and boys' financial literacy in any participated country but according to the results of boys and girls in math and reading tests, out of the students with similar scores, boys had a higher level of financial literacy in 12 of 18 countries, including Estonia. (OECD, 2014)

Analysis of the financial literacy of students at Estonian universities in 2012 showed that the level of financial literacy of students was low and that the interest of students in long-

[3] Programme for International Student Assessment (PISA); PISA 2012 financial literacy assessment, was administered to approximately 29.000 students in 13 OECD countries and 5 economies (Australia, the Flemish Community of Belgium, the Czech Republic, Estonia, France, Israel, Italy, New Zealand, Poland, the Slovak Republic, Slovenia, Spain and the United States) and five partner countries and economies (Colombia, Croatia, Latvia, the Russian Federation and Shanghai-China) (OECD_2014).

term planning was not remarkably high. 51.0% of the respondents had low financial literacy and only 3.4% planned their finances for several years. The survey revealed that females as well as non-Estonians younger than 26 years and students in non-economic disciplines had lower financial literacy level. (Mändmaa and Zhiguleva, 2013; Publication I) University students in science or mathematics-oriented subjects had higher financial knowledge, especially male students. (Mändmaa, 2019)

The Finnish study conducted in 2014 was the first representative study of financial literacy in Finland. The sample (1477 observations) had respondents aged from 18 to 92 and the results were presented separately for the entire sample and for those between the ages of 25 and 65. The researchers reported that the overall level of financial literacy in Finland was relatively high, though it was unequally distributed, as some groups (e.g., the elderly, women, and the less educated) had clearly lower levels of financial literacy. Concerning the interest rate for the entire population, 58% of the respondents provided the correct answer (the ages between 25 and 65, 61%), the question about inflation was answered correctly by 77% of the entire population (ages between 25 and 65, 78%), and the question about risk and diversification was answered correctly by 66% of Finns overall (the ages between 25 and 65, 68%). Furthermore, evidence was found of a positive relationship between financial literacy and retirement planning among women but not among men. The results indicated that scaling down publicly guaranteed pension benefits may pose a challenge to the less financially literate segment of the population. (Kalmi and Ruuskanen, 2018)

In 2018, for the first time in Finland, the financial literacy of 15-year-olds was measured as part of the PISA 2018[4] survey, where Finnish students' knowledge showed a high level. On performance in the assessment, an average financial literacy performance in Estonia, score 547, was higher than that in every other participating country/economy, followed by performance in Finland, score 537, while OECD mean score 505 was markedly lower. The gender differences of financial literacy were small between boys and girls in the participated OECD countries/economies, included Estonia and Finland. Boys scored 2 points higher than girls in the PISA 2018 financial literacy assessment on average, and after accounting for performance in mathematics and reading, boys outperformed girls by 10 points.

In the OECD/INFE International Survey of Adult Financial Literacy Competencies[5], the overall levels of financial literacy were found relatively low, indicated by combining

[4] Thirteen OECD countries and economies and seven partner countries participated in the PISA 2018 assessment of financial literacy. Some 117 000 15-year-old students sat the test, representing around 13.5 million students. (OECD, 2020)

[5] OECD/INFE International Survey of Adult Financial Literacy Competencies published in 2016:
Thirty countries and economies, including 17 OECD countries, participated in this international survey of financial literacy, using the OECD/INFE toolkit to collect cross-comparable data. In total, 51,650 adults aged 18 to 79 were interviewed using the same core questions, in a total of 30 languages. This report provides high-level highlights of the survey's findings focusing on relevant aspects of financial knowledge,

scores on knowledge, attitudes and behaviour, which showed significant room for improvement. The average score across all participating countries was just 13.2 out of a possible 21 (a combination of a maximum of 7 for knowledge, 9 for behaviour and 5 for attitudes), and 13.7 across participating OECD countries, also included Estonia 13.4 (5.3; 4.9; 3.2) and Finland 14.8 (5.2; 6.3; 3.3). Financial literacy includes a number of behaviors that can promote financial well-being. Some of these behaviors, like budgeting and saving, included to the Students financial literacy questionnaire, were used for the assessment of the situation in students' financial literacy in the current research.

Budgeting as a component of financial literacy is widely accepted as a valuable tool for money management. The results published in 2016 about OECD/INFE International Survey of Adult Financial Literacy Competencies showed that across all participating countries and economies, 60% of households, on average, had a budget (57% of households across participating OECD countries), including Estonia with 43% and Finland with 63%.

Active savers exhibit a behavior that can help them to smooth income and expenditure flows, thus supporting their budgeting behavior. According to the result of the OECD/INFE 2016, there were 40% of active savers in Estonia and 61% in Finland. (the average in all participated countries was 59% and OECD countries 60%).

The survey results reflected some gender differences in financial knowledge, based on the assessed minimum target score (5 or more). Among Estonian respondents, 73% of women and 74% of men exceeded the target score and for Finnish respondents, 65% of women and 75% of men, while OECD averages were 56% and 69%, respectively. (OECD, 2016)

2.3.1 **Estonia**

Estonia is a country in Northern Europe with a population of 1.3 million. The official language is Estonian, which belongs to the Finnish branch of the Ural languages and is closely related to the Finnish language spoken in Finland. These two are both among the few European languages that are not of the origin of Indo-Europe. Estonia declared the independence in 1918 and in 2018, the Republic of Estonia celebrated its 100th birthday, although the land was occupied by the Soviet Union nearly for 50 years (till 1991). Estonian GDP was 20.342 billion euros at the start of collecting data for the studies, in the year 2015 (Bank of Estonia, 2019). Estonia has been a member of the European Union (EU) since 2004 and joined to the euro area in 2011 (European Union, 2019). Since 2004, Estonia has been a member of NATO, allowing Estonia to participate productively in international security co-operation, which represents the most certain guarantee of Estonia's national defence. Estonia joined the OECD in 2010. OECD has categorized

behaviour, attitudes and inclusion, and insights into the financial literacy of the population and their needs in terms of education and other forms of support.

Estonia as a high-income country and described it as “excellent business environment, high educational attainment, high labour market participation, an innovative ICT sector and solid public finances” (OECD, 2017, p. 10). However, there is substantial income inequality in Estonia and the gender pay gap is the largest in the EU (Eurostat, 2017). Estonia was at the 19th position among the EU countries at the start of collecting data with an average monthly net salary 923 USD[6]. (ReinisFischer)

The history of formal education in Estonia dates back to the 13th and 14th centuries when the first monastic and cathedral schools were founded; the oldest university is the University of Tartu, established by the Swedish king Gustav II Adolf in 1632[7].

Education plays a key role in providing individuals with the knowledge, skills and competences needed to participate effectively in society and in the economy as well as finding a job and earning enough money. A well-educated and well-trained population is essential also for a country's social and economic well-being. In Estonia, 89% of adults aged 25-64 have completed upper secondary education (85% of men and 92% of women have successfully completed high school), which is higher than the OECD average of 78% and one of the highest rates in the OECD. Furthermore, 30% of Estonian population has a university or college degree. (OECD, BLI[8]; Statistics Estonia)

The OECD's Programme for International Student Assessment (PISA) reviews the extent to which students have acquired some of the knowledge and skills that are essential for full participation in modern societies. In the 2015 PISA tests, Estonia had the fifth position among OECD countries in reading literacy, maths and sciences. The average student scoring 524 was notably above OECD average. In the 2018 PISA test, Estonian students again ranked on the high, fifth position, with an average score 525.3. (FactsMaps)

In 2020 there were 18 higher education institutions, and the number of students was 45259 in Estonia. (Statistics Estonia)

2.3.2 **Finland**

Finland is a country in Northern Europe with a population of 5.5 million. The native language of 87.3% of the population is Finnish. Finnish is closely related to Karelian and Estonian and more remotely to the Sami languages and Hungarian. Despite some overlaps in the vocabulary, in terms of its origin, Estonian and Finnish languages are not related to their nearest geographical neighbours, Swedish, Latvian, and Russian, which are all Indo-European languages. Throughout history, Finland, like Estonia, has been part of the Kingdom of Sweden and the Russian Empire.

[6] An average monthly gross wage in Estonia 2015 was 1065 EUR (Statistics Estonia)
[7] The university courses were first taught in Estonian language in 1919. (https://en.wikipedia.org/wiki/Estonia#Education_and_science)
[8] Better Life Index (BLI) (http://www.oecdbetterlifeindex.org)

From the end 13th century, Finland gradually became an integral part of Sweden as a consequence of the Northern Crusades. In 1809, Finland was annexed by Russia as the autonomous Grand Duchy of Finland. The first university in Finland (Royal Academy of Turku) was founded in 1640. In mid-19th century, Finnish became an official language, and gradually replaced Swedish as the schooling language. In 1898, everyone was given the right to attend kansakoulu[9].

Finland became a presidential republic in 1919 and the Finnish–Russian border was defined in 1920 by the Treaty of Tartu. Finnish democracy did not experience any Soviet coup attempts. Finland joined the OECD in 1969, the NATO Partnership for Peace in 1994, the European Union in 1995, and the Eurozone at its inception in 1999.

Finnish GDP was 234.4 billion USD at the start of collecting data for the research in 2015, and among the EU countries Finland was at the fourth position with an average monthly net salary 2553 USD. (OECD Data; ReinisFischer)

Finland has one of the world's most extensive welfare systems that guarantees decent living conditions for all residents: Finns, and non-citizens. Compared to other OECD countries, Finland ranks at the top in education and skills and subjective well-being, and above average for the other dimensions, like income and wealth, jobs and earnings, health status, environmental quality, personal security, social connections, housing and work-life balance but below in civic engagement. In Finland**,** 88% of adults aged 25-64 have completed upper secondary education, which is higher than the OECD average of 78% (85% of men have successfully completed high school compared with 91% of women). 38% of Finnish population has a university or college degree, which is among the highest percentages in the world. (OECD BLI)

Education is free and living expenses are largely financed by the government through student benefits. There are 14 universities in Finland and in 2015 there were 157,436 registered students (of which 73,815 male and 83,621 female) and in 2020 the number of students was 156,577, including 71,049 male and 85,528 female students. (Statistics Finland)

Finland is a top-performing country in terms of the quality of its educational system. Finns' educational level is high, which is evidenced in the PISA surveys. The average score of PISA 2015 Mathematics, Science and Reading tests was 522.7 and position 8. In PISA 2018, with participants from 78 nations, the Finnish students average score of Mathematics, Science and Reading was 516.3 and the position was 10. (FactsMaps, n.d.)

[9] The early educational system under Swedish rule was in Swedish and consisted of a basic "pedagogio" for teaching reading and writing, a trivial school teaching grammar, Latin, Greek, rhetoric and dialectics, a gymnasium preparing for university, and the university. In the 19th century, the system evolved into what was later known as kansakoulu ("people's school") and oppikoulu ("learning school"), including high school (lukio), followed by university.

3 Methodology

3.1 Paradigm

The research paradigm is considered to reflect the researcher's basic epistemological, ontological, and methodological beliefs (Guba, 1990; Lincoln, 1998). Epistemology deals with the sources, nature, and limitations of knowledge. The ontology raises the question of the nature of reality. The methodology focuses on how we gain knowledge of the world around us (Guba and Lincoln, 1989; Lincoln et al., 2011).

Ontology refers to 'the science or study of being' aiming at encompassing 'claims about what exists, what it looks like, what units make it up and how these units interact with each other' (Blaikie, 1993, p. 3). In simple words, this branch is a science of being that describes one's worldview and assumptions on the nature of reality, which can be both objective and subjective.

However, ontology and its ideas lead to and raise another set of important questions. How is the reality measured? What constitutes knowledge of reality? How does one know where the reality is? The answers to these questions are provided by epistemology.

Epistemology accompanies ontology in its attempt to define reality. Easterby-Smith, Thorpe and Jackson (2008) assert that epistemology considers the most appropriate methods of enquiring into our natural world, and Eriksson & Kovalainen (2008, p. 37) think that it answers the question 'what is knowledge and what are the sources and limits of knowledge' and discuss how it defines the ways of producing and arguing for knowledge.

From an ontological point of view, proponents of the paradigmatic approach find that conventional beliefs of positivism[10] are related to realism[11], and beliefs of constructivism are related to relativism[12]; epistemological beliefs are based on objectivism[13] for

[10] Positivism is a philosophical theory that states that genuine knowledge (knowledge of anything that is not true by definition) is exclusively derived from experience of natural phenomena and their properties and relations. Thus, information derived from sensory experience, as interpreted through reason and logic, forms the exclusive source of all certain knowledge. Positivism therefore holds that all genuine knowledge is a posteriori knowledge. Verified data (positive facts) received from the senses are known as empirical evidence; thus positivism is based on empiricism. (Wikipedia)

[11] Realism in the philosophy of science, or scientific realism, is the view that theoretical objects really exist and that scientific theories are approximately true. In general language, realism means taking reality into account. (Wikipedia)

[12] Relativism is a family of philosophical views which deny claims to objectivity within a particular domain and assert that facts in that domain are relative to the perspective of an observer or the context in which they are assessed. (Wikipedia)

[13] Objectivism as "a philosophy for living on earth", based on reality, and intended as a method of defining human nature and the nature of the world in which we live. (Wikipedia)

positivism and subjectivism[14] for constructivism; and methodologically, positivism is based on interventionist/experimental methods, and constructivism is based on hermeneutical methods (i.e., methods of interpretation).

Tashakkori and Teddlie (1998) note that there have been several paradigm wars in the social sciences, emphasizing the importance of one or the other paradigm over another. They call these social science paradigms or models a positivist / empiricist approach and a constructivist / phenomenological orientation.
Additionally, these two paradigms are characterized as follows:

- qualitative and quantitative research paradigm,
- constructivist and positivist,
- fixed and flexible, etc.

The constructivist paradigm is also synonymous with the interpretive or interpretive and naturalistic paradigm, although here, too, there are different opinions and some authors, for example, tend to see differences in interpretive and constructivist approaches.

There is no consensus on what constitutes a paradigm, how many paradigms exist, and whether a researcher should follow one paradigm or have the freedom to choose which paradigm he or she wishes to represent (Tashakkori and Teddlie, 1998).

In the 1990s, there was a widespread spread of qualitative methods in social sciences. Constructivism as a qualitative approach presupposes that reality is socially constructed. For constructivists, knowledge is not an objective and passive reflection of the real world but constructed by people in a linguistic-cultural and historical context. Constructivism is based on an ontology based on relativism. Constructivist researchers find that the researcher's task is to understand the diverse social constructions of the world of knowledge and meaning, and they use research methods such as interviews and observations that allow them to gain diverse perspectives to understand it. According to a constructivist approach, participants in scientific research help to construct so-called "reality" with the researcher (Robson, 2002). Research in the field of cognitive neuroscience shows that our physical structure influences what and how we know (Rizzolatti et al., 1997).

The positivist paradigm separates reality from the knowledge of it (i.e., subject from object) and provides an objective reality against which researchers can compare their claims and ascertain truth. The positivist approach tests hypotheses that were developed from existing theory through measurement of observable social realities and presumes the social world exists objectively and externally. Being based upon values of reason, truth and validity, positivism focuses on facts exclusively and controls that these are gathered and measured properly – using empirical quantitative methods such as survey

[14] Subjectivism is the doctrine that "our own mental activity is the only unquestionable fact of our experience", instead of shared or communal, and that there is no external or objective truth. (Wikipedia)

and experiments and statistical analysis (Blaikie, 1993; Saunders, Lewis and Thornhill, 2007; Easterby-Smith et al., 2008; Eriksson and Kovalainen, 2008).

Creswell has chosen to use the term of worldview instead of the term paradigm. He has described the worldview as a general philosophical orientation about the world and the nature of research that a researcher brings to a study. So, four of these worldviews that guide the research and are widely discussed in the literature are: post positivism, constructivism, transformative, and pragmatism. (Creswell, 2014)

The postpositivist assumptions have represented the traditional form of research and hold true more for quantitative research. This worldview is sometimes called the scientific method, or doing science research, or positivist/postpositivist research, or empirical science, and post-positivism. This last term is called post-positivism because it represents the thinking after positivism, challenging the traditional notion of the absolute truth of knowledge (Phillips and Burbules, 2000) and recognizing that we cannot be positive about our claims of knowledge when studying the behaviour and actions of humans. (Creswell, 2014) Postpositivists believe that a reality exists, but, unlike positivists, they believe that reality can be known only imperfectly and probabilistically. (Wikipedia)

Constructivism or social constructivism (often combined with interpretivism) is typically seen as an approach to qualitative research, as already described above. Social constructivists believe that individuals seek understanding of the world in which they live and work. The researcher's intent is to make sense of (or interpret) the meanings others have about the world. Rather than starting with a theory (as in postpositivism), inquirers generate or inductively develop a theory or pattern of meaning. (Creswell, 2014)

A transformative worldview holds that research inquiry needs to be intertwined with politics and a political change agenda to confront social oppression at whatever levels it occurs (Mertens, 2010). This standpoint arose during the 1980s and 1990s from individuals who felt that the postpositivist assumptions imposed structural laws and theories that did not fit marginalized individuals in our society or issues of power and social justice, discrimination, and oppression that needed to be addressed. There is no uniform body of literature characterizing this worldview, but it includes groups of researchers that are critical theorists; participatory action researchers; Marxists; feminists; racial and ethnic minorities; persons with disabilities; indigenous and postcolonial peoples; and members of the lesbian, gay, bisexual, transsexual, and queer communities. This philosophical worldview focuses on marginalized or disenfranchised groups and individuals in our society. The theoretical perspectives may be integrated with the philosophical assumptions that construct a picture of the issues being examined, the people to be studied, and the changes that are needed, such as feminist perspectives, racialized discourses, etc. (Creswell, 2014)

Current research is founded on a worldview of pragmatism. Pragmatism began in the United States in the 1870s and its origins are often attributed to the philosophers Charles

Sanders Peirce, William James, and John Dewey. Murphy (1990), Patton (1990), and Rorty (1990) are known as contemporary authors. "Pragmatism is a philosophical tradition that considers words and thoughts as tools and instruments for prediction, problem solving, and action, and rejects the idea that the function of thought is to describe, represent, or mirror reality." (Wikipedia) Pragmatists contend that most philosophical topics—such as the nature of knowledge, language, concepts, meaning, belief, and science—are all best viewed in terms of their practical uses and successes. There are many forms of this philosophy, but for many, pragmatism as a worldview arises out of actions, situations, and consequences rather than antecedent conditions (as in post positivism). There is a concern with applications—what works—and solutions to problems (Patton, 1990). Instead of focusing on methods, researchers emphasize the research problem and use all approaches available to understand the problem (see Rossman and Wilson, 1985). As a philosophical underpinning for mixed methods studies, Morgan (2007), Patton (1990), and Tashakkori and Teddlie (2010) convey its importance for focusing attention on the research problem in social science research and then using pluralistic approaches to derive knowledge about the problem. Using Cherryholmes' (1992), Morgan's (2007), and Creswell's (2014) views, pragmatism provides a philosophical basis for research:

• Pragmatism is not committed to any one system of philosophy and reality. This applies to mixed methods research in which inquirers draw liberally from both quantitative and qualitative assumptions when they engage in their research.
• Individual researchers have a freedom of choice. In this way, researchers are free to choose the methods, techniques, and procedures of research that best meet their needs and purposes.
• Pragmatists do not see the world as an absolute unity. In a similar way, mixed methods researchers look to many approaches for collecting and analysing data rather than subscribing to only one way (e.g., quantitative or qualitative).
• Truth is what works at the time. It is not based on a duality between reality independent of the mind or within the mind. Thus, in mixed methods research, investigators use both quantitative and qualitative data because they work to provide the best understanding of a research problem.
• The pragmatist researchers look to what and how to research based on the intended consequences—where they want to go with it. Mixed methods researchers need to establish a purpose for their mixing, a rationale for the reasons why quantitative and qualitative data need to be mixed in the first place.
• Thus, for the mixed methods researcher, pragmatism opens the door to multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis. (Creswell 2014, p. 39)

Research on the three elements of financial literacy – financial knowledge, behaviour and attitudes – is conducted mainly in economics, finance, sociology and psychology, but there are also links to anthropology, management, marketing, and even to technology disciplines. Therefore, the emergence of both interdisciplinary and multidisciplinary research has become possible, where the Interdisciplinary means that "relevant parts (concepts, models, methods, findings) of different scientific disciplines are merged

together and neatly integrated" (Schoot Uiterkamp and Vlek, 2007, p. 176), and multidisciplinary entails looking at the topic from different disciplines without substantial integration (Huutoniemi et al., 2010). Until recently, the economists worked on financial literacy topics without partnering with psychologists or sociologists, and vice versa. With the development of economic psychology and behavioural economics, however, this has started to change (Ferreira, 2011) and researchers that had previously analysed financial literacy purely from an economist´s perspective, have started to incorporate behavioural insights in their studies (e.g., Ambuehl et al., 2017). Economists studying financial decisions have begun to add psychological factors into their models, and psychologists have started studies of decision-making in financial contexts. Lutz (1989) has interpreted such a change in the dominant paradigm as an evolutionary paradigm shift.

Behavioural scientists have been employed by the governments of several countries to help policymakers improve the citizens´ financial behaviour. The behavioural insights teams counselled the governments, for example, in the UK, Germany, and also the European Commission (The Behavioural Insights Team, 2015; Lourenço et al., 2016). Hence, there has been a paradigm shift in policy, just as it occurred in financial literacy research that was mentioned above.

Behaviour change could start from admitting the heuristics and biases affecting decisions; generate awareness and assist people to understand their own behaviour could be the first step towards overcoming these obstacles. Fornero (2015) has suggested a new paradigm: reform, inform and educate. The design of the reforms and educational programmes should learn from behavioural sciences and improve the choice architecture of such complicated decisions. Information about pension reforms should be clearly communicated in human language and done so persistently to reach everyone, despite the information overload. The same applies to providing financial education, where the participants should be nudged towards behaviour change already during the course, to ensure the effectiveness of the programme. Today, there are many tools, apps and impartial websites available, the key is to find motivation for looking into the matter. For making informed choices, people need help and financial education using interactive tools can help to visualize life (for example, after retirement), and to find motivation. (Fornero, 2015)

3.2 Research process

The research was started by pilot study among Estonian university students with sample size of 522 students (Publication I) after that the questionnaire was changed and the principles for samples were confirmed and the methodology was chosen.

3.2.1 **Research design**

Current dissertation uses Mixed Methods Research (MMR) design, which is a procedure for collecting, analysing, and "mixing" both quantitative and qualitative data at some stage of the research process within a single study, for understanding a research problem more completely (Creswell and Plano Clark, 2006; Creswell, 2014).

In a mixed methods approach, the researchers are using pragmatic grounds (Maxcy, 2003) and asserting that truth cannot be purely calculated but is rather "what works" in reality (Howe, 1988). "Pragmatism is a philosophical movement that includes those who claim that an ideology or proposition is true if it works satisfactorily, that the meaning of a proposition is to be found in the practical consequences of accepting it, and that unpractical ideas are to be rejected." ("Pragmatism", n.d.)

The field of mixed methods research is relatively new and early thoughts about the value of methods mixing was hidden in the idea that all methods had bias and weaknesses, and the collection of quantitative and qualitative data could neutralize the weaknesses of both form of data. So, triangulating data sources was born - a means for seeking convergence across qualitative and quantitative methods (Jick, 1979). By the early 1990s, mixed methods turned toward the systematic convergence of quantitative and qualitative databases, and the integration to different types of research designs appeared. These types of designs were extensively discussed in a major handbook addressing the field in 2003 (Tashakkori & Teddlie, 2010).

Many designs exist in the mixed methods area but the next three are the primary models used in social sciences today:

• Convergent parallel mixed methods are a form of mixed methods design where the investigator typically collects both forms of data at roughly the same time and then integrates the information in the interpretation of the overall results. Contradictions or incongruent findings are explained or further probed in this design.
• Explanatory sequential mixed methods are a form in which the researcher first conducts quantitative research, analyses the results, and then builds on the results to explain them in more detail with qualitative research. It is considered explanatory because the initial quantitative data results are explained further with the qualitative data. It is considered sequential because the initial quantitative phase is followed by the qualitative phase.
• Exploratory sequential mixed methods are the reverse sequence from the explanatory sequential design. In the exploratory sequential approach, the researcher first begins with a qualitative research phase and explores the views of participants. The data are then analysed, and the information is used to build into a second, quantitative phase. (Creswell 2014)

This research focuses on the Explanatory sequential mixed methods design, as it is "one of the most popular mixed methods designs in educational research" (Creswell et al., 2003; Creswell, 2014) and sounds most suitable for current topics. The design involves a

two-phase project in which the researcher collects quantitative data in the first phase, analyses the results, and then uses the results to plan the second, qualitative phase. The quantitative results typically inform the types of participants to be purposefully selected for the qualitative phase and the types of questions that will be asked. (Creswell, 2014) The purpose to use the Explanatory sequential mixed methods design in the present study is that the qualitative results assist in explaining and interpreting the findings of a quantitative study.

The quantitative phase of the current research focuses on university students' financial literacy level, factors influencing the level, students' interest to acquire additional knowledge, participants' ratings about own personal financial knowledge and sources of personal financial education. The data collection method was a questionnaire survey, to gather as standardized information as possible about many students that can be analysed statistically.

The qualitative phase of research aspires to explain the needs and gaps in financial knowledge and education, as the results from the quantitative phase have shown the deficit of financial knowledge among students. While the origin for the qualitative study is the description of real life, an unstandardized focus group interviewing technique (method) was chosen for collecting the information. Focus groups are less threatening to research participants, and it is suggested that the environment is helpful for participants to discuss perceptions, ideas, opinions, and thoughts (Krueger and Casey, 2015) and the interactions among the participants can yield important data (Morgan, 1998).

The quantitative part of this research design is rather represented by the exploratory study where a deductive approach is used. However, the qualitative part, which creates new knowledge, takes an inductive approach.

Figure 3 "Visual Model for Mixed Methods Procedures" illustrates the research strategy.

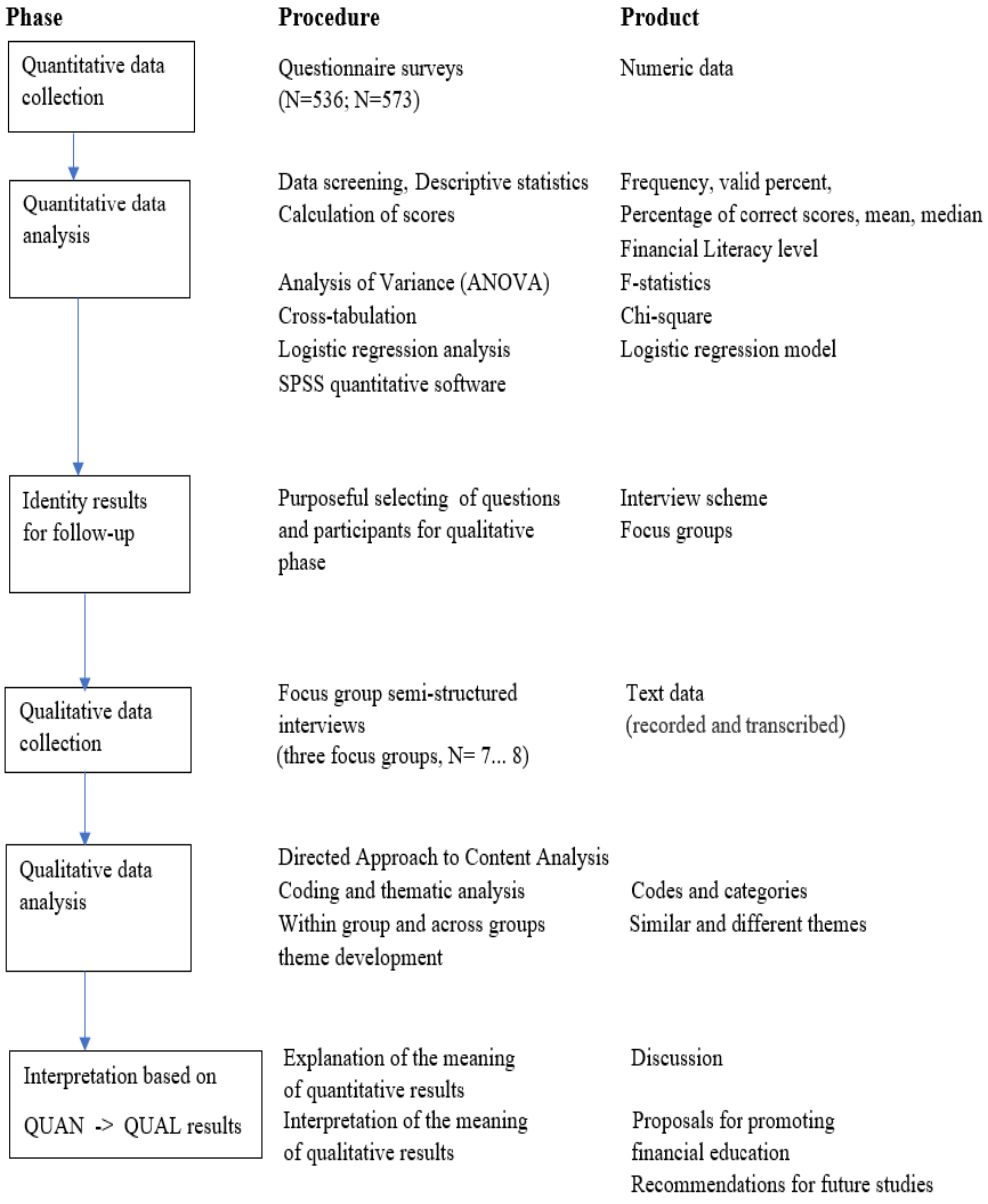


Figure 3 Visual Model for Mixed Methods Procedures (Sequential Explanatory Mixed Methods Design)

Notes: QUAN is abbreviation for Quantitative; QUAL is abbreviation for Qualitative

Source: Composed by the author

3.2.2 Quantitative data collection

Hirsijärvi and Huttunen argue that a questionnaire survey is a method that is appropriate for use in quantitative research for gathering data and is a good choice if the characteristics, preferences, opinions, or beliefs of a group of people are the centre of interest. (2005)

In the first, quantitative phase of this study, a standardized survey method was used for data collection to assess the participants' financial literacy and factors influencing that. The questionnaire covered major aspects of personal finance, including knowledge on general personal finance, saving, borrowing, investment, and insurance, and additionally, questions about students' financial choices, opinions, and assessments for acquired financial knowledge and education.

A questionnaire is a research instrument consisting of a set of questions intended to capture responses from respondents in a standardized manner, where structured questions are asked from respondents to select an answer from a given set of choices. (Bhattacherjee, 2012)

This survey used multiple-choice questions, including 12 questions on socio-demographic data, 22 questions to measure financial literacy and six questions to clarify financial choices, opinions and assessments, including students' self-assessments. Appendix A "Questions for data collection" presents the questions used in this research.

The questions were chosen similar to those of surveys conducted in a number of other countries, which enabled comparisons within and across the country. The issues varied in difficulty, although none of them was excessively complex nor required expert knowledge.

The questions originated mainly from approved financial literacy questionnaires. Eight questions were selected from the questionnaire used by Chen and Volpe (1998) to assess US students' financial literacy, which has been used by several researchers in their studies as well. The questions from "A simple financial literacy module", which was designed in 2004 for the American Health and Retirement Study (HRS) by Lusardi and Mitchell (2011) have been included (three questions, with one small correction) to the current study. These three questions have proved effective in measuring knowledge of simple but fundamental financial decision-making concepts. Two of them have been used in the OECD 2012 study questionnaire. The present survey used seven questions of eight possible from the OECD 2012 questionnaire. Since participants from universities of technology have high level of knowledge in mathematics, the question about division (Question no. 1 in OECD 2012 knowledge questions) was omitted.

The validity and clarity of the survey were previously evaluated by a group of master level students and by three experts knowledgeable in personal finance areas.

The polls were conducted during the lectures in the paper form. That form was chosen because internet or mail-based surveys might provide the respondents with an opportunity to present improved knowledge, thereby overstating their true knowledge; in addition, that form supported the increase of participant number. The respondents answered anonymously and as there was no need to worry about confidentiality, these responses could be more reliable.

The sample used in the quantitative phase was composed of students studying in universities of technology. The selection of universities was based on convenience that was driven of readiness for cooperation.

Purposive sampling was used, where the main criterion for the selection of respondents was study at a mathematics-based academic discipline (Engineering Science, Economics, Business) in university. Showkat and Parveen (2017) pointed out that purposive sampling is a non-probability sampling method where the researcher chooses the participants as per own judgment, keeping back in mind the purpose of the study. Non-probability sampling technique uses non-randomized methods to draw the sample, and that sample is used to study existing theoretical insights or developing new ones.

The sample size was planned to be 1000-1200 students, more precisely 500-600 respondents from both participating countries. The actual size of the sample used to evaluate students' financial literacy and influencing factors, and to gather their estimates about the financial knowledge acquired was 1110 students. Participants were from two countries. From Finnish two universities, 574 (426 male and 148 female) students were participating: 321 (250 male and 71 female) students from Tampere University of Technology and 253 (176 male and 77 female) students from Lappeenranta University of Technology. From Estonia, the number of survey participants was 536 (326 male and 210 female students) and all of them were students in Tallinn University of Technology.

The characteristics of the sample are presented in Appendix B "Characteristics of the quantitative study Sample".

3.2.3 Qualitative data collection

Qualitative study seeks first and foremost to find and present facts to the public, rather than to prove already existing (truth) claims. (Hirsijärvi et al., 2005)
In the second, qualitative phase of the study, the focus group interview form was chosen for data collection to explain the students' ratings to acquired financial knowledge to enable appropriate enhancement in financial education.

Traditionally, focus group research is "a way of collecting qualitative data, which involves engaging a small number of people in an informal group discussion (or discussions), 'focused' around a particular topic or set of issues" (Wilkinson, 2004, p. 177). Grönfors (1982, p. 109) has acknowledged that interviewees feel more relaxed and that their talk is more reliable when several people are present. A focus group interview

is a conversational group interview conducted according to a structured survey plan, which has a definite, rather narrow focus on the topic and the goal of achieving mutual stimulation from the informants participating in the conversation. The focus group is led by a moderator whose mission is to keep the conversation within specific time and topic frames and to create and preserve an atmosphere free from social pressure.

Grönfors (1982, p. 109) has recognised that interviewees feel more relaxed and that their talk is more reliable when several people are present. A focus group interview is a conversational group interview conducted according to a structured survey plan, which has a definite, rather narrow focus on the topic and the goal of achieving mutual stimulation from the informants participating in the conversation. The focus group is led by a moderator whose task is to keep the conversation within specific time and topic frames and to create and maintain an atmosphere free from social pressure. The focus group size can range from 4 to 12 participants (Krueger, 1994; Krueger and Casey, 2015). The rationale for the range of focus group size stems from the goal that focus groups should include enough participants to yield diversity in the information provided, yet they should not include too many participants because large groups could make the sharing of personal thoughts, opinions, and beliefs uncomfortable. (Krueger and Casey, 2015; Onwuegbuzie et al. 2009; Vaughn et al., 1996)

To collect data in the qualitative phase of the present study, an unstandardized focus group interviewing technique (method) was chosen. To reach saturation, three different focus groups were used, while each group met once. Focus groups were formed on the bases of university students participating in the quantitative phase (i.e., survey) and the size of groups was 7 to 8 participants. The focus group meetings (i.e., group interviews) took place in spring semester 2016 and interviews lasted an average of two hours. The interviews were semi-structured, conducted according to the survey plan (Table 1), led by a moderator. To create a comfortable atmosphere and interaction, the moderator was a bachelor's student in the third year economics programme.

Table 1 Semi-structured interview guide

No	**Question**
	Research question:
I	How can the statistical results obtained in the quantitative phase be explained?
	Sub-questions:
1.	How do students evaluate their financial knowledge
2.	Would their financial skills - knowledge (about budgeting/ saving / borrowing / investing etc.) need to be improved?
3.	Where does students' knowledge come from (family/ basic school/ upper secondary school/ university etc.)?
4.	What did they learn from knowledge providers and what could have been different?

	Research question:
II	How could financial education be improved?
	Sub-questions:
5.	Should borrowing be taught?
6.	Should saving be taught?
7.	Should budgeting be taught - how to create and maintain a budget?
8.	Should the happenings in financial markets be taught?
9.	Should investing be taught?
10.	Should the assessment of the financial condition and value of a company be taught?
11.	Summary:
	a) When and who should teach? At what age?
	b) How should be taught? Should it be a special subject - Personal finance?
	c) What knowledge would be needed (Interests)?

Source: Composed by the author (Publication V)

Based on the principles of the strategic sample (Trost, 1986; Laherand, 2008), the subjects were selected according to a combination of homogeneous and heterogeneous characteristics. In this phase of research, students' opinions in relation to the acquisition of financial knowledge were looked at, with the aim to differentiate the sample by the participant's field of study (the heterogeneous feature of the sample), while previous experiences were relatively similar, i.e., all students had exposure to financial knowledge and participated in a university financial literacy survey (these were homogeneous features of the sample).

Flick (2009) and Onwuegbuzie et al. (2009) have recommended using multiple focus groups to assess if the themes that emerged from one group also appeared from other groups, which assists the researcher in reaching data saturation and/or theoretical saturation. In the present study, to reach saturation, three different focus groups from different study fields (Civil Engineering, Business/Economics, International studies) were used.

The focus groups were selected on the bases of findings from the quantitative part of the study and the results of previous studies (Chen and Volpe, 2002; Mandel, 2008; Publication II, III, IV). Differences in students' financial literacy between different academic disciplines, and in addition, different nationalities were taken into account. The size of groups was 7 to 8 students, and the focus groups included all together 22 participants of them 10 male and 12 female students aged 18 to 30.

3.2.4 Data analysis

In the quantitative phase of this study, the responses from each participant were used to calculate the mean percentage of correct scores for each question and the entire survey. Consistent with the existing literature (Chen & Volpe, 1998; Mändmaa, 2019), the mean percentage of correct scores was grouped into three categories. The first category represented a relatively high level (more than 80%) of knowledge, the second a medium (60% to 79%) and the third a relatively low level (below 60%) of knowledge. Earlier research suggested that levels of financial literacy vary among subgroups of students (Chen and Volpe, 1998). To provide further evidence of the differences, this study used the Analysis of variance (ANOVA).

Several studies throughout the world report that females have lower level in financial literacy than males. To find evidence and understand whether the financial education should be taught to male and female students differently, students' responses, choices (financial planning and services using), opinions and self-assessment, were analysed by gender.

An earlier study conducted by Mandell (2008) revealed that students who study science and engineering have the highest financial literacy scores because they learn how to do research and solve problems. Previous studies (for example, Chen and Volpe, 2002) also have linked mathematics skills to higher levels of financial literacy. To find out whether the current study confirms the above statements, the connections with students' financial literacy level and field of study were further investigated and compared by using the Cross-tabulation, Chi-square tests and ANOVA.

The differences in financial literacy (i.e., correct responses) scores were analysed further using the logistic regression analysis. The participants were divided into two groups using the median percentage of correct answers. Students with scores higher than the sample median were classified as students with relatively higher (More) knowledge coded as “1” and students with scores equal or below the median were classified as those with relatively lower (Less) knowledge coded as “0”. This dichotomous variable, the Financial literacy level (More, Less), was used in the logistic regression as the dependent variable, which was explained by independent variables.

The independent variables used in this analysis included participants’ academic discipline, level of education, age, work experience, gender, household size, personal monthly income, parents' educational level, amount of books in childhood home, currently available financial services, including using the credit card, planning period of financial affairs, and participants’ interest to improve their financial literacy.

The logistic regression analysis was conducted separately for three times (1. entire sample; 2. male participants; 3. female participants) to detect if the independent variables have different effects on participants' financial literacy.

In order to assess the current financial education situation more effectively, the study focused on participants' interest to improve the financial literacy level, students' ratings about own personal financial knowledge and sources of personal financial education.

For the assessment of personal finance knowledge and knowledge providers, the rating scales from 1 to 5 were used. A similar technique (five-point scale) has been used repeatedly by other scientists, including Chen and Volpe (2002) and Mändmaa (2019). For comparability with financial literacy levels, the students' own knowledge rankings were converted to values: Low (1 and 2), Medium (3), High (4 and 5). The Analysis of Variance, Cross-tabulations and Chi-Square tests were used to provide evidence of the differences.

The collected data were analysed using the software Statistical Package for the Social Sciences (SPSS).

The directed approach of content analysis was chosen to analyse the collected qualitative data. Content analysis is a widely used qualitative research technique with three distinct approaches - conventional, directed, and summative. All three are used to interpret meaning from the content of text data, but there are differences among the approaches in the coding schemes, origins of codes, and threats to trust worthiness. In a directed approach, analysis starts with a theory or relevant research findings as guidance for initial codes. (Hsieh and Shannon, 2005, p. 1277) Hsieh and Shannon (2005) recommend a directed approach to the content analysis if the existing theory or prior research about a phenomenon is incomplete or needs further description.

The results of previous studies about the acquisition of students' financial knowledge were insufficient and further descriptions were needed to provide the whence for promoting financial education. In the current study, the data were collected through focus groups interviews, and all the interviews were recorded and transcribed.

Following Hsieh and Shannon's (2005) and Laherand's (2008) suggestions, coding was started with predefined codes. The initial coding scheme was established on the basic concepts of previous research and a coding legend was created as a continuation. Own code was created for each focus group member that included the information about the participant's education (academic discipline, level of study), gender and age (Appendix C). During the coding of the text, important and emphasized thematic concepts were identified and grouped into categories based on similarity. Laherand (2008) has pointed out that the main purpose of coding is to break down the text and understand it, to develop categories and to put them in an orderly system as the study progresses.

The guiding research questions for the qualitative phase with the categories and sub-categories created to aggregate the answers are presented in Table 2.

Table 2 Coding scheme - The guiding research questions and categories

No	Questions and categories
I	How can the statistical results obtained in the quantitative phase be explained?
	The assessment of acquired financial knowledge from:
1.	Family
2.	Basic school
3.	Upper secondary school
4.	University
II	How could financial education be improved?
1.	1.Topics
2.	2.Teaching process - tips and hints

Source: Composed by the author (Publication V)

The categories and codes were used to create two informative organized tables, the first focusing on the origin of students 'financial knowledge – where, what and how did they learn? was that knowledge important? what could have been differently? and the second on students' interest in improving their knowledge - what should be taught? who should teach? and when?. In addition to the coded text, the most substantive citations were presented in the tables, which both describe and refine the codes, thus creating a whole. These informative tables and the results of prior research were guiding the discussion about findings and helping prepare conclusions.

4 Results

4.1 Publication I – Financial literacy - what and why should we improve

This study was conducted as a pilot study to understand the actual level of university students' financial literacy and factors influencing that. Collection of the data was enforced among students studying in higher education institutions in Estonia in 2012. The questionnaire was filled in by 522 students (318 female and 204 male) from 13 educational institutions, including 12 public schools and one private school. More specifically, a standardized survey method was used, and the survey forms were distributed to five public universities; to six national institutions of the professional higher education; to one private higher education institution; and to one public vocational training institution (offering higher education programs).

The results showed insufficient financial knowledge. The overall mean of correct answers for the survey was 59%. By far the weakest area was investing, meaning a little knowledge of the link between the price of the bond and the interest rate. The study revealed that financial literacy of the students was affected by gender, nationality, age and academic discipline. Level of the education that students pursue, the household size, the work experience of the students, the personal monthly net income and the level of the parents education did not affect students' financial literacy level. 51% of the respondents had Low level of the financial literacy, 40% of the respondents had Medium level and only 47 students (9% of the respondents) had a High level of the financial literacy. Lower levels of the financial literacy were found among subgroups like women, non-Estonians, students from the age of 18-21 and students from non-economic disciplines. Students' interest for long-term planning was not high - only 3.4% of the students planned their financial affairs in advance for several years and 55.9% had considered retirement funding. The results showed that loans were not very popular among Estonian students as just 24.1% of the participants were credit card users and 26.1% had a bank loan. The study established that students have interest in getting more information about financial matters and improving their financial literacy.

On the basis of results obtained during the pilot study, it could be concluded that the level of students' financial literacy was low. Altintas (2011) and Chen and Volpe (1998) came to the same results in their financial literacy studies surveying the level of the financial literacy among Turkish and US students, respectively.

Previous studies conducted in Estonia did not show significant differences in financial literacy between women and men. There were also no significant differences between girls 'and boys' financial literacy skills, as reported by the PISA 2012 test results (OECD, 2014). Current study showed that men's financial literacy was higher than women's. The same results were presented by Atkinson et al. (2006) in surveying UK population, Chen and Volpe (1998) in researching US students, Lusardi et al. (2010) in interviewing US

young people, and Monticone (2010) in exploring Italian population. Wagland and Taylor (2009), who examined the level of Australian students' financial literacy, came to the result that the gender does not affect the level of financial literacy. Altintas (2011), whose study was conducted in Turkey, came to the result that females' financial literacy level was higher than men's.

Analyzing the impact of the nationality on financial literacy, it turned out that Estonians have a higher level of financial literacy compared to non-Estonians. The same results were obtained in Faktum and Ariko's (2010) financial literacy study and in PISA 2012 test results (OECD, 2014).

Current study revealed that students in an economic academic discipline have better financial literacy than students who do not learn in the economic direction. The same result was obtained by Chen and Volpe (1998). Altintas (2011) in his study exposed that academic discipline does not affect the level of financial literacy.

The results of this research (Publication I), earlier studies in worldwide and Mändmaa's (2019) paper, gave a direction for continue survey. Some needed changes appeared: first, widen the area (to two neighbour countries); secondly, narrow the sample (to mathematics based academical disciplines only); and thirdly, change the questionnaire to more comparable form.

4.2 Publication II - Empirical Study on Personal Financial Literacy of University Students for Develop the Financial Education

This study analysed the responses collected from Estonian university students by the survey questionnaire, in order to evaluate students' financial literacy to develop personal financial education. The study focused on the gender differences in financial knowledge and the choices and opinions that may affect the financial literacy. 536 students, 210 women, and 326 men from Tallinn University of Technology participated in the survey; according to the results, their financial literacy level was Medium.

Statistically significant results showed gender differences in financial literacy and on average female students knew more (69.1%) about personal finance than males (66.5%). The previous study among Estonian university students (Mändmaa, 2019) revealed that men had a higher level of financial literacy than women. Similar results were obtained by Atkinson et al. (2006) in interviewing UK population; Goldsmith & Goldsmith (1997, 2006) and Chen & Volpe (1998, 2002) while researching the US students; Lusardi et al. (2010) who examined the US youth and Monticone (2010) who studied the population of Italy. Wagland and Taylor (2009) who examined the level of financial literacy of Australian students, found that gender does not affect the level of financial literacy. Altintas (2011), whose study was conducted in Turkey, and Pires and Quelhas (2015), whose study was conducted in Portugal, obtained results similar to the present study, indicating that the level of female students' financial literacy is higher than males.

The ANOVA test revealed statistically significant differences in university students' financial literacy levels in the following subgroups: Educational background - academic discipline and level of education; Experience - participants' age groups and work experience; Demographic characteristics - nationality and household size; and Income. There were some differences between the samples of females and males, such as factors of age, work experience, nationality, and income that were not statistically significant for females, and for males, the household size was not statistically significant.

Pilot study results suggested that statistically significant factors influencing Estonian university students' financial literacy were the academic discipline, level of education, gender, age, and nationality (Publication I). Based on the current research, it can be argued that the higher scores in the financial literacy of female students have a direct relation to the choice of academic discipline, as female students from Civil Engineering department received higher financial literacy scores than male students or students studying in any other study field. The results obtained by this survey reflect the positive impact of mathematics and other number-oriented sciences to financial literacy.

In the results of PISA 2012, where girls and boys aged 15 were tested in the financial literacy, no significant gender differences were found. The differences occurred when the results of the math and reading tests were included in the analysis, and students with similar scores were compared. Then the results showed that boys had a higher level of financial literacy than girls. Looking more closely at the mathematics results of the PISA test of Estonian students, it can be seen that since 2009 there is a statistically significant difference between the levels of girls and boys, with the average score of girls being lower (points in 2009: boys 516 and girls 508; points in 2012: boys 523 and girls 518). (SA Innove, 2013) The gender gap in the results of the study conducted in 2012 among Estonian university students was statistically significant and the level of the financial literacy of females was lower than that of males (females 56% and males 64%). Students in non-economic disciplines or in other non-mathematic-oriented specialties had weaker results, and the share of correct responses of women was 53% and of men 63%. (Mändmaa, 2019; Publication I) Therefore, it could be argued that the results of the girls' math tests and the female students' financial literacy assessments were supporting evidence of the relationship between mathematics skills and financial literacy levels.

The results of the current study confirmed that students who use financial services have more knowledge in financial literacy. The findings of a study conducted among Portuguese students showed that the existence of a prior experience, such as credit clients or the existence of saving habits increases the financial literacy of individuals (Pires and Quelhas, 2015). An earlier study conducted among Estonian university students showed that financial services with statistically significant effects were: Debit Card, Bank loan, Investment Services, and Insurance (Mändmaa, 2019). The results of this thesis research showed that there were more financial services with a statistically significant effect: Current Account, Debit Card, Credit Card, Housing loan, Insurance, Investment Services, and Pension fund shares. Previous research has found that people with low financial literacy are more likely to have problems with debt and they are less likely to participate

in the stock market (Lusardi and Tufano, 2009; van Rooij et al., 2007, 2011). The results of this study showed that students' use of loan instruments was low, neither were the investments popular, and there were no statistically significant differences between female and male students in the use of the financial services. The described situation could be explained by the relatively short period of post-socialism, during which neither the habits of the population nor the Estonians conservative attitude towards money matters have changed.

According to the results of a survey among undergraduate students in the USA, 84% of participants said they needed more education in financial management topics (Sallie Mae, 2009). In a previous study in Estonia, the question "Do you want to get more information about financial services and monetary affairs planning?" was answered by "yes"´ by 65% of the participants. The students whose financial literacy level was low (below the median 57.14% level) were found more curious. The level of interest to receive additional information about financial services and monetary affairs planning among male and female students was quite similar. Male students' interest was just 5% lower. (Mändmaa, 2019) In the present survey, the students' opinions about needs to improve their financial literacy, showed the rising trend, as 79% of female students and 84% of male (Figure 4) students reported that they are interested in improving own financial literacy. The level of male students' interest was 5% higher, while the level of financial literacy was higher among female students (accordingly, females' 69% and males' 66%).

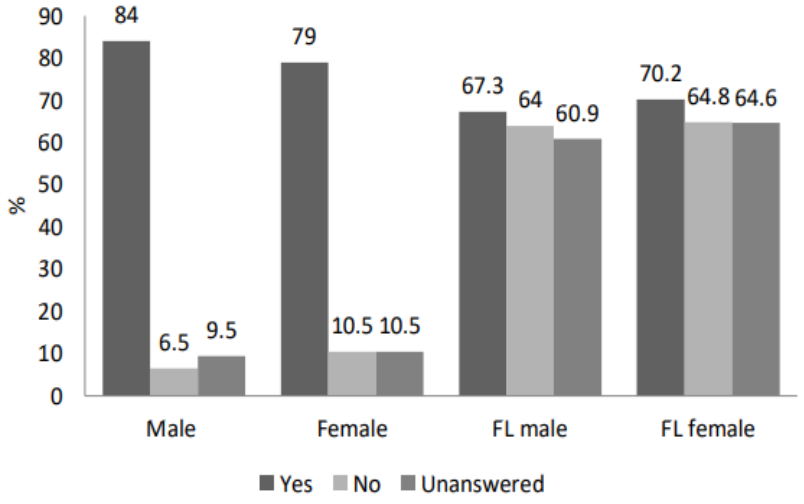


Figure 4 Students' interest about financial topics by gender and financial literacy

To evaluate students' confidence, they were asked to assess their own financial literacy level. The level was assessed rightly by 203 students, which accounted for 38% of the

respondents in the full sample, including 39% of females and 37% of male students. Students who assessed their financial knowledge at the High level (225 incl. 97 female and 128 male students) could be counted as self-confident, as well as those (55 incl. 17 female students and 38 male students) whose financial literacy level was Low but proposed own level as the Medium. Previous studies (Goldsmith and Goldsmith 1997; Chen and Volpe 2002) have found that women have lower confidence in and less interest to personal finance than men, which were suggested as possible reasons of gender differences in financial literacy. The results of the current study did not confirm these observations, as nearly half (46%) of female participants rated their financial knowledge at a High level, and that shows rather high confidence. At the same time, the disparities between female and male students were minor, in self-assessments and in having an interest in the topics of personal finances.

To evaluate the sources of personal financial knowledge, students were asked to rate the importance of the acquired financial education and knowledge providers. The highly rated source of personal financial education for female and male students was the family, the University and High School were the next. The Primary School was rated as of little importance by 56% of students (female 62% and male 58%).

In conclusion, in agreement with earlier researchers' opinions, further development of financial education in university is important, as students have expressed interest and the results of the students' financial literacy assessment show the need for improvement. In addition, students will be soon the founders of the family themselves, and the parents' financial knowledge and ability to manage resources efficiently are important factors in the development of the next generation's financial well-being.

4.3 Publication III Personal Financial Literacy among University Students studying Engineering

The main goal of this study was to examine personal financial literacy, opinions and choices among university students in engineering sciences to provide the results that will enable identification of needs and gaps in financial education to develop the area and well-being in society. Students' financial literacy was assessed by the answers of the survey questionnaire. The study analyzed the results that were gathered from 536 university students in Tallinn University of Technology. The cross-tabulation, Chi-square, ANOVA test and Logistic Regression were used to analyze the responses.

The survey results showed that Low level scores concerned topics of asset liquidity, insurance, and interest formation. The study results demonstrated that Estonian students' financial literacy level was raised from a Low (58.9%) (Mändmaa, 2019; Publication I) to a Medium (67.5%) level. These results are in line with the results published by the Saar Poll research agency, revealing that people's knowledge have improved over the previous five years and the financial literacy level of the Estonian population indicates an upward trend. (Saar Poll, 2015) A study conducted in the same period among Portuguese students

also shows a positive direction, i.e., a good level of financial literacy of students (Pires and Quelhas, 2015).

In the current study, statistically significant results of ANOVA showed that older students had higher level of financial knowledge. The regression analysis (Table 3b) gave the outcome that age was influencing the students' financial literacy only in the sample of Civil Engineering department (financial literacy scores among age groups: 18-22 73.0%; 23-29 68.4%; 30 and up 73.4%). A remarkable change occurred in the level of financial literacy of the younger age group, which had significantly risen compared to the results of the previous survey (18-22 55.9%), presumably due to the developments in personal financial education. Several researchers have noted earlier that older students have higher financial literacy levels (Chen and Volpe, 1998; Atkinson et al., 2006; Publication I). However, Wagland and Taylor (2009) in their study of Australian students' financial literacy, found that age would not affect the level of financial literacy, which could be a sign of appropriate financial education.

Analysing the effect of nationality to financial literacy, it turned out that Estonians had a higher level of financial literacy compared to non-Estonians. The same results were obtained in the financial literacy studies by Faktum and Ariko (2010), Mändmaa (2019), and in the PISA 2012 test (OECD, 2014). Based on the results of a survey conducted among Estonian students in 2012, it can be assumed that the reason was lack of financial education (teaching materials) in the mother tongue. In a 2012 survey, 65% of non-Estonians answered that they did not understand the demands/explanations given from financial institutions, and 84% of them expressed an opinion that it would be helpful if service providers used clients' mother tongue. (Mändmaa and Zhiguleva, 2013)

Participants' educational background had a significant impact on their financial knowledge. The results for the entire survey clearly showed that students Civil Engineering were more knowledgeable than students from other academic disciplines. On average, engineering students answered correctly 71% of the survey questions while in other disciplines, the score was 47%. Mandell's study of US students (2008) revealed that the level of financial literacy of students in the scientific fields of study is high. Previous study (Mändmaa, 2019) conducted among Estonian university students concluded that in science and mathematics-based areas, the level of financial literacy was high. The highest scores were received by students whose study field was Economy (females 67% and males 70%) and Information Technology came next (females 65% and males 70%). In the same study, Mändmaa (2019) reported that students studying Civil Engineering (previously named Construction) had the lowest level of financial literacy (mean score 52%; females 39% and males 56%). The current study showed the opposite results (mean score 71.5%; females 72.5% and males 70.8%).

The differences could be explained first by differences in the samples, as in the earlier study, the educational level of respondents from the study field of Construction was lower (44% in Applied studies and 56% in Integrated, i.e., previously named Combined

studies). Civil Engineering students studied in the Bachelor and Master Studies were not included in the sample of the previous study, while the overall financial literacy scores were higher in that level (previous study overall scores: Bachelor 57.7%; Master 64.3%; Applied 57.7%; Integrated 53.7%; current study Civil Engineering students mean scores: Bachelor 81.7%; Master 74.4%; Integrated 66.9%). Secondly, the financial literacy levels could be affected positively by actively started financial education.

The results confirmed that students who used financial services had a higher level of financial literacy (Table 5). Based on earlier studies (Pires and Quelhas, 2015; Mändmaa, 2019), available financial services were found to have an impact on students' financial literacy level. The research among Portuguese students revealed that the existence of prior experience, as credit clients or the existence of saving habits, increases the financial literacy of individuals. (Pires and Quelhas, 2015) Earlier study conducted among Estonian university students showed that financial services with statistically significant effect were: Debit Card, Bank loan, Investment Services, and Insurance (Mändmaa, 2019). Current study results showed that financial services with a statistically significant effect were even more: Current Account, Debit Card, Housing loan, Insurance, Investment Services, Pension Fund Shares, and Credit Card. Students studded in Civil Engineering department were significantly more active users of financial services than the participants from other study fields (financial literacy scores: Civil Engineering 71% and Other 47%).

Contrary to the results of various other studies that brought out the problems with debts (van Rooij et al. 2007, 2011; Reed, 2008; Lusardi and Tufano, 2009), the borrowing was not very popular among Estonian students, as only 21% of participants had a Credit Card, 12% Student loan, 6% Housing loan, and 2% Other bank loan, and the loan users' average financial literacy level was not low (respectively, 70%, 69%, 72%, and 71%). The amount of loan users among students studying Civil Engineering was similar (Credit Card 22%, Student loan 12%, Housing loan 7% and Other bank loan 2%).

Earlier studies expressed concerns in people's behaviour whether they accumulate and manage wealth effectively (Hilgert et al., 2003; Stango and Zinman, 2007) or whether they plan funding for retirement (Lusardi and Mitchell, 2006, 2009). Previous survey among Estonian students (Mändmaa, 2019) showed that 7% of students hold the Investment Services, 25 % had Insurance services, and 56% of students has been thought about Retirement Funding. The findings of the current study displayed positive movement, as 8% of students owned Investment Services, 29% Insurance services, 22% of participants own Savings Account, and 29% own Pension Fund Shares and the students studied the Civil Engineering showed even more activity, as 9% of students owned Investment Services, 32% Insurance services, 31% owned Pension Fund Shares, and 22% of participants owned Savings Account.

