Lithuania

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Introduction

Overview of Education System

Lithuania's Parliament defines the basic principles, structures, and objectives of education, while the Ministry of Education, Science and Sport devises and implements education policy. The Ministry of Education, Science and Sport defines the curriculum in use throughout the country and determines teacher salaries, requirements for teacher qualifications, priorities for qualification development, and the assignment of education staff. The Ministry allocates funds for the education of the pupil (called the student or class basket), and owners of comprehensive schools[a] (usually municipalities with the exception of some national-level schools such as the National School of Arts) are responsible for the administration and financing of their respective schools. Municipalities are also responsible for the assessment of schools, administrators, teachers, professional development, and student achievement. Primary and basic schools follow a national curriculum that schools and teachers are expected to adapt to their particular needs. The administration of nonformal education is decentralized under the jurisdiction of local municipalities and includes extracurricular activities, optional curriculum hours, and the establishment of nonformal schools and their curricula (e.g., music, sports, and art).

The levels of education in Lithuania are divided according to the United Nations Educational, Scientific and Cultural Organization (UNESCO)'s International Standard Classification of Education (ISCED) 2011.[1] Early childhood education comprises preschool and preprimary education and is attributed as nonformal education. Preschool education is compulsory nonformal education when the child reaches the age of 5 or no later than when the child reaches the age of 6. Children can take part in preschool education from birth until they start compulsory preprimary education at the age of 6. As of September 2016, 1 year of preprimary education is compulsory from ages 6 to 7. Preprimary education is carried out according to a 1-year or 2-year general preprimary education curriculum approved by the Minister of Education, Science and Sport. Preschool and preprimary education can be provided by private,

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a   A comprehensive school is a school whose main activity is to provide education within the framework of primary, basic, secondary, or relevant special programs of formal education.

state, or municipal kindergartens, kindergarten-schools, schools, or other institutions, as well as by freelance educators or other education providers. Education for children up to the age of 16 is compulsory, i.e., the student must learn according to the primary education curriculum and must complete the lower secondary education curriculum.

According to the Law on Education,[2] children must start attending primary school when they turn 7 years of age during any given calendar year. By parents' request, a child can begin the school year earlier. Primary education lasts 4 years and consists of Grades 1 to 4. Primary education can be obtained in kindergarten-schools, primary schools, progymnasiums, basic schools, gymnasiums (in some cases), or multifunctional school centers (institutions that provide early childhood education; education from Grades 1 to 10; and other formal and nonformal education, including cultural and social services). Parents and children can also choose schools of nontraditional education[b] or individual classes/groups in municipal schools.

Lower secondary education lasts for 6 years (from Grade 5 to Grade 10) and is also compulsory. It is provided in progymnasiums (Grades 1 to 8 or Grades 5 to 8), basic schools (Grades 5 to 10), gymnasiums (Grades 9 and 10, also called Grades 1 and 2 in lower secondary education), multifunctional school centers, and vocational schools (from Grade 9 in combination with a vocational training program).

Upper secondary education lasts 2 years (Grades 11 and 12, also called Grades 3 and 4 in upper secondary education) and is not mandatory. It is provided by gymnasiums, as well as vocational schools in combination with a vocational training program.

The Lithuanian National Curriculum for Primary and Lower Secondary Education (National Curriculum)[3] is approved by the Ministry of Education, Science and Sport. The implementation of the National Curriculum is regulated by the General Education Plan approved by the Minister. It outlines the scope, time, and main principles of curriculum implementation.

In Lithuania, the official national language is Lithuanian. In most schools, the language of instruction is Lithuanian, but in a considerable number of schools (usually national minority schools), the language of instruction is the mother tongue of the majority of the school's student population—Russian, Polish, Belarussian, German, English, French, or Ukrainian. All schools with a language of instruction other than Lithuanian teach Lithuanian as a second language and the official national language. In schools providing primary and lower secondary education, which include Grade 4 and Grade 8, respectively, mathematics, science, and social studies are usually taught in the school's language of instruction.

