Czech Republic

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Introduction

Overview of Education System

Responsibility for schools in the Czech Republic is distributed among the Ministry of Education, Youth, and Sports, regional education authorities, and municipalities. The Ministry sets policies and assesses the development of the education system. For example, the Ministry defines compulsory educational components, is partially responsible for funding public schools, and oversees the school register, a tool that ensures all students have access to appropriate educational opportunities. Among other responsibilities, the Ministry oversees institutions that provide professional development for teachers. The Ministry also retains direct control of several institutions related to institutional or preventive care, such as orphanages, detention centres for juveniles, and schools for students with physical needs or disabilities. The Czech School Inspectorate serves as the main state authority responsible for monitoring school quality at the preprimary, primary, secondary, and post-secondary levels.

From 2001 to 2003, regional education authorities were established to fundamentally decentralize the education system. The Ministry of Education, Youth, and Sports retained its policymaking responsibilities but transferred administrative responsibilities to regions and municipalities. After decentralization, the regions assumed responsibility for secondary schools (International Standard Classification of Education [ISCED] 3), *conservatoires* (ISCED 2, ISCED 3, ISCED 5), and tertiary professional schools (ISCED 6). Municipalities are responsible for nursery schools (ISCED 0) and basic schools (ISCED 1 and ISCED 2), which provide compulsory primary and lower secondary education, and guarantee their funding (except for salaries and instructional equipment, which the central government funds indirectly via regional education authorities). Some schools are run by private entities or denominations and are required to meet a set of criteria to obtain state authorization and receive state funding.

Nursery schools provide education, usually for children ages 3 to 6, as part of preprimary education. As of 2017, attendance is compulsory for children who are 5 years old (the final year of preprimary education). The final year of preprimary education is free of charge. Although the availability of care for children younger than age 3 is limited, some schools accept these children

under certain conditions. Forty percent of all 2-year-olds attend nursery school.[1] Since 2014, the Ministry of Labour and Social Affairs has established a special service for children from age 1 until start of the compulsory education, called Children's Groups. The service does not ensure children's preprimary education but focuses on developing their competencies and educating them on cultural and hygiene practices.

School attendance is compulsory for all children ages 5 to 15. Basic schools provide nine years of education at the primary and lower secondary levels: five years at the primary level for students ages 6 to 11, and four years at the lower secondary level for students ages 11 to 15. At the end of the primary level (fifth grade), students may leave primary school to start an eight year track of general secondary school (eight year *gymnasium*) or *conservatoire*, in which they may complete their compulsory education within the first four years of study by age 15. Similarly, at the end of seventh grade of basic school, students may start a six year *gymnasium* after passing an entrance examination set by the school. Approximately 12 percent of students study in a multiyear *gymnasium* or *conservatoire*. All public basic schools are free of charge.[2]

At the primary level, one teacher usually teaches all subjects, whereas lower secondary teachers are specialists, generally in two subjects. The Framework Educational Programme for Basic Education (FEP BE) sets objectives and the basic curricular content on which schools base their educational programs.

Three kinds of schools provide upper secondary education: *gymnasium* schools, providing general academic programs for 31 percent of students ages 15 to 19 and culminating with a school leaving examination; secondary technical and vocational schools for 48 percent of students ages 15 to 19, also culminating with a school leaving examination; and secondary vocational schools for 21 percent of students ages 15 to 17 or 18 offering an apprenticeship certificate without a school leaving examination. [3] Prerequisites for acceptance into upper secondary schools include completion of compulsory education and fulfilment of school entrance requirements. Students must pass an upper secondary school leaving examination to apply for post-secondary education. Students completing vocational school with an apprenticeship certificate may apply for post-secondary education after completing two years of follow-up courses and passing a school leaving examination.

