MathPRO

Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare

NORDPLUS Adult NPAD-2013/10268

SABIEDRĪBAS INTEGRĀCIJAS FONDS

HOW TO STRENGTHEN CITIZENS' MATH SKILLS

Latvia - Lithuania - Estonia, 2014

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ISBN 978-9934-14-303-8

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PREFACE

It is our pleasure to present the Guide for adult educators Created in the framework of Nordplus Adult education programme mapping project ID: NPAD-2013/10628 „Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare (MathPRO)“. Adult educators from three Baltic States organizations: NGO Education Innovations Transfer Centre (Latvia), Vilnius Gabriele Petkevicaite – Bite Adult Education Center (Lithuania) and NGO Innova Estonia working together has shared their knowledge and practical experience in the field of mathematic competence development to adults.

The main objective of this cooperation was to identify the needs of math knowledge and skills for sustainable development and welfare and prepare recommendations for those improvements.

Project team hope that the research problems addressed in this Guide and their solutions will interest not only teachers who work with mathematic subjects but also practitioners, who use mathematic knowledge in their work environment improving the social reality and contribute to the sustainable development.

Acknowledgements

Project team is grateful to NORDPLUS Adult Programme for great opportunities to cooperate and develop new knowledge and experience!

INTRODUCTION

About Nordplus Adult Programme

NORDPLUS is the Nordic Council of Ministers' most important programme in the area of lifelong learning.

The Nordplus Programme offers financial support to a variety of educational cooperation between partners in the area of lifelong learning from the **eight participating countries in the Baltic and Nordic regions.**

Nordplus Adult – one of five sub-programmes of Nordplus – supports networking, collaboration and exchanges between actors from the Nordic and Baltic countries, **whether in formal, non-formal or informal adult learning.**

The overall objectives of the Nordplus adult programme are:

- to strengthen adults key competences and recognition of adults informal and non-formal learning
- to support adult education and learning to meet the challenges of modern citizenship, with special focus on adult teacher education and multiculturalism
- to strengthen the link between adult learning and working life.

The countries participating in the Nordplus Adult Learning programme are the Nordic countries Denmark,

Finland, Iceland, Norway and Sweden, the autonomous regions the Faroe Islands, Greenland, and Aaland and the Baltic countries Estonia, Latvia and Lithuania.

More detailed information about programme: http://www.nordplusonline.org/

General information on the project

Mathematics is a discipline, which is a background for specialists who works in environmental protection, engineering, construction, business, telecommunication, textile, new energy sources, ect. It is obvious that mathematic knowledge and competences have a great input in everyday life and in the workplace. Mathematics becomes essential also in the lifelong learning process. Analyzing socio-economic situation, it is obvious, that mathematic competences are not developed enough in the Baltic region.

Therefore the aim of the Nordplus Adult education mapping project ID: NPAD-2013/10628 „Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare“ was activate the role of mathematics in the region's sustainable development by identifying the citizens' math educational needs and developing recommendations to adult education providers about basic mathematical skills promotion as well as to promote different types of organizations' contribution in the mathematics further education development within lifelong learning context.

The project was implemented by three organizations from Latvia, Estonia and Lithuania.

Coordinator:

NGO Education Innovations Transfer Centre (Latvia)

Partners:

- NGO Innova (Estonia)
- Vilnius Gabriele Petkevicaite – Bite Adult Education Center (Lithuania)

Project budget: EUR 49334 (Nordplus grant - EUR 37000, own contribution – EUR 12334)

Project period: 1-Jul-2013 – 30-Sep-2014

Project work group:

Country	*Position*	*Name surname*
Latvia	Coordinator	**Anna Vintere**
	Asistant	**Aivars Vinters**
Estonia	Coordinator	**Olga Wolf**
	Asistant	**Veranika Shchura**
Lithuania	Coordinator	**Kristina Martinavičiutė**
	Asistant	**Indrė Adomaitienė**

Project activities and outcomes

The main outcome of the project is a collaboration network among the three Baltic organizations to exchange experiences and to create new innovative Lifelong Learning products.

Project group meetings

During the project there were 3 project group meetings. The first project group meeting took place in Jurmala, Latvia on 28 -31August, 2013. The second meeting was

arranged in Vilnius, Lithuania on 09 – 13 April, 2014 and the third one was in Tallinn, Estonia on 21-25 August, 2014. Each project group meeting included intensive work in terms of workshops and seminars as well as interesting cultural and social programme.

Research on Baltic States citizens' math needs

Within the framework of the project MathPRO a feasibility study was done identifying mathematics continuing education supply in Latvia, Lithuania and Estonia and mathematical education needs of Baltic States citizens. Transnational comparative study on the math educational needs in Baltic States was conducted with the participation of a number of researchers in the Baltic States.

Survey (online questionnaires)

Employers and the citizens' questionnaires in five languages: English, Latvian, Estonian, Lithuanian and Russian was created as a part of Nordplus Adult Learning Programme project "Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare" (MathPRO) aiming to activate the role of mathematics in the region's sustainable development by identifying the citizens' math educational needs and developing recommendations to adult education providers about basic mathematical skills promotion.

In the framework of the project MathPRO has also created an electronic survey tool. The link to the online questionnaire and the report are on the project website http://www.iipc.lv/mathpro/.

Database

Database contains the results of the survey done in Latvia, Estonia and Lithuania. Data is available electronically and can be exported to Excel or SPSS. These results can also be used in other educational research.

Seminars - discussions

Three seminars-discussions concerning various aspects of citizen' mathematics skills promotion were arranged in the Baltic States: in Estonia on April - June, 2014, in Latvia on August 20, 2014 and in Lithuania on September 10t, 2014.

Recommendations

Based on the results of research and seminars-discussions were created several mapping documents:

- Recommendations for the adult education providers about basic mathematical skills promotion;
- Recommendations for adult math further education methodological provision**;**
- Description of the different organizations involvement possibilities in basic mathematical skills promotion.

Methodological platform

In the framework of the project MathPRO built common Baltic States methodological platform. The most popular web-pages in each partner country are collected to help

person to use such elementary mathematics calculations as salary, taxes and loans, currency exchange and other accounting. Methodological platform also contains e-course on percentage calculations (www.mathpro.iipc.lv).

Brochure

The brochure contains the most essential information about the project (general information, the project activities and outcomes, the most important recommendations concerning math skill promotion).

Guide for adult educators

It contains all the essential information about the project, the survey, the seminars-discussion and more relevant information. It is available in two languages (in English and Latvian) on the project website. The printing versions were also distributed among the libraries and seminars-discussions participants in Latvia, Estonia and Lithuania.

Project website http://www.mathro.iipc.lv

Project website was created in 5 languages (English, Latvian, Estonian, Lithuanian and Russian) to suit the needs of most website visitors in the Baltic States. On the project website are available detailed information about the project activities and the outcomes, the online survey, the methodological platform, the project book and other useful materials.

Publicity

The project received enough publicity in different ways: at the seminars-discussions, on National TV (http://youtu.be/hnb6ek6mRkE), in the press and on the Internet.

The survey results presented at the 15th International Conference Teaching Mathematics: Retrospective and Perspectives, in Liepaja, Latvia on May 8-10, 2014 and at the IX Nordic – Baltic Agrometrics Conference, in Kaunas, Lithuania, on June 11 – 13, 2014.

MATH EDUCATION CHARACTERISTICS IN THE PARTNER COUNTRIES

Teaching math at universities

NGO Education Innovations Transfer Centre (Latvia)

Rapid technological development is changing society and its attitudes towards education. This process is caused urgent needs to change the education environment. The math is very much touched by this process. There is a gap between math offered by universities and math needed to educate new specialist. Math as a discipline has been taught in schools, colleges, vocational training and universities. However, different organizations have difficulties in preparation of qualified and competitive specialists of math for the main economic sectors.

What is the problem? Math must appear understandable and relevant and be of practical use in the adults' living world. However, the subject of Mathematics is often represented as a long succession of facts to be memorized and reproduced. Many research findings show that the math in schools and universities of today does not necessarily provide a sound and unassailable foundation. The "university math" and the math that actually used or needed in a range of life situations are not related.

Latvian classifier of professions[1] describes necessary competences (education, knowledge, experience and skills) for completing tasks of different professions – that

[1] http://www.lm.gov.lv/upload/darba_devejiem/profesiju_klasifikators_0811.pdf

is dome to ensure labour record keeping and comparison appropriate to international practice.

Profession standard[2] gives levels of theoretical and practical background – minimal education, knowledge and skills level including in mathematics: insight, comprehension, application (Table 1.)

Table 1. **Level of mathematics' knowledge**

Qualification	Insight	Compre-hension	Applica-tion
Programmer		+	+
Engineer of forestry			+
Engineer of wood-working		+	
Engineer of power system in agriculture		+	
Engineer of mechanics			+
Building engineer		+	
Landscape architect	+		
Engineer of land survey			+
Surveyor			+
Engineer of environment			+
Catering organizer		+	
Hotel service organizer		+	
Manager of enterprise or organization		+	

Several researches show that mathematics and the subjects which require mathematical knowledge, have always been favourite for approximately 65% of students, but 30.1% did not understand most mathematical concepts. 44.2% of students think that math at university was taught matter-of-factly and boringly (Figure 1).

[2] http://www.lm.gov.lv/upload/darba_devejiem/profesiju_standarti_0811.pdf

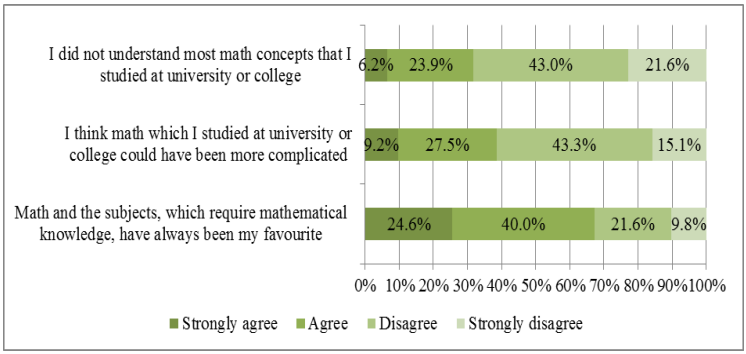


Figure 1. **Students' self-assessment**

The following challenging questions about math teaching at universities are being arises: What is math? Why is it an essential learning area? What is the purpose of teaching math? What do we want students to understand? What do we want students to do with their understanding? What is the purpose of teaching? What are the goals for the students? What are the goals of the students?[3]

Based on personal experience as well as taking in coincidence findings in several educational researches, the following directions of improvement of teaching of math at universities or colleges should be identified:

- Enhancement of the link between teaching of math and practice;
- The lecturers should explain examples of real life where is used particular teaching substance. It makes easier to perceive and understand the math

[3] Mustoe, L. (2004) The Future of Mathematics in the united Kingdom. 12th SEFI Maths Working Group Seminar, Proceedings, Vienna University of echnology, 2004, pp 113-117.

concepts differently, the question arises whether it is necessary;

- Increase students' motivation;
- Before starting to learn a particular branch of math, first of all it would be useful how it can be applied in practice in a particular specialisation. It would encourage students' interest and would make easier the process of learning;
- Lecturers should be more interested in the application of math in the particular area of science;
- Learning should be directed towards understanding;
- It is necessary to strive to teach a person to understand math, but not teach him/her only in order to make him know formulas without an opportunity to learn how to apply them in the life;
- Links between math and other subjects;
- To pay more attention to the methods of applied statistics.

Teaching math to adults (e.g. in adult education centres)

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre

In Vilnius city during the period of 2012-2014 school year adult education is provided by the following adult education schools and centres:

- Vilnius Gabriele Petkevicaite-Bite Adult Education Centre

- Vilnius Adult Education Centre
- Vilnius "Zidinys" Adult Gymnasium
- Vilnius "Varpas" Adult Secondary School
- Vilnius Adult Education Centre in Penitentiary Institutions

In Lithuanian adult education schools and centres maths is taught on the basis of basic education and secondary education national core curriculums.

After finishing the 10th form, students take basic education achievement maths exam. The exam rules have been constantly redesigned: for some years it was an optional exam subject or the exam results have no influence upon students' promotion to the 11th form.

Table 1. **2012 maths state exam in Vilnius adult education schools**

	Finished the 12th form	Chose to take maths state exam	Chose to take maths state exam (%)
Vilnius "Zidinys" Adult Gymnasium	135	2	1,48
Vilnius "Varpas" Adult Secondary School	126	4	3,17
Vilnius Adult Education Centre	118	11	9,32
Vilnius "Akiratis" Adult Secondary School	35	5	14,29

Since 2010, after finishing the12th form, students can choose to take maths state exam. Until 2010, students had

a possibility to choose between maths school or maths state exam after they finish the12th form. The new order reduced the number of students who wish to take maths state exam.

We present Table 1, Table 2, Table 3 about the results of maths school leaving exam of Vilnius adult education centres and schools in the years 2012, 2013, 2014. The information about exams is announced by Lithuanian National Exam Centre.

Table 2. **2013 maths state exam in Vilnius adult education schools**

	Finished the 12th form	Chose to take maths state exam	Chose to take maths state exam (%)
Vilnius "Zidinys" Adult Gymnasium	131	5	3,8%
Vilnius "Varpas" Adult Secondary School	114	2	1,7%
Vilnius Adult Education Centre	82	5	6,1%
Vilnius "Akiratis" Adult Secondary School	41	1	2,4%

Table 3. **2014 maths state exam in Vilnius adult education schools**

	Finished the 12th form	Chose to take maths state exam	Chose to take maths state exam (%)
Vilnius "Zidinys"	144	2	1,39

Adult Gymnasium			
Vilnius "Varpas" Adult Secondary School	124	1	0,81
Vilnius Adult Education Centre	106	8	7,55

As we can see from the results seen in Table 1, Table 2, Table 3 during recent years the number of students who chose to take math state exam has considerably decreased. In 2012 22 students took the exam, i.e. 5,3%, in 2013 13 students took the exam, i.e. 3,5% of all the students, in 2014 11 students took the exam, i.e. 2,9% of all the school-leavers.

We present Table 4, Table 5, Table 6 about the results of math school-leaving exam in different types of Lithuanian schools.

Table 4. **Results of 2012 state exams in schools of different types: mathematics**

	1-100 (passing %)
Lithuania	93,21
General schools of secondary education	94,92
Vocational schools	62,08
Adult schools	63,64

Table 5. **Results of 2013 state exams in schools of different types: mathematics**

	1-100 (passing %)
Lithuania	93,53
General schools of secondary education	94,96
Vocational schools	60,73
Adult schools	50

Table 6. **Results of 2014 state exams in schools of different types: mathematics**

	1-100 (passing %)
Lithuania	88,33
General schools of secondary education	89,88
Vocational schools	36,18
Adult schools	Absence of results

Maths exam is chosen only by a very small number of adult school learners, the passing percentage is also lower in comparison with schools of other types.

We may come to conclusion that there are certain serious gaps in teaching maths to adults:

1. The contemporary examination system does not promote maths learning and taking exam in mathematics.
2. Adult learners, who do not have basic or secondary education, can study maths only according to national basic education and secondary education core curriculums.

3. There is no supply to study maths according to other curriculums or other forms.

We can also come to conclusion that because of the decreasing number of adult learners who take math school-leaving exam, students' continuous learning in colleges and schools of higher education should become limited only to studies of humanity subjects, as if people wish to study technical, exact or subjects of natural sciences, they need to have taken math state exam.

Teaching math at schools

NGO Innova Estonia

Many school pupils do not like mathematics. They consider this subject boring and very complicated science. Why?

Reasons for this can be different for all. For example, ones do not see motivation to study hard this subject, others say directly about laziness and time shortage. Many pupils consider that teachers cannot explain clearly to understand mathematics themes. Many opinions, because it is possible to find reasons, in order justify own poor mathematics skills. As we know only 20% of student results depends on teacher….Maybe pupils think that nobody knows about this!?

Mathematics has many themes and subthemes. "Mathematics is queen of all sciences" (Gauss). Mathematics has relations with economics, but nobody can live without economics. Now economic crisis in

Europe and everybody feel this. Development and enlivening of European Union economics depends on us.

Mathematics is complicated and do not understanding subject for most of school pupils. This is serious situation for our future. Who will work with modern technology – this is not possible, if you do not have strong mathematics skills.

Now mathematics is done as obligated state exam for gymnasium. But we see this is not effective method to improve school student mathematic skills.

Tallinn Technology University conduct mathematic exam for students, who wish to study technology. But about 50% go away at the first year of study also, because of mathematics.

"Mathematics is intellect gymnastics" (A.V.Suvorov). Mathematics helps to develop logics and thinking, training for thinking, but these ones are needed for work and everyday life. Mathematics is necessary subjects for our technology century. Problem solution is also constructed on mathematics base.

Estonia school pupils do not study hard mathematics. There are new study books in the schools, these ones are nice illustrated, but unfortunately not understanding for the most. Texts are not clear. Courses are not rational. There are many problems with mathematics along the young. School pupils do not know why mathematics is needed? They do not see mathematics usage in future work and life.

