

**СРАВНИТЕЛЕН АНАЛИЗ НА НОРМАТИВНАТА БАЗА ЗА
ОЧАКВАНИТЕ РЕЗУЛТАТИ ОТ РАБОТАТА ПО МАТЕМАТИ-
КА В НАЧАЛНОТО УЧИЛИЩЕ В РЕПУБЛИКА БЪЛГАРИЯ И В
АНГЛИЯ**

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**COMPARATIVE ANALYSIS OF THE LEGAL REGULATIONS RE-
LATED TO THE EXPECTED RESULTS FROM THE EDUCATION
IN MATHEMATICS IN PRIMARY SCHOOLS IN BULGARIA AND
ENGLAND**

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Abstract. Education as a process includes training, upbringing, and socialization. Different factors affect it including the economy, social conditions, cultural-historic, and educational traditions of the particular country and not in last place development of science.

The initial stage of Primary school is the basis of the educational system and is very important for the cognitive and intellectual development of the students.

Every country has legal regulations that define the structure, the activities, and the forms for pedagogic interaction between the students and the expected results from the education in mathematics of the Primary school students.

This article analyzed the legal regulations that outline the expected results from the education in mathematics in Primary school in the Republic of Bulgaria and England. Comparative analysis of these results is presented in the article as well.

The performed analysis regarding the level of development of mathematical knowledge, skills, competences, and competencies as well as the comparative analysis of the legal documents related to the education in mathematics of grade 3 students in the Republic of Bulgaria and England contribute to finding the pattern in structuring the expected results from the methodical work and for identifying the main similarities and differences between the two systems.

The similarities and the differences in the legal regulations related to the expected results from the education in mathematics in Primary school in both countries which have been identified during the research work are pre-condition for improvement of the pedagogical interaction during mathematics classes and in the methodical work of the Primary school teacher.

Keywords: education in mathematics, expected results, knowledge, skills,

competencies

Introduction

The legal regulations related to the education in mathematics in Primary schools in the Republic of Bulgaria and England have got significant importance for the overall mathematical training of the students. This article aims to perform a comparative analysis of the expected results from the education in mathematics in the Primary schools in the Republic of Bulgaria and England based on the related legal documentation and requirements in both countries.

The research work adopted the following criteria:

First criterion: legal requirements related to the development of knowledge and skills in the students regarding numbers.

Second criterion: legal requirements related to the development of knowledge and skills in the students regarding the arithmetic operations of addition, subtraction, multiplication and division.

Third criterion: legal requirements related to the development of knowledge and skills in the students regarding mathematical quantities.

Forth criterion: legal requirements related to the development of geometry knowledge and skills in Primary school students.

This analysis would help the teachers during the education process of students who started their education in one of the countries and later continued in the other. For example, the teachers will know which are the missing knowledge and skill that they need to pay special attention to.

Additionally, this analysis can be used by the teachers to identify the similarities and the differences in the educational content from one side and the expected results from the education in mathematics in the Primary school from the other and consequently to compare them. Also, the analysis will show the teachers in which parts of the educational content they can share innovative ideas for upgrading the methodology of teaching.

Literature review

In the course of the research work, the author did a theoretical analysis of different legal documents. For Bulgaria, these are the Requirements regarding the results from the education in mathematics for Primary school (2015) and Educational programs in mathematics for grades 1-4 (2015-2017). For England, the National educational program in mathematics – key stages 1 and 2 of the Department of Education, England (2020) was analyzed. The results from this analysis are presented below.

Data

The Primary school in England has two key stages – key stage 1 and key stage 2. Key stage 1 covers the 5-7 years old students. These are the first and second age groups. Key stage 2 covers 8-11 years old students. These are from third to sixth age groups.

The analysis of the National educational program in mathematics for Primary schools in England is presented below.

The expected results from the education are divided into six strands: Number and place value, Number facts, Addition and subtraction, Multiplication and division, Fractions and Geometry.