Private primary and secondary schools were established in 1990, and private universities were established in 1999. These schools are mostly secular and typically are established by profit or nonprofit grant-aided organizations. Nongovernmental basic schools (private and denominational schools) represent only 6 percent of basic schools and educate 2.4 percent of primary school students. In contrast, nongovernmental secondary schools make up 25.4 percent of all secondary schools and educate 16.1 percent of secondary school students.[4] Private schools receive a state contribution toward their operating costs. This funding is formula-based, and the method of calculation is still under development. School fees and other private sources cover capital expenditures and rent.

Use and Impact of TIMSS

Assessments like TIMSS, the Progress in International Reading Literacy Study (PIRLS), and the Programme for International Student Assessment (PISA) provide experts (i.e., researchers, teachers, nongovernmental organizations, the Czech School Inspectorate) and policymakers with important information regarding student achievement in the Czech Republic, as Czech schools do not participate in regular national assessments of mathematics and science achievement at the primary or lower secondary levels. Experts tend to use TIMSS results as a starting point when discussing the quality of mathematics and science education in the Czech Republic, especially when the results indicate a stable or even decreasing level of student achievement. Policymakers generally take these results into account when developing and implementing reforms in mathematics and science education.

In 2016, after the last TIMSS results were released, a national report[5] was published, and seminars were held throughout the country to familiarize teachers and experts with the assessment frameworks and results. In the following year, a document was published containing released mathematics and science items, a coding guide, and comments for better understanding the purpose of the TIMSS assessment questions.[6] Both publications were distributed to schools free of charge, and an electronic version is available on the Czech School Inspectorate's website.

Since 2017, the Czech School Inspectorate has organized hundreds of educational seminars, inviting teachers from all schools. The seminars provide support for teachers and headmasters to improve mathematics and science teaching, taking into account the use of TIMSS tasks, including their practical use in teaching. Approximately 2,100 teachers and headmasters have attended these seminars over the last three years.

The Mathematics Curriculum in Primary and Lower Secondary Grades[7]

Mathematics at the primary level follows the FEP BE and is divided into four thematic areas of mathematics and its application: Numbers and Arithmetic Operations, Data and Relations, Plane and Spatial Geometry, and Problem Solving. Exhibit 1 lists expected capabilities for students in each content area by the end of the fifth grade. The Standards for Basic Education, which took effect September 1, 2012, were introduced to the FEP BE, specifying more detailed content standards and student achievement outcomes in mathematics in Grades 5 and 9.

Exhibit 1: Mathematics Content Areas and Capabilities by the End of Grade 5

Content Area	Capabilities
Numbers and Arithmetic Operations	▪ Read, record, and compare natural numbers and read and compose statements of equality and inequality ▪ Use natural numbers to model real-life situations, count objects in a given set, and create sets with a given number of elements ▪ Use linear arrangement and represent numbers on a number line ▪ Perform oral and written arithmetic operations on natural numbers ▪ Round natural numbers, perform estimates, and verify the results of arithmetic operations on natural numbers ▪ Use commutative and associative properties of addition and multiplication when performing both oral and written calculations ▪ Create and solve problems that require the application of arithmetic operations on natural numbers ▪ Model and determine fractions as parts of a whole, and represent fractions using numbers ▪ Compare simple fractions, and add and subtract fractions with the same denominator ▪ Read decimals and show them on a number line ▪ Understand the symbol "–" in negative numbers, and show negative numbers on a number line
Data and Relations	▪ Understand the concept of time and perform simple time-unit conversions ▪ Describe simple relationships between real-world variables ▪ Gather, display, and classify data ▪ Complete tables, charts, diagrams, and sequences of numbers
Plane and Spatial Geometry	▪ Draw basic plane figures (square, rectangle, triangle, and circle) and perform simple constructions ▪ Measure and estimate the length of line segments, add and subtract graphic line segments, and determine the length of a broken line or the perimeter of a polygon ▪ Construct parallel and perpendicular lines ▪ Determine the area of a geometric figure by means of a quadratic grid and use basic units of area ▪ Identify and draw simple axisymmetric figures on a quadratic grid and determine the axis of symmetry by folding paper
Problem Solving	▪ Solve simple practical word problems as well as nonroutine problems

Mathematics at the lower secondary level also is divided into four thematic areas: Numbers and Variables, Data and Relations, Plane and Spatial Geometry, and Problem Solving. Exhibit 2 shows what students should be able to do in each content area by the end of the ninth grade.