Humanitarians consider that only languages are needed now.

“You should learn mathematics, because this one do order in your mind” (M.V.Lomonossov). I agree with him. Only mathematics forces you to think hard and take decision. At first in school, where you decide mathematics tasks, then – at working places or in other life situations.

If young person has strong mathematic skills, that he can study in every university and receive any profession.

There are not enough study lessons for mathematics at schools. Study programs depend on politic party, which is Parliament. This influences to education quality in Estonia.

I like mathematics and know that this subject is not easy, but this one helps me to be concentrated and work hard. I think it is useful for everyone.

RESULTS OF THE RESEARCH

Latvian citizens' math education needs

NGO Education Innovations Transfer Centre (Latvia)

Citizens survey results

388 Latvian citizens participated in the survey. 292 of them are full of answers that are used as a research base. The characteristic of the survey sample is presented in Table 1.

Table 1. **Characteristic of the survey sample**

Gender	*Female*			*Male*			
	267			*97*			
Age	*Younger than 18*	*18-25*	*26-30*	31-40	41-50	*51-60*	61 and older
	5	*93*	*45*	*72*	*75*	*54*	*21*
Place of residence	Rural	Small town	Medium	City			
	79	58	98	130			
When did you graduate from the last education institution?	*1-5 years ago*	*5-10 years ago*	*10-20 years ago*	*More than 20 years ago*			
	146	*84*	*68*	*67*			
Which one of the following best describes you?	*Company / department manager*	*Employer*	*Employee*	*Self employed*	*Unemployed*	*Student*	*Housewife etc.*
	55	*31*	*157*	*33*	*1*	*84*	*4*
Educational level	*Basic*	*Secondary*	*Professional*	*Higher*	*Mg degree*	*PhD*	
	6	*87*	*27*	*99*	*71*	*19*	

The sample in Latvia was formed:

- Sending written request with the address of the webpage, where the electronic version of the questionnaire is placed to enterprises and to NGO in Zemgale region/Latvia
- Using social networks Draugi, Facebook ...

The citizens' survey was divided in two parts by educational level: basic, secondary, and professional (120 full answers) and higher education, Mg or PhD degree (189 full answers). The characteristics of the respondents with basic, secondary or professional education are given in Table 2, with higher education, Mg or PhD degree – in Table 3.

Table 2. **Respondents with basic, secondary or professional education**

Gender	*Female*			*Male*			
	81			*39*			
Age	*Younger than 18*	*18-25*	*26-30*	31-40	41-50	*51-60*	61 and older
	3	*78*	*9*	10	13	*3*	4
When did you graduate from the last education institution?	*1-5 years ago*	*5-10 years ago*	*10-20 years ago*	*More than 20 years ago*			
	87	*11*	*6*	*16*			

Table 3. **Respondents with higher education, Mg or PhD degree**

The respondents were asked to mark what knowledge of mathematics needed for the specialists of specific professional field. In Table 4 given answers by respondents with basic, secondary or professional education.

Gender	*Female*				*Male*		
	154				35		
Age	*Younger than 18*	*18-25*	*26-30*	31-40	41-50	*51-60*	61 and older
	2	*13*	*25*	48	43	*45*	13
When did you graduate from the last education institution?	*1-5 years ago*	*5-10 years ago*	*10-20 years ago*	*More than 20 years ago*			
	45	*55*	*51*	*31*			

Table 4. **Math knowledge needed for specialists**

	Excel usage in the different calcu-lations	Grouping of the data	Tasks on the calcu-lation of %, averages and/ or errors	Estima-tion of statistical relations	Statistical methods of the data analysis	Graphical representation of the data and etc	Market analysis - a demand and supply balance etc.	The calculation of area and volume	Appro-ximate calcula-tion	Proba-bility theory	I don't know	Other
Crafts	3	2	2	0	0	1	2	2	1	0	0	0
Carpentry	1	0	1	0	1	1	1	1	1	1	0	0
Tourism	1	1	1	0	1	0	2	0	1	0	0	0
Agriculture	4	2	1	0	0	2	0	2	1	0	0	0
Information technology	3	4	2	2	2	3	2	2	2	2	0	0
Culture	3	2	2	0	1	3	2	1	1	2	2	0
Health and health protection	1	0	0	0	1	1	0	0	1	0	0	0
Food, household and guest service tag	11	6	1	4	6	7	5	3	2	1	2	0
Transport services	3	2	3	2	3	2	2	3	2	2	0	0
Seller	3	1	3	0	0	0	1	0	0	0	3	0
..... services	38	32	37	27	27	32	31	4	4	12	4	1

In Figure 1 showed math knowledge needed for people with basic, secondary or professional education in total.

Results show that for specialists with basic, secondary or professional education the most significant skills are Excel usage in the different calculations, grouping of the data and calculation of %, averages and / or errors. The

graphical representation of the data is also much needed skill. The study also showed that in the services sector for analysing the market is needed knowledge in statistics and statistical methods of the data analysis.

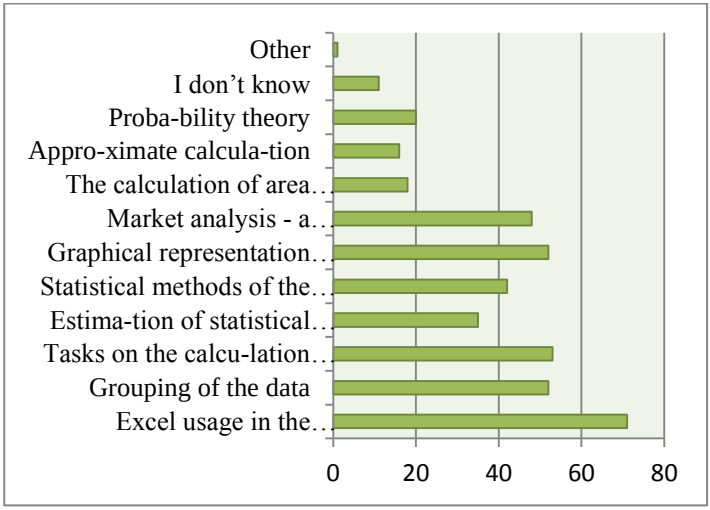


Figure 1. **Math knowledge needed for people with basic, secondary or professional education**

The same question was asked to people with higher education and Mg or PhD degree providing several specific areas / topics of mathematics what might be necessary for different expertise field's specialists. The answers are collected in Figure 2.

Results show that for people with higher education the most significant math knowledge are operations research, linear and nonlinear programming as well as net planning It determined by daily practical issues to be addressed: the description of a situation, the tasks of productivity, recourse administration, logistics, transport, the tasks solutions of the integrated jobs planning and etc.

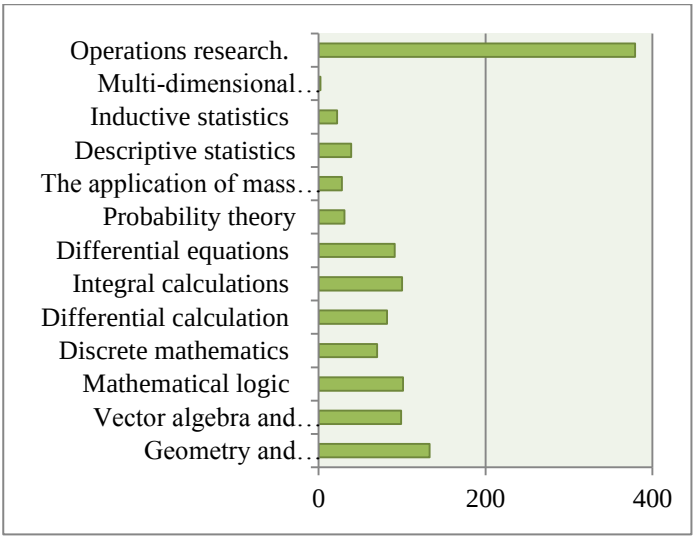


Figure 2. **Math knowledge needed for people with higher education, Mg or PhD degree**

No human action is possible without motivation. It is motivation that makes us move, guides our actions and maintains our behaviour through time. Motivation is determined by several factors. In the questionnaire where given three factors: better paid work / career opportunities at work / other occupation area, entrepreneurship and personal development. Of course, respondents could write also other if they have. Motivation to improve math skills by educational level analysed in Figure 4.

Results show that mathematics has high status – most of respondents answered that the motivation to improve math skill is personal development.

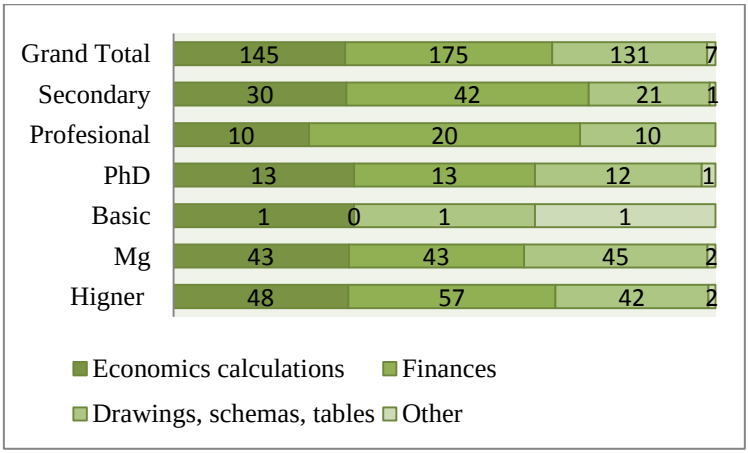


Figure 3. **Which mathematics elements do you use at work or home?**

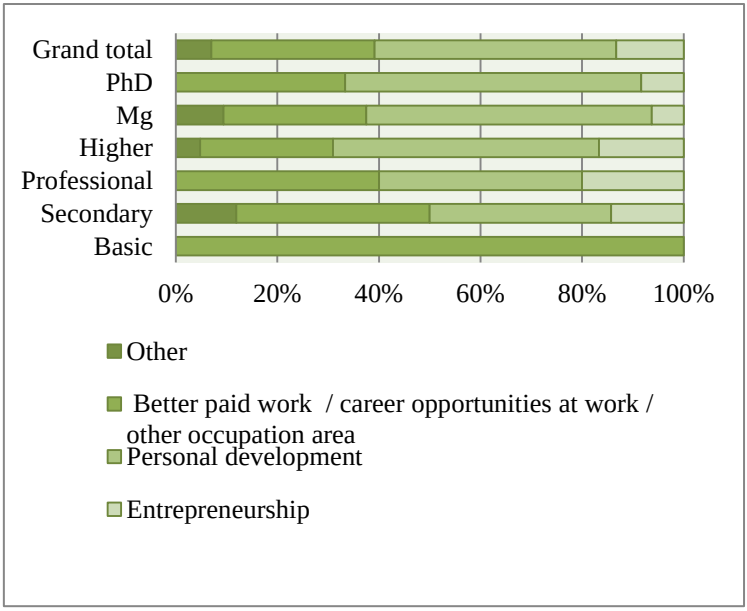


Figure 4. **Motivation to improve math skills by educational level**

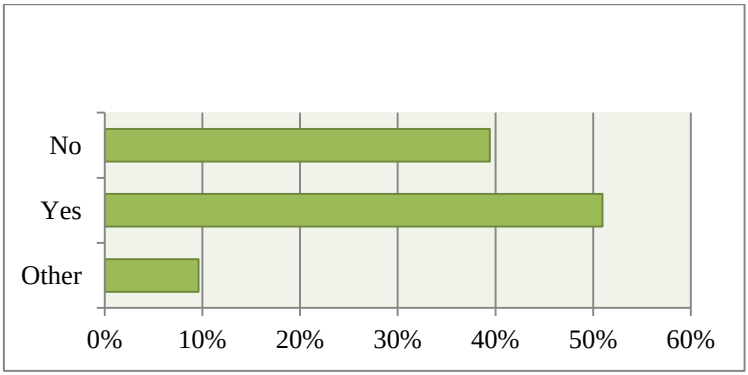


Figure 5. **Willingness to improve your mathematics knowledge / skills**

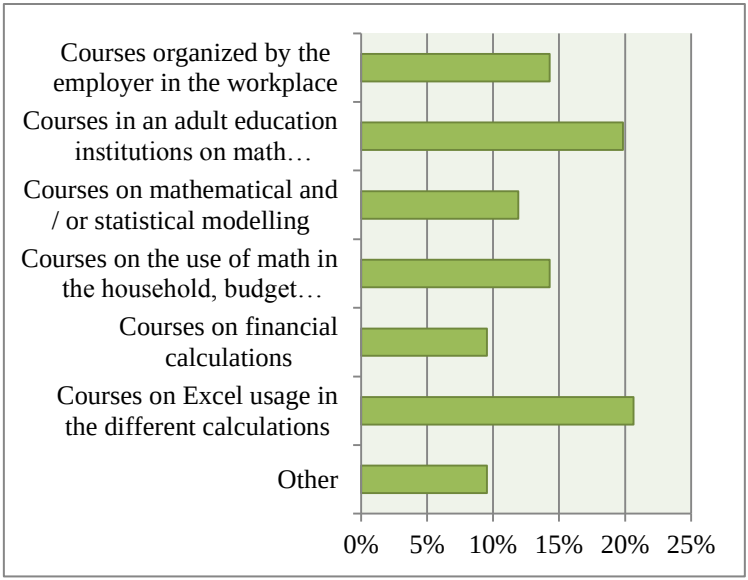


Figure 6. **Training methods preferred by respondents**

Respondents pointed that they would like to attend courses on Excel usage in the different calculations and courses in adult education institutions on mathematics

application how to solve the practical problems of my professional field.

Employers survey results

Employers were asked to evaluate the mathematics knowledge level what is needed for their company / institution's employees (Figure 7) in the scale from 1 to 10, where 1 – is not required and 10 – very high: all processes are based on the mathematical modelling / calculations / etc.

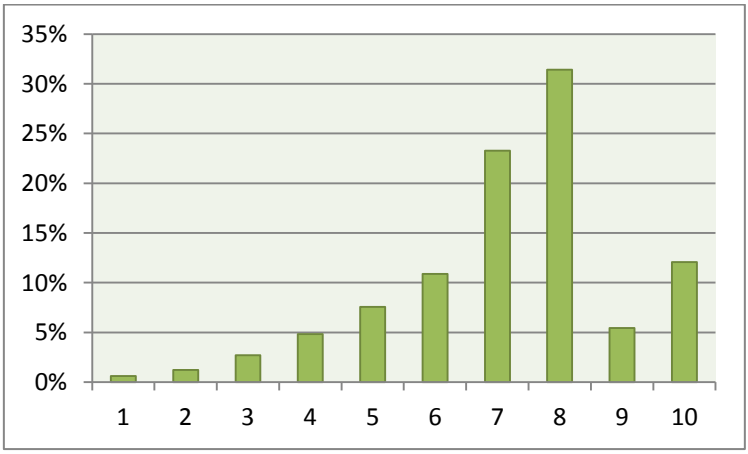


Figure 7. **Math knowledge level needed employees**

Results show that mathematical knowledge most is used in small (1 -25 employees) and very large companies (more than 100 employees) as well as in private companies. Analysing the need of mathematical knowledge by the company profile, we can see that the highest level of usability is in the service sector, including agriculture and education (Figure 8).

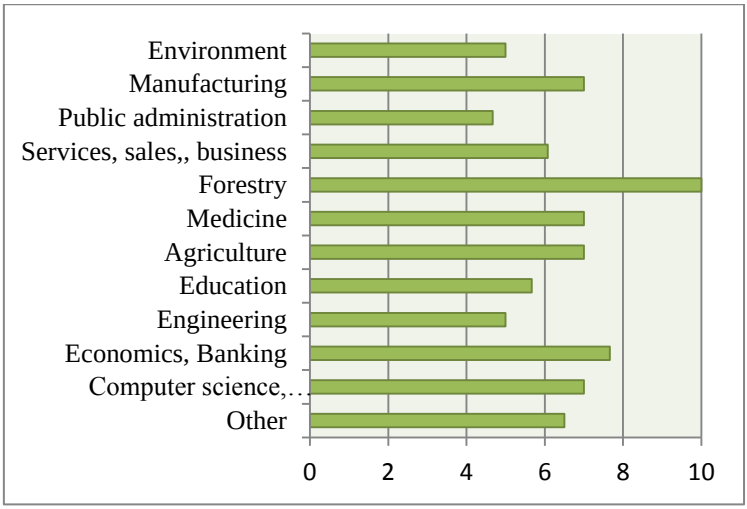


Figure 8. **Evaluate math knowledge level by profile**

Companies / institutions managers were asked to mark those fields of the deeper knowledge of mathematics that are needed for the specialists of your field to accomplish their professional activities successfully (Figure 9).

