

# Slovak Republic

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## Introduction

### Overview of Education System

Since January 2004, a new act has regulated the state administration and regional self-government of primary and secondary school education in the Slovak Republic. This act decentralized the national education system into eight autonomous, self-governing regions (*samosprávny kraj*). Primary schools, preschools, and school facilities are administered by municipalities, while secondary schools are administered by self-governing regions.<sup>1</sup>

At the national level, the Ministry of Education, Science, Research, and Sport oversees the administration of the public school system. The Ministry also is responsible for developing education concepts and a unified education policy, as well as for creating laws, general binding regulations, and documents related to education (e.g., curriculum documents).

In 2008, the National Council of the Slovak Republic approved Act No. 245/2008 (the Education Act), addressing upbringing and education and defining the two-level system of education.<sup>2</sup> The act mandates that education in schools be conducted according to the State Education Program (*Štátny Vzdelávací Program*, or *ŠVP*) and the School Education Program (*Školský Vzdelávací Program*, or *ŠkVP*). The State Education Program defines the compulsory content of education in schools and delineates the general objectives and key competencies for education in Slovakia. It provides a framework for teaching plans and corresponding teaching standards at all school levels. The School Education Program is a curricular document adapted for individual schools that describes how schools may attain the general objectives and content standards required by the State Educational Program, considering specific regional and school conditions.

The New Innovated State Education Program (*Inovovaný Štátny Vzdelávací Program*, or *iŠVP*) was approved in 2015. This program was introduced in the 2015–2016 school year and applied in the first and fifth grades of primary school and the first grade of secondary school (International Standard Classification of Education [ISCED] 1, ISCED 2, and ISCED 3, respectively). In the following school years, it was applied in subsequent grades. The main changes were defined education standards and time taught for each grade; additional lessons for Slovak language and literature, the reintroduction of mathematics and science subjects (Basics of Science [*Prvouka*] was reintroduced for the first and the second grades), and a sharp decrease in the number of optional

lessons managed by schools themselves. All students participating in TIMSS 2019 were educated in line with this new curricular program.<sup>3</sup>

Principals manage primary and secondary schools and are responsible primarily for curricular implementation, the integration of professional and pedagogical standards into the teaching process, the evaluation and ongoing education of the teaching staff, budget management and the effective use of school financial resources, and the first level of state administration for individual students (e.g., admission, exclusion, delay of enrollment, permission to follow an individual study plan). The principal collaborates with a school board, which functions as a public monitor and comprises pedagogical and nonpedagogical school employees, parents, students (at secondary schools), and representatives of the municipality or self-governing region.<sup>4</sup>

There are four main levels in the education system in Slovakia: preprimary, primary, secondary, and higher education.

Preprimary education (ISCED Level 0) is provided by kindergartens (*materská škola*), and special kindergartens for children with special education needs, designed for children from ages 3 to 5. Preschools are founded mostly as independent institutions but can be associated with primary schools. Preschool education is not compulsory, but it is considered part of the education system and is organized according to official documents approved by the Ministry. Generally, it is provided on a fee-paying basis. In accordance with the 2008 Education Act, the final year of preprimary education should be provided free of charge.

Compulsory education in the Slovak Republic lasts 10 years (ages 6 to 16) and consists of three stages. The first two stages comprise primary school (*základná škola*) in Grades 1 to 4 (ISCED Level 1) and Grades 5 to 9 (ISCED Level 2). The final year of compulsory education typically coincides with the first year of secondary school. Children from socially disadvantaged backgrounds who have not reached the development level necessary for primary school by age 6 have the option to attend an additional Grade 0. Students with special education needs may attend special primary schools.

After completing the fifth grade, students with special talent in academic subjects or the arts may apply for enrollment in an eight year grammar or conservatory school, each requiring an entrance examination. National examination Testing 5 (*Testovanie 5*) has been administered annually in Slovakia since 2015. Students are tested in mathematics and the language of instruction (Slovak or Hungarian). In the ninth grade, students take the national examination Testing 9 (*Testovanie 9*), in mathematics and their language of instruction (in addition to Slovak, if the student has studied in a minority language). Students may then apply to a secondary school that may require them to pass an additional entrance examination.

Secondary education (ISCED 2A, 3) is provided by three main types of schools: grammar schools (*gymnázium*), secondary specialized schools, and conservatories.