Exhibit 2: Mathematics Content Areas and Capabilities by the End of Grade 9

Content Area	Capabilities
Numbers and Variables	▪ Perform arithmetic operations on whole, natural, and rational numbers ▪ Calculate square numbers and square roots ▪ Round numbers, make estimates to a specified level of precision, and use calculators effectively ▪ Express whole-part relationships using natural numbers, ratios, fractions, decimals, and percentages ▪ Solve problems involving ratios and work with the graphic scales of maps and plans ▪ Solve problems involving percentages (including percentages greater than 100) ▪ Represent simple real-life situations using variables, expressions, and equations, including simultaneous equations ▪ Add, multiply, and factor polynomials
Data and Relations	▪ Gather, evaluate, and process data and compare data sets ▪ Determine direct or inverse proportionality ▪ Express functional relations with tables, equations, and graphs ▪ Describe simple real-life situations with relations
Plane and Spatial Geometry	▪ Characterize and classify basic plane and spatial figures and identify their properties ▪ Determine the size of an angle by measurement or calculation ▪ Estimate and calculate the area and perimeter of basic plane figures and the volume and surface area of three-dimensional figures ▪ Perform constructions of figures in a plane ▪ Apply theorems of congruent and similar triangles in proofs and calculations ▪ Construct and characterize centrally symmetric and axisymmetric figures ▪ Solve application problems with geometry
Problem Solving	▪ Apply combinatory logic when solving problems, and use spatial reasoning to solve problems

The Science Curriculum in Primary and Lower Secondary Grades

The science curriculum in the primary grades (Grades 1 to 5) follows the FEP BE and is divided into five thematic areas—Man and His World: Place Where We Live, People Around Us, Man and Time, Diversity of Nature, and Man and His Health. Traditionally, instruction in Grades 1 to 3 integrates subject matter from the five individual thematic areas into one subject. In Grades 4 to 5, instruction is divided into two subject areas: one area draws on the thematic areas Place Where We Live, People Around Us, and Man and Time as a foundation for geography and history, and the other draws on the thematic areas Diversity of Nature and Man and His Health as a foundation for the natural sciences. Exhibit 3 describes the subject area topics, traditionally taught as a foundation for the natural sciences, that students will have covered by the end of fifth grade.

The national curriculum includes also the cross-curricular subjects. These subjects represent a mandatory part of basic education and must be included in Stage 1 (Grades 1 to 5) and Stage 2 (Grades 6 to 9) of education. Cross-curricular subjects may be integrated into the educational content of a subject of instruction in the form of individual subjects, projects, seminars, courses,

and other activities. One cross-curricular subject is Environmental Education. Environmental Education introduces four thematic areas—Ecosystems, Fundamental Conditions of Life, Human Activities and Environmental Problems, and Humankind's Relationship to the Environment—and connects those areas with current issues. The primary goal in introducing Environmental Education is not to expand the educational content of the curriculum but to introduce a formative element by providing students an opportunity for individual engagement and teamwork that will foster their personal development and shape their attitudes and values.