To find out if the independent variables have different effects on students' financial literacy, the logistic regression analysis was conducted. The Forward Stepwise method

was chosen for the regression analysis, and the analysis was run separately for two different samples (Full sample and Sample of students from Civil Engineering Department). The statistically significant results of logistic regression analysis are shown in Tables 1a and 1b. As suggested by the Chi-square values, the models have high explanatory power. In addition, the overall fit of the models was assessed by its ability to classify observations correctly. For the entire sample, 77.6% of the observations were correctly classified as compared with 56.7% change classification and for the Civil Engineering sample, 75.2% of the observations were classified correctly compared with the change classification 67.8%.

Table 3a Full sample. The Logistic Regression Model

	Step 1		Step 2		Step 3		Step 4		Step 5		Step 6		Step 7	
	B	ExpB	B	ExpB	B	ExpB	B	ExpB	B	ExpB	B	ExpB	B	ExpB
Acad. Discipline (1)	3.577**	35.771	3.553**	34.920	3.537**	34.350	3.980**	53.528	3.892**	49.020	3.874**	48.154	3.910**	49.909
Level of Education (2)			1.893**	6.637	1.949**	7.024	1.960**	7.099	2.011**	7.473	1.962**	7.114	1.933**	6.912
Financial services (1)					1.399**	4.052	1.352**	3.864	1.279**	3.595	1.177**	3.244	1.119**	3.061
Gender (1)							-0.876**	0.416	-0.942**	0.390	-0.902**	0.406	-0.911**	0,402
Financial services (10)									3.053**	21.188	3.003**	20.141	2.962**	19.345
Financial services (2)											0.551*	1.734	0.573*	1.774
Income (4)													-0.577*	0.562
Constant	-2.833**	0.059	-3.059**	0.047	-4.267**	0.014	-3.349**	0.035	-3.229**	0.040	-3.612**	0.027	-3.494**	0.030
-2 log Likelihood	569.583		536.039		516.239		499.907		478.191		474.229		470.299	
Chi-Square	163.770**		197.314**		217.113**		233.446**		255.162**		259.124**		263.054**	
Adjusted R^2	0.353		0.413		0.447		0.474		0.508		0.514		0.520	
Correct Classified	72.9		72.9		76.1		76.1		76.3		77.1		77.6	
Chance Classification 56.7														

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

The results of the Full sample showed that students in Civil Engineering department (Acad. discipline 1) are 50 times more likely to belong to the group of more knowledgeable about financial literacy than students from others academic disciplines. Students in the Master studies (Level of education 2) were 7 times more likely to have relatively higher knowledge about personal finance than students from Bachelor or Integrated studies. The coefficient (B) of Gender (1) denotes Male students and was negative. Consistent with the findings of ANOVA, the result suggests that those males

were more likely to be less knowledgeable about personal finance than females. Using a small calculation (1/Exp(B)N=1/0.402=2.487), the result could be presented from female students' perspective and to state that they were 2.5 times more likely to be more knowledgeable about personal finance than males. For this sample, the financial services that had significant impact on participants' financial literacy were Current Account (Financial services 1), Debit Card (Financial services 2), and Investment services (Financial services 10).

Table 3b Sample of Civil Engineering department. The Logistic Regression Model

	Step 1		Step 2		Step 3		Step 4		Step 5	
	B	Exp(B)	B	Exp(B)	B	Exp(B)	B	Exp(B)	B	Exp(B)
Level of Education (3)	-1.852**	0.157	-1.816**	0163	-1.902**	0.149	-1.956**	0.141	-1.922**	0.146
Financial services (1)			1.336**	3.803	1.326 **	3.764	1.275**	3.579	1.231**	3.424
Nationality (1)					-0.867**	0.420	-0.879**	0.415	-0.832**	0.435
Age (2)							-0.691**	0.501	-0.667**	0.513
Financial services (2)									0.571*	1.769
Constant	1.976**	7.217	0.802*	2.230	1.026**	2.790	1.351**	3.862	0.887*	2.428
-2 log Likelihood	496.639		478.845		470.292		461.908		458.013	
Chi-Square	65.220**		83.014**		91.567**		99.952**		103.846**	
Adjusted R^2	0.190		0.237		0.259		0.280		0.290	
Correct Classified	67.8		71.8		74.5		72.0		75.2	
Chance Classification	67.8									

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

The findings of the logistic regression analysis about the sample of Civil Engineering department reported that the coefficient (B) of variables Level of Education (3), Age (2) and Nationality (1) was negative. In the current case, the Level of Education (3) indicated students in Integrated Studies who were more likely to be less knowledgeable about personal finance than students studding in Bachelor or Master Studies. The variable Nationality (1) indicated non-Estonians, who were more likely to be less knowledgeable about personal finance than Estonians. After calculation (1/Exp(B)N=1/0.435=2.298), the results showed that 2.3 times more likely Estonian students belong to the group with a higher level of financial literacy than non-Estonians. The variable Age (2) suggested that participants in the age of 23-29 were more likely to belong to a lower level of financial literacy group than students from other age groups. The financial services that influenced

financial literacy in the current sample of participants were Current Account and Debit Card.

Analysis of students' financial planning habits showed that in terms of short-term planning, higher financial literacy level is generally related to a longer planning period and lower financial literacy level is linked to a very short or missing planning habit (Figure 5). The most preferable planning period for students was one month, as 39% of the whole sample (41% of males and 36% of females) and 40% of the participants from the sample of Civil Engineering department (43% of males and 35% of females) picked that answer. The study revealed that only 5% of students planned their financial affairs on several years' basis and less than 1% until retirement (was only male students' choice). The number of students who see no need to plan was an average 6%. In the previous study of university students, the statistically significant factor influencing the financial literacy level was advance planning of financial affairs daily while the most popular planning period was one month, and no differences were found in the responses of male or female students (Mändmaa, 2019).

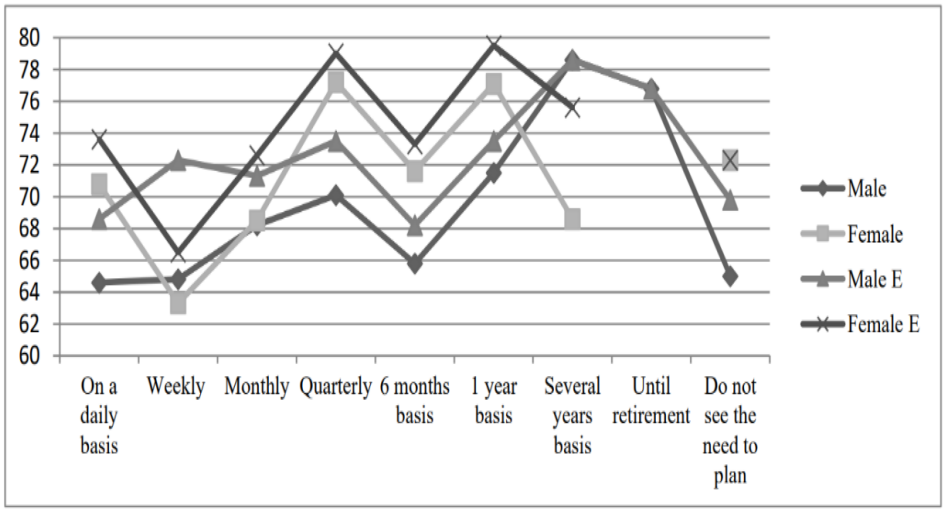


Figure 5 Students' financial affairs planning habits described through the financial literacy level and gender

Notes: Financial affairs planning habits of male and female students from Civil Engineering department are denoted by Male E and Female E.

Several researchers (Goldsmith and Goldsmith, 1997; Chen and Volpe, 2002) have suggested that the level of financial literacy tend to be affected by interest in financial topics. In the previous study in Estonia, 65% of the participants turned out to be interested. Students with a lower level of financial literacy (below the median 57.14% level) were found more interested, including Estonians, participants from the youngest (18-21) age group and students studied in the field of Construction and Energetics. (Mändmaa, 2019)

In the current survey, the students were asked to express their opinion if their financial literacy needs improvement, i.e., if they are interested in getting additional information about financial topics. The level of interest of male students was just 5% higher, based on the fact that 79% of female students and 84% of male students reported that they are interested in improving their financial literacy. However, the results showed that the higher interest was related to higher financial literacy, and students studying Civil Engineering were most interested in personal financial topics. This study did not confirm the results of previous studies (Goldsmith and Goldsmith, 1997; Chen and Volpe, 2002) that women have lower confidence in and less interest in personal finance than men. The differences between females' and males' self-assessments, and interests were small. Findings about self-assessments from the previous study among university students in Estonia showed that 8% of students rated their own financial knowledge at High level (in reality by responses 9%) and 32% of students assessed the knowledge at Low level (by responses 51%) (Mändmaa, 2019). Based on the previous research in Estonia, it was concluded that the self-assessment about financial knowledge indicated as not high means it is quite adequate (Faktum & Ariko, 2010). In the current study, 43% of students studying engineering and 42% of all participated students rated their financial knowledge as High while by study results, the number of students whose responses exceeded the high-level border was accordingly 24% and 20%. Students who admitted that their knowledge is in the Low level accounted for 7% students studying engineering and 8% among all of participants, while based on the scores of correct answers, 12% and 26% of students were on the Low level, respectively. Though the students' self-assessment was not quite adequate, and the knowledge was overrated, it could be concluded that Estonian students' self-confidence had risen noticeably in the past years. The situation points to concerns as too high self-confidence could lead to painful mistakes and it draws attention to the need to continue surveys with additional care to improve the curriculum.

4.4 Publication IV How to Promote Personal Financial Education - Findings from Finnish University Students' Financial Literacy Study

This study examined the knowledge of students from two universities in Finland to assess the students' financial literacy level, to find out the factors influencing the knowledge of personal finance and to compare the findings with similar studies. The size of the sample used in the evaluation of students' financial literacy was 574 (426 male and 148 female students), which included: 321 (250 male and 71 female) students from Tampere University of Technology and 253 (176 male and 77 female) students from Lappeenranta University of Technology. The study includes a comparison with studies that were conducted in the neighbouring country, Estonia, among university students in 2012 (522 participants) and 2015 (536 participants). Among Finns, the level of financial literacy was found to be relatively high. Using the scale Low-Medium-High, the students' financial knowledge in both countries (studies from 2015/2016) was assessed at the Medium level, but Finnish results were slightly higher (FIN 74% and EST 68%) and there occurred some gender differences. Among Finnish students, males had higher financial literacy scores

than females (male 74% and female 72%), but Estonian female students' average score was a little higher than male students' score (female 69% and male 67%). By far the weakest answers to the questions were about homeowner's insurance and about connection between interest rate changes and treasury bonds prices, where only 15% and 18% of the participants accordingly gave correct answers. Participants' choices about using the financial services were analysed and the results showed that in general, the participants with higher level of financial literacy used financial services more than participants with lower financial literacy level. 17% of the participants were users of credit cards, which is not an amount to be worried. The responses about planning habits of financial affairs[15] showed that most preferable planning period was one month, picked by 37% of students; 13% of students planned their financial affairs to several years and less than 1% until retirement. In terms of long-term planning, the higher financial literacy level generally was related to a longer planning period. The share of students who see no need to plan was on average 3%.

[15] Appendix D provides additional information on student financial planning habits, which includes information on student choices that indicated more than one planning period and was not reflected in the published article due to volume constraints.

Table 4 The statistics of answers to the three core questions

Description A. Interest rate question	Full sample % EST ***	Full sample % FIN	Male % EST ***	Male % FIN	Female % EST ***	Female % FIN	Estonian university students' FL survey 2012 % ***	Finnish 2014 summary statistics (full sample) % **
> 110 *	65.9	82.2	65.3	84.3	66.7	76.4	50.4	58.1
= 110	16.0	2.6	16.9	1.6	14.8	5.4	36.0	28.0
<110	2.8	7.5	2.5	7.0	3.3	8.8	6.3	6.6
DK	4.1	2.1	4.3	1.2	3.8	4.7	0	6.1
Refused to answer	11.2	5.6	11.1	5.9	11.5	4.7	7.3	1.4
EST: Chi-Square=0.894 p-value= 0,971			*FIN: Chi-Square= 14.131 p-value=0.007*				*CS=56.194 P=0.000*	
B. Inflation question								
More	2.8	1.6	3.4	1.9	1.9	0.7	5.4	7.1
Exactly the same	0.9	2.4	1.2	2.6	0.5	2.0	2.7	8.8
Less *	85.3	90.6	83.1	92.3	88.6	85.8	78.4	76.5
DK	10.1	5.2	11.7	3.1	7.6	11.5	13.6	6.4
Refused to answer	0.9	0.2	0.6	0.2	1.4	0	0	1.3
EST: Chi-Square=0.270 p-value=0.270			*FIN: Chi-Square =16.954 p-value= 0.002*				*CS=33.840 P=0.000*	
C. Risk diversification question								
Correct (True)	3.9	1.0	3.7	0.9	4.3	1.4	8.8	24.0
Incorrect (False)*	79.5	92.5	78.5	94.4	81.0	87.2	79.3	65.8
DK	14.6	6.4	15.6	4.7	12.9	11.5	11.9	10.2
Refused to answer	2.1	0	2.1	0	1.9	0	0	0
EST: Chi-Square=0.932 p-value=0.818			*FIN: Chi-Square = 8.655 p-value= 0.013*				*CS=9.669 P=0.008*	
D. Cross-question Consistency								
Interest and inflation correct	59.9	75.4	58.0	78.6	62.9	66.2	28.5	48.0
EST: Chi-Square=1.267 p-value=0.150			*FIN: Chi-Square=9.147 p-value=0002*				*CS=6.434*	
All correct	50.7	71.4	48.8	75.6	53.8	59.5	27.2	35.6
EST: Chi-Square=0.020 p-value=0.555			*FIN: Chi-Square=13.999 p-value=0.000*				*CS=5.379*	
None correct	3.0	1.0	3.1	0.7	2.9	2.0	5.2	7.4
EST: Chi-Square=0.020 p-value=0.555			*FIN: Chi-Square=1.858 p-value=1.181*				*CS=9.356*	
At least one DK	18.3	10.1	18.4	6.3	18.1	20.9	22.2	14.0
EST: Chi-Square=0.008 p-value=0.512			*FIN: Chi-Square=25.804 p-value=0.000*				*CS=32.284*	
All DK	0.7	0.3	0.9	0.2	0.5	0.7	0	1.4
EST: Chi-Square=0.340 p-value=0.489			*FIN: Chi-Square=0.615 p-value=0.450*				-	
Number of observations	536	574	326	426	210	148	522	1477

Notes: The correct answer is marked by an asterisk (*); EST marks the results origin country Estonia; FIN marks the results origin country Finland; FL abbreviation for financial literacy; DK abbreviation for "Do not know"; CS abbreviation for Chi-Square. ** Data in marked column are from Kalmi and Ruuskanen (2018). *** Author's own preparations based on Estonian university students' financial literacy studies from years 2012 and 2015.

The answers to the questions from "A simple financial literacy module" are scored and compared with study results from Finland, USA, and Estonia. Finland and USA participated in the project called Financial Literacy around the World (FLat World), coordinated by Lusardi and Mitchell. The Finnish study conducted in 2014 was the first representative study of financial literacy in Finland. The sample (1477 observations) had respondents aged from 18 to 92 and the results were presented separately for the entire sample and for those between the ages of 25 and 65 (Kalmi & Ruuskanen, 2018). The current study sample included 81% of students aged from 18 to 22; thus, the entire sample was used for the comparisons. Concerning the question of the interest rate, the difference of the correct answers between the students and the respondents of the first study was 24% (82% and 58%). The question about inflation was answered correctly by 91% of the students and 77% of the respondents of the first study (difference 14%). The question about risk and diversification was answered correctly by 93% of the students and 66% of the respondents of the first study (difference 27%). In the current study, the share of respondents who answered all the questions correctly was 71% and in the Finnish first survey 36%, making up more than one-third of the respondents. The results showed that students from universities of technology had particularly good general financial knowledge and the level of knowledge was higher than Finns' overall in Table 4 (III and IX). These results were as expected; as the earlier research has shown, mathematical skills and educational attainment affect the financial literacy level (Publication II, III).

Comparing the scores of the Finnish university students (Table 4 III) with those of a USA study (published by Lusardi, 2019), the difference in the correct answers provided to the question of the interest rate was 17% (82% and 65%). The question about inflation was answered correctly by 91% of students and 64% of participants from the US study and the question about risk and diversification by 93% and 52%, respectively. In the current study, the share of respondents who answered all the questions correctly was 71% (Table 4, D III) and in the US survey - 30%. There were remarkable differences in the share of "do not know" answers, and the biggest gap was found in the answers to the question of risk and diversification (28%). The differences were similar to the comparison made with the sample of Finnish population. Results of the current survey are consistent with arguments reported by Lusardi and Mitchell (2011) that financial literacy is highly and positively correlated with schooling. The findings from Health and Retirement Study (HRS), a nationally representative longitudinal dataset of Americans over the age of 50, showed that respondents with educational level "college and more" had higher scores to the right answers of the three core questions (Q) (Q1 82%; Q2 85%; Q3 70%) and lower DK scores (Q1 3%; Q2 3%; Q3 14%) than those with educational level "less than high school" (Q1 51%; Q2 62%; Q3 31% and DK Q1 17%; Q2 21%; Q3 56%) (Lusardi and Mitchell, 2011).

Next, financial knowledge of Estonian and Finnish students is compared. In the first comparison made between students (sample size 522) in Estonian higher education institutions and students (sample size 574) in Finnish universities of technology, the level and answers to the three core questions were compared. The results in Table 4 (III and VIII) show that Estonian students' financial knowledge is lower than that of Finnish

students, especially in answers to the question of the interest rate. That could be explained by the short history of the Estonian financial markets - little experience, and by the differences in the sample - academic discipline, level of education.

The Finnish sample consisted only of students from mathematics-based disciplines on the Bachelor and Master level. The sample of the Estonian 2012 study had 28% of students from implementing higher education studies and 47.5% of students from non-mathematics-based disciplines. The results from Estonian 2012 study showed clear differences (10.5%) in the financial literacy levels between students in Economic or Non-Economic academic disciplines. Even greater differences appeared in the overall share of mathematics-based studies. Differences in students' financial literacy in the Bachelor studies were 13.6% (male 7.6% and female 13.6%) and in the Master studies 9.1% (male 13.4% and female 5.2%) in favour of mathematics-based learning.

The second comparison was made between Estonian (sample size 536) and Finnish (sample size 574) students in universities of technology. Comparison was made and presented separately for three core questions (from "A simple financial literacy module" with little correction), and for the results of the whole questionnaire. The statistics for three core questions is shown in Table 4 (II-VII). The results showed that Estonian students' financial knowledge was slightly lower than that of Finnish students, except the amount of Estonian female participants' right answers about inflation questions, which was 3% higher compared to neighbour country female students' answers. The share of "do not know" (DK) answers among Finnish students was lower than that in Estonian students in all samples, and much lower compared to male students' answers. This could be understood as Finnish male students' higher self-confidence in financial knowledge. In addition, the current study of Finnish students showed the differences between female and male students' responses and that male students had 6 to 8% higher scores, which is consistent with several earlier studies results (Atkinson et al., 2006; Atkinson and Messy, 2012; Bucher-Koenen and Lusardi, 2011; Bucher-Koenen et al., 2017; Chen and Volpe, 1998; Chen and Volpe, 2002; Fonseca et al., 2012; Goldsmith and Goldsmith, 1997; Goldsmith and Goldsmith, 2006; Kalmi and Ruuskanen, 2018; Lusardi et al., 2010; Mändmaa, 2019; Publication I).

Differences between Estonian and Finnish students' financial knowledge were small. The results of the whole questionnaire showed that students' financial literacy is at Medium level - an average score of correct answers among Estonians was 68% and among Finns 74%, whereas female students answered 69% of the questions and 72% of questions correctly, respectively and male students 67% and 74% of the questions correctly. The lowest scores in the answers to the question were acquired in both countries in: "If the interest rate rises, the prices of a Treasury bond will: increase; decrease; remain the same; impossible to predict; do not know." This question needs more specific knowledge or experience, and the results were as expected, as respondents were university students mostly in their young age (18 to 22), which means they were in a very early stage of their financial life cycle.

There were gender differences found in students' financial literacy, shown in Figures 6 and 7. Female students in the Estonian survey had slightly higher financial literacy level than male students and Finnish students' results were vice versa.

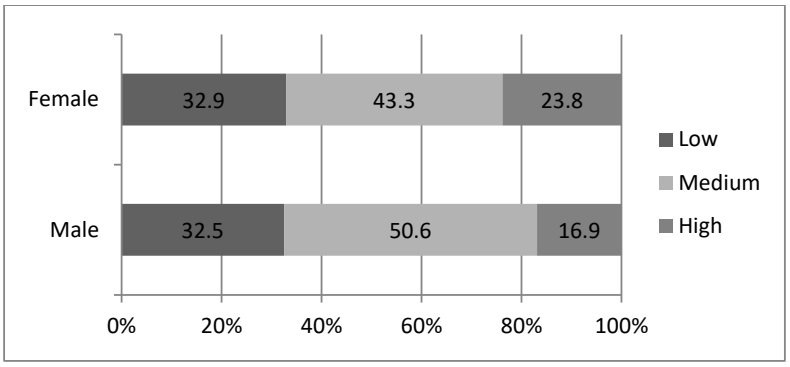


Figure 6 Estonian students' level of financial literacy
Notes: Chi-Square=4.561 significant at the 0.102 level.
Source: Author's own preparation based on Estonian university students' financial literacy study from year 2015.

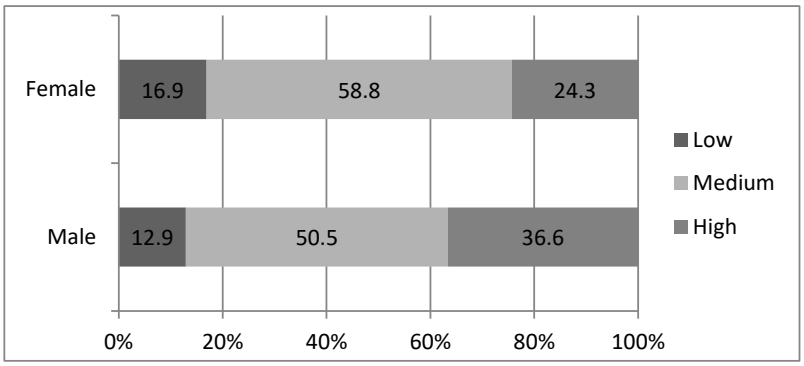


Figure 7 Finnish students' level of financial literacy
Notes: Chi-Square=7.656 significant at the 0.022 level.

The gender differences in the results of the two countries could be explained by differences in political history. The former Communist societies were much more egalitarian with respect to gender roles and as Estonia was part of Soviet Union for 51 years, that could explain female slightly higher financial knowledge. Researchers have argued in earlier studies that gender differences in financial literacy in the former Communist societies could be interpreted as prime facile evidence that as financial markets develop, women are left behind in terms of financial knowledge (Bucher-Koenen et al., 2017).

Table 5 Logistic Regression results of factors influencing participants' financial literacy Model (All participants)

	Step 1		Step 2		Step 3	
	B	**Exp(B)**	**B**	**Exp(B)**	**B**	**Exp(B)**
Investment services	0.625**	1.867	0.611**	1.843	0.554**	1.741
Gender (1)			0.506**	1.658	0.578**	1.782
Income(1)					0.655**	1.926
Income(2)					1.668**	5.303
Income(3)					0.429	1.536
Income(4)					0.362	1.436
Constant	-0.148	0.862	-0.522**	0.594	-1.097**	0.334
-2 log Likelihood	783.557		776.783		763.163	
Chi-Square	10.746**		17.521**		31.140**	
Adjusted R^2	0.025		0.040		0.071	
Correct Classified	55.8		55.8		59.7	
Chance Classification	50.4					

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

The regression analyses were run separately for three different samples (Full; Male and Female). The statistically significant results of logistic regressions about Full sample are presented in Tables 5 and additionally in Publication IV.

Based on the logistic regression analysis of Full sample, the gender variable was positive and statistically significant, which indicates that male participants were 1.8 times more likely to belong to the group of more knowledgeable about personal finance than female participants. The positive coefficients of investment services indicating that students using these services were more likely to be more knowledgeable (in the whole sample 1.7 times) about personal finance than students without investment services. Regarding income related variables, coefficients of Income(1) and Income(2) indicate that those with monthly net income from 301 to 2800 euros were more likely to be more knowledgeable in personal finance compared to students with monthly net income up to 300 euros.

In the logistic regression analysis of the male sample, the coefficients of Investment services and Insurance Services were positive and statistically significant, indicating that students using these services were more likely to be more knowledgeable (2.1 times using Investment Services and 1.7 times using Insurance Services) about personal finance than students without these choices. Regarding income related variables, coefficients of Income(1) and Income(2), the value of coefficients shows that those with monthly net income from 301 to 1360 euros were (2.4 times) and those with monthly net income from 1361 to 2800 euros were (4.6 times) more likely to be more knowledgeable in personal finance than students with monthly net income up to 300 euros.

Based on the results of the logistic regression analysis of the female sample, the only variable influencing female students' financial literacy was their choice whether they use Insurance Services. The coefficient of Insurance Services was positive and statistically significant, indicating that students using these services were more likely to be 3.4 times more knowledgeable in personal finance than students without using the Insurance Services.

The results of regression analyses showed some differences in the factors influencing students' financial literacy. In the study of Estonian students, Academic Discipline, Level of Education, Age and Nationality were found as statistically significant factors, which were not significant in the Finnish students' study. Previous experience in using financial services was a significant factor for the financial literacy of both countries' students. Findings showed that income was a significant factor in the Finnish study, which had no significant impact on Estonian students' financial literacy. The differences pointed out above could be caused by the lower standard of living in Estonia, a shorter history of financial market, deficiency of financial education and missing skills of parents to passing on the financial knowledge to children. In addition, comparison of the results of the current study with the findings of the study conducted among students in Estonian higher educational institutions in 2012 revealed a notable impact of an academic discipline. Students in academic disciplines with mathematics-based studies showed higher financial literacy scores (68% and 57%) than students from other disciplines (Mändmaa, 2019; Publication I) while in the current study, the sample consisted only of students with mathematics-based curriculums and the results demonstrated no influence of the academic discipline on the students' financial literacy (Table 5).

4.5 Publication V The knowledge in financial literacy and the improvement of it through financial education from the perspective of university students: comparative study

The goal of this study was to find out how the university students rate their acquired financial knowledge and knowledge providers, with the purpose to find solutions for promoting personal financial education to promote financial literacy. In addition, this study makes contribution to the literature on Mixed Methods Research (MMR) by describing the procedure how the solutions to the research problem were found. In the present study, the Explanatory sequential mixed methods design was used, in which a quantitative part of the study was conducted among 1110 participants, which was followed by a qualitative part with a sample sized of 22 students. Students at universities of technology from two neighbouring countries, Estonia, and Finland, participated in the survey. The data were collected in a quantitative part through a questionnaire survey and in a qualitative part, during three focus groups. Based on the results of the quantitative survey, questions and participants were purposefully selected for the qualitative phase in order to explain the content of the quantitative results, i.e., students' assessments to financial literacy providers and to financial education in general. For studies (quantitative

and qualitative) carried out separately, a clear link between quantitative results and qualitative research would have been lost. In addition, due to the choice of MMR, the collection of all information was also coordinated by the same researcher who carried out the analysis and interpreted the results . This approach ruled out possible errors in the interpretation of the data and results, such as different interpretations of the wording, etc.

There were no significant differences in the comparison results of students from Estonia and Finland. A worrying indicator was an overestimation of students' own knowledge, as the proportion of students who overestimated own level of financial literacy was over 40% in both countries. Regarding relations between students' self-assessment by gender, Estonian female students rated their financial literacy higher than male students, as 46% of females and 39% of male students rated their knowledge at High level, while self-assessment among Finnish students has shown results vice versa. 64% of male students rated their financial literacy at High level and only 47% of female students gave the same rating. This result can be interpreted as a sign of the self-confidence of Finnish male students.

Figures 8 and 9 display the comparison of students' self-assessment with rated financial literacy levels. These results were statistically significant (Estonian: Chi-Square 31.775 sig=0.000 and Finnish: Chi-Square 19.973 sig=0.003).

Figure 8 shows the results about Estonian students. The level of own financial literacy was assessed rightly by 203 students, which accounted for 38% of the total number of respondents. 225 students, which accounted for 42% of the respondents, evaluated their financial knowledge higher of the tested value, and 57 students rated their financial literacy level lower than the value in the study results.

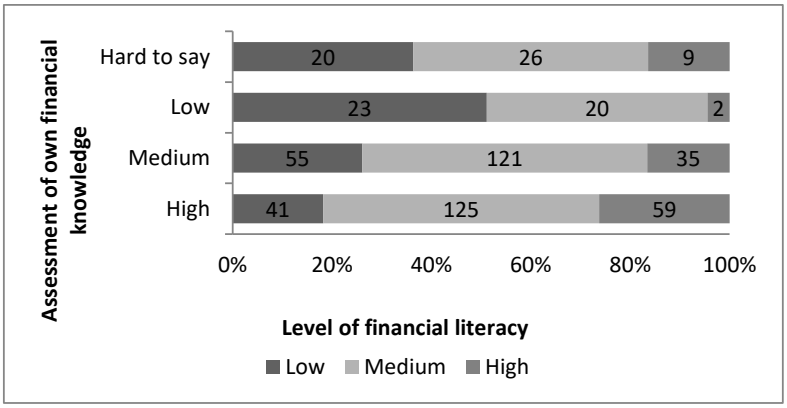


Figure 8 Comparison of Estonian students' self-assessment with the financial literacy study results

Source: Composed by the author. Results of the financial literacy survey in Publication III.

Figure 9 shows the results about Finnish students. The level of own financial literacy was assessed rightly by 238 students, which accounted for 42% of the total number of respondents. 237 students, accounting for 41% of the respondents, evaluated their financial knowledge higher of the tested value, and 88 students rated their financial literacy level lower than was the value in the study results.

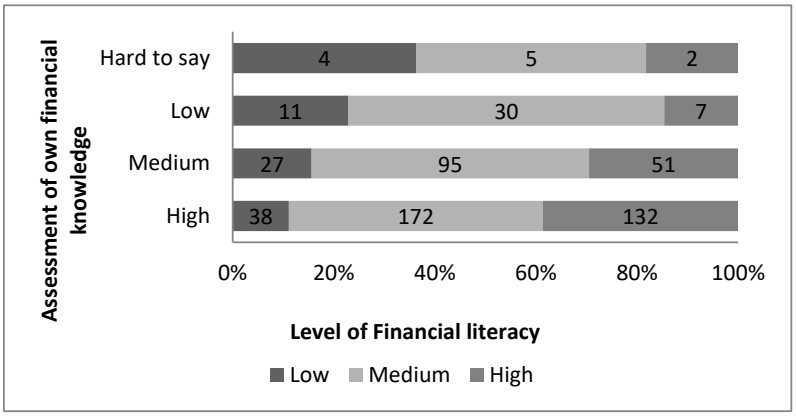


Figure 9 Comparison of Finnish students' self-assessment and the financial literacy study results

Source: Composed by the author. Results of the financial literacy survey in Publication IV.

Too high self-esteem can lead to decisions that are detrimental to well-being, but as the results of the quantitative part showed, more than 80% of students (82% of Estonians and 87% of Finns) were interested still in the improvement of their financial knowledge.
In earlier studies (Goldsmith and Goldsmith, 1997; Chen and Volpe, 2002; Publication III), several researchers suggested that financial literacy tends to be affected by interest about financial topics. Table 6 shows differences in students' financial literacy levels resulting from different opinions about the improvement of the financial knowledge. Statistically significant results showed that the interest of Estonian students increased with financial literacy. Finnish students with the higher financial literacy score were not interested in improving financial literacy. That could be interpreted as Finnish male students' higher confidence as the answer "No" came mostly from male students (13.4% of males; 3.4% of females). The differences in the answers of Finnish and Estonian students could be explained by the differences between the two countries in the recent history, which has also been reflected in the results of previous studies (Bucher-Koenen and Lusardi, 2011; Bucher-Koenen et al., 2017; Publication IV).

Table 6 Differences in financial literacy levels in case of differing opinions about the need to improve the financial knowledge

Students' opinions	Estonian students		Finnish students	
	Count	FL level	Count	FL level
Does your financial literacy level need improvement?				
Yes	440	68.4%	501	73.6%
No	43	64.4%	62	74.4%
Unanswered	53	62.4%	11	63.2%
Total	536	67.5%	574	73.5%
F Statistic		(4.724)**		(5.208)**

Notes: **significant at the 0.01 level or greater; FL - Financial literacy
Source: Composed by the author

Students' assessments of their financial knowledge providers and ratings were given on a scale from one to five, where 1 was "Unimportant" and 5 was "Very important". The results showed that the most important financial knowledge provider was the family as the importance was assessed with "5" or "4" by 74% of Estonian and 79% of Finnish students. The next most important financial knowledge provider was the university as it was evaluated with "5" or "4" by 51% of participants from Estonia and 44% of participants from Finland. The Upper Secondary School as knowledge provider was assessed nearly at the same level. According to the students' opinions, the Basic School and the Non-school related courses or Financial service provider were assessed as of modest importance at the acquisition of financial knowledge.

The quantitative study alone did not provide clarity about and the topics of interest relevant for students, which is extremely important information for the development of personal financial education. Krueger and Casey (2015) suggested using focus groups to gain understanding about a topic, so that decision makers could make more informed choices. At the same time, the results of the qualitative part only, in which 22 students participated and expressed their opinions, would not have had a significant weight. In the current case, the 1110 students who answered in the quantitative part, increased the reliability of the results of the qualitative part.

Based on previous studies and the assessments of the students who participated in the quantitative part of this study, a Conceptual Model (Figure 10) about financial knowledge providing has been developed. This Model shows the order of importance created on the basis of students' assessments, where the most important or number one (No 1) provider

of financial knowledge was the family. However, the well-being and sustainability of the family (and not only) will be directly affected by the students' financial literacy.

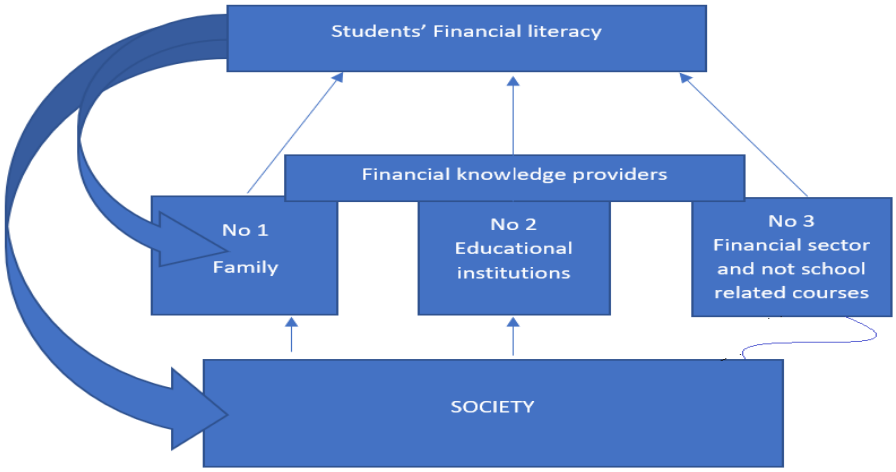


Figure 10 Conceptual Model of providing financial knowledge
Source: Composed by the author

Teaching of personal financial knowledge has been considered notably necessary by all the students who participated in the focus groups. Many participants believed personal financial knowledge should come from the family and should be taught from an early age - such as saving, budgeting, etc. However, it has been noted that families may not be very aware of these issues and may not be able to manage their finances well. Thus, the study concludes that promotion of personal financial education is necessary and financial knowledge must be delivered continuously.

The results of the quantitative part of this study reflected low importance of the knowledge acquired in the basic school (school years 1 to 9), explained by the students involved in the interviews mainly with lack of interest - boring subjects and teachers. Based on the results of the qualitative phase of the study, it can be argued that financial knowledge should be provided at every level of education, starting with a course in basic school and continuing with more comprehensive knowledge in secondary school and university. According to the collected opinions, connection with real life, use of interesting examples, tasks and practical advice are most important in organizing teaching in financial education. As the opinions of the students showed, there are no benefits of subjects that are not understood - they are simply not remembered or used. The important emphasis here is on the teaching staff, their knowledge, and skills. This is an area that is being addressed where there is still much room for improvement.

4.5 Publication V The knowledge in financial literacy and the improvement of it through financial education from the perspective of university students: comparative study 79

The objects of this study were students from technology universities; based on the assessments of the quantitative part, they highly appreciated the knowledge gained from university. Their opinions expressed in the qualitative part of the study included suggestions to offer a preparatory financial course to the first-year students, which would contain knowledge of saving, borrowing, budgeting, investing, as well as financial risks.

Students have also noted interest in additional, i.e., more in-depth, courses for making informed investment decisions related to happening in the financial markets, the current economic situation in different countries, evaluation of companies' value and economic activities, etc. Mixed Methods Research (MMR) was appropriate for achieving this research goal, and this method would be recommended for anyone planning to compile new curricula or subjects, as well as to further develop existing ones.

5 Conclusion

> *"Just as it was not possible to contribute to and thrive in an industrialized society without basic literacy the ability to read and write so it is not possible to successfully navigate today's world without being financially literate."*
>
> *(Lusardi 2017, p. 1).*

Financial literacy gives a person the ability to make sound and successful financial decisions, the impact of which is not limited to the individual but involves, to a greater or lesser extent, the well-being of both the family and society. Rapid evolution of the financial sector and the shift of responsibility for long-term financial well-being from the states to the individuals, caused mainly by demographic changes, requires a deeper understanding and evidence-based solutions for improving the financial literacy.

The main goal of this research was to find out gaps and needs in university students' financial literacy to develop the personal financial education.

With only common knowledge and opinions at the disposal, it is impossible to successfully promote the personal financial awareness or personal financial education - there is a need for scientific evidence. Lusardi and Michell (2007) have pointed out that the promotion of financial education cannot take place according to a single programme for all, i.e., "one-size-fits-all" but must be based on a specific target group.

This study started with pilot study among 522 university students from 13 different higher educational institutions and different academic disciplines, to assess the actual level of financial knowledge. The results of that study gave a direction for continue survey. Some changes were done: first, the area was widened to the two neighbour countries; secondly, the sample was narrowed to mathematics based academical disciplines only; and thirdly, the questionnaire was changed to more comparable.

The target group in the current study was students from universities of technology from two neighbouring countries, Estonia, and Finland. The size of the sample was 1110 students, including 752 male and 358 female students. From Finland, 574 (426 male and 148 female) students from two universities were participating: 321 (250 male and 71 female) students from Tampere University of Technology and 253 (176 male and 77 female) students from Lappeenranta University of Technology. From Estonia, the number of survey participants was 536 (326 male and 210 female students), and all of them from Tallinn University of Technology.

Three approaches were used in the present thesis research:

First, the students' financial literacy was studied by assessing the level and taking a close look at positive and negative factors influencing the levels. A questionnaire survey was

used to collect the data. The cross-tabulations, analysis of variance (ANOVA), and logistic regression analysis were used in the analysis.

Second, student evaluations of acquired financial knowledge and knowledge providers were examined. The data were collected by the questionnaire and assessed at the five-point scales.

Third, the focus was on how personal financial education can be promoted by gathering students' opinions, assessments and recommendations. For data collection, the focus groups and semi-structured questions were used that were constructed based on quantitative study results.

In this thesis research was used the Explanatory Sequential Mixed Methods design that is “one of the most popular mixed methods designs in educational research” (Creswell et al., 2003; Creswell, 2014).The chosen design is a procedure for collecting, analysing, and “mixing” both quantitative and qualitative data at some stage of the research process within a single study. It enables understanding a research problem more completely.

The dissertation was focused on six research questions:

1. What is the level of financial literacy of students in Estonian and Finnish universities of technology?

The financial literacy was examined at first in pilot study, conducted among 522 students, from Estonian higher educational institutions. Using the scale Low-Medium-High the results showed a Low level of financial knowledge (study from 2012, mean of the correct answers 59%). The research continued with bigger sample. Next, the financial literacy was examined (in 2015/2016) among 1110 students, with 536 students from Estonia and 574 students from Finland. The results showed that participants from both countries had a Medium level of financial literacy (60-80% of responses were correct). Figure 11 describes proportions of students' financial literacy levels by gender.

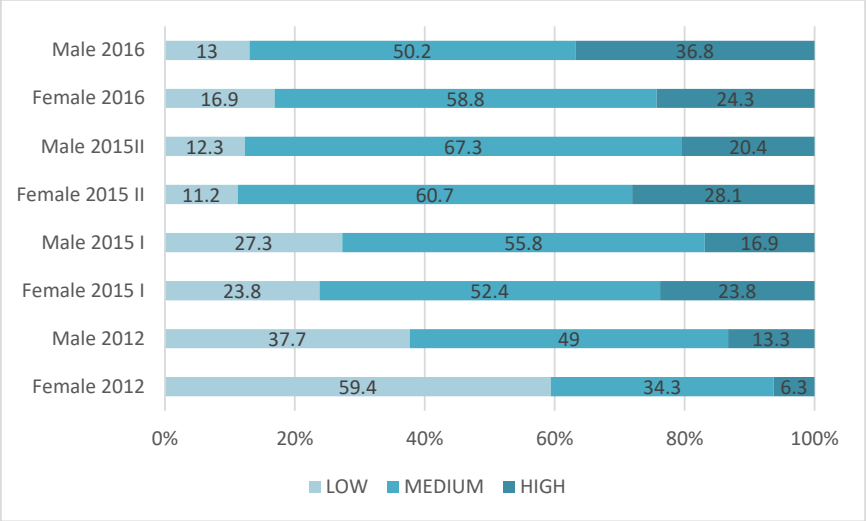


Figure 11 Proportions of students' financial literacy levels by gender through out of four studies

Notes: Positions Male 2015 II and Female 2015 II mark the level of financial literacy of students from the Faculty of Civil Engineering participated in the survey.
Source: Composed by the author

However, Finnish results by mean score were slightly higher (FIN 74% and EST 68%) and there occurred some gender differences. Among Finnish students, males had higher financial literacy scores than females (male 74% and female 72%), but Estonian female students' average score was a little higher than male students' score (female 69% and male 67%). By far the weakest answers were given to the questions about homeowner's insurance (FIN 15% and EST 37%), and about connection between interest rate changes and treasury bonds prices, where only 18% of the participants in both countries gave correct answers.

2. What factors affect students' financial literacy levels?

To find factors affecting students' financial literacy, the Forward Stepwise method was chosen, and the regression analyses were run separately for two different samples of Estonian students (Table 3a and 3b; Publication III) and for three different samples for Finnish students (Table 5 and Publication IV). Based on the results of Estonian students' logistic regression analysis the results of Full sample (Table 3a) showed that Academic discipline was the variable with the greatest impact. Students in Civil Engineering department (Acad. discipline 1) belong 50 times more likely to the group of more knowledgeable about financial literacy than students from other academic disciplines. The students in the Master studies (Level of education 2) were 7 times more likely to be with relatively higher knowledge about personal finance than students from Bachelor or Integrated studies. The coefficient (B) of Gender (1) denotes Male students and was

negative and indicated that females were 2.5 times more likely to be more knowledgeable about personal finance than males.

The findings of the logistic regression analysis about the sample of Civil Engineering department (Table 3b) showed that the coefficient (B) of variables Level of Education (3), Age (2) and Nationality (1) was negative. In the current case, the Level of Education (3) indicated that students at Integrated Studies were more likely to be less knowledgeable about personal finance than students in Bachelor and Master Studies. The variable Nationality (1) was indicating that non-Estonians were more likely to be less knowledgeable about personal finance than Estonians. The result could be presented from Estonians' perspective and to state that it is (1/Exp(B)N=1/0.435=2.298) 2.3 times more likely that Estonian students belong to group with higher level of financial literacy than non-Estonians. The variable, Age (2), suggested that participants in the age of 23-29 were more likely to be in a lower level of financial literacy group than students from other age groups.

Based on the logistic regression results, the financial services that had significant impact on the participants' financial literacy were Current Account (Financial services 1), Debit Card (Financial services 2), and Investment services (Financial services 10).

The regression analyses were run separately for three different samples (Full; Male and Female) of Finnish students. Based on the logistic regression analysis (Table 5), the gender variable was positive and statistically significant, which indicates that male participants are 1.8 times more likely to belong to the group of more knowledgeable about personal finance than female participants. The positive coefficients of investment services indicated that students using these services are more likely to be more knowledgeable (in the whole sample 1.7 times) about personal finance than students without investment services. Regarding income related variables, coefficients of Income(1) and Income(2) were positive and statistically significant and indicated that those with monthly net income from 301 to 2800 euros are more likely to be more knowledgeable in personal finance compared to students with monthly net income up to 300 euros.

The results of the logistic regression analysis of the Male sample (Publication IV) showed that coefficients of Investment services and Insurance Services were positive and statistically significant, indicating that students using these services were more likely to be more knowledgeable (2.1 times using Investment Services and 1.7 times using Insurance Services) about personal finance than students without these choices. Regarding income related variables, coefficients of Income(1) and Income(2) were positive and statistically significant. The value of coefficients showed that those with monthly net income from 301 to 1360 euros or from 1361 to 2800 euros are more likely to be more knowledgeable in personal finances (accordingly 2.4 and 4.6 times) than students with monthly net income up to 300 euros.

The logistic regression analysis of the Female sample showed that the only variable influencing female students' financial literacy was the choice whether to use Insurance

Services. The coefficient of Insurance Services was positive and statistically significant, indicating that students using these services were more likely to be 3.4 times more knowledgeable in personal finance than students without using the Insurance Services.

The results of regression analyses showed some differences in the factors influencing students' financial literacy. In the study of Estonian students, Academic Discipline, Level of Education, Age and Nationality were found as statistically significant factors, which were not significant in the Finnish students' study. Previous experience in using financial services was a significant factor for the financial literacy of students of both countries. Findings showed that a significant factor in the Finnish study model was income, which had no significant impact on Estonian students' financial literacy. The gender appeared in the regression analysis as an influencing factor of students' financial literacy in the results of both countries, but an opposite effect was observed.

Table 6 shows differences in students' financial literacy levels in case of different opinions about the improvement of the financial knowledge. Statistically significant results showed that the interest of Estonian students increased with financial literacy. Finnish students with the highest financial literacy score were not interested in improving financial literacy.

Based on the current research, it can be argued that the higher scores in financial literacy of female students have a direct relation to the choice of the academic discipline, as female students from Civil Engineering department acquired higher financial literacy scores than male students or students studying in any other study field (Table 3). The results obtained by this survey reflect the positive impact of mathematics and other number-oriented sciences on financial literacy.

3. Do students use financial services and plan their financial affairs, and is there a relationship between students' choices and financial literacy?

The analysis of Estonian students' choices about using the financial services[16] showed that 83% of the participants had Current Account, 79% Debit Card; 22% Saving Account, 30% Insurance Services, 12% Student loan, 6% Housing loan, 2% Other bank loan, 13% Investment Services, 29% Pension fund Shares, and 21% of the participants were Credit Card owners. Analysis of variance was used to detect if participants with different choices of using financial services had different levels of financial knowledge. The results confirmed that students who used financial services had a higher level of financial literacy. Students studding in Civil Engineering department were significantly more active users of financial services than other participants and their average financial literacy score (71%) was higher compared to total sample average score (68%). The findings showed that the following financial services revealed a statistically significant differences: Current Account, Debit Card, Insurance, Investment services, Pension fund shares, and Credit Card. (Publication III).

[16] For more information in publication number III.

Based on the logistic regression results, the financial services that had significant impact on participants' financial literacy were Current Account, Debit Card, and Investment services.

The analysis of Finnish students' choices about using the financial services[17] showed that 98% of the participants had Current Account, 91% Debit Card; 61% Saving Account, 58% Insurance Services, 38% Student loan, 4% Housing loan, 1% Other bank loan, 27% Investment Services, 2% Pension fund Shares, and 17% of the participants were Credit Card owners. Analysis of variance was used to find out if participants with different choices of using financial services had different levels of financial knowledge. Based on earlier studies (Pires & Quelhas, 2015) and on the current study of Estonian students, the use of financial services had positive impact on students' financial literacy, i.e., students with higher level of financial literacy used financial services more than participants at lower levels. The Finnish students' part of the present study showed some opposite results in students' financial literacy levels. The differences implicated more on female students' choices.

Based on the logistic regression analysis, the financial services that had significant impact on participants' financial literacy included the Insurance and Investment services for male students and the Insurance for female students. The study revealed some gender differences and an unusual finding about female students using Insurance services, i.e., the women not using Insurance services had higher level of financial literacy than those women who used these services (in case of men, it was vice versa). Unfortunately, the reasons explaining that situation could not be found in the context of the current research. (Publication IV).

Students use of loan instruments was not high and students using these instruments had relatively high financial literacy level. Student loan was the most used whereas notable differences were found between Finnish and Estonian students, as Finnish students were much more active loan users (38% of Finns and 12% of Estonians). Estonian students were more active in using the Credit Card (21% of Estonian students and 17% of Finnish students). At the same time, there were differences in the financial literacy, where among Finnish students, the financial literacy of credit card users was lower than that of non-users (73% for users and 74% for non-users) and an opposite case was found among Estonian students (70% for users and 68% for non-users).

The results of the analysis of students' financial planning habits showed that in terms of short-term planning, higher financial literacy level was generally related to a longer planning period, i.e., planning period would rise along with financial literacy, and in general, students preferred short-term planning to long-term planning.
For Estonian students, lower financial literacy level was linked to very short or missing planning habit and the most preferable planning period was one month, as 39% of the whole sample (41% of males and 36% of females) and 40% of the participants from the

[17] For more information in publication number IV.

sample of Civil Engineering department (43% of males and 35% of females) picked that answer. The study revealed that only 5% of students planned their financial affairs on several years' basis and less than 1% until retirement (was only male students' choice). The number of students who see no need to plan was an average 6%. (Publication II)

The responses of Finnish students showed also that most preferable planning period was one month, picked by 37% of students (36% of males and 41% of females) and 1% of students planned their financial affairs until retirement. The share of Finnish students whose financial affairs planning period was several years (13%) was noticeably higher than that of Estonian students (5%) and the difference in shares of students number who saw no need to plan was 3%, i.e., Finnish students share (3%) was lower than that of Estonian students (6%).

4. How to explain the differences in the financial knowledge and behaviour and factors influencing them of Finnish and Estonian students?

No remarkable differences were found in the financial literacy levels of Finnish and Estonian students participating in this study, but there were gender differences indicated. For Finnish students, the financial literacy of male students was higher than that of female students, and for Estonian students, the opposite was true, i.e., the financial literacy of female students was higher than that of male students.

Several previous studies have shown that men have a higher level of financial literacy than women and some studies have referred to the low interest of female students in financial topics and mathematics or other number-oriented subjects as reasons. The results of this study showed that female students' financial literacy results may be higher than male students if the selected academic discipline is linked with mathematics. So, it could be stated that the existence of an interest in mathematics, as a numerical and logical subject, supports the orientation in financial questions.

Gender differences in the results of the two countries could be explained by differences in political history. The former Communist societies were much more egalitarian with respect to gender roles and as Estonia was part of Soviet Union for almost 50 years, that could explain Estonian female students' slightly higher financial knowledge. Similar results have been also obtained in a study of the financial literacy of former East and West German residents (Bucher-Koenen and Lusardi, 2011; Bucher-Koenen et al., 2017). It could also confirm the claim of Bucher-Koenen et al. (2017) that gender differences in financial literacy in former Communist societies could be interpreted as prime facile evidence that as financial markets develop, women are left behind in terms of financial knowledge.

Student use of loan instruments was modest. Student loan was the most used loan instrument and notable differences were found between Finnish and Estonian students. 38% of Finnish participants were loan users compared to 12% of Estonian participants. At the same time, Estonian students were more active in using the Credit Card (21% of

Estonian students and 17% of Finnish students). Some differences were also revealed in the financial literacy of financial service users, where among Finnish students, the financial literacy of credit card users was lower than non-users (73% for users and 74% for non-users) and on the contrary, among Estonian students (70% for users and 68% for non-users).

These observations could be explained, in particular, with the differing time of financial market existence in the two countries and, consequently, by the longer-term experience of Finnish students in the use of financial services and the skills to take into account the credit card risks.

The analysis of students financial planning habits revealed the share of Finnish students whose financial affairs planning period was several years (13%), which was noticeably higher than that of Estonian students (5%), and the difference between students' number who saw no need to plan was 3% (3% of Finnish students and 6% of Estonian students). These differences indicate better financial education of Finnish students.

The results of regression analyses showed some differences in the factors influencing students' financial literacy. In the study of Estonian students, Academic Discipline, Level of Education, Age, and Nationality were found as statistically significant factors, which were not significant in the Finnish students' study. Previous experience in using financial services was a significant factor for the financial literacy of both countries' students. Findings showed that the most important factor in the Finnish study was income, which had no significant impact on Estonian students' financial literacy.

The differences pointed out above could be caused by the lower standard of living in Estonia, a shorter history of financial market, deficiency of financial education and missing skills of parents to passing on the financial knowledge to children.

The research findings showed the differences in students' financial literacy levels in case the opinions of improvement of the financial knowledge were differing. The interest of Estonian students increased with financial literacy while Finnish students with higher financial literacy score were not interested in improving their own financial literacy. That could be interpreted as Finnish male students' higher confidence as answer "No" came mostly from male students. The differences in the opinions of Finnish and Estonian students could be explained again by the differences between the two countries and recent history of their financial markets.

As the differences in the financial literacy of students in the two countries are not large (the level of financial literacy of students in both countries was Medium), it can be concluded that in current case the different political history have no significant impact on financial literacy, but rather education is important. Based on the results of the PISA test, which showed a very good level of knowledge of both Estonian and Finnish students, including in mathematics, a good level of general education can be assumed in both countries, and it can be argued that it has ensured a good level of financial literacy. The

differences in the level of university student knowledge (FIN average 72%, male 74%, female 72% and EST average 67%, male 67%, female 69%) can be attributed to the development of the financial market and financial education. Bucher-Koenen et al. (2017) have referred to the negative link between the level of financial literacy of women and the development of the financial market, which can also be confirmed on the basis of the results of this study.

5. How do students evaluate the acquired financial knowledge and knowledge providers?

To see how students evaluate the acquired financial knowledge, first, they were asked to assess their own financial literacy level. Based on the findings, student assessment of the financial knowledge was quite high, as 60% (47% of female and 64% of male) of Finnish and 42% (46% of female and 39% of male) of Estonian students rated their knowledge "High", and "Low" only 8% (FIN: 14% of female and 7% of male; EST: 8% of female and 9% of male) of participants from both countries.

Next, students were asked to assess their financial knowledge providers and ratings were given on a scale from one to five, where 1 was "Unimportant" and 5 was "Very important".

The results showed that the most important financial knowledge provider was the family, as the importance was assessed with "5" or "4" by 74% of Estonian and 79% of Finnish students. The next most important financial knowledge provider was the university, evaluated with "5" or "4" by 51% of participants from Estonia and 44% of participants from Finland. Nearly the same level was found in the assessment of the Upper Secondary School (EST: 50% and FIN: 39%) as knowledge provider. According to the students' opinions, financial knowledge acquired in the Basic School (assessed with "1" or "2" by 50% of Estonian and 48% of Finnish students) was evaluated as of modest importance, the same evaluation was given to Non-school related courses and Financial service providers, as financial knowledge providers.

However, many participants believed that personal financial knowledge should come from the family and should be taught from an early age, while it has been noted that families may not be very aware of these issues and may not always be able to manage their finances well. Thus, the study concludes that financial knowledge must be delivered continuously.

6. What changes should be made to promote financial education?

The interest of the parties concerned is essential in making the changes. Therefore, the students were asked the question: “Does your financial literacy need improvement?”. 82% of Estonian and 87% of Finnish respondents answered “yes”. Estonian female students had remarkably (16%) lower interest to financial literacy improvement than Finnish female students (interest accordingly 79% and 95%), but the male students' interest was on a similar level (84% and 85% respectively).

Results of several studies worldwide, including the current study, have shown gender differences in financial literacy where women tend to have lower financial literacy level.

Given the role of women in modern society, where everyday financial responsibilities and family well-being are often at the shoulders of women, and women have longer life expectancy, greater attention to improving women's financial literacy is essential.

Moreover, in situations where caring for children is primarily the responsibility of women, insufficient financial literacy can hinder the intergenerational transmission of financial literacy, influencing the early learning, behaviour and attitudes of the next generation of consumers, as noted also by Hung et al. (2012).

The results of the present study showed that female students' financial literacy may be higher than that of male students if the selected academic discipline is linked with mathematics. So, it could be stated that the existence of interest in mathematics as a numerical and logical subject supports the orientation in financial systems and helps to improve one's personal as well as more broadly social financial wellbeing.

It is necessary to improve the teaching of mathematics and in some levels, the subject could be taught separately to males and females and universities could even offer optional mathematics courses to prepare students for better understanding of managing personal finance and to reduce the subconscious fear to mathematics – numbers.

Study results showed that Finnish students had better saving habits, as 61% of students had the Savings accounts, while only 22% of Estonian students had made the same choice and the same direction prevailed in the use of investment services (27% of Finnish and 8% of Estonians). However, the opposite situation was revealed in the possession of pension fund shares, where 29% of Estonian students and only 2% of Finnish students had Pension fund shares. Furthermore, in the financial planning habits, if the chosen planning period was till retirement, the percentage of positive responses of students in both countries was low, close to one.

Although the impact of personal financial knowledge acquired is noticeable among students, the above would suggest that training programmes should guide students' understanding of their future responsibilities. It is necessary to explain openly the problems associated with an ageing population and the reduction of national support systems, as well as the positive aspects of long-term saving - investing (including the impact of compound interest).

Based on the results of the research, evidence was found of students' quite high self–esteem; 41% of Finnish and 42% of Estonian participants evaluated their financial knowledge higher than the tested value. At same time, 60% of Finnish and 42% of Estonian students marked their financial literacy level as High, whereas in reality only 33% of Finnish and 20% of Estonian students exceeded the High level limit.

Too high self-esteem can lead to decisions that are detrimental to well-being. Therefore, it is important to include real-life examples and necessary calculations in the curricula to an extent possible to minimize easy-going financial decisions, light trust and overconfidence.

Teaching of personal financial knowledge has been considered notably necessary by all the students who participated in the focus groups. Many of them believed that personal financial knowledge like saving and budgeting should come from the family and should be taught from an early age. However, it has been noted that families may not always be knowledgeable enough in these issues and may not to be able manage the finances well.

Based on the views expressed in the focus groups, it can be argued that financial knowledge should be provided at every level of education, starting with a course in basic school and continuing with more comprehensive knowledge in secondary school and university. Students involved in the interviews explained the low importance of the knowledge acquired in basic school (school years 1 to 9) mainly with lack of interest - boring subjects and teachers.

According to the collected opinions, connection with real life, the use of interesting examples, tasks and practical advice in organizing teaching in financial education is most important. So, the emphasis here should be on the teaching staff, their knowledge, and skills. Though this area is under discussion, there is still much room for improvement.