Grammar schools (*gymnázium*) provide general secondary education in four year, five year, and eight year study programs. Bilingual grammar schools offer five year programs. Students may attend eight year grammar schools after completing fifth grade (depending on their entrance

examination results). The standard duration of grammar school programs is four years (for primary school leavers). Grammar schools offer academic courses in a variety of subjects and primarily prepare students to study at higher education institutions. Upon completion of general secondary education, students take a school leaving examination (*Maturita*), and if successful, they receive a school leaving certificate that gives them access to higher education.

Secondary specialized schools (*stredná odborná škola*) prepare students not only for vocational occupations but also for higher education. The duration of programs culminating with school leaving examinations (*Maturita*) is four or five years. There are three year and four year programs leading to a certificate of apprenticeship, as well as two year and three year training programs leading to qualifications for trade workers and vocational occupations (mainly for low achievers who do not complete the primary education program). Conservatories (*konzervatórium*) offer six year (music, drama) and eight year (dance) programs. Upon completion of these programs, students take a school leaving examination (*Maturita*), and may continue their studies in higher education or complete an additional two years of conservatory (post-secondary) to obtain an *absolutorium* diploma.

Depending on the type of secondary education completed, students may continue their studies in post-secondary education (ISCED 4), higher professional education (ISCED 5B), or university education (ISCED 5A). The tertiary level of education is provided only by universities in the Slovak Republic.

Special schools provide education using special education and training methods and accommodations for students with mental, sensory, or physical disabilities; students with dysphasia; students with multiple disabilities; and talented students. Special schools provide education from kindergarten to the secondary level. Special education and training are also provided for students with special needs in regular school classrooms or in special classes within regular schools with the assistance of specialized teachers. Special schools typically accept students on the recommendation of pedagogical, psychological, or specialized advisory centers.<sup>5,6,7</sup>

### *Use and Impact of TIMSS*

The National Institute for Certified Educational Measurements published a report describing student achievement in the Slovak Republic compared with its international peers coinciding with the release date of the International TIMSS Report. This report followed national reports on TIMSS 2003, 2007, 2011 published by the Slovak TIMSS team and containing detailed analysis of results from a Slovak point of view. The National Institute for Certified Educational Measurements also prepared textbooks in mathematics and science based on released items from the TIMSS 2007 and 2011 cycles.

## The Mathematics Curriculum in Primary and Lower Secondary Grades

The mathematics curriculum for Grades 1 to 4 is in accordance with the *iŠVP* for the domains of mathematics and Information and Communications Technology (ICT) and contains topics in both subject areas. The mathematics educational content for ISCED 1 is structured into three thematic fields: Natural Numbers and Algebraic Calculations with Natural Numbers; Geometry and Measurement; and Solving Applied Problems and Problems Developing Specific Mathematical Thinking. Exhibit 1 presents the mathematics topics and expected competencies of students at the end of Grade 4 of primary education assessed in TIMSS 2019.

**Exhibit 1: Mathematics Content Areas and Competencies by the End of Grade 4<sup>8</sup>**

Content Areas	Competencies
Natural Numbers and Algebraic Calculations with Natural Numbers	<ul style="list-style-type: none"> <li>▪ Read, write (including expanded form in the decimal system), compare, arrange, and round natural numbers, mark numbers on an axis</li> <li>▪ Add and subtract natural numbers (up to 10,000) mentally, on paper, and with a calculator</li> <li>▪ Multiply and divide natural numbers using a multiplication table up to 100</li> <li>▪ Know and use terms (addend, sum, minuend, subtrahend, difference, factor, product, dividend, divisor, fraction, multiple, odd and even numbers)</li> <li>▪ Use commutative properties of addition and multiplication</li> <li>▪ Identify fractions (propaedeutic level fraction, graphically)</li> <li>▪ Solve simple conceptual and applied problems using parentheses</li> <li>▪ Solve simple equations, inequalities</li> <li>▪ Understand numerical series</li> <li>▪ Know basic Roman numerals</li> </ul>
Geometry and Measurement	<ul style="list-style-type: none"> <li>▪ Recognize points, lines, and line segments; draw lines and line segments</li> <li>▪ Know units of measurement for length and apply and convert between them independently; measure the length of line segments; add, subtract, and multiply line segments; compare line segments based on length</li> <li>▪ Draw squares and rectangles on graph paper and determine vertices, sides, and pairs of adjacent sides</li> <li>▪ Enlarge and reduce geometrical plane figures on graph paper; construct triangles based on given side lengths, and determine vertices and sides</li> <li>▪ Calculate perimeter of squares, rectangles, and triangles by adding their sides (introductory)</li> <li>▪ Draw circles given center and distance and recognize their properties</li> <li>▪ Construct geometrical space figures using cubes according to a given plan and design a construction plan for geometrical space figures using cubes</li> </ul>
Solving Applied Problems and Problems Developing Specific Mathematical Thinking	<ul style="list-style-type: none"> <li>▪ Create compound statements and decide whether they are true (or false)</li> <li>▪ Collect, record, and interpret data in different ways</li> <li>▪ Work with a table and a bar chart (creation, orientation, and completion of data)</li> <li>▪ Solve problems using combinatorics and in the area of financial literacy</li> <li>▪ Create or complete patterns with numbers, figures, or symbols based on a rule</li> </ul>