Exhibit 3: Natural Sciences Content Areas and Capabilities by the End of Grade 5

Subject Area	Main Topics	Subtopics
The Diversity of Nature	Substances and their properties	▪ Classification, properties, comparisons, and changes of substances ▪ Changes of state in matter ▪ Measuring quantities ▪ Working with units of measurement
	Water and air	▪ Distribution, properties, importance for life, and forms of water ▪ The water cycle ▪ Characteristics, composition, and importance of air ▪ Air circulation
	Minerals, rocks, and soil	▪ Economically important rocks and minerals, weathering, and the origin and importance of soil
	Earth and the universe	▪ The Solar System, day and night, and the seasons
	Plants, fungi, and animals	▪ What living things need to survive and characteristics that help them survive in particular environments ▪ Life cycles, nutrition, and the body structure and importance of familiar species
	Living conditions	▪ Diversity of the conditions for life on Earth ▪ Importance of the atmosphere, water, soil, fauna, and flora ▪ Climate and weather ▪ Extreme events and handling extreme events
	The balance of nature	▪ Relationships among organisms, and ecosystems
	Conservation and protection	▪ Human responsibility toward the environment, conservation, and protection of the environment ▪ Waste disposal ▪ Natural and ecological disasters
	Skills/capabilities	▪ Carrying out simple experiments using a group of familiar substances and identifying their common and different qualities ▪ Measuring basic quantities using simple measuring instruments ▪ Setting up a simple experiment, planning and justifying the procedure, evaluation, and explanation of its outputs

Subject Area	Main Topics	Subtopics
Man and His Health	The human body	▪ What humans need to survive and characteristics that help them survive in particular environments ▪ Basic structures and functions in humans ▪ Reproductive differences between males and females, the basics of human reproduction and human development
	Health	▪ Exercise, nutrition, substance abuse, illness, minor injuries and wounds, first aid, injury prevention, personal and intimate hygiene, mental health, stress and its risks

The Man and Nature science curriculum in the lower secondary grades (Grades 6 to 9) follows the FEP BE and includes four educational fields: Physics, Chemistry, Natural Sciences (Biology), and Geography. Exhibit 4 presents the science topics covered in Grades 6 to 9. As in the primary grades (Grades 1 to 5), the cross-curricular subject Environmental Education has been added to the science curriculum, covering the same topics. The function of Environmental Education is to promote students' understanding of the complex and intricate relationship between humans and the environment, foster students' personal development (i.e., their acquisition of specific values and attitudes), and direct students' individual behavior toward sustainable development.

Exhibit 4: Summary of the Man and Nature Curriculum, Grades 6 to 9

Subject Area	Main Topics	Subtopics
Physics	Substances and their properties	▪ Measured quantities (length, volume, mass, temperature, and time) ▪ States of matter (the connection between state of matter and particulate structure, and diffusion)
	Motions of bodies and forces	▪ Uniform and nonuniform motion ▪ Rectilinear and curvilinear motion ▪ Gravity and gravitational fields ▪ Compression force and pressure ▪ Force of friction ▪ Addition and subtraction of force vectors ▪ Newton's first, second, and third laws of motion ▪ Equilibrium state for levers and fixed pulleys
	Mechanical properties of fluids	▪ Pascal's Law, hydraulic equipment ▪ Hydrostatic and atmospheric pressure (the relationship between hydrostatic pressure, depth, and the density of a liquid; and the relationship between atmospheric pressure and weather) ▪ Archimedes' principle (buoyant force, and immersion, suspension, and flotation of bodies in fluids at rest)
	Energy	▪ Forms of energy (kinetic and potential energy, internal energy, electrical energy and power, production and transfer of electrical energy, nuclear energy, nuclear fission, nuclear reactors, nuclear power plants, and protection against radiation) ▪ State changes (melting and freezing, latent heat of melting, evaporation and condensation, factors influencing evaporation, and the boiling point for liquids) ▪ Renewable and nonrenewable sources of energy