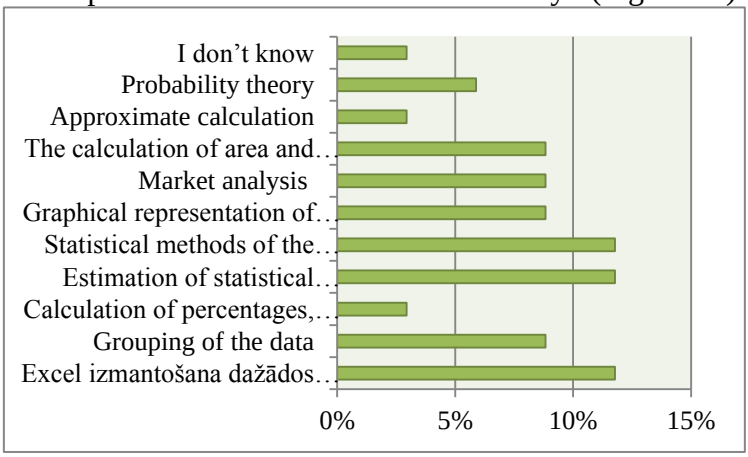


Figure 9. **Math knowledge in professional activities**

Companies / institutions managers consider that the most important is the statistical knowledge and skills to use Excel.

Managers were asked about improvement of their employees' professional competence (Figure 10) and they opinion, how could be done it.

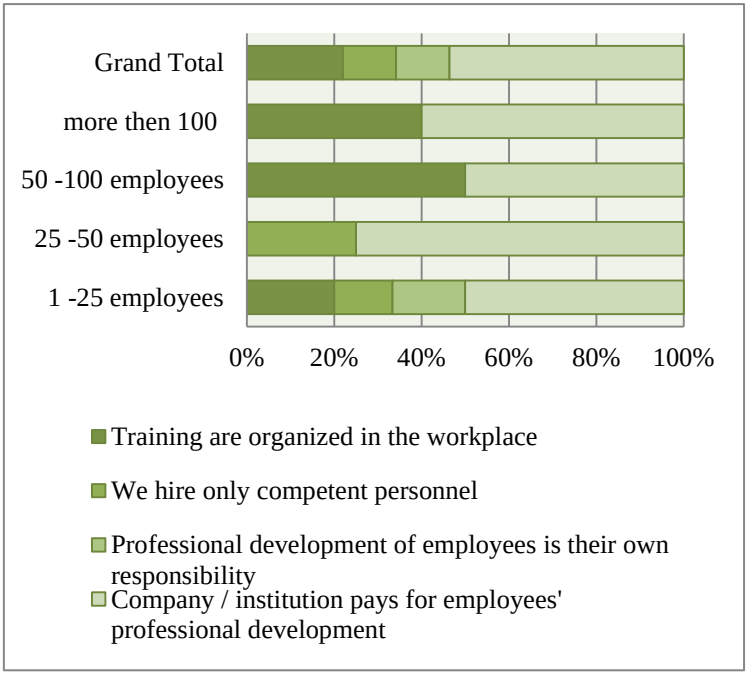


Figure 10. **Improvement employees' professional competence by company / institution size**

In Latvia more often company / institution pays for employees' professional development, sending staff to the relevant courses, training, etc., especially in medium and large enterprises.

Figure 11. **Improvement employees' professional competence by company / institution profile**

As seen in Figure 11 forest sector employees professional development of employees is their own responsibility, in manufacturing training are organized in the workplace according to the needs of the company, but in engineering - pays for employees' development, sending staff to the relevant courses, training, etc.

Mathematics has a high status in Latvia. Latvian people and managers appreciate potential values of mathematics: problem-solving and thinking developing means, the advantage of mathematics knowledge on the labor market etc.

Lithuanian citizens' math education needs

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre

Citizens survey results

276 respondents have answered the survey questions in Lithuania. There is the statistics of survey results presented. In Table 1, Table 2, and Table 3 you can see the number of men and women who graduated from the last education institution, the year of their graduation and also the age of the respondents.

Table 1. „**Gender“**

Female	167
Male	109

Table 2. „**When did you graduate from the last education institution?“**

1-5 years ago	116
5-10 years ago	40
10-20 years ago	46
20 years ago	74

Table 3. „**Age“**

Younger than 18	4
18-25	66
26-30	56
31-40	70
41-50	36
51-60	26
61 and older	18

It is seen from the presented survey results, that women were more active in the survey. Most respondents

graduated 1-5 years ago, considerable number of people, who participated in the survey, graduated 20 years ago.

In Table 4 and Table 5 you can see the occupations of the respondents.

Table 4. **„Which one of the following best describes you?“**

Employee	54,78%
Student	12,50%
Company / department manager	9,93%
Self-employed	8,09%
Unemployed	6,99%
Employer	5,51%
Housewife etc.	2,21%

Table 5. „**What is your main field of expertise?“**

Education	26,2%
Natural sciences	10,2%
Engineering	9,6%
Services, sales, business	9,1%
Computer science	9,1%
Public administration	8,0%
Social science	7,0%
Art/Humanities	5,9%
Other	4,8%
Technology	3,2%
Medicine	2,7%
Entrepreneurship	2,1%
Design	1,1%
Human resources	1,1%

The statistics of the survey results is presented in Figure 1, Figure 2, Figure 3.

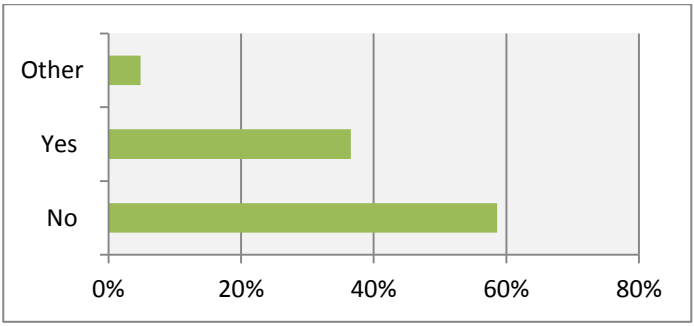


Figure 1. **Does math knowledge influence your everyday life?**

More than one third of respondents think, that mathematics knowledge influence their everyday life. More than a half of respondents (59%) do not think that mathematics knowledge influences their everyday life much. So, more than one third of people think, that mathematics is extremely important in their everyday life.

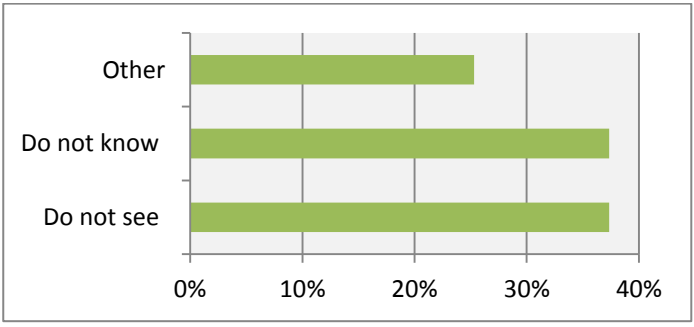


Figure 2. **Do you see needs in math knowledge in modern labour market conditions?**

More than one third of respondents are not sure that the need for learning mathematics is extremely important in the contemporary market conditions.

Other third of respondents do not think that they need learning mathematics in the contemporary market conditions. So, quite enough people do not think, that the need for learning mathematics in the contemporary market conditions is not extremely important. Such results can be explained by the fact that quite big number of unemployed people have participated in the survey.

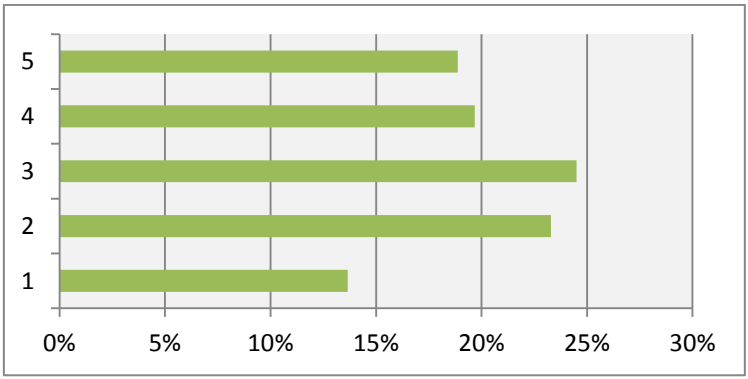


Figure 3. **Please evaluate the role of math in your professional work** in the scale from 1 to 5, where 1 - insignificant, 5 - very important

Evaluating the role of mathematics in their professional work, bigger number of respondents think, that mathematics extremely influences their professional work - 39%. A little bit more than one third of respondents states, that the role of mathematics is not so important in their professional work.

The results of respondents' answers to the survey question „What do you think are the potential values of mathematics?" are presented in Table 6, Table 7, Table 8, and Table 9.

Table 6. „**Math develops thinking, helps to make a decision in a particular situation, find new ideas“**

Strongly agree	83
Agree	114
Neither	30
Disagree	10
Strongly disagree	4
I don't know	8

Table 7. **„Studying math develops logical thinking, accuracy and concreteness of future specialists“**

Strongly agree	81
Agree	119
Neither	23
Disagree	13
Strongly disagree	5
I don't know	8

Table 8. „**The knowledge and abilities of math, math thinking helped me to achieve more in my life“**

Strongly agree	46
Agree	75
Neither	66
Disagree	46
Strongly disagree	13
I don't know	3

Table 9. „**People, who understand mathematics well, are highly assessed by employers“**

Strongly agree	33
Agree	77
Neither	67
Disagree	42
Strongly disagree	10
I don't know	20

It is seen from the above presented results that mathematics helps to make a decision in a particular situation, find new ideas to the majority of respondents (79%).

Absolute majority think, that studying mathematics develops logical thinking, accuracy and concreteness of future specialists (80% of all responses). Half of people participating in the survey (49%) state, that the knowledge and abilities of mathematics, mathematical thinking helped them to achieve more in their lives. Such results show that majority of people highly appreciate the importance and need of mathematics in their every day and professional lives. They think that mathematics is important; it helps to make a decision, find new ideas. It is seen from the Table 9 results that majority of people think that employees who understand mathematics well, are highly assessed by employers. It is interesting that respondents do not have opinion if employees who know mathematics are highly assessed by employers. We can do the presumption that such results are because of the fact, that quite big number of unemployed people participated in the survey, who are not sure what competences and knowledge are necessary for employees.

The statistics of survey answers is presented in Figure 4, Figure 5, Figure 6.

The place people live in (or work) provide an opportunity to improve competence in mathematics for 35% respondents. „No“ for 36%, the answer „I don’t know“ was chosen by 28% of respondents.

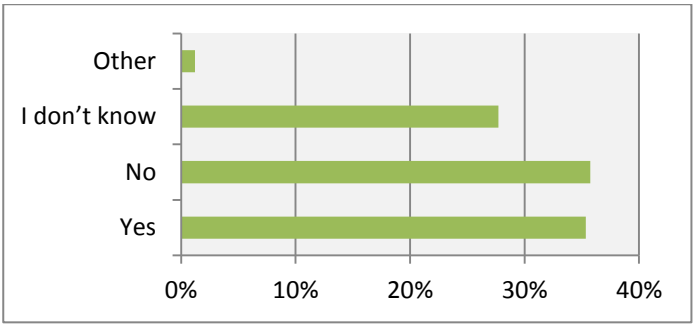


Figure 4. **Does the place you live in (or work) provide an opportunity to improve competence in math?**

It is seen that 65% of respondents do not have information how they can improve their competence in mathematics or the place they live in (or work) does not provide an opportunity to learn mathematics. So, we can state, that the need of mathematics for Lithuanian respondents is bigger than the possibilities.

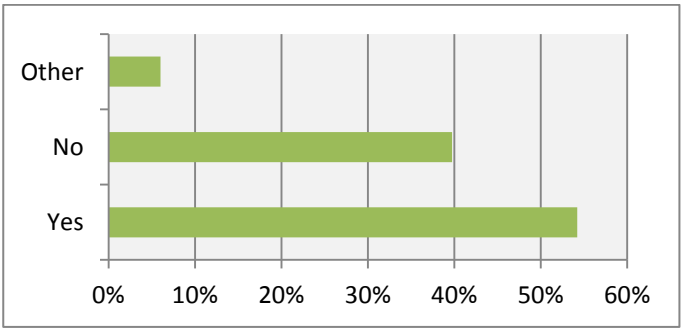


Figure 5. **Would you like to improve your mathematics knowledge / skills?**

Chart 5 shows that approximately half of respondents (54%) would like to improve their mathematics knowledge and skills. 40% of respondents, who

participated in the survey, think that they have enough mathematics knowledge and skills.

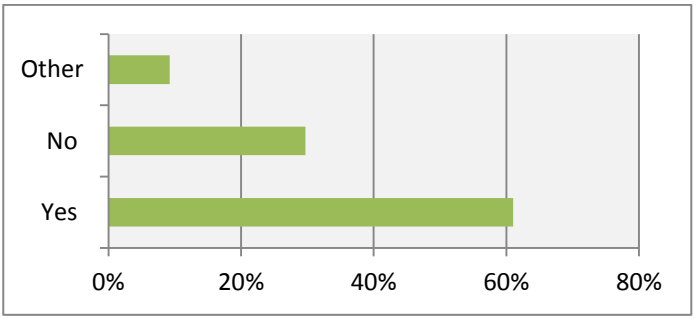


Figure 6. **If mathematics courses would be organized free of charge, do you agree to attend them?**

We see from Chart 6 if mathematics courses would be organized free of charge, 61% of respondents would like to improve their mathematics knowledge. So, if mathematics courses would be organized free of charge, there would be more people who would like to improve their mathematics competence. Quite big number of respondents wants to improve their mathematics knowledge and skills, but the place people live in does not provide an opportunity to do that.

The following are the ways suggested by the respondents how to improve the existing situation in order to improve their mathematics competence.

- continuing education courses at an affordable fee, these courses should be organized by the adult schools, colleges, high schools;
- mathematics competence development: compulsory examination for everyone;
- popularization of mathematics knowledge and skills: the articles on the popular electronic

mass media, quizzes, where you can participate when resolving mathematics tasks;

- courses where you can prepare for retaking the state mathematics examination;
- training in adult education centres;
- to create attractive web pages, adding information to various social networks (Facebook, twitter)
- to organize training in the workplace, the state should finance mathematics courses for adults;
- to provide opportunities to learn mathematics remotely.

We present the survey results in Table 10 what knowledge is necessary for employers.

Table 10. **"What knowledge of math are needed for the specialists of your field:"**

Excel usage in the different calculations	20.2%
The tasks on the calculation of percentages, averages and/ or errors	17.6%
Approximate calculation	16.1%
The calculation of area and volume	11.0%
Graphical representation of the data and etc	8.4%
Market analysis - computing a demand and supply balance etc.	6.6%
Grouping of the data	6.2%
Statistical methods of the data analysis	3.3%
Estimation of statistical relations	2.9%
Probability theory	2.9%

We can see from the answers that the following are the most often indicated by the respondents: Excel usage in the different calculations (20,2%), The tasks on the calculation of percentages, averages and/ or errors (17,6%), Approximate calculation (16.1%).

The respondents also suggest the spheres of mathematics which they are interested in and make suggestions of what they would like to learn and what is not mentioned in the questionnaire:

- MS Excel for mathematics and statistical modelling;
- budget and financial calculations;
- household, management;
- higher mathematics course in some areas;
- interesting mathematics.

Employers survey results

According to Survey statistics, 31 employers have answered to the questions. 17 from them are working in the private company, 9 in state institution, 3 in public, Other - 2. Employers Survey answers are presented in Table 11, Table 12, and Table 13.

To the question „Please evaluate the mathematics knowledge level what is needed for your company/institution's employees“, according to 10 degree scale a little bit more than a half of respondents **(**58%) have chosen the answers from 7 to 10, that means, that they appreciate mathematics knowledge as extremely necessary for their company's employees.

Table 11. **„Employees make mistakes because of the lack of basic mathematical knowledge“**

Strongly agree	9
Agree	13
Disagree	8
Strongly disagree	0
I don't know	1

Table 12. **„You notice that your employees lack of mathematical skills“**

Strongly agree	3
Agree	13
Disagree	13
Strongly disagree	2
I don't know	0

Table 13. **When you take on a new employee you prefer graduates in science studies**

Strongly agree	7
Agree	9
Disagree	7
Strongly disagree	6
I don't know	2

When analysing Table 11, Table 12, and Table 13 results, we can see, that majority of employers (71%) think, employees make mistakes because of the lack of basic mathematical knowledge (Table 11). Looking at the results of Table 12, we can see, that a half of employers (52%) notice, that their employees lack of mathematical skills. And the results in Table 13 show, that approximately a half of employers (51%) when giving a job to a new employee also prefer graduates in science studies. So, we can draw a conclusion, that the employers who participated in the survey, think that their employees lack mathematics knowledge, employers appreciate mathematics knowledge as important and approximately a half of them when giving a job to a new employee prefer graduates in science studies.

The results of the employers' answers to the survey question „In your opinion, how could be improved

competence in mathematics? "are presented in Table 14 and Table 15.