The mathematics curriculum for Grades 5 to 9 is in accordance with the *iŠVP* for the domain Mathematics and ICT, and contains topics in mathematics and Information Science. Exhibit 2 presents the mathematics topics and expected competencies of students at the end of Grade 8 of primary school assessed in TIMSS 2019.

**Exhibit 2: Mathematics Content Areas and Competencies by the End of Grade 8<sup>9</sup>**

Content Areas	Competencies
Numbers, Variables, and Algebraic Calculations with Numbers	<ul style="list-style-type: none"> <li>▪ Use natural, integer, and rational numbers to depict real situations</li> <li>▪ Read, write, and compare natural, integer, and rational numbers</li> <li>▪ Use, write, and read correlations of equality</li> <li>▪ Locate numbers on an axis</li> <li>▪ Know and use different ways to express relationships quantitatively (i.e., whole numbers and their parts—fractions, decimals, and percentages), solve conceptual and applied problems</li> <li>▪ Solve ratios by modeling and calculating; work with scale in maps and plans</li> <li>▪ Solve contextual problems in direct and inverse proportion, ratios, and measures</li> <li>▪ Represent real life situations mathematically using variables and determine their value</li> <li>▪ Represent real life situations mathematically using equations and systems of equations and solve the equations</li> <li>▪ Formulate and solve problems applying knowledge of numbers and algebraic calculations</li> </ul>
Variables, Expressions	<ul style="list-style-type: none"> <li>▪ Know addition, subtraction, multiplication, and division of numerical expressions and algebraic expressions containing variables</li> <li>▪ Solve word problems including true-false tests</li> <li>▪ Solve an equation for a variable</li> <li>▪ Work in the Cartesian coordinate system</li> </ul>
Geometry and Measurement	<ul style="list-style-type: none"> <li>▪ Know, describe, name, draw, and construct basic plane figures; know their basic elements and properties and the fundamental relationships among their elements and properties (height, axis, diagonals); calculate perimeter and volume of plane figures</li> <li>▪ Calculate perimeter and surface area of plane figures (triangle, quadrilateral, compound polygon, circle)</li> <li>▪ Identify relative position of a line with respect to a circle (chord, Thales's theorem)</li> <li>▪ Recognize, name, and describe basic geometrical space figures; find corresponding shapes in real life; identify their components (i.e., diagonals and relationships among edges); calculate surface area and volume of plane figures (cubed, cuboids, cylinders)</li> <li>▪ Recognize and construct figures reflected across axes and points; understand simple geometrical transformations; know the basic properties of pairs of symmetrical figures and apply them to simple constructions</li> <li>▪ Know how to measure angles and calculate with angles; apply properties of known pairs of angles (e.g., supplementary, alternate, complementary) to calculate inner and outer angles of plane figures</li> <li>▪ Know measuring tools and units; use them independently to take practical measurements</li> <li>▪ Analyze and solve geometrical problems by applying acquired mathematical techniques</li> </ul>

Content Areas	Competencies
Probability, Statistics	<ul style="list-style-type: none"> <li>▪ Read, collect, sort, organize and graphically display data from a table</li> <li>▪ Calculate averages</li> <li>▪ Know and use the basic terms from statistics, probability, and combinatorics</li> <li>▪ Solve contextual problems using combinatorics</li> <li>▪ Read and interpret data from tables, pie charts, and bar charts</li> </ul>

## The Science Curriculum in Primary and Lower Secondary Grades

The science curriculum for Grades 1 to 4 is in accordance with the *iŠVP* for the domain Nature and Society and contains topics in the two subject areas Natural Science (*Prírodoveda*) and Basics of Science (*Prvouka*). Exhibit 3 presents content areas of education by the end of Grade 4 of primary school.