Subject Area	Main Topics	Subtopics
	Sound	▪ Properties of sound (propagation media, speed, reflection, echo, absorption, and pitch)
	Electricity and light	▪ Electric circuits, voltage sources, electric appliances, and switches ▪ Electricity and magnetism (electric and magnetic field, electric and magnetic force, electric charge, thermal effects of electric currents, resistance, direct current motors, transformers, and safety) ▪ Properties of light (sources, speed in a vacuum and in various media, shadows, and solar and lunar eclipses; reflection, and concave and convex mirrors; imaging by refraction through thin converging and diverging lenses; and dispersion of white light by a prism)
	The universe	▪ The solar system (main components and phases of the moon) ▪ Composition of stars
	Skills/capabilities	▪ Choosing measuring instruments and using them to measure substances and bodies ▪ Using a diagram to build an electrical circuit and analysing a diagram of an actual circuit
Chemistry	Observation, experimentation, and chemical safety	▪ Properties of substances (density, solubility, thermal and electrical conductivity, and the effect of the atmosphere on properties and states of substances) ▪ Safety (in the school laboratory and in everyday life, risk and safety labels on chemicals and machinery, warning symbols, and industrial accidents)
	Mixtures	▪ Heterogeneous and homogeneous solutions ▪ Concentration and saturation of solutions ▪ Solubility and factors affecting solubility (temperature, stirring, and surface area of solute) ▪ Separation of components of mixtures (sedimentation, filtration, distillation, crystallization, and sublimation) ▪ Water (distilled, potable, and waste water, drinking water production, and water purity) ▪ Composition and purity of air and the ozone layer
	The particulate composition of matter and elements	▪ Atoms and molecules (atomic nucleus, protons, neutrons, electrons, and electron shells) ▪ Elements (names, symbols, properties and uses, the periodic table, groups, periods, and atomic number) ▪ Chemical bonds, nomenclature of simple inorganic and organic compounds
	Chemical reactions	▪ The law of conservation of mass ▪ Chemical equations ▪ Molar mass ▪ Chemical reactions (combination, neutralization, exothermic, and endothermic) ▪ Factors influencing the rate of chemical reactions (temperature, surface area of reactants, and catalysts) ▪ Electrochemistry: chemical sources of electric current

Subject Area	Main Topics	Subtopics
	Inorganic compounds	▪ Oxides (nomenclature, properties, and applications) ▪ Acids and bases (pH, properties, formulas, and names and applications of acids and bases) ▪ Chemistry of oxygen and halide salts (nomenclature, properties, applications, and oxidation state)
	Organic compounds	▪ Hydrocarbons (alkanes, hydrocarbons with multiple bonds, and aromatic hydrocarbons) ▪ Fuels (petroleum, coal, natural gas, and synthetic fuels) ▪ Hydrocarbon derivatives (alcohols and carboxylic acids) ▪ Natural substances (sources, properties, and examples of the functions of proteins, fats, saccharides, and vitamins in the human body)
	Chemistry and society	▪ The chemical industry (industrial fertilizers, heat-treated materials, plastics, synthetic fibers, detergents, pesticides, insecticides, combustible compounds, drugs, and addictive substances)
	Skills/capabilities	▪ Separating the known components of a mixture ▪ Giving examples of the separation of components in practice
	General biology and genetics	▪ Emergence, development, and diversity of life and its significance (nutrition, respiration, growth, reproduction, development, and reactions to stimuli; views on the emergence of life) ▪ Fundamental structures of life (cells, tissues, organs, organ systems, and unicellular and multicellular organisms) ▪ Classification of organisms, heredity and mutability of organisms (transfer of hereditary information, genes, and crossbreeding) ▪ Viruses and bacteria (occurrence, significance, and practical application)
Natural Sciences/Biology	Fungal biology	▪ Fungi without fruiting bodies (basic characteristics, and positive and negative impact on humans and living organisms) ▪ Fungi with fruiting bodies (structure, occurrence, importance, consumption, and first aid for mushroom poisoning) ▪ Lichens (structure, symbiosis, occurrence, and importance)
	Plant biology	▪ Plant anatomy and morphology (structure and significance of parts of higher plants: root, stem, leaf, flower, seed, and fruit) ▪ Plant physiology (photosynthesis, respiration, growth, and reproduction) ▪ Plant categorization (classification of common species of algae, bryophytes, pteridophytes, gymnosperms, and angiosperms; their development; and the use of economically important plants) ▪ The importance and protection of plants
	Animal biology	▪ Animal anatomy and morphology (animal cells, tissues, organs, organ systems, unicellular and multicellular organisms, and reproduction) ▪ Animal evolution, development, and classification (protozoans, invertebrates [cnidarians, platyhelminthes, nemathelminthes, mollusks, annelids, arthropods], chordates [chondrichthyes, osteichthyes, amphibians, reptiles, birds, and mammals]) ▪ Distribution, significance, and protection of animals (economically and epidemiologically important species, raising domesticated animals, and animal communities) ▪ Animal behavior