Focusing on teaching at university, students had proposals to offer a preparatory financial course to the first-year students, which would contain knowledge of saving, borrowing, budgeting, investing, and about financial risks, to help them start as independent persons. Furthermore, students also expressed interest in additional, i.e., more in-depth, courses for making informed investment decisions, including topics like happenings in the financial markets, the actual economic situation in different countries, evaluation of companies' value and economic activities etc.

Contribution

The value of the doctoral thesis stands in the scientific knowledge about:

1. The level of financial literacy of technology university students that has not been assessed before, but which is in critical need taking into account experience of other countries and international organizations.

2. The gender differences in the financial literacy levels of university students in two neighbouring countries with different political history and financial market development levels, which provides necessary knowledge for future research, in order to advance the effectiveness of financial education.

3. Students' assessments about acquired financial knowledge and knowledge providers, which is necessary for the promotion of financial education.

4. The factors influencing financial literacy and the extent of the assessed impact, both in numerical and verbal form, which together with the students' proposals help to shape the education policy and supply evidence for future research.

In addition, the study findings pointed out the importance of mathematics knowledge, as the students in mathematics-based academic disciplines compared to others had higher level of financial literacy. This knowledge could be important for education policy makers and educators at different levels of education.

Limits of the research

Financial literacy is a complex topic that touches several disciplines, including economics and finance, psychology and sociology, management and anthropology and even developments in information technology. To employ the theories and findings from all of these disciplines in one doctoral dissertation is just impossible, as each of these has a slightly different approach to studying human behaviour and there are sometimes contradictory paradigms within them.

The current study had its limitations, as the questionnaire was anonymous, it was not possible to contact participants in person later. For better outcomes, the question about participant's contact data - phone number or e-mail address (individually encoded or created special temporary e-mail address) should be added, to clarify later the answers if needed or let the respondent express their perspectives on (participate in focus group or interview).

The participation of Finnish students in the focus groups was small partly because of the termination of the Tampere University of Technology as an independent unit.

The time and volume limits hindered a more comprehensive study of gender differences affecting students' financial literacy. The topic definitely needs further research, both in terms of academic knowledge and attitudes and behaviour related to financial education.

Future research topics

The findings of the research show that there is still abundant room for further studies in the area of financial literacy and personal financial education. The suggestions for further research are provided, at first, on topics more related to the current study and next, on broader topics.

The present study highlighted gender differences in students' financial literacy, which has been confirmed in many studies around the world. Given the role of women in today's world, where much of the day-to-day financial responsibilities and family welfare are borne by women, it is vital to continue research about the impact of gender differences on financial literacy in order to improve the financial well-being in society.

A more specific issue arose based on the results of the logistic regression analysis, where the financial services that had significant impact on Finnish participants' financial literacy were Investment services and Insurance services. There was difference between the results of male and female analysis, as for female students, a significant effect appeared

only on Insurance services and that in the opposite direction. The reasons of this result should be investigated in future.

The results of the current study showed the positive impact of Mathematics on female students' financial literacy, while not being able to provide clear answers as how to increase interest in mathematics. There are myths and gender roles that girls are weaker in math or science, which can affect the attitudes of girls and that could hinder their advancement, i.e., can causing aversion towards math and related subjects. Further research is needed to reverse the situation, and the education system is in a privileged position to resolve the situation as several studies have confirmed that students are successful on subjects they like.

A broader objective of financial education is to improve the financial well-being of people. To this end, it is necessary to keep up with the level of knowledge available and the suitability of learning methods. So, it is important to repeat studies to assess the level of financial literacy and get feedback to the acquisition of knowledge.

With the development of economic psychology and behavioural economics, approaches in the research of financial literacy are changing (Ferreira, 2011) and researchers that analysed financial literacy purely from an economist´s perspective, have started to incorporate behavioural insights in their studies (e.g., Ambuehl et al., 2017). The involvement of behavioural knowledge in the development and implementation of national financial education strategies has only just begun (IOSCO, 2018); so, there are needs for additional studies and tools to enhance the financial education programmes.

For measuring financial literacy, better tools are needed. Some researchers have suggested addition of the measurement of psychological factors into the financial literacy construct, as their effect on financial well-being has been found to be more significant than that of knowledge (Fernandes et al., 2014). These data could enable the analysis of cultural differences and the role of social norms in financial behaviour and better organization of the programs and provision of personal financial education.

To develop evidence-based tools for improving financial literacy, the randomised controlled trials should be conducted, like these widely used in behavioural economics and economic psychology research. Edovald and Firpo (2016) have argued that this is the only method that allows the assessment of causality, instead of merely showing correlations. In the use of that method, the participants are randomly assigned into at least two groups, one is the control group and the other(s) the treatment group(s). If in the end, the treatment group(s) have significantly changed their behaviour compared to the control group, it can be said that the financial education programme was effective. So, ideally, in addition to persons' self-reported behaviour and financial situation, real objectively measurable indicators could and would be used.

With reference to the complexity of financial literacy and personal financial education improvement, the list above of recommendations for future research topics is by no means exhaustive.

References

Ajzen, I. (1993). *Attitude theory and the attitude-behavior relation*. In D. Krebs & P Schmidt (Eds.), New directions in attitude measurement (pp. 41-57). New York: Walter de Gruyter.

Ajzen, I. and Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84(5), pp. 888-918.

Akerlof, G. A. and Shiller, R. J. (2009). *Animal Spirits: How Human Psychology Drives the Economy, and Why it Matters for Global Capitalism*. Princeton: Princeton University Press.

Albert, D., Aschenbrenner, K.M. and Schmalhofer, F. (1989). Cognitive choice processes and the attitude-behavior relation. In A. Upmeyer (Ed.), Attitudes and behavioral dimensions, pp. 61-99. New York: Springer-Verlag.

Alexander, P.A. (2003). The development of expertise: The journey from acclimation to proficiency. *Educational Researcher*, 32(8), pp. 10-14.

Alexander, P.A., & Dochy, F.J.R.C. (1995). Conceptions of knowledge and beliefs: A comparison across varying cultural and educational communities. *American Educational Research Journal*, 32(2), 413-442.

Alexander, P.A., & Jetton, T.L. (2000). *Learning from text: A multidimensional and developmental perspective.* In M.L. Kamil, P.B. Mosenthal, P.D. Pearson, & R. Barr (Eds.), Handbook of reading research: Volume III (pp. 285-310).

Alexander, P. A., Jetton, T. L. and Kulikowich, J. M. (1995). Interrelationship of knowledge, interest, and recall: Assessing a model of domain learning. *Journal of Educational Psychology, 87*(4), pp. 559–575.
https://doi.org/10.1037/0022-0663.87.4.559

Allport, G.W. (1967). Attitudes. In M. Fishbein (Ed.), *Readings in attitude theory and measurement* (pp. 1-13). New York: John Wiley & Sons.

Altintas, K. M. (2011). The dynamics of financial literacy within the framework of personal finance: An analysis among Turkish University Students. *African Journal of Business Management*, 5(26), pp. 10483 - 10491.
http://www.academicjournals.org/app/webroot/article/article1380526343_Altintas.pdf

Altman, M. (ed.) (2006). *Handbook of Contemporary Behavioral Economics: Foundations and Developments*. Armonk, New York: M.E. Sharpe.

Altman, M. (2011). Behavioural Economics Perspectives: Implications for Policy and Financial Literacy. Available at SSRN: https://ssrn.com/abstract=2013449

Altman, M. (2012). Implications of behavioural economics for financial literacy and public policy. *Journal of Behavioral and Experimental Economics (formerly The Journal of Socio-Economics)*, 41(5), pp. 677-690.

Ambuehl, S., Bernheim, B.D. and Lusardi, A. (2017). A Method for Evaluating the Quality of Financial Decision Making, with an Application to Financial Education. GFLEC Working Paper Series 2017-2, 90. Global Financial Literacy Excellence Center, Washington.

Atkinson, A., McKay, S., Kempson, E. and Collard, S. (2006). Levels of Financial Capability in the UK: Results of a baseline survey. University of Bristol: Personal Finance Research Centre. 150 pp. [Retrieved Jan. 20, 2016], url: http://www.pfrc.bris.ac.uk/publications/Reports/Fincap_baseline_results_06.pdf

Atkinson, A. and Messy, F. (2012). Measuring financial literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot study. OECD Working Papers on Finance, Insurance and Private Pensions, No 15, OECD Publishing, Paris

Atkinson, A., Messy, F.-A., Rabinovich, L. and Yoong, J. (2015). Financial Education for Long-term Savings and Investments. OECD Working Papers on Finance, Insurance and Private Pensions. OECD, Paris.

Bank of Estonia. (2019). Annual economic indicators for Estonia (homepage). Statistical indicators. http://statistika.eestipank.ee/#/en/p/ MAJANDUSKOOND/r/2053/1902 (Accessed 22.02.19).

Bernheim, B.D. and Garrett, D.M. (2003). The effects of financial education in the workplace: evidence from a survey of households. *Journal of Public Economics*, 87(7-8), pp. 1487–1519. https://doi.org/10.1016/S0047-2727(01)00184-0

Bertrand, M., Mullainathan, S. and Shafir, E. (2006). Behavioural Economics and Marketing in Aid of Decision- Making Among the Poor. *Journal of Public Policy and Marketing*, 25, pp. 8-23.

Bhattacherjee, A. (2012). Social Science Research: Principles, Methods, and Practices. Textbooks Collection. 3. http://scholarcommons.usf.edu/oa_textbooks/3

Blaikie, N. (1993), Approaches to Social Enquiry, 1st ed, Polity Press, Cambridge.

Bloom, B. S. (1976). *Human characteristics and school learning.* New York: McGraw Hill.

Bertrand*Taxonomy of educational objectives. Handbook I: Cognitive domain.* New York: David McKay.

Bloom, B.S., Englehart, M.D., Frost, E.J., Hill, W.H., & Krathwol, D.R. (1956). *Taxonomy of educational objectives*. Handbook I: Cognitive domain. New York: David McKay.

Bloom, B. S., Hastings, J. T. and Madaus, G. F. (1971). *Handbook on formative and summative evaluation of student learning*. New York: McGraw Hill.

Braunstein, S. and Welch, C. (2002). Financial literacy: An overview of practice, research, and policy. *Federal Reserve Bulletin*, pp. 445-457.

Bucher-Koenen, T., & Lusardi, A. (2011). Financial literacy and retirement planning in Germany. *Journal of Pension Economics and Finance, 10*(4),565-584. Available at: https://doi.org/10.1017/S1474747211000485.

Bucher-Koenen., T., Lusardi, A., Alesi, R., & Van Rooij, M. (2017). How financially literate are women? An overview and new insights. *Journal of Consumer Affairs, Wiley Blackwell, 51*(2),255-283.Available at: https://doi.org/10.3386/w20793.

Campbell, J. Y. (2006). Household Finance. *Journal of Finance,* 61(4), pp. 1553-1604.

Chen, H. and Volpe, R. P. (1998). An Analysis of Personal Financial Literacy among College Students. *Financial Services Review*, 7(2), pp. 107-128. https://doi.org/10.1016/S1057-0810(99)80006-7

Chen, H. and Volpe, R. P. (2002). Gender Differences in Personal Financial Literacy among College Students. *Financial Services Review*, 11(3), pp. 289-307. [Retrieved Jan. 20, 2014], url: https://www.researchgate.net/publication/285358406_Gender_Differences_in_Personal _Financial_Literacy_Among _College_Students

Cherryholmes, C. H. (1992). Notes on pragmatism and scientific realism. *Educational Researcher*, pp. 13–17.

Christelis, D., Jappelli, T. and Padula, M. (2010). Cognitive Abilities and Portfolio Choice. *European Economic Review*, 54(1), pp. 18-38.

Clark, R., Lusardi, A. and Mitchell, O.S. (2017). Employee Financial Literacy and Retirement Plan Behavior: A Case Study. *Economic Inquiry*, 55(1), pp. 248–259. https://doi.org/10.1111/ecin.12389

Creswell, J.W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches.* 4th ed. SAGE Publications, Inc.

Creswell, J.W. and Plano Clark, V. L. (2006) *Designing and conducting mixed methods research*. Thousand Oaks, Calif.: SAGE Publ.

Creswell, J.W, Plano Clark, V., Gutmann, M. and Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori and C Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 209-240*)*. Thousand Oaks, CA : Sage.

Cole, S. A., Paulson, A. L. and Shastry, G. K. (2012). Smart Money: The Effect of Education on Financial Behaviour. Harvard Business School Finance Working Paper No. 09-071. http://dx.doi.org/10.2139/ssrn.1317298

Courchane, M. and Zorn, P. (2005), Consumer Literacy & Credit Worthiness, Prepared for *Federal Reserve System's Community Affairs Research Conference*. Available at: https://www.researchgate.net/publication/5042561_Consumer_literacy_and_creditworthiness

de Meza, D., Irlenbusch, B. and Reyniers, D. (2008). *Financial Capability: A Behavioural Economics Perspective*. London: Financial Services Association.

Drexler, A., Fischer, G. and Schoar, A. (2014). Keeping it Simple: Financial Literacy and Rules of Thumb. *American Economic Journal: Applied Economics*, 6(2), pp. 1–31. https://doi.org/10.1257/app.6.2.1

Eamets, R., Kaasa, A., Kaldaru, H., Parts, E. and Trasberg, V. (2005). *Introduction to economic theory.* (Sissejuhatus majandusteooriasse.) Tartu: Tartu Ülikooli Kirjastus.

Easterby-Smith, M., Thorpe, R. and Jackson, P. (2008). Management Research, 3rd ed, SAGE Publications Ltd., London.

Edovald, T. and Firpo, T. (2016). Running randomised controlled trials in innovation, entrepreneurship and growth: an introductory guide. Nesta. London.

Eriksson, P. and Kovalainen, A. (2008). Qualitative Methods in Business Research, 1st ed, SAGE Publications Ltd., London.

Erwin, P. (2001). *Attitudes and persuasion*. Philadelphia: Taylor & Francis Inc.

European Union. (2019). Estonia. EU member countries in brief (homepage). Official website of the European Union. https://europa.eu/european-union/abouteu/countries/member-countries/estonia_en (Accessed 22.2.19).

Eurostat Statistics Explained. File:Number of tertiary education students by level and sex, 2015. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Number_of_tertiary_education_students_by_level_and_sex,_2015_(thousands)_YB17.png

FactsMaps. (n.d). PISA 2015 Worldwide ranking – average score of math, science and reading. Retrieced from: https://factsmaps.com/pisa-worldwide-ranking-average-score-of-math-science-reading/

FactsMaps. (n.d). PISA 2018 Worldwide ranking – average score of mathematics, science and reading. Retrieced from: https://factsmaps.com/pisa-2018-worldwide-ranking-average-score-of-mathematics-science-reading/

Faktum & Ariko. (2010). Financial literacy among the Estonian population. (Finantsalane kirjaoskus Eesti elanike seas.) Available at: https://www.fi.ee/sites/default/files/finantskirjaoskuse_uuring.pdf

Fernandes, D., Lynch, J. G. and Netemeyer, R. G. (2014). Financial Literacy, Financial Education, and Downstream Financial Behaviors. *Management Science*, 60(8), pp. 1861–1883. https://doi.org/10.1287/mnsc.2013.1849

Ferreira, V.R. de M. (2011). Can Economic Psychology and Behavioural Economics Help Improve Financial Education? in: Improving Financial Education Efficiency. OECD, Paris, pp. 103–120.

Flick, U. (2009). An Introduction to Qualitative Research 4th ed. SAGE Publications, Inc.

Fonseca, R., Mullen, K., Zamarro, G. and Zissimopoulos, J. (2012). What Explains the Gender Gap in Financial Literacy? The Role of Household Decision-Making. *The Journal of Consumer Affairs*, 46(1), pp. 90–106. https://doi.org/ 10.1111/j.1745-6606.2011.01221.x

Fornero, E. (2015). Economic-financial Literacy and (Sustainable) Pension Reforms: Why the Former is a Key Ingredient for the Latter - Revue Banque. *Bankers, Markets and Investors*, 134 (Special Issue Pension), pp. 18–32.

Gable, R.K., and Wolf, M.B. (1993). *Instrument development in the affective domain: Measuring attitudes and values in corporate and school settings* (2nd ed.). Boston, MA: Kluwer Academic Publishers.

Guba, E. G. (1990). The alternative paradigm dialog. In E. G. Guba (Ed.), The paradigm dialog (pp. 17–30). Newbury Park, CA: Sage.

Guba, E. G. and Lincoln, Y. S. (1989). *Fourth generation evaluation.* Sage Publications, Inc.

Grönfors, M. (1982). *Qualitative field research methods*. (Kvalitatiiviset kenttätyömenetelmät), WSOY, Helsinki.

Goldsmith, E. B. and Goldsmith, R. E. (1997). Gender differences in perceived and real knowledge of financial investments. *Psychological Repor*t, 80 pp. 236-238. https://doi.org/10.2466/pr0.1997.80.1.236

Goldsmith, E. B. and Goldsmith, R. E. (2006). The Effects of Investment Education on Gender Differences in Financial Knowledge. *Journal of Personal Finance.* 5(2), pp. 55-69. [Retrieved Jan. 20, 2016], url: https://www.academia.edu/2833951/The_effects_of_investment_education_on_gender_differences_in_financial_kno wledge

Hammack, P.L., Robinson, W.L.V., Crawford, I. and Li, S.T. (2004). Poverty and Depressed Mood Among Urban African-American Adolescents: A Family Stress Perspective. *Journal of Child and Family Studies*, 13(3), pp. 309-323.

Hilgert, M., Hogarth, J. and Beverly, S. (2003). Household financial management: The connection between knowledge and behavior. *Federal Reserve Bulletin*, pp. 309–322.

Hirsijärvi, S. and Huttunen, R. (2005). *Introduction to educational science* (Sissejuhatus kasvatusteadusse), Medicina, Tallinn

Hirsijärvi, S., Remes, P., Sajavaara, P. (2005). *Investigate and write.* (Uuri ja kirjuta). Medicina, Tallinn.

Howe, K.R. (1988). Against the Quantitative-Qualitative Incompatibility Thesis or Dogmas Die Hard. *Educational Researcher,* 17(8), pp. 10-16. https://doi.org/10.2307/1175845

Hsieh, H-F. and Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis, *Qualitative Health Research*, 15(9), pp. 1277-1288. https://doi.org/10.1177/1049732305276687

Hung, A., Yoong, J. and Brown, E. (2012), Empowering Women Through Financial Awareness and Education, *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 14, OECD Publishing, Paris. https://doi.org/10.1787/5k9d5v6kh56g-en.

Huston, S. J., 2010. Measuring financial literacy. *The Journal of Consumer Affairs*, 44(2), pp. 296-316. https://doi.org/10.1111/j.1745-6606.2010.01170.x

Huutoniemi, K., Klein, J.T., Bruun, H. and Hukkinen, J. (2010). Analyzing interdisciplinarity: Typology and indicators. *Research Policy*, 39, pp. 79–88. https:// doi.org/10.1016/j.respol.2009.09.011

IOSCO (2018). The Application of Behavioural Insights to Financial Literacy and Investor Education Programmes and Initiatives. IOSCO and OECD.

Jick, T.D. (1979). Mixing Qualitative and Quantitative Methods: Triangulation in Action. *Administrative Science Quarterly*, 24, pp. 602-611. https://doi.org/10.2307/2392366

Jones, J. E. (2005). College students' knowledge and use of credit. *Journal of Financial Counseling and Planning*, 16(2), 9-16.

Kahneman, D. (2003). Maps of Bounded Rationality: Psychology for Behavioral Economics. *American Economic Review* 93, pp. 1449–1475.

Kahneman, D. and Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), pp. 263–291. https://doi.org/10.2307/1914185

Kaiser, T., Menkhoff, L. (2017). Does Financial Education Impact Financial Behavior, and if So, When? *The World Bank Economic Review*, 31(3), pp. 611–630, https://doi.org/10.1093/wber/lhx018

Kalmi, P. and Ruuskanen, O. P. (2018). Financial literacy and retirement planning in Finland. *Journal of Pension Economics and Finance*, 17(3), pp. 335-362. https://doi.org/10.1017/S1474747217000270.

Kann, L. (2010). Survey: People's financial literacy is insufficient. (Uuring: inimeste finantskirjaoskus jätab soovida.) Available at: https://www.raamatupidaja.ee/uudised/2010/10/28/uuring-inimeste-finantskirjaoskus-jatab-soovida

Kessler, R. C. and Neighbors, H. W. (1986). A New Perspective on the Relationships Among Race, Social Class, and Psychological Distress. *Journal of Health and Social Behavior*, pp. 107-115.

Kim, M., and Hunter, J. E. (1993). Attitude-behavior relations: A meta-analysis of attitudinal relevance and topic. *Journal of Communication*, 43(1), pp. 101-141.

Klapper, L., Lusardi, A., Van Oudheusden, P. (2015). Financial Literacy Around the World. Insights from the Standard & Poor's Ratings Services Global Financial Literacy Survey.

Krueger, R. A., Casey, M. A. (2015). *Focus groups: A practical guide for applied researchers* (5th ed.). Thousand Oaks, CA: Sage. Available at: https://books.google.ee/books?hl=en&lr=&id=8wASBAAAQBAJ&oi=fnd&pg=PP1&ots=XfbJGAcFmT&sig=z25Kib9jSxqbhU29pEr2kEgJLtk&redir_esc=y#v=onepage&q&f=false

Krueger, R. A. (1994). *Focus groups: A practical guide for applied research* (2nd ed.). Thousand Oaks, CA: Sage.

Laherand M-L (2008) *Qualitative research method*. (Kvalitatiivne uurimisviis.) Tallinn: Infotrükk,

LaPiere, R.T. (1967). Attitude versus actions. In M. Fishbein (Ed.), Readings in attitude theory and measurement (pp. 26-31). New York: John Wiley & Sons.

Lincoln, Y. S. (1998). The Ethics of Teaching in Qualitative Research. *Qualitative Inquiry,* 4(3), pp. 315-327. https://doi.org/10.1177/107780049800400301

Lincoln, Y. S., Lynham, S. A. and Guba, E. G. (2011). Paradigmatic controversies, contradictions, and emerging confluences revisited. In N. K. Denzin & Y. S. Lincoln, The SAGE handbook of qualitative research (4th ed., pp. 97–128). Thousand Oaks, CA: Sage.

Lorant, V., Deliege, D., Eaton, W., Robert, A., Philippot, P. and Ansseau, M. (2003). Socioeconomic Inequalities in Depression: A Meta-analysis. *American journal of epidemiology.* 157(2), pp. 98-112.

Lourenço, J.S., Ciriolo, E., Almeida, S.R. and Troussard, X. (2016). Behavioural Insights Applied to Policy. European Report. Joint Research Centre, European Commission, European Union. https://doi.org/10.2760/903938

Lusardi, A. (2004). Saving and the Effectiveness of Financial Education. (Ed.) by O. Mitchell and S. Utkus, *Pension Design and Structure: New Lessons from Behavioral Finance*. Oxford University, New York, pp. 157–184.

Lusardi, A. (2017). Visiting Swedish House of Finance to share her research and receive Skandia's 2017 research award. https://www.houseoffinance.se/lusardi-financial-literacy-levels-need-robust-intervention/

Lusardi, A. (2019). Financial literacy and the need for financial education: evidence and implications. *Swiss Journal of Economics and Statistics*, 155(1). https://doi.org/10.1186/s41937-019-0027-5

Lusardi, A. and Mitchell, O.S. (2006). Financial Literacy and Planning: Implications for Retirement Wellbeing." Working Paper, Pension Research Council, Wharton School, University of Pennsylvania. [Retrieved Jan. 20, 2016], url: https://pensionresearchcouncil.wharton.upenn.edu/wp-content/uploads/2015/09/PRC-WP-2006-1.pdf

Lusardi, A. and Mitchell, O. S. (2007a). Financial Literacy and Retirement Planning: New Evidence from the Rand American Life Panel, Working Papers wp157, University of Michigan, Michigan Retirement Research Center.

Lusardi, A., and Mitchell, O.S. (2007b) Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education. *Business Economics*, 42(1), pp. 35-44.

Lusardi, A. and Mitchell, O.S. (2008). Planning and Financial Literacy: How Do Women Fare? *American Economic Review*, 98(2), pp. 413-417.

Lusardi, A. and Mitchell, O. S. (2009). How Ordinary People Make Complex Economics Decisions: Financial Literacy and Retirement Readiness. NBER Working Paper 15350.

Lusardi, A., Mitchell, O. S. and Curto, V. (2010). "Financial Literacy among the Young". Journal of Consumer Affairs 44, pp. 358–380. https://doi.org/10.1111/j.1745-6606.2010.01173.x

Lusardi, A. and Mitchell, O.S. (2011). Financial literacy around the world: an overview. Journal of Pension Economics and Finance 10(4), pp. 497–508. https://doi. org/10.1017/S1474747211000448

Lusardi, A. and Mitchell, O. S. (2013). The Economic Importance of Financial Literacy: Theory and Evidence. NBER Working Paper 18952.

Lusardi, A. and Tufano, P. (2009). Debt Literacy, Financial Experiences, and Over indebtedness. NBER Working Paper Cambridge, Mass., USA, National Bureau of Economic Research.

Lutz, R.J. (1989). Presidential Address Positivism, Naturalism and Pluralism in Consumer Research: Paradigms in Paradise. *Advances in Consumer Research,* 16, pp. 1–8.

Mackenbach, J.P., Stirbu, I., Roskam, A.J.R., Schaap, M.M., Menvielle, G., Leinsalu, M. and Kunst, A.E. (2008). Socioeconomic Inequalities in Health in 22 European Countries. *New England Journal of Medicine*, 358(23), pp. 2468-2481.

Mandell, L. (2008). The Financial Literacy of Young American Adults. Results of the 2008 National JumpStart Coalition Survey of High School Seniors and College Students. JumpStart Coalition: pp. 1- 253. Available at: https://www.stockmarketgame.org/assets/pdf/2008%20JumpStart%20Financial%20Literacy%20Survey.pdf

Mandell, L. and Klein, L. S. (2007). Motivation and financial literacy. *Financial Services Review*, 16, pp. 105–116

Mandell, L. and Klein, L. S. (2009). The impact of financial literacy education on subsequent financial behavior. *Journal of Financial Counseling and Planning, 20*(1), pp. 15–24.

Manning, R.D. and Kirshak, R. (2005). Credit Cards on Campus: Academic Inquiry, Objective Empiricism, or Advocacy Research? *NASFAA Journal of Student Financial Aid,* 35, (1), pp. 39-48.

Marmot, M. (2005). Social Determinants of Health Inequalities. *The Lancet*, 365 (9464), pp. 1099 - 1104.

Maxcy, S. J. (2003). Pragmatic Threads in Mixed Method Research in the Social Sciences: The Search for Multiple Modes of Inquiry and the End of the Philosophy of Formalism. In A. Tashakkori, & C. Teddlie (Eds.), Handbook of Mixed Methods in the Social and Behavioural Sciences (pp. 51-89). Thousand Oaks, CA: Sage.

Mertens, D. M. (2010). Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods (3rd ed.). Thousand Oaks, CA: Sage.

Miller, M., Reichelstein, J., Salas, C. and Zia, B. (2015). Can you help someone become financially capable? A meta-analysis of the literature. *The World Bank Research Observer,* 30(2), pp. 220–246.

Monticone, C. (2010). How Much Does Wealth Matter in the Acquisition of Financial Literacy? Journal of Consumer Affairs, 44 (2), pp. 403 - 422. [Online] EBSCO (31.03.2012).

Morgan, D. (1998). Practical strategies for combining qualitative and quantitative methods: Applications to health research. *Qualitative Health Research*, 8, pp. 362–376.

Morgan, D. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, 1(1), pp. 48– 76

Moore, D.L. (2003). Survey of Financial Literacy in Washington State: Knowledge, Behavior, Attitudes, and Experiences. Technical Report, 03-39, Washington State University. https://doi.org/10.13140/2.1.4729.4722

Murphy, J. P. (1990). *Pragmatism: From Peirce to Davidson*. Boulder, CO: Westview.

Mändmaa, S. (2019). Analyzing the factors influencing university students' financial literacy. *International Journal for Innovation Education and Research, 7*(7), pp. 465-497. https://doi.org/10.31686/ijier.Vol7.Iss7.1628.

Mändmaa, S. and Zhiguleva, K. (2013). Financial literacy – the level of knowledge among students in Estonia. Poster presented to the conference Higher education - higher level learning? Tallinn, Estonia; January 23rd -25th.

Nicolini, G., Cude, B.J. and Chatterjee, S. (2013). Financial literacy: A comparative study across four countries. *International Journal of Consumer Studies* 37(6), pp. 689–705. https://doi.org/10.1111/ijcs.12050

O'Donoghue, T. and Rabin, M. (1998). Procrastination in preparing for retirement. University of California-Berkeley Working Paper. Available at: http://www.wiwi. uni-bonn.de/kraehmer/Lehre/Beh_Econ/Papiere/ODonoghue-Rabin-retire.pdf (accessed 16. May 2016).

O'Donoghue, T. and Rabin, M. (1999). Incentives for Procrastinators. *The Quarterly Journal of Economics*, 114(3), pp. 769–816. https://www.jstor.org/stable/2586884

OECD, 2005. Improving Financial Literacy: Analysis of Issues and Policies. OECD Publishing, Paris.

OECD. (2006). Improving Financial Literacy: Analysis of Issues and Policies. *Financial Market Trends* 2005/2,111-123. https://dx.doi.org/10.1787/fmt-v2005-art11-en

OECD (2011), Improving Financial Education Efficiency: OECD-Bank of Italy Symposium on Financial Literacy, OECD Publishing. http://dx.doi.org/10.1787/9789264108219-en

OECD (2012). Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study. OECD Working Papers on Finance, Insurance and Private Pensions No. 15. https://dx.doi.org/10.1787/5k9csfs90fr4-en

OECD, (2013). Improving financial education effectiveness through behavioural economics. OECD key findings and way forward. Russia Trust Fund. OECD, Paris.

OECD. (2014). *PISA 2012 Results: Students and Money (Volume VI): Financial Literacy Skills for the 21st Century.* PISA, OECD Publishing, Paris. https://dx.doi.org/10.1787/9789264208094-en

OECD (2016). *OECD/INFE International Survey of Adult Financial Literacy Competencies.* OECD. Paris. [Retrieved Jan. 22, 2017], url: www.oecd.org/finance/OECD-INFE-International-Survey-of-Adult-Financial-Literacy-Competencies.pdf

OECD (2017). OECD Economic Surveys: Estonia 2017. OECD, Paris.

OECD (2020). *PISA 2018 Results (Volume IV): Are Students Smart about Money?,* PISA, OECD Publishing. Paris. https://doi.org/10.1787/48ebd1ba-en.

OECD INFE (2017). Revised concept note on measuring financial well-being. OECD, Paris.

OECD Better Life Index.(BLI) Estonia. Available at: http://www.oecdbetterlifeindex.org/countries/estonia/

OECD Better Life Index.(BLI) Finland. Available at: http://www.oecdbetterlifeindex.org/countries/finland/

OECD Data. Available at: https://data.oecd.org/finland.htm

OECD, Finland Economic Snapshot. Available at: https://www.oecd.org/economy/finland-economic-snapshot/

Onwuegbuzie, A. J., Dickinson, W.B., Leech, N. L. and Zoran, A. G. (2009). A Qualitative Framework for Collecting and Analyzing Data in Focus Group Research. *The International Journal of Qualitative Methods*, 8(3), pp. 1-21. https://doi.org/10.1177/160940690900800301

Patton, M. Q. (1990*). Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.

"Pragmatism," by Douglas McDermid, *The Internet Encyclopedia of Philosophy*, ISSN 2161-0002, https://www.iep.utm.edu/, 23.06.2018.

O´Prey, L. and Shephard, D. (2014). Financial Education for Children and Youth: A Systematic Review and Meta-analysis. Aflatoun Working Paper No. 2014. 1C. Aflatoun International, Amsterdam.

Perry, V.G. and Morris, M.D. (2005). Who Is in Control? The Role of Self Perception, Knowledge, and Income in Explaining Consumer Financial Behavior. *Journal of Consumer Affairs*, 39(2), pp. 299-313.

Phillips, D. C., & Burbules, N. C. (2000). *Postpositivism and Educational Research*. (Philosophy, Theory, and Educational Research Series). Rowman & Littlefield Publishers

Pires, V. and Quelhas, A. P. (2015). Financial Literacy among the Higher Education Students: Empirical Evidence for the Portuguese Case. *Portuguese Journal of Finance, Management and Accounting*, 1(1), pp. 84-103. Available at: http://u3isjournal.isvouga.pt/index.php/PJFMA

Reed, M. (2008) Report Student Debt and the Class of 2007. The Project on Student Debt. [Retrieved Nov. 20, 2012], url: http://ticas.org/sites/default/files/pub_files/classof2007.pdf

ReinisFischer. Average Salary in European Union 2015. Available at: https://www.reinisfischer.com/average-salary-european-union-2015

Rizzolatti, G., Fadiga, L., Fogassi, L. and Gallese, V. (1997). The Space Around Us. Science, 277(5323), pp. 190-191. https://doi.org/10.1126/science.277.5323.190

Robb, C.A. (2011). Financial Knowledge and Credit Card Behavior of College Students. *Journal of Family and Economic Issues* 32, pp. 690–698. https://doi.org/10.1007/s10834-011-9259-y

Robb, C.A. and Woodyard, A. (2011). Financial Knowledge and Best Practice Behavior. *Journal of Financial Counseling and Planning*, 22(1), pp. 60-70.

Roberts, J. and Jones, E. (2001). Money attitudes, credit card use, and compulsive buying among American college students. *Journal of Consumer Affairs*, 35(2), pp. 213-240.

Robson, C. (2002). *Real World Research: A Resource for Social Scientists and Practitioner-researchers*. Oxford: Blackwell.

Rorty, R. (1990). Pragmatism as anti-representationalism. In J. P. Murphy, Pragmatism: From Peirce to Davison (pp. 1–6). Boulder, CO: Westview.

Roubini, N. and Mihm, S. (2010). *Crisis Economics: A Crash Course in the Future of Finance*. New York: Penguin.

Rossman, G. B. and Wilson, B. L. (1985). Numbers and words: Combining quantitative and qualitative methods in a single large-scale evaluation study. *Evaluation Review*, 9(5), pp. 627–643.

Saar Poll OÜ (2015). Study of financial literacy among Estonian residents. (Finantsalase kirjaoskuse uuring Eesti elanike seas.) Ministry of Finance, Tallinn. pp. 1-77. Available at: http://www.saarpoll.ee/UserFiles/File/Finantskirjaoskus_2015_ARUANNE_FINAL.pdf

SA Innove. (2013). Results of PISA 2012 Estonia. (PISA 2012 Eesti tulemused). edited by Gunda Tire, Tallinn Dec 4, 2013, SA Innove. [Retrieved Jan. 15, 2015], url: https://issuu.com/innove/docs/pisa_2012_eesti_tulemused_2

Sallie Mae. (2009). How undergraduate students use credit cards. Sallie Mae's National Study of Usage Rates and Trends. [Retrieved Jan. 10, 2012], url: http://www.salliemae.com/about/ news_info/research/credit_card_study/

Saunders, M., Lewis, P. and Thornhill, A. (2007). Research Methods for Business Students, 4th ed, Prentice Hall Financial Times, Harlow.

Schoot Uiterkamp, A.J.M and Vlek, C. (2007). Practice and Outcomes of Multidisciplinary Research for Environmental Sustainability. *Journal of Social Issues*, 63(1), pp. 175– 197. https://doi.org/10.1111/j.1540-4560.2007.00502.x

Schrader, P.G. and Lawless, K.A. (2004). The Knowledge, Attitudes, & Behaviors Approach How to Evaluate Performance and Learning in Complex Environments. *Performance Improvement*, 43(9), pp. 8-13. https://doi.org/10.1002/pfi.4140430905

Schuchardt, J., Hanna, S.D., Hira, T.K., Lyons, A.C., Palmer, L. and Xiao, J.J. (2009). Financial literacy and education research priorities. *Journal of Financial Counseling and Planning* 20(1), pp. 84-95.

Seccombe, K., (2000). Families in Poverty in the 1990s: Trends, Causes, Consequences, and Lessons Learned. *Journal of Marriage and Family*, 62(4), pp. 1094-1113.

Shefrin, H. (2002). *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing*. New York: Oxford University Press

Shiller, R. J. (2001). *Irrational Exuberance.* Princeton: Princeton University Press.

Shiller, R. J. (2009). How About a Stimulus for Financial Advice? *New York Times*, January 17. Available at: https://www.mandomarketing.com/library/wp-content/uploads/2015/05/Robert-Shiller-How-About-a-Stimulus-for-Financial-Advice.pdf

Showkat, N. and Parveen, H. (2017). Non-Probability and Probability Sampling. e-PG Pathshala UGC-MHRD. Available at: https://www.researchgate.net/publication/319066480_Non-Probability_and_Probability_Sampling

Simon, H. A. (1978). "Rationality as a Process and as a Product of Thought." American Economic Review 70, pp. 1–16.

Stango, V. and Zinman, J. (2007). Fuzzy Math and Red Ink: When the Opportunity Cost of Consumption Is Not What It Seems. Mimeo, Dartmouth College.

Stango, V. and Zinman, J. (2009). Exponential Growth Bias and Household Finance. *Journal of Finance*, 64(6), pp. 2807-2849.

Statistics Estonia (homepage). https://www.stat.ee

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Thousand Oaks, CA: Sage.

Tashakkori, A. and Teddlie, C. (Eds.). (2010). *SAGE handbook of mixed methods in social and behavioral research* (2nd ed.). Thousand Oaks, CA: Sage.

Thaler, R. H. and Sunstein, C. R. (2009). *Nudge: Improving decisions about health, wealth, and happiness.* London: Penguin Books.

The Behavioural Insights Team, 2015. The Behavioural Insights Team (homepage). http://www.behaviouralinsights.co.uk/about-us/ (Accessed 28.5.2016).

Trost, J. (1986) Statistically nonrepresentative stratified sampling: A sampling technique for qualitative studies. *Qualitative Sociology*, 9(1), pp. 54–57. DOI:10.1007/BF00988249

Van Rooij, M., A. Lusardi and R. Alessie. (2007). "Financial Literacy and Stock Market Participation." NBER Working Paper 13565. https://www.nber.org/papers/w13565.pdf

Van Rooij, M., Lusardi, A. and Alessie, R. (2011). Financial Literacy and Stock Market Participation. *Journal of Financial Economics*, 101(2), pp. 449-472.

Vaughn, S., Schumm, J.S. and Sinagub, J.M. (1996), *Focus Group Interviews in Education and Psychology*. Sage Publication, Inc.

Wagland, S. P., Taylor, S. (2009). When it comes to financial literacy, is gender really an issue? *Australasian Accounting Business & Finance Journal*, 3(1), pp. 13 - 25. https://ro.uow.edu.au/cgi/viewcontent.cgi?referer=https://www.bing.com/&httpsredir=1&article=1049&context=aab fj

Wilkinson, S. (2004). Focus group research. *Qualitative research: Theory, method, and practice*, pp.177-199.

Willis, L. E. (2008). Against financial literacy education. *Iowa Law Review*, 94. . [Retrieved Aug. 3, 2012], url: http://lsr.nellco.org/ upenn/wps/papers/208/.

Woolfolk, A.E. (1998). *Educational psychology* (7th ed.). Boston, MA: Allyn and Bacon.

Wärneryd, K.-E. (2001). *Stock-Market Psychology*. Cheltenham, U.K.: Edward Elgar.

Xiao, J.J. and Porto, N. (2017). Financial education and financial satisfaction: Financial literacy, behavior, and capability as mediators. *International Journal of Bank Marketing*, 35(5), pp. 805-817. https://doi.org/10.1108/IJBM-01-2016-0009

Yoong, J. (2010). Financial Illiteracy and Stock Market Participation: Evidence from the RAND American Life Panel. Pension Research Council Working Paper: The Wharton School of the University of Pennsylvania, Philadelphia, PA.

Appendix A: Questions for data collection

Name of the university you are studying at_____

Name the department you are studying at _____

What is your class rank?

a) Undergraduate
   1st 2nd 3rd year
b) Graduate
   1st 2nd year
c) Integrated Bachelor's and Master's Study _____

What is your major field of study?

a) Businessb) Education c) Liberal Arts d) Engineering Science

e) Other (please specify) _____

What is your age group?

a) 18…22 b) 23…29 c) 30…39 d) 40 or older

What is your sex?

a) Male b) Female

What is your nationality?

a) Finnish b) Swedish c) Russian d) Other (please specify) _____

Your household

a) Live alone
b) Live with husband/ wife
c) Live with husband/ wife and children
d) Live with parents/grandparents
e) Other (please specify) _____

Your monthly net income

a) Under 300 EUR (*minimum wage rates)
b) 301- 750 EUR (*2013 average salary in Estonia was 750 EUR)
c) 751 EUR and over
d) Do not want to answer

How many years of working experience do you have? Including full- and part-time experience.

a) None
b) Less than 2 years

c) 2 to 5 years
d) More than 5 years

Do your parents/caretakers have obtained higher education? (Please underline suitable(s)).

a) mother
b) father
c) step-parent
d) grandparent

How many books did you have in your childhood home?

a) Under 100
b) 101 – 500
c) More than 500
d) _____

General Personal finance knowledge

1. **Personal financial literacy can help you to**
   a) Avoid being victimized by financial scams
   b) Buy the right kind of insurance to protect you from catastrophic risk
   c) Find the right approach to invest for your future needs
   d) Lead a financially secure life through forming healthy spending habits
   e) Do all of the above

2. **The most liquid asset is**

   a) Money in long-term deposit bank account
   b) Money in bank account
   c) A car
   d) A computer
   e) A house
   f) Do not know

3. **High inflation means that the cost of living is increasing rapidly.**

   a) True b) False c) Do not know

4. **Imagine that you get a gift of 100 EUR, and you put it in the drawer at home for 12 months. After one year how much could you buy for this money?**

   a) More
   b) The same amount
   c) Less than you could buy today
   d) Do not know

5. **You lend 25 EUR to a friend one evening and he gives you 25 EUR back the next day. How much interest has he paid on this loan?**

   Open response**: _____**

6. **... is not cost of leasing an apartment.**

a) Security deposit
b) Monthly rental payment
c) Expenses incurred for non-compliance of lease terms
d) Medical expenses of your friend who fell and broke his arm on the icy pavement
e) Security deposit retained by the landlord for damages to property beyond normal wear and tear

7. If you signed a twelve-month rental agreement for 300 EUR per month but never occupied the apartment, you legally owe the landlord.

a) Your security deposit
b) Your first month's rent of 300 EUR
c) Your twelve month's rent of 3600 EUR
d) Nothing
e) Whatever the landlord requires

8. Let's assume that in 2016 your income is twice what it is now and that consumer prices also grow twofold. Do you think that in 2016 you will be able to buy more, less, or the same amount of goods and services as today?

a) More than today
b) Exactly the same
c) Less than today
d) Do not know

9. Let's assume that you saw a TV set of the same model on sale in two different shops. The initial retail price of it was 1000 EUR. One shop offered a discount of 150 EUR, while the other one offered a 10% discount. Which one is a better bargain, a discount of 150 EUR or 10%?

a) A discount of 150 EUR
b) A 10 % discount
c) Do not know

Your saving, borrowing, insurance and investments

10. Let's assume that you are planning to collect 10,000 EUR for refurbishing your apartment. A year after the repairs is going to do and you need all the money. Which of the following is the most appropriate place for keeping money?

a) Home storage
b) Money in term deposit
c) Bond fund
d) Shares
e) Do not know

11. Suppose you put 100 EUR into a savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much money would be in the account at the end of the first year, once the interest payment is made?

Open response**: _____**

12. and how much money would be in the account at the end of five years? Would it be:

a) More than 110 EUR
b) Exactly 110 EUR
c) Less than 110 EUR
d) It is impossible to tell from the information given
e) Do not know

13. Imagine that the interest rate on your savings account is 1 percent a year and inflation is 2 percent a year. After one year, would the money in the account buy more than it does today, exactly the same or less than today?

a) More
b) Same
c) Less
d) Do not know

14. A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage

a) True b) False c) Do not know

15. but the total interest over the life of the loan will be less.

a) True b) False c) Do not know

16. If you co-sign a loan for a friend, then

a) You become responsible for the loan payments if your friend defaults
b) It means that your friend cannot receive the loan by himself
c) You are entitled to receive part of the loan
d) Both a and b
e) Both a and c

17. Which service of those listed below has the highest interest rate?

a) Credit Card
b) Consumer credit
c) Mortgage Loan
d) Express Loan (i.e., small short-term loans)
e) Do not know

18. The main reason to purchase insurance is to

a) Protect you from a loss recently incurred
b) Provide you with excellent investment returns
c) Protect you from sustaining a catastrophic loss
d) Protect you from small incidental losses
e) Improve your standard of living by filling fraudulent claims
f) Do not know

19. If you invest 1000 EUR today at an interest rate of 4%, your balance in a year will be

a) Higher if the interest is compounded daily rather than monthly
b) Higher if the interest is compounded quarterly rather than weekly
c) Higher if the interest is compounded yearly rather than quarterly
d) 1040 EUR no matter how the interest is computed
e) 1000 EUR no matter how the interest is computed
f) Do not know

20. Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund."

a) True b) False c) Do not know

21. An investment with a high return is likely to be high risk.

a) True b) False c) Do not know

22. If interest rates rise, the price of a Treasury bond will

a) increase
b) decrease
c) remain the same
d) impossible to predict
e) Do not know

Your personal finance opinions, decisions and education

23. How long in advance do you plan your financial affairs (the expected revenues, the necessary costs and predictable financial situation)?

a) Do not see the need to plan
b) On a current basis, on a daily basis
c) Weekly or fortnightly
d) On a monthly basis
e) On a 3-month basis
f) On a 6-month basis
g) On a 1-year basis
h) On a several year basis
i) Until retirement
j) Do not know

24. Which of the following financial services are currently available to you?
(Multiple answers possible)

a)Current Account
b) Debit Card

c) Term deposit
d) Savings Account
e) Student loan
f) Housing Loan
g) Other bank loan (if desired, please specify) _____
h) Vehicle Lease
i) Insurance (car, life, etc.)
j) Investment Services
k) Pension fund shares
l) Other Services _____

25. Do you use a credit card?

a) Yes b) No c) Yes, but not my own

26. Where have you obtained your knowledge about money matters and financial planning issues?
Please evaluate the importance of the financial knowledge you have acquired from different financial education providers on a scale of 1 to 5 where "1" is of little importance and "5" is very important.

	Un-important	2	3	4	Very important	Cannot say
Primary School						
Secondary School						
High School						
University						
Not school related course organisers						
Financial service providers (Banks, etc)						
Parents, family						

27. How do you evaluate your level of financial knowledge for organising your financial affairs and services and making reasonable and smart financial decisions?
Using the scale 1 to 5 please rank (1 insufficient 5 very sufficient)

1 2 3 4 5 _____

28. Does your financial literacy level need improvement?

a) Yes b) No

Appendix B: Characteristics of the quantitative study Sample

Characteristics	Estonian sample		Finnish sample	
	Frequency	%	Frequency	%
Total amount of observations	536	100	574	100
A. Education				
1. Academic discipline				
a) Engineering	447	82.5	463	80.7
b) Other*	89	17.5	111	19.3
2. Level of education				
a) Bachelor studies	177	33.0	516	89.9
b) Master studies	95	17.8	49	8.5
c) Other**	264	49.2	9	1.6
B. Experience				
1. Age groups				
a) 18-22	340	63.4	465	81.0
b) 23-29	157	29.3	81	14.1
c) 30 and up	39	7.3	28	4.9
2. The work experience				
a) None	171	31.9	47	8.3
b) Less than 2 years	207	38.6	317	55.2
c) 2 to 5 years	83	15.5	161	28.0
d) More than 5 years	66	12.3	49	8.5
e) Unanswered	9	1.7	0	0
C. Demographic characteristics				
1. Nationality				
a) Finnish/ Non-Estonian	91	17.0	573	99.8
b) Other/ Estonian	445	83.0	1	0.2
2. Gender				
a) Male	326	60.8	426	73.9
b) Female	210	39.2	148	25.8
3. Household size				
a) Live alone	156	29.1	335	58.4
b) Live with husband/ wife	100	18.7	115	20.0
c) Live with husband/ wife and children	40	7.5	14	2.4
d) Live with parents/ grandparents	190	35.4	27	4.7
e) Other	50	9.3	83	14.5

Notes: Other* including Economic and Business, Info technology, and Mathematics; Other** including Integrated Bachelor's and Master's Study, and Unanswered.
Source: Composed by the author (Publication IV)

Appendix C: Coding

Coded list of participants in Focus Groups

P1-IU3F22

P2-IU2F19

P3-IU3F24

P4-IG3F30

P5-IU3M26

P6-IU2F20

P7-IG2M23

P8-IU4M23

P9-BG5M26

P10-BU3M20

P11-BU3F20

P12-BU3F21

P13-BU4M21

P14-BU3M21

P15-BU2F20

P16-EU4F20

P17-EU5F20

P18-EG4M23

P19-EG5M24

P20-EG4F23

P21-EU3F21

P22-EU4M21

Coding legend

Participant code (short PX)		
The position in code	**Denotation**	**Meaning**
	„PX-YYXYXX“ (ex: P1-IG3M23)	
1,2	PX (X= number 1 to 22)	Participant code used in text
3	I	Industrial Engineering and Management International Business Administration
3	B	Economics
3	E	Civil Engineering
4	U	Undergraduate
4	G	Graduate or Integrated study
5	Number (1 to 5)	Self-assessment of own financial knowledge
6	F	Female
6	M	Male
7,8	Number	Age

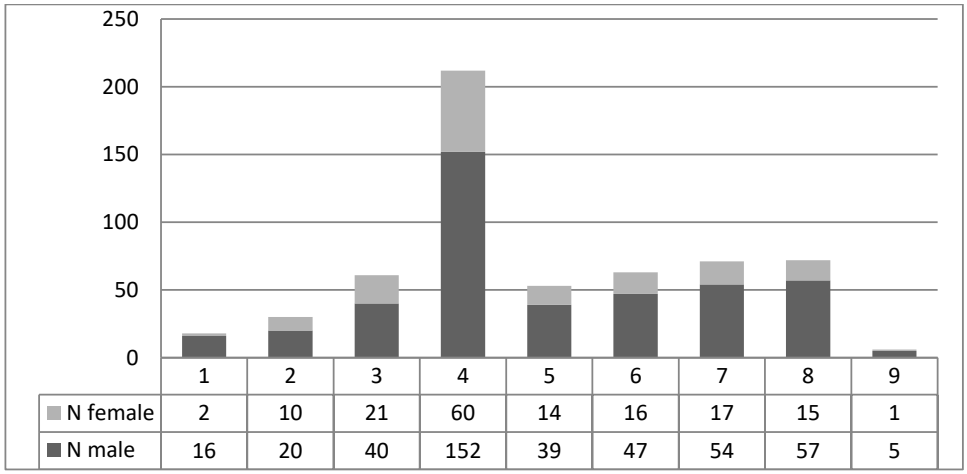
Codes for text		
Type	**Denotation**	**Meaning**
The guiding research question	I	How can the statistical results obtained in the quantitative phase be explained?
The guiding research question	II	How could financial education be improved?
Category	1	Family
Category	2	Basic school
Category	3	Upper secondary school
Category	4	University
Category	1	Topics
Category	2	Teaching process - tips and hints
Assessment (quality)/ opinion	+	Positive/good quality/useful/satisfied
Assessment (quality)/ opinion	-	Negative/ poor quality/ useless/ boring/ insufficient
Assessment (quality)/ opinion	/	Weak/ short/ in minor importance/ In some way/ something/ a little/ modest
Assessment (quality)/ opinion	dnr	Do not remember
Assessment (quality)/ opinion	ni	Not interested/ not consider it necessary
Assessment (quality)/ opinion	iie	An interest in exploring/ interest

Assessment (quality)/ opinion	fkp	First knowledge/ primary knowledge
Assessment (quality)/ opinion	gk	General knowledge/ general/ basic
Assessment (quality)/ opinion	sd	Specific/ deep/ a lot of information/ interesting
Assessment (quality)/ opinion	el	Easy/ logical
Assessment (quality)/ opinion	ceu	Connect with real life/ explanations how to understand/use
Assessment (quality)/ opinion	neu	No explanations on how to understand/use what was learned
Assessment (quality)/ opinion	#	Complicated/ difficult/ incomprehensible
Assessment (quality)/ opinion	sbe	Should be for everyone
Assessment (quality)/ opinion	nfe	Not for everyone
Source of information	m	Mother
Source of information	f	Father/ stepfather
Source of information	ps	Parents (if mentioned together)/ stepparents/ family
Source of information	gp	Grandparents
Source of information	r	Relatives
Source of information	s	Spouse
Source of information	tl	Teacher / lecturer
Source of information	vl	Visiting lecturer / specialist / entrepreneur / bank employee
Source of information	gcf	Games/cartoons/films etc.
Source of information	jw	Job / workplace
Source of information	pe	Practical experience/ practice
Source of information	sc	Student company
Source of information	ec	Elective course/ subject
Subjects and topics	es	Economics
Subjects and topics	bu	Budgeting
Subjects and topics	bo	Borrowing
Subjects and topics	sa	Saving
Subjects and topics	in	Investing
Subjects and topics	fim	Financial markets
Subjects and topics	be	Business and entrepreneurship
Subjects and topics	aoc	Assessment of a company’s financial and economic standing
Subjects and topics	bk	Basic knowledge (for sound personal financial decisions)
Subjects and topics	set	Stock exchange trading
Subjects and topics	rei	Real estate investments
Subjects and topics	li	Loans and interest

Subjects and topics	cde	Cyclical development of the economy, economic crises
Subjects and topics	lr	Losses/ risks associated with financial services (real life examples)
Time or place	fh	Family/ home
Time or place	ec	Early childhood
Time or place	ki	Kindergarten
Time or place	bs	Basic school
Time or place	bs1	Basic school (1st to 3rd grade)
Time or place	bs2	Basic school (4th to 6th grade)
Time or place	bs3	Basic school (7th to 9th grade)
Time or place	uss	Upper secondary school
Time or place	un	University
Time or place	un1	University 1st year
Time or place	tc	Training / courses for teachers
	*	Assessment for the whole category
	( )	Opinion/clarification on necessity
	:	Space between related codes
	_	Space between unrelated codes and categories

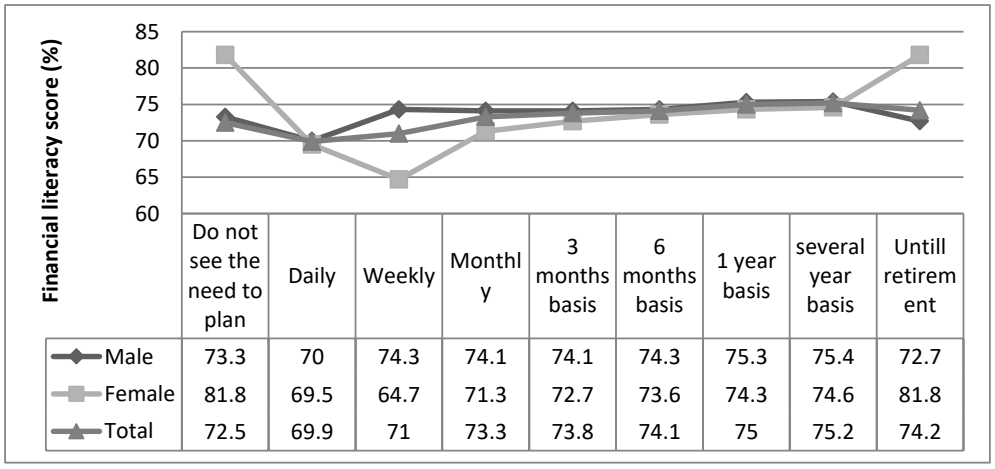
Notes: The categories and codes were used to create two informative organized tables (I past; II future), the first focusing on the origin of students' financial knowledge - Where, what and how did they learn? Was that knowledge important? What could have been differently? and the second on students' interest in improving their knowledge - What should be taught? Who should teach? When? and opinions/assessments on future activities were enclosed in brackets, if available.
Example:
P11BU3F20_I1:ps:s:jw:be_ps:gp:in:rei_ps:bu_fkp+*_I2:tl:bs3:es:/:bu:neu_
I3:es:ec:sc:be:/+_vl:sd_
II1:bu(ceu)_bk:sa:bo:li:fim:aoc:in_II2:bk:fh(fkp)_es:bs(gk:sbe)_bu:ceu_bo:vl(sd+)_uss:fim(gk)_un:aoc(nfe)_iie:un

Appendix D: Finnish students' planning habits



	1	2	3	4	5	6	7	8	9
N female	2	10	21	60	14	16	17	15	1
N male	16	20	40	152	39	47	54	57	5

Numeric overview of Finnish students' planning habits by gender



	Do not see the need to plan	Daily	Weekly	Monthly	3 months basis	6 months basis	1 year basis	several year basis	Untill retirement
Male	73.3	70	74.3	74.1	74.1	74.3	75.3	75.4	72.7
Female	81.8	69.5	64.7	71.3	72.7	73.6	74.3	74.6	81.8
Total	72.5	69.9	71	73.3	73.8	74.1	75	75.2	74.2

Overview of Finnish students' planning habits by financial literacy level and gender

Publication I

Mändmaa, S.
Financial Literacy – What and Why Should We Improve

Reprinted with permission from
Eurasian Journal of Social Sciences
Vol. 7(2), pp. 12-28, 2019

Eurasian Journal of Social Sciences. 7(2). 2019. 12-28
DOI: 10.15604/ejss.2019.07.02.002

EURASIAN JOURNAL OF SOCIAL SCIENCES

www.eurasianpublications.com

FINANCIAL LITERACY – WHAT AND WHY SHOULD WE IMPROVE*

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Abstract

Financial literacy has become a necessary skill for life and employment. This paper aims to introduce the research findings from a survey conducted in higher education institutions. 522 students participated in the poll. The main goal of this study was to analyze the financial literacy of students in Estonia. The standardized survey method of data collection was used and logit regression model was chosen to examine the impact of financial and non-financial variables on the financial literacy of respondents. The survey revealed that financial literacy of students is affected by gender, nationality, age and academic discipline. However, the level of education the students pursue, the work experience of the students and the level of education of the parents does not affect the level of financial literacy. The main conclusions of this study were that students' financial literacy level in Estonia was low and students' interest for long-term planning was not very high. 51% of the respondents had low level of financial literacy, only 3.4% plan their financial affairs in advance on a several years basis and 55.9% have considered retirement funding. These results have important implication for policy makers and further researchers to develop better strategies for financial education.

Keywords: Students, Financial Literacy, Personal Finance, Financial Knowledge, Financial Education

1. Introduction

The importance to manage personal finances has increased as people must plan for housing acquisition, children's education, medical and life insurance needs, short-term savings and borrowings for vacation, car, etc. The responsibility for the financial security of self-retirement has shifted to people instead of relying on state pensions in the context of aging populations.

Financial literacy helps to orientate in financial services and make deliberate decisions. If people do not have sufficient knowledge for making financial decisions, there can be consequences for the individuals themselves and for the economy as a whole (Lusardi *et al.* 2010). Financial literacy is an essential life skill, which could improve financial welfare at all life-stages, and is high on the global policy agenda (OECD, 2014).

