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THE IMPACT ON THE MATHEMATICS CURRICULUM FOR GRADES 7–9 IN THE COMPETENCY-BASED APPROACH IN THE LEARNING PROCESS IN LATVIA

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ABSTRACT

From the school year 2020/2021 in Latvia has been introduced a new basic education standard as well as competency-based learning.

The aim of the article is to describe the main changes in the mathematics curriculum for Grades 7–9. The method used in this article is document analysis as documentary research. We also describe pupils' results in Latvian Regional Olympiad 2022 problems that are related to school topics.

The changes in the standard make some significant changes to the mathematics subject curriculum as well as focus on different teaching methods. Compared to the previous mathematics standard, some topics have been reordered and some have been moved to the secondary school. The correct use of mathematical language and use of different problem-solving strategies play an important role in the current teaching process. Understanding a mathematical concept or quantity is primary to practising calculating the numerical value of that quantity, which is necessary but secondary. In the past, more emphasis was placed on exercises and solving tasks according to a given algorithm.

As the education system in Latvia is in the process of transition, it is important to understand how the changes might affect pupils' knowledge and skills in mathematics.

Keywords: *competency-based education, education system in Latvia, mathematics for Grade 7–9, mathematics olympiad, basic education standard, mathematics curriculum.*

Introduction

In the 21st century, learning has become global, today's pupils will be competing tomorrow with young people all over the world. Comparing educational systems is quite popular, but a very difficult task as contexts can be very different and information needed for the comparison is not always available in English. Tests as TIMMS or PISA do a good job comparing different education systems in different countries, including a field of mathematics, but we cannot get detailed information from these tests, such

as what exactly is included in a curriculum of a particular country. (By the way, in both tests, Latvia shows a higher result than the average of these tests, for more, see (PISA 2018 Results. Combined Executive Summaries. Volume I, II & III, 2019) and (Mullis, Martin, Foy, Kelly, & Fishbein, 2020).) So, there are other different ways to compare education systems. We can compare educational systems via the following aspects: types of regulation, standards, and curricula; content of mathematics curricula; textbooks, evaluation system and exams, results in mathematical olympiads etc.

There are several research studies describing or comparing education systems, for example, education systems of different countries in a field of mathematics are compared in (Kácovský, u.c., 2022), (Moravcova, Surynková, & Hromadová, 2019), (Dudok, 2019), changes in the curriculum of a particular country are described in (Demirtaş, Arslan, Eskicumalı, & Kargi, 2015), (Prendergast & Treacy, 2017). There are also studies related to the national education reform in Latvia, such as (Birzina, Pigozne, & Cedere, 2021), (Kestere, 2019). However, these publications are from a different perspective and there are no publications that compare a mathematics curriculum of Latvia with other countries curricula or describe changes in mathematics curriculum in Latvia.

In Latvia children start school at the age of 7, complete 9 years of general basic education, followed by 3 years of secondary education. Basic education has two stages, Grades 1 to 6 (primary programme) and Grades 7 to 9 (lower secondary programme). (More about system of education in Latvia see (System of education, 2022).) As studies in Gymnasiums starts only from Grade 7, part of pupils decides to change school when they are in Grade 6. In this article changes in the content of mathematics for Grades 7 to 9 will be analysed.

In Latvia, the official document that sets out requirements for basic education is Republic of Latvia Cabinet of Ministers Regulation No. 747 (Regulations Regarding the State Basic Education Standard and Model Basic Education Programmes, 2018). To make it easier for teachers to fulfil the requirements of the law, in Latvia a sample of curriculum for mathematics (Mathematics for grades 1–9. Sample curriculum, 2020) is centrally developed and it is recommended when organizing the mathematics learning process.

Since 2020, the new standard that is developed as part of the National Centre of Education ESF project Nr. 8.3.1.1./16/I/002 “Competence Approach to Curriculum (School 2030)” (About Project, 2022) gradually is implemented in different grade groups. These changes affect educational institutions at all levels, from preschool to secondary school. The aim of the project is to develop a general education standard and teaching approach in schools in Latvia that will provide pupils with the knowledge, skills and

attitudes needed for modern life. In school year 2022/2023 all Grades are learning by the new standard.