Subject Area	Main Topics	Subtopics
	Human biology	▪ Human reproduction ▪ Anatomy and physiology (structure and function of body parts, organs, and organ systems, including skeletal, muscular, circulatory, respiratory, digestive, excretory, reproductive, and nervous systems; higher nervous activity; and mental health) ▪ Illnesses and injuries, and their prevention (causes, symptoms, essential knowledge and methods for treating common illnesses; serious injuries and life-threatening conditions; epidemics) ▪ Impact of environmental factors and lifestyle on human health
	Geology and Earth science	▪ Earth (origin and structure) ▪ Minerals and rocks (formation, properties, qualitative classification, practical importance, uses, and principles of crystallography) ▪ Endogenic and exogenic geological processes (causes and consequences) ▪ Soils (composition, properties, and importance of soil for plant nutrition, economic importance, dangers and examples of soil degradation, and options for and examples of recultivation) ▪ Evolution of Earth's crust and development of life on Earth (geological changes, emergence of life, occurrence of typical organisms and their adaptation to the environment) ▪ Geological development and structure of the territory of the Czech Republic (the Bohemian Massif and the Carpathian Mountains) ▪ Climate and weather in relation to life (importance of water and clean air for life, use and protection of natural resources, impact of anthropogenic air pollution and climate change on ecosystems and humans life) ▪ Extreme events (causes, important types of global extreme events, types of extreme events in the Czech Republic—e.g., floods, hurricanes, blizzards, avalanches, rimes, and handling extreme events)
	Ecology	▪ Organisms and their environment (relationships among and between organisms and their environment; populations, communities, and natural and artificial ecosystems; food chains; balance within an ecosystem) ▪ Environmental protection (global environmental problems and protected natural areas)
	Empirical exploration of nature	▪ Empirical methods of exploring nature (observation with a magnifying glass, microscope, or telescope, simplified identification keys, atlases) ▪ Important biologists and their discoveries
Geography	Geographic information, data sources, cartography, and topography	▪ Geographic and cartographic terminology (basic topographical formations, plans, maps, map terminology, statistical data, tables, and graphs) ▪ Geographic data sources and geographic cartography and topography (globes, globe scales, geographic grids, meridians and parallels, geographic coordinates, determining geographic position) ▪ Scale and content of plans and maps ▪ Orienting plans and maps with respect to the cardinal points