Table 14. **„I would like to collaborate with educational institutions providing services of math competence development for adults"**

Strongly agree	2
Agree	20
Disagree	4
Strongly disagree	4
I don't know	1

Table 15. **„I think there should be a network of educational institutions, offering adults the opportunity to learn math "**

Strongly agree	8
Agree	16
Disagree	2
Strongly disagree	3
I don't know	2

We can see from Table 14 and Table 15, that majority (71%) of employers would like to collaborate with educational institutions providing services of mathematical competence development for adults. So, the majority of employers notice the lack of mathematics knowledge of their employees and they would like to change the existing situation collaborating with other institutions.

A little bit more employers (77%) emphasize, that there should be a network of educational institutions, offering adults the opportunity to learn mathematics. So, the network which would help to join educational institutions teaching mathematics is extremely necessary and important.

According to the survey results we can draw a conclusion that the majority of employers agree that their employees lack of mathematics knowledge and that their employees also make mistakes because of the lack of basic mathematical knowledge. Moreover, the majority of employers would collaborate with educational institutions offering adults the opportunity to learn mathematics in order to improve mathematics competence of their employees.

Estonian citizens' math education needs

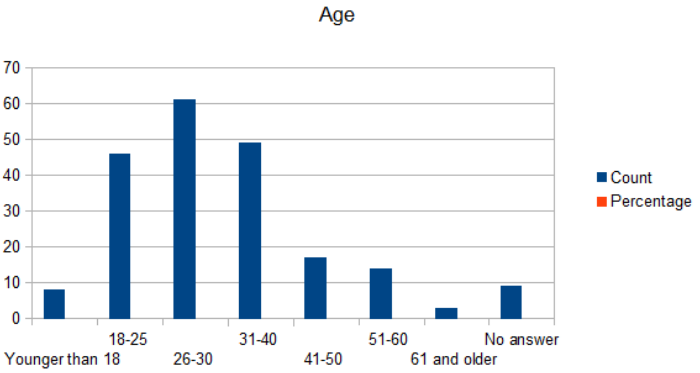
NGO Innova Estonia

Citizens survey results

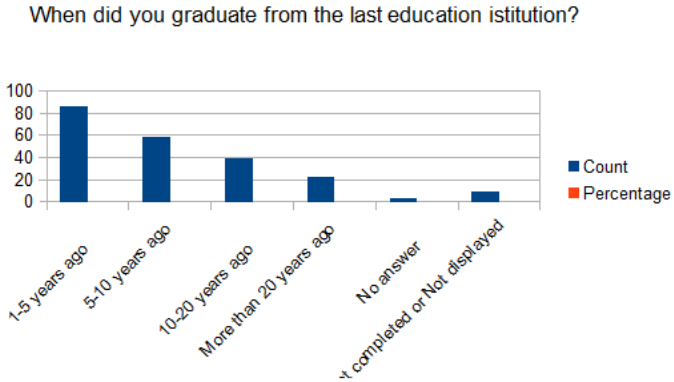
Questionnaire is conducted along Estonia people, in order to investigate their level of mathematic skills and how they think about needs in mathematic knowledge in everyday life, at working place, home and so on.

It was asked 219 persons in Estonia: 52% women and 42% men. Age of these persons, participated in the questionnaire was absolutely different: younger than 18 and more than 61 years old. The most active were participants of 26-30 years old. This category of people composes 29% of all participants, 31-40 years old are 23% and from 18 to 25 years old are 22% of persons asked.

39% people received education 1-5 years ago; 30% of participants received education 5-10 years ago; 18% people received education 10-20 years ago.

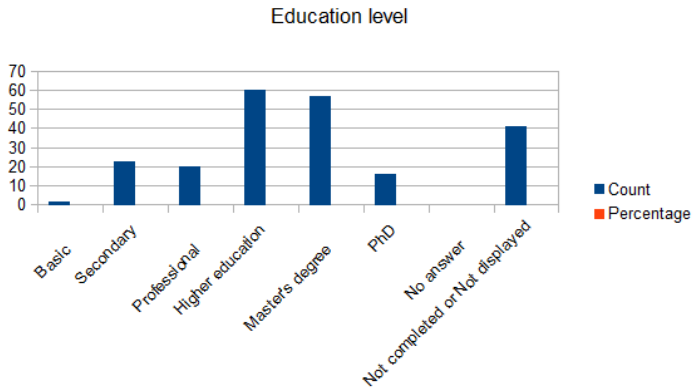


Most of participant are employees – this group is 33%, 21% - students, 14% - employers, managers of department/company are 13%, and FIE, unemployed, housewives – every group is less than 10%. Level of education is different.



Survey results shows that highly educated people category is 28%, not completed education in universities – 19%. This is index, how many students break study in universities. It is negative situation for small country like Estonia. There are 12% masters, doctorates are 7%,

10,5 % have the second education, 9% persons have education of professional college and others.

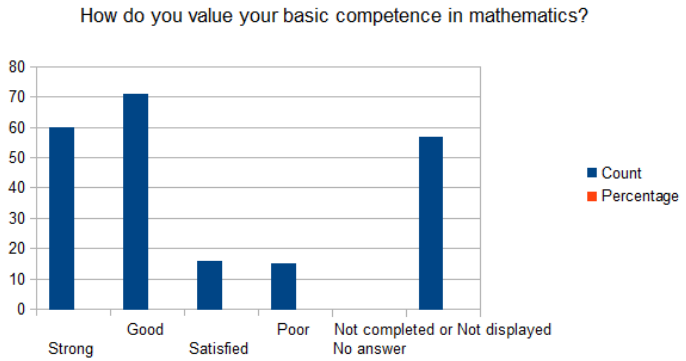


Education is very important to be successful in life. In mainly, survey participants work in education field (17%); computer technology (12%); natural subjects (10%); unfortunately, engineering has small index (9%), that also reflects not positive situation with this specialists in Estonia society, we can see that technical specialists are reduced in quantity and this is negative tendency for development of economics, because as e rule namely technical specialists have string mathematic skills, generate new ideas and move innovations to society; entrepreneurs (8%); services, trade, business (7,8%); social subjects (6%); art/architecture (5,5%); technology (4,7%) and so on.

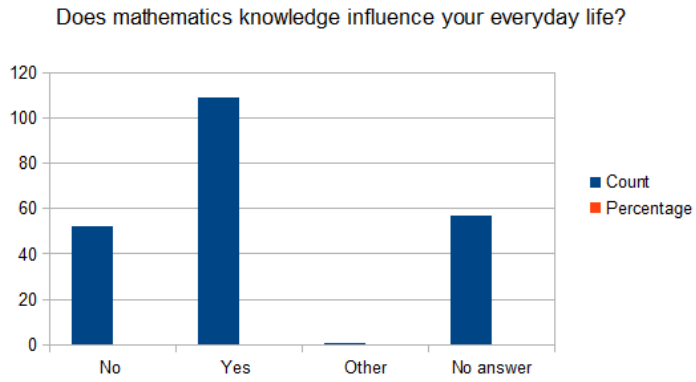
All these groups consider that mathematic skills are needed in definite volume, for example grouping of information, tasks for presents calculation, medium means/mistakes, evaluation of medium statistic deflections, statistic methods and analysis of information, graphical presentations of information, market analysis,

proposals and requirement analysis, calculations of field and volume, approximate calculations, probability theory and others. These mathematic skills need for proper work. In such way people answers.

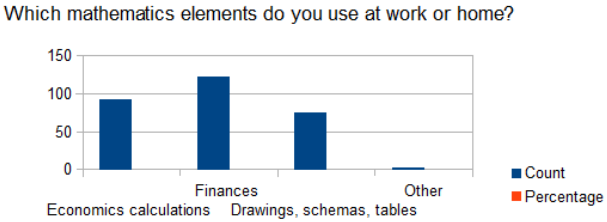
The most people work by profession, for which they receive education (51%). 27% have strong mathematic skills, 32% - good, 7% - satisfactory, 6% - poor skills in mathematic field, but many persons could not give answer about their mathematic skills (26%).



Many persons consider, that mathematics was favourite subject for them (63%), some persons agree that mathematics, which they studied in school (university, college, high/professional school and so on) could be more complicate (16%), some person do not like mathematics at all (7%) and this can be connected with different reasons, such as not understanding, laziness, not motivation and not wish, but 10% persons do not understand the most part of mathematics. 50% people considers that mathematic skills influence to everyday life, but 24% do not see mathematics as needed, 26% do not know how to answer to this question.

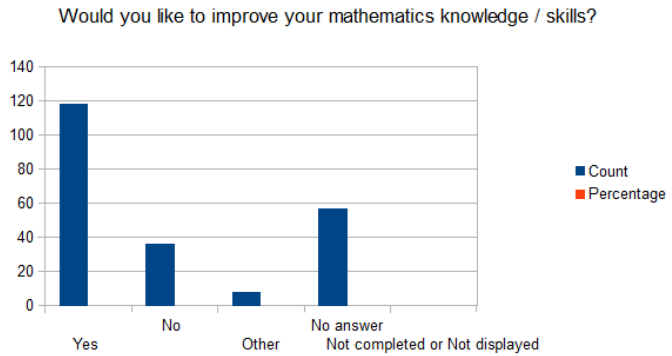


In mainly Estonia people use at working places and home the following parts of mathematics: finances 42%, economic calculations 32%, drawings, schemes, tables and so on, which composes 26%.



In conclusion, the questionnaire shows that mathematics play important role in people life. Many persons want to improve their mathematics skills (54%) for personal development and own interests, but not many for professional increase, because mathematics knowledge is not asked by businessmen and does not give better and

higher salary. If mathematics courses will be free of charge, people agree to attend at these ones (58%).



Employer survey results

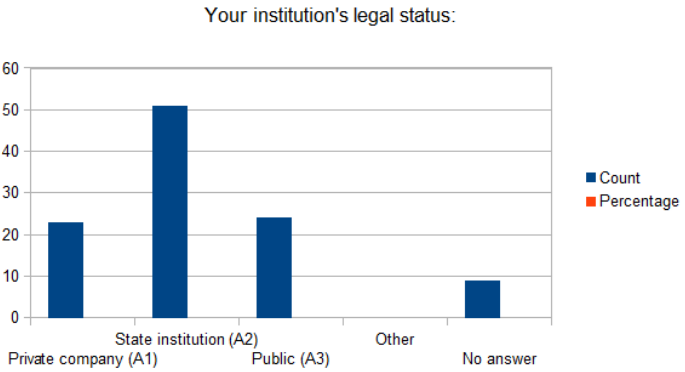
This questionnaire is conducted along Estonia people, in order to know level of mathematics skills, needed for employers and their personnel.

It is asked 107 employers. The most survey participants have work in the state institutes - 48%; non-profit activity - 22%; private companies - 22% and persons, who did not answered to this question - 8%.

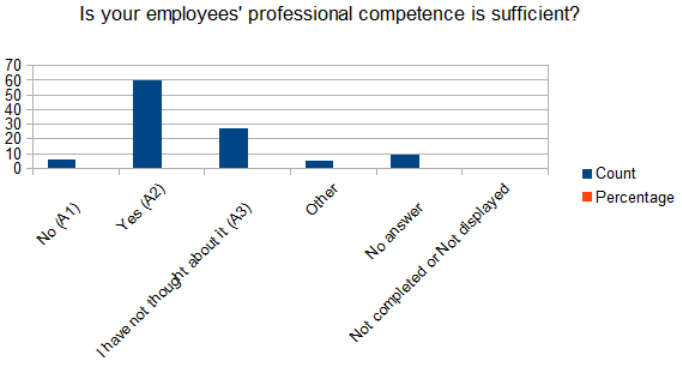
Popular firms of this survey, which work in manufacturing or environment field – 9%,construction – 9%, architecture – 6%, food industry – 4% and so on.

Number of employees in these companies is 25-50 persons (30%), 50-100 persons are 23%, more than 100 persons are also 23% and 1-25 persons as well 23%. Competence of employees is essential, because according to answers this composes 56%, many employers (25%) do not think about this and do not ask this from

employees, 7% employees are not competent or other (14%).



Employees themselves improve their competence at the working place according to company/institute requirements (36%), professional development of employees is personal responsibility at many enterprises (20%), but some enterprises pay for professional education and development and send them to proper courses, education and so on.



For employees the following is needed at the working places: Excel in different calculations (9%), grouping of information (16%), tasks of per cent calculations, calculations of medium values (8%), evaluation of statistic relations (10%), statistic methods of information analysis (9%), graphical presentation of information (5%) and so on, market analysis – calculation of proposals and demands (16%), calculation of square and volume (12%), approximate calculations (7%) and probability theory (4%) – all these subjects are needed for different specialists for fulfilment of their working responsibilities. Employers consider that mathematic logics is necessary for specialists to be successful and this composes 20%, decision taking in non-definite conditions, definite and risk conditions (modelling of alternative choose by mathematics formula of conditions and so on), which is important part for specialists – 10%, description statistics (grouping of information, tasks of per cent calculation, medium values, mistakes, evaluation of statistic relations, graphical presentation of information and so on) – this composes 7%. This is considered as most important for specialists.

In conclusion, we can say, that specialists use mathematics knowledge, but not in much volume at their working places. In mainly specialists use the proper and prepared computer programs, which require only know instruction for users. For example in wide uses such programs as market analysis, grouping of information and others like these ones (banks, trade, services and so on).

SEMINARS-DISCUSSIONS MATERIALS

Seminar-discussion on math skills promotion

Jelgava, Latvia, August 20, 2014

Employers, representatives of NGOs, Zemgale region and Jelgava, teachers, tutors and parents were invited to a seminar-discussion to work together and find answers to your questions:

- What should be done at national, institutional and individual level, to promote citizen's basic mathematical skills;
- How different types of organizations / institutions can participate in this process;
- How to organize the adult further education in mathematics and what methodological support is desirable / necessary.

The seminar-discussion was held in Jelgava Palace and was attended by 38 participants.
The work was organized in three sections.

During the first work section the project manager Anna Vintere provided information

on Nordplus program, project MathPRO goals, objectives, results and study carried out in the framework of project.

Ilze Balode (*IIPC*, Ventspils University College) gave insight into International comparative study - research results on Baltic States citizens' attitudes towards mathematics knowledge, skills and abilities.

Svetlana Atslega (LLU, Latvian Mathematical Society) explained the term "math competence" and shared practical experience on cooperation to promote math competence at university.

Edgars Paulovics (Zemgale Planning Region) analysed employment and presented need for math knowledge and skills in Zemgale region.

Uldis Dumins (Zemgales NVO centre) emphasize NGOs role in the adult education, shared experience in several European projects and told how to develop "competence to learn" and about validation of competences at European level.

Rudite Andersone (LU, Latvian Association of Mathematics Teachers) explained the interrelations among theoretical and practical knowledge in mathematics, mathematics for life and mathematics for

the workplace. A lot of discussions were on mathematics as a part of cultural heritage.

The second section of the work was devoted to a variety of methodological issues.

Ivita Steke (Jelgavas Secondary school No.4) - "Mathematics as a game". She shared projects experience as well as introduced with the results.

Raitis Ozols (LU, Latvian Mathematical Society) presentation was about thinking and it the development in mathematics.

Sarmite Cernajeva (*IIPC*, RTU, Ozolnieki Secondary School) presented several options how to enhance the learning process in order to improvement mathematics learning at school and university. She introduced seminar-discussion participants with a number of e-materials to improve math knowledge and skills. She also showed changes in the paradigm of teaching / learning mathematics.

Natalija Sergejeva (LLU, Latvia Mathematical Society) told about courses organized for adult in the framework of Latvia-Lithuania Cross border project MATNET - topics, teaching issues, learners interests etc.

Rasa Žilionė (VšĮ "Žinių kodas / NGO Knowledge Code) from Lithuania told about youth employment in Lithuania and basic skills (math) as well as about main reasons for youth unemployment and analysed Results of state maturity math exam. She said that Lithuania needs more people with math skills and that Ministry of Education on 5th August, 2014 decided that from 2016 applicants to state-funded places at universities or colleges will have to take the mathematics exam.

During the third work section all participants worked in group. The moderator of first group was Evija Kopeika (*IIPC*, RTU). The topic discussed: How different types of organization / institution can:

1) Participate in the promotion of education of the population, as well as the identification of needs
2) Cooperate with each other to promote math skills.

Second group was moderated by Sarmite Cernajeva (*IIPC*, RTU, Ozolnieki Secondary School). Topic - What should be suggested to do at the national level, institutional and individual level in order to promote basic math skills?

Third group moderated by Irena Eglite (RTU) discussed how to organize adults' continuing education in mathematics - the potential target group, level of knowledge and determination, themes ... and what methodological support would be desirable / necessary.

After that group presented their work as well as discussed the issue with other seminar-discussion participants.

At the end of the seminar-discussion the participants were awarded certificates.

Math knowledge and competences in Life Long Learning process

Vilnius, Lithuania, September 10, 2014

Speakers:

1) Izolda Bražukienė, associate professor at the Vilnius University;
2) Algimantas Čeponis, employer of UAB „Darbo aplinka“;
3) Rasa Dauguvietytė, adult teacher of mathematics;
4) Mindaugas Geryba, adult teacher of ICT and mathematics.

Participants: adult learners and teachers from different adult education centers.