The aim of the article is to analyse the main changes in the basic education standard and mathematics curriculum for Grades 7–9 compared to the previous standard (Regulations Regarding the State Standard in Basic Education, the Subjects of Study Standards in Basic Education and Model Basic Educational Programmes, 2014) and curriculum (Mathematics for Grades 7–9. Sample Curriculum, 2011).

Changes in the mathematics curriculum will have an impact not only on how pupils learn in school, but also on mathematics olympiads in Latvia. In Latvia, mathematical olympiads and contests are organized by the University of Latvia A. Liepa's Correspondence Mathematics School (UL A. Liepa's Correspondence Mathematics School, 2022). The largest olympiads organized by UL A. Liepa's Correspondence Mathematics School, in terms of the number of participants, are State Mathematical Olympiad in three rounds (~6000 participants) and Open Mathematical Olympiad (~3500 participants), where participate pupils from all regions of Latvia.

Method

The research subject of this paper is the changes in the mathematics curriculum for Grades 7–9 in Latvia. The study aims to overview the current situation of education system and teaching mathematics in Latvia. The method used in this article is document analysis as documentary research. We use primary sources (educational laws, national curricula, regulations), i. e., we analyse general and specific changes in mathematics curricula compared to the previous mathematics standard and curricula that were introduced in 2011.

The research is divided into three parts. The first one is to describe the general changes in the learning and teaching process. The second one is to describe specific changes in mathematics curricula compared to the previous mathematics curricula. In the last one is described pupils' results in the Latvian Regional Mathematical Olympiad (2nd round of the State Mathematical Olympiad) two problems that are related to school topics, because there are no final exam results yet that could give information on how the changes have affected pupils' knowledge and skills in mathematics.

Results and Discussion

This section is divided into three parts. In the first part we describe the general changes in the basic education system in Latvia according to the new approach in learning process. The second part is dedicated to the

specific mathematical content changes in Grades 7–9. In the third part we describe pupils' results in the Latvian Regional Mathematical Olympiad.

General Changes in the Basic Education System in Latvia

In the rapidly changing world, school content and organization form must be changed accordingly to the public interest and labour market demand. Last time fundamental changes in the basic education for only Grade 7–9, in Latvia were made as a part of the European Social Fund project "Natural Sciences and Mathematics" (Project "Natural sciences and mathematics". Archive, 2008), which was implemented between December 15, 2008, till October 31, 2011.

The mathematics curriculum and standard for Grades 1–6 were not changed and these grades until 2019 continued to follow the mathematics curriculum approved in 2005 (Mathematics for Grades 1–9. Sample curriculum for mathematics, 2005).

To ensure that a pupil gains all necessary knowledge, skills, and attitudes for life, since 2016 National Centre for Education has been implementing the project "Competence Approach to Curriculum (School 2030)", whose aim is to develop and introduce improved and modern content of secondary education and a new approach to teaching pupils from pre-school to secondary school. In this project with the term "competence" is understood as one's ability to use complex knowledge, skills, and express attitudes, to solve changing reallife situations.

The project states that nowadays we need people who are willing and able to learn throughout their whole life, can find solutions to unprecedented problems, creating innovation by using the results of their learning – acquired knowledge, skills, and habits. It emphasizes that an individual's personality is shaped starting from childhood, so a proficient pupil with referred personality traits is the goal of the improved curriculum and approach. That is why one of the key challenges while revising the curriculum is to reduce fragmentation, as well as passive, disconnected from real-life situations knowledge acquisition and isolated skill development. To provide every modern pupil with competency-based education, it is essential to improve the approach to learning alongside the content, reinforcing the shift from imparting readymade knowledge to guided learning, where pupils learn by going deeper (Objective: Proficiency, 2020).

Consequently, the content of mathematics is structured into six main parts with explanations (see (Mathematics. Basic Education, 2020) and (Regulations Regarding the State Basic Education Standard and Model Basic Education Programmes, 2018)):

- the language of mathematics,
- strategies and reasoning characteristic to mathematics,

- numbers, operations on numbers,
- elements of algebra and functions,
- data and elements of statistics,
- shapes.

More attention has been paid to mathematical language, building an understanding about the value of the individual mathematical symbols. These skills will be evaluated in the final exam of mathematics, previously in exams the correct use of mathematical language was not evaluated.