Hogarth and Hilgert (2002, p. 1) have stated: "Well-informed, financially literate consumers should make better decisions for their families, increasing their economic security and wellbeing. Secure families are better able to contribute to vital, thriving communities, further fostering community economic development. Thus, financial literacy is not only important to the individual household and family, but also to their communities as well". Huston (2010) marks that increasing consumer financial literacy is a public policy objective to improve welfare through better decision making.

* The author would like to thank Kiira Zhiguleva and colleagues from Tallinn University of Technology for their valuable help in data gathering and Priit Mändmaa for his advice.

There are a number of factors we are not aware of or whose effect we cannot assess yet. Good knowledge cannot always result in wise behavior. For instance, in a study undertaken in 14 countries by OECD (2012), Estonians ranked in the second group in financial knowledge and last in behavior - exhibited significantly lower levels of behavior than all other countries, except Albania.

PISA 2012 was the first large-scale international study to assess the financial literacy of young people (OECD, 2014). The financial literacy test was taken in 18 countries and economies, including Estonia. In Estonia, 1088 students took the financial literacy test and achieved a mean score of 529 points, which was significantly above the OECD mean score, what was 500 points. The disturbing fact in results was the gap, between the groups with different languages spoken at home. The students' who have Estonian language spoken at home, had the mean score 46 points higher than the students' whose home spoken language was another language (OECD, 2014).

Previous studies such as Estonian Institute of Economic Research (2010); Faktum and Ariko (2010); and Kann (2010) have shown that Estonians elementary level of financial literacy is not a problem, because it is compensated by the conservative behavior of the money matters. Problems in financial literacy arise when there is a need for using long term financial services and calculations. Faktum and Ariko (2010) identified the main risk group or target audience for the improvement of financial literacy as the average urban consumer: younger or middle age group; wage earner; an average income of middle class and regularity; level of education above the average of the sample.

The objects of the current survey were students studying in higher education institutions. The selection of objects to study relied on the main risk group of an earlier study and on the following deliberation: Students, as young people, are the next economically active population and the creators of the future families, and the most promising segment to use financial services in the future due to better jobs, higher positions, bigger salaries.

This study had three purposes: First, to provide evidence of personal financial literacy among higher education students. Secondly, find out the relationship between the financial literacy and students characteristics. Thirdly, examine students' opinions about the long-term financial planning and assess the linkage between planning and financial (knowledge) literacy.

The main goal of this study was to analyze the financial literacy of students in Estonia to give the results what will enable to identify needs and gaps in financial education provision to develop the field. As the topic of financial literacy is continuingly highly important, these results could be useful for researchers, educational and financial policymakers as well as persons who are interested in the field.

The paper is organized as follows. The second section reviews previous studies on financial literacy. The third section describes the methodology used. The fourth section presents the results and discussion and the fifth section concludes the paper.

2. Literature Review

There are many different definitions about financial literacy. According to Vitt *et al.* (2000), financial literacy is the ability to read, analyze, manage, and communicate about the personal financial conditions that affect material well-being. It includes the ability to discern financial choices, discuss money and financial issues without discomfort, plan for the future, and respond competently to life events that affect every day financial decisions, including events in the general economy.

Remund (2010) introduced a definition of financial literacy: "Financial literacy is the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial well-being", brought out the need for a more consistent conceptual definition and offered the following: "Financial literacy is a measure of the degree to which one understands key financial concepts and possesses the ability and confidence to manage personal finances through appropriate, short-term decision-making and sound, long-range financial planning, while mindful of life events and changing economic conditions." (Remund, 2010, pp. 284-285)

The definition by OECD (2012, p. 14) was the following: “Financial literacy is a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and ultimately achieve individual financial wellbeing“.

In an international study to assess the financial literacy of young people, namely PISA 2012[1], the financial literacy definition used was the following: “Financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life“ (OECD, 2014, p. 33). In this study, the definition used by the OECD is mainly followed.

Several studies throughout the world (Altintas, 2011; Atkinson *et al.* 2006; Atkinson and Messy, 2012; Chen and Volpe, 1998; Kalmi, 2013; Lusardi *et al*. 2010; Mändmaa and Zhiguleva, 2013; van Rooij *et al*. 2007; Smith and Stewart, 2008; Wagland and Taylor, 2009) have shown that the level of financial literacy needs improvement.

Previous research has found that financial literacy can have important implications for financial behavior. People with low financial literacy are more likely to have problems with debt (Lusardi and Tufano, 2009), less likely to participate in the stock market (van Rooij *et al*. 2007), less likely to choose mutual funds with lower fees (Hastings and Tejeda-Ashton, 2008), less likely to accumulate wealth and manage wealth effectively (Hilgert *et al*. 2003; Stango and Zinman, 2007), and less likely to plan for retirement (Lusardi and Mitchell, 2006, 2007, 2009).

The financial situation of today’s youth is characterized increasingly by high levels of debt. In USA between 1997 and 2007, average undergraduate student loan debt rose from $9,250 to $19,200 — a 58% increase after accounting for inflation; average debt for college students graduating with loans rose 6% in just one year between 2006 and 2007, from $18,976 to $20,098 (Reed, 2008).

There are other potentially costly consequences of accumulating high levels of debt early on, such as bankruptcy (Roberts and Jones, 2001). For instance, in US 2002, the fastest-growing group of bankruptcy filers was those of the age 25 and younger. (Lusardi *et al*. 2010).

Financial literacy is an important component of sound financial decision-making, and many young people wish they had more financial knowledge. In a 2009 survey on credit card use among undergraduate students, 84% of students said they needed more education on financial management topics, 64% would have liked to receive information about financial management topics in high school, and 40% would have liked to receive such information as college freshmen (Sallie Mae, 2009).

Understanding financial literacy among young people is thus of critical importance for policymakers in several areas; it can aid those who wish to devise effective financial education programs targeted at young people as well as those writing legislation to protect younger consumers (Lusardi *et al.* 2010).

3. Methodology and Data

This study uses a standardized survey method of data collection. The questionnaire designed to cover major aspects of personal finance and includes financial literacy on economic base-terminology, saving, borrowing, investment and insurance. The survey participants are asked to answer multiple-choice questions, including ten questions on demographic data, 14 questions to measure financial literacy and seven questions about students’ opinions and choices. The validity and clarity of the survey have been previously evaluated by three master level students and by three individuals who are knowledgeable in personal finance.

[1] Programme for International Student Assessment (*PISA*); PISA 2012 financial literacy assessment, was administered to approximately 29.000 students in 13 OECD countries and economies (Australia, the Flemish Community of Belgium, the Czech Republic, Estonia, France, Israel, Italy, New Zealand, Poland, the Slovak Republic, Slovenia, Spain and the United States) and five partner countries and economies (Colombia, Croatia, Latvia, the Russian Federation and Shanghai-China) (OECD_2014).

The responses from participants are used to calculate the mean percentage of correct scores for each question, section and entire part of survey measuring the financial literacy levels. Consistent with the existing literature (Chen and Volpe, 1998), the mean percentage of correct scores is grouped into (1) more than 80%, (2) 60% to 79% and (3) below 60%. The first category represents a relatively high level of knowledge, the second a medium and the third represent a relatively low level of knowledge. Previous research advises that levels of financial literacy vary among subgroups of students (Chen and Volpe, 1998). This study uses analysis of variance (ANOVA) to provide additional evidence and the differences are further analyzed using logistic regression models. The participants are divided into two groups (based on more or less knowledge) using the median percentage of correct answers of the sample. Students with scores higher than the sample median are classified as students with relatively (more) higher knowledge and students with scores equal or below the median are classified as those with relatively (less) lower knowledge. This dichotomous variable, financial literacy level (more, less), is used in logistic regression as the dependent variable, which is explained simultaneously by all of the independent variables.

In this study, the form of the logistic model is following:

$$\log[p/(1-p)] = B_0 + B_1\,(\text{Gender}) + B_2(Age1) + B_3(Age2) + B_4(Age3) + B_5(Nationality) + B_6(Academic) + B_7(Education1) + B_8(Education2) + B_9(Education3) + B_{10}(Education4) + B_{11}\,(Household1) + B_{12}\,(Household2) + B_{13}\,(Household3) + B_{14}\,(Household4) + B_{15}\,(Household5) + B_{16}\,(Work1) + B_{17}\,(Work2) + B_{18}\,(Work3) + B_{19}\,(Income1) + B_{20}(Income2) + B_{21}\,(Income3) + B_{22}\,(Income4) + B_{23}\,(Income5) + B_{24}(ParentsEd) + e_i \quad (1)$$

The independent variables in this case are variables such as gender, academic discipline, age, nationality, level of education, household size, the work experience and personal monthly net income of the student and level of education of the parents. The coefficients represent the effect of each subgroup compared with the reference group (reference groups are in Table 1 at positions “a)” and marked in bold), which is arbitrarily selected.

To improve financial education, it is necessary to examine more deeply how students' financial knowledge affects their views on personal finance issues and financial decision making. For that reason, seven questions about students’ opinions and choices, containing personal financial services and financial planning, basic financial literacy self-assessment and interest in having more information in the field, were added and analyzed. The sample divided into three groups using the mean percentage of correct scores: relatively high level of knowledge (more than 80%); a medium level of knowledge (60% to 79%); relatively low level of knowledge (below 60%). To determine if the difference of the three groups' opinions and decisions are statistically significant, the Cross-tabulations and Chi-square tests are used.

For the data collection, the survey was conducted among students studying in higher education institutions in Estonia at 2012. The questionnaire was filled in by 522 students from 13 educational institutions, including 12 public and one private school. More specifically, the survey was distributed in 5 public universities; 6 state institutions of professional higher education; 1 Private institution of professional higher education; 1 state vocational education institution (offering higher education programs).

Detailed characteristics of the sample are presented in Table 1. In terms of education, about 85.4% of the participants acquire "Non-economical" education, 42% of the participants are in Bachelor studies, 28% in Applied higher educational, 22.2% in Master, 6.7% in Combined, which in current case is 5 years study in the field of ensnaring and 1% Doctoral studies. In terms of demographic background, most of the participants are Estonians. By the work experience, the sample is almost evenly distributed to three groups. About 81.8% of the students are from 18 to 25 years of age. The gender distribution of sample, 61% females and 39% males, is close to the gender distribution (female 59% and male 41%) of the students who studied in Estonian higher education institutions at same study year. Similar proportional divisions were also present in student distribution among various levels of education. Table 2 shows the data to describe the share of students in different educational levels during the conduct of this study.

Table 1. Characteristics of the Sample

	Characteristics	Number of Participants	Percentage
A.	**Education**		
	1. Academical discipline		
	a) Non-economical	446	85.4
	b) Economic	76	14.6
	2. Level of education		
	a) Applied higher educational studies	146	28.0
	b) Bachelor studies	220	42.1
	c) Master or Doctoral studies*	121	23.2
	d) Combined studies	35	6.7
B.	**Demographic Characteristics**		
	1. Gender		
	a) Female	318	60.9
	b) Male	204	39.1
	2. Age groups		
	a) 18-21	250	47.9
	b) 22-25	177	33.9
	c) 26 and up	95	18.2
	3. Nationality		
	a) Estonian	418	80.1
	b) Non-Estonian	104	19.9
	4. Household size		
	a) Live alone	133	25.5
	b) Live with husband/ wife	136	26.0
	c) Live with husband/ wife and children	45	8.6
	d) Live with parents/grandparents	181	34.7
	e) Other	27	5.2
C.	**Experience**		
	1. The work experience		
	a) 0 years	181	34.7
	b) 1 to 2 years	165	31.6
	c) 3 years and up	176	33.7
D.	**Income**		
	1. Personal monthly net income		
	a) Under 300 EUR	239	45.8
	b) 301- 600 EUR	135	25.9
	c) 601 – 1000 EUR	56	10.7
	d) 1001 EUR and over	35	6.7
	e) Do not want to answer	57	10.9
E.	**Background**		
	1. Level of education of the parents		
	a) Higher education exists	314	60.2
	b) Higher education missing	208	39.8

Note: * As the number of participants in the level of doctoral studies was lower than 1% of sample size, the answers have been taken into consideration together with master level.

Table 2. The distribution of students (studied at Estonian higher education institutions and participated in poll) by educational levels and gender in the academic year 2011/2012

	Data from Statistics Estonia in the beginning of academic year 2011/2012		Data received during survey	
	No of students	**Percentage %**	**No of students**	**Percentage %**
Higher Education Levels				
Applied higher education	20,791	31	146	28
Bachelor's study Undergraduate	26,571	39	220	42
Combined studies	4,024	6	35	7
Master studies	13,170	19	116	22
Doctoral studies	3,051	5	5	1
Total	67,607	100	522	100
Gender				
Male	27,610	41	204	39
Female	39,997	59	318	61
Total	67,607	100	522	100

Source: Author's own preparation based on Statistics Estonia (2012)

4. Results and Analysis

To evaluate and analyze students' financial literacy, the collected data were analyzed by using the software Statistical Package for the Social Sciences (SPSS).

4.1. Overall Results of the Survey

The overall results are presented in Figure 1 and Figure 2, and in Table 3. and Table 4. The mean percentage of correct scores is grouped into three categories: over 80, 60-79, and below 60. The overall mean percentage of correct scores was 58.9%, indicating on average the participants answered more than 40% of the survey questions incorrectly. The median percentage of correct scores was 57.1%. The findings suggest that students' knowledge on personal finance is inadequate as 51% of the respondents had a low level of financial literacy, 40% of the respondents had a medium level of financial literacy and only 47 students had a high level of financial literacy which was 9% of the respondents. One reason for the low level of financial literacy could be the systematic lack of a sound personal finance education in curricula. A similar view has been expressed by several researchers from several countries. Another reason for the low level of knowledge can be caused by young ages of the participants. As shown in Table 1 and Table 3. about 82% of the participants were under 26. It means they are in very early stage of their financial life cycle. Figure 1 pictures the students' financial literacy levels including differences between male and female students.

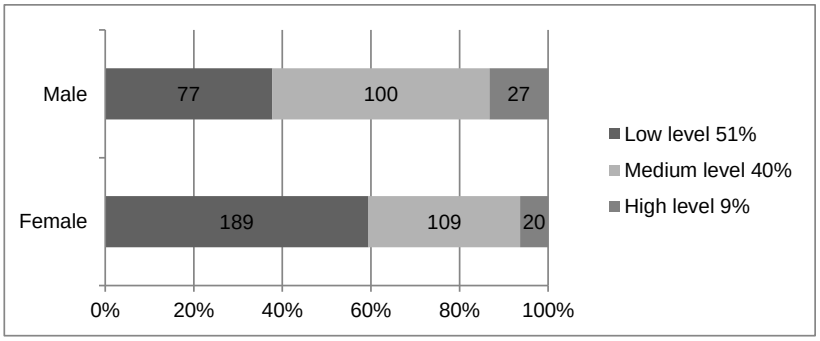

Figure 1. Estonian students' level of financial literacy

204 male and 318 female students participated in the poll. Looking at the distribution of students between the different financial literacy levels, it is notable that the biggest number of male students (100 or 49%) was in medium level but the biggest number of female students (189 or 59%) was in low level.

Table 3. Characteristics by Level of Financial Literacy in percentages except where noted

Characteristics	All obs	Students' financial literacy level			Chi-Square	P-values
		Low	Medium	High		
Number of observations	522	266	209	47	148.379**	0.000
Gender					24.878**	0.000
Female	61	60	34	6		
Male	39	38	49	13		
Age groups					10.910*	0.028
18-21	48	54	40	6		
22-25	34	52	36	12		
26 and up	18	40	49	11		
Nationality					10.697**	0.005
Estonian	80	48	42	10		
Non-Estonian	20	64	32	4		
Academical discipline					28.465**	0.000
Economic	15	26	53	21		
Non-economical	85	55	38	7		
Level of education					19.606*	0.012
Applied higher educational studies	28	54	37	9		
Bachelor studies	42	51	43	6		
Combined studies	22	66	28	6		
Master studies	7	45	40	15		
Doctoral studies	1	0	100	0		
Household size					5.681	0.683
Live alone	25	51	39	10		
Live with husband/ wife	26	52	37	11		
Live with husband/ wife and children	9	47	46	7		
Live with parents/grandparents	35	49	44	7		
Other	5	63	26	11		
The work experience					4.105	0.392
0 years	35	48	43	9		
1 to 2 years	31	57	36	7		
3 years and up	34	48	41	11		
Personal monthly net income					12.516	0.130
Do not want to answer	11	60	37	3		
Under 300 EUR	46	51	41	8		
301- 600 EUR	26	54	36	10		
601 – 1000 EUR	11	46	43	11		
1001 EUR and over	6	31	49	20		
Level of education of the parents					2.282	0.319
Higher education exists	60	49	43	8		
Higher education missing	40	54	36	10		

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

Questions that ascertain the level of financial literacy covered the following financial topics: Saving; Investment; Borrowing; Economic base-terminology and Insurance. Figure 2 shows the percentage of respondents, who answered correctly by topic.

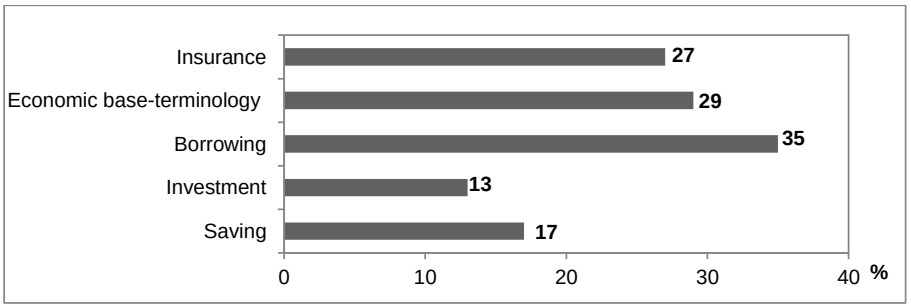

Figure 2. The percentage of respondents who answered correctly by topic

As it seen in Figure 2, the most known topic was borrowing: 182 students, which accounts for 35 percent of respondents, answered correctly to all of the questions about borrowing. All the 14 questions were answered by 522 students and Table 4 give us more specific overview about correct responses.

Table 4. Number and Mean Percentage of Correct Responses to Each Survey Question, Section, and the Entire Survey

	Number of correct responses	Level of Personal Financial Literacy		
		Low Below 60%	Medium 60-79%	High Over 80%
I Saving				
Appropriate saving place	389		74.5	
Annual percentage rate	263	50.4		
Impact of inflation	409		78.4	
Time value of money	191	36.6		
Mean Correct Responses for the Section			**60.0**	
II Investment				
Risk diversification	414		79.3	
Interest rates changes and treasury bond price	89	17.0		
Mean Correct Responses for the Section		**48.2**		
III Borrowing				
Monthly payments of mortgage	383		73.4	
Interest of loan	294	56.3		
Loan co-sing consequences	364		69.7	
The interest rate evaluation	463			88.7
Mean Correct Responses for the Section			**72.0**	
IV Economic base-terminology				
Asset liquidity	258	49.4		
Net worth calculation	251	48.1		
Mean Correct Responses for the Section		**48.8**		
V Insurance				
Understanding the content of insurance	214	41.0		
Considerations in picking the insurance cover	323		61.9	
Mean Correct Responses for the Section		**51.5**		
Mean Correct Responses for the Entire Survey		**58.9**		
Median Correct Responses for the Entire Survey		**57.1**		

The differences in the mean percentages of correct answers for the sections of Economic base-terminology (48.8%), Savings (60.0%), Borrowing (72.0%), Insurance (51.5%), and Investment (48.2%) could be explained by early stage financial life cycle attributes. At this stage of the cycle, most of students' incomes are spent on consumption rather than investment and they are exposed to a limited number of financial issues related to general knowledge, savings, borrowing, and insurance.

According to a survey by Chen and Volpe (1998), students score higher on issues with which they are familiar and earn low scores in areas they have little experience. The highest percentage of correct answers for the section Borrowing could be explained by low personal income, as 46% of participants have monthly income under 300 EURO (Table 3.). A further look into the scores on individual questions about students choices and opinions (Table 7) shows that only 24.1% have Insurance and 6.5% Investment Services.

4.2. Analysis of Results by Subgroups of the Sample

In this section, the relationship between personal financial literacy and participants' education, demographic characteristics, work experience, income and other background are examined. Table 5 shows the mean percentage of correct responses for entire survey and ANOVA has been used to detect if participants from various subgroups have different levels of knowledge.

Participants' educational background has a significant impact on their knowledge. The results for the entire survey clearly show that students from academic discipline, economic are more knowledgeable than students from non-economic discipline. On average, the students from economic discipline answered correctly 67.95% of the survey questions and from non-economic discipline 57.37%. The findings also suggest that participants from different level of education have different levels of financial knowledge. Generally, graduate students know more than the undergraduate students. The testing results of ANOVA indicate that the differences are statistically significant at the 0.01 level.

Table 5 shows participants' knowledge varies with their demographic characteristics. The percentages of correct answers from the female participants (55.77%) are lower than those from the male participants (63.80%). The values of F-statistic suggest that these differences are highly significant. The participants from different age groups have different levels of financial knowledge. The group of youngest students (18-21) got the lowest scores (55.77%) and the group of oldest students (26 and up) reached the highest (63.76%). These results are as expected as knowledge grow over time. The different scores are statistically significant at the 0.01 level. The nationality has as well an influence to the level of financial literacy, as the difference between Estonians and non-Estonians correct answers scores is 6.4% and the results are statistically significant at the 0.01 level.

In terms of participants' household size, it seems that participants with more moral imperatives, like in groups Live alone and Live with husband/wife and children, are more knowledgeable than those with less responsibilities.

The testing results of ANOVA indicate that the differences are not statistically significant at subgroups like Household size, Work experience and Level of education of the parents. Finally, participants with higher personal income answered more questions correctly (69.18%) than those with lower income (scores start 58.20%). The differences in the level of financial literacy, among different personal monthly income, are statistically significant at the 0.01 level.

The results of the logistic regression are shown in Table 6 where the reference categories are given in bold. The model was constructed adding all the independent variables in the model at the same time (Enter method). The same method was used by Chen and Volpe (1998). As suggested by the high Chi-square values, the model has high explanatory power. Another widely used measure of the overall fit of the models is to examine its ability to correctly classify observations. This model is correctly classifying the outcome for 65.1% of the cases compared to 51.0% in the null model.

Table 5. Mean Percentage of Correct Responses by Characteristics of Sample and Results of ANOVA

	Characteristics	**%**
A.	**Education**	
	1. Academic discipline	
	a) Non-economic	57.37
	b) Economic	67.95
	F Statistic	(22.864)**
	2. Level of education	
	a) Applied higher educational studies	57.73
	b) Bachelor studies	57.56
	c) Master and Doctoral studies	64.29
	d) Combined studies	53.67
	F Statistic	(5.209)**
B.	**Demographic Characteristics**	
	1. Gender	
	a) Female	55.77
	b) Male	63.80
	F Statistic	(25.254)**
	2. Age groups	
	a) 18-21	55.94
	b) 22-25	60.49
	c) 26 and up	63.76
	F Statistic	(7.543)**
	3. Nationality	
	a) Estonian	60.18
	b) Non-Estonian	53.78
	F Statistic	(10.501)**
	4. Household size	
	a) Live alone	60.04
	b) Live with husband/ wife	58.56
	c) Live with husband/ wife and children	60.16
	d) Live with parents/grandparents	58.17
	e) Other	57.94
	F Statistic	(0.287)
C.	**Experience**	
	1. The work experience	
	a) 0 years	59.55
	b) 1 to 2 years	56.41
	c) 3 years and up	60.59
	F Statistic	(2.436)
D.	**Income**	
	1. Personal monthly net income	
	a) Under 300 EUR	58.22
	b) 301- 600 EUR	58.20
	c) 601 – 1000 EUR	61.61
	d) 1001 EUR and over	69.18
	e) Do not want to answer	54.51
	F Statistic	(4.161)**
E.	**Background**	
	1. Level of education of the parents	
	a) Higher education exists	59.03
	b) Higher education missing	58.72
	F Statistic	(0.036)

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

Table 6. The logistic regression model

Characteristics	B	Exp (B)	P-values
Gender (Female)			
Male	0.954**	2.597	0.000
Age groups (18-21)			
22-25	0.281	1.325	0.305
26 and up	0.883*	2.419	0.031
Nationality (Estonian)			
Non-Estonian	-0.681**	0.506	0.008
Academic discipline (Economic)			
Non-economical	1.439**	4.217	0.000
Level of education (Applied higher educational studies)			
Bachelor studies	-0.196	0.822	0.457
Combined studies	0.033	1.033	0.914
Master and Doctoral studies	-0.356	0.700	0.407
Household size (Live alone)			
Live with husband/ wife	0.258	1.295	0.347
Live with husband/ wife and children	0.089	1.093	0.839
Live with parents/grandparents	0.233	1.263	0.364
Other	-0.437	0.646	0.358
The work experience (0 years)			
1to 2 years	-0.231	0.794	0.350
3 years and up	0.110	0.896	0.718
Personal monthly net income (under 300 EUR)			
301- 600 EUR	0.463	1.588	0.168
601 – 1000 EUR	0.190	1.209	0.599
1001 EUR and over	0.379	1.461	0.381
Do not want to answer	0.934	2.545	0.069
Level of education of the parents (Higher education exists)			
Higher education missing	-0.306	0.736	0.131
Constant	-0.899*	0.407	0.044
Chi-Square	79.078**		0.000
-2 log Likelihood	644.376		
Adjusted R^2	0.187		
Correct Classification	65.1%		
Chance Classification	51.0%		

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

Based on the results of the logistic regression analysis presented above, men are 2.6 times more likely to have a higher level of financial literacy than women. Students of the age of 26 and older are 2.4 times more likely to have higher financial literacy compared to students from the age of 18-21. The coefficient (B) of non-Estonians is negative and significant at the 0.01 level. Consistent with findings of ANOVA, the result suggests that non-Estonians are more likely to be less knowledgeable about personal finance than Estonians. The students studying economical discipline are 4.2 times more likely to belong to a higher level of financial literacy group than the students studying other academic disciplines. The result that academic discipline "Economic" are more knowledgeable is consistent with findings of previous researches and is not surprising because curriculum requirements give them more opportunity to take finance and related courses.

While educational levels pursued by students' and income variables affect the level of knowledge in one-way ANOVA, they no longer have any significant impact in the logistic regression where all the variables are used simultaneously to explain the level of knowledge. Consistent with results of ANOVA the students' household size, work experience and

educational level of the parents do not affect students' financial literacy level. The non-significance of the characteristics was assessed by an indicator of significance.

4.3. How knowledge affects student's opinions and decisions

To examine more deeply how students' financial knowledge affects their views on personal finance issues and financial decision making, seven questions were added and analyzed. Four questions asked about personal financial planning and financial services and three questions about self-assessment and interest in having more information in the field. For analyzing, the sample was divided into three groups using the mean percentage of correct scores: the low level (below 60%), the medium level (60% to 79%) and the high level of knowledge (more than 80%). To determine if the difference of the three groups' opinions and decisions are statistically significant, the Cross-tabulations and Chi-square tests were used. Table 7 gives us short overview about students' choices in financial planning and financial services.

Table 7. Differences in students' financial services and planning depending on financial literacy level

	Students' financial literacy level %			Total %	Chi-Square	P-value
	Low	Medium	High			
How long in advance do you plan your financial affairs (the expected revenues, the necessary costs and predictable financial situation)?						
On a current basis, on a daily basis	23.7	15.3	12.8	19.3	6.693*	0.035
On a monthly basis	38.8	43.5	25.5	39.1	5.508	0.064
On a 3 months basis	13.5	15.8	25.5	15.5	4.406	0.110
On a 6 months basis	7.5	9.6	10.6	8.6	0.892	0.640
On a 1 year basis	7.1	6.7	10.6	7.3	0.897	0.638
On a several year basis	2.3	3.8	8.5	3.4	4.845	0.089
Do not see the need to plan	5.6	3.3	4.3	4.6	1.412	0.493
Do not know	2.3	1.9	2.1	2.2	0.066	0.967
Have you thought about retirement funding?						
Yes	52.3	59.8	59.6	55.9	2.986	0.225
What could be your pension in the future (the ratio of average wage)?						
50%	7.1	6.2	6.4	6.7	0.168	0.919
75%	28.9	37.3	36.2	33.0	3.957	0.138
100%	27.8	29.7	23.4	28.2	0.775	0.679
Your own version	31.2	17.7	19.1	24.7	12.323**	0.002
Do not know	4.9	9.1	14.9	7.4	7.108*	0.029
Which of the following financial services are currently available to you?						
Current Account	89.1	92.3	91.5	90.6	1.497	0.473
Debit Card	74.1	86.1	95.7	80.8	18.405**	0.000
Credit Card	21.1	26.8	29.8	24.1	3.007	0.222
Savings Account	24.1	26.3	25.5	25.1	0.322	0.851
Bank loan	20.7	30.6	36.2	26.1	8.753*	0.013
Vehicle Lease	4.9	5.3	4.3	5.0	0.092	0.955
Insurance (car, life, etc.)	19.5	26.8	38.3	24.1	9.011*	0.011
Investment Services	3.0	10.0	10.6	6.5	10.970**	0.004

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

Remund (2010) pointed out the importance of personal long-range financial planning in the U.S. Previous studies in Estonia have shown that problems in financial literacy arise when there is a need for using long-term financial services and calculations (Estonian Institute of Economic Research, 2010; Faktum and Ariko, 2010; Kann, 2010).

Current study shows that 19.3% of students plan their financial affairs ahead on a daily basis and only 3.4% of participants plan on a several year basis. Despite the fact that only 55.9% of the participants have thought about retirement funding, students are quite aware about what could be their pension in the future, as only 7.4% of them gave an answer “Do not know”. Most popular answer about pension was 75% of average wage which was chosen by 33% of participants.

The financial situation of today’s youth in USA is characterized increasingly by high levels of debt (Reed, 2008). In current study, the limitations do not allow a comprehensive analysis of students' level of debt but there was a possibility to analyze available financial services. The results show that loans are not very popular among students as 24.1% of participants have a credit card and 26.1% have a bank loans. While a Current account (90.6%) and a debit card (80.8%) are actively used by students and approximately every fourth student owns savings account.

The answers to the questions about self-assessment and interest in having more information in the field are described next. Students were asked to answer the question: „How do you evaluate your own level of financial knowledge for organizing your financial affairs and services and making reasonable and smart financial decisions? “ **Figure 3** characterizes the relationship between the students’ self-assessment about financial knowledge and their actual financial literacy level.

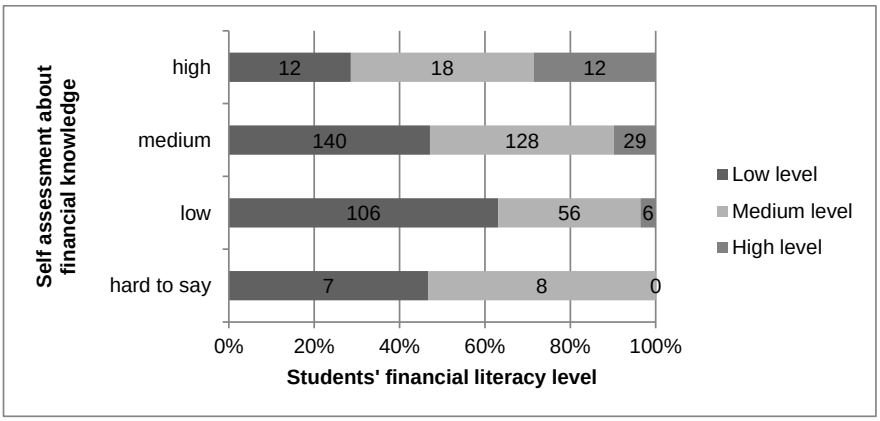

Figure 3. The proportion of students' financial literacy in a subjective and objective assessment

Table 8 gives us statistically more specific overview about relation between students’ self-assessment and tested financial literacy levels. The level of own financial literacy was assessed rightly by 246 students, which accounted for 47% of the total number of respondents. 297 students, which is 57% of the respondents, evaluated their financial knowledge to the medium level and 168 students, which is 32%, evaluated their financial knowledge to the low level. Previous research in Estonia have made the conclusion that if the self-assessment about financial knowledge is not high that means it is quite adequate (Faktum and Ariko, 2010).

Table 8. Relationship between students' self-assessment and tested financial literacy level

			Students' financial literacy level			Total
Self-assessment about financial knowledge			Low	Medium	High	
1	High	Count	12	18	12	42
		% within	28.6%	42.9%	28.6%	100.0%
		% of Total	2.3%	3.4%	2.3%	8.0%
2	Medium	Count	140	128	29	297
		% within	47.1%	43.1%	9.8%	100.0%
		% of Total	26.8%	24.5%	5.6%	56,9%
3	Low	Count	106	56	6	168
		% within	63.1%	33.3%	3.6%	100.0%
		% of Total	20.3%	10.7%	1.1%	32.2%
4	Hard to say	Count	8	7	0	15
		% within	53.3%	46.7%	0%	100.0%
		% of Total	1.5%	1.3%	0%	2.9%
Total		Count	266	209	47	522
		% within	51.0%	40.0%	9.0%	100.0%
		% of Total	51.0%	40.0%	9.0%	100.0%

Note: Chi-Square=37.591 significant at the 0.05 level

To the question "Do you want to get more information about financial services and monetary affairs planning?" 340 students answered yes, which accounts for 65% of the participants in the survey. Students with low level of financial literacy were even more interested in, as 70.7% of them gave the answer "yes". Table 9 reflects, in summary, the relationship between the level of financial literacy of students and the interest about additional financial knowledge.

Table 9. Relationship between the level of financial literacy and the interest to get additional information about financial services and monetary affairs planning

Do you want to get more information about financial services and monetary affair planning?		Financial literacy level			Total
		Low	Medium	High	
Yes	Count	188	126	26	340
		55.3%	37.1%	7.6%	100.0%
	% of Total	36.0%	24.1%	5.0%	65.1%
No	Count	78	83	21	182
		42.9%	45.6%	11.5%	100.0%
	% of Total	14.9%	15.9%	4.0%	34.9%
Total	Count	266	209	47	522
	% of Total	51.0%	40.0%	9.0%	100.0%

Note: Chi-Square=7.754 significant at the 0.05 level

Finally, the students were asked to indicate in which financial issues they need more information. This question was answered by 182 students, which accounted for 35% of the participants in the survey. Some of the students noted several topics of which they would be interested in. 61 students (34% of respondents to this question) wanted to get more information about investing, 40 students about financial-base terminology, 37 about borrowing, 21 about saving and 15 about pension funds. The other topics that the students noted were planning the money matters, insurance, taxes, legislation, conditions of contracts.

5. Discussion

On the basis of the results obtained during this work, it can be concluded that the level of financial literacy of students is low. Altintas (2011) and Chen and Volpe (1998) came to the

same results in their financial literacy studies surveying the level of financial literacy of Turkish and US students, respectively. The students involved in this study were the least aware of investment. Chen and Volpe (1998) received the same result in their work.

Previous studies conducted in Estonia have no significant differences in the level of financial literacy of women and men. Also, there were no significant differences between the girls' and boys' financial literacy skills, as revealed in PISA 2012 test results (OECD, 2014). The current study revealed that men have a higher level of financial literacy than women. To the same result came Atkinson *et al.* (2006) in UK, Chen and Volpe (1998) while studying the US students, Lusardi *et al.* (2010), who studied the US youth and Monticone (2010), who examined the financial literacy of the Italian population. Wagland and Taylor (2009), who examined the level of financial literacy of Australian students, came to the result that the gender does not affect the level of financial literacy. Altintas (2011), whose study was conducted in Turkey, came to the result that the level of female financial literacy is higher than men's.

As a result, it was noted that the 26 year old and older students are in higher financial literacy levels than the youngest (18-21 age group) involved in this study. Atkinson *et al.* (2006) obtained a similar result in the study of financial literacy of the United Kingdom population. Chen and Volpe (1998) noted that participants under the age of 30 are more likely to be less knowledgeable as compared with those of the age of 40 or older. Wagland and Taylor (2009) came to the result that age would not affect the level of financial literacy of Australian students.

The study revealed that students with an economic academic discipline have better financial literacy than students who do not learn in the economic direction. The same result was obtained by Chen and Volpe (1998). Altintas (2011) in his study exposed that academic discipline does not affect the level of financial literacy.

Analyzing the impact of nationality on financial literacy, it turned out that Estonians have a higher level of financial literacy compared to non-Estonians. The same results were obtained in Faktum and Ariko's (2010) financial literacy study and in PISA 2012 test results (OECD, 2014).

The findings of this study show that the levels of education students pursue, work experience, and higher education of parents do not affect the level of financial literacy. Wagland and Taylor (2009) got similar results to this study but in contrast, Chen and Volpe (1998) came to the result that working experience does affect the level of financial literacy of students. The impact of educational level to the level of financial literacy is reported in survey results by Atkinson *et al.* (2006) and Chen and Volpe (1998). The result that higher education of students' parents affects the students' level of financial literacy has been obtained by Altintas (2011) and Lusardi *et al.* (2010) in their surveys.

As previous research has found the financial literacy can have important implications for financial behavior, as people with low financial literacy are less likely to participate in the stock market (van Rooij *et al.* 2007), accumulate and manage wealth effectively (Hilgert *et al.* 2003; Stango and Zinman, 2007), and less likely to plan for retirement (Lusardi and Mitchell, 2006, 2007, 2009). The survey results show that only 6.5% of students hold the investment services, 25.1% owns Savings Account, and 55.9% of students have thought about retirement funding but the level of students financial literacy does not make any significant differences in current cases.

Lusardi and Tufano (2009) noted that people with low financial literacy are more likely to have problems with debt. Reed (2008) in his report concludes that the financial situation of today's youth in USA is characterized increasingly by high levels of debt. In current study, the time and space limitations do not allow a comprehensive analysis of students' level of debt. The results show that loans are not very popular among students as 24.1% of participants were credit card users and 26.1% had bank loan.

In a 2009 survey on credit card use among undergraduate students in USA, 84% of students said they needed more education on financial management topics (Sallie Mae, 2009). In current study to the question "Do you want to get more information about financial services and monetary affairs planning?" 65% of the participants answered "yes". Students with low level of financial literacy were even more interested in as 70.7% of them gave the answer "yes".

6. Conclusion

The main goal of this study was to analyze the financial literacy of students in Estonia to give the results that will enable to identify needs and gaps in financial education provision to develop the field.

This study examined 522 students from 13 different higher education institutions. The standardized survey method of data collection was used and logit regression models were chosen. The overall mean of correct answers for the survey was about 59%. By far the weakest area was investing, meaning a little knowledge of the link between the price of the bond and the interest rate. The survey revealed that financial literacy of students is affected by gender, nationality, age and academic discipline. However, the level of education the students pursue, the household size, the work experience of the students, the personal monthly net income and the level of education of the parents do not affect the level of financial literacy. Students' financial literacy level in Estonia was low and students' interest for long-term planning was not very high. 51% of the respondents had low level of financial literacy, medium level had 40% of the respondents and only 47 students (9% of the respondents) had a high level of financial literacy. Lower levels of financial literacy were found among subgroups like women, non-Estonian, students from the age of 18-21 and students studying non-economic disciplines. Just 3.4% of students plan their financial affairs in advance on a several year basis and 55.9% have considered retirement funding. The results show that loans are not very popular among Estonian students as 24.1% of participants were credit card users and 26.1% had bank loan. The study confirmed that students have interest in getting more information about and improving their financial literacy.

To answer shortly to the question presented in a title, what and why should we improve, it is good to use thoughts from earlier studies as well. The illiteracy and its costly consequences make individuals worry about their finances to the extent that their productivity in workplaces is affected (Chen and Volpe, 1998). When individuals cannot manage their finances, it becomes a problem for the society (Chen and Volpe, 1998). The findings of this study show that students are not knowledgeable about personal finance and there is a systematic lack of personal finance education. The results suggest that students' knowledge of financial literacy needs improvement, as the incompetency will limit their ability to make informed financial decisions.

To improve the students' financial literacy level, it is required to integrate topics in economics and personal finance to all academic disciplines, especially to non-economics academic disciplines and to the non-Estonian curriculums. To enhance financial education, it is necessary to examine more deeply how students' financial knowledge affects their views on personal finance issues and financial decision-making.

References

Altintas K. M., 2011. The dynamics of financial literacy within the framework of personal finance: An analysis among Turkish university students. *African Journal of Business Management*, 5(26), pp. 10483 - 10491. https://doi.org/10.5897/AJBM11.401

Atkinson, A., McKay, S., Kempson, E., and Collard, S., 2006. *Levels of financial capability in the UK: Results of a baseline survey.* [Pdf] Available at: < http://www.fsa.gov.uk/static/pubs/consumer-research/crpr47.pdf> [Accessed on 10 June 2018].

Chen, H. and Volpe, R.P., 1998. An analysis of personal financial literacy among college students. *Financial Services Review*, 7(2), pp. 107-128. https://doi.org/10.1016/S1057-0810(99)80006-7

Estonian Institute of Economic Research, 2010. *Eesti elanike probleemid finantsteenustega [Estonian population' complications with financial services].*Tallinn: Estonian Institute of Economic Research.

Faktum and Ariko, 2010. *Finantsalane kirjaoskus Eesti elanike seas [Financial literacy among the Estonian population].* [Online] Available at:

<http://www.minuraha.ee/public/Finantskirjaoskuse_uuring.pdf> [Accessed on 2 April 2012].

Hastings, J. and Tejeda-Ashton, L., 2008. Financial literacy, information, and demand elasticity: Survey and experimental evidence from Mexico. *NBER Working Paper* n. 14538. https://doi.org/10.3386/w14538

Hilgert, M., Hogarth, J. and Beverly, S., 2003. Household financial management: The connection between knowledge and behavior. *Federal Reserve Bulletin*, pp. 309–322.

Hogarth, J. M. and Hilgert, M. A., 2002. Financial knowledge, experience, and learning preferences: Preliminary results from a new survey on financial literacy. *Consumer Interest Annual*, 48, pp. 1-7

Huston, S. J., 2010. Measuring financial literacy. *The Journal of Consumer Affairs*, 44(2), pp. 296-316. https://doi.org/10.1111/j.1745-6606.2010.01170.x

Kalmi, P., 2013. Taloudellinen lukutaito ja sen kritiikki [Financial literacy and its criticism]. *Kansantaloudellinen aikakauskirja*, 2, pp. 150-159.

Kann, L., 2010. *Uuring: inimeste finantskirjaoskus jätab soovida [Survey: People's financial literacy is insufficient]* [online]. Available at: <http://raamatupidaja.ee/?PublicationId=f9180841-a50b-430f-8683-9964adc4b06f> [Accessed on 10 May 2014].

Lusardi, A., and Mitchell, O. S., 2006. Financial literacy and planning: Implications for retirement wellbeing. *Working Paper, Pension Research Council*, Wharton School, University of Pennsylvania.

Lusardi, A., and Mitchell, O. S., 2007. Baby boomer retirement security: The role of planning, financial literacy, and housing wealth. *Journal of Monetary Economics*, 54(January), pp. 205–224. https://doi.org/10.1016/j.jmoneco.2006.12.001

Lusardi, A. and Mitchell, O. S., 2009. How ordinary people make complex economics decisions: Financial literacy and retirement readiness. *NBER Working Paper* 15350. https://doi.org/10.3386/w15350

Lusardi, A., and Tufano, P., 2009. Debt literacy, financial experiences, and over indebtedness. *NBER Working Paper*, 14808. https://doi.org/10.3386/w14808

Lusardi, A., Mitchell, O. S. and Curto, V., 2010. Financial literacy among the young. *Journal of Consumer Affairs*, 44, pp. 358–380. https://doi.org/10.1111/j.1745-6606.2010.01173.x

Monticone, C., 2010. How much does wealth matter in the acquisition of financial literacy? *Journal of Consumer Affairs*, 44(2), pp. 403 - 422. https://doi.org/10.1111/j.1745-6606.2010.01175.x

Mändmaa, S and Zhiguleva, K 2013 'Financial literacy – the level of knowledge among students in Estonia', poster presented to the conference Higher education - higher level learning? Tallinn, Estonia; January 23rd -25th.

OECD, 2012. Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study, OECD Working Papers on Finance, Insurance and Private Pensions No. 15. https://dx.doi.org/10.1787/5k9csfs90fr4-en

OECD, 2014. PISA 2012 *Results: Students and Money: Financial Literacy Skills for the 21st Century (Volume VI)*, PISA, OECD Publishing. https://doi.org/10.1787/9789264208094-en

Reed, M., 2008. *Report student debt and the class of 2007.* [online] The Project on Student Debt. Available at: <http://ticas.org/sites/default/files/pub_files/classof2007.pdf> [Accessed on 20 November 2012].

Remund, D. L., 2010. Financial literacy explicated: The case for a clearer definition in an increasingly complex economy. *Journal of Consumer Affairs*, 44(2), pp. 276-295. https://doi.org/10.1111/j.1745-6606.2010.01169.x

Roberts, J. and Jones, E., 2001. Money attitudes, credit card use, and compulsive buying among American college students. *Journal of Consumer Affairs,* 35(2), pp. 213-240. https://doi.org/10.1111/j.1745-6606.2001.tb00111.x

van Rooij, M., Lusardi, A., and Alessie, R., 2007. Financial literacy and stock market participation. *NBER Working Paper* n. 13565. https://doi.org/10.3386/w13565

Sallie Mae, 2009. *How undergraduate students use credit cards.* Sallie Mae's National Study of Usage Rates and Trends April 2009., Sallie Mae, Inc.

Smith, B., and Stewart, F., 2008. Learning from the experience of OECD countries: Lessons for policy, programs, and evaluations. In: A. Lusardi, ed. 2008. *Overcoming the saving slump: How to increase the effectiveness of financial education and saving programs.* Chicago: University of Chicago Press. pp. 345-367.

Stango, V. and Zinman, J., 2007. Fuzzy math and red ink: When the opportunity cost of consumption is not what it seems. *Mimeo*, Dartmouth College.

Statistics Estonia, 2012. *Statistical database: Social life – education* [online]. Available at: <http://pub.stat.ee/px-web.2001/Database/Sotsiaalelu/05Haridus/10Kergharidus/10Kergharidus.asp> [Accessed on 12 January 2012].

Vitt, L. A., Anderson, C., Kent, J., Lyter, D. M., Siegenthaler, J. K. and Ward, J. 2000. Personal finance and the rush to competence: Financial literacy education in the U.S. *Institute for Socio-Financial Studies (ISFS)* Available at: <https://www.isfs.org/documents-pdfs/rep-finliteracy.pdf > [Accessed on 20 June 2016].

Wagland, S. P., and Taylor, S., 2009. When it comes to financial literacy, is gender really an issue? *Australasian Accounting Business & Finance Journal,* 3(1), pp. 13 - 25.

Publication II

Mändmaa, S.
Empirical Study on Personal Financial Literacy of University Students for Develop the Financial Education

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International Journal of Business and Applied Social Science (IJBASS)
Vol. 6(6), pp. 8-25, 2020

Empirical Study on Personal Financial Literacy of University Students for Develop the Financial Education

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International Journal of Business and Applied Social Science (IJBASS)
Vol. 6. Issue 6, pp. 8-25, 2020

Abstract

Earlier surveys showed students' inadequate knowledge of personal finances and pointed out the need to develop the financial education. Researchers have stated that female students tend to display a lower level at personal financial literacy than male students as they have lower self-confidence in and less interest to learn about Personal Finance. This study used the data gathered from Estonian university students (210 women, 326 men) by a survey questionnaire. The study focused on the gender differences in financial knowledge and the choices and opinions that may affect the financial literacy. Results showed that females who had chosen a math-based academic discipline had higher level in the financial literacy than male students. Furthermore, 79% of women had interest to improve their knowledge in Personal Finance and their self-confidence was slightly higher than that of male students.
The results obtained give the direction for future research and enable enhance the financial education.
.
Keywords: financial literacy assessment; financial education; gender differences; university students

1. Introduction

Financial literacy gives individuals the ability to make informed financial choices. 'Just as it was not possible to contribute to and thrive in an industrialized society without basic literacy - the ability to read and write - so it is not possible to successfully navigate today's world without being financially literate.'(Lusardi 2017, 1).
JumpStart Coalition states that: "Financial literacy is the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial well-being." (Remund 2010, 285).
The financial literacy definition used in an international study to assess the financial literacy of young people, PISA 2012[1], was as follows: "Financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge

[1] Programme for International Student Assessment (PISA); PISA 2012 financial literacy assessment, was administrated to approximately 29.000 students in 13 OECD countries and economies (Australia, the Flemish Community of Belgium, the Czech Republic, Estonia, France, Israel, Italy; New Zealand, Poland, the Slovak Republic, Slovenia, Spain and United States) and five partner countries and economies (Columbia, Croatia, Latvia, the Russian Federation and Shanghai-China) (OECD 2014).

and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life." (OECD 2014, 33).

Many different definitions are available about financial literacy, but the important component of these all is knowledge, which must be passed on to humans.

Several studies have shown gender differences in financial knowledge. Researchers have argued that females tend to display lower level in personal financial literacy than males, among adults (Fonseca et al. 2010; Lusardi & Mitchell 2006; Monticone 2010; OECD 2012), students (Atkinson et al. 2006; Chen and Volpe 1998; Chen and Volpe 2002; Goldsmith et al. 1997; E. Goldsmith and R.E. Goldsmith 2006; Mändmaa 2019a; Mändmaa 2019b), and adolescents (Lusardi, Mitchell and Curto 2010). E. Goldsmith and R.E. Goldsmith (1997; 2006) suggest that females have lower level in financial literacy than males as their general interest in investment and personal finance is usually lower, and they are less confident in their ability to perform financial analysis. Following the same line of reasoning, Chen and Volpe (2002) found that women generally have not only less knowledge about personal finance, but also have less enthusiasm for, lower confidence in, and less willingness to learn about personal finance topics than men do. As Personal Finance is mostly number-oriented subject, it is not attractive to women, as women prefer courses with less mathematics and other number-oriented sciences. Chen and Volpe (2002) concluded that enthusiasm and confidence may be the contributing factors that explain why men are more financially knowledgeable than women.

In order to draw conclusions and make suggestions for the promotion of financial education, it is important to assess the existing knowledge. Understanding how and why male and female students have different levels of financial literacy allows higher improvement of financial education.

"Financial education is the process by which financial consumers/ investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become aware of (financial) risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being and protection." (OECD 2006, 118).

The objects of the current survey are students in a higher education institution in Estonia. University students are the future decision makers and due to better jobs - higher positions, bigger salaries - the most promising segment of using financial services. The lack of their financial knowledge may lead to catastrophical consequences not only at personal level but may affect the well-being of society as well.

The goal of this study is to assess the financial knowledge of female and male students' and the factors influencing their financial literacy level, with the purpose to provide starting points for improving financial education.

Since knowledge is closely tied with an individual's education, the study observes students' sources of financial education too.

1.1. Results and Conclusions of Previous Studies

PISA 2012 was the first large-scale international study to assess the financial literacy of young people. There were no remarkable differences in girls' and boys' financial literacy in any participated country but according to the results of boys' and girls' math and reading tests, out of the students with similar scores, boys had a higher level of financial literacy in 12 of 18 countries, including Estonia. Studies conducted among adults in some of the countries and economies that were participating in the 2012 PISA financial literacy assessment also reported that men perform

better than women on surveys measuring financial knowledge. As argued, to some extent, gender differences in adulthood are related to the different socio-economic characteristics of men and women. OECD 2014)

Various studies (Chen and Volpe 1998; Mandell 2008; Mändmaa 2019a; Mändmaa 2019b; Pires and Quelhas 2015) examined students' financial knowledge and revealed that students with an economic academic discipline or individuals attending programs in business sciences tend to exhibit a higher level in financial literacy. Lewis Mandell, who was surveying the Financial Literacy of Young American Adults, released his opinion: “Regardless of major, college students learn how to do research and solve problems. In a rapidly changing financial system, these two skills are more important to financial decision-making than understanding financial products, rules and regulations. Knowing how to approach a problem and how to research it are key to making the best personal financial decisions.” (Mandell 2008, 29) According to the results, students who study science and engineering have the highest financial literacy scores and those who study business or economics come next. (Mandell 2008)

The research among Portuguese students revealed that the existence of prior experience as credit clients or the existence of saving habits increases the financial literacy of individuals (Pires and Quelhas 2015). The survey among Estonian students showed that financial literacy and using of financial services have a statistically significant connection (Mändmaa 2019b).

Financial literacy can have important implications for financial behaviour. Previous research has found that people with low financial literacy are more likely to have problems with debt (Lusardi and Tufano 2009), and less likely to participate in the stock market (van Rooij, Lusardi and Alessie 2007). Financial education improves credit scores and dramatically reduces the probability of declaring bankruptcy, as well as increases significantly investment income and retirement savings (Cole, Paulson and Shastry 2012).

Financial literacy is an important component of sound financial decisions-making. In a 2009 survey on credit card use among undergraduate students, 84 percent of students said they were interested in pursuing some areas of education to increase financial literacy, and 64 percent of them would have liked to receive information in high school and 40 percent as a college freshman (Sallie Mae 2009). In a survey organized among Estonian university students, the question “Do you want to get more information about financial services and monetary affairs planning?” was answered “Yes” by 65 percent of the students.. Students with low financial literacy were more interested, as 55 percent of the "yes" answers came from them. (Mändmaa 2019a)

2. Methodology and Data

This study used a standardized survey method to assess participants’ personal financial literacy. The questionnaire was designed to cover major aspects of personal finance and included knowledge on general personal finance, saving, borrowing, investment and insurance. The survey participants were asked to answer multiple-choice questions. This study included 10 questions on demographic data, 23 questions to measure the financial literacy and five questions about students’ opinions and choices. The validity and clarity of the survey questions were evaluated by experts knowledgeable in personal finance.

The responses from each participant were used to calculate the median and mean percentage of correct scores, to measure the financial literacy levels and to analyse the results. Consistent with the existing literature (Chen and Volpe 1998; Mändmaa 2019a, 2019b), the mean percentage of correct scores was grouped into three categories. The first category represents a relatively high

level (High - more than 80%) of knowledge, the second a medium (Medium - 60% to 79%) and the third represents a relatively low level (Low - below 60%) of knowledge. The median percentage was used in the analysis to divide participants into two groups. Students with scores higher than median were classified as students with relatively higher (More) knowledge and students with scores equal or below the median were classified as those with relatively lower (Less) knowledge.

Previous research advised that levels of financial literacy vary among subgroups of students (Chen and Volpe 1998, 2002; Mändmaa 2019a, 2019b). To provide evidence of the differences, the Analysis of variance (ANOVA) was used.

Participants' choices to use financial services, opinions about their own personal finance, and evaluation of sources of personal financial education were explored. Cross-tabulation and Chi-Square tests were used to determine differences between female and male participants. The differences were further analysed by using ANOVA.

Based on previous research results, the students studying in math-based disciplines - mostly engineering, were chosen as subjects of this study. To increase the participation, the poll was conducted during the lectures on paper form. There were 536 students from Tallinn University of Technology (TalTech, one of the leading technological universities in the Baltic Sea region) participating in the poll. Students who studied civil engineering (82.5%) were a large part of the participants. In terms of gender, female participants accounted for about 39% of the sample, and male participants for 61%.

The characteristics of the sample by gender are presented in Table 1. There were five noticeable differences. First, most of participants were Estonians (83%), but there was a difference between female and male participants, as there were six percent more Non-Estonians among female participants. Second, the higher proportion of male participants was in the higher level of education than female participants. About 70% of male participants were studying in Master or Integrated studies, while only about 61% of female participants were in the same level of education. Third, male participants were older than female participants. About 39% of male participants were older than 23 years, while only 32% of the female students were in these age groups. Fourth, there were differences in participants' households. About 39 percent of male students stated that they live with parents or grandparents, which was their most preferred choice and exceeded the female students' same choice by 8 percent. About 26% of female participants lived together with a life partner, while only 14% of male participants had made the same choice. Fifth, there were differences in the background. The existence of participants' mothers' higher education was a noteworthy characteristic, which was significantly higher for both female and male students than the existence of fathers' higher education (differences accordingly 15% and 13%).

Table 1 Characteristics of the Sample

Characteristics	Female participants		Male participants		Entire sample participants	
	Frequency	%	Frequency	%	Frequency	%
Total amount of observations	210	100	326	100	536	100
A. Education						
1. Academic discipline						
a) Civil Engineering	178	84.7	269	82.5	447	82.5
b) Other	32	15.3	57	17.5	89	17.5
Inc. Info technology	8	3.8	32	9.8	40	7.4
Mathematics	9	4.3	7	2.1	16	3.0
Economic	10	4.8	5	1.5	15	2.8
2. Level of education						
a) Bachelor studies	81	38.3	96	29.5	177	33.0
b) Master studies	36	17.2	59	18.1	95	17.8
c) Integrated Bachelor's and Master's Study	92	44.0	168	51.5	260	48.5
d) Unanswered	1	0.5	3	0.9	4	0.7
B. Experience						
1. Age groups						
a) 18-22	142	67,6	198	60.7	340	63.4
b) 23-29	55	26,2	102	31.3	157	29.3
c) 30 and up	13	6,2	26	8.0	39	7.3
2. The work experience						
a) None	67	31.9	104	31.9	171	31.9
b) Less than 2 years	81	38.6	126	38.7	207	38.6
c) 2 to 5 years	40	19.0	43	13.2	83	15.5
d) More than 5 years	16	7.6	50	15.3	66	12.3
e) Unanswered	6	2.9	3	0.9	9	1.7
C. Demographic characteristics						
1. Nationality						
a) Non-Estonian	43	20.5	48	14.7	91	17.0
b) Estonian	167	79.5	278	85.3	445	83.0
2. Gender						
a) Male	0	0	326	100	326	60.8
b) Female	210	100	0	0	210	39.2
3. Household size						
a) Live alone	54	25.7	102	31.2	156	29.1
b) Live with husband/ wife	55	26.2	45	13.8	100	18.7
c) Live with husband/ wife and children	13	6.2	27	8.3	40	7.5
d) Live with parents/grandparents	64	30.5	126	38.7	190	35.4
e) Other	24	11.4	26	8.0	50	9.3
D. Income						
1. Personal monthly net income						
a) Do not want to answer	36	17.1	61	18.7	97	18.1
b) Under 300 EURO	90	42.9	129	39.6	219	40.9
c) 301- 750 EURO	52	24.8	70	21.5	122	22.8
d) 751 EURO and over	32	15.2	66	20.2	98	18.2
E. Background						
1. Educational level of parents - existence of higher education						
a) Mother	120	57.1	207	63.5	327	61.0
b) Father	88	41.9	166	50.9	254	47.4
c) Stepparent	11	5.2	12	3.7	23	4.3
d) Grandparent	44	21.0	69	21.2	113	21.1
2. Number of books in childhood home						
a) Under 100	54	25.7	76	23.3	130	24.3
b) 101 – 500	112	53.3	176	54.0	288	53.7
c) More than 500	39	18.6	68	20.9	107	20.0
d) Unanswered	5	2.4	6	1.8	11	2,0

3. Results

The survey was conducted to evaluate the level of financial literacy and analyse the factors influencing female and male students' financial knowledge. The questionnaire was filled in by 536 university students (210 female and 326 male). The collected data were analyzed using the software Statistical Package for the Social Sciences (SPSS).