Use and Impact of TIMSS

Lithuania has participated in TIMSS since 1995. TIMSS was the country's first large-scale mathematics and science study. The Ministry of Education, Science and Sport and the National Agency for Education (formerly known as the National Examination Centre) were responsible

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b   Nontraditional education is a type of education implemented according to formal (primary, basic, and secondary) and/or nonformal (preschool, preprimary, and other nonformal) education curricula based on a unique pedagogical system (e.g., Maria Montessori, Waldorf, Shin'Ichi Suzuki) or its separate elements.

for the national implementation of TIMSS 1995. TIMSS results and recommendations led to changes to the design of the new mathematics and science curriculum for primary and lower secondary education. The revised Lithuanian National Curriculum for Primary and Lower Secondary Education was approved in August 2008, and students in first grade began following the new National Curriculum in September 2009. As of September 2010, primary and lower secondary education students have been following the National Curriculum in all grades (Grades 1 to 10). Not surprisingly, the results of Lithuania's students on TIMSS have been increasing gradually with each TIMSS survey cycle.

Following the TIMSS 2011 report, which drew attention to science laboratories in primary and basic schools (Grades 5 to 8), all schools in Lithuania were equipped with scientific labs. Ten open-access centers dedicated to science, technology, engineering, the arts, and mathematics (STEAM) were also established. The centers are equipped with science laboratories for students in formal and nonformal education. Lithuania also established the national Science and Technology Popularization Centre.

Deeper analysis of TIMSS 2015 and TIMSS 2019 results led to changes to the National Curriculum once more. The Minister of Education, Science and Sport approved the Guidelines for the Renewal of the General Curriculum in 2019.[4] The guidelines were presented and discussed with the education community. The Lithuanian National Curriculum for Primary and Lower Secondary Education was updated in August 2022 according to these guidelines. Students in Grades 1, 3, 5, 7, 9, and 11 began following the new curriculum in September 2023 (with some changes to the chemistry and physics curricula that also affected students in Grade 8). As of September 2024, all students in all grades will be following the new National Curriculum.

The Mathematics Curriculum in Primary and Lower Secondary Grades

Fourth-Grade Mathematics Curriculum

The current mathematics curriculum for Grade 4 in Lithuania was approved in 2008. According to the National Curriculum, mathematics education in primary school (Grades 1 to 4) aims to help students develop calculating, reasoning, and formalizing skills, as well as visual, spatial, and statistical thinking. The curriculum is based on the premise that understanding and applying mathematical concepts, models, methods, and relationships will enable students to better understand the world, solve everyday life problems, and adopt a culture of human thought and action that was developed over centuries. Knowledge gained in various mathematical content areas will help students orient themselves in everyday life and prepare for further studies in mathematics, the natural sciences, and technology.

Student skill objectives include communicating and collaborating using mathematical concepts as a means of conveying information, using mathematical vocabulary and symbols, adopting elements of mathematical reasoning, and learning to solve simple problems from

everyday life that correspond to personal experience and interests. Students are expected to develop an appreciation of the importance of mathematics in their own lives and the lives of others, and its applications in various spheres of practical human endeavor. Overall, the curriculum aims to help students grow to value the honesty, perseverance, and creativity needed for intellectual work, and aspire to additional mathematical knowledge and skills.

The primary school curriculum comprises several mathematics content areas: numbers; expressions, equations, and inequalities; geometry; measurement; and statistics. When studying numbers, students focus on developing their skills in mental and written calculations in order to learn the names and components of arithmetic operations and the concepts of numbers, digits, and fractions (however, students do not apply arithmetic operations to fractions in primary school). Exhibit 1 summarizes the knowledge content and specialized skills students learn in mathematics in Grades 3 and 4.