As was mentioned before, there is a special part that is dedicated to different problem-solving strategies. For example, it is recommended to acquire and use problem-solving strategies such as guess and check, make an orderly list, eliminate possibilities, use symmetry, consider special cases, look for a pattern, solve a simple problem, work backwards, check all possible cases. These strategies are not new, they are described in the works of G. Polya, for example, (Polya, 2004). Such strategies have been used for years when solving problems in mathematical olympiads. Hopefully this innovation in mathematics lessons will contribute to improving pupils' results in mathematics olympiads.

Continuity, systematicity and integrity are the guiding principles behind the new content. The content of mathematics is structured around the six main parts and is continued through all grades. For example, see Table 1, where is shown how the idea about numbers is developing through the grades.

Table 1. Learning Outcomes According to the Standard

3. Numbers are used to solving specific as well as practical problems. Every operation with numbers has a definite meaning and rules/algorithms		
3.1. Notation of the number and comparison of numbers		
Graduating Grade 3	Graduating Grade 6	Graduating Grade 9
3.1.1. Explain the decimal structure of a natural number, its relationship to notation in concrete examples using different models and representations.	3.1.1. Explain the decimal structure of a rational number (written as a decimal), its relation to notation in concrete examples.	3.1.1. Explain, using concrete examples, what the numerical value of an irrational number written as the square root of a rational number is and how to obtain it, including using digital tools.
…	…	…

The approach to learning process itself has also changed. If at the end of 20th century teacher was more like a lecturer imparting readymade knowledge to pupils, then this new approach emphasises that a teacher must become more like a consultant, helping pupils to construct new

knowledge themselves and apply them in new situations. Thus, the learning process is changed from transfer and referral of ready-made knowledge to questioning, conversation, situation analysis, productive exercises, enabling pupils to create new knowledge. The frontal teaching process changes to involvement and corporation where pupils actively work together and train not only specific subject skills, but also cross-cutting skills such as oral/ written communication, critical thinking, working effectively in teams, and the real-world application of skills and knowledge. The accents in the study process are on using and creating knowledge in vide variety of situations and contexts not only to remember specific facts as a goal of a study subject. Understanding a mathematical concept or quantity is primary to practising calculating the numerical value of that quantity, which is necessary but secondary.

In the new standard are formulated both simple learning outcomes (for example, plot the graph of a linear function according to the given formula) and complex learning outcomes (for example, creates and reads different representations of a linear function, converts from one form of representation to another, using digital tools for these activities, in situations with mathematical and other contexts). Complex learning outcomes describe pupils' ability to apply knowledge, skills and habits in new situations. Learning outcomes for each pupil are measurable during the learning process (formative) or at the end of a topic (summative). The evaluation system also is changed from primary summative grading to providing meaningful feedback to the pupil on the learning process, pupil's reflections on his work and his or her learning process.

A teacher must set learning outcomes for a pupil for each lesson and must be able to check if each pupil has achieved them at the end of the lesson. During lessons, the teacher should provide appropriate support and feedback, as well as pupils should be encouraged to reflect on their learning and thinking.

Changes in the Mathematics Curriculum in Grades 7–9 and the Impact on Mathematical Olympiad

In this subsection curriculum example for Grades 7–9 in year 2011 (Mathematics for Grades 7–9. Sample Curriculum, 2011) and in year 2020 (Mathematics for grades 1–9. Sample curriculum, 2020) are compared, focusing on content changes in each grade.

In Table 2 is given the order of the topics in the previous and current mathematics curriculum, as well as number of lessons (indicated in brackets) intended for each topic. In the previous curriculum 5–6 lessons per week were planned for mathematics, but in the new curriculum 5 lessons per week are planned for Grade 7 to 9 (in Latvia one lesson is 40 minutes

and there are 35 weeks in a school year). So, the number of lessons devoted to mathematics in basic education has decreased. This affects learning mathematics in a secondary school and consequently at a university (in national and international level), as well as pupils results in national and international olympiads, and not only in mathematics, bet also in other STEM subjects that needs mathematics knowledge and skill.

