Uzbekistan

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Introduction

Overview of Education System

The education system of the Republic of Uzbekistan includes (1) national education standards and national education requirements, curricula, and study programs; (2) educational institutions implementing national education standards, national education requirements, and curricula; (3) organizations that assess the quality of education; (4) scientific and pedagogical institutions that carry out studies necessary for ensuring the functioning and development of the education system; and (5) public administration bodies in the field of education, as well as organizations under their jurisdiction.[1] The education system of the Republic of Uzbekistan is unique and continuous.

The responsibilities of the Cabinet of Ministers of the Republic of Uzbekistan in the field of education include the following:

- implement a unified national policy in the field of education
- provide leadership of state management bodies in the field of education
- approve and ensure the implementation of national programs in the field of education
- establish the procedures for the creation, reorganization, and closure of educational institutions
- determine the procedures for employing teaching staff in educational organizations and assessing their activities
- issue permits to educational institutions from other countries to conduct education activities within the territory of the Republic of Uzbekistan
- establish the procedure for recognizing education documents from foreign countries and certifying their equivalence in accordance with legal regulations
- approve state education standards

- approve documents on education in the state-approved format and establish the procedures for their issuance
- determine the amount of state grants and the procedures for admission to educational institutions
- appoint rectors for state higher education institutions
- establish procedures for transferring students from one accredited educational institution to another

The Cabinet of Ministers of the Republic of Uzbekistan may exercise other powers in accordance with legislation.[2]

Education in the Republic of Uzbekistan comprises the following types:[3]

- preschool education and upbringing
- general secondary and specialized secondary education
- professional education
- vocational education
- postgraduate education
- retraining and advanced training of specialists
- extracurricular education

General secondary education (Grades 1 to 11) consists of the following stages:[4]

- primary education (Grades 1 to 4)
- basic secondary education (Grades 5 to 9)
- secondary education (Grades 10 and 11)

Children are admitted to the first grade of general secondary education in the year they turn 7.

In accordance with Decree of the President of the Republic of Uzbekistan No. PD-269, "On Measures to Implement Administrative Reforms in New Uzbekistan,"[5] and Decree of the President No. PD-14, "On Priority Organizational Measures to Effectively Establish the Activities of the Executive Authorities of the Republic,"[6] the Ministry of Preschool and School Education was established. The following are considered priority areas of activity for the Ministry of Preschool and School Education:[7]

- developing and implementing a unified state policy in the fields of preschool, general secondary, and extracurricular education, ensuring the strong interconnection and continuity of education and upbringing processes
- introducing curricula, programs, educational-methodical complexes, and modern pedagogical technologies that are developed based on international standards into the education and upbringing process
- identifying, selecting, and creating necessary conditions for the comprehensive development of talented youth, ensuring their worthy participation in international Olympiads, competitions, and contests in general education subjects

- enhancing and assessing the professional knowledge and skills of pedagogical staff, strengthening their status and reputation, and providing material and moral incentives, as well as ensuring their social protection
- digitizing the processes of preschool, general secondary, and extracurricular education and expanding state services in these areas

Use and Impact of TIMSS

In accordance with Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 997[8] and the agreement signed on June 25, 2021, between the State Inspectorate for Quality Control in Education and the International Association for the Evaluation of Educational Achievement (IEA), the field test and main testing stages of the TIMSS program were conducted within designated time frames.

In accordance with Clause 175 of the state program Implementation of the Development Strategy of New Uzbekistan for 2022–2026 in the Year of Attention to People and Quality Education, approved by Decree of the President of the Republic of Uzbekistan No. PD-27[9] and Order of the Ministry of Preschool and School Education No. 43, Uzbekistan's participation in the main testing stage of the TIMSS 2023 international assessment program was ensured.