Exhibit 1: Mathematics Learning Objectives and Expectations, Grades 3 and 4

Content Area	Objectives and Expectations
Numbers	• read and write natural numbers up to 10,000; simple fractions with denominators of 2, 3, 4, 5, 6, 7, 8, 9, 10, and 100; and decimal fractions with no more than two digits after the decimal point • compare numbers of the same type correctly using symbols such as <, >, or = • identify how close a given number is to which multiple of 10, 100, or 1,000 • carry out practical counting tasks • add and subtract natural numbers, multiply and divide by one-digit and two-digit numbers, and round three-digit and four-digit numbers (e.g., 100 or 1,000) • solve simple real-life and abstract problems, and estimate and check the results of calculations • explain the appearance of remainders from division in the context of concrete situations
Expressions, Equations, and Inequalities	• calculate values of simple numerical expressions or quantities • depict everyday practical and mathematical situations using simple numerical expressions • use the commutative and distributive properties of addition and multiplication when rearranging simple numerical expressions • solve simple equations and inequalities using more than one variable by guessing the answer and checking the result

Exhibit 1: Mathematics Learning Objectives and Expectations, Grades 3 and 4 (Continued)

Content Area	Objectives and Expectations
Geometry	• recognize and draw points, segments, triangles, rectangles, squares, circles, cubes, parallelepipeds, pyramids, cones, and spheres • show elements of triangles and rectangles (e.g., side, angle, and vertex) in models and sketches • show radius of circles, and edges, vertices, and walls of cubes, parallelepipeds, and prisms in sketches • identify symmetry in objects or geometric plane figures • apply knowledge of plane and solid figures to solving simple problems
Measurement	• read and write measurement results correctly • draw segments of a given length, rectangles of given dimensions, and circles of a given radius • estimate parameters of simple objects (e.g., length, width, and volume in liters) without using measuring instruments • solve simple problems in which measurements are needed to carry out operations • use calendars and schedules • calculate average speed given distance and elapsed time • calculate perimeter of triangles and quadrilaterals and area of rectangles
Statistics	• collect data from the surrounding environment and display in frequency tables • read information from bar graphs, pictograms, and frequency tables, and represent given (or collected) data in bar graphs • answer simple questions and draw simple conclusions based on given (or collected) data

Eighth-Grade Mathematics Curriculum

The current mathematics curriculum for Grade 8 in Lithuania was approved in 2008. The lower secondary education curriculum (Grades 5 to 10) emphasizes acquiring knowledge of various mathematical content areas for use in everyday life and building a strong foundation for the study of other subjects, such as the natural sciences and technology. Student skill objectives include communicating and collaborating, using mathematical vocabulary and symbols, adopting elements of mathematical methods and reasoning, conducting mathematical investigations in everyday life, solving mathematical problems, and understanding and applying mathematical relationships.

The curriculum conveys the need for students to understand the historical evolution of mathematics and to explore ideas about modern areas of mathematics that might contribute to advances in natural, social, and computer sciences. Students should recognize the importance of mathematics for society, its objectivity, and its practical applicability in various areas of

human activity. Mathematics instruction in Grades 5 to 10 aims to motivate students to seek mathematical knowledge and develop openness, perseverance, positive attitudes toward change, willpower, motivation, and responsibility. It emphasizes the need for students to learn and remain interested in other subjects that are built on a mathematical foundation.

The lower secondary education curriculum divides mathematical knowledge and skills into the following content areas: numbers; expressions, equations, inequalities, and their systems; relationships and functions; geometry; measurement; statistics; and probability theory. The curriculum further divides general skills and attitudes into knowledge and understanding, mathematical communication, mathematical reasoning, problem-solving, and the ability to learn and develop interest in mathematics. Exhibit 2 summarizes the knowledge content and specialized skills students learn in mathematics in Grades 7 and 8.