Table 2. Topic Order in Curriculum for Grade 7–9

	Curriculum 2011	**Curriculum 2020**
7.1.	Introduction to planimetry (15)	How to determine sample space and calculate probabilities of events? (15–19)
7.2.	Angles (15)	How to define geometric shapes? (18–22)
7.3.	Linear expressions and equations (26)	How to describe the relationship between variables? (10–12)
7.4.	Combinatorics and probabilities (16)	How to investigate functions whose graph is a straight line? (16–20)
7.5.	Linear inequalities (16)	How to describe a triangle using its elements? (18–22)
7.6.	Triangles (21)	What is the relation between the elements of a triangle? (18–22)
7.7.	Relations in triangles (16)	What does it mean to modify an expression with a variable? (14–18)
7.8.	Linear function (21)	What are the techniques for finding unknown variable? (18–22)
7.9.	Symmetry (13) *(Moved to Grade 6)*	How to compare expressions that contain a variable? (14–18) *(Systems moved from Grade 9)*
7.10.	Integer exponents (16) *(Moved to Grade 8)*	
7.11.	Polynomials (16) *(Moved to Grade 8)*	
8.1.	Polynomial factorization (16) *(Moved to Grade 9)*	How to describe and analyse data mathematically? (12–16)
8.2.	Statistics (14)	How to interpret and use power with integer exponent? (18–22) *(Moved from Grade 7)*
8.3.	Real numbers (20)	What to do if a number cannot be written as a fraction? (24–28)
8.4.	Area and volume (20)	How to calculate the area of any triangle, circle? (18–22)
8.5.	Sequences (10) *(Moved to Grade 9)*	What is common for all quadrilaterals whose opposite sides are parallel? (20–24)

Continued from previous page

	Curriculum 2011	**Curriculum 2020**
8.6.	Parallelogram (23)	How to explain and make operations with expressions? (18–22) *(Moved from Grade 7)*
8.7.	Trapezium (18) *(Moved to Grade 9)*	How different functions are used for mathematical modelling? (19–23) *(Divided topic from Grade 9)*
8.8.	Quadratic equations (26) *(Moved to Grade 9)*	How to determine the length of the unknown side of a right triangle? (14–18)
8.9.	Pythagorean theorem (14)	
9.1.	Rational expressions (29) *(Moved to Grade 10)*	How similar triangles are defined and characterised? (16–20)
9.2.	Similar triangles (12)	What is common for all quadrilaterals whose exactly two opposite sides are parallel? (18–22) *(Moved from Grade 8)*
9.3.	Trigonometric relations (14)	How to use the ratio of two sides of a right triangle in problem solving? (16–20)
9.4.	Quadratic function (23) *(Combined with quadratic equations and inequalities)*	How to use factorization of expressions? (20–24) *(Moved from Grade 8)*
9.5.	Angles and segments in a circle (17) *(Moved to Grade 9)*	How to explain and use formulas in working with quadratic equations, quadratic functions? (20–24) *(Moved from Grade 8 and combined)*
9.6.	Circle and polygon (16)	How to describe situations with two unknown variables? (18–22)
9.7.	Equation and inequality systems (24)	How number sequences can be expressed with formulas? (17–21) *(Moved from Grade 8)*
9.8.	Overview of geometric shapes (24)	How to describe the relative positions of a circle and a polygon? (18–22)

As it is shown in Table 2, in some grades the order of topics has been reordered, some topics have been moved from one grade to another, some topics have been divided over several grades. The number of topics covered in Grades 7 and 8 has been reduced, thus decreasing the fragmentation of content.

In fact, many topics (especially in algebra) that are very significant for the secondary school mathematics topics have been moved to Grade 9, thus pupils do not have time for practising and strengthening their skills. These topics of algebra (factorising expressions, formulas like square of a sum, quadratic equations) are basis for mathematical olympiad problems

and as consequences it will reduce amount of knowledge that can be used in olympiads. Some topics (like statistics, combinatorics, probabilities) that do not need good technical skills, but need deeper and more general understanding of abstract concepts are moved to lower grades where pupils are not ready to acquire them, also for these topics practise and repetition is not so crucial. Moving the topic about rational algebraic fractions to the secondary school is very concerning, because pupils will not be given enough time to practice and develop these skills that are very essential, because elements of mathematical analysis must be learned at an advanced level in secondary school.