3.1 Differences in Personal Financial Literacy

Table 2 summarizes the survey responses and shows differences in the financial literacy by gender. The results were presented by the topic, followed by the question number and a brief description. The first section contained general personal finance knowledge (9 questions) and the second saving, borrowing, insurance, and investments (14 questions).

In Section I, the results of the comparison of male and female students' knowledge showed that the average scores were almost equal, accordingly 72.7% and 73.5%. In Section II, females showed better results than males, accordingly 66.2% and 62.5%. On average, female students answered 69.1% of the questions correctly, while male students had the correct answers to 66.5%.

Table 2 also shows the differences of answers to the questions by the level of financial literacy. Lower scores mainly concerned topics of insurance and interest formation. In total, survey results showed that participants' financial literacy was at Medium level.

Table 2 Mean percentages of correct responses by gender resulting from ANOVA

	Level of Personal Financial Literacy									Total %
	Low Below 60%			Medium 60-79%			High Over 80%			
	M	F	F test	M	F	F test	M	F	F test	
I General Personal finance knowledge										
1. Personal financial literacy				73.9	70.0	0.983				72.4
2. Asset liquidity	41.1	48.6	2.895							44.0
3. Definition of inflation				71.8	77.1	1.904				73.9
4. Time-value of money							79.4	83.3	1.250	81.0
5. Interest paid on a loan							95.7	96.2	0.076	95.9
6. Cost of apartment leasing				68.1	69.0	0.053				68.5
7. Legal requirement for apartment lease				66.9	70.0	0.574				68.1
8. Change in the purchasing power of money	59.5	50.9	3.811*							56.2
9. Discount valuation							97.8	96.7	0.705	97.4
Mean correct responses for the I section				72.7	73.5	0.332				73.0
II Saving, borrowing, insurance and investments										
10. Appropriate saving place				76.1	76.7	0,025				76.3
11. Calculation of interest plus principle							89.3	90.5	0.203	89.7
12. Compound interest				65.3	66.7	0.100				65.9
13. Purchasing power assessment							83.1	88.6	3.016	85.3
14. Monthly payments of mortgage				68.1	70.5	0.337				69.0
15. Interest of loan	53.4	56.7	0.557							54.7
16. Loan co-sing consequences				59.5	66.2	2.425				62.1
17. The interest rate evaluation							89.0	91.0	0.551	89.7
18. Understanding the content of insurance	35.6	38.6	0.489							36.7
19. Homeowners' insurance	33.1	43.3	5.737*							37.1
20. Revenue of different Interest calculation	46.9	49.5	0.343							47.9
21. Diversification				78.5	80.9	0.459				79.5
22. Risk and return							81.9	84.8	0.739	83.0
23. Interest rates changes and treasury bond price	15.3	22.9	4.860*							18.3
Mean correct responses for the II section				62.5	66.2	5.243*				63.9
Mean correct responses for the entire survey				66.5	69.1	3.683*				67.5
Median correct responses for the entire survey				69.6	73.9					69.6

Notes: "M" average score of male participants; "F" average score of female participants; F test marks F-statistics value;
* significant at the 0.05 level.

3.2. Analysis of Results by Subgroups of the Sample

The ANOVA results in the previous section showed the gender differences in the financial literacy, but the effects of other determining factors were not controlled. In this section, the relationship between personal financial literacy and characteristics of the sample were examined (Table 3). The ANOVA had been used to detect if participants from various subgroups have differences in the levels of financial knowledge.

Participants' educational background had a significant impact on their financial knowledge. The results for the entire survey clearly showed that students from the Civil Engineering department were more knowledgeable than students from other educational disciplines. On average, the students who studied engineering answered correctly 71% (Female participants 73% and Male participants 71%) of the survey questions, while in other disciplines, the scores varied between 41% to 56%. The findings also suggested that participants from different levels of education had different levels of financial knowledge, and the students of Master studies knew more than students at Integrated studies or Bachelor studies. The testing results of ANOVA indicated that the differences in the Education area were statistically significant at the 0.01 level.

The participants from different age groups had different levels of financial knowledge. The group of youngest students (18-22) got the lowest score (67%) and the group of oldest students (30 and up) reached the highest (73%) score. These results were statistically significant at the 0.05 level and were as expected, as knowledge grows over time. The work experience, which grows over time and broadens people's perceptions, was also a statistically significant factor (at the 0.01 level) that affected financial literacy. In the subgroup Experience, the results showed no remarkable gender differences.

Findings showed that students' different demographic characteristics influenced their financial knowledge. The nationality influenced the level of financial literacy and the difference between Estonians' and non-Estonians' correct answer scores was 4%. The growth of the personal household size had a positive impact on financial literacy. The difference in students' financial literacy in the situation where student lived alone (67%) or lived together with a partner and children (70%) was 3%. The different scores in this subgroup were statistically significant at the 0.05 level.

The differences in financial knowledge in the subgroup Personal monthly net income were statistically significant at the 0.01 level and the financial literacy level rose together with income. Students whose monthly income was less than 300 EURO, had the average score of correct answers 67% and students who earned over 750 EURO per month, had the score of correct answers 72%. In the subgroup Income, the differences in the results of female and male participants were similar.

Based on F-statistic values, there were no significant differences in the subgroup named Background (Level of education of the parents and Number of books in childhood home).

Table 3 Characteristics of the Sample with the percentage of correct answers by gender, and results of ANOVA

	Female participants %	Male participants %	Entire sample %
A. Education			
1. Academic discipline			
a) Civil engineering	72.54	70.78	71.48
b) Info technology	55.98	47.83	49.45
c) Mathematics	41.06	41.61	41.30
d) Economic	49.56	41.74	46.95
e) Other departments	55.65	46.82	49.27
F Statistic	(26.518)**	46.678**	(71.183)**
2. Level of education			
a) Bachelor studies	69.73	61.41	65.22
b) Master studies	75.97	73.32	74.32
c) Integrated Bachelor's and Master's Study	65.88	67.34	66.82
d) Unanswered	60.87	47.83	47.83
F Statistic	(4.490)**	(9.650)**	(10,066)**
B. Experience			
1. Age groups			
a) 18-22	68.83	65.22	66.73
b) 23-29	68.54	67.39	67.79
c) 30 and up	73.91	72.74	73.13
F Statistic	(0,764)	(3.013)*	(3.183)*
2. The work experience			
a) None	66.45	64.51	65.27
b) Less than 2 years	69.03	65.08	66.24
c) 2 to 5 years	72.17	69.06	70.56
d) More than 5 years	73.37	72.00	72.33
e) Unanswered	66.67	66.67	66.67
F Statistic	(1.380)	(2.632)*	(3.693)**
C. Demographic characteristics			
1. Nationality			
a) Estonian	69.28	67.66	68.26
b) Non-Estonian	68.25	59.78	63.78
F Statistic	(0,168)	(10.965)**	(6.659)*
2. Gender			
a) Male	-	-	66.50
b) Female	-	-	69.07
F Statistic	-	-	(3.683)*
3. Household size			
a) Live alone	67.79	67.01	67.28
b) Live with husband/ wife	71.70	67.34	69.74
c) Live with husband/ wife and children	70.23	69.89	70.00
d) Live with parents/grandparents	65.42	64.77	64.99
e) Other	75.00	67.89	71.30
F Statistic	(2.622)*	(0.833)	(2.953)*
D. Income			
1. Personal monthly net income			
a) Do not want to answer	65.82	59.80	62.03
b) Under 300 EURO	68.69	65.59	66.86
c) 301- 750 EURO	69.81	68.57	69.10
d) 750 EURO and over	72.55	72.27	72.36
F Statistic	(1.264)	7.939**	(8.465)**
E. Background			
1. Level of education of the parents. Higher education exists			
a) Mother	69.31	67.73	68.31
b) Father	68.38	66.58	67,20
c) Stepparent	70.75	71.74	71.27
d) Grandparent	68.67	66.29	67.22
F Statistic	(0.040)	(0,016)	(0,051)
2. Number of books in childhood home			
a) Under 100	70.21	66.30	67.93
b) 101 – 500	68.94	65.46	66.82
c) More than 500	68.34	69.88	69.32
d) Unanswered	65.22	60.87	65.84
F Statistic	(0,257)	(1.632)	(1.002)

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

3.3 Analysis of Results by Participants' Choices

Analysis of variance was used to detect if participants with different financial choices had different levels of financial knowledge. Based on earlier studies (Pires and Quelhas, 2015; Mändmaa 2019b), the use of financial services has an impact on students' financial literacy.

Current study results showed that the financial services with a statistically significant effect were: Current Account, Debit Card, Housing loan (only on male participants'), Insurance, Investment Services, Pension fund shares, and Credit Card. To describe the users of statistically significant financial services, the Cross-tabulation and Chi-square tests were run. The results are given in Table 4.

Students with higher levels of financial literacy used financial services more than students with lower financial knowledge and vice versa – the financial services users had higher financial literacy level. (Table 4, columns 8 and 9). The argument was confirmed by choices made by students studying in Civil Engineering department (Table 4, columns 2 and 3), who were significantly more active users of financial services than students from other study fields (Table 3, Financial literacy scores in Civil Engineering 71-73% and Others 41-56%).

Differences in students' choices on using a Debit Card were statistically significant and confirmed an earlier argument, as Non-Estonian students' share among debit card users was 11% smaller (Table 4, 81% of Estonians and 70% of Non-Estonians) and their financial literacy score was 4% lower (Table 3, Estonians 68% and Non-Estonians 64%).

Based on Chi-square tests, there were no significant differences between female and male students' choices (Table 4), and as the statistical significance of the tests was over 0.05, these generalizations are not appropriate.

Table 4 Description about users of currently available financial services

A. Using the Current account	CED	Other	Estonian	Non-Estonian	Male	Female	FL less	FL more
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Yes Count	392	60	379	73	272	180	169	283
% of column	87.7	67.4	85.2	80.2	83.4	85.7	72.8	93.1
No Count	55	29	66	18	54	30	63	21
% of column	12.3	32.6	14.8	19.8	16.6	14.3	27.2	6.9
Total Count	447	89	445	91	326	210	232	304
% of Total	83.4	16.6	83.0	17.0	60.8	39.2	43.3	56.7
	Chi-Square=23.098**		Chi-Square=1.400		Chi-Square=0.502		Chi-Square=40.817**	
B. Using the Debit Card	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Yes Count	368	57	361	64	262	163	161	264
% of column	82.3	64.0	81.1	70.3	80.4	77.6	69.4	86.8
No Count	79	32	84	27	64	47	71	40
% of column	17.7	36.0	18.9	29.7	19.6	22.4	30.6	13.2
Total Count	447	89	445	91	326	210	232	304
% of Total	83.4	16.6	83.0	17.0	60.8	39.2	43.3	56.7
	Chi-Square=15.107**		Chi-Square=5.361*		Chi-Square=0.588		Chi-Square=24.388**	
C. Using the Credit Card	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Yes Count	99	12	97	14	69	42	37	74
% of column	22.1	13.6	21.8	15.4	21.2	20.0	15.9	24.3
No Count	301	61	299	63	215	147	155	207
% of column	67.3	69.3	67.2	69.2	66.0	70.0	66.8	68.1
Yes, but not my own Count	38	9	38	9	34	13	27	20
% of column	8.5	10.2	8.5	9.9	10.4	6.2	11.6	6.6
Unanswered Count	9	7	11	5	8	8	13	3
% of column	2.0	6.8	2.5	5.5	2.5	3.8	5.6	1.0
Total Count	447	89	445	91	326	210	232	304
% of Total	83.6	16.4	83.0	17.0	60.8	39.2	43.3	56.7
	Chi-Square=8.913*		Chi-Square=4.016		Chi-Square=3.797		Chi-Square=17.744**	
D. Using Housing loan	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Yes Count	31	1	30	2	21	11	11	21
% of column	6.9	1.1	6.7	2.2	6.4	5.2	4.7	6.9
No Count	416	88	415	89	305	199	221	283
% of column	93.1	98.9	93.3	97.8	93.6	94.8	95.3	93.1
Total Count	447	89	445	91	326	210	232	304
% of Total	83.4	16.9	83.0	17.0	60.8	39.2	43.3	56.7
	Chi-Square=4.465*		Chi-Square=2.779		Chi-Square=0.330		Chi-Square=1.100	
E. Using Insurance Services	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Yes Count	143	15	138	20	101	57	52	106
% of column	32.0	16.9	31.0	22.0	31.0	27.1	22.4	34.9
No Count	304	74	307	71	225	153	180	198
% of column	68.0	83.1	69.0	78.0	69.0	72.9	77.6	65.1
Total Count	447	89	445	91	326	210	232	304
% of Total	83.4	16.6	83.0	17.0	60.8	39.2	43.3	56.7
	Chi-Square=8.181**		Chi-Square=2.966		Chi-Square=0.905		Chi-Square=9.818**	
F. Using Investment Services	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Yes Count	40	1	36	5	23	18	6	35
% of column	8.9	1.1	8.1	5.5	7.1	8.6	2.6	11.5
No Count	407	88	409	86	303	192	226	269
% of column	91.1	98.9	91.9	94.5	92.9	91.4	97.4	88.5
Total Count	447	89	445	91	326	210	232	304
% of Total	83.4	16.6	83.0	17.0	60.8	39.2	43.3	56.7
	Chi-Square=6.433**		Chi-Square=0.720		Chi-Square=0.416		Chi-Square=14.844**	
G. Using Pension fund shares	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Yes Count	138	16	125	29	92	62	50	104
% of column	30.9	18.0	28.1	31.9	28.2	29.5	21.6	34.2
No Count	309	73	320	62	234	148	182	200
% of column	69.1	82.0	71.9	68.1	71.8	70.5	78.4	65.8
Total Count	447	89	445	91	326	210	232	304
% of Total	83.4	16.6	83.0	17.0	60.8	39.2	43.3	56.7
	Chi-Square=6.027**		Chi-Square=0.527		Chi-Square=0.106		Chi-Square=10.297**	

Notes: CED- Civil Engineering department; Sig= significant at the level; *significant at the 0.05 level; **significant at the 0.01 level or greater.

3.4. Relationships between Interest, Self-assessment, Confidence and Financial Literacy

Three different samples and answers to two questions were used to analyse this topic. The first question examined participants' interest in improving their financial literacy (results in Figure 1) and the second asked them to evaluate their own financial knowledge (results in Table 5). Figure 1 describes participants' interest about financial topics through the differences by gender and financial literacy (FL) levels. The results showed that male students were more interested (84% of males and 79% of females), but female students had higher level of financial literacy (females' 69% and males' 66%). About 82% of all students participating in the poll admitted their interest to improve financial literacy level and only 8% of participants found that there was no need for improvement (F Statistic= 4.724 significant at 0.009 level).

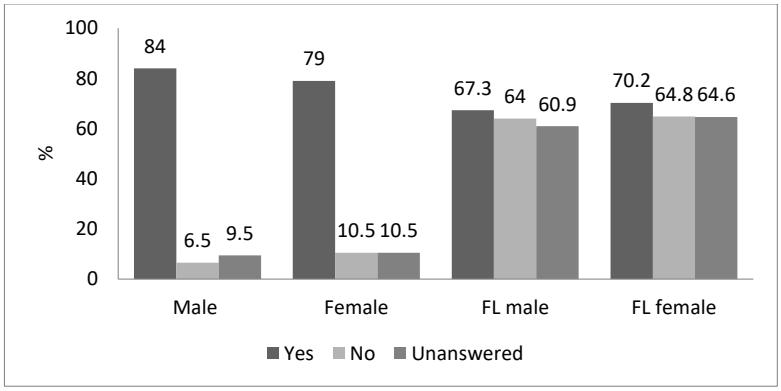

Figure 1 Students' interest about financial topics by gender and financial literacy

46% of female and 39% of male students rated their financial literacy level to "High" and only 8% of women and 9% of men rated their level to "Low". The results about evaluation of participants' financial literacy showed that 24% of females' and 17% of males had financial knowledge at high level, and 24% of women and 27% of men had scores at low level (Table 5). The level of own financial literacy was assessed rightly by 203 students, which accounted for 38% of the total number of respondents in full sample (Table 5 A) and similar proportions were in samples "Female" (39%, Table 5 B) and "Male" (37%, Table 5 C). As a result, it could be concluded that students had overrated their own knowledge, as in the full sample, 42% of the students evaluated their knowledge to high level, but only 20% of those in the survey exceeded the high-level border (right answers 80% and over). The students who assessed their financial knowledge to the high level (225 incl. 97 female students, i.e., 46% of females and 128 male students, i.e., 39% of males) could be counted as self-confident, as well these students (55 incl. 17 female students, and 38 male students) whose financial literacy level was low but proposed own level as medium. The differences between self-assessment and actual scores were significant for both female and male participants (Table 5, the difference at high level 22% for both, and at low level 16% and 18%, respectively). Regarding questions about confidence and interest, disparities among female and male students were minor (2 to 5%).

Table 5 Differences in self- assessments

A. Self-assessment about financial knowledge?		Financial literacy level			Full sample
		Low	Medium	High	
High	Count	41	125	59	225
	% within	18.2%	55.6%	26.2%	100.0%
	% within column	29.5%	42.8%	56.2 %	42.0%
Medium	Count	55	121	35	211
	% within	26.1%	57.3%	16.6%	100.0%
	% within column	39.6%	41.4%	33.3%	39.4%
Low	Count	23	20	2	45
	% within	51.1%	44.4%	4.4%	100.0%
	% within column	16.5%	6.9%	1.9%	8.4%
Hard to say	Count	20	26	9	55
	% within	36.4%	47.3%	16.3%	100.0%
	% within column	14.4%	8.9%	8.6%	10.2%
Total	Count	139	292	105	536
	% of Total	25.9%	54.5%	19.6%	100.0%
Note:		Chi-Square=12.847* Sig= 0.046			
B. Self-assessment about financial knowledge?		**Financial literacy level**			**Females sample**
		Low	**Medium**	**High**	
High	Count	17	49	31	97
	% within	17.5%	50.5%	32.0%	100.0%
	% within column	34.0%	44.5%	62.0%	46.2%
Medium	Count	17	41	16	74
	% within	23.0%	55.4%	21.6%	100.0%
	% within column	34.0%	37.3%	32.0%	35.2%
Low	Count	9	6	1	16
	% within	56.3%	37.5%	6.3%	100.0%
	% within column	18.0%	5.5%	2.0%	7.6%
Hard to say	Count	7	14	2	23
	% within	30.4%	60.9%	8.7%	100.0%
	% within column	14.0%	12.7%	4.0%	11.0%
Total	Count	50	110	50	210
	% of Total	23.8%	52.4%	23.8%	100.0%
Note:		Chi-Square=17.446** Sig= 0.008			
C. Self-assessment about financial knowledge?		**Financial literacy level**			**Males sample**
		Low	**Medium**	**High**	
High	Count	24	76	28	128
	% within	18.8%	59.4%	21.9%	100.0%
	% within column	27.0%	41.8%	50.9%	39.3%
Medium	Count	38	80	19	137
	% within	27.7%	54.4%	13.9%	100.0%
	% within column	42.7%	44.0%	34.5%	42,0%
Low	Count	14	14	1	29
	% within	48.3%	48.3%	3.4%	100.0%
	% within column	15.7%	7.7%	1.8%	8.9%
Hard to say	Count	13	12	7	32
	% within	40.6%	37.5%	21.9%	100.0%
	% within column	14.6%	6.6%	12.7%	9.8%
Total	Count	89	182	55	326
	% of Total	27.3%	55.8%	16.9%	100.0%
Note:		Chi-Square=19.067** Sig= 0.004			

Notes: Sig = significant at the level; *significant at the 0.05 level; **significant at the 0.01 level or greater.

3.5 Students Sources of Personal Financial Education

Students were asked to evaluate the importance of the financial knowledge they have acquired from different financial education providers on the scale of 1 to 5, where 1 is of little importance and 5 is especially important. Position 6 has used in cases “Cannot say” or “Unanswered”.

51% of women and 47% of men evaluated the knowledge obtained from their parents especially important ("5"), and 27% of women and 24% of men important ("4"), (Figures 2B and 2C).
Evaluation of the importance of the financial knowledge acquired from parents, family:

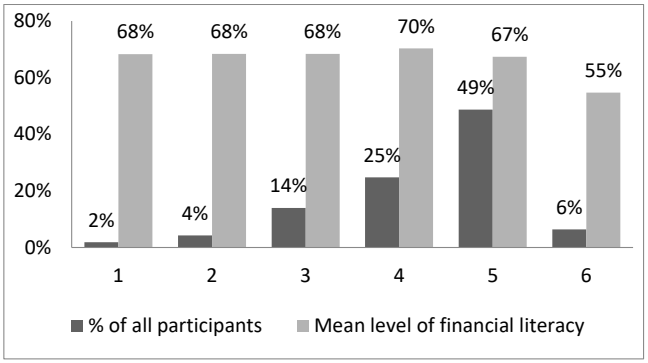

Figure 2A Entire sample
Notes: F=4.365 Sig=0.000

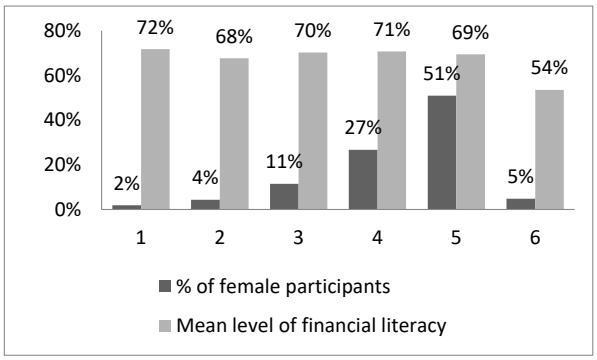

Figure 2B Sample of female students
Notes: F=2.594 Sig=0.027

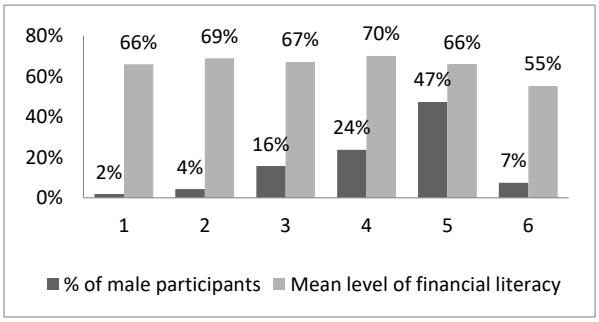

Figure 2C Sample of male students
Notes: F=3.608 Sig=0.003

The next most important financial knowledge provider was the university as it was evaluated by 49% of women and 52% of men with grade "5" or "4" (Figures 3B and 3C).
Evaluation of the importance of the financial knowledge acquired from the University:

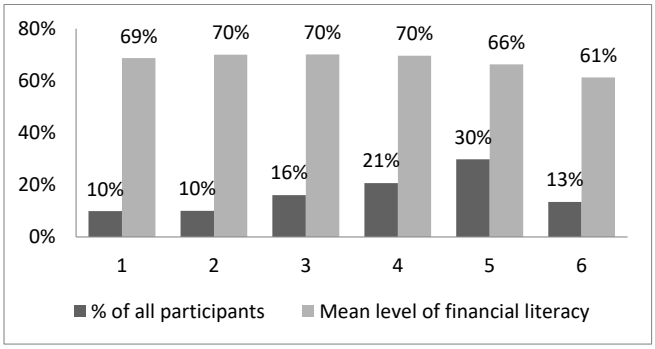

Figure 3A Entire sample
Notes: F=4.072 Sig=0.001

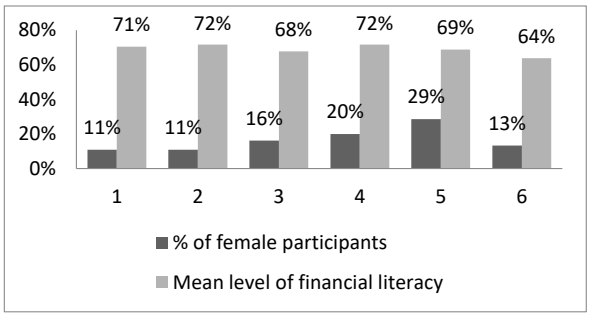

Figure 3B Sample of female students
Notes: F=1.249 Sig=0.288

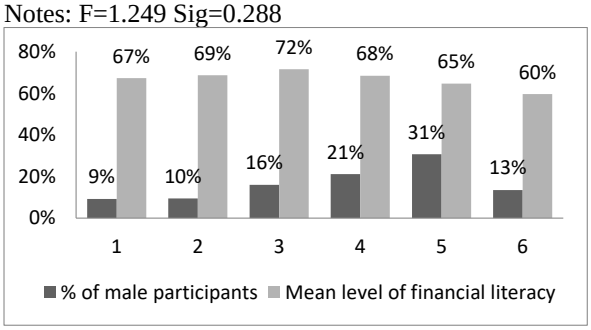

Figure 3C Sample of male students
Notes: F=3.645 Sig=0.003

The personal financial knowledge acquired from the High School was rated important, as 49% of women and 50% of men evaluated it with grades "5" or "4" (Figures 4B and 4C).

Evaluation of the importance of the financial knowledge acquired from the High School:

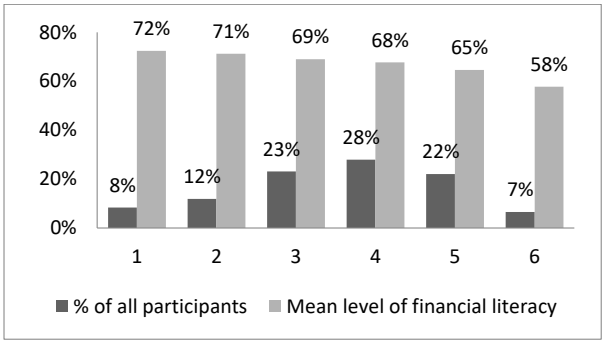

Figure 4A Entire sample
Notes: F=6.005 Sig=0.000

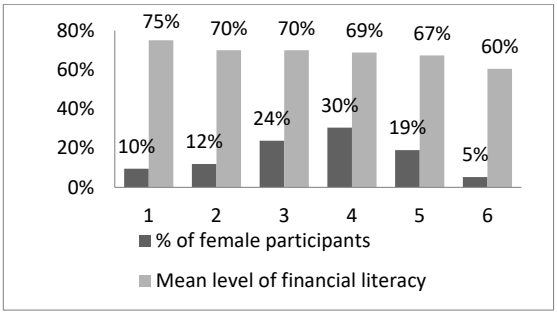

Figure 4B Sample of female students
Notes: F=1.610 Sig=0.159

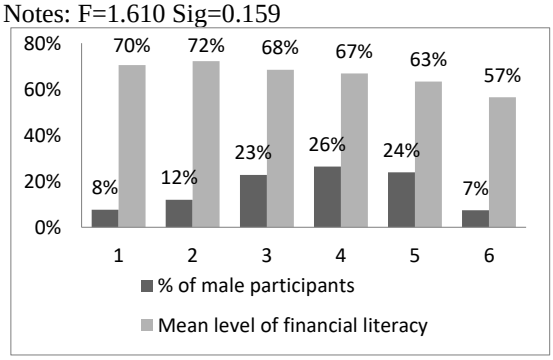

Figure 4C Sample of male students
Notes: F=4.524 Sig=0.001

The importance of the financial knowledge acquired from the Primary School was rated as of little importance. The grade “1” was given by 62% of female and by 58% of male participants (Figures 5B and 5C).

Evaluation of the importance of the financial knowledge acquired from the Primary School:

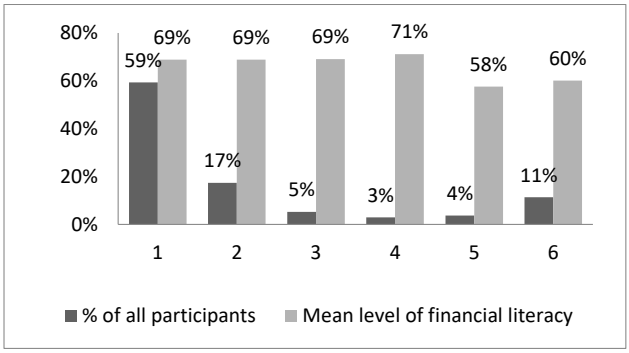

Figure 5A Entire sample
Notes: F=5.744 Sig=0.000

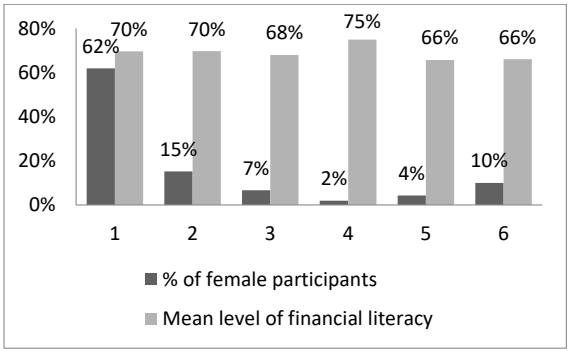

Figure 5B Sample of female students
Notes: F=0.456 Sig=0.809

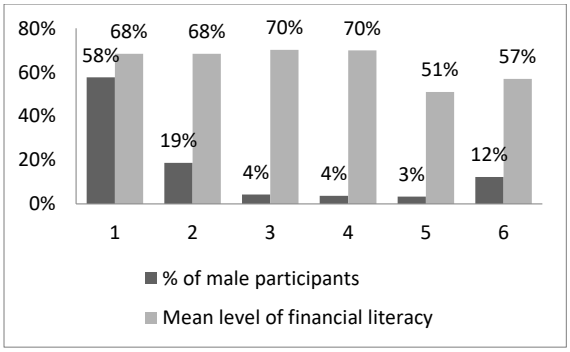

Figure 5C Sample of male students
Notes: F=6.820 Sig=0.000

F-statistic showed that there were no statistically significant differences between men's and women's results.

4. Discussion

Statistically significant results showed that on average female students know more (69.1%) about personal finance than male students (66.5%). Previous study among Estonian university students (Mändmaa 2019b) revealed that men have a higher level of financial literacy than women and similar results were obtained by Atkinson et al. (2006) in interviewing UK population; Goldsmith & Goldsmith (1997; 2006) and Chen & Volpe (1998; 2002) while researching the US students; Lusardi et al. (2010) who examined the US youth and Monticone (2010) who studied the population of Italy. Wagland and Taylor (2009) who examined the level of financial literacy of Australian students, concluded that the gender does not affect the level of financial literacy. Altintas (2011), whose study was conducted in Turkey, and Pires and Quelhas (2015), whose study was conducted in Portugal, received results similar to the present study that the level of female students' financial literacy is higher than that of males.
The important factors that affect the level of financial literacy of university students were: Educational background – academic discipline and level of education; Experience - the participants' age groups and the work experience; Demographic characteristics - nationality and household size and Income (Table 3). There were some differences between the samples of females and males, as factors like age, work experience, nationality and income were not statistically significant for females and household size for males. Previous study results suggested that statistically significant factors influencing Estonian university students' financial literacy were the academic discipline, level of education, gender, age, and nationality (Mändmaa 2019a).

Based on the current research, it can be argued that the higher scores in the financial literacy of female students have direct relation to the choice of academic discipline, as female students from Civil Engineering department obtained the higher financial literacy scores than male students or students studying in any other study field (Table 3). The results obtained by this survey reflect the positive impact of mathematics and other number-oriented sciences to the financial literacy. In the results of Pisa 2012, where girls and boys aged 15 were tested in the financial literacy, there were no significant gender differences. The differences occurred when the results of the math and reading tests were included in the analysis, and students with similar scores were compared. Then the results showed that boys had a higher level of financial literacy than girls. Looking more closely at the results of the PISA test of Estonian students' in mathematics, it can be seen that since 2009 there is a statistically significant difference between the levels of girls and boys, with the average score of girls being lower (points in 2009: boys 516 and girls 508; points in 2012: boys 523 and girls 518). (SA Innove 2013) The gender gap in the results of the study conducted in 2012 among Estonian university students was statistically significant and the level of financial literacy of females was lower than that of males (females 56% and males 64%). Students who studied on non-economic disciplines or other non-math-oriented specialties received weaker results, and the share of correct responses in women was 53% and in men 63%. (Mändmaa 2019a; Mändmaa 2019b)
The results of the girls' math tests and the female students' financial literacy assessments are the supporting evidence to the relationship between mathematics skills and financial literacy levels.

Current study results confirm that students who use financial services are more knowledgeable in financial literacy (Table 4). The findings of a study conducted among Portuguese students showed that the existence of prior experience, as credit clients or the existence of saving habits increases the financial literacy of individuals (Pires and Quelhas 2015). Earlier study conducted among Estonian university students exhibited that financial services with statistically significant effect were: Debit Card, Bank loan, Investment Services and Insurance (Mändmaa 2019b). Present study results show that there are more financial services with statistically significant effect: Current Account, Debit Card, Credit Card, Housing loan, Insurance, Investment Services, and Pension fund shares, but statistically significant gender differences were not revealed in this area (Table 4).

Previous research has found that it is more likely that people with low financial literacy have problems with debt and they are less likely to participate in the stock market (Lusardi and Tufano 2009; van Rooij et al. 2007). The results of this study showed that students' use of loan instruments was low, but investments were not popular either, and there were no statistically significant differences between female and male students in the financial services use (Table 5). As an explanation of the current situation, it should mention the relatively short period of post-socialism, during which the habits of the population and Estonians' conservative attitude towards money matters have not changed.

In a USA survey among undergraduate students, 84% of participants said they needed more education on finances management topics (Sallie Mae, 2009). In a previous study in Estonia, the question "Do you want to get more information about financial services and monetary affairs planning?", was answered "yes" by 65% of the participants. Students with a low financial literacy level (below the median 57.14% level) were found more curious. The level of interest to get additional information about financial services and monetary affairs planning among male and female students was quite similar. Male students' interest was just 5% lower. (Mändmaa, 2019b)

In the present survey, the students' opinions about needs to improve their financial literacy showed the rising trend, as 79% of female students and 84% of male (Figure 1) students reported that they have interest to improve their financial literacy. The level of male students' interest was 5% higher, while the level of financial literacy was higher among female students (accordingly females' 69% and males' 66%).

To evaluate students' confidence, they were asked to assess their own financial literacy level. The level was assessed rightly by 203 students, which accounted for 38% of respondents in full sample (Table 5), including 39% of female and 37% of male students. Students who assessed their financial knowledge to the high level (225 incl. 97 female and 128 male students) could be counted self-confident, as well as those (55 incl. 17 female students and 38 male students) whose financial literacy level was low but proposed own level as medium.

Previous studies (Goldsmith and Goldsmith 1997; Chen and Volpe 2002) reported that women have lower confidence in and less interest to personal finance than men and indicated those as possible reasons of gender differences in the financial literacy. The results of the current study do not confirm these observations, as nearly half (46%) of female participants rated their financial knowledge to High level, and that shows rather higher than low confidence. At the same time, the disparities between female and male students in self-assessments and in having interest about topics of personal finances were minor.

To evaluate the sources of personal financial knowledge, students were asked to rate the importance of the acquired financial education and knowledge providers.

The highly rated source of personal financial education for female and male students was the family, the University and the High School were the next (Figures 2, 4 and 5). Primary School (Figure 3) was marked of little importance for 56% of students (female 62% and male 58%).
The discussion can be concluded by agreeing with earlier researchers' opinions that further development of financial education in university is important, as students have expressed interest and the results of the students' financial literacy assessment showed a need for improvement. In addition, students will be soon the founders of family themselves, and the parents' financial knowledge and ability to manage resources efficiently are important factors in the development of next generations financial well-being.

5. Conclusion

This study analysed the responses collected from Estonian university students by the survey questionnaire in order to evaluate students' financial literacy in purpose to develop the personal financial education. 536 students, 210 women and 326 men, participated in the survey and by the results, their financial literacy level was Medium.
The study showed statistically significant gender differences in the financial literacy. On average, female students answered correctly to 69.1% of questions, while male students had the correct answers of 66.5%. Lower scores mainly concerned topics of insurance and interest formation. The important factors that affected the level of financial literacy of women and men were: Participants' Education – academic discipline and level of education; Experience - participants age group and work experience; Demographic characteristics - nationality and household size; Income; and the use of Financial services (Current Account, Debit Card, Credit Card, Home Loan, Insurance, Investment Services, Pension Funds Shares). 82% of all participants (84% of males and 79% of females) admitted their interest to improve the financial literacy level. The highly rated source of personal finance education for female and male students was the family, and the university was the next.
Several previous studies have shown that men have a higher level of financial literacy than women and a few studies have referred to the low interest of female students about financial topics and mathematics or other number-oriented subjects as reasons. The results of this study showed that female students' financial literacy results may be higher than male students' if the selected academic discipline is linked with mathematics. So, it could be stated that the existence of an interest in mathematics, as a numerical and logical subject, supports the orientation in financial systems and helps to improve one's personal as well as more broadly social financial well-being.
Unfortunately, this study could not give full answers neither to what boosts the math interest, nor to why gender differences exist in the financial literacy or how to manage them. There are myths and gender roles having their effects. The myths that girls are weaker in mathematics or science could hinder their advancement, as these may occur as some aversion to subject. To reverse the situation, the education system is in a privileged position as several studies show that students are successful in the subjects they like.
Students' financial literacy, choices and opinions were assessed to find the need and gaps in students' knowledge to develop the personal financial education. The survey gave a good overview but for better outcomes, the study should be continued as there are still numerous open questions. This study found out that the form of questionnaire is good for evaluation but not particularly enough for improvement the courses.

The current study had its limits, as the questionnaire was anonymous, it was not possible to contact participants later. For better outcomes, a question about participants' contact data - phone number or e-mail address, could be added to clarify their views and let them express their perspectives, for example, about inclusion of necessary topics, explanations etc.
Nowadays financial literacy is essential as much of the financial responsibility has been shifted from the government to the individual. Further development of financial education in universities is important, as students' financial literacy assessment showed a need for improvement, and students will be our next financially active generation – leaders, family founders, parents etc.
This study provides sound evidence for researchers and will be useful for politicians and educators to develop the financial education.

6. Acknowledgement

The author would like to thank colleagues and students from Tallinn University of Technology for their valuable help in data gathering.

7. References

Altintas, K. M. (2011). "The dynamics of financial literacy within the framework of personal finance: An analysis among Turkish University Students." *African Journal of Business Management* 5(26): 10483 - 10491.
http://www.academicjournals.org/app/webroot/article/article1380526343_Altintas.pdf

Atkinson, A., S. McKay, E. Kempson and S. Collard. (2006). "Levels of Financial Capability in the UK: Results of a baseline survey." *University of Bristol: Personal Finance Research Centre.* 150 pp. http://www.pfrc.bris.ac.uk/publications/Reports/Fincap_baseline_results_06.pdf

Chen, H. and R. P. Volpe. (1998). "An Analysis of Personal Financial Literacy among College Students." *Financial Services Review*, 7(2): 107-128.
https://doi.org/10.1016/S1057-0810(99)80006-7

Chen, H. and R. P. Volpe. (2002). "Gender Differences in Personal Financial Literacy among College Students." *Financial Services Review*, 11(3): 289-307
https://www.researchgate.net/publication/285358406_Gender_Differences_in_Personal_Financial_Literacy_Among_College_Students
Cole, S. A., A. L. Paulson and G. K. Shastry. (2012). "Smart Money: The Effect of Education on Financial Behaviour." *Harvard Business School Finance Working Paper* No. 09-071.
http://dx.doi.org/10.2139/ssrn.1317298

Goldsmith, E. B. and R. E. Goldsmith. (1997). "Gender differences in perceived and real knowledge of financial investments." *Psychological Report*, 80: 236-238.
https://doi.org/10.2466/pr0.1997.80.1.236

Goldsmith, E. B. and R. E. Goldsmith. (2006). "The Effects of Investment Education on Gender Differences in Financial Knowledge." *Journal of Personal Finance*. 5(2): 55-69.

https://www.academia.edu/2833951/The_effects_of_investment_education_on_gender_differences_in_financial_knowledge

Lusardi, A. and O. S. Mitchell. (2006). "Financial Literacy and Planning: Implications for Retirement Wellbeing." Working Paper, *Pension Research Council, Wharton School, University of Pennsylvania*. https://pensionresearchcouncil.wharton.upenn.edu/wp-content/uploads/2015/09/PRC-WP-2006-1.pdf

Lusardi, A. and P. Tufano. (2009). "Debt Literacy, Financial Experiences, and Over indebtedness." *NBER Working Paper,* 14808. https://doi.org/10.3386/w14808

Lusardi, A., O. S. Mitchell and V. Curto. (2010). "Financial Literacy among the Young". *Journal of Consumer Affairs* 44: 358–380. https://doi.org/10.1111/j.1745-6606.2010.01173.x

Lusardi, A. (2017)**.** Visiting Swedish House of Finance to share her research and receive Skandia's 2017 research award**.** https://www.houseoffinance.se/lusardi-financial-literacy-levels-need-robust-intervention/

Mandell, L. (2008). "The Financial Literacy of Young American Adults. Results of the 2008 National JumpStart Coalition Survey of High School Seniors and College Students." *JumpStart Coalition*: 1-253. https://www.stockmarketgame.org/assets/pdf/2008%20JumpStart%20Financial%20Literacy%20Survey.pdf

Monticone, C. (2010). "How Much Does Wealth Matter in the Acquisition of Financial Literacy?" *Journal of Consumer Affairs* 44 (2): 403 - 422. https://doi.org/10.1111/j.1745-6606.2010.01175.x

Mändmaa, S. (2019a). "Financial literacy – what and why should we improve." *Eurasian Journal of Social Sciences*, 7(2), 2019, 12-28. https://doi.org/10.15604/ejss.2019.07.02.002

Mändmaa, S. (2019b). "Analysing the factors influencing university students' financial literacy." *International Journal for Innovation Education and Research, 7*(7): 465-497. https://doi.org/10.31686/ijier.Vol7.Iss7.1628

OECD 2006. "Improving Financial Literacy: Analysis of Issues and Policies." *Financial Market Trends* 2005/2. https://dx.doi.org/10.1787/fmt-v2005-art11-en

OECD 2012. "Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study," *OECD Working Papers on Finance, Insurance and Private Pensions* No. 15. https://dx.doi.org/10.1787/5k9csfs90fr4-en

OECD 2014. PISA 2012 "Results: Students and Money: Financial Literacy Skills for the 21st Century." *PISA, OECD Publishing* Volume VI. http://dx.doi.org/10.1787/9789264208094-en

Pires, V. and A. P. Quelhas. (2015). “Financial Literacy among the Higher Education Students: Empirical Evidence for the Portuguese Case.” *Portuguese Journal of Finance,* Management *and Accounting.* 1 (1): 84-103. http://u3isjournal.isvouga.pt/index.php/PJFMA

Remund, D. L. (2010). “Financial Literacy Explicated: The Case for a Clearer Definition in an Increasingly Complex Economy.” *Journal of Consumer Affairs,* 44 (2): 276-295. https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1745-6606.2010.01169.x

van Rooij, M., A. Lusardi and R. Alessie. (2007). “Financial Literacy and Stock Market Participation.” *NBER Working Paper* 13565. https://www.nber.org/papers/w13565.pdf

SA Innove. (2013). “Results of PISA 2012 Estonia.” [PISA 2012 Eesti tulemused]. edited by Gunda Tire, Tallinn Dec 4, 2013, SA Innove. https://issuu.com/innove/docs/pisa_2012_eesti_tulemused_2

Sallie Mae. (2009). “How Undergraduate Students Use Credit Cards.” [Online] *Sallie Mae’s National Study of Usage Rates and Trends 2009.* http://static.mgnetwork.com/rtd/pdfs/20090830_iris.pdf

Wagland, S. P., Taylor, S. (2009). “When it comes to financial literacy, is gender really an issue? “*Australasian Accounting Business & Finance Journal* 3(1): 13 - 25. https://ro.uow.edu.au/cgi/viewcontent.cgi?referer=https://www.bing.com/&httpsredir=1&article=1049&context=aabfj

Publication III

Mändmaa, S.
Personal Financial Literacy among University Students studying Engineering

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International Journal for Innovation Education and Research
Vol. 8(8), pp. 669-692, 2020

Personal Financial Literacy among University Students studying Engineering

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Abstract

Nowadays financial literacy is essential as in a society much of the financial responsibility has shifted from governments to the individual. The findings of earlier studies show that university students are not knowledgeable about personal finance and their financial skills need improvement. This study analysed the survey results of 536 university students to assess the financial literacy, the impact of educational and demo-graphical characteristics to the participants' financial literacy, and the students' financial opinions and choices. Results of the regression analysis showed that statistically significant impact to the financial literacy had factors: academic discipline, level of education, gender, nationality, age, and the choices to have a current account, a debit card, and investment services. Students studied in the Faculty of Civil Engineering compared to others, had higher knowledge in finance, especially female students.

These results of study give the direction for future research and enable to enhance financial education.

Keywords: Personal financial literacy, financial education, higher education students, engineering studies, gender differences

1. Introduction

According to the definition used by Organization for Economic Co-operation and Development (OECD), financial literacy is a combination of awareness, knowledge, skill, attitude, and behaviour necessary to make sound financial decisions and ultimately achieve individual financial wellbeing (OECD, 2012).

In an international study to assess the financial literacy of young people, PISA 2012, the financial literacy was defined as follows: “Financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and

understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life." (OECD, 2014, p. 33).

To improve financial literacy, it is essential to enhance personal financial education. “Financial education is the process by which financial consumers/ investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become aware of (financial) risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being and protection “(OECD, 2006, p. 118).

To elaborate on personal financial education there is need to continue research as there is a range of factors that we do not know yet or whose effect we cannot assess. There are examples where good knowledge was not able to result in reasonable behaviour. For instance, in the OECD International Network on Financial Education pilot study undertaken in 14 countries, Estonians ranked in the second group in financial knowledge and last in the behaviour - exhibited significantly lower levels of behaviour than all other countries, except Albania. (OECD, 2012)

Previous studies among adults (Faktum & Ariko, 2010; Kann, 2010) have shown that Estonians’ elementary level of financial literacy is not a problem, because it is compensated by the conservative behavior of the money matters. Problems arise when there is a need for using long-term financial services and calculations. Study results from 2015 show that the financial literacy level of the Estonian population indicates an upward trend. People's perception of interest and its calculation, as well as investment awareness, have improved over the previous five years and there have been a steady increase of the number of families who account their incomes and expenses, i.e., draw up a household budget (2010 33%, 2012 39% and 2015 44% of participants). (Saar Poll, 2015)

The financial literacy test, PISA 2012, was taken in 18 countries and economies. In Estonia, 1088 students took the test and achieved a mean score of 529 points, which was significantly above the OECD mean (500 points) score (OECD, 2014). The disturbing fact in the results was the gap between the groups with different languages spoken at home, as students who spoke Estonian at home had the mean score 46 points higher than students whose home spoken language was another language (OECD, 2014).

Earlier analysis of the financial literacy of students at Estonian universities showed that the level of financial literacy of students was low and that the interest of students in long-term planning was not remarkably high. 51.0% of respondents had low financial literacy and only 3.4% planned their finances for several years. (Mändmaa, 2019a) University students studying science or mathematics-oriented subjects had more financial knowledge, especially male students. The lowest level of the financial literacy mean score (52%) was of students studying in the field of Construction. (Mändmaa, 2019b)

As financial education should meet the needs and financial literacy level of the target audience, it is important to explore more deeply what and how affects the financial knowledge, and what kind of influence the knowledge has on students' personal finance issues and decisions.
This study had two purposes: first, to examine the financial literacy and its relationships with financial opinions and choices (i.e., views on personal finance issues and financial decision making) made by students who studying engineering sciences in Estonia; second, to explore the impact of socio demographic characteristics on the participants' financial literacy, opinions and choices.

The main goal of this study was to examine personal financial literacy, opinions and choices among university students in engineering sciences to provide the results that will enable identification of needs and gaps in financial education to develop the area and well-being in society.
The paper is organized as follows. Section two addresses previous relevant contributions in the literature related to financial literacy and education. Section three describes the methodology and the sample that was used. Section four presents the results that were obtained, and finally, section five concludes the paper.

2. Literature review

Wealthy people are more financially literate than poor people, and those with high education attainment are also more financially literate. (Lusardi, 2017)

Financial education should be regarded as a lifetime, ongoing and continuous process, to take account of the increased complexity of markets, varying needs at different life stages, and increasingly complex information. (OECD, 2006)

The findings from an OECD International Network on Financial Education pilot study undertaken in 14 countries show that compound interest and diversification is lacking amongst sizable proportion of the population in every country. (OECD, 2012)

Researchers have examined the financial literacy and practice of various components of society. Several studies throughout the world have shown that females tend to display lower level on personal financial literacy than males, among adults (Lusardi & Mitchell, 2006; Fonseca, et al., 2010; Monticone, 2010), students (Chen and Volpe, 1998; Chen and Volpe, 2002; Atkinson et al 2006; OECD, 2012; Mändmaa, 2019a, b), and adolescents (Lusardi et al 2010). Goldsmith and Goldsmith (1997; 2006) suggested that females have lower level in financial literacy than males as their general interest in investment and personal finance is usually lower, and they are less confident in their ability to perform financial analysis. Chen and Volpe (2002) argued that enthusiasm and confidence may be the contributing factors that explain why men are more financially knowledgeable than women. They stated that Personal Finance is mostly a number-

oriented subject and not attractive to women, as women prefer courses with less mathematics and other number-oriented science. (Chen and Volpe, 2002)

Several researchers have noted that age makes an important influence on the level of financial literacy. For instance, Atkinson et al. (2006) obtained results in the study of the United Kingdom population that 26-year-old and older are in higher financial literacy levels than the younger. Similar results were obtained in the study among university students in Estonia (Mändmaa, 2019a). Chen and Volpe (1998) surveyed college students in US and noted that participants under the age of 30 are more likely to be less knowledgeable as compared with those of the age of 40 or older.

Various studies (Chen and Volpe, 1998; Mändmaa, 2019a,b; Pires and Quelhas, 2015) have examined students' financial knowledge, revealed that students with an economic academic discipline or those attending programs in business sciences tend to show a higher level of financial literacy. Lewis Mandell who has surveyed the Financial Literacy of Young American Adults expressed his opinion:" Regardless of major, college students learn how to do research and solve problems. In a rapidly changing financial system, these two skills are more important to financial decision-making than understanding financial products, rules, and regulations. Knowing how to approach a problem and how to research it are key to making the best personal financial decisions." (2008, pp. 29) According to the results, students who study science and engineering had the highest financial literacy scores and those who studied business or economics came next (Mandell, 2008).

The research among Portuguese students revealed that the existence of prior experience, as credit clients or the existence of saving habits increases the financial literacy of individuals. (Pires and Quelhas, 2015)

Financial literacy can have important implications for financial behaviour. Previous research has found that people with low financial literacy are more likely to have problems with debt (Lusardi and Tufano, 2009), less likely to participate in the stock market (van Rooij *et al*, 2007), less likely to accumulate wealth and manage wealth effectively (Hilgert *et al*, 2003; Stango and Zinman, 2007), and less likely to plan for retirement (Lusardi and Mitchell 2006, 2009).

The financial situation of today's youth in USA is characterized increasingly by high levels of debt, as between 1997 and 2007, average undergraduate student loan debt rose from $9,250 to $19,200 — a 58% increase after accounting for inflation (Reed, 2008). Cole, Paulson and Shastry showed that education improves credit scores, and dramatically reduces the probability of declaring bankruptcy, as well as significantly increases investment income and retirement savings (Cole *et al*, 2012).

Many young people wished they had more financial knowledge. In a 2009 survey on credit card use among undergraduate students in USA, 84% of students said they needed more education on financial management topics, 60% wanted to receive this education while in high school, and 40% as college freshmen (Sallie Mae, 2009). In a survey among Estonian university students, 65% of

the participants were interested to get more information about financial services and monetary affairs planning (Mändmaa, 2019a).

Understanding financial literacy among young people is thus of critical importance for policymakers in several areas; it can aid those who wish to devise effective financial education programs targeted at young people as well as those writing legislation to protect younger consumers (Lusardi et al, 2010).

3. Methodology

This study used a standardized survey method to determine participants' personal financial literacy. The questionnaire was designed to cover major aspects of personal finance, included knowledge on General Personal Finance, Saving, Borrowing, Investment and Insurance. In the current study, the multiple-choice questions used contained 10 questions on demographic data, 23 about personal finance knowledge and five concerning participants finance choices and opinions. The validity and clarity of the survey were previously evaluated by a group of master level students and by three individuals who were knowledgeable in personal finance topics.

The responses from each participant were used to calculate the mean and median percentage of correct scores, to measure the financial literacy levels and to analyse the results. Consistent with the existing literature (Chen and Volpe, 1998; Mändmaa, 2019a, b), the mean percentage of correct scores was grouped into three categories. The first category represents a relatively high level (more than 80%) of knowledge, the second a medium (60% to 79%) and the third represents a relatively low level (below 60%) of knowledge.

Previous research suggested that levels of financial literacy vary among subgroups of students (Chen and Volpe, 1998, 2002; Mändmaa, 2019a, b). To provide evidence of the differences, the Analysis of Variance (ANOVA) was used. The differences were further analysed using logistic regression models. The participants were divided into two groups using the median percentage of correct answers of the sample. Students with scores higher than the sample median were classified as students with relatively higher (More) knowledge, coded as "1" and students with scores equal or below the median were classified as those with relatively lower (Less) knowledge, coded as "0". The dichotomous variable, financial literacy level (More, Less), was used in the logistic regression as the dependent variable, which was explained simultaneously by all the independent variables. To find out if the independent variables have different effect on students' financial literacy, the logistic regression analysis was conducted separately two times: for the entire sample and for students studying Civil Engineering.

In the current case, the independent variables were age, academic discipline, level of education, gender, household size, nationality, work experience, currently available financial services (including the use of credit card), planning period for personal finance affairs, and interest about personal finance topics.

In this study, the logistic model took on the following functional form:

$$\log [p/(1-p)] = B_0 + B_1(Age1) + B_2(Age2) + B_3(Age3) + B_4(Academic\ discipline) + B_5(Credit\ Card) + B_6\ (Gender) + B_7\ (Household1) + B_8\ (Household2) + B_9\ (Household3) + B_{10}\ (Household4) + B_{11}\ (Household5) + B_{12}\ (Interest) + B_{13}\ (Financial\ services\ 1) + B_{14}\ (Financial\ services\ 2) + B_{15}\ (Financial\ services\ 6) + B_{16}\ (Financial\ services\ 9) + B_{17}\ (Financial\ services\ 10) + B_{18}\ (Financial\ services\ 11) + B_{19}\ (Income1) + B_{20}\ (Income2) + B_{21}\ (Income3) + B_{22}\ (Income4) + B_{23}\ (Level\ of\ education1) + B_{24}\ (Level\ of\ education2) + B_{25}\ (Level\ of\ education3) + B_{26}\ (Nationality) + B_{27}\ (Planning) + B_{28}\ (Work1) + B_{29}\ (Work2) + B_{30}\ (Work3) + B_{31}\ (Work4) + e_i \quad (1)$$

where p = the probability of a participant with relatively more knowledge about personal finance;

B= the coefficient. Coefficients B_1 to B_{31} represent the effect of each subgroup compared with the reference group.

To understand better and find the needs and gaps in the financial education, the students' choices (financial planning and services using), opinions and self-assessment were analysed in addition. To describe the relationships between students' choices, financial literacy and socio-demographic background, the Cross-tabulations, Chi-square tests, descriptive statistics, and analysis of variances (ANOVA) were used.

Based on earlier research results, the students from the Faculty of Civil Engineering mainly were chosen as subjects of this study. For the interests of results representativeness to all students, who studied in the Faculty of Civil Engineering in the academic year 2014/2015 the opportunity to participate in the survey was offered. To increase the number of participants, the poll was conducted in paper form during the lectures. As some lectures bring together students from several faculties, more answers were gathered, and these were used to make comparisons. The total sample size was 536 and 447 of them were students studying civil engineering. Among respondents studying civil engineering, the distribution of male and female students was similar with the whole Faculty of Civil Engineering, with 60% and 64% males, and 40% and 36% females, respectively. The comparison by gender and levels of education is shown in Table 1. The description of the sample is presented in Table 2.

Table 1 The distribution of students by educational levels and gender

Level of education	A. Faculty of Civil Engineering			B. Sample of students studying engineering		
	Total	Male	Female	Total	Male	Female
	Count %	Count %	Count %	Count %	Count %	Count %
Bachelor studies	156 12,0	79 50,6	77 49,4	93 20,8	41 44,1	52 55,9
Master studies	288 22,2	150 52,1	138 47,9	93 20,8	58 62,4	35 37,6
Integrated Bachelor's and Master's Study	855 65,8	606 70,9	249 29,1	261 58,4	170 65,1	91 34,9
Total	1299 100,0	835 64,3	464 35,7	447 100,0	269 60,2	178 39,8

Source: Author's own preparation based on Statistics of the TTU Faculty of Civil Engineering (2015)

Notes: The data presented in the table part B are appropriate for generalization (Chi-square=12,910 significant at level 0,002).

Table 2 Characteristics of the sample

Characteristics	Faculty of Civil Engineering		Male participants		Female participants		Entire sample	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Total amount of observations	447	100	326	100	210	100	536	100
A. Education								
1. Academic discipline								
a) Civil Engineering	447	100	269	82.5	178	84.7	447	82.5
b) Other	0	0	57	17.5	32	15.3	89	17.5
2. Level of education								
a) Bachelor studies	93	20.8	96	29.5	81	38.3	177	33.0
b) Master studies	93	20.8	59	18.1	36	17.2	95	17.8
c) Integrated Bachelor's and Master's Study	258	57.7	168	51.5	92	44.0	260	48.5
d) Unanswered	3	0.7	3	0.9	1	0.5	4	0.7
B. Experience								
1. Age groups								
a) 18-22	259	57.9	198	60.7	142	67,6	340	63.4
b) 23-29	150	33.6	102	31.3	55	26,2	157	29.3
c) 30 and up	38	8.5	26	8.0	13	6,2	39	7.3
2. The work experience								
a) None	126	28.2	104	31.9	67	31.9	171	31.9
b) Less than 2 years	172	38.5	126	38.7	81	38.6	207	38.6
c) 2 to 5 years	78	17.4	43	13.2	40	19.0	83	15.5
d) More than 5 years	64	14.3	50	15.3	16	7.6	66	12.3
e) Unanswered	7	1.6	3	0.9	6	2.9	9	1.7
C. Demographic characteristics								
1. Nationality								
a) Non-Estonian	75	16.8	48	14.7	43	20.5	91	17.0
b) Estonian	372	83.2	278	85.3	167	79.5	445	83.0
2. Gender								
a) Male	269	60.2	326	100	0	0	326	60.8
b) Female	178	39.8	0	0	210	100	210	39.2
3. Household size								
a) Live alone	129	28.9	102	31.2	54	25.7	156	29.1
b) Live with husband/ wife	92	20.6	45	13.8	55	26.2	100	18.7
c) Live with husband/ wife and children	37	8.3	27	8.3	13	6.2	40	7.5
d) Live with parents/grandparents	146	32.7	126	38.7	64	30.5	190	35.4
e) Other	43	9.6	26	8.0	24	11.4	50	9.3
D. Income								
1. Personal monthly net income								
a) Do not want to answer	64	14.3	61	18.7	36	17.1	97	18.1
b) Under 300 EURO	176	39.4	129	39.6	90	42.9	219	40.9
c) 301- 750 EURO	113	25.3	70	21.5	52	24.8	122	22.8
d) 751 EURO and over	94	21.0	66	20.2	32	15.2	98	18.2
E. Background								
1. Educational level of parents - existence of higher education								
a) Mother	278	62.2	207	63.5	120	57.1	327	61.0
b) Father	207	46.3	166	50.9	88	41.9	254	47.4
c) Stepparent	21	4.7	12	3.7	11	5.2	23	4.3
d) Grandparent	92	20.6	69	21.2	44	21.0	113	21.1
2. Number of books in childhood home								
a) Under 100	103	23.0	76	23.3	54	25.7	130	24.3
b) 101 – 500	243	54.4	176	54.0	112	53.3	288	53.7
c) More than 500	92	20.6	68	20.9	39	18.6	107	20.0
d) Unanswered	9	2.0	6	1.8	5	2.4	11	2,0

Notes: Author's own preparation based partly on Mändmaa, 2020.