Subject Area	Main Topics	Subtopics
		▪ Practical exercises and applications using cartographic products in printed and electronic form
	A natural image of the Earth	▪ Earth as a celestial body (the shape, size, and motion of Earth, day and night, change of seasons, Universal Time, time zones, local time, the International Date Line, and conventional time) ▪ Landscape area (the natural sphere, social and economic spheres, and components and elements of the natural sphere) ▪ The natural sphere on the planetary level (geographical belts, latitudinal zones, and altitudinal zones) ▪ The system of the natural sphere at the regional level (natural regions)
	Regions of the world	▪ Continents, oceans, and world macro-regions (criteria defining regions; natural and socioeconomic conditions, with an emphasis on their links and connections: natural zones, climate zones, settlement areas, language areas, religious areas, and cultural zones) ▪ Regions of the world: natural, social, political, industrial, and environmental problems
	The social and economic environment	▪ World population ▪ Globalization of social, political, and economic process ▪ The global economy: economic structure (sectors, industries), territorial division of labor, indicators of economic development, and standard of living ▪ Regional social, political, and economic units
	The environment	▪ Landscape (natural and social environments, and types of landscape) ▪ The relationship between nature and society (sustainable development, principles and fundamentals of environmental protection, protected natural areas, and global ecological and environmental problems)
	The Czech Republic	▪ Regions of the Czech Republic
	Field work	▪ Field exercises in and observations of the local landscape, geographical excursions. ▪ Personal safety in case of threats to life and health ▪ Natural disasters ▪ Disaster preparedness and measures

Professional Development Requirements and Programs[8]

Qualification and continuing education of teachers of all educational levels (apart from higher education) follow the Act on Education Staff. Teachers at the primary level (the first stage of basic schools, *základní školy*) and teachers of general and theoretical technical subjects at upper levels are required to have a master's degree (ISCED 746 or 747). Teachers obtain a university diploma, a diploma supplement, and the academic degree of *Magistr* (master).

The Act on Education Staff requires teaching staff in public schools and schools established by the Ministry of Education, Youth, and Sports to participate in in-service education for renewing, strengthening, and supplementing their qualifications. Teacher preparation includes an education

program (including in-school placement) that usually lasts 6 to 12 weeks, depending on the university. The Czech School Inspectorate has reported that 93.2 percent of teachers at basic schools are fully qualified.[9]

The Ministry of Education determines in a decree the types and conditions of in-service education for teaching staff and how it may be completed. (The Ministry of Interior and the Ministry of Defence determine the types and conditions for the in-service education of teaching staff in the schools under their responsibilities.)

In-service training of education staff can take place:

- At higher education institutions (*vysoké školy*)
- At institutions for in-service training of education staff and at other facilities on the basis of accreditation granted by the Ministry of Education
- Through self-study (teaching staff can be granted 12 free paid days in a school year)[10]

In-service training of education staff is also provided by school facilities for further education of education staff (*zařízení pro další vzdělávání pedagogických pracovníků*) registered in the School Register (*školský rejstřík*). They are established mainly by regions, but also by municipalities, ministries, and private and religious subjects. In 2019, 56 facilities were registered.

Most in-service training courses are offered by the National Institute for Further Education (*Národní institut pro další vzdělávání),* which was established during the restructuring of several education centers in 2004. The institute functions under the Ministry of Education, Youth, and Sports and receives funding from the state budget.

Monitoring Student Progress in Mathematics and Science

Students are assessed continuously in individual subjects and at the end of every term and receive a school report. School reports include an assessment of students' learning in every course, their behavior, and their overall outcomes. This school report is issued at the end of every term, although for the first term, students may receive an extract from the school report instead of the full report. Teachers include continuous assessment and end-of-term results in the school report. They assess students based on oral and written work, as well as homework. The reports also categorize outcomes according to the European Qualification Framework. The guidelines for assessment are established by individual schools in school code. Student assessment results are reported by written marks, verbally, or by a combination of both.[11]

The school head decides on the form of evaluation with the consent of the School Council. The school can convert a verbal assessment into a numerical mark or vice versa if the student is transferring to a school that uses a different type of assessment. A school head may agree to a verbal assessment for a student with a specific learning disability at the request of the student's legal guardian. Students with special education needs attending the special basic school (*základní škola speciální*) must receive a verbal assessment.

Students' conduct is assessed according to the following grading scale, where marks are used (usually numerical at the first stage of education and verbal at the second stage of education):1—Excellent; 2—Very good; 3—Good; 4—Satisfactory; and 5—Unsatisfactory.