A significant content change in Grade 7 is introduction of a linear function before the topic about linear equations. Pupils first learn about different relations which are represented graphically as dots, intuitively forming conclusions that some relations must be represented as continuous lines. After that pupils learn about linear functions (see Table 2). As linear equations solving and equivalent transformations are now planned to learn after functions, then part of skills such as expressing unknown variable from a formula and finding an intersection of two functions that are given analytically cannot be taught within the topic about linear functions. Pupils can find the unknown term in a simple equation since Grade 5, so the analytical method of finding the intercept of a graph of a function can be learnt, but linear functions in examples must be simple. Similarly, in the topic 7.5 and topic 7.6 about geometry, problems should be selected so they do not involve equations that pupils cannot solve yet. The most essential change in the topic about linear equations is that to find a solution a graphical method is used first, but the analytical method is used afterwards.

The last topic in Grade 7 is about linear inequalities where also both methods (graphically and analytically) for solving are used. Compared to the previous curriculum, this topic includes an introduction to linear systems of inequalities that was previously acquired in Grade 9. In general, this change can be evaluated positively, because pupils have the necessary knowledge and abilities to learn systems of linear inequalities already in Grade 7, giving the opportunity to learn more difficult topics in further grades, when pupils have already acquired technical skills and begin to understand more abstract mathematical concepts.

There are number of changes in the content of the topics for Grade 8 (see Table 1). Several topics are split and moved to other grades.

Solving simple quadratic equations begins in topic 8.7 after learning about quadratic functions. Previously, the quadratic function was only taught in Grade 9, while in Grade 8 all types of quadratic equations were already taught. At the end of Grade 9, pupils should be able to solve

various quadratic equations, choosing the most suitable method of solution. Although the idea of sequentially learn different quadratic equations is good, solving quadratic equations mostly happens only in the middle of Grade 9 (topics 9.4 and 9.5) and the time for training and improving skills is insufficient.

Only in topic 9.4 (previously it was at the beginning of Grade 8), the methods of factorization of expressions are taught. This limits the content of mathematics olympiads, because there are many different problems from different subfields of mathematics, for example, algebra, number theory, combinatorics, which are based on factorisation. An additional change is splitting the quadratic equation solving into two Grade 9 topics. In topic 9.4 pupils solve quadratic equations in the form using the factorization, but in the topic 9.5 they solve general quadratic equations using the discriminant formula. If in the previous curriculum the discriminant formula was presented as a known fact (without a proof), then now pupils start solving quadratic equations by completing the square and then together with a teacher they prove formulas for the discriminant and the roots of the quadratic equation, using skills they have gained by completing the square. In this way, pupils' understanding of the concepts they learn is deepened, which is one of the goals for competency-based education. Skills like completing the square quite often are needed in mathematical olympiads (for example, proving inequalities), thus pupils will be able to link skills they have acquired in school lessons to the skills they need in mathematical olympiads.

Thus, over the course of three topics (one of which is in Grade 8), pupils learn to solve quadratic equations, starting with the simple ones. In the topic 9.5, they also obtain the formula for calculating the coordinates of a vertex of a parabola and learn how to solve quadratic inequalities.

Traditionally, the theoretical part of the content of the subject was taught first and then this theory was applied to problems with different everyday situations context, but in the new curriculum a reversed trend can be seen (for example, in topic 8.7. about quadratic function and inverse proportionality function).

As it was mentioned before, the topics about powers with integer exponents and polynomials are moved from Grade 7 to Grade 8. The new curriculum emphasises that the topic of polynomials does not involve acquiring the skill of how to factorize expression into multiples by putting common factor before the parenthesis, however when solving problems, where "think backwards" solving strategy is required, pupils already do this. For example, this skill is already used in a problem that requires pupils to fill in the missing values in a product.

$$2c \cdot (\ldots + \ldots) = 4c^2 + 6c.$$

Pupils' Results in Mathematical Olympiads

As the new curriculum is still in the process of implementation, data on pupils' results in diagnostic work or exam are not yet available to assess changes in the level of their mathematical knowledge and skills. However, in recent years, Latvian Mathematics Olympiads as their first problem have included one that corresponds to some school topics for an according grade (Avotiņa & Šuste, 2015). Usually in the Regional Olympiad participate about 6000 pupils from all regions of Latvia. We analyse two problem results of a school year 2021/2022 (pupils of Grade 7 and Grade 10 already are learning by the new standard and curricula where the emphasis is put more on deeper understanding than just on practicing) in the Regional Mathematical Olympiad for Grade 7 and Grade 10 (accordingly 662 and 453 participants' results, the total amount of participants in these grades were larger, but not all regions sent the results). In fact, these two problems are classical school tasks that could be solved already in Grade 7, so it would be expected that results are very high (especially for Grade 10 where pupils complement and deepen their knowledge of a linear function), because in the olympiad participate pupils that are good at mathematics.