**Exhibit 3: Natural Science and Basics of Science Content Areas by the End of Grade 4<sup>10,11</sup>**

Main Topics	Content Areas
Plants	<ul style="list-style-type: none"> <li>▪ Characteristics of plant life; basic structure of plants (roots, stems, leaves, flowers, fruit); plant morphology and function</li> <li>▪ Germination; vegetative reproduction; conditions for plant growth (light, heat, water, air, soil); effects of water (hydrophilous and xerophilous plants) and light on plants; diversity of plants; pollinators; life span of plants (annual, biennial, and perennial plants); and effects of environmental changes</li> <li>▪ Poisonous plants; edible, nonedible, and poisonous mushrooms; molds; yeast cells</li> <li>▪ Typical strains of meadow plants, forest; introduction to the system of plants; differences between meadows and fields; the most important field commodities and their uses; medicinal plants (collection, storage, and application); the preparation of extracts (how to increase the solubility of compounds)</li> </ul>
Animals	<ul style="list-style-type: none"> <li>▪ Reproduction and development (growth, maturity, and death)</li> <li>▪ Animals hatched from eggs; life cycle of butterflies and birds; diversity in the animal kingdom; life span, growth, and development of various animal species</li> <li>▪ Various animal diets (herbivorous and carnivorous animals)</li> <li>▪ Significance of animal mobility</li> <li>▪ Various conditions for animal life; land and water animals (ways of life, flying land animals, and animals living in soil); parasites</li> <li>▪ Typical species of animals living in water and on land (meadows, fields, forests) and their ways of life; introduction to the system of animals</li> <li>▪ Characteristics of animal life, similarities and differences among living organisms, and basics of the system of vertebrates; fishes; reptiles; birds; animal societies and their ways of life (ants, bees); household animals</li> <li>▪ Food chains and the impact of their disruption</li> </ul>
Human Beings	<ul style="list-style-type: none"> <li>▪ Food as a source of energy and building material for renewal of organisms; food with different nutrient contents; obesity; vitamins</li> <li>▪ The digestive system and the process of digestion; poisons and drugs; water; the excretory system; the respiratory system and the process of breathing; the importance of oxygen; the synergy of respiratory and cardiac functions; the human skeleton; the importance of physical activity for health; the musculoskeletal system; the importance of clean air; coughing and sneezing; droplet infections; the importance of a proper lifestyle for supporting human</li> </ul>

Main Topics	Content Areas
	<p>body systems; bone fractures and healing; muscle development and exercise; the cardiovascular system (the heart, the function and composition of blood, circulation, heartbeat, blood pressure)</p> <ul style="list-style-type: none"> <li>▪ Reproduction (conception, pregnancy, birth, human development)</li> <li>▪ Functions of sensory organs (vision, hearing, taste, smell, touch)</li> <li>▪ Sound</li> <li>▪ Basics of a healthy lifestyle</li> </ul>
<p>Inorganic Nature and Exploration of Natural Events</p>	<ul style="list-style-type: none"> <li>▪ Living organisms and inorganic nature (differences)</li> <li>▪ Water as an environment for life (animals and plants)</li> <li>▪ Changes in states of water from liquid to solid (freezing) and to gas (evaporation)</li> <li>▪ Water supply; drinking water; the significance of water in soil and air; the water cycle; water uptake and defecation by various organisms; drinking regimes</li> <li>▪ Seasons and periodic changes in nature; measuring time by repeating phenomena (e.g., hour, sunrise and sunset, day, and year), pendulums, measuring time with a watch</li> <li>▪ Air, oxygen, carbon dioxide, air flow, wind, rainfall</li> <li>▪ Environmental temperature</li> <li>▪ Heat, temperature, thermometer, body temperature</li> <li>▪ Thermal conductivity of different types of materials (thermal insulators); heat distribution</li> <li>▪ Hydrologic cycle in nature, rain, snow, fog</li> <li>▪ Melting, evaporation, solidification, solids, liquids and gases; dissolution and melting</li> <li>▪ Floating and sinking objects in water, buoyancy of objects in water</li> <li>▪ Volume and weight (measurement)</li> <li>▪ Light sources of light; transmission of light (translucent and transparent materials); shadows; reflection of light</li> <li>▪ Simple devices (levers, inclined planes, pulleys, and gear wheels and their construction, uses, and principles of operation)</li> <li>▪ Deceleration and acceleration of falling objects</li> <li>▪ Magnets, magnetic fields, compasses</li> <li>▪ Changes of season; temperature changes during the year; the sun as a source of light and heat</li> <li>▪ The Universe, the planets, the Solar System, stars and constellations</li> <li>▪ Earth's rotation (day and night); Earth's axial tilt; Earth's revolution around the Sun (the seasons); conditions for life in the universe; space exploration</li> <li>▪ Electric energy and its importance; electric current; electric conductivity of materials (conductors and insulators); simple electric circuits<sup>a</sup></li> </ul>