This seminar is connected with an idea that mathematic becomes essential in the lifelong learning process and there is a need to use mathematic in everyday life, in the workplace, that we need to explore mathematics for life, we need more practical knowledge. It is obvious that mathematic knowledge and competences have a great input in everyday life and in the workplace and we need to know what the situation is in different institutions, starting from adult education centers and finishing with universities. So we organized a practical seminar for the learners and teachers from different adult education institutions. The purpose of this seminar was to disseminate idea, that learning mathematics can be interesting, valuable and very meaningful practically.

In the context of lifelong learning, the definition of “mathematical competence” is based on the ability to solve problems in everyday contexts, and places

emphasis on aspects of the process and the habit of using models of thinking (logical and spatial) and presentation (formulas, constructs, graphs, charts, etc.). It consists in the ability to identify structures and connections, repetitions and systematicity. Moreover, a positive attitude in mathematics is based on the respect of truth and willingness to looks for reasons and so assess their validity (EC recommendations "Key competences for lifelong learning", 2006).

1) **Izolda Bražukienė**, associate professor at the Vilnius University started with her presentation „Economical situation in Lithuania and practical math knowledge/skills of the students in the Vilnius University“. In this presentation we had possibility to hear the insights of an experienced lecturer, many years working in the Vilnius University. Izolda Bražukienė reported on economical situation in Lithuania nowadays and continued her report about economical knowledge and practical skills of Vilnius University students.

2) **Algimantas Čeponis**, employer of UAB „Darbo aplinka“ presented his ideas in the practical workshop „Practical skills of mathematic for the workplace“. Just as the level of mathematics needed for intelligent citizenship has increased dramatically, we need to

increase the level of mathematical thinking and problem solving needed in the workplace. Algimantas Čeponis talked about the most common employers problems, related with lack of mathematical competence of employees in the work. He confirmed that the lack of practical knowledge of mathematics is really an important issue.

He presented very interesting ideas, related with study program of Practical Mathematics. https://www.fmf.uni-lj.si/en/study-mathematics/practical-mathematics-I/ (the primary goal of the professional study program in Practical Mathematics is to produce professionals capable of application of their mathematical knowledge in the working process in communications and information technology, technology, logistics, and elsewhere).

Generic competences developed by the student:

- ability of critical assessment of solutions,
- ability of application of knowledge,
- ability of professional team work,
- ability to use and follow professional literature,
- ability to follow professional information on the internet,
- ability of written as well as oral presentation of professional reports,

- ability to adjust to new computer environments,
- understanding the role of advanced knowledge of information technologies,
- ability of identification of statistically significant differences,
- ability of lifelong self–education

Subject specific competences developed by the student:

- ability of employment of mathematical tools at practical problem solving,
- ability of identification of mathematical processes in professional environment,
- ability of result analysis,
- ability of presentation of results,
- ability of employment of mathematical tools in everyday environment,
- ability of initiation and conduct of software upgrade,
- ability of business process optimization,
- ability of mathematical modeling of technological processes,
- ability of employment of numerical methods at mathematical problem solving

3) Mindaugas Geryba, adult teacher of ICT and mathematics finished seminar with a practical workshop „Knowledge of mathematics in a practical way“. Experienced adult teacher organized very interesting practical workshop for all students and teachers. We had the opportunity to make sure that the math is really very interesting science and we use the science of mathematics and knowledge of economics every day in our daily life.

4) Rasa Dauguvietytė, adult teacher of mathematics presented her ideas in the presentation „How to teach math adults? Experience of different adult education centers“. Rasa shared her practical experience in teaching adults math and presented and introduced what mathematics teaching methods are used by teachers in other adult education centers. All participants of the seminar had the opportunity to try to solve some practical math tasks.

Seminars-discussions in Estonia

Tallinn, April – June, 2014

There were taken place some seminars in Estonia concerning the project context, purposes and questionnaire in period from April to June.

We have conducted three seminars with the grammar school students, teachers and parents. We discuss the mathematics as subject in

school and after this one. It was interesting conversation during the seminar. How the youth and adults think about mathematics and proper questionnaire. All these opinions are taken into consideration for investigation according to the project purposes.

As mathematics are the Basic for specialists from different fields of activity, that we conducted two seminars for businessmen. We have been in the organization hamed as „Full Gospel Business Men's Fellowship International“. This is the largest Christian organisation of businessmen. Today thousands of people in more than 160 countries are members of this fellowship. They exchange ideals to promote the Christian work ethics in the workplace.

They are not a church and do not represent the interests of any specific denomination. Because they have found their way to God in various Christian churches, their

members include Orthodox, Catholic and Protestant believers of different professional backgrounds: managers and bankers, doctors and teachers, actors and sportsmen, scientists and cultural professionals, female lawyers, actresses, factory workers, sales assistants, journalists, nurses and people who have their own business of whatever size.

We have partnership with this organization „Full Gospel Business Men's Fellowship International“ and very thankful, that we are invited to their meeting to talk about mathematics values in our society. It was chance to talk with different people, including, businessmen, who have moral values and own convictions. We talk with them and saw understanding. They also have taken our questionnaire to fill up.

Then we have meeting with group of specialists and engineers from one industrial group Baltic Ship Repair Shop. These specialists use mathematics continuously and have strong knowledge.

Moreover we have meeting with bank specialists, who say, that mathematics are so important for their work in spite of the computer programs.

In addition we collect group of information technology specialists. It was strange to hear, that they are not “friends” of mathematics.

As MTÜ Innova Estonia had concluded cooperation agreement to improve education quality standards, that we have met with students and their parents. The young will be also adults in future. It was interesting to compare, what parents and students think about mathematics. How they value own mathematics

skills? How do they see usage of math in everyday life? As a rule many parents help their children to do homework, especially on math. So parents have more basic mathematics skills, that their children. Moreover, many parents are interested to help their children in mathematics, so they fresh old knowledge and can decide new tasks.

We see that people have surprised to talk about mathematics, because this is not popular at present. Most people teach only foreign languages and do not understand why mathematics needs for in everyday life? Much people is interested to study mathematics, but do not see, where to apply these skills. As a rule businessmen require from personnel skills in different language, but not in mathematics.

Politics and economics should be changed, in order to promote mathematics skills.

All seminars and meetings are so useful for our project in Estonia. It is collected proper information for analysis and conclusion according to the project purposes.

RECOMMENDATIONS

Recommendations to the adult education providers on mathematical skills promotion

NGO Education Innovations Transfer Centre (Latvia)

The need to improve citizens' mathematical skills is determined by several factors. To explore the nature of the problem and possible solutions in the framework of project MathPRO in the portal *Delfi* was held a public discussion on this topic, as well as the seminar - discussion on citizens' math skills improvement was organized. In addition, the survey on Baltic States citizens' mathematics education needs collected the proposals on how to improve / promote competence in mathematics society.

Results show that the reason for the low population level of competence in mathematics lies in the school. Respondents argue that the education system and the program is that after the completion of school, youth is not ready for practical life, are unable to be reasoned. The school has just dry theory, learning by heart without understanding, driven young people into distaste for the learning process and that has no connection with real life. Mathematics program is such that causes allergies to mathematics for 2/3 of students in each class.

An important problem is that the teachers competence level is very low, their workload is very high, wages low, as a result, have little incentive to teach. Most of the teachers are working in Latvian from the heart and really

looking more and more new ways to teach pupils/ students. But increasing wages, better teachers will not work. Teachers who are working well, it is doing well on that salary, and those who are not interested; those would also be at a higher salary. If teachers' salaries should be increased the school would work well as those who now make money in other works, but in reality they would be very good teachers.

Learning / teaching requires two parties - one who wants to (it is comes from the family - the children should not only produce, but also to bring up), so they trained and the other half who wants to teach. Respondents think that the problem is in society and parenting methodology (less school). If parents allow their child refuse to learn, than he does not learn. Respondents pointed that to grow up learn horny generation society as a whole have to change but then each to start changing oneself.

Respondents think that for many years in Latvia is education has been as women world and the results are in accordance with - the humanities and sciences specialties popularity decline and in addition yet misunderstood gender equality.

In order to work out recommendations for the adult education providers on mathematical skills promotion, question “What would be done to strengthen the citizens' math skills?” was offered for discussions with aim to identify what measures should be taken at national / system level, institutional and individual level.

Measures to be taken **at national level**:

- Creating planning documents to incorporate there also math skills, thinking development activities;

- Developing training standards and guidelines take note of the practitioners (i.e. teachers) point of views. It is recommended to take time consolidation in programs - schedule time also for knowledge strengthening and the repetition, not only run through a large number of topics;
- Increase the number of mathematics lessons in schools;
- Review the curriculum, use a differentiated approach both in terms of mathematics content and extent of both the knowledge assessment;
- Vocational and higher education mathematics programs would be continuously improved according to labour market requirements. Carry out a research on the necessary mathematical knowledge and skills for different professions' specialists. Depending on the results, to differentiate mathematics programs, rather than as it is now - everyone learns at the same program that has not changed for many years;
- Significantly change the general public attitude towards school, teachers and the true values;
- Bringing prestige of teachers in society;
- Increase funding for teachers' salaries and learning organization;
- Creates a motivational program for adults who are interested to learn them throughout their lives;
- etc.

To strengthen the citizens' math skills **at institutional level** should be seen the following math education process participants:

- The organization of the math education process (at school, university, college, adults' learning centres etc.) to strengthen the citizens' math skills;
- Employers' attitudes and interest in employees' professional development as well as financial support;
- University degree courses in mathematics teacher preparation and assurance of practical training;
- Local community, their beliefs and values, etc.

Participants noted the following practical measures to be taken **at institutional level**:

- Mathematics in schools should be taught only by the professionals, i.e., teachers of mathematics;
- Build training in accordance with the principle of succession;
- Organize events (courses, optional hours, Olympiads, jigsaw solving competitions etc.) in schools, higher education institutions as well as at the workplace, to motivate pupils / students / adults to learn mathematics, as well as promote math knowledge and their role in the development of personality;
- Develop co-operation between the school and the family;
- Teacher - student - parent - support staff co-operation:
- Introduce entrance exams in universities, etc.

Individual level includes mainly **teachers** / professors / tutors, pupils / students / adult learners, parents, etc. The main questions of teachers are how to teach math/ how to motivate/ how to develop skills to learn/ how to assess the knowledge, skills, achievements, how to … etc:

- The teacher must be flexible and ready for changes;
- To break the stereotypes about mathematics learning difficulties;
- Use a variety of teaching methods;
- Teachers must always be prepared for lesson;
- Learning process with emphasis on mathematical knowledge and skills acquired;
- Give pupils / students in tasks that develop thinking and enhance creativity, more text and other tasks;
- Build a differentiated tasks according to pupils' abilities;
- Put forward clear requirements (at all levels of education);
- Provide instructions and guide pupils / students how to learn mathematics; etc.

Pupil / student's responsibility is to learn systematically, adhere to the teacher / teacher recommendations, ask questions and find answers, to choose their own level and to determine the learning goal, use a variety of supplementary teaching materials such as video lectures, etc.

Parents' responsibility is to keep track of your child's duties, educational achievements, be jointly responsible, to improve parents own basic math skills, be patient, etc.

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre (Lithuania)

Secondary school mathematics curriculum is divided into the basic course and the advanced course. Such a

distinction is the recognition that some students have low motivation or students are from such a social environment where education is not encouraged.

The possibility to learn basic mathematics means that a student after the 10^{th} grade is indisposed to the failure in mathematics or a student will not need mathematics in the future, or a student will not have to take mathematics examination. Thus, some students choose to study basic mathematics. Such students after graduating from secondary school have less possibility to pass mathematics examination, and this is in turn related to their choice for further studies.

In Lithuania, competitions to study science are less or there are no competitions at all for several years in comparison to the humanitarian studies. We recommend adult education institutions to comply with the provision that it should be abandoned to divide secondary school mathematics curriculum into the basic course and the advanced course and try to realize that.

Mathematics examination should be compulsory after completion the secondary education program. For several years, changing mathematics examination procedures do not encourage to take an interest in mathematics and to enjoy it, because mathematics examination is not compulsory for a student after completion the secondary education program. If we would analyse the results of state school-leaving examination in mathematics, we could observe a decrease in number of students who would choose to take mathematics examination.

In 2012, 22 students have chosen to take school-leaving examination in mathematics, in 2013 - 13 students in 2014 - 11 students. This is the data of the following main

adult education centres and schools in Vilnius: Vilnius "Zidinys" adult gymnasium, Vilnius “Varpas“ adult secondary school, Vilnius Adult Education Centre, Vilnius' Akiracio " adult secondary school. The number of students who graduate from secondary school education curriculum and choose to take state school-leaving examination in mathematics also decreases.

In the above mentioned schools, the number of students who have taken the state school-leaving examination in mathematics in comparison with the overall number of graduates from the secondary education curriculum, is as follows: 2012 - 5.3% 2013 - 3.5% 2014 - 2.9%. It is also noted that the results of school-leaving examination in mathematics decrease in adult education centres. In 2012, 63.64% of students passed school-leaving examination in mathematics, whereas in 2013 - 50%. This data was published by Lithuanian National Examination Centre. In 2014, National Examination Centre has stopped publishing the results of Lithuanian adult education centres it can be connected with a small number of students choosing to take the examination. Only at the end of July in 2014, Lithuanian Minister of Education signed the law which states that school leaving examination in mathematics is compulsory after completion the secondary school curriculum and starting from 2016 for the students who want to join the state-funded places, but also there are a lot of articles in the press criticizing this new law.

Taking into account poor results of school-leaving examination in mathematics in adult school, it should be given greater attention to the improvement of teachers‘ professional skills and teachers‘ certification. In Lithuania still not all teachers working in schools, have

studied programmes in Pedagogy or Andragogy, although there are high schools offering retraining and continuing education courses.

Adult education institutions must find funds for improvement of teachers‘ professional skills, as well as to pay the costs of web sites that promote e-learning. Teachers should be encouraged to take interest in the website e-Test and use it. The use of the website is paid and it costs 450TL (or € 130.33) a year for educational institution. The website is useful as mathematics teachers can use the tests on the website; they can also place their own tests or they can ask students to deal with the tasks online.

It should be also looked for the ways how to encourage students' interest in mathematics, to improve student motivation. As it is seen from the tendencies of the examination results in 2012-2014 years, the easiest way is being chosen – it can be said that the adults are not encouraged to keep the state school-leaving examination in mathematics. The adult education providers should look for the ways how to overcome the poor mathematical literacy gaps of the adults. The students should be encouraged to choose additional modules in mathematics, as well as to organize the courses for the students who have already completed secondary education program, allowing them to repeat the mathematics course.

In accordance to our carried survey results, 65% of respondents say that they do not have information of how to improve their mathematical competence, or there is no possibility for learning mathematics in the place they live. Therefore, adult education schools and centres

should take care of dissemination of information in society, informing about the services they provide. If a sufficiently big number of society is illiterate, it is not sufficient to put the information on the websites; one needs to find other ways how to disseminate information; it could be libraries or other cultural places in that living area: radio, television and the press.

Moreover, a reasonable proportion of the survey respondents - 54% say that they would like to improve their mathematical competences. So, we can draw a conclusion that the need of mathematics for Lithuanian respondents is greater than the possibilities provided. Thus, adult education centres should give students who have already completed secondary education programme everything necessary to study; it would be possible to offer equalizing module in mathematics. Educational institutions providing non-formal education services should offer different modules in mathematics. The supply of modules should meet the needs of the market. In accordance to the questionnaire data, the popular modules could be:

- Excel usage in the different calculations;
- the tasks on the calculation of percentages, averages;
- approximate calculation;
- budget and financial calculations;
- household, management;
- the interesting mathematics.

It should be also organized courses in adult education institutions where practical subjects would be taught how to apply mathematics knowledge in professional life.

Furthermore, adult education providers should offer people the training programmes for people who graduated from the school long time ago. For example, if the last time person studied mathematics was 10-20 years ago, it could be mathematics course modules for revision of mathematics and for the increase of mathematics literacy level. What is more, we need to look for the ways to make learning accessible to the society and the majority should be funded by the state.

High schools should offer bridging studies in mathematics, allowing students to change orientation of the studies. It is also recommended for higher education institutions to offer higher continuing education programs for people to retrain. This could be offered to the audience, who graduated in science education 15-20 years ago. The offered study programmes would meet the needs of the labour market:

- finance;
- accounting;
- information technologies.

NGO Innova Estonia

It is possible to draw any scheme for cooperation between different adult education providers. But it is needed to take into account the real situation in Estonia and other Baltic countries.

First of all economic conditions dictate knowledge and skills needed for society. If Estonia economics depends only on inside consumption like trade, different client services and construction this structure does not need strong mathematic skills. This is reality that is why main requirements at Estonia labour market are skills in

languages. Every young person knows about this, understands these facts and says, that only Estonia language is needed, in order to be successful in Estonia. That is why the young is not motivated to study and work hard on mathematics subject. This is confirmed by the state results in mathematics. Every year we can see that mathematics basic skills are not improved, but on the contrary. Estonia newspapers actively discussed exam results in this year. But no decision is proposed. Tallinn Technology University continuously say about problems with mathematic skills, because strong mathematic base is needed to study technology and engineering. There are many critics to politicians address from researchers and doctorates. That is why this is serious problem of Estonia society, which should be decided.