4. Results and Analysis

A survey was conducted to evaluate the level of financial literacy and analyze the factors influencing students in engineering in the higher education institution. The questionnaire was filled in by 536 students. Most of the participants were Estonians (83%). In terms of gender, male participants accounted for about 61% and females 39% of the sample. About 82% of the participants were from the Faculty of Civil Engineering and 93% of the participated students were under 30 years of age. The collected data were analyzed by using the software Statistical Package for the Social Sciences (SPSS).

4.1 Differences in personal financial literacy

The survey responses are summarized, and differences of answers by gender and by level of financial literacy are presented in Table 3. Lower financial literacy scores mainly concerned topics of insurance and interest formation. In total, survey results showed that participants' financial literacy was at Medium level.

Comparison of the the results of all respondents and respondents from the Faculty of Civil Engineering showed that the results of the Faculty of Civil Engineering were significantly better. There was only one question of the 23 (question about the impact of inflation), where the responses average score was 1.3% lower. On average, female students answered 69.1% of the questions correctly, while the score of students studying civil engineering was 72.5% and male students had correct answers for 66.5% and 70.8% of questions, respectively.

Table 3 Mean percentages of correct responses by gender and result of ANOVA

Brief description of the questions	Level of Personal Financial Literacy									Total %
	Low Below 60%			Medium 60-79%			High Over 80%			
	M	F	F test	M	F	F test	M	F	F test	
I General Personal finance knowledge										
1. Personal financial literacy				73.9 78.1	70.0 76.4	0.983 0.169				72.4 77.4
2. Asset liquidity	41.1 43.9	48.6 51.7	2.895 2.633							44.0 47.0
3. Meaning of inflation				71.8 76.2	77.1 79.2	1.904 0.551				73.9 77.4
4. Impact of inflation							79.4 85.1	83.3 82.0	1.250 0.763	81.0 83.9
5. Understanding of loan interest							95.7 96.7	96.2 97.7	0.076 0.456	95.9 97.1
6. Cost of apartment leasing				68.1 74.0	69.0 73.0	0.053 0.049				68.5 73.6
7. Legal requirement for apartment lease				66.9 68.4	70.0 73.6	0.574 1.387				68.1 70.5
8. Time value of money	59.5 61.7	50.9 53.9	3.811* 2.675							56.2 58.6
9. Discount valuation							97.8 98.9	96.7 97.2	0.705 1.747	97.4 98.2
Mean correct responses for the I section				72.7 75.9	73.5 76.1	0.332 0.021				73.0 76.0
II Saving, borrowing, insurance and investments										
10. Appropriate saving place				76.1	76.7	0,025	81.4	82.0	0.026	76.3 81.7
11. Annual percentage rate							89.3 91.8	90.5 92.7	0.203 0.113	89.7 92.2
12. Compound interest				65.3 71.0	66.7 73.6	0.100 0.356				65.9 72.0
13. Purchasing power assessment							83.1 88.5	88.6 92.1	3.016 1.583	85.3 89.9
14. Monthly payments of mortgage				68.1 76.6	70.5 78.1	0.337 0.138				69.0 77.2
15. Interest of loan	53.4	56.7	0.557	60.0	65.2	1.283				54.7 62.0
16. Loan co-sing consequences				59.5 64.7	66.2 68.5	2.425 0.710				62.1 66.2
17. The interest rate evaluation							89.0 93.7	91.0 92.1	0.551 0.395	89.7 93.1
18. Understanding the content of insurance	35.6 40.1	38.6 41.6	0.489 0.090							36.7 40.7
19. Homeowners' insurance	33.1 36.8	43.3 45.5	5.737* 3.383							37.1 40.3
20. Revenue of different Interest calculation	46.9 52.8	49.5 54.5	0.343 0.125							47.9 53.5
21. Risk diversification				78.5	80.9	0.459	83.6	86.0	0.437	79.5 84.6
22. High risk-return							81.9 87.0	84.8 88.8	0.739 0.312	83.0 87.7
23. Interest rates changes and treasury bond price	15.3 17.1	22.9 23.0	4.860* 2.408							18.3 19.5
Mean correct responses for the II section				62.5 67.5	66.2 70.3	5.243* 3.493				63.9 68.6
Mean correct responses for the entire survey				66.5 70.8	69.1 72.5	3.683* 2.070				67.5 71.5
Median correct responses for the entire survey										69.6 73.9

Notes: "M" - the average scores of male participants; "F" - the average scores of female participants; F test - value of F-Statistic; * significant at the 0.05 level. The first row of each position represents the results of the entire sample and the second row shows the results of students from department of Civil Engineering.
Author's own preparation based partly on Mändmaa, 2020.

4.2 Analysis of Results by Subgroups of the Sample

The results in the previous section displayed differences in the financial literacy about students' academic discipline and gender, but the effects of other determining factors were not controlled. In this section, the ANOVA was used to find out if factors from various subgroups had differences influencing the levels of financial knowledge.

Table 4 Mean percentage of correct responses by characteristics of sample and results of ANOVA

	Characteristic	Total count	Total %	Civil engineering count	Civil engineering %
A.	**Education**				
	1. Academic discipline				
	a) Civil engineering	447	71.48	447	71.48
	b) Other***	89	47.53	-	-
	F Statistic		(281.893)**		
	2. Level of education				
	a) Bachelor studies	177	65.22	93	81.67
	b) Master studies	95	74.32	93	74.43
	c) Integrated Bachelor's and Master's Study	260	66.82	258	66.88
	d) Unanswered	4	47.83	3	59.42
	F Statistic		(10.066)**		(43.171)**
B.	**Experience**				
	1. Age groups				
	a) 18-22	340	66.73	259	72.97
	b) 23-29	157	67.79	150	68.40
	c) 30 and up	39	73.13	38	73.45
	F Statistic		(3.183)*		(6.783)**
	2. The work experience				
	a) None	171	65.27	126	71.84
	b) Less than 2 years	207	66.24	172	70.42
	c) 2 to 5 years	83	70.56	78	72.02
	d) More than 5 years	66	72.33	64	73.03
	e) Unanswered	9	66.67	7	70.81
	F Statistic		(3.693)**		(0.596)
C.	**Demographic characteristics**				
	1. Nationality				
	a) Estonian	445	68.26	372	72.28
	b) Non-Estonian	91	63.78	75	67.54
	F Statistic		(6.659)*		(8,805)**
	2. Gender				
	a) Male	326	66.50	269	70.78
	b) Female	210	69.07	178	72.54
	F Statistic		(3.683)		(2.070)
	3. Household size				
	a) Live alone	156	67.28	129	71.35
	b) Live with husband/ wife	100	69.74	92	71.41
	c) Live with husband/ wife and children	40	70.00	37	71.44
	d) Live with parents/grandparents	190	64.99	146	70.55
	e) Other	50	71.30	43	75.23
	F Statistic		(2.953)*		(1.132)
D.	**Income**				
	1. Personal monthly net income				
	a) Do not want to answer	97	62.03	64	69.90
	b) Under 300 EURO	219	66.86	176	71.61
	c) 301- 750 EURO	122	69.10	113	70.76
	d) 750 EURO and over	98	72.36	94	73.17
	F Statistic		(8.465)**		(1.008)
E.	**Background**				
	1. Level of education of the parents. Higher education exists				
	a) Mother (F Statistic)	327	68.31 (2,399)	278	71.91 (0,838)
	b) Father (F Statistic)	254	67,20 (0,191)	207	71.90 (0,410)
	c) Stepparent (F Statistic)	23	71.27 (1,478)	21	72.67 (0,192)
	d) Grandparent (F Statistic)	113	67.22 (0,051)	92	71.17 (0.068)
	2. Number of books in childhood home				
	a) Under 100	130	67.93	103	72.81
	b) 101 – 500	288	66.82	243	70.62
	c) More than 500	107	69.32	92	72.87
	d) Unanswered	11	65.84	9	65.22
	F Statistic		(1.002)		(1.850)

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater; *** Participants who were not study in field of Civil Engineering were grouped together under the name "Other".

4.3 Analysis of Results by participants' choices and opinions

Analysis of variance was used to detect if participants with different financial choices have different levels of knowledge. More detailed overview about participants' choices made about currently available financial services is presented in Table 5.

Table 5 Results of ANOVA and mean percentage of financial literacy (FL) level in cases of differing financial choices

Students' financial choices	**Civil Engineering department**		**Male**		**Female**		**Total**	
	Count	**FL level**	**Count**	**FL level**	**Count**	**FL level**	**Count**	**FL level**
Currently available financial services								
Current Account								
a)Yes	392	72.9	272	69.4	180	70.4	452	69.8
b) No	55	61.4	54	52.0	30	61.1	84	55.3
F Statistic	(42.817)**		(68.789)**		(10.680)**		(73.395)**	
Debit Card								
a)Yes	368	73.9	262	69.3	163	70.7	425	69.8
b) No	79	64.6	64	55.1	47	63.4	111	58.6
F Statistic	(29.737)**		(49.933)**		(9.552)**		(52.907)**	
Term deposit								
a)Yes	62	70.3	43	67.7	29	68.1	72	67.9
b) No	385	71.7	283	66.3	181	69.2	464	67.4
F Statistic	(0,581)		(0.322)		(0.157)		(0.049)	
Saving Account								
a)Yes	100	72.9	76	67.8	43	70.5	119	68.8
b) No	347	71.1	250	66.1	167	68.7	417	67.1
F Statistic	(1.631)		(0.758)		(0.498)		(1.111)	
Student loan								
a)Yes	54	72.5	37	69.0	26	69.1	63	69.0
b) No	393	71.3	289	66.1	184	69.1	473	67.3
F Statistic	(0.567)		(1.076)		(0.000)		(0.705)	
Housing loan								
a)Yes	31	73.2	21	73.7	11	70.0	32	72.4
b) No	416	71.3	305	66.0	199	69.0	504	67.2
F Statistic	(0.615)		(4.948)*		(0.043)		(3.585)	
Other bank loan								
a)Yes	9	76.8	9	73.4	2	60.9	11	71.1
b) No	438	71.4	317	66.3	208	69.1	525	67.4
F Statistic	(1.612)		(1,869)		(0.632)		(0.646)	
Vehicle Lease								
a)Yes	25	75.3	18	73.2	10	71.3	28	72.5
b) No	422	71.2	308	66.1	200	69.0	508	67.2
F Statistic	(2.395)		(3.603)		(0.244)		(3.234)	
Insurance								
a)Yes	143	74.1	101	71.7	57	71.3	158	71.6
b) No	304	70.2	225	64.1	153	68.2	378	65.8
F Statistic	(9.240)**		(17.565)**		(1.856)		(16.578)**	
Investment Services								
a)Yes	40	77.6	23	74.1	18	79.7	41	76.6
b) No	407	70.9	303	65.9	192	68.1	495	66.7
F Statistic	(10.390)**		(6.092)*		(10.887)**		(16.273)**	
Pension fund shares								
a)Yes	138	74.6	92	72.5	62	71.3	154	72.0
b) No	309	70.1	234	64.1	148	68.1	382	65.7
F Statistic	(12.332)**		(20.828)**		(2.087)		(20.072)**	
Credit Card								
a) Yes	99	72.8	69	72.4	42	71.4	111	70.1
b) No	301	71.8	215	66.4	147	69.2	362	67.5
c) Yes, but not my own	38	69.0	34	66.0	13	64.9	47	65.7
d) Unanswered	9	57.5	8	46.2	8	61.4	16	53.8
F Statistic	(4.655)**		(5.677)**		(1.459)		(5.856)**	

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

Students were asked for their own opinion if their financial literacy needs improvement, and the results showed that the higher level of financial literacy tends to relate to higher interest. By the ANOVA, the results were statistically significant, and based on the full sample, generalizations could be made.

Table 6 Differences in financial literacy levels in case of differing opinions about improvement the financial knowledge

Students' opinions	Civil Engineering department		Male		Female		Total	
	Count	FL level	Count	FL level	Count	FL level	Count	FL level
Does your financial literacy level need improvement?								
a)Yes	374	71.9	274	67.3	166	70.2	440	68.4
b) No	33	70.6	21	64.0	22	64.8	43	64.4
c) Unanswered	40	67.8	31	60.9	22	64.6	53	62.4
F Statistic		(1.985)		(2.763)		(2,486)		(4.724)**

Notes: **significant at the 0.01 level or greater. FL - Financial Literacy

4.4 Students' financial planning habits

The ANOVA tests were used to find out if there were any differences in students' financial affair planning habits. The results showed that most preferable planning period was one month, as 39% of students in the whole sample (41% of males and 36% of females) and 40% in Civil Engineering department sample (43% of males and 35% of females) picked this answer to the question: "How long in advance do you plan your financial affairs (expected revenues, necessary costs and predictable financial situation)?". Statistically significant tests results (for the whole sample F=4.098 sig=0.000 and for the Civil Engineering department sample F=3.452 sig=0.000) revealed that only 5% of students planned their financial affairs on several years basis and less than 1% until retirement (was only male students' choice). The number of students' who did not see the need to plan was an average 6%. In terms of short-term planning, the higher financial literacy level was generally related to a longer planning period, and lower financial literacy level was linked to noticeably shorter or missing planning habit.

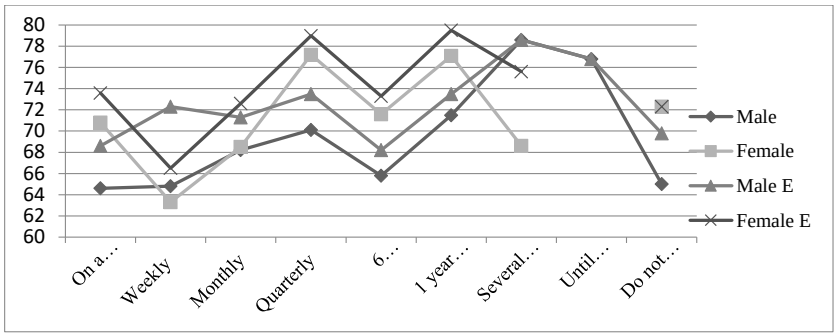

Figure 1 Students' financial affairs planning habits described through the financial literacy level and gender

Notes**:** Financial affairs planning habits of male and female students from Civil Engineering department are denoted Male E and Female E **.**

4.5 Relationships between self-assessment, confidence, and financial literacy

Students' assessment of their financial knowledge was not in line with the results of the financial literacy assessment conducted in the framework of the study. The overlap was only 38% for the whole sample (Table 7a) and 42% for the Civil Engineering department sample (Table 7b).

Based on these result, it could be concluded that students' own knowledge was overrated, as in the full sample, 42% of the students evaluated their knowledge to High level, but only 20 of those in the survey exceeded the High-level border, and the differences were similar (20%) in the Civil Engineering students' sample. Acording to the analysis of Low-level results, the gap between self-assessment and the results was small (5%) in the sample of Civil Engineering department but in the Full sample, the difference was much bigger (18%).

225 students (97 female students, i.e., 46% of females and 128 male students, i.e., 39% of males) who assessed their financial knowledge to the high level could be counted as self-confident, as well as these 55 students (17 female students and 38 male students) whose financial literacy level was low but they evaluated the level as medium.

Table 7a Full sample, differences in assessments

Self-assessment about financial knowledge?		Financial literacy level			Total
		Low	Medium	High	
High	Count	41	125	59	225
	% within	18.2%	55.6%	26.2%	100.0%
	% within column	29.5%	42.8%	56.2 %	42.0%
Medium	Count	55	121	35	211
	% within	26.1%	57.3%	16.6%	100.0%
	% within column	39.6%	41.4%	33.3%	39.4%
Low	Count	23	20	2	45
	% within	51.1%	44.4%	4.4%	100.0%
	% within column	16.5%	6.9%	1.9%	8.4%
Hard to say	Count	20	26	9	55
	% within	36.4%	47.3%	16.3%	100.0%
	% within column	14.4%	8.9%	8.6%	10.2%
Total	Count	139	292	105	536
	% of Total	25.9%	54.5%	19.6%	100.0%
	Note:	Chi-Square=12.847 significant at the 0.046 level			

Notes: Based on Mändmaa, 2020.

Table 7b Civil Engineering department, differences in assessments

Self-assessment about financial knowledge?		Financial literacy level			Total
		Low	Medium	High	
High	Count	11	124	59	194
	% within	5.7%	63.9%	30.4%	100.0%
	% within column	20.8%	42.9%	56.2%	43.4%
Medium	Count	26	121	35	182
	% within	14.3%	66.5%	19.2%	100.0%
	% within column	49.1%	41.9%	33.3%	40.7%
Low	Count	9	18	2	29
	% within	31.0%	62.1%	6.9%	100.0%
	% within column	17.0%	6.2%	1.9%	6.5%
Hard to say	Count	7	26	9	42
	% within	16.7%	61.9%	21.4%	100.0%
	% within column	13.2%	9.0%	8.6%	9.4%
Total	Count	53	289	105	447
	% of Total	11.9%	64.7%	23.5%	100.0%
	Note:	Chi-Square=26.011 significant at the 0.000 level			

4.6. Determining factors of personal financial literacy

In this section, the statistically significant differences were analyzed further. The relationship between personal financial literacy and the participants' gender, education, age, nationality, income, and some financial choices and opinions were examined.

The tested correlation among the independent variables was low, i.e., under 0.60 that indicates that the multi-collinearity was not a problem in the current analysis.

The Forward Stepwise method was chosen, and the regression analyses were run separately for two different samples. The statistically significant results of logistic regressions are reported in Tables 8a and 8b. As suggested by the Chi-square values, the models have high explanatory power. In addition, the overall fit of the models was assessed by its ability to classify observations correctly. For the entire sample, 77.6% of the observations were correctly classified as compared with 56.7% change in classification and for the Civil Engineering sample, 75.2% of the observations were classified correctly as compared with change in classification 67.8%.

Based on the logistic regression analysis, the results of the Full sample (Table 8a) showed that students in Civil Engineering department (Acad. discipline 1) are 50 times more likely to belong to the group of more knowledgeable about financial literacy than students from the other academic disciplines. The students in the Master studies (Level of education 2), were 7 times more likely to be with relatively higher knowledge about personal finance than those from Bachelor or Integrated studies.

The coefficient (B) of Gender (1) denotes Male students and was negative. Consistent with the findings of ANOVA, the result suggested that those males were more likely to be less knowledgeable about personal finance than females. Using a small calculation (1/Exp(B)N=1/0.402=2.487), the result could be presented on the contrary, i.e., from the female students' perspective and to state that they were 2.5 times more likely to be more knowledgeable about personal finance than males.

The coefficient (B) of Income (4) was also negative. That variable presented the situation when the participant refused to answer the question about monthly net income. Based on the logistic regression results, those participants were more likely to be less knowledgeable about personal finance than others who answered the question. The results were consistent with the ANOVA results (Table 4). This concrete variable (Income 4) was more like a behavioural factor as it did not give any answer about the influence of the amount of income.

ANOVA results (Table 5) of the current study showed that financial services that had statistically significant effect were: Current Account, Debit Card, Housing loan (only in the sample of Male students), Insurance, Investment Services, Pension fund shares, and Credit Card. Based on the

logistic regression results, the financial services that had significant impact on participants' financial literacy were Current Account (Financial services 1), Debit Card (Financial services 2), and Investment services (Financial services 10).

Table 8a Full sample. The logistic regression Model

	Step 1		**Step 2**		**Step 3**		Step 4		**Step 5**		**Step 6**		**Step 7**	
	B	**ExpB**	**B**	**ExpB**	**B**	**ExpB**	B	**ExpB**	**B**	**ExpB**	**B**	**ExpB**	**B**	**ExpB**
Acad. Discipline (1)	3.577**	35.771	3.553**	34.920	3.537**	34.350	3.980**	53.528	3.892**	49.020	3.874**	48.154	3.910**	49.909
Level of Education (2)			1.893**	6.637	1.949**	7.024	1.960**	7.099	2.011**	7.473	1.962**	7.114	1.933**	6.912
Financial services (1)					1.399**	4.052	1.352**	3.864	1.279**	3.595	1.177**	3.244	1.119**	3.061
Gender (1)							-0.876**	0.416	-0.942**	0.390	-0.902**	0.406	-0.911**	0,402
Financial services (10)									3.053**	21.188	3.003**	20.141	2.962**	19.345
Financial services (2)											0.551*	1.734	0.573*	1.774
Income (4)													-0.577*	0.562
Constant	-2.833**	0.059	-3.059**	0.047	-4.267**	0.014	-3.349**	0.035	-3.229**	0.040	-3.612**	0.027	-3.494**	0.030
-2 log Likelihood	569.583		536.039		516.239		499.907		478.191		474.229		470.299	
Chi-Square	163.770**		197.314**		217.113**		233.446**		255.162**		259.124**		263.054**	
Adjusted R^2	0.353		0.413		0.447		0.474		0.508		0.514		0.520	
Correct Classified	72.9		72.9		76.1		76.1		76.3		77.1		77.6	
Chance Classification 56.7														

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

Table 8b Sample of Civil Engineering department. The logistic regression Model

	Step 1		Step 2		Step 3		Step 4		Step 5	
	B	Exp(B)	B	Exp(B)	B	Exp(B)	B	Exp(B)	B	Exp(B)
Level of Education (3)	-1.852**	0.157	-1.816**	0163	-1.902**	0.149	-1.956**	0.141	-1.922**	0.146
Financial services (1)			1.336**	3.803	1.326 **	3.764	1.275**	3.579	1.231**	3.424
Nationality (1)					-0.867**	0.420	-0.879**	0.415	-0.832**	0.435
Age (2)							-0.691**	0.501	-0.667**	0.513
Financial services (2)									0.571*	1.769
Constant	1.976**	7.217	0.802*	2.230	1.026**	2.790	1.351**	3.862	0.887*	2.428
-2 log Likelihood	496.639		478.845		470.292		461.908		458.013	
Chi-Square	65.220**		83.014**		91.567**		99.952**		103.846**	
Adjusted R^2	0.190		0.237		0.259		0.280		0.290	
Correct Classified	67.8		71.8		74.5		72.0		75.2	
Chance Classification 67.8										

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

The findings of the logistic regression analysis about the sample of Civil Engineering department (Table 8b) were statistically significant and compatible with the results of ANOVA (Table 4). The result showed that the coefficient (B) of the variables Level of Education (3), Age (2), and Nationality (1) was negative. In the current case, the Level of Education (3) indicated that students at Integrated Studies were more likely to be less knowledgeable about personal finance than students in Bachelor and Master Studies. The variable Nationality (1) was indicating that non-Estonians were more likely to be less knowledgeable about personal finance than Estonians. The result could be presented from Estonians' perspective and to state that it is (1/Exp(B)N=1/0.435=2.298) 2.3 times more likely that Estonian students belong to group with higher level of financial literacy than non-Estonians. The variable Age (2) was suggesting that participants in the age 23-29 were more likely to be in a lower level of financial literacy group than students from other age groups. Based on the logistic regression results, the financial services influencing participants financial literacy were Current Account and Debit Card (ANOVA results in Table 5).

5. Discussion and conclusion

The main goal of this study was to examine personal financial literacy, opinions and choices among university students' in engineering sciences to give the results that will enable identification of needs and gaps in financial education to develop the area and well-being in society.

Students' financial literacy was assessed by the answers of the survey questionnaire. The study analyzed the results that were gathered from 536 university students in Tallinn University of

Technology. The cross-tabulation, Chi-square, ANOVA test and Logistic Regression were used to analyze the responses.

Current study revealed that there are differences between male and female students' financial literacy, and students who studied Civil Engineering were more knowledgeable in personal finance than students in other academic disciplines.

The survey results showed that low level scores concerned topics of asset liquidity, insurance, and interest formation.

Regression analysis results suggested that students' financial literacy was mainly related to four groups of variables: Education (Academic discipline and Level of education), Demographic characteristics (Gender and Nationality), Experience (Age) and Financial Services (Current Account, Debit card and Investment Services).

The study results showed that Estonian students' financial literacy level was risen from a low (58.9%) (Mändmaa, 2019a, b) to a medium (67.5%) level. These results are in line with the results published by the research agency Saar Poll that people's knowledge have improved over the previous five years and the financial literacy level of the Estonian population indicates an upward trend. (Saar Poll, 2015) A study on the same period among Portuguese students also shows a positive direction, i.e., a good level of financial literacy of students (Pires and Quelhas 2015). Contrary to these, the results of earlier studies among Turkish and US students demonstrated low levels of financial literacy (Chen and Volpe, 1998; Altintas, 2011).

Statistically significant results revealed that on average females' knowledge scores (69.1%) about personal finance were higher than those of males (66.5%). Previous study (Mändmaa, 2019b) among Estonian university students showed that men have a higher level of financial literacy than women. Atkinson et al. (2006), Goldsmith and Goldsmith (1997; 2006), Chen and Volpe (1998; 2002), Lusardi et al. (2010), and Monticone (2010) presented the same results. The result of the Australian students' financial literacy survey showed that gender does not affect the level of financial literacy (Wagland and Taylor, 2009), while Turkish students displayed similar results to the current survey, i.e., female students had higher level (Altintas, 2011).

In the current study, statistically significant results of ANOVA (Table 4) showed that older students had higher level of financial knowledge. The regression analysis (Table 8b) gave the outcome that age was influencing the students' financial literacy only in the sample of Civil Engineering department (financial literacy scores among age groups: 18-22 73.0%; 23-29 68.4%; 30 and up 73.4%). A remarkable change occurred in the level of financial literacy of the younger age group, which has significantly risen compared to the results of the previous survey (18-22 55.9%), presumably due to the developments in the personal financial education. Several researchers have noted earlier that the older students have higher financial literacy levels (Chen and Volpe, 1998; Atkinson et al., 2006; Mändmaa, 2019a). However, Wagland and Taylor (2009)

in researching Australian students' financial literacy came to the result that age would not affect the level of financial literacy, which could be a sign of appropriate financial education.

Analyzing the effect of nationality to financial literacy, it turned out that Estonians had a higher level of financial literacy compared to non-Estonians (Table 4). The same results were obtained in the financial literacy studies by Faktum and Ariko (2010), Mändmaa (2019a,b), and in the PISA 2012 test (OECD, 2014). Based on the results of a survey conducted among Estonian students in 2012, it can be assumed that the reasons lie in the lack of financial education (teaching materials) in the mother tongue. In 2012 survey, 65% of non-Estonians answered that they did not understand the demands/explanations given to them by financial institutions, and 84% of them thought that it would be helpful if the service providers spoke in clients' mother tongue. (Mändmaa and Zhiguleva, 2013)

Participants' educational background had a significant impact on their financial knowledge. The results for the entire survey clearly showed that students from Civil Engineering department were more knowledgeable than students from other academic disciplines. On average, the engineering students answered correctly 71% of the survey questions while on other disciplines the score was 47% (Table 4). Mandell (2008) revealed in a study of the US students that the level of financial literacy of students in scientific study fields is high. A previous study (Mändmaa, 2019b) conducted among Estonian university students concluded that in science and mathematics-based areas the level of financial literacy was high. The highest scores were received by the students whose study field was Economy (females 67% and males 70%) and Info technology came next (females 65% and males 70%). Mändmaa (2019b) reported in the same study that students studying Civil Engineering (previously named Construction) had the lowest level of financial literacy (mean score 52%; females 39% and males 56%). The current study showed the opposite results (mean score 71.5%; females 72.5% and males 70.8%). The differences could be explained first, by differences in samples, as in an earlier study, the educational level of respondents from the study field of Construction was lower (44% in Applied studies and 56% in Integrated i.e., previously named Combined studies). Participants from Bachelor and Master Studies whose overall financial literacy scores were (overall scores: Bachelor 57.7%; Master 64.3%; Applied 57.7%; Integrated 53.7%) higher in previous study and in the current study (Civil Engineering students mean scores: Bachelor 81.7%; Master 74.4%; Integrated 66.9%) were not included. Secondly, the financial literacy levels could be affected positively by actively started financial education.

The results confirmed that students who used financial services had a higher level of financial literacy (Table 5). Based on earlier studies (Pires and Quelhas, 2015; Mändmaa, 2019b), available financial services have an impact on students' financial literacy level. The research among Portuguese students revealed that the existence of prior experience, as credit clients or the existence of saving habits increases the financial literacy of individuals (Pires and Quelhas, 2015). An earlier study conducted among Estonian university students revealed that financial services

with statistically significant effect were: Debit Card, Bank loan, Investment Services, and Insurance (Mändmaa, 2019b). Current study results showed that financial services with a statistically significant effect were even more: Current Account, Debit Card, Housing loan, Insurance, Investment Services, Pension Fund Shares, and Credit Card. Students studded in Civil Engineering department were significantly more active users of financial services than participants from other study fields (Table 4, financial literacy scores: Civil Engineering 71% and Other 47%).

Contrary to the results of various other studies that bring out problems with debts (van Rooij et al. 2007; Reed, 2008; Lusardi and Tufano, 2009), borrowing is not very popular among Estonian students, as only 21% of participants have Credit Card, 12% Student loan, 6% Housing loan, and 2% Other bank loan, and the loan users' average financial literacy level is not low (respectively: 70%; 69%; 72% and 71%). The amount of loan users among students studying Civil Engineering was similar (Credit Card 22%, Student loan 12%, Housing loan 7%, and Other bank loan 2%).
Earlier studies expressed concern in people's behaviour, asking whether they accumulate and manage wealth effectively (Hilgert et al. 2003; Stango and Zinman, 2007) or whether they plan funding for retirement (Lusardi and Mitchell, 2006, 2009). A previous survey among Estonian students (Mändmaa, 2019b) showed that 7% of students hold the Investment Services, 25 % had Insurance services, and 56% of students have thought about Retirement Funding. The finding of the current study displayed positive movement (Table 5), as 8% of students' own Investment Services, 29% Insurance services, 22% of participants own a Savings Account, and 29% own Pension Fund Shares and the students studied the Civil Engineering showed even more activity as 9% of students own Investment Services, 32% Insurance services, 31% own Pension Fund Shares and 22% of participants own Savings Account.

The results of the analysis of students' financial planning habits showed that in terms of short-term planning, the higher financial literacy level is generally related to a longer planning period and lower financial literacy level links to a very short or missing planning habit (Figure 1). The most preferable planning period for students was one month, as 39% of the whole sample (41% of males and 36% of females) and 40% of participants from the sample of Civil Engineering department (43% of males and 35% of females) picked that answer. The study revealed that only 5% of students planned their financial affairs on several years' basis and less than 1% until retirement (was only male students' choice). The number of students who do not see the need to plan was an average 6%. In the previous study of university students, the statistically significant factor influencing the financial literacy level was advance planning of financial affairs daily while the most popular planning period was one month and that appeared without differences in the responses of male or female students (Mändmaa, 2019b).

Several researchers (Goldsmith and Goldsmith, 1997; Chen and Volpe, 2002) have suggested that financial literacy tends to be affected by interest financial topics. In a previous study in Estonia, 65% of the participants were interested. Students with lower financial literacy level (below the median 57.14% level), Estonians, participants from youngest (18-21) age group and students

studied in the field of Construction and Energetics were found more curious. (Mändmaa, 2019b) In the current survey, the students were asked their opinion if their financial literacy needs improvement, i.e., if they are interested in getting additional information about financial topics. The level of interest of male students was just 5% higher, based on fact that 79% of female students and 84% of male students reported that they are interested in improving their financial literacy. However, the results showed that higher interest was related to higher financial literacy, and students studying Civil Engineering were interested most about personal financial topics (Table 6).

This study did not confirm the results of previous studies (Goldsmith and Goldsmith, 1997; Chen and Volpe, 2002) that had found that women have lower confidence in and less interest to personal finance than men, as the results showed only small differences between females and males in self-assessment and interest. Findings about self-assessments from the previous study among university students in Estonia showed that 8% of students rated their own financial knowledge to High level (in reality by responses 9%) and 32% of students assessed the knowledge to Low level (by responses 51%) (Mändmaa, 2019b). Based on previous research in Estonia, it was concluded that if the self-assessment about financial knowledge is not high, it is taken as quite adequate (Faktum & Ariko, 2010). In the current study, 43% of students studying engineering and 42% of all participated students rated their financial knowledge as High while by the study results, the number of students whose responses exceeded the high-level border was accordingly 24% and 20%. Students who admitted that their knowledge is in the Low level accounted for 7% students studying engineering and 8% among all of participants, while based on the scores of correct answers, 12% and 26% of students were on the Low level, respectively. Whereas the students' self-assessment was not quite adequate, and the knowledge was overrated, it could be concluded that Estonian students' self-confidence had risen noticeably in the past years. The situation brings out concerns as too high self-confidence could lead to painful mistakes and attaches attention to the need to continue the surveys to improve curricula with additional care. It is important not to be influenced by the facts that students' financial literacy level has increased lately. There are still lots of open questions and risks.

Limits: The number of students from other faculties enrolled in this study was small, and students from other universities were missing, which meant that comparisons were limited. This involves, for example, situations if the financial literacy of female students is generally improving, or if it is only in math-based academic disciplines. As the questionnaire was anonymous, it was not possible to contact the respondents later and ask their needs in knowledge about Personal Finance, especially among students with lower scores.
These study results enable the author give advice to the educators in primary, secondary, and high schools to pay serious attention to mathematics teaching. It would be good to add simpler mathematics courses that develop logic to university curricula as well. Mathematics based on logic certainly improves personal ability to create so-called bigger picture and make sound financial decisions – enhances financial literacy.

In conclusion, it is relevant to point out the importance of personal financial knowledge by repeating the words of Professor Lusardi: "Financial literacy gives individuals the ability to make informed financial choices. Just as it was not possible to contribute to and thrive in an industrialized society without basic literacy - the ability to read and write - so it is not possible to successfully navigate today's world without being financially literate." (Lusardi, 2017, p. 1).

6. Acknowledgement

The author would like to thank colleagues and students from Tallinn University of Technology for their valuable help in data gathering.

7. References

[1]OECD, 2012. "Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study," OECD Working Papers on Finance, Insurance and Private Pensions No. 15. https://dx.doi.org/10.1787/5k9csfs90fr4-en

[2]OECD, 2014. PISA 2012 Results: Students and Money: Financial Literacy Skills for the 21st Century PISA, OECD Publishing, Volume VI. Available at: <http://www.oecd.org/pisa/keyfindings/PISA-2012-results-volume-vi.pdf> [Accessed 20. June 2016]. http://dx.doi.org/10.1787/9789264208094-en

[3]OECD, 2006. Improving Financial Literacy: Analysis of Issues and Policies. *Financial Market Trends*, Vol. 2005/2 DOI: https://dx.doi.org/10.1787/fmt-v2005-art11-en

[4] Faktum & Ariko, 2010. Finantsalane kirjaoskus Eesti elanike seas. [Financial literacy among the Estonian population]. [Online] Available at: <http://www.minuraha.ee/public/Finantskirjaoskuse_uuring.pdf >[Accessed 2. April 2012].

[5] Kann, L., 2010. Uuring: inimeste finantskirjaoskus jätab soovida. [Survey: People's financial literacy is insufficient] Available at: <http://raamatupidaja.ee/?PublicationId=f9180841-a50b-430f-8683-9964adc4b06f > [Accessed 10. May 2014].

[6] Saar Poll OÜ, 2015, Finantsalase kirjaoskuse uuring Eesti elanike seas [Study of financial literacy among Estonian residents]. Ministry of Finance, Tallinn. pp. 1-77. Available at: <http://www.saarpoll.ee/UserFiles/File/Finantskirjaoskus_2015_ARUANNE_FINAL.pdf >

[7] Mändmaa, S., 2019a. Financial literacy – what and why should we improve. *Eurasian Journal of Social Sciences*, 7(2), 2019, 12-28. DOI: 10.15604/ejss.2019.07.02.002

[8] Mändmaa, S., 2019b. Analyzing the factors influencing university students' financial literacy. *International Journal for Innovation Education and Research*, *7*(7), 465-497. https://doi.org/10.31686/ijier.Vol7.Iss7.1628

[9] Lusardi, A., 2017. Visiting Swedish House of Finance to share her research and receive Skandia's 2017 research award. Available at: <https://www.houseoffinance.se/lusardi-financial-literacy-levels-need-robust-intervention/>

[10] Lusardi, A., and Mitchell, O. S., 2006. Financial Literacy and Planning: Implications for Retirement Wellbeing. Working Paper, Pension Research Council, Wharton School, University of Pennsylvania.

[11] Fonseca, R., Mullen, K., Zamarro, G., Zissimopoulos, J., 2012. What Explains the Gender Gap in Financial Literacy? The Role of Household Decision-Making. *The Journal of Consumer Affairs*. 46(1), pp 90–106 Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3462438/>

[12] Monticone, C., 2010. How Much Does Wealth Matter in the Acquisition of Financial Literacy? *Journal of Consumer Affairs*, 44 (2), pp. 403 - 422. [Online] EBSCO (31.03.2012).

[13] Chen, H. and Volpe, R.P., 1998. An Analysis of Personal Financial Literacy among College Students. *Financial Services Review*, 7(2): 107-128.

[14] Chen, H. and Volpe, R.P., 2002. Gender Differences in Personal Financial Literacy among College Students. *Financial Services Review*, 11(3): 289-307

[15] Atkinson, A., McKay, S., Kempson, E. & Collard, S., 2006. Levels of Financial Capability in the UK: Results of a baseline survey. University of Bristol: Personal Finance Research Centre, 150 pp.

[16] Lusardi, A., Mitchell, O. S. and Curto, V., 2010. Financial Literacy among the Young. *Journal of Consumer Affairs*, Vol. 44, pp. 358–380. DOI:10.1111/j.1745-6606.2010.01173.x

[17] Goldsmith, E., and Goldsmith, R. E., 1997. Gender differences in perceived and real knowledge of financial investments. *Psychological Report*, 80, 236-238.

[18] Goldsmith, E., and Goldsmith, R. E., 2006. The Effects of Investment Education on Gender Differences in Financial Knowledge. *Journal of Personal Finance*, Vol. 5(2), pp. 55-69.

[19] Pires, V. and Quelhas, A. P., 2015. Financial Literacy Among the Higher Education Students: Empirical Evidence for the Portuguese Case. *Portuguese Journal of Finance*,

Management *and Accounting.* 1 (1), pp. 84-103. Available at: < http://u3isjournal.isvouga.pt/index.php/PJFMA>

[20] Mandell, L., 2008. The Financial Literacy of Young American Adults. Results of the 2008 National JumpStart Coalition Survey of High School Seniors and College Students. JumpStart Coalition, 1-253. Available at: <https://www.stockmarketgame.org/assets/pdf/2008%20JumpStart%20Financial%20Literacy%20Survey.pdf>

[21] Lusardi, A, and Tufano, P., 2009. Debt Literacy, Financial Experiences, and Over indebtedness. NBER Working Paper, 14808.

[22] van Rooij, M., Lusardi, A., and Alessie, R., 2007. Financial Literacy and Stock Market Participation. NBER Working Paper n. 13565.

[23] Hilgert, M., Hogarth, J. and Beverly, S., 2003. Household financial management: The connection between knowledge and behavior. Federal Reserve Bulletin, pp. 309–322.

[24] Stango, V. and Zinman, J., 2007. Fuzzy Math and Red Ink: When the Opportunity Cost of Consumption Is Not What It Seems. Mimeo, Dartmouth College.

[25] Lusardi, A. and Mitchell, O. S., 2009. How Ordinary People Make Complex Economics Decisions: Financial Literacy and Retirement Readiness. NBER Working Paper 15350.

[26] Reed, M., 2008. Report Student Debt and the Class of 2007. The Project on Student Debt. Available at: <http://ticas.org/sites/default/files/pub_files/classof2007.pdf> [Accessed 20 November 2012]

[27] Cole, S. A., Paulson, A. L., Shastry, G. K., Smart Money: The Effect of Education on Financial Behavior (April 11, 2012). Harvard Business School Finance Working Paper No. 09-071. http://dx.doi.org/10.2139/ssrn.1317298

[28] Sallie Mae, 2009. "How Undergraduate Students Use Credit Cards." [Online] Sallie Mae's National Study of Usage Rates and Trends 2009. Available at:< http://static.mgnetwork.com/rtd/pdfs/20090830_iris.pdf > [Accessed 26 November 2012].

[29] Mändmaa, S., 2020. Empirical Study on Personal Financial Literacy of University Students for Develop the Financial Education. *International Journal of Business and Applied Social Science (IJBASS),* Vol. 6(6). DOI: 10.33642/ijbass.v6n6p2

[30] Altintas K. M., 2011. The dynamics of financial literacy within the framework of personal finance: An analysis among Turkish University Students. *African Journal of Business Management*, vol. 5(26), pp. 10483 - 10491.

[31] Wagland, S. P., Taylor, S., 2009. When it comes to financial literacy, is gender really an issue? *Australasian Accounting Business & Finance Journal*, 3(1), pp. 13 - 25. [Online] EBSCO (1.03.2012).

[32] Mändmaa, S and Zhiguleva, K 2013 'Financial literacy – the level of knowledge among students in Estonia', poster presented to the conference Higher education - higher level learning? Tallinn, Estonia; January 23rd -25th

Publication IV

Mändmaa, S.
How to Promote Personal Financial Education - Findings from Finnish University Students' Financial Literacy Study

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International Journal of Educational Technology and Learning
Vol. 10(1), pp. 8-25, 2021

International Journal of Educational Technology and Learning
ISSN: 2523-0581
Vol. 10, No. 1, pp. 8-25, 2021
DOI: 10.20448/2003.101.8.25

How to Promote Personal Financial Education - Findings from Finnish University Students' Financial Literacy Study

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Abstract

The results of The Organization for Economic Co-operation and Development (OECD) and several studies show that the current level of financial literacy of the population can guarantee sustainability neither for them nor for society. As the financial crises and the situation during the COVID-19 pandemic have demonstrated, people have difficulty coping even with short-term income losses. This highlights the need to raise the level of financial literacy, which requires promotion of personal financial education, and specifically, –results from research. This paper presents the results from the first financial literacy survey in Finland that was organized among higher education students. The aim of the study was to assess the financial literacy and compare the results with similar studies to identify bottlenecks that could be improved through the promotion of financial education. The results of the survey showed a good level of students' financial knowledge, but also pointed out topics where the level of knowledge was low - areas like insurance and interest rate changes. The results indicated that financial literacy scores of students in mathematics-based academic disciplines are significantly better than those of students in non-numerical disciplines. A positive link was found between long-term planning and higher levels of financial literacy.

Keywords:
Personal financial literacy
Financial education
Higher education students
Gender differences.

Publisher:
Scientific Publishing Institute

Received: *8 December 2020*
Revised: *29 December 2020*
Accepted: *11 January 2021*
Published: *26 January 2021*

Funding: This study received no specific financial support.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.
Acknowledgement: The author would like to thank academic staff and students from Lappeenranta University of Technology and Tampere University of Technology for their great assistance in data collection.

1. Introduction

Understanding financial literacy among young people is of critical importance for policymakers in several areas; it can aid those who wish to devise effective financial education programs targeted at young people as well as those writing legislations to protect younger consumers (Lusardi, Mitchell, & Curto, 2010).

Researchers have examined the financial literacy and practice of various components of society and found out that financial knowledge needs improvement. Surveys throughout the world have shown that females tend to display lower level on personal financial literacy than males. In 2002, Chen and Volpe have argued that Personal Finance is mostly a number-oriented subject and not very attractive to women, as women prefer courses with less mathematics and other number-oriented science.

For improvement of financial literacy it is essential to enhance personal financial education.

Financial literacy is a combination of awareness, knowledge, skill, attitude, and behaviour necessary to make sound financial decisions and ultimately achieve individual financial wellbeing, according to the definition used by Organization for Economic Co-operation and Development (Atkinson & Messy, 2012).

The definition used in an international study to assess the financial literacy of young people is more specific: "Financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life." (OECD, 2014).

"Financial education is the process by which financial consumers/ investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become aware of (financial) risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being and protection (OECD, 2006).

This paper presents the results from the first financial literacy survey in Finland that was organized to assess university students' financial literacy. An earlier study conducted in 2014 in Finland focused on financial literacy of a sample including respondents aged from 18 to 92. The OECD questionnaire (Atkinson & Messy, 2012) formed the basis of the Finnish questionnaire that was supplemented with four questions. The researchers reported that the overall level of financial literacy in Finland was relatively high, though it was unequally distributed, as some groups (e.g., the elderly, women, and the less educated) had clearly lower levels of financial literacy. Furthermore, the results showed a positive and statistically significant connection between planning for retirement and financial literacy (Kalmi & Ruuskanen, 2018).

Finns' educational level is high, which is evidenced in the PISA surveys (Average Score of PISA 2015 Mathematics, Science and Reading - 522.7 and position 8: PISA 2018 Mathematics, Science and Reading - 516.3 and position 10. FactsMaps (n.d) and the levels of social security are high as well.

Accordingly, it is not surprising that students' financial literacy is good. However, the financial sector is developing and changing rapidly, which inevitably requires skills of individuals to possess and use knowledge to ensure smooth everyday life.

This study focused on two tasks:

1. To evaluate the financial literacy of students from universities of technology by highlighting differences between female and male students' levels.
2. To determine factors and obstructions having an impact on students' financial knowledge to contribute to the promotion of personal financial education.

The main goal of this study was to find out the needs and gaps in financial education using the assessment and comparison of students' financial literacy to develop the field.

In this study the financial literacy was assessed, and many factors were explored to see if they have the influence on students' financial literacy. The findings were compared with the results of studies conducted in Finland and in other countries to identify similarities or differences that would in current circumstances contribute to a better understanding of significance of the factors influencing financial literacy, in purpose to elaborate the personal financial education.

The selection of objects to study relied on the following deliberation:

Students are the next economically active population and creators of the future families, as well as the most promising segment to use financial services in the future due to better jobs, higher positions, and higher salaries. Students from universities of technology were chosen because of mathematics-based orientation. The sample contained 81% of students majoring in Engineering Science and 12% in Business.

This study gives the unique contributions to the literature by presenting the comparisons of financial knowledge between university students, who were coming from two related nations - Estonians and Finns but had a different recent history. Although the students in the same academic disciplines, i.e., in the current case, in the mathematics-based technological disciplines, revealed gender differences in financial knowledge.

Findings of this study suggest that Finnish students' financial literacy level is medium (statistically significant mean percentage of correct responses 73.5%) and male students have slightly higher scores than female students. According to the survey, in some areas in participants' financial knowledge, the scores are at low level. Furthermore, the results showed the positive influence of mathematics skills and a positive statistically significant connection between the financial planning period and financial literacy.

The paper is organized as follows. Section 2 reviews previous studies related to financial literacy and education. Section 3 describes the methodology and the used data. Section 4 presents the obtained results, and Section 5 concludes the paper.

2. Literature Review

The findings from an OECD International Network on Financial Education pilot study undertaken in 14 countries showed a lack of financial knowledge amongst a sizable proportion of the population; in each of the countries surveyed, compound interest and diversification were the weakest topics (Atkinson & Messy, 2012).

The findings from that pilot study highlighted that a significant proportion of the population in every country (at least 30%) could benefit from additional financial knowledge. Compound interest and diversification were pointed out as the weakest topics in financial knowledge. (Atkinson & Messy, 2012).

Several studies throughout the world have shown that females tend to display lower level on personal financial literacy than males among adults (Atkinson & Messy, 2012; Bucher-Koenen & Lusardi, 2011; Bucher-Koenen, Lusardi, Alesi, & Van Rooij, 2017; Fonseca, Mullen, Zamarro, & Zissimopoulos, 2012; Kalmi & Ruuskanen, 2018; Lusardi & Mitchell, 2006; Monticone, 2010), students (Chen & Volpe, 1998; Chen & Volpe, 2002; Mändmaa, 2019a; Mändmaa, 2019b) and adolescents (Lusardi et al., 2010). Goldsmith and Goldsmith (1997); Goldsmith and Goldsmith (2006) suggested that females have lower level in financial literacy than males as their general interest in investment and personal finance is usually lower, and they are less confident in their ability to perform financial analysis. Following the same line of reasoning.

Atkinson, McKay, Kempson, and Collard (2006) pointed out that girls tend to gain lower grades than boys in mathematics at school, and perhaps have lower levels of confidence in certain areas of financial literacy. It could also be related to traditional roles within the home, with men being delegated the task of keeping informed. Chen and Volpe (2002) found that women generally have not only less knowledge about personal finance, but also have less enthusiasm for, and less willingness to learn about personal finance topics than men do. They argued that enthusiasm and confidence may be the contributing factors that explain why men are more financially knowledgeable than women (Chen & Volpe, 2002). Fonseca et al. (2012) pointed out that women tend to live longer than men, have shorter work tenures, lower earnings and levels of pension or survivors' benefits, which places them at higher risk of having financial problems.

However, the surveys conducted among university students in Turkey (Altintas, 2011) and in Estonia (Mändmaa, 2020a; Mändmaa, 2020b) showed that female students have higher scores in financial literacy than men.

Understanding how and why men and women have different levels of financial literacy allow us to develop policies aimed at reducing the gender gap and improving the saving and investing decisions.

There are a number of studies in different parts of the world (Chen & Volpe, 1998; Mandell, 2008; Mändmaa, 2019a; Mändmaa, 2019b; Pires & Quelhas, 2015) that have examined students' financial knowledge and have revealed that students in an economic academic discipline or individuals attending programs in business sciences tend to exhibit a higher level of financial literacy. Lewis Mandell who has surveyed the financial literacy of young American adults expressed the following opinion: " Regardless of major, college students learn how to do research and solve problems. In a rapidly changing financial system, these two skills are more important to financial decision-making than understanding financial products, rules, and regulations. Knowing how to approach a problem and how to research it are key to making the best personal financial decisions." (2008, p. 29) According to the results, students majoring in science and engineering had the highest financial literacy scores and those majoring in business or economics came next (Mandell, 2008). Mändmaa (2020a) has reported similar results by surveying Estonian students majoring in engineering sciences.

Researchers have found (Mändmaa, 2020b; Pires & Quelhas, 2015) that the existence of prior experience, such as credit clients or the existence of saving habits, increases the financial literacy of individuals.

Previous research has found that people with low financial literacy are more likely to have problems with debt (Lusardi & Tufano, 2009) and are less likely to plan for retirement (Lusardi & Mitchell, 2006).

Between 1997 and 2007, the financial situation of young people in USA was characterized increasingly by high levels of debt, as average undergraduate student loan debt increased by 58% after accounting for inflation Reed (2008). Cole, Paulson, and Shastry (2012) showed that education improves credit scores, and dramatically reduces the probability of declaring bankruptcy, as well as significantly increases investment income and retirement savings.

Wealthy people are more financially literate than poor people, and those with high education attainment are also more financially literate (Lusardi, 2017).

3. Methodology

This study uses a standardized survey method of data collection. The questionnaire is designed to cover major aspects of personal finance and includes the topics about general knowledge of personal finance, saving, borrowing, investment, and insurance. This survey uses multiple-choice questions, including 10 questions on demographic data, 22 questions to measure financial literacy and six questions to clarify financial opinions and choices. The questions were chosen similar to those of surveys conducted in a number of other countries, which enables comparisons within the country and cross-country. The issues vary in difficulty, although none of them is excessively complex nor requires expert knowledge.

The questions originate mainly from approved financial literacy questionnaires.

Eight questions have been selected from the questionnaire used by Chen and Volpe (1998) to assess US students' financial literacy and have been later used in a few studies. The questions from "A simple financial literacy module", which has been designed in 2004 for the American Health and Retirement Study (HRS) by Lusardi and Mitchell (2011) have been included (three questions, with one small correction) to the current study. These three questions have proved effective in measuring knowledge of simple but fundamental financial decision-making concepts. Two of them have been used in the OECD 2012 study questionnaire, which comprises good practice questions drawn from existing financial literacy questionnaires (Atkinson & Messy, 2012). The present survey used seven questions of eight possible from the OECD 2012 questionnaire.

Since participants from universities of technology have high level of knowledge in mathematics, the question about division (Question no. 1 in OECD 2012 knowledge questions) was omitted.

The validity and clarity of the survey were previously evaluated by a group of master level students and by three experts knowledgeable in personal finance topics.

The polls were conducted during the lectures in the paper form. That form was chosen because internet- or mail-based surveys might provide the respondents with an opportunity to improve their knowledge, thereby overstating their true knowledge; in addition, that form supported the increase of participant number. The respondents answered anonymously and as they did not need to worry about confidentiality, the responses could be more reliable.

The responses from each participant were used to calculate the mean percentage of correct scores for each question and the entire survey, and also for calculating the median, to assess the level of financial literacy and to analyze the results. Consistent with the existing literature (Chen & Volpe, 1998; Mändmaa, 2019a; Mändmaa, 2019b) the mean percentage of correct scores was grouped into three categories. The first category represents a relatively high level (more than 80%) of knowledge, the second a medium (60% to 79%) and the third represents a relatively low level (below 60%) of knowledge. In addition, analysis of variance (ANOVA) was used to determine the differences in personal financial literacy between male and female students.

Based on previous studies (Bucher-Koenen et al., 2017; Kalmi & Ruuskanen, 2018) for the questions from "A simple financial literacy module", additional scores about correct answers were calculated to enable better comparison of the results.

Previous researchers suggested that levels of financial literacy vary among subgroups of students (Chen & Volpe, 1998; Chen & Volpe, 2002; Mändmaa, 2019a; Mändmaa, 2019b). The ANOVA tests were used to provide evidence of the differences. The differences were further analysed using logistic regression models. The participants were divided into two groups using the median percentage of correct answers for the entire survey. Students with scores higher than the median were classified as students with relatively high level (More) of knowledge, coded as "1" and students with scores equal or below the median were classified as those with relatively low level (Less) of knowledge, coded as "0". The dichotomous variable, financial literacy level (More, Less), was used in logistic regression as the dependent variable, which was explained by independent variables. The logistic regression analysis was conducted separately for three times (1. entire sample; 2. male participants; 3. female participants) to detect if the independent variables have different effects on participants' financial literacy. The independent variables (picked from Table 3, Table 4, and Table 5) used in this analyse included participants' academic discipline, level of education, age, work experience, gender, household size, personal monthly income, parents' educational level, amount of books in childhood home, currently available financial services, including using the credit card, and interest in the personal finance topics. In this study, the logistic model has the following functional form:

$$\begin{aligned}\log[p/(1-p)] = {} & B_0 + B_1(Age1) + B_2(Age2) + B_3(Age3) + \\ & B_4(Academic\ discipline) + B_5(Credit\ Card) + B_6\ (Gender) + \\ & B_7\ (Household1) + B_8\ (Household2) + B_9\ (Household3) + \\ & B_{10}\ (Household4) + B_{11}\ (Household5) + B_{12}\ (Interest) + \\ & B_{13}\ (Financial\ services\ 1) + B_{14}\ (Financial\ services\ 2) + \\ & B_{15}\ (Financial\ services\ 6) + B_{16}\ (Financial\ services\ 9) + \\ & B_{17}\ (Financial\ services\ 10) + B_{18}\ (Financial\ services\ 11) + B_{19}\ (Income1) + \\ & B_{20}\ (Income2) + B_{21}\ (Income3) + B_{22}\ (Income4) + \\ & B_{23}\ (Level\ of\ education1) + B_{24}\ (Level\ of\ education2) + \\ & B_{25}\ (Level\ of\ education3) + B_{26}\ (Nationality) + B_{27}\ (Planning) + \\ & B_{28}\ (Work1) + B_{29}\ (Work2) + B_{30}\ (Work3) + B_{31}\ (Work4) + e_i \end{aligned} \quad (1)$$

where: p = the probability of a participant with relatively more knowledge about personal finance; B = the coefficient. Coefficients B_1 to B_{31} represent the effect of each subgroup.

For the sake of comparability of the results, in this study, the same questionnaire and the functional form of the logistic model (1) used in the study conducted by Mändmaa (2020b) among Estonian students were used.

Researchers throughout the world have reported that females have lower level in financial literacy than males.

Table-1. Characteristics of the sample.

Characteristics	Entire sample		Male participants		Female participants	
	Frequency	%	Frequency	%	Frequency	%
Total amount of observations	574	100	426	100	148	100
A. Education						
1. Academic discipline						
a) Engineering Science	463	80.7	356	83.7	107	72.2
b) Business/ Economics	68	11.8	43	10.1	25	16.9
c) Other	43	7.6	27	6.3	16	10.9
2. Level of education						
a) Bachelor studies	516	89.9	381	89.4	135	91.2
b) Master studies	49	8.5	39	9.2	10	6.8
c) Other	9	1.6	6	1.4	3	2
B. Experience						
1. Age groups						
a) 18-22	465	81	337	79.1	128	86.5
b) 23-29	81	14.1	69	16.2	12	8.1
c) 30 and up	28	4.9	20	4.7	8	5.4
2. Work experience						
a) None	47	8.3	39	9.2	8	5.4
b) Less than 2 years	317	55.2	249	58.5	68	45.9
c) 2 to 5 years	161	28	106	24.9	55	37.2
d) More than 5 years	49	8.5	32	7.4	17	11.5
C. Demographic characteristics						
1. Nationality						
a) Finnish	573	99.8	426	100	147	99.3
b) Other	1	0.2	0	0	1	0.7
2. Gender						
a) Male	426	73.9	426	100	0	0
b) Female	148	25.8	0	0	148	100
3. Household size						
a) Live alone	335	58.4	249	58.5	86	58.1
b) Live with husband/ wife	115	20	87	20.4	28	18.9
c) Live with husband/ wife and children	14	2.4	9	2.1	5	3.4
d) Live with parents/grandparents	27	4.7	22	5.2	5	3.4
e) Other	83	14.5	59	13.8	24	16.2
D. Income						
1. Personal monthly net income						
a) Do not want to answer	22	3.9	16	3.8	6	4
b) Under 300 EURO	114	19.9	93	21.8	21	14.2
c) 301- 1360 EURO	409	71.3	294	69	115	77.7
d) 1361-2800 EURO	17	3	12	2.8	5	3.4
e) 2800 EURO and over	12	2.1	11	2.6	1	0.7
E. Background						
1. Educational level of parents - existence of higher education						
a) Mother	210	36.6	158	37.1	52	35.1
b) Father	207	36.1	144	33.8	63	42.6
c) Stepparent	21	3.7	16	3.8	5	3.4
d) Grandparent	58	10.1	42	9.9	16	10.8
2. Number of books in childhood home						
a) Under 100	207	36.1	165	38.7	42	28.4
b) 101 – 500	305	53.1	218	51.2	87	58.8
c) More than 500	59	10.3	41	9.7	18	12.2
d) Unanswered	3	0.5	2	0.4	1	0.7

To understand and find some evidence if financial education should be taught to male and female students differently, in addition, students' choices (financial planning and services using) were analyzed. The relationships between students' choices, financial literacy and socio-demographic background were described using the Cross-tabulations, Chi-square tests, descriptive statistics, and analysis of variances (ANOVA).