Exhibit 2: Mathematics Learning Objectives and Expectations, Grades 7 and 8

Content Area	Objectives and Expectations
Numbers	• read, write, and compare rational numbers, place them on a number line, round them to a specified digit, and use them in arithmetic calculations • raise rational numbers to a whole number power • find square or cube roots of rational numbers • continue to develop problem-solving skills involving percentages • use a calculator to carry out various calculations and to check results
Expressions, Equations, Inequalities, and Their Systems	• calculate values of simple numerical and algebraic expressions that may include two or three arithmetic operators, exponents, square roots, brackets, and one or two variables • rearrange terms in polynomials and factor them in simple cases • apply attributes of whole number exponents, square roots and cube roots in simple cases • solve first-degree equations and equations in the form of $A(x)B(x) = 0$, where $A(x)$ and $B(x)$ are first-degree binomials; and $ax^2 = b$ and $ax^3 = b$ ($a, b > 0$) • solve simple first-degree inequalities
Relationships and Functions	• represent two directly or inversely proportional quantities with tables, graphs, or formulas, and apply the concept of proportionality • draw a figure symmetrical to one given by applying point or line symmetry
Geometry	• classify angles, triangles, and quadrangles according to given attributes • apply properties of adjacent and vertical angles and parallel lines in solving simple problems • explore properties of triangles (isosceles and equilateral) and quadrilaterals (parallelograms and trapezoids), and apply the properties of congruence to triangles and symmetry to figures (point and line)

Exhibit 2: Mathematics Learning Objectives and Expectations, Grades 7 and 8 (Continued)

Content Area	Objectives and Expectations
Geometry	• prove simple statements by using geometric properties (e.g., triangle congruence, the sum of triangle or quadrilateral angles, and the Pythagorean theorem) • draw right triangles or quadrilateral prisms, cylinders, cones, spheres, and regular pyramids and name their elements • make models of right triangles or quadrilateral prisms, regular pyramids, and other regular solid figures
Measurement	• read and write results of measurements in both standard and nonstandard units • estimate parameters of simple objects in the real world, with and without measuring instruments • use formulas to calculate perimeter and area of triangles, parallelograms, trapezoids, and circles • understand and use properties of length, width, and area • apply measurement scales to solving problems that require finding length (perimeter) or area of figures • calculate the sum of the angles in triangles or quadrilaterals • calculate the volume and surface area of right prisms and cylinders • establish relationships among various units of measurement • add and subtract measurements in the same units and multiply and divide measurements in any unit • calculate speed, distance, and time using relevant formulas
Statistics	• find and analyze diverse statistical information from different sources • interpret and evaluate sample characteristics • display data and find numerical characteristics using spreadsheets
Probability Theory	• make subsets of several elements, with elements taken from different sets or from the same set • distinguish whether order in a subset is important • use the rule of multiplication when calculating a number of subsets when the order of subset elements is important • understand the concepts underlying probability experiments and their outcomes • conduct experiments, learn how to calculate relative frequency of outcomes, and draw simple conclusions about the likelihood of each outcome

The Science Curriculum in Primary and Lower Secondary Grades

Fourth-Grade Science Curriculum

The current science curriculum for Grade 4 in Lithuania was approved in 2008. As per the National Curriculum, primary school science education (Grades 1 to 4) aims to provide students with a comprehensive understanding of their immediate natural, social, and cultural surroundings. It also aims to help them comprehend how these surroundings impact individuals and their way of life. Additionally, it aims to develop the necessary skills, a positive worldview, and values required for living in such an environment. The science curriculum divides integrated social and natural science into several content areas: humans living together, humans' development, humans' environment, humans' health and safety, humans and nature, and humans and natural phenomena. Exhibit 3 summarizes the knowledge content and specialized skills students learn in these content areas during primary school.

Exhibit 3: Science Learning Objectives and Expectations, Grades 1 to 4

Content Area	Objectives and Expectations
Humans' Environment	• learn about general weather changes and geographical attributes of Earth
Humans' Health and Safety	• learn about the human body and its functions in a simple and understandable way • learn about proper breathing, posture, vision, hearing, and hygiene • learn first aid for oneself and others • develop a healthy diet and personal hygiene habits • learn the causes of contagious diseases and their prevention • learn where to go and who to contact in an accident, and how to prevent accidents • learn how to prevent alcohol abuse, how to calm oneself in a stressful situation, and how to rest actively
Humans and Nature	• learn to observe and remember facts, and link them to sets of causal relationships • pay attention to natural surroundings and the interrelationship of various life forms • explore the interrelationship of plants and animals (based on examples of forest or pond ecosystems) • recognize that the environment and natural phenomena (sunlight, air, and water) help sustain life • recognize the importance of solar energy for life on Earth • emphasize the consequences of human activities on nature