It is seen that level of mathematics skills depend of many factors as politic and economic situation, education study programs as well as on activity of education institutes, businessmen, media, NGO-s.

In order to study mathematics subject, any person should have not only natural abilities, but study hard continuously. But if there are not enough abilities to study exact subjects, that this person should work on mathematics as much as twice more. In order to study in such intensive conditions, any person should see perspective to apply this knowledge and receive good salary for this. But there is no such perspective in Estonia. We can consider advertisements about vacancies for work, no one says about mathematics skills, only languages. This means that a person does not see profits from this difficult subject. Why to cost a lot of efforts, if this does not give much money after?

We have conversations, discussions, talk with people, so see how they react to mathematic subject. They are interested to study for themselves in mainly, because think about own development and memory support, but not for professional development. There special computer programs to fulfil working responsibilities and many employees see that they have enough knowledge at the working places.

This situation should be changed, because we need business based on knowledge and innovations.

Competence in mathematics has been identified at EU level as one of the key competences for personal fulfilment, active citizenship, social inclusion and employability in the knowledge society of the 21st century.

Innovations develop economics and society. Innovations need logics and thinking, but strong mathematic knowledge is base for this.

It calls for overarching policies for mathematics education that are based on continuous monitoring, research evidence. It also argues for comprehensive support policies for teachers, a renewed focus on the various applications of mathematical knowledge and problem-solving skills, and for the implementation of a range of strategies to significantly reduce low achievement.

Estonia met with declining numbers of students of mathematics, science and technology, and faces a poor gender balance in these disciplines. Estonia needs to urgently address this issue as shortages of specialists in mathematics and related fields can affect the

competitiveness of our economies and our efforts to overcome the financial and economic crisis.

This report, which is based on the latest research and extensive country evidence, will make a timely contribution to the debate on effective mathematics education. It will be of great help to all those concerned with raising the level of mathematical competence of adults and young people.

The common challenges are facing Estonia and Baltic countries and responses to these challenges. It reviews national policies for raising attainment levels, increasing motivation and overcoming barriers to learning in the light of evidence on what constitutes effective mathematics teaching. It should be identified successful practices implemented in education systems and suggests ways to tackle the issue of low achievement.

For the purposes of this study, mathematical competence will be understood to go beyond Basic numeracy to cover a combination of knowledge, skills and attitudes. Mathematical competence will refer to the ability to reason mathematically, to pose and solve mathematical questions, and to apply mathematical thinking to solve real life problems. It will be linked to skills like logical and spatial thinking, the use of models, graphs and charts and understanding the role of mathematics in society.

It should be revised the mathematics curricula to bring into effect a stronger focus on competences and skills, an increase in cross curricular links and a greater emphasis on the application of mathematics in everyday life. This learning outcomes-based approach tends to be more comprehensive and flexible in responding to the needs of learners.

These tasks are for all education providers, including formal and informal education.

The aim of reach the objectives for reducing the level of low-achieving students in mathematics and increasing the number of graduates in mathematics-related fields should be supported. In this case there will be fewer problems in this field with adults.

NGO can help to decide problems with mathematics skills. This project is also cooperation between Baltic countries, in order to search ways, how to improve mathematics skills, which influence to economic development and society welfare.

This project team will generate new ideas to continue cooperation in mathematic field and decide above-mentioned problems.

Recommendations to adult math further education methodological provision

NGO Education Innovations Transfer Centre (Latvia)

Recommendations to adult math further education methodological provision include two parts - support for teaching staff and for learners.

Respondents and discussions' group participants is of the opinion that the quality of mathematics learning in formal education (school, college, university) has fallen since as a form of tests have been introduced. An important factor is also the fact that neither the school nor university anymore does not prove theorems but

learn (mostly by heart) only the rules. Several focus group participants believe that it is necessary restoring Soviet-era methods of teaching mathematics and training materials. It is also stated that all schools must use unit textbooks, in addition, those in which there are no errors. It is necessary to cancel student workbooks, which remains half-empty, and review the tasks in the books, as many of them are written so that the task for 2nd grade pupils cannot understand even parents with higher mathematical education.

In order to change the situation:

- Substantially change the general public attitude towards school, teachers and the true values;
- To learn mathematics, physics, chemistry is not an easy thing, many things must be memorized, a lot of practicing, need to make a big effort. Children need to be prepared for hard work, but the parents - to support them;
- The management of schools have to think about how to keep each hour for subjects learning, projects and other activities while leaving the execution in the free time.

Insufficient teachers' professionalism and competence is an important problem that was noted at the national level. In Latvia math teachers can improve their professional competence in several ways:

- Courses, seminars;
- Internet resources;
- Online networking;
- Free methodological / professional development in the workplace;

- Free methodological / professional development outside the workplace;
- Participation in professional organizations in order to be informed about the latest developments in adult math education (e.g., Latvian Mathematical Society, EGIP ...);
- Involvement in social networks to share experiences and see how others do it;
- Participation in European education projects and acquires or share experience/ creates new educational products, etc.

The most common professional development ways are different courses and seminars as well as various Internet resources. Educational researches show that participation in professional organizations of mathematics /adults' education, participation in European projects and social networks are not popular. In some schools / universities methodological / professional development organized in the workplace.

Question that was raised in the discussion were "*How to organize the adult further education in mathematics and what methodological support is desirable / necessary*?" Summarizing the results, it is evident that to enhance the adult education (including adult math education) in Latvia should be done:

- Arrange legislation and increase funding for adult education;
- Regular review of the programs (do they meet the modern requirements; subject content review and development; the use of different forms, create a variety of training programs etc.);
- Provide learning opportunities in rural areas;

- Interest, stimulate (increase the availability to the methodological bases ...);
- Cooperation with business sector to learn labour market needs;
- Share experiences with other EU countries;
- More information on the LLL opportunities etc.

In terms of further education in mathematics focus groups participants think that should be organized as follows:

- Organize courses for adults on basic math knowledge who have failed to complete primary school, secondary school;
- Courses for different target groups for specialized industries or social status positions, such as managers of small farmers, the unemployed;
- Courses in schools for parents who want to help their own children;
- Courses for students (at university) who want to study, but previous knowledge level is low;
- Additional courses in mathematics for teachers of certain subjects, such as the Olympiad tasks solving; etc.

For adult continuing education in mathematics are identified four strands:

- Financial literacy, budgeting, business plan preparation;
- Maths and ICT (Excel Using various estimates);
- Basic knowledge of mathematics;
- Specialized courses in a narrow target group.

Preferred methodological support for teachers includes:

- Computers, access to the Internet;
- Programs appropriate textbooks;
- Various toolkits of the teaching / training materials;
- Visual materials according to topics; etc.

Methodological support for learners (pupils / students / adults / math teachers etc.) includes

- E-materials;
- Recommendations on how to learn effectively;
- To create and provide access to a variety of formula sheets; summaries of the materials by topic;
- To create and provide access to video lessons, direct and remote consultations;
- Create opportunities for group work (can be also on the Internet), etc.

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre (Lithuania)

Introduction. Lithuanian adult education schools and centres provide adult learners with the possibility to obtain basic and secondary education as well as the service of non-formal education. Adult learners can choose studies in adult education centres regardless their age, they can also select the form of their studies: day and night classes or correspondence courses.

Speaking about math, adult learners study math according to basic and secondary education curriculums, education is free if students have not obtained basic or secondary education. When speaking about the service of non-formal education, possibility to study math depends

on the demand. Service of non-formal education is charged.

Situation. According to the data of Lithuanian national examination centre, in 2012, 33 students chose to take math state examination, 21 of them passed, i.e. 63.64%, in 2013, 10 students chose to take math exam, 5 passed, i.e. 50%. The results in Lithuanian schools of general education are: in 2012 - 93.21%, in 2013 – 93.53%. Here is the data about the students who finished schools that year, the data about students externs or students who retook examinations is not involved.

As adult learners do not choose to take math exam, this influences their selection of future studies. Adult school-leavers, who did not choose to take math school – leaving exam, do not have the possibility to study professions connected with natural sciences, exact subjects etc. Due to the low percentage of passed examinations as well as low number of students who take math school-leaving exam in adult education centres, it is important to find the ways how to improve the situation.

Recommendations. It is necessary to find ways how to encourage adult learners to trust their efforts, so that they would choose to take math state exam.

One of the reasons why adult learners do not choose to take math examination is studying math B level, i.e. a student does not learn all math topics and teachers do not encourage students to take the examination. That would be recommendation for teachers of adult schools and education centres to encourage students studying math A level in 11^{th} and 12^{th} forms.

Teachers should not also be afraid to take responsibility when students choose to take math exam because teachers are used to discourage weaker learners from taking exam as they state that the student studies B level and his knowledge is insufficient.

Teachers should also raise their qualifications and search for proper ways to interest learners in mathematics. It is necessary to find ways how adult working people who are busy and have little time to study could improve their knowledge. At the moment in Lithuania there is an internet site http://vaizdopamokos.lt/, where teachers place video lessons. Adult educators should also be encouraged to create material for video lessons, so that students could revise the material.

It is also recommended to expand distant learning service when teaching math in adult education. Distant learning is very important taking into consideration current economic situation in Lithuania. Many people give up studies just because they go abroad to work. These people would prefer distant learning.

According to the data of our project, the respondents answered which math spheres are necessary for their work. As we see from the table below, a very low percentage of respondents indicate main topics of mathematics as necessary in their professional career. We think that adult teachers should initiate students' interest in the above mentioned topics, emphasize math application into practice during lessons.

Table 1. **„Fields of the deeper knowledge of math that are needed for the specialists of your field to accomplish their professional activities successfully".**

Geometry and trigonometry, analytic geometry	0.74%
Vector algebra and linear systems, the operations with data matrixes	1.47%
Mathematical logic	2.57%
Discrete mathematics	1.47%
Differential calculation	1.10%
Integral calculations	0.00%
Differential equations	0.37%
Probability theory	2.57%
The application of mass service theories	1.47%
Descriptive statistics	3.68%
Inductive statistics	2.57%
Multi-dimensional statistical analysis	1.10%
Operations research. Linear and nonlinear programming. Net planning	1.84%
Decision-making in the uncertainty, certainty and risk conditions	2.94%
The elements of betting theory	2.21%
I don't no	0.37%

According to the data of our project, as we can see in the Figure 1 below, more than half of respondents would like to deepen the knowledge of math.

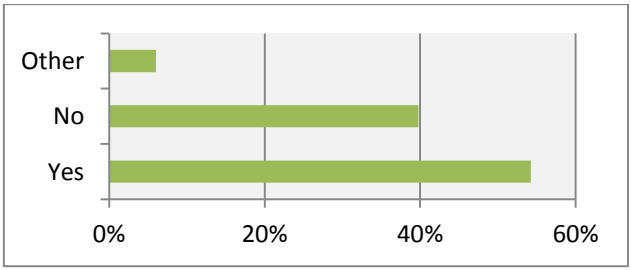


Figure 1. **Would you like to improve your mathematics knowledge / skills?**

We recommend adult institutions, which provide service of non-formal education, to expand the supply of maths

modules, so that adult learners could study the necessary ones. The recommended modules would be:

- Finances and accounting;
- Interesting mathematics;
- Math application in household budgeting.

NGO Innova Estonia

Estonia successfully applies client requirements in field of mathematics for everyday service. Any person can use such elementary mathematics calculations as salary, taxes and loans, currency exchange and other accounting. For these purposes some web-pages are developed and used by Estonia people widely.

The most popular web-pages are the following:

www.kalkulaator.ee (calculation of salary, taxes)

www.kasulik.ee (salary calculation)

https://www.swedbank.ee/private/credit/start (calculation loan, leasing, credit cards)

https://www.swedbank.ee/private/investor/start (investment, saving, pension)

https://www.swedbank.ee/private/planner?language=ENG (financial planner)

https://www.swedbank.ee/private/d2d/payments2/rates?language=ENG (currency exchange)

http://www.seb.ee/eng/loan-and-leasing/home-loan/home-loan (calculation of home loan)

http://www.seb.ee/eng/loan-and-leasing/leasing/car-leasing (car leasing)

http://www.seb.ee/eng/loan-and-leasing/small-loans (small loans)

http://www.seb.ee/eng/pension/second-pension-pillar/seb-conservative-pension-fund (pension fund)

http://www.seb.ee/eng/insurance/life-insurance/risk-insurance (insurance)

Other Estonia banks have similar calculation operations. Financial Planner is an internet environment for convenient management and observation of your money matters.

With the Financial Planner you can quickly get an overview of your financial situation, create budgets for yourself, obtain control over your expenses and make better use of your money. The Financial Planner automatically finds the right data from your transactions and organises them into expense and income groups. This enables you to get a great overview of your transactions by selected periods. You can observe how much money is spent on what and set a limit for each expense group, which you should not exceed. This way you can later see how you adhere to your budget. Adjusting your preferences only takes a few moments and later everything is done automatically.

Family financial planner: A lot of families prefer to organise their money matters from one ‘purse’. And that is exactly what the Family Financial Planner will let you do – it will give you an overview of all your family’s income and expenses. You can use this information to draw up budgets for you, set goals and more. Every member of your family can share their accounts with

everyone else, but you don't have to share yours in return if you don't want to.

Observing the budget. Budgets enable you to compare how much money you spend and how much money you think you should spend. It is possible to set a budget limit for each expense group and sub-group. All budgets for which you have set a limit are displayed on the budget page. Each budget line shows the expenses made in the chosen time period. The Financial Planner notifies you on the overview of finances page if you are approaching your budget limit or have exceeded it.

Currency exchange. You can use the currency calculator to find out how much buying or selling foreign currencies will cost you.

http://web.zone.ee/objekt/erialamat/index.html
(mathematics speciality)

Brief course to study calculation basics (numbers, units, price units, per cents, weights).

Colleges gives own information about calculations with help of Excel, which are needed for specific work (trade, feed preparation and others).

There are many special courses to study Excel calculations were proposed by Tallinn Technology University for specialists and unemployed people as well.

Different IT courses for specialists also include computer calculations.

But, unfortunately, the young absolutely cannot calculate without calculator. This influences to ability to think and analyse, because this is done only with help of computer. We live in technology century, but person manages

mechanisms, not on the contrary. So this tendency to do anything without thinking is harm for personal development.

Different tests are also completed by guess work – as result this is not develops thinking. Now it is main problem in the education system – how to teach student to think? Mathematics is good method to develop thinking.

New methodology should be prepared to develop mathematics skills, not only computer calculators and for client interests. Some special exercises for thinking are needed.

Estonia has problems with adults, because according to Estonia Education Minister information (September 2014) Estonia 1/3 labour market does not have any qualification. This part of population clearly does not have strong basic mathematics skills. But this is large number enough, in order to think, what will we do in future in our technology time?

Person, who does not know elementary mathematics, cannot think logically and understand well economics and society development processes. This category of people cannot work with innovations that are needed in our modern time.

This is main problem to decide, what math methodology is to be prepared for this people category? Strong math skills of adults, which were in young ages are also to be restored and supported. Unfortunately, mathematics as subject requires from person to work and think much. This is not popular in our time. As result we see, what happens at Tallinn Technology University, where the

young is not ready morally and educationally to study technology subjects, which need strong mathematics skills.

This is also problem number, which should be decided.

Description about different organizations involvement in math skills promotion

NGO Education Innovations Transfer Centre (Latvia)

The cooperation objectives could include three directions of the mathematics continuing education process:

- The development of the math continuing math program;
- Math continuing education process organization;
- Support activities.

Thus, summarizing the experience and taking into consideration the NGO Education Innovations Transfer Centre member's reflection, experience and observations, generalizing benefits from previous cooperation's several conclusions on cooperation level can be made. The cooperation can be seen on international or national / local level. The international cooperation includes:

- The cooperation can be implemented through cooperation with other adult education providers and with professional institutions as well;
- The cooperation with adult education providers can be implemented by offered education profile or by the level (local, regional, European etc.);

- Both international and local cooperation can be implemented in the adult education programs directions or particular specialty etc.

The cooperation at local level characterizes by:

- The cooperation between participants of study process: teaching staff (professors, lecturers, teachers etc.);
- Labour market (employees, employers);
- Other interested parties (e.g., adult learners, lifelong learning providers).

Participants of the seminar - discussion that took place on August 20, 2014 were asked to express their views on question how different types of institutions can work together to promote citizens' math skills. Summarizing the results identified the key areas of cooperation:

- Employers' financial support for the continuing education of its employees;
- Identifying the minimum of mathematics skills of different professions;
- Take regular population surveys to identify needs and drawing up an action plans;
- Adult Education actors jointly workshops and discussions;
- Various mathematics-related events (courses, seminars, camps, etc.);
- More promote the importance of knowledge of mathematics in schools;
- Employers specify the necessary math skills to employees;
- Cross-sectorial, regional projects on the use of mathematical knowledge, etc.