Data were collected from two universities of technology based on convenience sampling in purpose to achieve comparability of data with survey conducted among Estonian students.

The size of the sample used in the evaluation of students' financial literacy was 574 (426 male and 148 female students). In the survey, students from two Finnish universities participated: 321 (250 male and 71 female) students from Tampere University of Technology and 253 (176 male and 77 female) students from Lappeenranta University of Technology. The characteristics of the sample of the Finnish students' financial literacy study are presented in Table 1. In the further analyses, the missing responses caused the sample size to vary from 522 to 573 and therefore, different sample sizes were used to calculate valid percentages in Tables 4 and 5.

In the comparisons, the data from the study conducted among the students in Tallinn University of Technology in 2015 and partly from the study among Estonian university students in higher educational institutions in 2012 were used. The sample sizes were respectively 536 (326 male and 210 female students) and 522 (204 male and 318 female students). More specific information about these two studies is reported by Mändmaa (2020a); Mändmaa (2020b).

4. Results and Analysis

In this section, the results from the survey of students at higher education institutions in Finland are presented. The survey was conducted to evaluate the level of financial literacy and analyze the factors influencing students' financial knowledge. The questionnaire was filled in by 574 students. About 95% of the students were from 18 to 29 years of age. In terms of gender, male participants accounted for about 74% and females 26% of the sample.

The collected data were analyzed using the software Statistical Package for the Social Sciences (SPSS).

4.1. Differences in Personal Financial Literacy

The survey responses are summarized and differences of answers by gender and by the level of financial literacy are presented in Table 2. Lower financial literacy scores mainly concerned topics of insurance, development of interest, and loan co-sing consequences. In total, survey results showed that participants' financial literacy was at medium level - an average score of correct answers was 74%. Female students answered to 72% of the questions correctly, and male students had correct answers for 74% of questions.

Answers to questions from "A simple financial literacy module" were compared separately with responses from earlier studies and the results are presented in Table 7.

4.2. Analysis of Results by Subgroups of the Sample

The results in the previous section displayed the differences in students' financial literacy based on gender, but the effects of other determining factors were not addressed. In this section, the relationship between the personal financial literacy level and the characteristics of the sample was examined Table 3. The ANOVA was used to detect if factors from various subgroups had different effect on the level.

The ANOVA results showed that not many significant differences exist in the current sample. Findings admitted gender differences and differences in financial knowledge in the subgroup of personal monthly net income. The financial literacy level showed a rise with income, except the cases where the income was over 2800 euros per month. The nationality characteristic had also a significant value of F-statistic, but that was treated as an exception, as there was only one non-Finnish female student who probably had poor language skills, i.e., she did not understand the questions correctly. Based on the F-statistic values, there were no significant differences in the subgroup of background (level of education of the parents and number of books in childhood home).

4.3. Analysis of Results by Participants' Choices

This section analyzes participants' choices about using the financial services. The results showed that 98% of the participants had Current Account, 91% Debit Card; 61% Saving Account, 58% Insurance Services, 38% Student Loan, 27% Investment Services, and 17% of the participants were Credit Card owners.

Analysis of variance was used to detect if participants with different choices of using financial services had different levels of financial knowledge. Based on earlier studies (Mändmaa, 2020a; Mändmaa, 2020b; Pires & Quelhas, 2015) the use of financial services has an impact on students' financial literacy. In general, the participants with higher level of financial literacy used financial services more than participants with lower financial literacy level. Our findings showed that the following financial services had a statistically significant effect: Current Account, Debit Card, Insurance, and Investment Services. The results are presented in Table 4. No remarkable gender differences were found in the results, except in using investment services where the differences in female students' results were not statistically significant.

Table-2. Mean percentages of correct responses by gender and results of ANOVA.

	Level of Personal Financial Literacy								
	Low			Medium			High			Total
	Below 60%			60-79%			Over 80%			%
	M	F	F test	M	F	F test	M	F	F test	
I General personal finance knowledge										
1. Personal financial literacy							83.6	83.1	0.017	83.4
2. Asset liquidity				66.9	55.4	6.343***				63.9
3. Definition of inflation							85.2	77.7	4.465**	83.3
4. Time-value of money							86.1	84.5	0.256	85.7
5. Interest paid on a loan							89.2	92.6	1.390	90.1
6. Legal requirement for apartment lease				72.3	79.0	2.609*				74
7. Change in the purchasing power of money	58.9	60.1	0.067							59.2
8. Discount valuation							99.1	99.3	0.088	99.1
Mean correct responses for the I section				80.2	79.0	0.656				79.9
II Saving, borrowing, insurance and investments										
9. Appropriate saving place							90.4	85.1	3.093*	89
10. Calculation of interest plus principle							90.1	93.9	1.936	91.1
11. Compound interest							84.3	76.3	4.739**	82.2
12. Purchasing power assessment							92.2	85.8	5.381**	90.6
13. Monthly payments of mortgage				77.7	69.6	3.926**				75.6
14. Interest of loan				67.4	60.1	2.547*				65.6
15. Loan co-sing consequences	39.4	40.5	0.056							39.7
16. The interest rate evaluation							96.5	96.6	0.007	96.5
17. Understanding the content of insurance							79.8	82.4	0.479	80.5
18. Homeowners' insurance	15.3	13.5	0.264							14.8
19. Revenue of different interest calculation	49.3	41.2	2.881*							47.2
20. Diversification							94.4	87.2	8.316***	92.5
21. Risk and return							95.8	93.2	1.516	95.1
22. Interest rates changes and treasury bond price	18.1	18.2	0.002							18.1
Mean correct responses for the II section				70.6	67.4	7.744***				69.9
Mean correct responses for the entire survey				74.2	71.6	6.083***				73.5
Median correct responses for the entire survey										77.3

Notes: M = Male participants, F = Female participants, F test = F statistic, and * = significant at 0.1 level, **=significant at 0.05 level, *** = significant at 0.01 level or greater.

Table-3. Mean percentage of correct responses by characteristics of the sample and results of ANOVA.

	Total count	Total %	Male %	Female %
A. Education				
1. Academic discipline (F Statistic)		1.311	0.402	0.936
a) Engineering Science	463	73.7	74.3	71.7
b) Business/ Economics	68	73.8	74.1	73.3
c) Other	43	70.9	72.4	68.5
2. Level of education (F Statistic)		0.866	0.323	1.219
a) Bachelor studies	516	73.5	74.1	71.9
b) Master studies	49	74.4	75.4	70.4
c) Other	9	69.2	72.7	62.1
B. Experience				
1. Age groups (F Statistic)		1.086	0.749	1.397
a) 18-22	465	73.3	73.9	71.8
b) 23-29	81	73.6	74.6	67.4
c) 30 and up	28	76.5	76.8	75.6
2. Work experience (F Statistic)		1.323	1.794	0.470
a) None	47	71.6	70.9	75.0
b) Less than 2 years	317	74.0	74.7	71.4
c) 2 to 5 years	161	72.7	73.7	70.8
d) More than 5 years	49	75.0	76.0	73.3
C. Demographic characteristics				
1. Nationality (F Statistic)		6.69**	-	5.842*
a) Finnish	573	73.6	74.2	71.8
b) Other	1	45.4	-	45.4
2. Gender (F Statistic)		6.083**	-	-
a) Male	426	74.2	74.2	-
b) Female	148	71.6	-	71.8
3. Household size (F Statistic)		0.160	0.103	0.692
a) Live alone	335	73.6	74.0	72.6
b) Live with husband/ wife	115	72.8	74.2	68.7
c) Live with husband/ wife and children	14	73.0	73.2	72.7
d) Live with parents/grandparents	27	74.1	74.6	71,8
e) Other	83	73.8	74.8	71,2
D. Income				
1. Personal monthly net income (F Statistic)		2.540*	2.808*	0.801
a) Do not want to answer	22	72.3	73.8	68.2
b) Under 300 EURO	114	71.2	71.2	71.2
c) 301- 1360 EURO	409	74.0	74.9	71.7
d) 1361-2800 EURO	17	78.6	79.2	77.3
e) 2800 EURO and over	12	72.7	74.0	59.1
E. Background				
1. Educational level of parents - existence of higher education				
a) Mother (F Statistic)	210	73.5 (0.003)	74.7 (0.681)	69.9(1.893)
b) Father (F Statistic)	207	73.8 (0.157)	74.5 (0.225)	72,0(0.132)
c) Stepparent (F Statistic)	21	73.6 (0.001)	75.0 (0.096)	69.1(0.271)
d) Grandparent (F Statistic)	58	75.3 (1.747)	76.4 (1.987)	72.4(0.099)
2. Number of books in childhood home (F Statistic)		0.309	0.722	0.090
a) Under 100	207	73.0	73.4	71.4
b) 101 – 500	305	73.7	74.6	71.6
c) More than 500	59	74.3	75.4	71.7
d) Unanswered	3	71.2	68.2	77.3

Notes: * significant at 0.05 level, ** significant at 0.01 level or greater.

Table-4. Mean percentage of correct responses by students' financial choices and results of ANOVA.

Students' financial choices	Total		Male		Female	
	Count	FL level %	Count	FL level %	Count	FL level %
Financial services in use						
Current Account						
a)Yes	564	73.8	418	74.5	146	71.9
b) No	9	56.6	8	57.4	1	50.0
F Statistic (sig)	23.291**	(0.000)	20.608**	(0.000)	4.142*	(0.044)
Debit Card						
a)Yes	519	74.0	383	74.8	136	71.9
b) No	54	68.9	43	68.6	11	70.2
F Statistic	11.023**	(0.001)	13.094**	(0.000)	0.241	(0.624)
Term deposit						
a)Yes	111	74.8	85	752	26	73.6
b) No	462	73.3	341	73.9	121	71.4
F Statistic	1.820	(0.178)	0.926	(0.337)	0.868	(0.353)
Saving Account						
a)Yes	348	73.2	237	74.0	111	71.6
b) No	225	74.1	189	74.4	36	72.3
F Statistic	0.762	(0.383)	0.126	(0.723)	0.121	(0.728)
Student loan						
a)Yes	218	73.7	171	74.5	47	70.8
b) No	355	73.5	255	74.0	100	72.3
F Statistic	0.042	(0.838)	0.225	(0.636)	0.592	(0.443)
Housing loan						
a)Yes	23	73.9	15	75.1	8	71.6
b) No	550	73.5	411	74.1	139	71.8
F Statistic	0.024	(0.877)	0.126	(0.723)	0.003	(0.956)
Other bank loan						
a)Yes	5	76.4	4	80.7	1	59.1
b) No	568	73.5	422	74.1	146	71.9
F Statistic	0.334	(0.564)	1.465	(0.227)	1.382	(0.242)
Vehicle Lease						
a)Yes	1	22.7	1	22.7	-	-
b) No	572	73.6	425	74.3	147	71.8
F Statistic	22.796**	(0.000)	23.965**	(0.000)	-	-
Insurance						
a)Yes	330	74.1	233	75.8	97	70.1
b) No	243	72.8	193	72.2	50	75.1
F Statistic	2.208	(0.138)	12.328**	(0.000)	7.254**	(0.008)
Investment Services						
a)Yes	154	75.9	119	76.5	35	73.6
b) No	419	72.7	307	73.3	112	71.2
F Statistic	9.738**	(0.002)	8.070**	(0.005)	1.316	(0.253)
Pension fund shares						
a)Yes	12	76.5	9	76.8	3	75.7
b) No	561	73.5	417	74.1	144	71.7
F Statistic	0.903	(0.342)	0.528	(0.468)	0.405	(0.526)
Credit Card						
a) Yes	95	72.9	75	73.3	20	71.4
b) No	461	73.6	345	74.2	115	71.9
c) Yes, but not my own	18	75.0	6	81.8	12	71.6
F Statistic	0.344	(0,709)	1.776	(0.170)	0.023	(0.978)

Notes: * significant at 0.05 level, ** significant at 0.01 level or greater.

4.4. Students' Financial Planning Habits

In this section, the Cross-tabulations and Chi-square tests were used to show differences in students' financial affair planning habits. The results Table 5 showed that the most preferable planning period was one month, as 38% of students (37% of males and 40% of females) picked that to answer the question: "How long in advance do you plan your financial affairs (the expected revenues, the necessary costs and predictable financial

situation)?". Statistically significant test results revealed that 13% of students planned their financial affairs to several years and less than 1% until retirement (that was only male student's choice). In terms of long-term planning, the higher financial literacy level generally was related to a longer planning period. The share of students' who do not see the need to plan was on average 3% (4.1% of males, 1.5% of females).

Table-5. Students' financial planning habits by financial literacy level and by gender.

How long in advance do you plan your financial affairs?	Total	Financial literacy level			Gender	
		Low	Medium	High	Male	Female
do not see the need to plan	18	4	9	5	16	2
Count	100.0	22.2	50.0	27.8	88.9	11.1
% within row	3.4	5.8	3.2	2.9	4.1	1.5
% within column						
on a current basis, on daily basis	24	6	13	5	15	9
Count	1000	25.0	52.2	20.8	62.5	37.5
% within row	4.6	8.7	4.7	2.9	3.8	6.9
% within column						
weekly or fortnightly	48	14	17	17	34	14
Count	100.0	29.2	35.4	35.4	70.8	29.2
% within row	9.2	20.3	6.1	9.8	8.7	10.7
% within column						
on a monthly basis	196	22	118	56	144	52
Count	100.0	11.2	60.2	28.6	73.5	26.5
% within row	37.5	31.9	42.3	32.2	36.8	39.7
% within column						
on a 3-month basis	47	6	25	16	35	12
Count	100.0	12.8	53.2	34.0	74.5	25.5
% within row	9.0	8.7	9.0	9.2	9.0	9.2
% within column						
on a 6-month basis	57	5	32	20	44	13
Count	100.0	8.8	56.1	35.1	77.2	22.8
% within row	10.9	7.2	11.5	11.5	11.3	9.9
% within column						
on a 1-year basis	63	6	33	24	47	16
Count	100.0	9.5	52.4	38.1	74.6	25.4
% within row	12.1	8.7	11.8	13.8	12.0	12.2
% within column						
on several years basis	65	5	29	31	52	13
Count	100.0	7.7	44.6	47.7	80.0	20.0
% within row	12.5	7.2	10.4	17.8	13.3	9.9
% within column						
until retirement	4	1	3	0	4	0
Count	100.0	25.0	75.0	0	100.0	0
% within row	0.8	1.4	1.1	0	1.0	0
% within column						
Total	522	69	279	174	391	131
Count	100.0	13.2	53.4	33.3	74.9	25.1
% within row	100.0	100.0	100.0	100.0	100.0	100.0
% within column						
Notes:		Chi-square = 31.435 significant at the 0.012 level			Chi-square = 6.880 significant at the 0.550 level	

4.5. Determining Factors of Personal Financial Literacy

This section presents further analysis of the statistically significant differences. The relationships between personal financial literacy, the characteristics of the sample and choices made about using financial services were examined. To find out if there are different factors determining the male and female students' financial literacy, the analysis was run for male and female students separately. The results of logistic regression are reported in Tables 6A, 6B and 6C.

The tested correlation among the independent variables was low, i.e., under 0.60, which indicates that the multi-collinearity is not a problem in the current analysis.

The Forward Stepwise method was chosen, and the regression analyses were run separately for the three different samples (shown in Table 1). As suggested by the Chi-square values, the models have high explanatory power. In addition, the overall fit of the models was assessed by its ability to classify observations

correctly. For the entire sample, 59.7% of the observations were correctly classified as compared with 50.4% of change classification; for the male students' sample, 61.0% of the observations were classified correctly compared with the change classification of 53.8%; for the female students' sample, 66.0% of the observations were classified correctly compared with the change classification of 59.2%.

Based on the logistic regression analysis, the results of the whole sample Table 6A showed that consistent with ANOVA results presented in Table 3, the gender variable was positive and statistically significant. The results indicate that male participants are 1.8 times more likely to belong to the group of more knowledgeable about personal finance than female participants. Subsequent results suggested that students' financial literacy is related to two groups of variables: financial services and income. The coefficients of investment services were positive and statistically significant, indicating that students using these services are more likely to be more knowledgeable (in the whole sample 1.7 times) about personal finance than students without investment services. Regarding income related variables, coefficients of Income(1) and Income(2) were positive and statistically significant, indicating that those with monthly net income from 301 to 2800 euros are more likely to be more knowledgeable in personal finance compared to students with monthly net income up to 300 euros. The findings showed that the impact on financial literacy at the income over 2800 euros or with no answers from the participants was small.

The results of the logistic regression analysis of the male sample are presented in Table 6B. The coefficients of Investment services and Insurance Services were positive and statistically significant, indicating that students using these services are more likely to be more knowledgeable (2.1 times using Investment Services and 1.7 times using Insurance Services) about personal finance than students without these choices. Regarding income related variables, coefficients of Income(1) and Income(2) were positive and statistically significant. The value of coefficients shows that those with monthly net income from 301 to 1360 euros are (2.4 times) and those with monthly net income from 1361 to 2800 euros are (4.6 times) more likely to be more knowledgeable in personal finance than students with monthly net income up to 300 euros.

Table-6. Logistic regression results of factors influencing participants' financial literacy.

A. Model (All participants)

	Step 1		**Step 2**		**Step 3**	
	B	**Exp(B)**	**B**	**Exp(B)**	**B**	**Exp(B)**
Investment services	0.625**	1.867	0.611**	1.843	0.554**	1.741
Gender (1)			0.506**	1.658	0.578**	1.782
Income(1)					0.655**	1.926
Income(2)					1.668**	5.303
Income(3)					0.429	1.536
Income(4)					0.362	1.436
Constant	-0.148	0.862	-0.522**	0.594	-1.097**	0.334
-2 log Likelihood	783.557		776.783		763.163	
Chi-Square	10.746**		17.521**		31.140**	
Adjusted R^2	0.025		0.040		0.071	
Correct Classified	55.8		55.8		59.7	
Chance Classification			50.4			

B. Model (Only male participants)

	Step 1		**Step 2**		**Step 3**	
	B	**Exp(B)**	**B**	**Exp(B)**	**B**	**Exp(B)**
Investment services	0.777**	2.175	0.766**	2.152	0.727**	2.069
Insurance			0.632**	1.882	0.506**	1.659
Income(1)					0.873**	2.395
Income(2)					1.517*	4.556
Income(3)					0.734	2.083
Income(4)					0.775	2.172
Constant	-0.059	0.943	-0.398**	0.672	-1.014**	0.363
-2 log Likelihood	575.878		565.784		552.059	
Chi-Square	12.278**		22.371**		36.096**	
Adjusted R^2	0.038		0.068		0.109	
Correct Classified	55.9		59.6		61.0	
Chance Classification			53.8			

C. Model (Only female participants)

	Step 1	
	B	**Exp(B)**
Insurance	1.209**	3.350
Constant	-0.803**	0.448
-2 log Likelihood	187.294	
Chi-Square	11.503**	
Adjusted R^2	0.102	
Correct Classified	66.0	
Chance Classification		59.2

Notes: *significant at the 0.05 level; **significant at the 0.01 level or greater.

The results of the logistic regression analysis of the female sample are presented in Table 6C. Based on the results, the only variable influencing female students' financial literacy is their choice whether they use Insurance Services. The coefficient of Insurance Services was positive and statistically significant, indicating that students using these services are more likely to be 3.4 times more knowledgeable in personal finance than students without using the Insurance Services.

In conclusion, the results support several previous research findings that there are gender differences in financial literacy and previous experiences with financial services affect the financial literacy positively.

4.6. Comparisons and Discussion

In this section, comparisons with earlier studies are presented.

The answers to the questions from "A simple financial literacy module" are scored and compared with study results from Finland, USA, and Estonia. Finland and USA participated in the project called Financial Literacy around the World (FLat World), coordinated by Lusardi and Mitchell.

The Finnish study conducted in 2014 was the first representative study of financial literacy in Finland. The sample (1477 observations) had respondents aged from 18 to 92 and the results were presented separately for the entire sample and for those between the ages of 25 and 65 (Kalmi & Ruuskanen, 2018). The current study sample included 81% of students aged from 18 to 22; thus, the entire sample was used for the comparisons. Concerning the question of the interest rate, the difference of the correct answers provided between the students and the respondents of the first study was 24% (82% and 58%). The question about inflation was answered correctly by 91% of the students and 77% of the respondents of the first study (difference 14%). The question about risk and diversification was answered correctly by 93% of the students and 66% of the respondents of the first study (difference 27%). In the current study, the share of respondents who answered all the questions correctly was 71% and in the Finnish first survey 36%, making up more than one-third of the respondents. The results showed that students from universities of technology had particularly good general financial knowledge and the level of knowledge was higher than Finns' overall Table 7. These results were as expected; as the earlier research has shown, mathematical skills and educational attainment affect the financial literacy level (Mändmaa, 2020a; Mändmaa, 2020b).

Comparing the scores of the Finnish university students with those of a USA study (published by Lusardi (2019)), the difference in the correct answers provided to the question of the interest rate was 17% (82% and 65%). The question about inflation was answered correctly by 91% of students and 64% of participants from the US study and the question about risk and diversification by 93% and 52%, respectively. In the current study, the share of respondents who answered all the questions correctly was 71% and in the US survey - 30%. There were remarkable differences in the share of "do not know" answers, and the biggest gap was found in the answers to the question of risk and diversification (28%). The differences were similar to the comparison made with the sample of Finnish population.

Results of the current survey are consistent with arguments reported by Lusardi and Mitchell (2011) that financial literacy is highly and positively correlated with schooling. The findings from Health and Retirement Study (HRS), a nationally representative longitudinal dataset of Americans over the age of 50, showed that respondents with educational level "college and more" had higher scores to the right answers of the three core questions (Q) (Q1 82%; Q2 85%; Q3 70%) and lower DK scores (Q1 3%; Q2 3%; Q3 14%) than those with educational level "less than high school" (Q1 51%; Q2 62%; Q3 31% and DK Q1 17%; Q2 21%; Q3 56%) (Lusardi & Mitchell, 2011).

Next, financial knowledge of Estonian and Finnish students is compared.

In the first comparison made between students (sample size 522) in Estonian higher education institutions and students (sample size 574) in Finnish universities of technology, the level and answers to the three core questions were compared.

The results Table 7 showed that Estonian students' financial knowledge was lower than that of Finnish students, especially in answers to the question of the interest rate. That could be explained by the short history of the Estonian financial markets - little experience, and by the differences in the sample - academic discipline, level of education.

Table-7. The statistics of answers to the three core questions.

Description **A. Interest rate question**	**Full sample % EST** ***	**Full sample % FIN**	**Male % EST** ***	**Male % FIN**	**Female % EST** ***	**Female % FIN**	**Estonian university students' FL survey 2012 %** ***	**Finnish 2014 summary statistics (full sample) %** **
> 110 *	65.9	82.2	65.3	84.3	66.7	76.4	50.4	58.1
= 110	16.0	2.6	16.9	1.6	14.8	5.4	36.0	28.0
<110	2.8	7.5	2.5	7.0	3.3	8.8	6.3	6.6
DK	4.1	2.1	4.3	1.2	3.8	4.7	0	6.1
Refused to answer	11.2	5.6	11.1	5.9	11.5	4.7	7.3	1.4
EST: Chi-Square=0.894 p-value= 0,971			*FIN: Chi-Square= 14.131 p-value=0.007*				*CS=56.194 P=0.000*	
B. Inflation question								
More	2.8	1.6	3.4	1.9	1.9	0.7	5.4	7.1
Exactly the same	0.9	2.4	1.2	2.6	0.5	2.0	2.7	8.8
Less *	85.3	90.6	83.1	92.3	88.6	85.8	78.4	76.5
DK	10.1	5.2	11.7	3.1	7.6	11.5	13.6	6.4
Refused to answer	0.9	0.2	0.6	0.2	1.4	0	0	1.3
EST: Chi-Square=0.270 p-value=0.270			*FIN: Chi-Square =16.954 p-value= 0.002*				*CS=33.840 P=0.000*	
C. Risk diversification question								
Correct (True)	3.9	1.0	3.7	0.9	4.3	1.4	8.8	24.0
Incorrect (False)*	79.5	92.5	78.5	94.4	81.0	87.2	79.3	65.8
DK	14.6	6.4	15.6	4.7	12.9	11.5	11.9	10.2
Refused to answer	2.1	0	2.1	0	1.9	0	0	0
EST: Chi-Square=0.932 p-value=0.818			*FIN: Chi-Square = 8.655 p-value=0.013*				*CS=9.669 P=0.008*	
D. Cross-question Consistency								
Interest and inflation correct	59.9	75.4	58.0	78.6	62.9	66.2	28.5	48.0
EST: Chi-Square=1.267 p-value=0.150			*FIN: Chi-Square=9.147 p-value=0002*				*CS=6.434*	
All correct	50.7	71.4	48.8	75.6	53.8	59.5	27.2	35.6
EST: Chi-Square=0.020 p-value=0.555			*FIN: Chi-Square=13.999 p-value=0.000*				*CS=5.379*	
None correct	3.0	1.0	3.1	0.7	2.9	2.0	5.2	7.4
EST: Chi-Square=0.020 p-value=0.555			*FIN: Chi-Square=1.858 p-value=1.181*				*CS=9.356*	
At least one DK	18.3	10.1	18.4	6.3	18.1	20.9	22.2	14.0
EST: Chi-Square=0.008 p-value=0.512			*FIN: Chi-Square=25.804 p-value=0.000*				*CS=32.284*	
All DK	0.7	0.3	0.9	0.2	0.5	0.7	0	1.4
EST: Chi-Square=0.340 p-value=0.489			*FIN: Chi-Square=0.615 p-value=0.450*				-	
Number of observations	536	574	326	426	210	148	522	1477

Notes: The correct answer is marked by an asterisk (*); EST marks the results origin country Estonia; FIN marks the results origin country Finland; FL abbreviation for financial literacy; DK abbreviation for "Do not know"; CS abbreviation for Chi-Square.
** Data in marked column are from Kalmi and Ruuskanen (2018)
*** Author's own preparations based on Estonian university students' financial literacy studies from years 2012 and 2015.

The Finnish sample consisted of students from mathematics-based disciplines only on the Bachelor and Master level. The sample of the Estonian study 2012 had 28% of students from implementing higher education studies and 47.5% of students were from non-mathematics-based disciplines. The results from Estonian 2012 study showed clear differences (10.5% in total, 7.4% in male and 12.7% in female) in the financial literacy levels between students in Economic or Non-Economic academic disciplines. Even greater differences appeared in the overall share of mathematics-based studies. Differences in students' financial literacy in Bachelor studies were 13.6% (male 7.6% and female 13.6%) and in Master studies 9.1% (male 13.4% and female 5.2%) in favor of mathematics-based learning.

The second comparison was made between Estonian (sample size 536) and Finnish (sample size 574) students in universities of technology. Comparison was made and presented separately for three core questions (from "A simple financial literacy module" with little correction), and for the results of the whole questionnaire.

The statistics for three core questions is shown in Table 7. The results showed that Estonian students' financial knowledge was slightly lower than Finnish students', except the amount of Estonian female participants' right answers about inflation questions, which was 3% higher compared to neighbor country female students' answers.

The share of "do not know" (DK) answers among Finnish students was lower than that in Estonian students in all samples, and much lower compared to male students' answers. This could be understood as Finnish male students' higher self-confidence in financial knowledge.

In addition, the current study of Finnish students showed the differences between female and male students' responses and that male students had 6 to 8% higher scores, which is consistent with several earlier studies results (Atkinson et al., 2006; Atkinson & Messy, 2012; Bucher-Koenen & Lusardi, 2011; Bucher-Koenen et al., 2017; Chen & Volpe, 1998; Chen & Volpe, 2002; Fonseca et al., 2012; Goldsmith & Goldsmith, 1997; Goldsmith & Goldsmith, 2006; Kalmi & Ruuskanen, 2018; Lusardi et al., 2010; Mändmaa, 2019a; Mändmaa, 2019b).

Differences between Estonian and Finnish students' financial knowledge were small. The results of the whole questionnaire showed that students' financial literacy is at Medium level - an average score of correct answers among Estonians was 68% and among Finns 74%, whereas female students answered 69% of the questions and 72% of questions correctly, respectively and the male students 67% and 74% of the questions correctly, respectively.

Mean percentage of correct responses by gender, and results of ANOVA are reported in the Appendix and Table 2. The lowest scores in the answers to the question were acquired in both countries in: "If the interest rate rises, the prices of a Treasury bond will: increase; decrease; remain the same; impossible to predict; do not know." This question needs more specific knowledge or experience, and the results were as expected, as respondents were university students mostly in their young age (18 to 22), which means they were in very early stage of their financial life cycle.

There were gender differences found in students' financial literacy Figures 1 and 2. Female students in the Estonian survey had slightly higher financial literacy level than male students and Finnish students' results were vice versa.

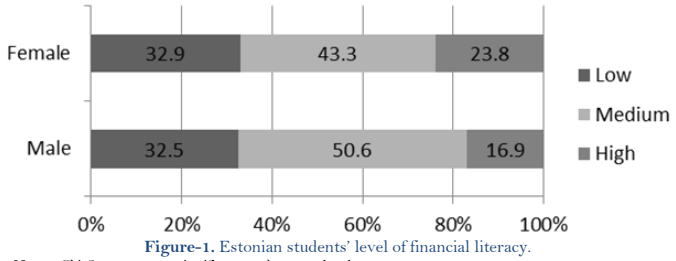

Figure-1. Estonian students' level of financial literacy.

Notes: Chi-Square=4.561 significant at the 0.102 level.

Author's own preparation based on Estonian university students' financial literacy study from year 2015.

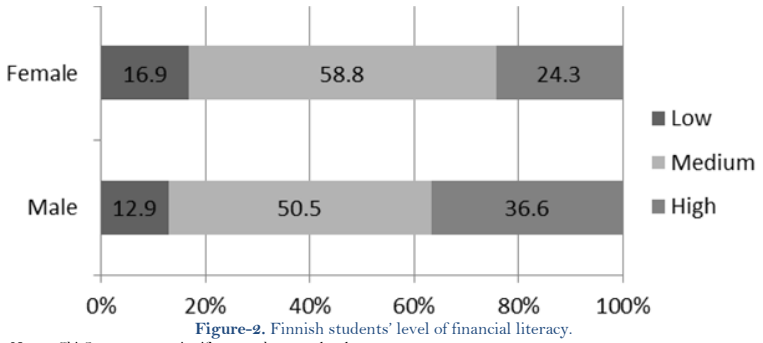

Figure-2. Finnish students' level of financial literacy.

Notes: Chi-Square=7.656 significant at the 0.022 level.

The gender differences in the results of the two countries could be explained by differences in political history. The former Communist societies were much more egalitarian with respect to gender roles and as Estonia was part of Soviet Union for 51 years, that could explain female slightly higher financial knowledge. Researchers have argued in earlier studies that gender differences in financial literacy in former Communist societies could be interpreted as prime facile evidence that as financial markets develop, women are left behind in terms of financial knowledge (Bucher-Koenen et al., 2017).

The results of regression analyses showed some differences in factors influencing students' financial literacy. In the study of Estonian students, Academic Discipline, Level of Education, Age and Nationality were found as statistically significant factors, which were not significant in the Finnish students' study. Previous experience in using financial services was a significant factor for the financial literacy of both countries' students. Findings showed that the most important factor in the Finnish study was income, which had no significant impact on Estonian students' financial literacy.

The differences pointed out above could be caused by the lower standard of living in Estonia, a shorter history of financial market, deficiency of financial education and missing skills of parents to passing on the financial knowledge to children.

In addition, comparison of the results of the current study with the findings of the study conducted among students in Estonian higher educational institutions in 2012 reveals a notable impact of an academic discipline. Students from academic disciplines with mathematics-based studies showed higher financial literacy scores (68% and 57%) than students from other disciplines (Mändmaa, 2019a; Mändmaa, 2019b) while in the current study, the sample consisted only of students with mathematics-based curriculums and the results demonstrate no influence of the academic discipline on the students' financial literacy Table 3.

5. Conclusions

The main goal of this study was to find out the needs and gaps in financial education using the assessment and comparison of students' financial literacy to develop the field.

This study examined the knowledge of 574 students from two universities in Finland to assess the students' financial literacy level, find out the factors influencing the knowledge of personal finance and to compare the findings with similar studies.

The study includes a comparison with studies that were conducted in the neighbouring country, Estonia, among university students in 2012 (522 participants) and 2015 (536 participants).

Among Finns, the level of financial literacy was found to be relatively high. Using the scale Low-Medium-High, the students' financial knowledge in both countries (studies from 2015/2016) was assessed to the medium level, but Finnish results were slightly higher (FIN 74% and EST 68%) and there occurred some gender differences. Among Finnish students, males had higher financial literacy scores than females (male 74% and female 72%), but Estonian female students' average score was a little higher than male students' score (female 69% and male 67%). By far the weakest answers to the questions were about homeowner's insurance and about connection between interest rate changes and treasury bonds prices, where only 15% and 18% of the participants accordingly gave correct answers.

Participants' choices about using the financial services were analyzed and the results showed that in general, the participants with higher level of financial literacy used financial services more than participants with lower financial literacy level. 17% of the participants were users of credit cards, which is not an amount to be worried.

The responses about planning habits of financial affairs showed that most preferable planning period was one month, picked by 38% of students; 13% of students planned their financial affairs to several years and less than 1% until retirement. In terms of long-term planning, the higher financial literacy level generally was related to a longer planning period. The share of students who see no need to plan was on average 3%.

Based on the results of regression analyses, the factors influencing students' financial knowledge were gender, income, and experience in using insurance and investment services.

Although Estonians and Finns are representatives of two related nations, the differences in recent history have left their marks. Comparison of the students in the same academic disciplines, i.e., in the current case, in the mathematics-based technological disciplines, revealed notable financial knowledge of Estonian female students. However, the results of students from different academic disciplines (study from 2012) showed a remarkable gap in students' financial literacy levels, acknowledging higher knowledge of male students.

These results confirm the arguments and enable drawing the following conclusions:

- As financial markets develop, women are left behind in terms of financial knowledge, as presented in an earlier study in Germany and in the comparison between Estonian and Finnish students' financial literacy in the current study.
- The better the skills in mathematics, the better the results in financial literacy, which was confirmed by the comparison with the survey results conducted in Estonia in 2012 and 2015.
- In the financial literacy, female students have weaker results because of weaker mathematics skills also, as it is argued in the earlier research - female students prefer non-math-based subjects.

On the whole, incompetency in financial literacy will limit students – the creators of our future – ability to make informed financial decisions and pass on necessary knowledge to descendants.

When individuals cannot manage their finances, it becomes a problem for the society (Chen & Volpe, 1998).

The findings of this study suggest that students' financial literacy needs improvement especially in the conditions of our rapidly changing financial markets. Moreover, it is necessary to improve the teaching of mathematics that in some levels could be taught to males and females separately and universities could offer optional mathematics courses to prepare better understanding of managing personal finance and to reduce the subconscious fear to the subject - mathematics.

The finding that students prefer short-term planning to long-term planning is of equal importance, which gives another goal for educators - to teach young people to understand responsibility of own future. Furthermore, the understanding about financial terminology and the ability to understand the market alone do not pay the bills, neither today nor at retirement - there must be some reserves to ensure sustainability.

This study has its limits, as the quantitative research methods were used there is a lack of specific suggestions for promoting personal financial education, including students' visions - needs. That highlights the need to continue the research with qualitative methods - interviews.

References

Altintas, K. M. (2011). The dynamics of financial literacy within the framework of personal finance: An analysis among Turkish University Students. *African Journal of Business Management*, *5*(26), 10483 - 10491.

Atkinson, A., McKay, S., Kempson, E., & Collard, S. (2006). *Levels of financial capability in the UK: Results of a baseline survey* (Vol. 150): University of Bristol: Personal Finance Research Centre.

Atkinson, A., & Messy, F. (2012). Measuring financial literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot study. OECD Working Papers on Finance, Insurance and Private Pensions, No 15, OECD Publishing, Paris.

Bucher-Koenen, T., & Lusardi, A. (2011). Financial literacy and retirement planning in Germany. *Journal of Pension Economics and Finance*, *10*(4), 565-584.Available at: https://doi.org/10.1017/S1474747211000485.

Bucher-Koenen, T., Lusardi, A., Alesi, R., & Van Rooij, M. (2017). How financially literate are women? An overview and new insights. *Journal of Consumer Affairs*, *Wiley Blackwell*, *51*(2), 255-283.Available at: https://doi.org/10.3386/w20793.

Chen, H., & Volpe, R. P. (1998). An analysis of personal financial literacy among college students. *Financial Services Review*, *7*(2), 107-128.Available at: https://doi.org/10.1016/S1057-0810(99)80006-7.

Chen, H., & Volpe, R. P. (2002). Gender differences in personal financial literacy among college students. *Financial Services Review*, *11*(3), 289-307.

Cole, S. A., Paulson, A. L., & Shastry, G. K. (2012). Smart Money: The effect of education on financial behavior. Harvard Business School Finance Working Paper No. 09-071.

FactsMaps. (n.d). PISA 2015 Worldwide ranking – average score of math, science and reading. Retrieced from: http://factsmaps.com/pisa-worldwide-ranking-average-score-of-math-science-reading/.

Fonseca, R., Mullen, K., Zamarro, G., & Zissimopoulos, J. (2012). What explains the gender gap in financial literacy? The role of household decision-making. *The Journal of Consumer Affairs*, *46*(1), 90–106.

Goldsmith, E. B., & Goldsmith, R. E. (1997). Gender differences in perceived and real knowledge of financial investments. *Psychological Report*, *80*, 236-238.Available at: https://doi.org/10.2466/pr0.1997.80.1.236.

Goldsmith, E. B., & Goldsmith, R. E. (2006). The effects of investment education on gender differences in financial knowledge. *Journal of Personal Finance*, *5*(2), 55-69.

Kalmi, P., & Ruuskanen, O. P. (2018). Financial literacy and retirement planning in Finland. *Journal of Pension Economics and Finance*, *17*(3), 335-362.Available at: https://doi.org/10.1017/S1474747217000270.

Lusardi, A., & Mitchell, O. S. (2006). Financial literacy and planning: Implications for retirement wellbeing. Working Paper, Pension Research Council, Wharton School, University of Pennsylvania.

Lusardi, A., & Tufano, P. (2009). Debt literacy, financial experiences, and over indebtedness. NBER Working Paper, No 14808.

Lusardi, A., Mitchell, O. S., & Curto, V. (2010). Financial literacy among the young. *Journal of Consumer Affairs*, *Wiley Blackwell*, *44*, 358–380.Available at: https://doi.org/10.1111/j.1745-6606.2010.01173.x.

Lusardi, A., & Mitchell, O. S. (2011). Financial literacy and planning: Implications for retirement wellbeing. National Bureau Of Economic Research, Working Paper No 17078.

Lusardi, A. (2017). Lusardi on financial literacy levels: "We need robust interventions". House of Finance, Stocholm. Retrieved from: https://www.hhs.se/en/houseoffinance/research/featured-topics/2017/lusardi-on-financial-literacy-levels-we-need-robust-interventions/.

Lusardi, A. (2019). Financial literacy and the need for financial education: evidence and implications. *Swiss Journal of Economics and Statistics*, *155*(1), 1.

Mandell, L. (2008). The financial literacy of young american adults. Results of the 2008 National JumpStart Coalition Survey of High School Seniors and College Students. JumpStart Coalition for Personal Financial Literacy, Washington DC. Retrieved from: https://www.stockmarketgame.org/assets/pdf/2008%20JumpStart%20Financial%20Literacy%20Survey.pdf.

Mändmaa, S. (2019a). Financial literacy – what and why should we improve. *Eurasian Journal of Social Sciences*, *7*(2), 12-28.Available at: https://doi.org/10.15604/ejss.2019.07.02.002.

Mändmaa, S. (2019b). Analyzing the factors influencing university students' financial literacy. *International Journal for Innovation Education and Research*, *7*(7), 465-497.Available at: https://doi.org/10.31686/ijier.Vol7.Iss7.1628.

Mändmaa, S. (2020a). Empirical study on personal financial literacy of university students for develop the financial education. *International Journal of Business and Applied Social Science*, *6*(6), 8-25.Available at: https://doi.org/10.33642/ijbass.v6n6p2.

Mändmaa, S. (2020b). Personal financial literacy among university students studying engineering. *International Journal for Innovation Education and Research*, *8*(8), 669-692.Available at: https://doi.org/10.31686/ijier.vol8.iss8.2575.

Monticone, C. (2010). How much does wealth matter in the acquisition of financial literacy? *Journal of Consumer Affairs*, *44*(2), 403 - 422.Available at: https://doi.org/10.1111/j.1745-6606.2010.01175.x.

OECD. (2006). Improving financial literacy: Analysis of issues and policies. Financial Market Trends 2005/2,111-123. Retrieved from: https://dx.doi.org/10.1787/fmt-v2005-art11-en.

OECD. (2014). PISA 2012 results: Students and money: Financial Literacy Skills for the 21st Century (Vol. 6). Paris: PISA, OECD Publishing.

Pires, V., & Quelhas, A. P. (2015). Financial literacy among the higher education students: Empirical Evidence for the portuguese case. *Portuguese Journal of Finance, Management and Accounting*, *1*(1), 84-103.Available at: http://u3isjournal.isvouga.pt/index.php/PJFMA.

Reed, M. (2008). Report student debt and the class of 2007. The project on student debt. Retrieved from: http://ticas.org/sites/default/files/pub_files/classof2007.pdf. [Accessed 20 November 2012].

Appendix Mean percentages of correct responses by gender, and the results of ANOVA.

	Level of Personal Financial Literacy									
Brief description of the questions	**Low**			**Medium**			**High**			**Total**
	Below 60%			**60-79%**			**Over 80%**			**%**
	M	**F**	**F test**	**M**	**F**	**F test**	**M**	**F**	**F test**	
I General Personal finance knowledge										
1. Personal financial literacy				73.9	70.0	0.983				72.4
2. Asset liquidity	41.1	48.6	2.895							44
3. Definition of inflation				71.8	77.1	1.904				73.9
4. Time value of money							79.4	83.3	1.250	81
5. Interest paid on loan							95.7	96.2	0.076	95.9
6. Legal requirement for apartment lease				66.9	70.0	0.574				68.1
7. Change in the purchasing power of money	59.5	50.9	3.811*							56.2
8. Discount valuation							97.8	96.7	0.705	97.4
Mean correct responses for the I section				72.7	73.5	0.332				73
II Saving, borrowing, insurance and investments										
9. Appropriate saving place				76.1	76.7	0,025				76.3
10. Calculation of interest plus principle							89.3	90.5	0.203	89.7
11. Compound interest				65.3	66.7	0.100				65.9
12. Purchasing power assessment							83.1	88.6	3.016	85.3
13. Monthly payments of mortgage				68.1	70.5	0.337				69
14. Interest of loan	53.4	56.7	0.557							54.7
15. Loan co-sing consequences				59.5	66.2	2.425				62.1
16. The interest rate evaluation							89.0	91.0	0.551	89.7
17. Understanding the content of insurance	35.6	38.6	0.489							36.7
18. Homeowners' insurance	33.1	43.3	5.737*							37.1

19. Revenue of different Interest calculation	46.9	49.5	0.343					47.9
20. Diversification				78.5	80.9	0.459		79.5
21. Risk and return							81.9 84.8 0.739	83
22. Interest rates changes and treasury bond price	15.3	22.9	4.860*					18.3
Mean correct responses for the II section				62.5	66.2	5.243*		63.9
Mean correct responses for the entire survey				66.5	69.1	3.683*		67.5
Median correct responses for the entire survey								69.6

Notes: "M" - the average scores of male participants; "F" - the average scores of female participants.
F test - value of F-Statistic; * significant at the 0.05 level.
Source: Author's own preparation based on Estonian university students' financial literacy study, published by Mändmaa… (2020b)).

Publication V

Mändmaa, S.

Financial education from the perspective of university students: comparative study

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Eurasian Journal of Social Sciences
Vol. 9(3), pp. 150-175, 2021

Eurasian Journal of Social Sciences, 9(3), 2021, 150-175
DOI: 10.15604/ejss.2021.09.03.003

EURASIAN JOURNAL OF SOCIAL SCIENCES

www.eurasianpublications.com

FINANCIAL EDUCATION FROM THE PERSPECTIVE OF UNIVERSITY STUDENTS: COMPARATIVE STUDY

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Received: July 28, 2021 Accepted: September 22, 2021

Abstract

The importance of financial literacy has rapidly increased in the last decades. The critical need for sustainable financial decisions is driven by changes in the economy. The goal of this study was to find out how the university students rate their acquired financial knowledge and knowledge providers, with the purpose to find solutions for promoting personal financial education to promote financial literacy. The study used Explanatory sequential mixed methods design, in which a quantitative part of study was conducted among 1110 participants, followed by a qualitative part with a sample of 22 students. Students at universities of technology from two neighboring countries, Estonia, and Finland, participated in the survey. The data were collected in a quantitative part through a questionnaire survey and in a qualitative part during three focus groups. Based on the results of the quantitative survey, questions and participants were purposefully selected for the qualitative phase in order to explain the content of the quantitative results. The results showed that students' interest to improve their financial literacy was high. The assessments revealed that most important financial knowledge provider was the family, and the university came next. The obstacle that was most mentioned in the pursuit of pre-university education, was a lack of interest in obtaining financial knowledge, which was largely due to boring teachers and learning material. The article presents students' assessments, opinions, and suggestions, and contributes to the literature on Mixed Methods Research (MMR) by describing the procedure how the solutions to the research problem was found.

Keywords: Personal Financial Literacy, Financial Education, Higher Education Students, Gender Differences, Mixed Methods Research (MMR)

1. Introduction

The importance of financial literacy has rapidly increased in the last decades. The critical need for sustainable financial decisions is driven by changes in the economy – globalization with the abundance of goods and services, changes in financial markets, innovation in the financial sector, etc., but also by the ageing process of the population, which in turn increases the obligations on individuals and their financial responsibility. Financial literacy is an essential life skill, which could improve financial welfare at all life-stages (OECD, 2014). If people do not have sufficient knowledge for making financial decisions, there can be consequences for the individuals themselves and for the economy as a whole (Lusardi *et al*. 2010). Huston (2010) marked that

increasing consumer financial literacy is a public policy objective to improve welfare through better decision making.

According to OECD (2014, p. 33) definition, “Financial literacy is knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life."

Researchers have examined the financial literacy and practice of various components of society and found out that financial knowledge needs improvement. For improvement of financial literacy it is essential to enhance personal financial education. “Financial education is the process by which financial consumers/investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become aware of (financial) risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being and protection“ (OECD, 2006, p. 118).

While financial literacy and financial education are defined in a number of ways, this study is based on the above-mentioned OECD definitions, which have been the basis for a number of international studies, as well as financial literacy studies of Estonian and Finnish students in 2015/2016.

Finns and Estonians are two relative nations with different late history. Their languages are closely related to Karelian and more remotely to the Sami and Hungarian, but are not related to their nearest geographical neighbors, Swedish, Latvian, and Russian, which are all Indo-European languages. Throughout history, Finland, like Estonia, has been part of the Kingdom of Sweden and the Russian Empire, but Finland became a presidential republic in 1917 and their (Finnish) democracy did not experience any Soviet coup attempts. Estonia has been a part of the socialist planning economy for nearly 50 years and then has developed a market economy for 30 years. Finland, on the other hand, has been a market economy country all along. This study compares these two countries in purpose to find whether there occur specific differences in students’ financial literacy that could be explained by differences in historical background.

Earlier surveys in Estonia and Finland have shown the need to improve the university students' financial knowledge (Mändmaa, 2020a, 2020b, 2021), but there were few specific suggestions for promoting personal financial education and a lack of the overview about proposals, visions and needs of the students themselves.

The results of studies in the United States and Australia highlighted the importance of teacher training in teaching personal financial education (Asarta *et al.* 2014; Blue *et al.* 2014). The researchers in New Zealand (Cameron *et al.* 2014) pointed out that financial literacy education beginning at the high school level may be the key to improving financial decision-making in the population.

The goal of this study was to find out how the university students rate their acquired financial knowledge and knowledge providers, with the purpose to find solutions for promoting personal financial education to promote financial literacy.

Current study uses Mixed Methods Research (MMR) design, which is the combination of quantitative and qualitative approaches that provide a better understanding of a research problem than either approach could alone (Creswell and Plano Clark, 2006; Creswell, 2014). The numeric data collected were analyzed by quantitative methods and further explained by using qualitative methods.

The results of this study showed that university students’ interest to improve their financial literacy is high. The most important financial knowledge provider was the family, and the university came next. The obstacle most mentioned by students in the pursuit of lower education levels, i.e., pre-university education, was a lack of interest in obtaining financial knowledge, which was largely due to boring teachers and learning material. The students' assessments and opinions with examples gathered in the research are presented in more detail in the Results section. The paper is organized as follows. Section 2 describes the methodology and the used data. Section 3 presents the obtained results; Section 4 discuss about findings and Section 5 concludes the paper.

2. Methodology

Based on previous studies and the assessments of students who participated in the quantitative part of this study, a simple Conceptual Model (Figure 1) about provision of financial knowledge has been developed. This Model shows the order of importance created on the basis of students' assessments, where the most important or number one (No 1) provider of financial knowledge is the family. However, the well-being and sustainability of the family (and not only) will be directly affected by the students' financial literacy.

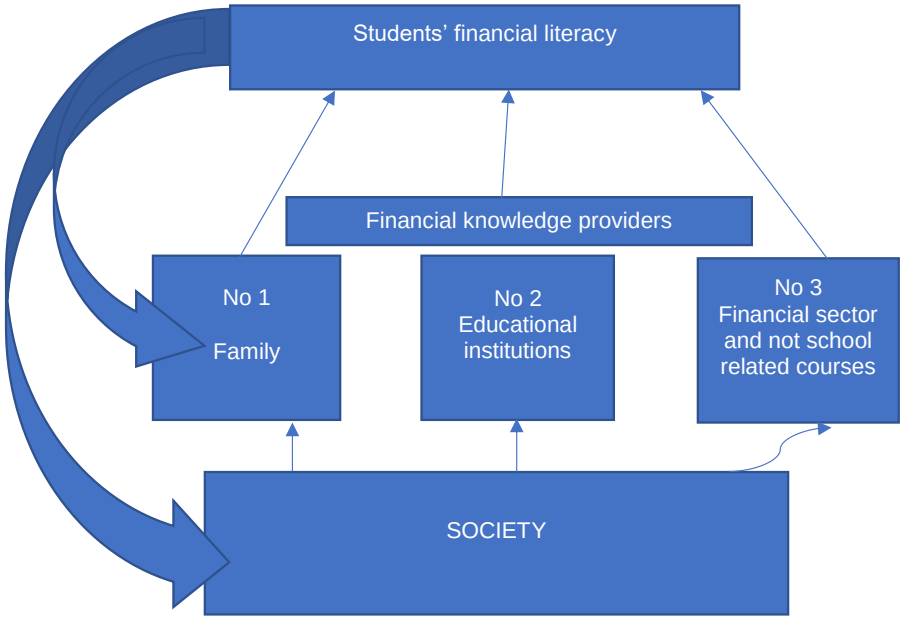

Figure 1. Conceptual model
Source: Author's own preparation

The research questions, for the first quantitative phase of this study, were:

- Do the students have an interest to improve their Financial Literacy?
- Are there any differences between evaluated and self-assessed financial literacy levels?
- Are there any differences in ratings between financial knowledge providers?

The guiding research questions, for the second qualitative phase, were:

- How can the statistical results obtained in the quantitative phase be explained?
- How could financial education improve the financial literacy?

The sub-questions to perform Phase II of the study were formulated on the basis of the results of the first, quantitative phase of the study and are presented in the Methodology of this article (Table 1).

2.1. Research design

The present study uses Mixed Methods Research (MMR) design, which is a procedure for collecting, analyzing, and "mixing" both quantitative and qualitative data at some stage of the research process within a single study, for understanding a research problem more completely (Creswell and Plano Clark, 2006; Creswell, 2014).

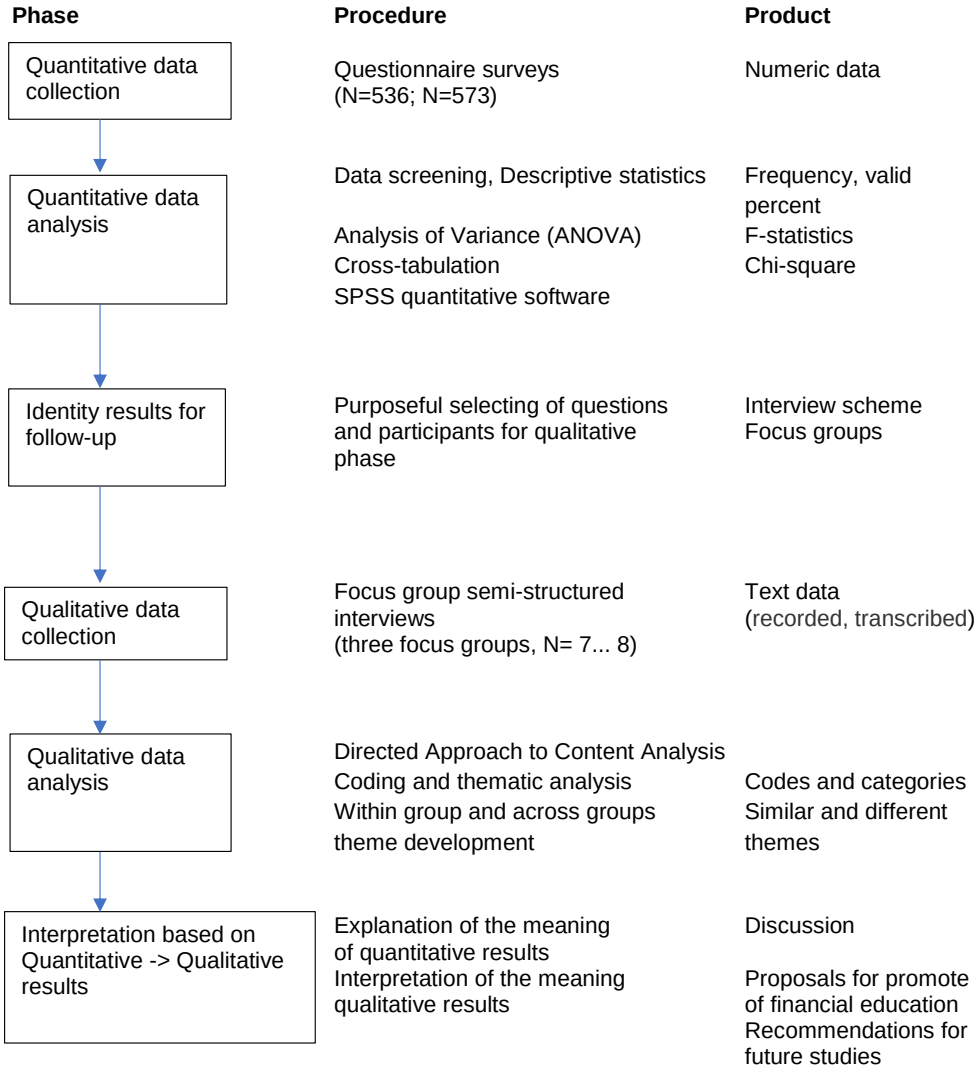

Figure 2. Visual model for mixed methods procedures (sequential explanatory mixed methods design)
Source: Composed by the author

In a mixed methods approach, the researchers are using pragmatic grounds (Maxcy, 2003) and are asserting that truth cannot be purely calculated but is rather “what works” in reality (Howe, 1988). "Pragmatism is a philosophical movement that includes those who claim that an ideology or proposition is true if it works satisfactorily, that the meaning of a proposition is to be found in the practical consequences of accepting it, and that unpractical ideas are to be rejected.” (IEP, n.d.) By the words of Creswell (2014), for the mixed methods researcher, pragmatism opens the door to multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis.

“Mixed methods involve combining or integration of qualitative and quantitative research and data in a research study. Qualitative data tends to be open-ended without predetermined responses while quantitative data usually includes closed-ended responses such as found on questionnaires or psychological instruments.” (Creswell, 2014, p. 43) Although many designs exist in the mixed methods field, this research focuses on the Explanatory sequential mixed methods design, as it is one of the most popular mixed methods designs in educational research (Creswell *et al.* 2003; Creswell, 2014).

The explanatory sequential mixed methods design involves a two-phase project in which the researcher collects quantitative data in the first phase, analyzes the results, and then uses the results to plan the second, qualitative phase. The quantitative results typically inform the types of participants to be purposefully selected for the qualitative phase and the types of questions that will be asked (Creswell, 2014). The purpose to use the explanatory sequential mixed methods design in the current study is that the qualitative results to assist in explaining and interpreting the findings of a quantitative study. Figure 2 presents “Visual Model for Mixed Methods Procedures” that illustrate the research strategy.

2.2. Quantitative phase

Quantitative research is used to quantify behaviors, opinions, attitudes, and other variables. Quantitative research focuses on quantifying the collection and analysis of data, which can be used to find trends or averages, test causal relationships, make predictions, and generalize results to wider populations.

Survey is a method that is appropriate for use in quantitative research for gathering data. It is a good choice to find out about the characteristics, preferences, opinions, or beliefs of a group of people (Hirsijärvi and Huttunen, 2005).

A questionnaire is a research instrument consisting of a set of questions intended to capture responses from respondents in a standardized manner, while questions may be unstructured or structured. Structured questions ask respondents to select an answer from a given set of choices (Bhattacherjee, 2012).

One type of survey is a group-administered questionnaire where a sample of respondents is brought together at a commonplace and time, and each respondent is asked to complete the survey questionnaire while in that room. This format assures the high responses rate and although the respondents enter their responses independently, there remains a possibility to ask clarification if any specific question is not understandable (Bhattacherjee, 2012). The above-mentioned survey type was in use on data collection of the current study.

The first, quantitative phase of the study, focused on participants' interest to have additional knowledge, and to the students' ratings about own personal financial knowledge and sources of personal financial education. The data were collected by the questioning survey method to gather standardized information to be analyzed statistically about as many students as possible. In the current study, 10 questions from the questionnaire of University students' financial literacy survey were used and analyzed. For the data collection, structured multiple-choice questions including 7 questions on students’ education and other demographic information were used to characterize the sample and to analyze students' opinions. For the assessment of personal finance knowledge and knowledge providers, the rating scales from 1 to 5 were used. A similar technique (five-point scale) was used by Chen and Volpe (2002) and Mändmaa (2019b, 2020a). For comparability with financial literacy levels, students’ own knowledge rankings were converted to values: Low (1 and 2), Medium (3), High (4 and 5).