In respect of the Number and place value strand, by the end of their sixth year of age students acquire knowledge about numbers and the positional principle of writing them. They learn the meaning of each unit in the written form of a 4-digit number and know the interconnections between adjacent ordinal units – units and tens, know the meaning of each unit in a 3-digit number. During the fifth year of their education students study fractional numbers and know the meaning of the numbers two characters after the decimal point.

The second is the Number facts strand. The students should be able to count in forward and reverse order up to 10. During the second year of their education, the students shall consolidate the knowledge and skills for addition and subtraction of numbers up to 10. At the end of the third year, the students acquire facts about multiplication and division in the multiplication tables with 10, 5, 2, 4, and 8. Students solve tasks for division with a single-digit divisor.

The third strand is the Addition and subtraction strand. By the end of the sixth year of education, the students should be able to present the numbers up to 10 as a sum of two adding. They must be able to read, write down and interpret equations with addition, subtraction, multiplication, and division. Also, the students should be able to add and subtract numbers up to 100 as well as 3-digit numbers using a vertical recording. They must understand the reverse relation between the arithmetic operations of addition and subtraction. Students learn that two numbers can be connected additively or multiplicatively. They solve tasks that include two unknown quantities.

The fourth strand is the Multiplication and division strand. The students must learn the multiplication tables with the numbers 2, 5, and 10. They should be able to solve contextual problems, to apply known facts about multiplication and division. Students learn to apply the commutative and distributive property of multiplication, multiply and divide integer

numbers by 10 and 100. Additionally, students learn written algorithms for multiplication and division of 4-digit numbers with a one-digit number without remainder and with the remainder.

Fifth is the Fractions strand. By the end of the sixth year of education the students must be able to interpret and write down proper fractions, to present one or several fractions of an integer number, that have been divided into equal fractions. They can add and subtract fractions with the same denominator within 1. Also, students acquire knowledge to convert mixed numbers into irregular fractions and vice versa, to add and subtract irregular and mixed fractions with the same denominator. Additionally, students should be able to find equivalent fractions and to understand that they have equivalent values and positions in the linear number system. Students should be able to compare fractions with different denominators greater than 1.

The sixth strand is the Geometry strand. Students should be able to recognize the most common 2D and 3D shapes presented with different orientations. They acquire knowledge on how to recognize right angles and to determine parallel and perpendicular sides. Students develop skills to draw. They can say which geometry figures are equilateral triangles and which are squares, find the circumference of regular and irregular polygons, finish symmetrical figures or patterns/models to the line of symmetry. Also, students acquire knowledge and skills to measure angles in degrees and to compare them, to draw the angle on a given degree measure. They calculate and compare the area of rectangles and squares using standard measuring units. Additionally, students can draw, compose and decompose figures according to given properties including size, angles and area, and solve related problems.

In the Republic of Bulgaria, the expected results from the education in mathematics in Primary school are presented in the educational programs for grades 1-4 (2015-2017) and in the Requirements for the educational content in mathematics (2015).

The knowledge, skills, and competencies which students must develop are separated into four competency Clusters: Numbers, Measurement, Geometry figures and bodies, and Modelling.

At the end of grade 1, students must learn the following from competency Cluster Numbers: to know the natural numbers up to 20 and the principle of composing the order of natural numbers; to perform the arithmetic operations addition and subtraction with natural numbers up to 20. They must understand the relationship between components and the result from

the arithmetic operations with the numbers up to 20; to read and write the natural numbers 10, 20, 30, 40, 50, 60,70, 80, 90,100. Students should acquire knowledge and skills to perform the arithmetic operations addition and subtraction with the numbers 10, 20, 30, 40, 50, 60,70, 80, 90,100 and to make the difference between single-digit and 2-digit numbers.

At the end of grade 2 students must know from the competency Cluster Numbers the natural numbers up to 100 and the principle of composing the order of numbers up to 100. They also should be able to perform the arithmetic operations addition and subtraction with numbers up to 100 and the arithmetic operations multiplication and division with single-digit (multiplication table cases). Additionally, students acquire knowledge to find unknown addend and unknown multiplication factors.