At the end of the first term, an overall assessment of the students´ educational outcomes may be reported. The assessment is expressed in the school report as follows:

- **Passed with honors**: No mark for any compulsory subject specified in the school educational program is higher than 2, the average is not higher than 1.5, and student behavior is assessed as very good. For verbal or combination assessments, the school conforms to principles of assessment included in the school code.
- **Pass**: No mark for a compulsory subject or the corresponding verbal assessment is a 5.
- **Failed:** Student receives a 5 in any compulsory subject or the corresponding verbal assessment, or student is not assessed at the end of the second term.
- **Not assessed**: It is not possible to assess student in one of the compulsory subjects of the school educational program at the end of the first term.

Noncompulsory subjects are assessed in the same manner as compulsory subjects but are not included in the overall evaluation. Students who pass all compulsory subjects are promoted to the next grade, while students who do not pass all compulsory subjects repeat the grade. Students may repeat only one grade at the primary level and one at the lower secondary level.

It is not compulsory for schools to administer standardized tests; however, most schools administer some type of commercial test. Students at the primary and lower secondary levels do not take any regular national or regional examinations. Since the 2011–2012 school year, the Czech School Inspectorate, an agency for the independent evaluation of schools (in accordance with ISCED 5B), has been using a computer-based student assessment system for its own purposes. The system enables sample and national testing across subjects and grades. The Czech School Inspectorate conducts the testing every year. The most recent testing in 2019 (a sample survey) focused on the performance of Grade 8 students in scientific literacy and Grade 4 students in a second language.

Special Initiatives in Mathematics and Science Education

The long-term initiatives in mathematics and science education can be in general divided into two broad categories:

- State-managed initiatives—Covering allowance organizations of the Ministry of Education, Youth, and Sports (i.e., the National Institute for Further Education, the National Institute for Education, the Education Counseling Centre, and the Centre for the Continuing Education of Teachers)
- Expert-managed voluntary initiatives—Covering concerned associations that unite experts (i.e., researchers, scholars, and teachers) in their respective fields of research (e.g., the Union of Czech Mathematicians and Physicists, the Czech Chemical Society, and the Czech Geographical Society)

State-managed organizations focus on preparing and implementing educational programs for pedagogical staff in all regions of the Czech Republic, developing didactic materials for use in schools, and analyzing future needs in education (including mathematics and science education). Expert-managed voluntary initiatives aim to support and facilitate mathematical, biological, chemical, and geographical research, improve mathematics and science education, disseminate new knowledge from theory into practice, and popularize the various branches of mathematics and science. The expert-managed initiatives comprise conferences, professional development programs for teachers from every type of school, activities to enhance student interest in mathematics and science, mathematics and science competitions for students, and didactic materials for every type of school.

Various nongovernmental or private organizations funded by the European Social Fund or the Regional Funds offer further support to schools, in the form of didactic materials and educational programs. Initiatives led by nongovernmental organizations and civic associations focusing on environmental and sustainable development education have made a long-term positive impact on the development of students' values and attitudes toward science education. The most well-known examples of nongovernmental initiatives are The *Heuréka* Project and the *Hejny* method.

The *Heuréka* Project aims to improve physics education, to obtain new ideas and further inspiration.[12] Since 2009, seminars have been held under the auspices of Charles University. The *Heuréka* Project puts together enthusiastic teachers from different types of schools, future teachers, representatives from universities, and other parties interested in physics education to improve physics education at all levels.

The *Hejny* method[13] is a new and developing, nontraditional method of teaching mathematics (at all levels of primary school and, since 2018, lower secondary schools). It is a scheme-oriented education approach that uses its own textbooks and teachers' books. The method promotes enabling children to discover mathematics on their own and develop an enjoyment of mathematics and has been adopted by more than 750 of the 4,100 Czech schools operating at the primary and lower secondary levels.

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