Exhibit 3: Science Learning Objectives and Expectations, Grades 1 to 4 (Continued)

Content Area	Objectives and Expectations
Humans and Natural Phenomena	• learn to investigate natural phenomena • using illustrations from everyday life, explore movement and its laws, the phenomenon of electricity, sources of energy and ways of saving energy, properties and changes of materials, the phenomenon of burning, and the water cycle in nature • learn to formulate hypotheses, predict results, and draw conclusions • learn to apply scientific methods to analyze simple problems • develop the ability to distinguish what is true from what is probable • learn to plan and conduct experiments, using simple instruments from everyday life as well as basic laboratory equipment

Eighth-Grade Science Curriculum

Science education in lower secondary school (Grades 5 to 10) aims to help students to acquire foundational knowledge in the natural sciences, master essential concepts and ideas in the natural sciences, acquire skills that will help them develop an understanding of the world around them, and develop certain values and attitudes. The curriculum aims to help students become responsible citizens, be able to lead healthy lifestyles, and address sustainable development issues.

In Grades 5 and 6 of basic school, science is taught as an integrated subject, and geography only is taught as a separate subject in Grade 6. From Grade 7 on, biology, chemistry, and physics are taught as separate subjects.

Overall, the science curriculum focuses on knowledge and understanding, problem-solving, practical skills, scientific communication, and skills for learning science. Exhibit 4 summarizes the dimensions and content areas of natural science in Grades 7 and 8 of basic school.

Exhibit 4: Science Learning Objectives and Expectations, Grades 7 and 8

Dimension	Content Area	Objectives and Expectations
Scientific Investigation	Scientific Investigation	• continue to learn the sequence of scientific investigation, including formulating a hypothesis based on life experience, planning and carrying out simple experiments and observations, presenting results, formulating conclusions, and identifying the main factors that influence studied phenomena • learn to predict and check relationships between two or more variables based on scientific laws • learn to research, summarize, and present information from various sources

Exhibit 4: Science Learning Objectives and Expectations, Grades 7 and 8 (Continued)

Dimension	Content Area	Objectives and Expectations
Scientific Investigation	Scientific Investigation	• explore the influence of the natural sciences and technology on human life • learn to apply scientific knowledge to explain phenomena • explore the issues of sustainable development, taking into account social and economic factors • investigate which personal qualities support the study of the natural sciences • learn strategies for studying science
Living Nature (Biology)	Structure and Function of Organisms	• explore the structural and functional links of cells, tissues, and organs; photosynthesis and breathing; metabolism and energy; food and a balanced diet; the nervous system and substances that affect its functioning; and reproduction, sexual intercourse, and healthy living
	Continuity and Diversity of Life	• explore the transmission of heritable traits, evolution, and the adaptation and classification of organisms
	Organisms and the Environment: Humans and the Biosphere	• explore the movement of substances and energy in ecosystems and populations, and the impact of environmental pollution on organisms
Matter and Change (Chemistry)	Knowledge of the Composition and Characteristics of Matter	• explore the periodic table of the elements, table periods and groups, and the composition of an atom; chemical elements and formulas; homogeneous and heterogeneous mixtures; and physical attributes of substances (e.g., mass and density)
	Changes in Matter	• explore physical and chemical changes in matter, signs of and necessary conditions for chemical reactions, and Avogadro's number and the mole
	Knowledge and Use of Common Substances	• explore air, oxygen, oxides, and ozone; chemical substances in everyday life; and the impact of human activities on the environment

Dimension	Content Area	Objectives and Expectations
Physical Phenomena (Physics)	Knowledge of Motion and Forces	• explore rectilinear and curvilinear motion, distance, speed, average speed, and acceleration; the interaction of objects; inertia; mass; the relationship of force, mass, and acceleration; the forces of action and reaction; types of forces; equilibrium of bodies, center of mass, and moment of inertia; and hydrostatics and atmospheric pressure
	Knowledge of Energy and Physical Processes	• explore mechanical energy, work, power, potential and kinetic energy, and the law of conservation of energy; simple machines; molecular composition of matter (solids, liquids, and gases); thermal expansion of bodies; electrical currents and circuits; free and forced vibration; mechanical waves and sound; and light and the laws of reflection and refraction
	Knowledge of Earth and the Universe	• explore the phases of the Moon and the movement of the planets