At the end of grade 3, the students should know from competency Cluster Numbers the natural numbers up to 1000 and the decimal positional number system. They should be able to perform arithmetic operations addition and subtraction with natural numbers up to 1000 as well as multiplication and division of numbers up to 1000 with a single-digit number. Additionally, students acquire knowledge and skills to find unknown minuend and unknown divisor and also they should recognize half, third, quarter and tenth as parts of a whole.

At the end of grade 4, students should know from competency Cluster Numbers the natural numbers above 1000 and the decimal positional number system. They should be able to perform the arithmetic operations addition and subtraction with natural numbers bigger than 1000 as well as multiplication and division with single-digit and 2-digit numbers. They should acquire knowledge and skills to present numbers using Roman numerals and to find unknown subtrahend and unknown divisors.

The second competency Cluster is Geometry figures and bodies. At the end of grade 1, students should be able to recognize the geometry figures section, square, triangle, circle, and rectangular. They also should be able to recognize the element side and tip of the triangle, rectangular and square. They should be able to draw sections by a given length in centimeters as well as different studied geometry figures (excluding circles) on a square mesh.

At the end of grade 2 students should be able to recognize the geometry figures triangle, rectangular, and square and their elements and also to determine the type of angles and consequently the type of triangles by their angles.

At the end of grade 3 students should be able to recognize the geome-

try figures straight line, curved line, ray, angle, and their elements and also to determine the type of angles and the type of triangles by their angles.

At the end of grade 3 students should be able to recognize the geometry figure circle and its elements. They should acquire knowledge and skills to draw an angle by a given degree and a circle by a given radius. They should be able to recognize the geometry figures cube, rectangular parallel-epiped, sphere, cylinder, cone, and pyramid.

The third competency Cluster where the expected results are presented is Measurement.

At the end of grade 1 students should know the measuring units for length (centimeter), mass (kilogram), time (hour). They also should be able to recognize the value of the Bulgarian banknotes and coins (lev, stotinka). Students should be able to draw sections. They should operate with studied measuring units of the same type (excluding the measuring unit for time) and correctly use drawing tools (ruler in this case).

At the end of grade 2 students should be able to recognize the measuring units for length (decimeter, meter), time (minute, day, week, year), and the relations between them. They should perform operations with the measuring unit decimeter and meter. They can find the circumference of a triangle, square and rectangular. The second graders acquire knowledge and skills to use a ruler for measuring the sides of the geometry figures triangle, square and rectangular.

At the end of grade 3 students shall learn the measuring units for length (millimeter, kilometer), for mass (gram, ton), for time (century, second), and the relations between them. They should be able to operate with studied measuring units of the same type (excluding those for time).

At the end of grade 4 students shall know the measuring units for angle (degree) and area (square millimeter, square centimeter, square decimeter, square meter, square kilometer, decare). They acquire knowledge and skills to measure angles by given degree. They also operate with studied measuring units of the same type (excluding those for time). The 4-graders should be able to find the area of a rectangular and to correctly use the drawing tools ruler, protractor, and pair of compasses.

The fourth competency Cluster is Modelling. At the end of the first year of study, using numeric expressions, students should be able to do modeling of situations described with the relations “with more than ...”, “with... less than...”. They should be able to explain the results received after solving a particular text task. They can read information from different sources – text, illustrations as well as different schematic images.

At the end of the second year students using numeric expressions, should be able to model situations described with the relations “... times more” and “... times less”. They can solve text tasks with one and two calculations. They also should be able to explain the results received after solving a particular text task. They use the information presented in tabular and schematic form.

At the end of grade 3 students, using numeric expressions should be to model situations described with the relations “with ... more than ...”, “with ... less than...”, “... times more than ...” and “... times less than ...” (using up to 3 calculations). They know how to describe situations from the real world around them using a mathematical model (tasks related to buying and selling as well as related to the circumference of figures). They can do reasoning over the results received from solving a text task and extract information from different sources – tables and drawings.