The validity and clarity of the survey was previously evaluated by a group of master level students and by three experts knowledgeable in personal finance topics. The polls were conducted during the lectures in the paper form as that supported the increase of participant number. The respondents answered anonymously, therefore they did not have to worry about confidentiality and their answers could be more reliable.

The Analysis of Variance (ANOVA), Cross-tabulations and Chi-Square tests were used to provide evidence of the differences. The collected data were analyzed using the software Statistical Package for the Social Sciences (SPSS).

2.3. Qualitative phase

The origin for the qualitative study is the description of real life. Qualitative study seeks first and foremost to find and present facts to the public, rather than to prove already existing (truth) claims (Hirsijärvi *et al.* 2005).

Traditionally, focus group research is "a way of collecting qualitative data, which involves engaging a small number of people in an informal group discussion (or discussions), 'focused' around a particular topic or set of issues" (Wilkinson, 2004, p. 177). Grönfors (1982) have acknowledged that interviewees feel more relaxed and that their talk is more reliable when several people are present. A focus group interview is a conversational group interview conducted according to a structured survey plan, which has a definite, rather narrow focus on the topic and the goal of achieving mutual stimulation from the informants participating in the conversation. The focus group is led by a moderator, whose task is to keep the conversation within specific time and topic frames and to create and maintain an atmosphere free from social pressure (Vihalemm, 2014). Social science researchers in general rely on focus groups to collect data from multiple individuals simultaneously. Focus groups are less threatening to many research participants, and what occurs in this environment is helpful for participants to discuss perceptions, ideas, opinions, and thoughts (Krueger and Casey, 2015). The interactions among the participants can yield important data (Morgan, 1997), and can provide a setting where the participants can discuss personal problems and provide possible solutions (Duggleby, 2005).

Well-designed focus groups usually last between 1 and 2 hours and are composed of 5 to 8 people, but the size can range from 6 to 12 participants (4 to 12 by Krueger and Casey, 2015). The rationale for the range of focus group size stems from the goal that focus groups should include enough participants to yield diversity in the information provided, yet they should not include too many participants because large groups could make the sharing of personal thoughts, opinions, and beliefs uncomfortable (Krueger and Casey, 2015; Onwuegbuzie *et al.* 2009; Vaughn *et al.* 1996). The number of times a focus group meets can vary from a single meeting to multiple meetings. Likewise, the number of different focus groups can vary. However, using multiple focus groups allows the researcher to assess the extent to saturation (Flick, 2009; Onwuegbuzie *et al.* 2009). Krueger (1994) and Morgan (1997) have suggested that three to six different focus groups are adequate to reach data saturation and/or theoretical saturation, with each group meeting once or multiple times. Focus groups can be formed by using pre-existing groups (e.g., colleagues at a place of work) also (Onwuegbuzie *et al.* 2009).

To collect answers (i.e., data) in the present study's qualitative phase, the unstandardized focus group interviewing technique (method) was chosen. To reach saturation, three different focus groups were used, while each group met once. Focus groups were formed on the bases of university students who participated in the quantitative phase (i.e., survey) and the size of groups was 7 to 8 participants. The focus group meetings (i.e., group interviews) took place in the spring semester 2016 and interviews lasted an average for two hours. The interviews were semi-structured, conducted according to the survey plan (Table 1) and were led by a moderator. To create a comfortable atmosphere and interaction, the moderator was a third-year bachelor student in economics.

The directed approach of content analysis was chosen to analyze the collected qualitative data. Researchers regard content analysis as a flexible method for analyzing text data (Cavanagh, 1997). The goal of the content analysis is "to provide knowledge and understanding of the phenomenon under study" (Downe-Wamboldt, 1992, p. 314). According to Hsieh and

Shannon (2005), the qualitative content analysis is defined as a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns.

Table 1. Semi-structured interview guide

No	Question
	Research question:
I	How can the statistical results obtained in the quantitative phase be explained?
	Sub-questions:
1.	How do students evaluate their financial knowledge
2.	Would their financial skills - knowledge (about budgeting/ saving / borrowing / investing etc.) need to be improved?
3.	Where does students' knowledge come from (family/ basic school/ upper secondary school/ university etc.)?
4.	What did they learn from knowledge providers and what could have been different?
	Research question:
II	How could financial education be improved?
	Sub-questions:
5.	Should borrowing be taught?
6.	Should saving be taught?
7.	Should budgeting be taught - how to create and maintain a budget?
8.	Should the happenings in financial markets be taught?
9.	Should investing be taught?
10.	Should the assessment of the financial condition and value of a company be taught?
11.	Summary:
	a) When and who should teach? At what age?
	b) How should be taught? Should it be a special subject - Personal finance?
	c) What knowledge would be needed (Interests)?

Source: Composed by the author

Content analysis is a widely used qualitative research technique with three distinct approaches - conventional, directed, and summative. All three are used to interpret meaning from the content of text data, but there are differences among the approaches in coding schemes, origins of codes, and threats to trust worthiness. With a directed approach, analysis starts with a theory or relevant research findings as guidance for initial codes (Hsieh and Shannon, 2005).

Hsieh and Shannon (2005) recommended using a directed approach to the content analysis if an existing theory or prior research about a phenomenon is incomplete or needs further description. By Potter and Levine-Donnerstein (1999), this might be categorized as a deductive use of theory based on their distinctions on the role of the theory.

The goal of a directed approach in the content analysis is to validate or extend conceptually a theoretical framework or theory while existing theory or research can help focus the research question and help to determine the initial coding scheme or relationships between codes (Hsieh and Shannon, 2005). Using existing theory or prior research, researchers begin by identifying key concepts or variables as initial coding categories (Potter and Levine-Donnerstein, 1999). The theory or prior research used will guide the discussion of findings. The main strength of a directed approach in the content analysis is that an existing theory can be supported and extended (Hsieh and Shannon, 2005).

As the results of previous studies on the acquisition of students' financial knowledge were insufficient, further descriptions were needed. Data were collected through focus groups interviews and were analyzed by using a Directed Approach in the Content Analysis. All interviews were recorded and transcribed.

Following the recommendations of Hsieh and Shannon (2005) and Laherand (2008), coding was started with predefined codes. The initial coding scheme was found from the basic concepts of previous research and as a continuation, a coding legend was created. For each

focus group member, an own code was created as well, which included information about the participant's education (academic discipline, level of study), gender and age. During the coding of the text, important and emphasized thematic concepts were identified and grouped into categories based on similarity. The main purpose of coding is to break down the text and understand it, to develop categories and to put them in an orderly system as the study progresses (Laherand, 2008).

The guiding research questions for the qualitative phase with the categories and sub-categories created to aggregate the answers are presented in Table 2.

Table 2. Coding scheme - **The guiding research questions and categories**

No	Questions and categories
I	How can the statistical results obtained in the quantitative phase be explained?
	The assessment of acquired financial knowledge from:
1.	Family
2.	Basic school
3.	Upper secondary school
4.	University
II	How could financial education be improved?
1.	1.Topics
2.	2.Teaching process - tips and hints

Source: Composed by the author

The categories and codes were used to create two informative organized tables, the first focusing on the origin of students' financial knowledge - was that knowledge important?, what and how did they learn?, what could have been differently?, and the second on students' interest in improving their knowledge - who should teach?, what should be taught? and when?. In addition to the coded text, the most substantive citations were presented in the tables, which both describe and refine the codes, thus creating a whole. Two separate tables were compiled for each focus group, the first contains the coded and categorized answers to the first four questions in a Semi-structured interview guide (Table 1) and the second contains the coded information about students' answers to questions 5 to 11 (Table 1). These tables and the results of prior research were guiding the discussion about findings and helping prepare conclusions. Due to the limited volume of the article, these tables, and the coding legend were not included to the article, but these are available from the author upon request.

2.4. Sample

2.4.1. Quantitative

The sample used in the quantitative phase of this study was composed of students enrolled at technological universities. The selection of universities was based on convenience driven by readiness for cooperation.

Purposive sampling was used, where the main criterion for the selection of respondents was the study in mathematics-based academic discipline (Engineering Science, Economics, Business) in university. Purposive sampling is a non-probability sampling method where the researcher chooses the participants as per own judgment, keeping back in mind the purpose of the study (Showkat and Parveen, 2017). Non-probability sampling technique uses non-randomized methods to draw the sample, and that sample is used to study existing theoretical insights or developing new ones.

The sample size was planned to be 1000-1200 students, more precisely 500-600 respondents from both participate countries. The size of the sample used to evaluate students' financial literacy and to gather their estimates about the financial knowledge acquired, was 1110 students. There were participants from two different countries. 574 (426 male and 148 female) students were participating from two Finnish universities: 321 (250 male and 71 female) students from Tampere University of Technology and 253 (176 male and 77 female) students from Lappeenranta University of Technology. From Estonia, the number of survey participants was

536 (326 male and 210 female students) and all of them were students in Tallinn University of Technology. The characteristics of the sample are presented in Table 3.

Table 3. Characteristics of the Sample

Characteristics	Estonian sample		Finnish sample	
	Frequency	%	Frequency	%
Total amount of observations	536	100	574	100
A. Education				
1. Academic discipline				
a) Engineering	447	82.5	463	80.7
b) Other*	89	17.5	111	19.3
2. Level of education				
a) Bachelor studies	177	33.0	516	89.9
b) Master studies	95	17.8	49	8.5
c) Other**	264	49.2	9	1.6
B. Experience				
1. Age groups				
a) 18-22	340	63.4	465	81.0
b) 23-29	157	29.3	81	14.1
c) 30 and up	39	7.3	28	4.9
2. The work experience				
a) None	171	31.9	47	8.3
b) Less than 2 years	207	38.6	317	55.2
c) 2 to 5 years	83	15.5	161	28.0
d) More than 5 years	66	12.3	49	8.5
e) Unanswered	9	1.7	0	0
C. Demographic characteristics				
1. Nationality				
a) Finnish/ Non-Estonian	91	17.0	573	99.8
b) Other/ Estonian	445	83.0	1	0.2
2. Gender				
a) Male	326	60.8	426	73.9
b) Female	210	39.2	148	25.8
3. Household size				
a) Live alone	156	29.1	335	58.4
b) Live with husband/ wife	100	18.7	115	20.0
c) Live with husband/ wife and children	40	7.5	14	2.4
d) Live with parents/ grandparents	190	35.4	27	4.7
e) Other	50	9.3	83	14.5

Note: Other* including Economic and Business, Info technology, and Mathematics; Other** including Integrated Bachelor's and Master's Study, and Unanswered.

Source: Composed by the author

2.4.2. Qualitative

For the data collection in the study qualitative phase, the focus group method was used. Based on the principles of the strategic sample (Trost, 1986; Laherand, 2008), the subjects were selected according to a combination of homogeneous and heterogeneous characteristics. In this qualitative phase of research, which looked at students' opinions in relation to the acquisition of

financial knowledge, the aim was to differentiate the sample by students' field of study (which was the heterogeneous feature of the sample), while previous experiences were relatively similar, i.e., all students had exposure to financial knowledge and participated in a university financial literacy survey (these were homogeneous features of the sample).

Onwuegbuzie *et al.* (2009) recommend researchers to use the multiple focus groups to assess if the themes that emerged from one group also emerged from other groups. Doing so would assist the researcher in reaching data saturation and/or theoretical saturation. To reach saturation, three different focus groups from different study fields (Civil Engineering, Business/Economics, International studies) were used. The selection of focus groups was based on the findings of the quantitative part of this study and the results of previous studies (Chen and Volpe, 2002; Mandell, 2008; Mändmaa 2020a, 2020b, 2021), taking into account differences in students' financial literacy levels between different academic disciplines, and in addition, among different nationalities. The size of groups was 7 to 8 students. The amount of groups was between 3 and 6, and the number of participants 6 to 12, had been recommended by multiple scientists earlier (see in part 3.1). In focus groups, there were all-together 22 participants of them 10 male and 12 female students, aged from 18 to 30.

3. Results

3.1. Quantitative part

This section presents the results of the quantitative analysis. The data were collected from students enrolled at universities of technology in Estonia and Finland during a questionnaire survey in 2015-2016. The questions concerned students' interest to improve financial literacy, their self-assessment about financial knowledge, and assessments to the financial knowledge providers. Students' responses were analyzed by financial literacy levels and gender using the software Statistical Package for the Social Sciences (SPSS). Students' financial literacy levels used in the analysis were published earlier (papers by Mändmaa, 2020a, 2020b, 2021) and have been used in the current study with permission of the author.

Consistent with the existing literature (Chen and Volpe, 1998; Mändmaa 2019a, 2019b, 2020a, 2020b, 2021), the mean percentage of correct answers was grouped into three categories: High level (more than 80%); Medium level (60% to 79%), and Low level (below 60%). The financial literacy of participated students was at Medium level - an average score of correct answers among Estonians was 68% and among Finns 74%, whereas female students answered 69% and 72% of questions correctly, respectively, and male students 67% and 74% of the questions, respectively (Mändmaa, 2021).

3.1.1. The students' interest to improve their financial literacy

The following subsection describes the results of the quantitative part of the current study to respond to the first guiding research question. The question "Does your financial literacy need improvement?" 82% of Estonian (Table 4) and 87% of Finnish (Table 4) respondents answered "yes". Estonian female students had remarkably (16%) lower interest in financial literacy improvement than Finnish female students, but the male students' interest was on a similar level. Table 4 summarizes the opinions relating to the interest about additional financial knowledge by gender.

In earlier studies (Goldsmith and Goldsmith, 1997; Chen and Volpe, 2002; Mändmaa, 2020b), several researchers suggested that financial literacy tends to be affected by interest about financial topics. Table 5 shows differences in students' financial literacy levels in case of differing opinions about the need to improve the financial knowledge. Statistically significant results show that the interest of Estonian students increased with financial literacy, but Finnish students with the higher financial literacy score were not interested in improving financial literacy. That could be interpreted as Finnish male students' higher confidence, as the answer "No" came mostly from male students (Table 4).

Table 4. Students' opinions about the need of financial literacy improvement

1. Estonian students	**Yes**	**No**	**Unanswered**	**Total**
Male	274	21	31	326
	84.1%	6.4%	9.5%	100%
Female	166	22	22	210
	79.0%	10.5%	10.5%	100%
Total	440	43	53	536
	82.1%	8.0%	9.9%	100%
2. Finnish students	**Yes**	**No**	**Unanswered**	**Total**
Male	361	57	8	426
	84.7%	13.4%	1.9%	100%
Female	140	5	3	148
	94.6%	3.4%	2.0%	100%
Total	501	62	11	574
	87.3%	10.8%	1.9%	100%

Note: For Estonian students; Chi-square = 3.101, significant at the 0.212 level. For Finnish students; Chi-square = 11.407, significant at the 0.003 level.

Source: Composed by the author

The differences in the answers of Finnish and Estonian students could be explained by the differences between the two countries in recent history, which has also been reflected in the results of previous studies (Bucher-Koenen and Lusardi, 2011; Bucher-Koenen *et al.* 2017; Mändmaa, 2021).

Table 5. Differences in financial literacy levels in case of differing opinions about the need to improve the financial knowledge

Students' opinions	**Estonian students**		**Finnish students**	
Does your financial literacy level need improvement?	Count	FL level	Count	FL level
Yes	440	68.4%	501	73.6%
No	43	64.4%	62	74.4%
Unanswered	53	62.4%	11	63.2%
Total	536	67.5%	574	73.5%

Note: FL - Financial literacy

Source: Composed by the author

3.1.2. Differences between levels of evaluated and self-assessed financial literacy

The following subsection describes the results of the quantitative part to respond to the second guiding research question of the current study. Table 6 gives a descriptive overview about the relation between students' self-assessment by gender. Estonian female students rated their financial literacy higher than male students, as 46% of females and 39% of male students rated their knowledge at high level (Table 6).

Self-assessment among Finnish students shows the opposite results, as 64% of male students rated their financial literacy at High level while only 47% of female students marked the same rating (Table 6). This result can again be interpreted as a sign of self-confidence of Finnish male students.

Table 6. Participants' evaluation of their financial knowledge

1. Evaluate your level of financial knowledge (Estonian students' answers)	**Hard to say**	**Low**	**Medium**	**High**	**Total**
Male	32	29	137	128	326
Weights (responses of male students')	9.8%	8.9%	42.0%	39.3%	100%
Female	23	16	74	97	210
Weights (responses of female students')	11.0%	7.6%	35.2%	46.2%	100%
Total	55	45	211	225	536
Weights (responses of male students')	10.3%	8.4%	39.3%	42.0%	100%
2. Evaluate your level of financial knowledge (Finnish students' answers)	**Hard to say**	**Low**	**Medium**	**High**	**Total**
Male	8	28	118	272	426
Weights (responses of male students')	1.9%	6.6%	27.7%	63.8%	100%
Female	3	20	55	70	148
Weights (responses of female students')	2.0%	13.5%	37.2%	47.3%	100%
Total	11	48	173	342	574
Weights (responses of male students')	1.9%	8.4%	30.1%	59.6%	100%

Note: For the first question; Chi-square = 3.363, significant at the 0.339 level. For the second question; Chi-square = 14.655, significant at the 0.002 level. Low = mean percentage of correct answers below 60%; Medium= 60% to 79%; High= more than 80% of questions.

Source: Composed by the author

Figures 3 and 4 display the comparison of students' self-assessment with rated financial literacy levels. The Cross-tabulations and Chi-Square tests were used, and the results were statistically significant (Estonian: Chi-Square 31.775 sig=0.000 and Finnish: Chi-Square 19.973 sig=0.003).

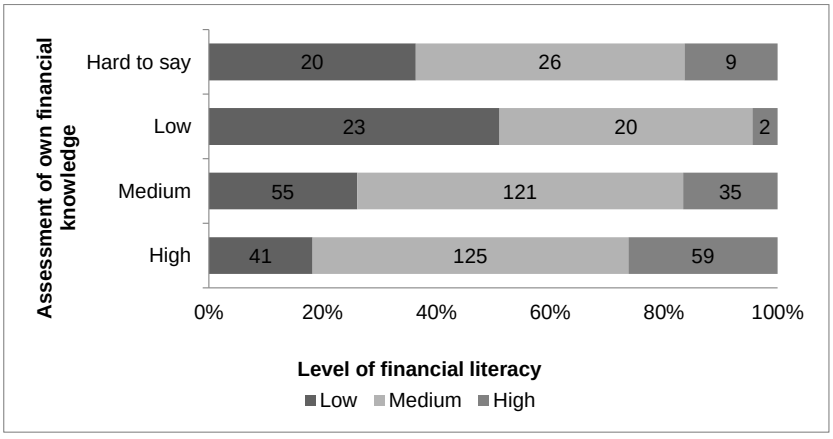

Figure 3. Comparison of Estonian students' self-assessment with the financial literacy study results

Source: Composed by the author based on Mändmaa (2021)

Figure 3 shows the results about Estonian students. The level of own financial literacy was assessed correctly by 203 students, which accounted for 38% of the total number of respondents. 225 students, which is 42% of the respondents, evaluated their financial

knowledge higher of the tested value, and 57 students rated their financial literacy level lower than was the value in the study results.

Figure 4 shows the results about Finnish students. The level of own financial literacy was assessed correctly by 238 students, which accounted for 42% of the total number of respondents. 237 students, which is 41% of the respondents, evaluated their financial knowledge higher of the tested value, and 88 students rated their financial literacy level lower than was the value in the study results.

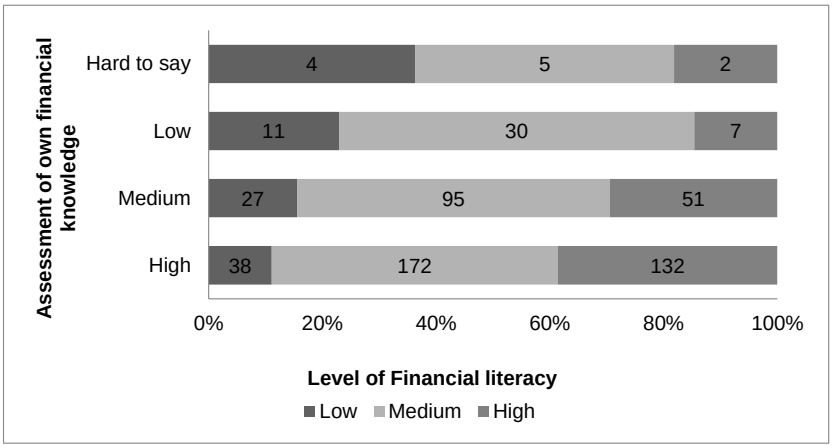

Figure 4. Comparison of Finnish students' self-assessment and the financial literacy study results

Source: Composed by the author based on Mändmaa (2021)

There were no significant differences in the comparison results of students from the two countries. A worrying indicator is an overestimation of students' own knowledge, as the proportion of students who overestimated own level of financial literacy was over 40% in both countries.

3.1.3. Differences in ratings of financial knowledge providers

The following subsection describes the results of the quantitative part in order to respond to the third guiding research question of the current study. Students' assessments of their financial literacy providers are presented in Table 7. Ratings were given on a scale from one to five, where 1 was "Unimportant" and 5 was "Very important". The indicators under position 6 expressed the number of respondents who did not give an assessment (i.e., they selected the answer "Hard to say").

Results show that the most important financial knowledge provider was the family, as the importance was assessed with "5" or "4" by 74% of Estonian and 79% of Finnish students. The next most important financial knowledge provider was the university, as it was evaluated with "5" or "4" by 51% of participants from Estonia and 44% of participants from Finland. Assessment nearly at the same level was given to the Upper Secondary School as knowledge provider (Table 7). By the students' opinions, modest importance as financial knowledge provider was given to the Basic School as well as to the Non-school related courses or financial services providers (Table 7).

ANOVA has been used to detect if participants who gave different ratings to financial knowledge providers have differences in financial literacy levels. The testing results of ANOVA indicated that differences are statistically significant at the 0.05 level. Differences in financial literacy levels were noticeable not only between rating groups or knowledge providers but also in the results of the two countries, which referred to the need to continue the study with more detailed methods to better understand gaps in financial education.

Table 7. Evaluations of sources of financial knowledge

A. Estonian students						
1. Importance of financial knowledge acquired from Basic School (stage I – grades 1-3)	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	318	93	28	16	20	61
% of participants' total number	59.3	17.4	5.2	3.0	3.7	11.4
Mean financial literacy level (%)	68.8	68.8	69.1	71.2	57.6	60.1
F Statistic = 5.744 significant at the 0.000 level						
2. Importance of financial knowledge acquired from Basic School (stage II and III – grades 4–9)	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	128	142	143	51	32	40
% of participants' total number	23.9	26.5	26.7	9.5	6.0	7.5
Mean financial literacy level (%)	69.5	69.0	68.3	66.8	64.0	56.5
F Statistic = 5.583 significant at the 0.000 level						
3. Importance of financial knowledge acquired from Upper Secondary School	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	45	64	124	150	118	35
% of participants' total number	8.4	11.9	23.1	28.0	22.0	6.5
Mean financial literacy level (%)	72.5	71.3	69.0	67.7	64.6	57.8
F Statistic = 6.005 significant at the 0.000 level						
4. Importance of financial knowledge acquired from university	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	53	54	86	111	160	72
% of participants' total number	9.9	10.1	16.0	20.7	29.9	13.4
Mean financial literacy level (%)	68.7	70.0	70.1	69.6	66.3	61.2
F Statistic = 4.072 significant at the 0.001 level						
5. Importance of financial knowledge acquired from not school related courses	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	164	54	64	63	65	126
% of participants' total number	30.6	10.1	11.9	11.8	12.1	23.5
Mean financial literacy level (%)	69.7	68.1	67.3	68.0	70.4	62.7
F Statistic = 3.784 significant at the 0.002 level						
6. Importance of financial knowledge acquired from financial service provider	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	116	75	108	66	57	114
% of participants' total number	21.6	14.0	20.1	12.3	10.6	21.3
Mean financial literacy level (%)	68.6	68.6	70.6	70.0	67.3	61.5
F Statistic = 5.158 significant at the 0.000 level.						
7. Importance of financial knowledge acquired from family, parents	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	10	23	75	133	261	34
% of participants' total number	1.9	4.3	14.0	24.8	48.7	6.3
Mean financial literacy level (%)	68.3	68.4	68.4	70.3	67.4	54.7
F Statistic = 6.062 significant at the 0.000 level						

Table 7. Continued

B. Finnish students						
1. Importance of financial knowledge acquired from Basic School (grades 1–3)	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	316	128	49	7	4	70
% of participants' total number	55.1	22.3	8.5	1.2	0.7	12.2
Mean financial literacy level (%)	73.5	74.6	75.3	77.3	68.2	70.0
F Statistic = 2.383 significant at the 0.037 level						
2. Importance of financial knowledge acquired from Basic School (grades 4–9)	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	104	169	166	79	18	38
% of participants' total number	18.1	29.4	28.9	13.8	3.1	6.6
Mean financial literacy level (%)	72.2	74.7	74.0	75.1	74.5	65.7
F Statistic = 5.288 significant at the 0.000 level.						
3. Importance of financial knowledge acquired from Upper Secondary School	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	47	71	204	166	55	31
% of participants' total number	8.2	12.4	35.5	28.9	9.6	5.4
Mean financial literacy level (%)	71.4	74.8	73.6	74.6	74.6	65.2
F Statistic = 4.715 significant at the 0.000 level						
4. Importance of financial knowledge acquired from University	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	51	65	156	164	85	53
% of participants' total number	8.9	11.3	27.2	28.6	14.8	9.2
Mean financial literacy level (%)	72.0	72.8	74.1	74.8	73.8	69.6
F Statistic = 2.176 significant at the 0.054 level						
5. Importance of financial knowledge acquired from not school related courses	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	149	86	106	72	40	121
% of participants' total number	26.0	15.0	18.5	12.5	7.0	21.1
Mean financial literacy level (%)	73.7	75.4	74.9	75.8	74.8	68.9
F Statistic = 6.164 significant at the 0.000 level						
6. Importance of financial knowledge acquired from financial service provider	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	75	90	118	143	76	72
% of participants' total number	13.1	15.7	20.6	24.9	13.2	12.5
Mean financial literacy level (%)	72.2	75.2	75.1	73.6	74.4	69.0
F Statistic = 3.773 significant at the 0.002 level						
7. Importance of financial knowledge acquired from family, parents	**1**	**2**	**3**	**4**	**5**	**6**
Number of participants	5	22	67	165	286	29
% of participants' total number	0.9	3.8	11.7	28.7	49.8	5.1
Mean financial literacy level (%)	78.2	75.6	74.6	73.7	73.6	66.6
F Statistic = 2.852 significant at the 0.015 level.						

Source: Composed by the author

3.2. Qualitative part

Hsieh and Shannon (2005) argued that sometimes existing prior research is incomplete or would benefit from further description and in this case the qualitative researcher might choose to use a directed approach to the content analysis. Existing research can help focus on the research question and help to determine the initial coding scheme or relationships between codes. Potter

and Levine-Donnerstein (1999) suggested beginning the research by identifying key concepts or variables as initial coding categories.

This section presents the results of the qualitative part of the current study where the directed approach to the content analysis was used, which was based on the existing quantitative study (see 3.1.). The thoughts expressed by the focus group members were analyzed and interpreted on the light of guiding research questions.

In the present study, directed coding was used, where coding was done according to the research questions and the remaining topics were excluded from this research. The coding was performed with predefined codes, i.e., on the basis of a previously prepared coding scheme (Table 2). The assessments and opinions of the three focus groups participating in the study were remarkably similar despite differences in field of study or nationality (country of origin), and as the information occurred so repeatedly, the collecting of more data appeared to have no additional interpretive worth.

To start, all focus groups members had to evaluate their own financial knowledge. The personal financial knowledge was rated on a scale of 1 to 5, where “1” was “Insufficient” and “5” “Excellent”. The largest number of participants, 9 students, assessed their knowledge with the score “3”, followed by 6 students with the score “4”, 4 students admitted that their knowledge was excellent (score “5”) and the rest 3 assessed their knowledge with the score “2”. Although participated students admitted their knowledge as satisfactory or higher, all 22 acknowledged the need to improve their financial literacy, even those who rated own knowledge as very good or excellent. Students expressed the view that: “... always you can improve yourself in something.”; “... how money moves in the stock market, ... how to put money to work, that's what is needed.”.

3.2.1. The explanation of statistical results obtained in the study quantitative phase

The following subsection describes the information gathered during the interviews to answer to the first guiding research question of qualitative part of current study. The description covers four categories (Table 2, 1.-4.) that can be grouped under a common topic: The assessment of acquired financial knowledge from knowledge providers (Was that knowledge important?; What and how did they teach?; What could have been differently?). The number following the letter P refers to the specific student who participated in the focus group.

3.2.1.1. Assessment of acquired financial knowledge from the family

Thoughts expressed by the focus group members revealed that the most valued source of financial knowledge was the family, which is in line with the results of the quantitative survey. The students noted that important explanations were received from parents about both financial terminology and meeting financial needs:

"... I used to watch news and stuff, and I used to ask a lot from my stepdad, like what does this mean, what does that mean ..."(P6);

"... I got a basic from home, that as you want something, go do your own job, go earn your own money, ..." (P19);

"... yes, she /mother/ also directed me to work quite early in the summertime ... well, to earn my pocket money ..." (P20).

The occupational effects of parents or relatives were highlighted. For example:

"My mother works in bank, so I hear through it." (P18);

"... well, my mother is an accountant, and then she deals a lot with that money ... and basically now, in my adult life, I also ask her for advice." (P20);

"... the initial knowledge in principle comes from my parents, because I have a well-enterprising family, ... everyone is developing their business." (P13).

The family has also taught about saving, and investing:

“I was maybe 11 or 12 years old, I have this box, my mom created for me, like this wood box. So, whenever visitors come to our house and give me money or something, she said, oh, ‘go put that in a box, you don't have to spend this, you have to save for something so that's my upbringing ..." (P5);

"My first knowledge definitely came from my parents, who have always, I would say, handled money very well ... and also managed to invest in real estate mostly..." (P11);

“… I think in the sixth grade then I started investing with my father, uh well, let's say that through my father came this economic interest ... " (P14);

“… when I was a kid, we opened this … kind of stock account for me … when I was younger, when my dad got it to me, I was like a, I don’t need it. But I now, I think it is very good thing that I have it because it is kind of like start.” (P4)

3.2.1.2. Assessment of acquired financial knowledge from the basic school

Little knowledge was gained from the Basic School, and several students expressed the opinion that teaching was not appropriate:

"... how to draw it /a budget/ was taught, but precisely how to view it and what to read from it, that ee ... it would have been more important." (P11);

"... it was an economic subject, but it was ... very poorly drafted, and we learned some things about the stock markets there, but for me - for what these are?...” (P12)

However, one student who had had a subject in Economics since the first grade was very pleased with it and pointed out:

"... perhaps bringing in more young teachers who seem to be able to pass on their experience, ... not that any academic knowledge, but just that experience, well, we had a few of them and ... it motivated me a lot." (P10)

3.2.1.3. Assessment of acquired financial knowledge from the upper secondary school

The focus groups have highlighted the positive elements of economics studies framework in Estonian Upper Secondary Schools, as the creation of student companies and related practical activities, which increased the economic knowledge of the participants:

"... making a student company... which, as to some extent, also provided knowledge, we still talked in every lesson about everything economically before we tested it directly on our student company ..." (P11)

Guest speakers, i.e., representatives of different companies - entrepreneurs, as well as the teacher's personal business experience (entrepreneur-to-teacher) also contributed to the acquisition of knowledge:

"As much as I had that economics studies in Upper Secondary School, I can say it was quite useful, because our teacher was an entrepreneur himself, and he kind of told a lot about his own experience ..." (P15)

More personal financial knowledge was gained from the Upper Secondary School than during the previous educational levels, but still several students pointed out problems that the subject was too general - theoretical, students had no interest in these topics and what they learned was not remembered longer. For example:

"Well, I had economics as such, ... I do not remember if it was 1 or 2 years that kind of ... short, general, kind of boring ... then I thought that I will never study economics (laughs) ... " (P13);

"… uh, to me … secondary school courses on economics, were not really helpful, maybe because of the methods of teaching. … I did not understand anything, so. Yeah." (P3)

3.2.1.4. Assessment of acquired financial knowledge from the university

Students estimate that more financial knowledge was acquired from the university than from previous educational institutions by both as opinions of participants in the focus group and as questionnaire survey results.

The usefulness of knowledge was assessed differently depending on the subjects included in the specific curricula. For example, the courses in Micro and Macroeconomics were assessed as particularly useful and logical, but they could not be associated with real life:

"Well for me … it was the 1st time I took economy, and it was easy for me to understand. From the beginning it was not so easy but then like it got more and more interesting but ... mm ... I do not know how to use these things in life, because I do not see any connection between life and .. (laughs)." (P1)

The importance of pedagogical work was reflected in the opinions of all those involved in the focus groups, i.e., the ability of pedagogues to link knowledge to real life and to understandably convey it - to generate in listeners the interest and to guide it. For example:

"I had a good example last semester, I had Financial Analysis and Accounting, which was really good, because it was taught by this man who is a financial manager in one big company, so actually he knew how to explain this stuff and how use it in real life, but this semester I have Corporate Finance, which I hate, I do not understand anything there. And the teacher is very knowledgeable with numbers and theory, she is very wise, but she cannot teach. The way she explains the stuff, is like we were, we were mathematicians…" (P4)

One student studying at the Faculty of Economics also noted the knowledge acquired during the internship:

"... I definitely got some knowledge at the university and then a particularly good, very great benefit was the internship, at Swedbank ..." (P12)

The results of the qualitative part of the study support the statistical results of the quantitative analysis and affirm the great importance of the family in acquiring financial knowledge. Although, the possibility that the parents themselves may not have the necessary knowledge is also noted. Students are of the opinion that gathering the financial knowledge in family as a child has a sustainable effect. Being close to parents (authority) allows them to start gathering knowledge at an early age, which is constantly evolving with the help of interest and the environment. The knowledge offered during the years of Basic School has been assessed very insignificant in both qualitative and quantitative results. This is mainly due to a lack of interest and boring study methods. In the level of Upper Secondary School, the students' own interest in personal financial knowledge has already been considerably higher, that is why the assessments are also higher. However, there have been repeated criticism for studies organized boringly. The personal financial knowledge provided at the University has been assessed by the students as good, although sometimes too complicated. That suggests that the topic of personal financial education needs to be improved at the university also and it must not be forgotten that most of students are future family creators - parents.

3.2.2. Students' suggestions for financial education to improve the financial literacy

This subsection aggregates the information gathered during the focus groups interviews to respond to the second guiding research question of qualitative part. Students were most interested about budgeting and investing:

"... I would like to know about budgeting (laughs) that would be first, that comes to my mind, and then I would like to know a lot about investing money, because I think it is like good way to earn money." (P1);

"… more about investments, and also taxes, … risks of it, … tips and tricks ..." (P6)

Some students mentioned interest in the economics situations of different countries and the needs to translated information:

"… So, if I get more knowledge more about the Chinese system and this is very difficult because I already search it, but most of the documents are in Chinese and I may speak 4 languages but not Chinese (laugh)... I really would like to study it and to understand it also because it could really affect us as European Union … if the Chinese system just falls down." (P8)

When asked whether borrowing should be taught, many students answered that this knowledge should come from the family or by experiences.

"I think …, we can learn that from our parents, as well … before getting a loan… you should understand the terms and conditions …" (P5)

At the same time, it was considered that students should be aware about the procedures of borrowing, responsibilities of repaying and about interests. Some students had suggestions that borrowing could be taught at the university level:

" ... more emphasis should be placed on the consequences and how to get a loan ... I guess they can teach you in school, but I don't think at that age you'll think of loans because you're still dependent on your parents and it's not something that you care about that much, so maybe in university …" (P2);

" ... it has to be your knowledge, which have to save you and to give you the opportunity to take a loan, to understand what is the loan, … and if you can repay it, effectively." (P8);

"... how interest is actually calculated." (P18)

Talking about saving, students found that the topic is much more important than borrowing and should be taught already at early ages by parents and as well at school:

" ... saving should be taught… It is very important, like this wooden box - from the early age - do not waste your money, right away." (P3);

"... your parents should like to tell you it's a good thing to save, or something like that, but because my parents didn't emphasize on that, so I kind of just spend everything." (P6);" ... parents... cannot be bad at savings. (laugh) So you have to teach your children how to save for the rainy days, ... so it should be taught right from the household …" (P5);

"... savings is a lot more important to teach than loaning, because it's more beneficial in a way, so … it should be taught, definitely, like, at least if not as a subject alone, part of something…" (P2)

Interesting reactions were expressed about teaching budgeting among participants in focus groups. Most of the students were interested in budgeting, the students from Estonia were sure that budgeting should be taught at school:

"Yes, budgeting should be taught. So, speaking, it helps to save money and, to keep the costs lower, ... it could be at a very young age, in basic school ..."(P19);

"... the ninth grade seems reasonable."(P20);

" ...we had to made budget in basic school ... it definitely provided some support for future." (P10)

But students from other countries had opinions that teaching budgeting is not important because that depends on personality and conditions:

"I do not think it should be taught, at least in school, cause some people are systematic, that they keep track on what they do… it is something that you come up with yourself if you want to do it or not."(P4);

"… you will just like, by experience... slowly learn how to manage."(P2);

"… well, it comes with your lifestyle."(P1);

"I do not think it … should be taught, ... I believe, budgeting is just your common sense ..."(P3)

There were students who thought that financial markets is the topic for everyone, and others whose opinions were the opposite. There was a student who explained his opinion about reasons why that topic is for everyone:

"… Everyone has to have some knowledge about that ... it's part of the financial education, you start with the basic knowledge in the primary /basic/ school, and then when you get older and you already have some knowledge about that, you focus more of the, on the financial markets and everything, what does it mean... We could actually avoid the financial crisis in 2008, if most of the people knew what was happening in the markets in the world,... the biggest problem was that most of the people don't have an idea how the financial system works, … if you don't know that you are not able to face a crisis. And the crisis in the capitalistic system are, … like a cycle." (P8)

Some opposite opinions:

"… if someone is interested, then why not, but taught by everyone? I do not think that it is sufficient."; (P1)

"… the financial market is still only for those who really want to enter it." (P16)

The students of the Faculty of Economics were more optimistic in their opinions and thought that the financial markets could be introduced in the upper secondary school and those interested could be offered the opportunity to study in more depth - as an elective subject, and then in more detail already in the university.

Students' unequal knowledge levels about investing refers to the need for courses with different levels:

"We need the stock market and the exchange market for the thing, then we need to know how competitive is this company which we are investing and how many other companies there are that are working in the same sector because if you invest in a sector, which is monopoly sector, of course you will have more probability to... have some income. If you invest in a sector that is very competitive, you will have the opportunity to lose your money. I need to know who is the owner of the company, where is the base of the company." (P8);

"… it depends on the investment, so if it is like currency, I need to know about inflation, I need to know about social psychology, people's behavior, how it is going to impact currency rate…"(P6);

"... to know what are the benefits, and like, what might be the risks, … consequences, … about the market … what happened to people who invested there... it is kind of important to have some background knowledge about ... at least have some basis..., maybe, in the university, would be nice, like before you go off to... to real world." (P2);

"... about derivatives, ... futures, options, and forwards ..."(P9)

Students' answers to the question of what information you need about investing can be summarized as follows: knowledge of the behaviors of stock and real estate markets in order to make investments; advice how options can be traded on the US stock markets and on which

platforms they can be traded as cheap as possible; introduction of investment platforms; information on derivatives; practical help from someone who has traded and knows the markets well.

Students gave contradictory opinions on the question of whether the assessment of a company's financial and economic condition should be taught. Some felt that a basic understanding is important for everyone:

"... basic stuff everybody should know ... cause everything in the society evolves around the companies ... ratios for those people who are interested, and the basic stuff for everybody …" (P8)

Others thought the topic should be taught only for the specialists in this area or to those interested in investing:

"I don't believe it has to be taught to a wide audience. ... Well, obviously except for the specialists in this area, those who are interested." (P3);
"… it should not be taught for everyone, … the investors, who are going to invest in the companies and ... they should know the basic information."(P1)

Earlier sections of this paper have already highlighted the need to improve teachers' knowledge and skills as well as teaching methods. According to students' opinions, teaching the courses of personal financial knowledge should be interesting - not boring, more practical - connected with everyday life, enriched with living examples – cases, and with visual materials:

"... First I had a course on economics in high school, I was not interested and I.. did not get anything... because I was not interested … then, I had … more advanced course in my 1st degree and I was not interested either ... but here in this university, it was much better, probably because it was less boring, we had more ... examples, more visual materials, more ... living examples, cases, ... practical tests... I think it has to do with the methods of teaching. And it should not be boring." (P3);
"… it would be... better if ... there would be subject what will connect life, … how to invest for example."(P1)

Several students expressed an opinion that teaching personal financial knowledge is mostly the obligation of parents and later on, the knowledge could be received from school or university:

"I feel like it's more up to your parents to teach you because people don't really take what they learn in school too seriously and then forget, and... if your parents kind of tried to get it into you slowly, then I think it's more effective... and … in the beginning of your university maybe... you are a little smarter and take things more seriously..." (P2);
"... a little knowledge would be good, from school … the last year ... or maybe the first year of university, ... 18-19, ..." (P1)

Teaching financial knowledge through active discussion and using film material to start the discussion had been suggested as interesting ideas that were welcomed greatly by the rest of focus group members:

"I think it should start from like /age of/10...11 …, it should be very basic, ...like really simple stuff by parents and then in school it should be kind of subject, but not as kind of book subject, it should be ... open discussion, to just go sit in class, someone introduces things happening in their family, like someone lost money.. and then the teacher who has like good knowledge about this matter, bring it in the children language, like if you are not careful then you invest in bad things and the parents lose money, and stuff like that … I think discussion part is the best way to learn ..."(P6);

"Another way can be documentaries and movies. I saw another movie, "Big Short" it was recently in cinema, there were many things I didn't understand, but it was really interesting, ... so it would be great if they bring it up in class and they say, "yeah this happened" then give an example, they just... dedicate ... to this movie, and just discussing it and what happened ..." (P6)

Students who participated in focus groups often expressed the opinion that this or that information could been obtained from parents, which means, however, that parents must acquire this knowledge in advance. The part of the interviews (qualitative part) significantly complemented earlier information, especially about the financial knowledge acquired from the Basic School that had low level importance by the results of the quantitative part. Based on the results of the qualitative part, the teaching of personal financial knowledge is important in every educational level, provided interesting (not boring) study methods and teachers with practical knowledge and explaining skills (about budgeting, saving, borrowing, investing, assessment of financial markets and companies etc.) are used.

4. Discussion

The current study was planned in purpose to collect and compare students' assessments and opinions about the acquired financial knowledge, together with suggestions for the promotion of personal financial education.

In the present study, the Explanatory sequential mixed methods design was used, in which a quantitative part of the study was conducted among 1110 participants, followed by a qualitative part of the study with a sample sized of 22 students. Students at the universities of technology from two neighboring countries, Estonia, and Finland, participated in the survey.

The data were collected in a quantitative part through a questionnaire survey and in a qualitative part during three focus groups. Based on the results of the quantitative survey, questions and participants were purposefully selected for the qualitative phase in order to explain the content of the quantitative results, i.e., students' assessments to financial literacy providers and to financial education in general. For studies (quantitative and qualitative) conducted separately, a clear link between quantitative results and qualitative research would have been lost. The quantitative study alone did not provide clarity about bottlenecks and the topics of interest relevant for students, which is extremely valuable information to develop the personal financial education. Krueger and Casey (2015) suggested using of focus groups to gain understanding about a topic, so decision makers could make more informed choices. At the same time, the results of the qualitative part only, in which 22 students participated and expressed their opinions, would not have had a significant weight. In the current case, the 1110 students who responded in the quantitative part increased the reliability of the qualitative part results.

In addition, due to the choice of MMR, the collection of all information was coordinated by the same researcher, who carried out the analysis and interpreted the results. This approach ruled out possible errors in the interpretation of the data and results, such as different interpretations of the wording, etc. MMR was excellent for achieving this research goal, and this method would be recommended for anyone planning to compile new curricula or subjects, as well as to further develop existing ones.

In earlier studies (Goldsmith and Goldsmith, 1997; Chen and Volpe, 2002; Mändmaa, 2020b), several researchers suggested that financial literacy tends to be affected by interest about financial topics. Statistically significant results show that the Estonian students interest to improve the financial knowledge increased with financial literacy, but Finnish students with the higher financial literacy score were not interested in improving financial literacy. That could be interpreted as Finnish male students' higher confidence, as the answer "No" came mostly from male students (Table 4). The differences in the answers of Finnish and Estonian students could be also explained by the differences between the two countries in recent history.

The results about the relation between students' self-assessment by gender showed that Estonian female students rated their financial literacy higher than male students, as 46% of females and 39% of male students rated their knowledge at High level (Table 6). Self-assessment among Finnish students had the opposite results, as 64% of male students rated their financial

literacy at High level while only 47% of female students marked the same rating (Table 6). This result can again be interpreted as a sign of self-confidence of Finnish male students.

The comparison of students' self-assessment with rated financial literacy levels showed that the level of own financial literacy was assessed correctly by 38% of Estonian and 42% of Finnish students and , 42% of the respondents from Estonia and 41% from Finland, evaluated their financial knowledge higher of the tested value. There were no significant differences in the comparison results but a worrying indicator is an overestimation of students' own knowledge (over 40% in both countries). Too high self-esteem can lead to decisions that are detrimental to well-being. The results of the quantitative part showed, that more than 80% of students (82% of Estonians and 87% of Finns) were still interested in improving their financial knowledge, and that can balance the situation.

The results of financial knowledge providers assessment showed that the most important financial knowledge provider was the family, as the importance was assessed with "5" or "4" by 74% of Estonian and 79% of Finnish students. The next most important financial knowledge provider was the university, as it was evaluated with "5" or "4" by 51% of participants from Estonia and 44% of participants from Finland. Assessment nearly at the same level was given to the Upper Secondary School as knowledge provider (Table 7). By the students' opinions, modest importance as financial knowledge provider was given to the Basic School as well as to the Non-school related courses or financial services providers (Table 7).

The results of the qualitative part of the study supported the statistical results of the quantitative analysis and affirmed the significant importance of the family in acquiring financial knowledge. Although, the possibility that the parents themselves may not have the necessary knowledge is also noted, the students are of the opinion that gathering the financial knowledge in family as a child has a sustainable effect.

The knowledge offered during the basic school years has been assessed as very insignificant in terms of both qualitative and quantitative results. The main reasons are lack of interest and boring teaching methods. At the upper secondary school level, the students' own interest in personal financial knowledge has already been considerably higher, therefore the assessments are also higher.

However, boring lessons have repeatedly been criticized, which points to the need for professionally trained teachers. The results of research conducted in the USA and Australia also highlighted the importance of teacher training in teaching personal financial education (Asarta *et al.* 2014; Blue *et al.* 2014).

The personal financial knowledge offered at the university has been assessed by students as good, although sometimes too complicated. That suggests that the topic of personal financial education needs to be improved at the university as well.

Researchers in New Zealand (Cameron *et al.* 2014) have argued that financial literacy education, starting at the high school level, can be key to making financial decisions for the population.

The objects of this study were students from technology universities. Their opinions expressed in the qualitative part of the study included suggestions to offer a preparatory financial course to the first-year students, which would contain knowledge of saving, borrowing, budgeting, investing, as well as financial risks. Students have also noted interest in additional information, i.e., more in-depth, courses for making informed investment decisions - what is happening in the financial markets, the current economic situation in different countries, evaluation of companies' economic activities, etc.

Students who participated in focus groups often expressed the opinion that this or that information could been obtained from parents, which means, however, that parents must acquire this knowledge in advance. Based on the results of the qualitative part, the teaching of personal financial knowledge is important in every educational level, if provided interesting (not boring) study methods and teachers with practical knowledge and explaining skills (about budgeting, saving, borrowing, investing, assessment of financial markets and companies etc.) are used.

5. Conclusion

The goal of this study was to find out how the university students rate their acquired financial knowledge and knowledge providers, with the purpose to find solutions for promoting personal financial education to promote financial literacy.

The results of this study showed that university students' interest to improve their financial literacy is high. The most important financial knowledge provider was the family, and the university came next. The obstacle most mentioned by students in the pursuit of lower education levels, i.e., pre-university education, was a lack of interest in obtaining financial knowledge, which was largely due to boring teachers and learning material.

Teaching of personal financial knowledge has been considered notably necessary by students participated. Many of students had opinion that personal financial knowledge like saving and budgeting should come from the family and should be taught from an early age. However, it was noted that families may not always be knowledgeable enough in these issues and may not to be able manage the finances well.

Based on the views expressed in the focus groups, it can be argued that financial knowledge should be provided at every level of education, starting with a course in basic school and continuing with more comprehensive knowledge in secondary school and university. Students involved in the interviews explained the low importance of the knowledge acquired in basic school (school years 1 to 9) mainly with lack of interest - boring subjects and teachers. According to the collected opinions, connection with real life, the use of interesting examples, tasks and practical advice in organizing teaching in financial education is most important. So, the emphasis here should be on the teaching staff, their knowledge, and skills.

Study results revealed differences in male and female students' self-confidence and interest in personal finance, but due to time and volume limits, these topics were left for future studies. Research could be continued through the development, piloting and monitoring of specific subjects aimed at promoting financial literacy of students and also educating appropriate pedagogues. At the same time, it would be necessary to continue research on gender differences in financial knowledge in order to find both causes and solutions.

This study makes contribution to the literature on Mixed Methods Research (MMR) by describing the procedure of how the solutions to the research problem were found.

The study is important for researchers dealing with financial literacy or interested in using MMR in research. The results of this study could provide interesting information for politicians and educators who are planning improvements in teaching personal financial knowledge, as well as for financial executives, economic managers, investors, entrepreneurs, or anyone who has knowledge and interest in issues of fundamental importance to the sustainable economic growth and welfare.

References

Asarta, C. J., Hill, A. T., and Meszaros, B. T., 2014. The features and effectiveness of the keys to financial success curriculum. *International Review of Economics Education,* 16, pp. 39-50. https://doi.org/10.1016/j.iree.2014.07.002

Bhattacherjee, A., 2012. *Social science research: Principles, methods, and practices*. Textbooks Collection. 3. Available at: <http://scholarcommons.usf.edu/oa_textbooks/3> [Accessed on 12 August 2020]

Blue, L., Grootenboer, P. and Brimble, M., 2014. Financial literacy education in the curriculum: Making the grade or missing the mark? *International Review of Economics Education,* 16, pp. 51-62. https://doi.org/10.1016/j.iree.2014.07.005

Bucher-Koenen, T. and Lusardi, A., 2011. Financial literacy and retirement planning in Germany. *Journal of Pension Economics and Finance,* 10(4), pp. 565-584. https://doi.org/10.1017/S1474747211000485

Bucher-Koenen, T., Lusardi, A., Alesi, R. and van Rooij, M., 2017. How financially literate are women? An overview and new insights. *Journal of Consumer Affairs, Wiley Blackwell,* 51(2), pp. 255-283. https://doi.org/10.3386/w20793

Cavanagh, S., 1997. Content analysis: concepts, methods and applications. *Nurse Researcher,* 4(3), pp. 5-16. https://doi.org/10.7748/nr.4.3.5.s2

Cameron, M. P., Calderwood, R., Cox, A., Lim, S. and Yamaoka, M., 2014. Factors associated with financial literacy among high school students in New Zealand. *International Review of Economics Education,* 16, pp. 12-21. https://doi.org/10.1016/j.iree.2014.07.006

Chen, H. and Volpe, R. P., 1998. An analysis of personal financial literacy among college students. *Financial Services Review,* 7(2), pp. 107-128. https://doi.org/10.1016/S1057-0810(99)80006-7

Chen, H. and Volpe, R. P., 2002. Gender differences in personal financial literacy among college students. *Financial Services Review,* 11(3), pp. 289-307.

Creswell, J. W., Plano Clark, V., Gutmann, M. and Hanson, W., 2003. Advanced mixed methods research designs. In: Tashakkori A and Teddle C (eds) *Handbook of mixed methods in social and behavioral research.* Thousand Oaks, CA: SAGE, pp. 209-240.

Creswell, J. W. & Plano Clark, V. L., 2006. *Designing and conducting mixed methods research*. Thousand Oaks, CA: SAGE

Creswell, J. W., 2014. *Research design: Qualitative, quantitative and mixed methods approaches.* (4th ed.) Thousand Oaks, C.A.: SAGE.

Downe-Wamboldt, B., 1992. Content analysis: Method, applications, and issues. *Health Care for Women International,* 13(3), pp. 313-321. https://doi.org/10.1080/07399339209516006

Duggleby, W., 2005. What about focus group interaction data? *Qualitative Health Research,* 15(6), pp. 832–840. https://doi.org/10.1177/1049732304273916

Flick, U., 2009. *An Introduction to qualitative research.* 4th eds. Thousand Oaks, CA: SAGE.

Goldsmith, E. B. and Goldsmith, R. E., 1997. Gender differences in perceived and real knowledge of financial investments. *Psychological Report,* 80, pp. 236-238. https://doi.org/10.2466/pr0.1997.80.1.236

Grönfors, M., 1982. *Kvalitatiiviset kenttätyömenetelmät [Qualitative field research methods].* Helsinki: WSOY.

Hirsijärvi, S. and Huttunen, R., 2005. *Sissejuhatus kasvatusteadusse.* [*Introduction to educational science].* Tallinn: Medicina.

Hirsijärvi, S., Remes, P. and Sajavaara, P., 2005. [*Uuri ja kirjuta] Investigate and write*. Tallinn: Medicina.

Howe, K. R., 1988. Against the quantitative-qualitative incompatibility thesis or dogmas die hard. *Educational Researcher,* 17, pp. 10-16. https://doi.org/10.3102/0013189X017008010

Hsieh, H.- F. and Shannon, S. E., 2005. Three approaches to qualitative content analysis, qualitative. *Health Research,* 15(9), pp. 1277–1288. https://doi.org/10.1177/1049732305276687

Huston, S. J., 2010. Measuring financial literacy. *The Journal of Consumer Affairs,* 44(2), pp. 296-316. https://doi.org/10.1111/j.1745-6606.2010.01170.x

Krueger, R. A., 1994. *Focus groups: A practical guide for applied research.* 2. eds. Thousand Oaks, CA: Sage.

Krueger, R. A. and Casey, M. A., 2015. *Focus groups: A practical guide for applied researchers* (5th ed.). Thousand Oaks, CA: Sage.

Laherand, M.- L., 2008. *Kvalitatiivne uurimisviis* [*Qualitative research method]*. Tallinn: Infotrükk,

Lusardi, A,, Mitchell, O. S. and Curto, V., 2010. Financial literacy among the young. *Journal Of Consumer Affairs, Wiley Blackwell,* 44, pp. 358–380. https://doi.org/10.1111/j.1745-6606.2010.01173.x

Mandell, L., 2008. *The financial literacy of young American adults. Results of the 2008 National JumpStart Coalition Survey of High School Seniors and College Students.* JumpStart Coalition for Personal Financial Literacy, Washington DC. [PDF] Available at: <https://www.stockmarketgame.org/assets/pdf/2008%20JumpStart%20Financial%20Literacy%20Survey.pdf> [Accessed on 10 March 2021].

Maxcy, S. J., 2003. Pragmatic threads in mixed methods research in the social sciences: The search for multiple modes of inquiry and the end of the philosophy of formalism. In: A. Tashakkori A and Teddlie C, eds. 2003. *Handbook on mixed methods in the behavioral and social sciences.* Thousand Oaks, CA: SAGE, pp. 51-89.

Morgan, D. L., 1997. *Focus groups as qualitative research.* 2nd ed. Thousand Oaks, CA; SAGE. https://doi.org/10.4135/9781412984287

Mändmaa, S., 2019a. Financial literacy – what and why should we improve. *Eurasian Journal of Social Sciences,* 7(2), pp. 12-28. https://doi.org/10.15604/ejss.2019.07.02.002

Mändmaa, S., 2019b. Analyzing the factors influencing university students' financial literacy. *International Journal for Innovation Education and Research,* 7(7), pp. 465-497. https://doi.org/10.31686/ijier.vol7.iss7.1628

Mändmaa, S., 2020a. Empirical study on personal financial literacy of university students for develop the financial education. *International Journal of Business and Applied Social Science,* 6(6), pp. 8-25. https://doi.org/10.33642/ijbass.v6n6p2

Mändmaa, S., 2020b. Personal financial literacy among university students studying engineering. *International Journal for Innovation Education and Research,* 8(8), pp. 669-692. https://doi.org/10.31686/ijier.vol8.iss8.2575

Mändmaa, S., 2021. How to promote personal financial education - Findings from Finnish University students' financial literacy study. *International Journal of Educational Technology and Learning,* 10(1), pp. 8-25. https://doi.org/10.20448/2003.101.8.25

OECD, 2006. Improving financial literacy: Analysis of issues and policies. *Financial Market Trends,* 2005/2, pp. 111-123. https://doi.org/10.1787/fmt-v2005-art11-en

OECD, 2014. *PISA 2012 Results: Students and money (Volume VI): Financial literacy skills for the 21st century.* Paris: OECD Publishing.

Onwuegbuzie, A. J., Dickinson, W. B., Leech, N. L. and Zoran, A. G., 2009. A qualitative framework for collecting and analyzing data in focus group research. *The International Journal of Qualitative Methods,* 8(3), pp. 1-21. https://doi.org/10.1177/160940690900800301

Potter, W. J. and Levine-Donnerstein, D., 1999. Rethinking validity and reliability in content analysis. *Journal of Applied Communication Research,* 27, pp. 258-284. https://doi.org/10.1080/00909889909365539

IEP, n. d. *Internet Encyclopaedia of Philosophy* Pragmatism by Douglas McDermid, [online] Available at: <https://iep.utm.edu/pragmati/> [Accessed on 3 September 2019].

Showkat, N. and Parveen, H., 2017. *Non-probability and probability sampling.* Gujarat: e-PG Pathshala.

Trost, J., 1986. Statistically nonrepresentative stratified sampling: A sampling technique for qualitative studies. *Qualitative Sociology*, 9(1), pp. 54–57. https://doi.org/10.1007/BF00988249

Vaughn, S., Schumm, J. S. and Sinagub, J., 1996. *Focus group interviews in education and psychology*. Thousand Oaks, CA: SAGE. https://doi.org/10.4135/9781452243641

Vihalemm, T., 2014. *Fookusgrupi intervjuu*. [*Focus group interview*]. [online] Available at: <http://samm.ut.ee/fookusgrupi-intervjuu> [Accessed on 12 June 2021].

Wilkinson, S., 2004. Focus group research. In: D. Silverman, ed. 2004. *Qualitative research: Theory, method, and practice.* Thousand Oaks, CA: SAGE. pp. 177–199.

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ISBN 978-952-335-796-9
ISBN 978-952-335-797-6 (PDF)
ISSN-L 1456-4491
ISSN 1456-4491
Lappeenranta 2022