Teacher Professional Development Requirements and Programs

Teachers are entitled to receive continuing professional development (CPD) as part of their working conditions. As required by the Law on Education, the owner of the school ensures that teachers and other education staff are paid for a minimum of 5 days of CPD per year. CPD is provided through various in-service training institutions (methodological centers at schools, municipal teacher education centers, and professional development providers at higher education institutions). These institutions usually offer specific CPD programs for mathematics and science teachers (for example, "Environmental chemistry in school (for science teachers)" or "Maths in a simple and understandable way"). Also, the municipal education authorities and regional teacher education centers regularly provide information about the plans for CPD. Since 1993, teacher professional development in Lithuania is encouraged through the assignment of qualification categories: junior teacher, teacher, senior teacher, teacher methodologist, and teacher expert. Teachers' salaries in public schools primarily depend on their qualification category and length of service. Teachers must be recertified every 5 years to confirm their present category or advance to a higher one.

Monitoring Student Progress in Mathematics and Science

There are no national examinations at the primary level. Students take examinations at the end of lower secondary school (Grade 10) and at the end of upper secondary school (Grade 12). The examinations at the end of lower secondary school cover Lithuanian language and literature (oral and written), mother tongue (Belarusian, Polish, Russian, German) (oral and written), and mathematics. Students in minority language schools take an additional examination in the Lithuanian language. At the end of upper secondary school, the range of final examinations (the Matura examinations, or *Brandos egzaminai*) is much wider. Lithuanian language and literature (either as a mother tongue or as the national language) is the only compulsory examination. Students are free to choose other examinations from among biology, physics, chemistry, geography, history, mathematics, foreign languages, art, music, informatics, and mother tongue (for language minorities). Students must pass at least two examinations to receive the secondary school leaving (Matura) certificate.

In 2014, a project was initiated to create diagnostic tools for Grade 2. Since the 2013–2014 academic year, all schools have been using a range of standardized tests in mother tongue, mathematics, science, and social science for Grades 4, 6, and 8. Since 2015, these tests have been delivered to schools using the National Examination Centre (now the National Agency for Education) data transmission system *KELTAS* (translated as "the ferry").[5] The tests are provided to schools free of charge. The aim of the tests is to enable schools and teachers to evaluate student learning outcomes independently and objectively and to collect feedback for improving education quality and management. At the end of the school year, standardized testing tools are stored on the National Examination Centre website[6] and are available to the public. In certain districts, students are tested to monitor school conditions and gather information for education management decisions. Example questions with scoring instructions and national-level statistics are made available to teachers to help them gauge the relative achievement of their students. A number of commercial tests are also available, but they are not quality assured or standardized. Primary school students (Grades 1 to 4) do not receive grades but are evaluated in detailed narrative assessments based on teacher observations. Beginning in Grade 5, after a transitory period of approximately half a year, teachers begin grading students on a scale from 1 to 10, with 4 indicating the minimum "passing" grade and 10 an "excellent" grade.

Special Initiatives in Mathematics and Science Education

Many school- or class-level mathematics and science initiatives are implemented in lower secondary schools in Lithuania. National initiatives also encourage students of all ages to develop mathematical and science skills. The Plan for Improving Teaching and Learning in Mathematics for 2023–2027[7] is being developed to ensure that the quality of teaching and learning in mathematics is strengthened and the mathematics achievement of students in general education is improved. Lithuania has various initiatives for high-achieving students, including the Young Researcher project, which includes the mobile laboratory MoMoLab

and an accompanying biology class for learning to apply scientific methods to research and experimentation.[8,9] There are also professional volunteer projects, whereby business professionals can share their experiences with students; national science festivals for gifted and talented students; and various subject Olympiads.[10]

Suggested Reading

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