At the end of grade 4 students should be able to describe situations from the real world around them using a mathematical model (tasks related to buying and selling, finding the area of a figure, or a circumference of a figure). They can do reasoning over the results received from solving a text task and extract information from different sources needed to compose numeric expressions and text tasks.

Results

The comparative analysis of the expected results from the education in mathematics in the Republic of Bulgaria and England offered the following similarities and differences:

The duration of Primary school in the Republic of Bulgaria is four years and students start their education at seven-years of age. In England, the duration of Primary school is 6 years and students are 5 years old when they start their education. Also, the duration of the Primary school in England is 2 years longer than the Primary school in Bulgaria.

One of the most important differences between the two educational systems is the fact that the educational content in the Republic of Bulgaria is systematized in four competency Clusters: Numbers, Geometry figures and bodies, Measurement, and Modelling and in England the educational content is systematized in six strands - Number and place value, Number facts, Addition and subtraction, Multiplication and division, Fractions and Geometry.

Students in the Republic of Bulgaria study natural numbers up to and above one billion as well as the arithmetic operations addition, subtraction,

multiplication, and division with them. Students are familiar with the positioning principle for writing down numbers. Differently, in England students study in addition to these numbers, one-tenth, one-hundredth, and one-thousandth of 1. In other words, they work with fractional numbers, compare fractions, etc., which is presented in the separate strand Fractions.

In respect of the knowledge in Geometry, the students in both countries study the plane figures section, angle, square, triangle, and rectangular as well as bodies. Students learn to find the circumference of a geometry figure. Another important difference between the two educational systems is that in England students learn to find the area of irregular polygons. These figures are not included in the educational program in Bulgaria.

In respect of mathematical quantities, the students in both countries learn to measure length using different measuring units. They measure angles in degree, calculate the face of circumference and square, compare areas. The difference is that in England there is no separate strand for this educational content but in Bulgaria, there is separate competency Cluster Measurement for the purpose.

In both countries, students solve problem text tasks that include ratios and relations as well as problem tasks that include two unknown quantities.

Conclusions

The analysis performed in this study including the comparative analysis of the legal regulations related to the expected results from the education in mathematics in Primary schools in the Republic of Bulgaria and England contributes to identifying the structure of the expected results and for presenting the main similarities and differences. All of this is a prerequisite for improving both the pedagogical interaction during mathematics classes and the methodical work of the primary school teacher.

Knowing well the expected results the teacher can determine which part of the mandatory knowledge and skills in mathematics have been acquired by the students, what are their omissions, and consequently, take adequate measures to compensate for these omissions. Additionally, the teacher will understand how the achievement of the expected results in mathematics can contribute to the development of key competencies and what activities to plan for further achievements.

Good knowledge of the legal requirements related to the education in mathematics in England helps for borrowing mathematical tasks from the English educational content in mathematics and their use in the educational process in Bulgaria. This also will help the exchange of methodology ideas

and innovations which will enrich and improve the work of the Primary school teacher.

This opens new opportunities for international contacts leading to improvement of the methodical work of the Primary school teacher.

REFERENCES

Educational program for grade 2. (2016). Order No. RD09-300 dated 17.03.2016.

Educational program for grade 3. (2017). Order No. RD09-1093 dated 21.01.2017.

Educational program for grade 4. (2017). Order No. RD09-5778 dated 22.11.2017.

Educational program in mathematics for grade 1. (2015). Ministry of Education, Order No. RD09-1857 dated 17.12.2015.

Requirements regarding the results from the education in mathematics. (2015). *State gazette*, 95, 08.12.2015, Regulation No.5 dated 30.11.2015.

The national curriculum in England. Key stages 1 and 2 framework document. (2013).

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/425601/PRIMARY_national_curriculum.pdf

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