<sup>a</sup> Electric energy is included in the subject Technical Education.

The science curriculum for Grades 5 to 8 is in accordance with the *iŠVP* for the domain Man and Nature, and contains topics in biology, physics, and chemistry, as presented in Exhibits 4, 5 and 6.

**Exhibit 4: Biology Content Areas by the End of Grade 8<sup>12</sup>**

Main Topics	Content Areas
<ul style="list-style-type: none"> <li>▪ Nature and life</li> <li>▪ Kingdoms of organisms</li> <li>▪ Life with humans and in human habitats</li> <li>▪ Living organisms and their bodily structure</li> <li>▪ The bodily structure of vertebrates</li> <li>▪ Humans and the human body</li> <li>▪ Basic life processes of organisms</li> <li>▪ Heredity and changeability of organisms</li> <li>▪ The environment of organisms and human beings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Understanding the relationship between organic and inorganic nature</li> <li>▪ Observations, experiments, magnifiers, microscopes, binoculars</li> <li>▪ Living organisms and their importance in nature and for human life; forest, water, meadow, and field ecosystems and human habitats as living environments for organisms; typical organisms and their objective characteristics, life processes, and food web relationships; prevention of and protection from harmful species</li> <li>▪ The basic structure, functions, and life characteristics of plant and animal cells; unicellular and multicellular organisms; viruses, bacteria, fungi and parasites</li> <li>▪ The bodily structure of invertebrates and vertebrates, reproduction and development</li> <li>▪ The basic structure and function of human organ systems (skin, skeleton, muscular, digestive, breathing, circulatory, excretory/urinary and reproductive system; human development; illnesses</li> <li>▪ Basic first aid principles; activities of the human body as an integral system in terms of health and healthy lifestyle; alcoholism, obesity, smoking, psychoactive substances (addiction)</li> <li>▪ Photosynthesis</li> <li>▪ Genetics and heredity; DNA; chromosomes; cross-breeding; genetic disorders</li> <li>▪ Elements of the environment; environmental science; pollution of water, air, and soil; global environmental problems; protection of nature, protected species and areas; renewable sources of energy</li> </ul>

**Exhibit 5: Physics Content Areas by the End of Grade 8<sup>13</sup>**

Main Topics	Content Areas
Examining the properties of gases, liquids, and solids	<ul style="list-style-type: none"> <li>▪ Different and similar properties; measurement and units of length, volume, and weight</li> </ul>
The behavior of objects in gases and liquids	<ul style="list-style-type: none"> <li>▪ Measuring and comparing volume and weight of buoyant, floating, and sinking objects in water and liquids of various densities; density and its units of measurement; determining density of various liquids through experimentation; observing the behavior of soap bubbles in air and gases of higher density than air; density of gases</li> </ul>
Temperature; examining changes of state of matter	<ul style="list-style-type: none"> <li>▪ Time and temperature (measurement and units); constructing graphs showing the relationship of temperature and time</li> <li>▪ Examining changes of state of matter (e.g., liquid to gas through evaporation and boiling; boiling temperature; atmospheric pressure and boiling point; steam to water through condensation; measuring condensation point; modeling rain; melting and freezing); constructing graphs to display data collected, meteorological observations</li> <li>▪ Crystalline and amorphous materials</li> </ul>
Heat	<ul style="list-style-type: none"> <li>▪ Receiving and transmitting of heat by objects; heat conduction; constructing calorimeters from simple components; estimating and measuring final temperature after heat transmission between hot metals or hot water (copper,</li> </ul>