(Problem 1, Grade 7) Find the area of the quadrilateral bounded by the lines

$$y = 1,\ x = -2,\ y = \frac{3}{5}x + \frac{21}{5}$$

(Problem 1, Grade 10) Points A(21; 1)*, B*(20; 22)*, and C*(10; 2) *are given. Write an equation of a line passing through the point C parallel to the line AB.*

The olympiad participants' solutions were corrected by mathematics teachers in the regions according to the common criteria (see Table 3 and Table 4), developed centrally by UL A. Liepa's Correspondence Mathematics School.

Table 3. Evaluation Criteria for the Olympiad Problem for Grade 7

The lines $x = -2$, $x = 3$ and $y = 1$ are drawn in the coordinate plane	3 points
The line $y = \frac{3}{5}x + \frac{21}{5}$ is drawn in the coordinate plane	2 points
Quadrilateral bounded by the given lines is set out.	1 point
It is calculated that *S(AECD)* = 15 square units	1 point
It is calculated that *S(AEB)* = 7.5 square units	1 point
It is calculated that *S(ABCD)* = 15 + 7.5 = 22.5 square units	2 points

Table 4. Evaluation Criteria for the Olympiad Problem for Grade 10

The coefficient of the direction of the line AB is obtained	3 points
It is justified that the coefficient of the direction of the line for the given straight line is $k = -21$, because parallel straight lines have the same coefficient of the direction	2 points
Equation of a gained straight line is written in a form $y = -21x + b$	1 point
Value b is calculated	3 points
Equation of a straight line $y = -21x + 212$ is written	1 point

Pupils of Grade 7 have learnt the topic about linear functions following the new curriculum, which is based on a deeper understanding. All the necessity knowledge for solving the problem is included in the new standard and curriculum (see (Mathematics for grades 1–9. Sample curriculum, 2020)) as learning outcomes or ideas about concepts:

- the formula of a linear function is $y = kx + b$ (Grade 7),
- draw the graph of a linear function according to a given formula (Grade 7),
- the numerical value of the area of a rectangle is obtained by multiplying the numerical values of the lengths of the adjacent sides (Grade 4),
- calculates the area of a rectangle using area units if the side lengths are known (Grade 4),
- on the grid sheet, determine the area of a right-angled triangle by adding it to a rectangle (Grade 4),
- calculates the area of a combined figure by expressing it as the sum or difference of the areas of two rectangles (Grade 4).

Therefore, it would be expected that participants in the olympiad would perform well in this problem that requires only the basic skills learnt in regular lessons. Unfortunately, the results for Grade 7 problem are low (see Figure 1).

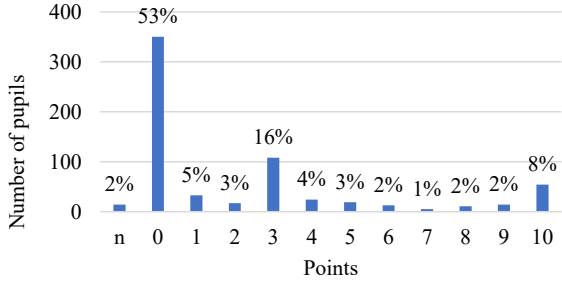

Figure 1. Pupils Results in Regional Mathematical Olympiad 2022, Grade 7

More than half of the participants scored 0 (if the participant did not even try to solve this given problem, he received *n*), which means they cannot even draw any of the given straight lines they have learnt in mathematics lessons. About 16% of the participants scored 3 points, which means that they can draw only elementary straight lines. Only 8% of all participants solved this problem completely. Thus, we see that even the participants of the mathematics olympiad (who usually in school lessons score higher results than others) are unable to use even basic skills, without being able to get to new and complex situations. As one of the reasons for the low results could be the fact that due to Covid19 school lessons were partly delivered remotely in the school year 2021/2022, whereas in the previous school year school lessons were held remotely almost all the time. The second reason could be that there are no textbooks yet, that correspond to the new curriculum, so it is possible that some teachers, during their lessons, are using the old textbooks where the linear function is one of the last topics in Grade 7 and so these pupils might not have had time to learn this topic before olympiad. But this means that teachers have not considered the Mathematics Olympiad Curriculum (Mathematics Olympiads programme, 2021), where it is specified that the topic of the linear functions must be acquired before Regional Mathematics Olympiad.