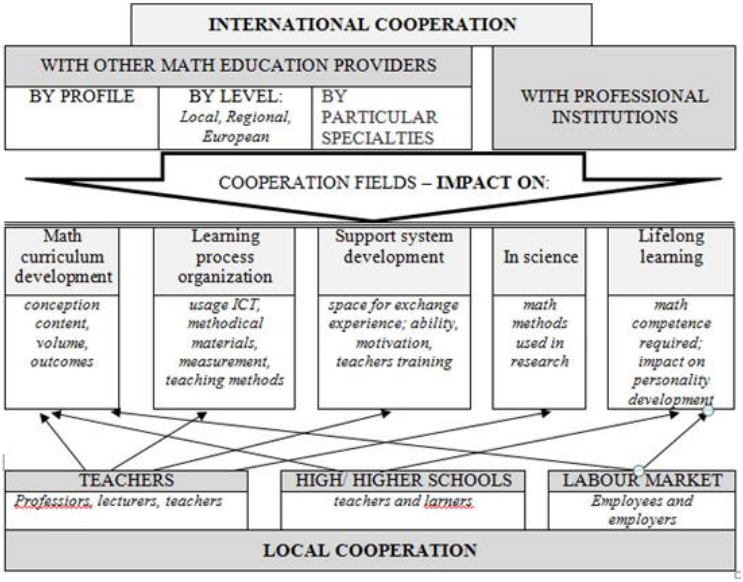


Figure 1. **Cooperation forms and their impact on math education process development**

The cooperation forms as well as their impact on mathematics education process development generalized in Figure 1.

The main reason for the cooperation, of course, is mathematics education development. Adult education providers play an important role in the context of lifelong learning. Summarizing the attainments within the projects mentioned above, cooperation impact on math continuing education process can be generalized by the following the directions:

- Math continuing education curriculum development (learning outcomes, content, volume, methods used);

- Math education process organization (usage ICT in studies, methodical materials, measurement of learning outcomes, teaching methods etc.);
- Study support system (teachers training, space for exchange experience, accessibility of mathematical competencies, the motivation of the students, etc.).

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre (Lithuania)

With the wish to promote math learning to adults and to improve math exam results, it would be recommended to the Ministry of Education when designing math curriculums to give up subject division into into A and B levels because students select learning syllabus in 10^{th} form and study math for two years in 11^{th} and 12^{th} forms A and B levels. After finishing math syllabus B level, the possibility to pass math school – leaving exam becomes reduced. This influences further education as students have no possibility to continue studying natural sciences or exact subjects. As we know, progress in this sphere has already taken place as in July 2014 the minister of education has signed the order that since 2016 the ones entering state funded places in colleges and universities will have to pass math school-leaving exam. Math will not be obligatory only for art students.

According to the data of our questionnaire, 54% of respondents claim that they would like to improve their math skills. Thus it is recommended to adult education centres which provide service of non-formal education to offer math modules to adult learners. When considering

the results of our questionnaire shown in Table 1 below, it is possible to recommend modules which respondents point out as the most necessary in their professional activities. This would be Excel usage in the different calculations, the tasks on the calculation of percentages, averages and/ or errors, approximate calculation.

Table 1**. "Knowledge of math are needed for the specialists of your field"**

Excel usage in the different calculations	19,9%
The tasks on the calculation of percentages,	17,3%
Approximate calculation	15,9%
The calculation of area and volume	10,8%
Graphical representation of the data and etc.	8,3%
Market analysis - computing a demand and	6,5%
Grouping of the data	6,1%
I don't know	5,1%
Statistical methods of the data analysis	3,2%
Probability theory	2,9%
Other	1,1%

According to results of the questionnaire presented in Table 2 below, we can see that the most necessary in adult education institutions are mathematics courses, other types courses are also required: courses on the use of mathematics in the household, budget planning and management, courses on Excel usage in the different calculations.

Table 2. **"Which type of mathematical further training do you prefer?"**

Courses in an adult education institutions on mathematics application how to solve the	20,0%

Courses on the use of mathematics in the household, budget planning and management	18,7%
Courses on Excel usage in the different	15,3%
Courses on financial calculations	14,7%
Courses organized by the employer in the	12,0%
Courses on mathematical and / or statistical	10,0%
Other	9,3%

Taking into consideration recommendations of questionnaire respondents, we think that mathematics should be popularized through mass media, this would include math games for learners on TV, quizzes on math subject, also emissions forming children‘s values and rising motivation to study math.

Math promotion in media and TV is recommended, more articles and emissions including information about international research results are necessary, e.g. what is the literacy of adults’ in math with the comparison to other countries. Media should also include articles about usefulness of math and its application in everyday life: counting finances, foreseeing business.

Adult education institutions are recommended to find ways how to implement distant learning, so that adult learners would be provided with the possibilities o use modern e-learning devices.

Adult education institutions, teachers and lecturers are recommended to contribute to math promotion when placing useful information on the internet. Useful are sites, where people can find much information about math, math history, i.e.: http://lt.wikipedia.org as well as http://www.lithuanian.net. Math teachers are also recommended to create math video material, math tests,

placing information on internet sites www.vaizdopamokos.lt, www.etest.lt.

Employers are recommended to collaborate with adult education institutions and to organize courses on improvement of math competences in work places. Employers are also recommended to fulfill employees' math literacy tests in work places, the employees who show well in the tests should be promoted.

NGO Innova Estonia

Mathematical skills are needed for specialists, who work in engineering, economics, IT and others. Mathematical skills are needed for business, founded on knowledge and innovations according to Europe Strategy.

Mathematic skills level influences to economic and social development of country. The country politics create conditions for the youth and adults to learn mathematics.

Competence in mathematics is identified as key competence at EU level for personal fulfilment, active citizenship and social literacy in knowledge society of 21th century.

We see that during 20 years education reforms are continued in Estonia. Unfortunately education programs depend on political party or coalition that is in majority of Parliament. This means that politics determines education strategy and influence to education quality, what Estonia universities say about.

Political experiments are resulted in the following:

- from 2007 the state math exam is cancelled.

- from 2014 the state math exam is done as obligatory again
- from 2010 year it is done new math program in grammar school – narrow and wide. courses, that differ each other by teach hours and context volume.

New study books for mathematics do not means higher quality. On the contrary students consider that mathematics study books are not understanding and not clear for studying.

Moreover most of the young is not interested in mathematics, because this subject needs a lot of efforts, concentration and time to study. That is, why namely from the school mathematic skills are developed and the young are adult in the nearest future and complete the labour market.

That is why the school creates the mathematic base and responsible for skills in this subject. But as it is said above politics regulates education system and schools fulfil Estonia government orders and apply these ones into the school study programs. This means that politicians should think about future of the country.

Economic crisis shows, that there are need strong skills in exact subjects. Thinking ability is needed for innovations. That is why mathematical skills should be improved in Estonia in Europe generally.

Some changes are seen in Estonia society from 2014 years. From 2014 years Estonia universities consider math exam results of future students. Many university researchers say in media about mathematics role in study, work and life. Estonia President says about math and

engineering importance, about information technology in every profession.
Eesti Energia large enterprise general director says about role of engineers. This corporation works closely with Tallinn Technology University and give the best students to work for energy industry in Estonia.

Estonia media says and writes about mathematics from 2013 more and more. Newspapers wrote about exam results in schools in detail, some discussions of universities researches are published. There are special broadcasts about mathematics at Estonia radio. Mathematics teachers say about mathematics in different way.

Tallinn Technology University criticizes Estonia politics in field of exact subjects, especially the study mathematics programs for gymnasium. They consider that the narrow and wide courses are not suitable to study then in technology universities, because these ones do not give proper mathematics skills, needed to study for engineering. We live in technology century, when logical and innovation thinking is the most important for innovations and economic development. Mathematics plays the main role for welfare of society now and in future.

The most important problem for Estonia is economic structure. If 1/3 part of labour market does not have any qualification (source: Estonia Education Minister, September 2014), that this shows clearly, which mathematics skills level of people in the country. If person has strong mathematic skills, that he complete the gymnasium and receive qualification in different education institutes. If Estonia working places do not

need education and qualification that it is not possible to say about improving mathematics skills. Most of all Estonia economic structure should be changed. Now Estonia business is based on services (75%), including trade, hotels and restaurants, tourism and so on.

Businessmen generation should be changed as soon as possible. Universities researchers say about this. Businessmen should have strong education, inc mathematics skills. In such way they should be interested to develop business, based on knowledge and innovations, that need to employ highly qualified and educated personnel. This will be natural way for promotion of mathematics skills. If person can work without qualification and education, that nothing helps to promote mathematics skills in society. And on the contrary, many working places, needed mathematics skills will be the best promotion of this in society. Only this is way to change situation with mathematics in Estonia and Baltic countries. All these countries have the same economic structure and similar problems, including mathematics skills.

This project is cooperation between Baltic countries in field of mathematics investigation. The project shows that problems concerning of mathematics skills are similar in these countries.

It is needed common work to restructure economics to value mathematics skills in society. The project gives new information and new experience as well as discovers problems with economic structure in Baltics countries.

GENERALIZATION

Information about the partners

NGO Education Innovations Transfer Centre (Latvia)

Non-governmental organization "Education Innovation Transfer Centre" was founded in 2009 in order to gather international issues of education and make them more accessible to the Latvians as well as enhancing learning opportunities for everyone throughout life. This non-governmental organization brings together actors of all education levels - teachers, university lecturers, formal and non-formal adult education teachers, students of education science, researchers, as well as all levels learners, etc. The organization's main focus is to promote international cooperation, creating networks for the identification of innovative experiences as well as the coordination of the cooperation, to promote the educational development projects. The organization is also engaged in other activities that promote educational innovation in the promotion and transfer:

- **provides** recommendations for educational development,
- **forms** the infrastructure for the practical implementation of educational research,
- **carries out** information activities in society as an educational innovation,

- **promotes** the usage of modern educational technologies in the educational process,
- **organizes** training courses for adults etc.

The organization is new, but already has experience in several international projects (10), which characterizes the areas of association expertise.

As project coordinator:

1) NORDPLUS Adult Education Mapping Project No.NPAD-2013/10268 "Cooperation to strengthen the citizens' math skills in the context of sustainable society development and welfare" (01/07/2013 – 30/09/2014);
2) NORDPLUS Adult Education preparatory visit No. AD-2012_1b-32124 „Cooperation to strengthen the citizens' math skills in the context of sustainable development" (11/2012 – 03/2013);
3) EU LLP Grundtvig workshop INOVATE – "Implement New Operating Changes for Valuing Adult Training and Education" (22/05/2012 – 28/05/2012);
4) NORDPLUS Adult Education preparatory visit Nr. AD-2010_1b-24542 „Adult today" (11/2010-03/2011).

As partner:

1) NORDPLUS Adult Education Development Project ID Nr. NPAD-2014/10167 **"**Scandinavian as a second language – also in Baltic countries**"** (01/07/2014-28/02/2015);
2) NORDPLUS Adult Education Mobility Project ID Nr. NPAD-2014/10170 "Transforming losers into winners" (09/2014-08/2015);

3) Youth in Action ID Nr. 2013-5646/034-001 YT7 PYWMOB „ Inter-organizational learning: Employability and Social Inclusion through Non-formal Education of young people" (24/03/2014-30/11/2014);
4) NORDPLUS Adult Education Development Project No. AD-2012_1a-28886 „How to challenge an adult to teach an adult" (01/09/2012 – 01/09/2014);
5) NORDPLUS Adult Education Development Project No. AD-2012_1a-29721 " Effective language learning for people aged 18-30" (01/08/2012 – 01/08/2013);
6) EU LLP Grundtvig Learning Partnership Project No. 2011-1-PL1-GRU06-199824 „Aging With Active Knowledge and Experience" (AWAKE) (1/08/2011 – 31/07/2013).

Society's most significant publications:

- How to challenge an adult to teach an adult, Project book, 2014, ISBN 978-609-8126-10-5.
- Vıntere A., Cernajeva S., KOROLOVA J. (2014) Challenges ın work wıth adults: the sıtuatıon analysıs ın Latvıa. ISSN 1691-5887.
- Vintere A. (2013) NEW CHALLENGES FOR ADULT EDUCATORS. Creative Personality, Vol. XI, Collection of Scientific papers, 124.-132.lpp., ISBN 978-9934-503-13-9; ISSN 1407-6276.
- Vintere A., Vronska N., Balode I., Kopeika E., Cernajeva S. (2013) Educational needs and expectations of people over 50. Latvia, 2013, 128

p. Print Publications ISBN 978-9984-48-105-0; CD: ISBN 978-9984-48-106-7.

- Samoiljuk V., Vintere A., Golubevaite L., (2013) Effective language learning. Project book. Estonia – Latvia - Lithuania, 2013. 120 p. En: ISBN 978-9949-33-168-0, LV: ISBN 978-9984-49-884-3.

Association's members are the people who work in the field of adult learning as well as in adult education decision-making processes.

Staffs have cross-cultural competence, can communicate with people from different countries and have the experience to overcome the cultural differences.

Location: 23 Kronvalda street, Jelgava, Latvia
Contacts: +371 29419351, iipc@tl.lv
Website: www.iipc.lv

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre (Lithuania)

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre (hereinafter called as Education Centre) was founded in 1994 by the model of the Danish FYN'S County schools. In 1998, the institution was named after Gabriele Petkevicaite-Bite, a famous writer and public

figure associated with educational activities. The motto of Education Centre is as follows: "It is never too late to learn". The Education Centre is for adults who seek new skills and knowledge required for professional career and life. Since its foundation, the Education Centre provides primary, basic and secondary education and subject-specific (modular) knowledge for adults of Vilnius and the surrounding areas.

The Education Centre provides formal and non-formal learning services. In our Centre there are about 700 hundred students. We have got 5 – 10 grades of the basic education. We provide basic education for those adult people, who haven't finished secondary schools and fell out of education system because of various reasons (such as needs to work, low studying motivation).

There are a growing number of learners who choose to study individual subjects. Adult learners of different ages are studying in the Education Centre. 3 teachers methodologist, 17 senior teachers, 4 teachers, 1 psychologist and 2 social pedagogue work in Education Centre. Currently it is possible:

- to get primary, basic education;
- to learn subject-specific modules (foreign languages, information technology, sewing, knitting, wool felting, silk painting, embroidery, dancing, therapeutic gymnastics, self-defence, etc.).

The Education Centre has experience in international projects.

Grundtvig projects:

1) ELBA – Electronic Book for adults (2005-2008).

2) Together in Completeness (2005-2008).
3) Together towards Knowledge – Based Society in Europe (2010-2012).
4) Mobile Devices and Web 2.0 - A New Perspective in ICT for Digital Inclusion in Europe (2013-2014)
5) Senior Volunteering Projects (2012-2014).

Nordplus project:

Cooperation to Strengthen the Citizens' math skills in the context of sustainable Development and Welfare (2013-2014).

Location: Žirmūnų st. 32, Vilnius, LT-09228
Contacts: +37065026976, kristinamart@gmail.com
Website: www.gpbite.eu

NGO Innova Estonia

NGO Innova Estonia is organization for Engineers and technical specialists. It is not important, if person does work for technical field now or have done this before or if somebody only is going to connect his future life with technology – all these persons are interested in new technology, natural sciences and mathematics. All these persons like intellectual work, innovations and new ideas, that is why they are able to develop any projects, which are useful for our people, country and European Union in general to create additional value. This is large potential, which is especially valuable in time of Europe economic crisis to react promptly to work force market and economic changes.

NGO Innova Estonia is founded to promote natural sciences, inc mathematics, the interests of graduated Engineers, technical specialists, qualified and logically thinking persons.

Engineers and technical specialists are always looking to the future, using modern and innovative methods to reach their purposes.

Decision of our society problems depends on our thinking and activity. Not only in technical fields – innovations are needed everywhere in our work and life.

As a rule Engineers solve problems and create economic growth, development, new jobs, improve living standards and create greater democracy.

NGO Innova Estonia considers knowledge, new ideas and projects as new job opportunities.

There are many aims to realize and together with NGO Innova Estonia it is possible to achieve the results put before the society.

NGO Innova Estonia has concluded the cooperation agreement to improve education quality with NGO School of the 21 century.

NGO School of the 21 century is the certified gymnasium. Education quality is success for future of any person and society. NGO Innova Estonia works with the young.

NGO Innova Estonia prepares education projects for this gymnasium and does research work with students. This activity is intended to generate new ideas and use innovations as important condition for development of education system.

NGO School of the 21 century proposes the following:

- Initiative development and active usage;
- Thinking priority before knowledge;
- Creativity development in every young person;
- Provision of education needs of students;
- Study programs with high potential of self-teaching and self-development;
- Intensive studying of foreign languages (English, German, French);
- Comfort study environment.
- Additional learning of basic subjects, inc mathematics.

NGO Innova Estonia and NGO School of the 21 century know that mathematics is a master of all subjects and sciences that is why the gymnasium creates friendly conditions to study mathematics and natural subjects, in order young persons were interested in these ones. The present and future time need high mathematics and technology skills to develop Europe economics.