Main Topics	Content Areas
	aluminum, iron) and cold water; difference in temperature ( $\Delta t$ ); specific heat capacity; heat and its units of measurement ( $c$ , $Q$ , $J/kg^{\circ}C$ , $J$ , $Q = c \cdot m \cdot \Delta t$ ); determining the energy value of foods by fuel combustion <ul style="list-style-type: none"> <li>Heat combustion engines and its impact on the environment</li> </ul>

#### Exhibit 6: Chemistry Content Areas by the End of Grade 8<sup>14</sup>

Main Topics	Content Areas
Substances and their properties	<ul style="list-style-type: none"> <li>Chemical substances (sugar, salt, sand, water, glass, ethanol, and others) and their properties (flammability, state, smell, odor, appearance, solubility)</li> <li>Homogeneous and heterogeneous mixtures (solutions, water, and saturated mixtures)</li> <li>Solvents and solutes; methods for separating components of mixtures (sedimentation, filtration, evaporation, distillation, crystallization)</li> <li>Water and air (drinking and sewage water, water and air as mixture substances, pollution)</li> </ul>
Transformation of substances	<ul style="list-style-type: none"> <li>Observing chemical reactions</li> <li>The law of conservation of mass, combustion and flammable substances, reactants and products, chemical association and dissociation, heat transformation in chemical reactions, rate of chemical reactions and factors affecting the rate of chemical reactions</li> </ul>
Composition of substances	<ul style="list-style-type: none"> <li>Chemical elements (symbols) and compounds</li> <li>Chemical formulas; particles of matter; atoms (electron shell and nucleus, protons, neutrons, electrons, atomic number); molecules; ions (cation and anion)</li> <li>Chemical bonds (covalent and ionic)</li> <li>Observing of the properties of the ionic/covalent and metallic substances</li> </ul>
Major chemical elements and compounds	<ul style="list-style-type: none"> <li>The periodic table of the elements; groups and periods</li> <li>Oxygen and its compounds (oxides); hydrogen and its compounds (acids, oxo-acids, oxygen-free acids, acidic solutions)</li> <li>Alkali metals and their compounds (hydroxides, alkaline solutions)</li> <li>Salts (neutralization, pH, pH scale, pH indicators)</li> <li>Oxidation and reduction, the oxidation-reduction reaction</li> </ul>

## Professional Development Requirements and Programs

New Act No.138/2019 on pedagogical staff and professional employees took effect on September 1, 2019, replacing Act No. 317/2009, which was in effect in Slovakia during TIMSS 2019. Therefore, conditions of professional development for teachers are in line with the Act No. 317/2009.<sup>15</sup>

In the Slovak Republic, there is no mandatory requirement for teachers to undertake professional development, but incentives to participate are strong, as professional development activities give teachers necessary credits for career advancement and eligibility for a salary allowance. There is a direct link between the accumulation of professional development credits and teachers' salary: for each 30 credits obtained, teachers receive a 6 percent bonus (to a maximum 12 percent bonus for 60 credits), which is valid for seven years.

Professional development activities that are undertaken in the context of school development plans are free of charge for teachers. Teachers are also given five working days to take courses that

prepare them for the first and second certification examinations. The following types of professional development are available: adaptation programs, specialization programs, functional programs, updating programs, and innovation programs.

Professional development is provided by a range of institutions, including higher education institutions and educational organizations of the Ministry of Education (the National Institute of Education, the Methodology and Pedagogy Centre and the National Institute of Vocational Education).<sup>16</sup> Programs of professional development are accredited by the Accreditation Council, which is part of the Ministry of Education. The largest provider of professional development is the Methodology and Pedagogy Centre (MPC).<sup>17</sup> It provides courses free of charge. The main role of MPC is to develop and provide in-service education and training to teachers. MPC's activities provide continuing education for teaching and professional staff in schools and school facilities and prepares school leadership; provides expert methodological activities in the area of continuing education of teaching and professional staff; and carries out research activities in the field of continuing education of teaching and professional staff.

Examples of educational programs include creating tasks to develop mathematical literacy, using reading strategies to support development of students' mathematical literacy in primary education, and project education in science subjects.