Pupils learn about linear functions in Grade 7 and deepen their knowledge about this topic in Grade 10 with the following learning outcomes:

- draw a straight line in the coordinate plane, if its equation is given,
- use relationships between slope coefficients of parallel and perpendicular lines,
- write and use the equation of a straight line, if given: 1) coordinates of one point and slope coefficient of the line, 2) coordinates of two points of a line, 3) position of the line in the coordinate plane, i. e. see if it is parallel to one of the axes.

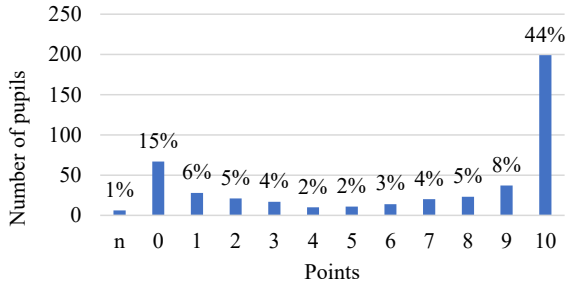

Figure 2. Pupils Results in Regional Mathematical Olympiad 2022, Grade 10

Thus, it is expected that in Regional Mathematics Olympiad in the problem about a linear function almost all participants get very high results. Although 44% of the participants solved the problem completely (see Figure 2), still 16% of the pupils scored 0 points and 15% received 1–3 points, which means that in the solution only some ideas that are related to the problem were mentioned.

It was expected that the results of olympiad participants in these classical school tasks would be high or at least good, unfortunately it was not confirmed. However, it is too early to draw conclusions that the new program does not provide an opportunity to learn something with a deeper understanding, or that the new curriculum is even worse than the previous one, because firstly, the curriculum has not yet gone through a full cycle, where pupils learn from Grade 1 according to the new approach, and secondly, the impact of the Covid-19 pandemic should also be taken into account since these pupils have been learning (or not learning) remotely for almost year and a half.

Conclusions

We have described changes in education system in Latvia as well as changes in the mathematics standards and curricula since 2011.

In the school year 2022/2023 all grades (Grades 1 to 12) in all schools in Latvia will be learning according to the new basic education curriculum, which sets out a competencybased learning approach. In the past, more emphasis was placed on exercises and solving tasks according to a given algorithm. The new approach is more based on comprehension. Problem-solving strategies are taught to pupils. Also, there is a greater emphasis on the correct use of mathematical language and the skill will be evaluated in exams.

Compared to the previous mathematics standard, some topics have been reordered and some topics have been moved to the secondary school. The content of mathematics is developed so that it is more united, successive and more suitable for nowadays pupils to gain a deeper understanding. This transition is a challenge not only for pupils, but also for the teachers, because textbooks corresponding to the new curriculum are yet to be developed.

The changes in the subject content and in the teaching approach are significant, but at the moment it is not known how these changes will affect pupils knowledge. As a transition from one curriculum to another is still ongoing, there has not yet been a final exam corresponding to the new curriculum, so there is no data to draw conclusions about pupils' results and analyze the impact on pupils' mathematical knowledge and skills. To

investigate the immediate effect (if any) that this curriculum change has on pupils' mathematical knowledge and skills, in this article the results for school level problems of the Regional Mathematics Olympiad were described. Overall, the results given by Grade 7 pupils are low, but it should be considered that these results may have been affected, for example, by the Covid-19 pandemic.

To draw qualitative conclusions about the impact of the new curriculum on the pupils learning, it is necessary that factors affecting the learning process, such as the Covid-19 pandemic, pupils that have only partially studied following the new curriculum, preparedness of teachers, lack of textbooks, no longer have a significant impact on pupils' results.

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