Math is used throughout the world as an essential tool in many fields, including natural science, engineering, medicine, finance and the social sciences. Applied math, the branch of mathconcerned with application of mathematical knowledge to other fields, inspires and makes use of new mathematical discoveries, which has led to the development of entirely new mathematical disciplines, such as statistics and game theory.

Location: Magdaleena 3-34, Tallinn, Estonia
Contacts: +372 507 82 57, olgawf@gmail.com
info@innovaestonia.ee
Website: www.innovaestonia.ee

Project group meetings

Baltic networking seminar on cooperation to strengthen the citizens' math skills

Jurmala, Latvia, August 28-31, 2013

Baltic networking seminar on cooperation to strengthen the citizens' math skills was held in Jurmala, Latvia, August 28-31, 2013. Seminar was organized in the framework of Nordplus Adult education project Baltic networking seminar on cooperation to strengthen the citizens' math skills was held in Jurmala, Latvia, August 28-31. Seminar was organized in the framework of Nordplus Adult education project „Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare“.

The project is managed by NGO Education Innovations Transfer Centre (Latvia), project partners are from Estonia - NGO Innova Estonia, and from Lithuania - Vilnius Gabriele Petkevicaite – Bite Adult Education Center. The aim of the project is to activate the role of mathematics in the region's sustainable development, identifying the citizens' math educational needs and developing recommendations to adult education

providers about basic mathematical skills promotion, promoting different types of organizations' contribution in the mathematics further education development within lifelong learning context. The project idea was developed during preparatory visit in Tallinn, January, 2013.

The seminar started with discussions on Partnership agreement and was followed by an intensive work the following days. The latter day all the partners worked in groups and prepared presentations on how they understand the project activities and imagine the expected results. Later they were presented to all participants. Partners also brainstormed on the contents of the survey and composed the draft of the questionnaires. Later the partners agreed on the next steps of the project, composed the detailed project implementation plan and arranged the next meeting dates, which will be held in March in Vilnius, Lithuania.

After very intensive day of work on 30th August, partners attended Sweet Soul Music Revue in Concert call Dzintari.

Second project meeting

Vilnius, Lithuania, April 9 – 13, 2014

09 – 13 April, 2014 a meeting of the Nordplus project "Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare" took place in Vilnius Gabriele Petkevicaite – Bite adult education center. The meeting involved project participants from Latvia, Estonia and teachers as well as administrative staff representatives from Vilnius Gabriele Petkevicaite – Bite adult education center.

The following activities took place during the meeting:

The Project coordinator from Latvia introduced the first version of questionnaire , evaluated the work of all partners, and foresaw further possibilities and work deadlines.

Before this meeting in Vilnius each country performed a preliminary evaluation of the questionnaire and during the meeting made certain suggestions about questionnaire improvement, these suggestions were fixed, and their implementation was discussed.

The methodological platform composition in each country was discussed, dates and work were set and each

country presented their examples and suggestions about the improvement of common project results.

Each country made a presentation "Citizens math competence/ situation analysis in the country/ teaching math to adults (e.g.in adult education centers) /math teachers' professional development" (presentations of each country). After the presentations of all the countries discussion about situation in each partner country took place, similarities and differences in each partner country were evaluated.

During the meeting much time was devoted to dissemination activities: how to more effectively inform learners and other concerned parties about project results. Each partner presented the fulfilled activities as well as all the planned work for future.

The project coordinator from Latvia made a presentation about preparation of financial documentation of the project and report after the project finishes.

The activities with methodological material and writing of recommendations were discussed.

The project participants participated in a cultural program: a tour of Vilnius and opera. The date for the next meeting in Estonia also was set.

Third networking meeting

Tallinn, Estonia, August 21-25, 2014

Third networking meeting of partners in Tallinn on 21-24 August was the last meeting for project "Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare". That is why this meeting was to present the project results, reports and discuss these ones.

There were two mathematicians from Latvia. They teach in gymnasium and university and prepared presentations about own practice in experience to teach mathematics in Latvia. Moreover they gave information about mathematics programs and education politics in this field. Some comparisons between Baltic countries were done regarding the project questionnaire. Presentations were clear and interesting, well-illustrated. This helps in preparation of final reports and the project book.

Lithuania, Latvia and Estonia partners considered all information and data for preparation of the book and final reports. It was discussed theoretical and practical questions. All issues are decided friendly and with understanding.

All partners visited Estonia private Gymnasium School of the 21-st century that is partner in education field of NGO Innova Estonia. Guest saw the school classes, the pupils pictures gallery and others. One day of the networking meeting was conducted namely in this gymnasium. Estonia partners presented the recent article about director of this gymnasium. Director Alla Kornilova is professional conductor, that is why creative person. Under her leadership this private gymnasium acts already 20 years (this celebration is in September 2014). Partners discussed here problems with mathematics in all Baltic countries.

The partners saw draft reports and agree to prepare final documents by 15 September 2014 to print the project book.

There was intensive project work during three days. Then all partners go to see waterfalls. It was nice excursion. Beautiful nature!

Moreover Baltic partners saw Tallinn sights, the beach and other places.

Baltic networking meeting was so important at these days, because on 23 August "Baltic chain" was celebrated 25th anniversary. This is historical event for all

Baltic countries. Baltic partners spent this evening at the Victory plats. It was shown concert there, Festival salute and other. All Baltic partners were happy to be with Estonian people at this day and celebrate the freedom of all Baltic countries.

Baltic partners consider this fact as favourable sign for this project. It means that Baltic cooperation to be continued with other project to decide common problem and improve social welfare in these countries as the present project says and put aims.

Benefits acquired in the project MathPRO

NGO Education Innovations Transfer Centre (Latvia)

The greatest values of this project is an opportunity

1) to gain new experiences and knowledge;
2) to discuss topical issues of adult educators with colleagues from other countries, as well as from similar Latvian organizations,
3) to learn about other cultures and meet people from other countries etc.

This project is very important to participating organizations and people who participated in it. During this project meetings were organized in all partner countries; there were held discussions on the mathematics education and adult math competences, on various ways how to organize math continuing education, on adult' motivation to improve math skills.

People, who were involved in all activities, exchanged their knowledge and experiences. They learned a lot about math education in partner countries they broke the stereotypes related to teaching and learning mathematics. The main benefits from this research could be divided in three results groups.

Gained new knowledge:

- created the questionnaire – tool for the identifying mathematics continuing education supply in Latvia, Lithuania and Estonia and mathematical education needs of Baltic States citizens;
- developed an electronic survey tool;
- evaluated the organization of math continuing education in Latvia as well as in partners countries;
- prepared recommendations for the adult education providers on mathematical skills promotion and for adult math further education methodological provision;
- described the different organizations involvement possibilities in math skills promotion etc.

Created new databases:

- collected results of the Baltic States citizens' and employers survey;

- guide for adult educators “How to strengthen the citizens' math skills” (project book);
- two presentations at International scientific conferences; made the transnational comparative study on the math educational needs in Baltic States.

Obtained new skills:

- obtained new professional knowledge and experience in adult mathematics education organization and teaching issues;
- expanded knowledge of the education systems in Nordic-Baltic region;
- improved language competence, motivation and encouragement for obtaining new experience, especially at the international level;
- increased desire to know more about other cultures; to travel, to meet people from other countries;
- gained very important experience in realization of international projects and experience to be a coordinator;
- increased self-esteem and helped rid of complexes, above all to overcome psychological barriers to speak English

The project raised our organization's status and credibility at the local and international arena.

During the project implementation was established personal contacts with colleagues from partner countries. Cooperation and contacts will be the basis for a new development projects in the future.

During the seminar-discussion was an opportunity to establish contacts with schools and other institutions providing adult education services in Jelgava and Zemgale's region.

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre (Lithuania)

This Project was very interesting and successful for the participating institutions, teachers and learners. It was the first Nordplus Adult Project for our institution and we are satisfied about achieved Project goals. Main results of this Project are: experience, researches, challenges, recommendations and many new ideas in every country.

Benefits for the learners:

- identifying their math educational needs;
- participating in the research (analysis made on mathematics continuing education supply in Latvia, Lithuania and Estonia; questionnaire of employers and interviews with other social partners; Research of mathematical education needs of Baltic states population);
- participating in the seminar – discussion, gained new skills: e.g. mathematics, IT;
- possibility to evaluate oneself's mathematical knowledge and to gain new experience in the field of mathematics;
- increased self-esteem participating in the international project;
- possibility to participate in the international study;

- breaking stereotypes related to mathematics;
- meetings with teachers from different adult education centers, workers from the Vilnius University, employers;
- better understanding about the meaning of mathematics: learning mathematic becomes essential in the lifelong learning process;
- better understanding of the ability to use mathematics in everyday life;
- better understanding that „mathematics is for life". Knowing mathematics can be personally satisfying and empowering.

Benefits for the teachers and organization:

- sharing experiences, practice and methods contributes to raise mathematical knowledge;
- promoting different types of organizations' contribution in the mathematics further education development within lifelong learning context;
- developing and using recommendations to adult education teachers about basic mathematical skills promotion;
- better understanding about the meaning of mathematics: learning mathematic becomes essential in the lifelong learning process;
- participating in the research (analysis made on mathematics continuing education supply in Latvia, Lithuania and Estonia; Questionnaire of employers and interviews with other social partners; Research of mathematical education needs of Baltic states population);
- better understanding of the ability to use mathematics in everyday life;

- participating in the seminar – discussion with teachers from different adult education centers, lecturer from the Vilnius University and employers;
- possibility to develop and enrich the teaching methods connected with the learning of mathematics, which will contribute to the improvement of the quality of our adult education center work;
- building a strong network of contacts in 3 Baltic countries for creating new partnerships;
- for all our teachers and our adult education center it was an inspiration to develop new ways and directions in teaching adults, we have new solutions and ideas in teaching adults;
- possibility to recognize the power of the cooperation – creating new local partnerships with partners from the Baltic countries;
- important experience in realization of Nordplus Adult projects (our organization participating in the Nordplus Adult project for the first time);
- better understanding that „mathematics is for life“; knowing that learning mathematics can be personally satisfying and empowering;
- developing a collaboration network between the three Baltic organizations to exchange experiences and to create new ideas;
- possibility for the dialogue between policy makers, stakeholders and employers, who use mathematic knowledge in their work environment improving the social reality and contribute to the sustainable development of the Nordic - Baltic region;

- building of the common Baltic States methodological platform;
- understanding mathematics as a part of cultural heritage.

NGO Innova Estonia

The project "Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare" was useful for NGO Innova Estonia. This is cooperation of Baltic countries and common work in field of mathematics. It was so interesting to receive information in detail about situation with mathematics skills in other Baltic countries, mutual discussions about education systems between Baltic partners. Consideration of problems, which are similar, that is why to search ways, how to improve and promote mathematics skills in all Baltic countries.

Before this project NGO Innova Estonia concluded partnership agreement with Tallinn private gymnasium to improve education quality. This project helps to generate new ideas and to work with the young, especially in research work.

During the project realization it was prepared the research work about mathematics with the gymnasium student under management of NGO Innova Estonia member. It was done investigation about mathematic subject along students of different schools. The student research work has given addition information to the project, some comparisons done between the young and adults relations to mathematics. This student work helped

to see wider situation with mathematics in Estonia. Informal investigation is more useful, than official one, because this shows a real picture, what happens with mathematic skills in Estonia, which problems exist and so on. Analysis and conclusions are done, which is good addition to the project.

NGO Innova Estonia with help of this project and the student research work can see better real situation with mathematic in Estonia.

NGO Innova Estonia study carefully all information concerning mathematics in Estonia. All of this is value base to continue to work in this field. NGO Innova Estonia is interested to promote mathematics and engineering skills in Estonia society and search ways, how to do this.

Partnership with Baltic countries with this project and with private gymnasium has given new knowledge and experience in field of education, which will be used in future activity.

NGO Innova Estonia search new possibilities to improve mathematics skills of students and adults.

During the project NGO Innova Estonia talk much with people and collected proper information that will be used in future activity.

NGO Innova Estonia strength its activity in field of mathematics and think more how to decide the proper problems.

This project is good start to develop other projects, based on mapping done. Successful partnership, good cooperation and common thinking, how to decide

problems and improve situation with mathematics should be definitely continued.

Further development of the issue

NGO **Education Innovations Transfer Centre** (Latvia)

Mathematics continuing education offer in the Baltic countries and development issues are practically the same. By evaluating the experience of implementation of the project during past year, one can see the strengths and weaknesses of each partner organization. This means that we have the potential to learn each from another. It also outlines future opportunities for cooperation and further development of the issue which should be continued in four directions.

The further development of the issue at national level includes:

- To provide different sectors (schools, universities, adult educators, NGO, employers, professional organizations, etc.) cooperation;
- To proper conditions for specialists to develop mathematical skills;
- To motivate adults to improve mathematical skills and remove the technological/ psychological barriers;
- To provide support to adult teachers and lifelong learning organizations;
- To promote citizens math skills via regular measures (courses, consultations, clubs, magazines with math tasks and games etc.) and

various actions (competitions organized on Internet, etc.).

Cooperation at the institutional level:

- To develop cooperation with other adult education providers in partner countries as well as develop and implement joint projects;
- To develop a common platform that motivate adult teachers to use suitable teaching tools and change his professional activities;
- To promote the role of mathematics and statistics in the life-long learning;
- To work on an adults math competence assessment, etc.

Collaboration between teachers includes:

- To exchange of new experience through teaching staff mobility;
- To create training courses for adults in the lifelong learning context;
- To work out new teaching methods;
- To develop joint methodical literature, e-communication, etc.;
- To create joint e-learning materials for adult learners; etc.

Cooperation between adult learners includes promotion of the mobility of learners.

Vilnius Gabriele Petkevicaite-Bite Adult Education Centre (Lithuania)

1) The project overall goal was to activate the role of mathematics in the region's sustainable development identifying the citizens' math educational needs and

developing recommendations to adult education providers about basic mathematical skills promotion. So, we should work on this, promoting our ideas to different types of organizations' contribution in the mathematics further education development within lifelong learning context.

2) Analysing Lithuanian, Latvian and Estonian situation, it is obvious, that mathematical competences required in the labour market are not developed enough in the region. We should work further with participation of representatives of employers, adult schools and universities, ministries, municipalities.

3) It was a really good idea building a common Baltic States methodological platform. We have heard many nice words about it, we know that people are using it, we should continue with it involving Nordic countries also.

4) All careers require a foundation of mathematical knowledge and practical skills of mathematics. Mathematics as a discipline has been taught in schools, colleges, vocational training and universities. However, several regional institutions have difficulties with the qualified and competitive specialists in mathematics for the main economic sectors. We need to analyse programs and specialists qualification in mathematics field.

5) Analysing socio - economic situation In the Baltic states, it is obvious, that mathematic competences are not developed enough in the Baltic region. We can notice low Financial Literacy in the Baltic States and this is a serious problem. It would be useful to know situation in the Nordic countries, to compare it with a

situation of the Baltic states and maybe to learn from the experience of Nordic countries.

6) Implementing our project, we carried out the Research (analysis made on mathematics continuing education supply in Latvia, Lithuania and Estonia; questionnaire of employers and interviews with other social partners; research of mathematical education needs of Baltic States population). It would be very interesting and useful to continue work in this field starting another project, carrying out research and this time involve partners from Nordic countries.

NGO Innova Estonia

The project "Cooperation to strengthen the citizens' math skills in the context of sustainable development and welfare" is mapping project. It means that during this project proper research is done, problems are disclosed, situation is determined. According to this the project results should be analysed to think how to continue with this issue. It is needed to generate new ideas for next project concerning mathematics.

We see that problems with mathematics along adults are the similar in all Baltic countries. Cooperation during this project helped to see better this situation. Partners received new information and experience from each other. This was interesting and useful common work. Close contacts and meetings between partners. Intellectual cooperation in field of mathematics definitely should be continued between these partners.

This project is start for other, because of mapping category.

Partners consider that mathematics is needed for development of society and welfare. Every partner will think about new idea to prepare other project of this issue.

Partners see that this project connected more Baltic countries. We have common problems, but also common interest and perspectives.

Now it depends only from partners, how to prepare new project and promote mathematics in Baltic countries.

We hope that this successful cooperation to be continued.

FINAL WORD

The project was successful. In spite of its short duration and the small size of the project team all the expected outcomes were achieved. In fact during only one year the project team managed to do the amount of work that it is usually done during several years of project work.

So the project has great potential. The results will be spread it to other organizations and extended at the regional level.

The perspectives include common studies concerning several mathematics learning/ teaching aspects, e.g. didactic aspects of e-learning, promotion of the development of the competences necessary for the labour market at any age, the impact of mathematics competence on career development, etc.

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HOW TO STRENGTHEN CITIZENS' MATH SKILLS / Guide for adult educators / Latvia - Lithuania - Estonia, 2014. – 132 p.: illustr.

ISBN 978-9934-14-303-8

This project has been funded with support from Nordplus Adult Learning Programme.