## Monitoring Student Progress in Mathematics and Science

Since 2005, students in the ninth grade of primary school have been required to take a national examination, Testing 9 (*Testovanie 9*), which assesses student abilities and knowledge in the language of instruction, literature, and mathematics. Students attending schools where instruction is delivered in minority languages are tested in Slovak language and literature, as well. Examination results may provide decisive admission criteria for secondary schools.

Testing 5 (*Testovanie 5*), a national examination of students in Grade 5, has been administered in Slovakia since 2015. The testing is compulsory for all students and covers the language of instruction (Slovak or Hungarian), literature, and mathematics. The main objective of Testing 5 is to assess student knowledge at the beginning of ISCED 2 and provide schools with feedback on how well students are prepared for the transition from ISCED 1 to ISCED 2. Testing 5 also aims to monitor student knowledge and skills at the national level at the end of ISCED 1.<sup>18,19</sup>

The use of other standardized tests is not compulsory for schools, but most schools use some type of commercially prepared tests.

The Education Act prescribes various forms of student assessment. Teachers conduct ongoing assessment of student performance using numeric grades (on a five point scale), oral examinations, and a combination of the two. Up to the fourth grade, assessment may comprise oral examinations exclusively. Continuous assessment is conducted throughout the school year and is based on observations, student activities, oral examinations, written examinations, and other assignments (e.g., projects). Twice per school year (at the end of January and the end of June), students receive assessment feedback with the final evaluation in June presented as a report card.

Students who pass in all subjects advance to the next grade. Students who fail to complete or pass the end of year examination for up to two subjects may retake the examinations with the permission of the school principal. Students who pass the examinations the second time may advance to the next grade. Students who fail end-of-year examinations in more than two subjects or who fail examination retakes must repeat the grade.

## Special Initiatives in Mathematics and Science Education

To improve the quality of mathematics education in primary and secondary education, the National Institute for Education issued the draft “Framework for Improving the Quality of Mathematics Education in Primary and Secondary Education.” It was prepared by a working group consisting of teachers and members of several educational institutions. The main goals of this framework are a more effective education process; improved quality of mathematics education focused on mathematical thinking development; and monitoring of effective implementation of state education programs and mathematics education standards into school education programs and processes.<sup>20</sup>

The Ministry of Education, Science, Research, and Sports of the Slovak Republic made a call for proposals named “Reading, Mathematical and Science Literacy in Primary School” aimed to improve the quality of the education process and student achievement in reading, mathematics, and science in primary schools. The call was open to primary schools in all regions of Slovakia. Most schools have started to implement these educational activities, which were introduced in September 2019.<sup>21</sup>

Methodology and pedagogy centers, universities, and other education institutions also work to enhance student interest in natural science and mathematics by organizing various educational programs (e.g., Physics Live, Natural Science for Everyone, Young Scientists, and the AMAVET Festival of Science and Technology).

Students with a high interest in mathematics and natural science may participate either in national competitions, such as a mathematics, physics, or biology Olympiad, Pythagorics (*Pytagoriáda*), or Mathematical Kangaroo (*Matematický Klokan*), or in correspondence seminars, such as MAKS, Genius Logicus, PIKOFYZ, and PIKOMAT.

To ensure the education of children from socially disadvantaged backgrounds, schools modify particular conditions—namely, implementing preprimary education, establishing teaching assistant and pedagogical consultant positions, and introducing Grade 0—to:

- Integrate the children into the education system
- Reduce the number of students per class
- Apply whole day education
- Enhance cooperation with families

Students from socially disadvantaged backgrounds are educated in standard classes, together with other students. If necessary, a school may launch an individual educational program for a particular student in one or more subjects.

## References

- <sup>1</sup> *Zákon 596/2003 Z. z. o štátnej správe v školstve a školskej samospráve a o zmene a doplnení niektorých zákonov.* [Act No. 596/2003 coll. on state administration in the school system and school self-government and on amending and supplementing certain other acts]. (2003). Retrieved from <https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2003/596/>
- <sup>2</sup> *Zákon 245/2008 Z.z. o výchove a vzdelávaní (školsky zákon) a o zmene a doplnení niektorých zákonov.* [Act No. 245/2008 coll. on upbringing and education (the school act) and on amending and supplementing certain other acts]. (2008). Retrieved from <https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2008/245/>
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