The Mathematics Curriculum in Primary and Lower Secondary Grades

According to Order No. 125 of the Ministry of Preschool and School Education of the Republic of Uzbekistan, the hours allocated to the mathematics subject are distributed as follows:[10]

- in Grades 1 to 6, 5 hours per week
- in Grades 7 to 11, 3 hours per week for algebra and 2 hours per week for geometry

The purposes of the mathematics curriculum are to form the mathematical literacy of students; form basic and general competencies of the subject in students; prepare students for life, including the formation of logical thinking; help students develop their intellect to find optimal ways of solving problems in nature and society; help students acquire, form, and develop necessary knowledge; and teach students to use that knowledge in their daily lives.

The tasks of the mathematics curriculum are as follows:

- form and develop mathematical knowledge, skills, and competencies in the following content domains, among others: Numbers and Operations, Geometry and Measurements, Algebra and Functions, Statistics and Probability, and Mathematical Analysis
- apply mathematical language and basic mathematical laws to solve real-world and practical problems, studying quantitative relationships and spatial forms
- create mathematical models for interpreting and solving problems and for describing real processes

- form basic skills in the use of mathematical methods in the study and solution of problems of physics, chemistry, biology, and other theoretical fields and practical activities
- develop independent learning, creativity, critical thinking and logical analysis, curiosity, and problem-solving decision-making as individual characteristics
- develop educational and research skills through achievements in science and their application in practice
- develop logic, critical thinking, and creative abilities to select appropriate mathematical methods for solving practical problems; evaluate obtained results and determine their reliability
- develop communication skills, including the ability to convey information accurately and effectively, and use information from various sources, publications, and electronic media
- develop personal qualities such as independence, responsibility, initiative, determination, patience, and tolerance, which are also necessary for teamwork
- introduce mathematical concepts, the history of the development of mathematics, and its emergence

Exhibits 1 and 2 present the mathematics learning outcomes for each content domain in Grade 4 and Grade 8, respectively.

Exhibit 1: Learning Outcomes for Grade 4 Students in Mathematics

Content Domain	Description
Numbers and Operations	• know numbers and place values up to 1,000,000; read and write them • show and arrange rounding, calculations • know divisors and rational numbers • divide a number up to six digits by a single-digit number • solve life problems related to natural numbers
Fractional Numbers	• express in fractions and determine relative magnitude • know the concept of simple fractions • understand the comparison and ordering of fractions with the same denominator • distinguish equal fractions • know how to compare and sort fractions that do not have the same denominator • add and subtract fractions with the same denominator or when one of the denominators is a multiple of the other • know equal parts of a whole • have an idea about simple fractions

Exhibit 1: Learning Outcomes for Grade 4 Students in Mathematics (Continued)

Content Domain	Description
Geometry	• recognize and differentiate between geometric shapes: rectangle, square, parallelogram, rhombus, trapezoid, triangle • distinguish between the properties of rectangles: square
Measurement	• know multiplication and division operations related to length, mass, and volume • understand addition and subtraction of money (in complex units using the decimal system) • know how to solve problems related to volume units: cube, centimeter, cubic meter • know how to solve problems related to volume: cube and cuboid, liquid

Exhibit 2: Learning Outcomes for Grade 8 Students in Mathematics

Content Domain	Description
Algebra and Functions	• reduce algebraic fractions, convert them to common denominators, and perform operations on them; replace fractional-rational expressions with even numbers • calculate the arithmetic square root • understand irrational numbers and solve examples involving them • know what real numbers are; divide numbers into subsets • insert the numerator inside the square root sign, rewrite or simplify expressions that contain the square root • calculate the square root of a fraction using properties: eliminate irrational numbers from the denominator, rewrite expressions involving a square root • solve modular simple equations and inequalities • find approximate values of quantities and approximation errors • round numbers, find the absolute and relative error • approximate the values of the square root and solve simple quadratic equations • solve equations that are squared equations
Statistics and Probability	• know the rules of addition and multiplication of combinatorics • solve problems of repetitive combinatorics using the rules of substitution, positioning, and grouping • use combinatorial problem-solving methods: solve problems using sorting, table, and possibility tree methods • understand combinations (repeated arrangements), permuations (arrangements), and combinatorics; distinguish between repeated and nonrepeated arrangements

Exhibit 2: Learning Outcomes for Grade 8 Students in Mathematics (Continued)

Content Domain	Description
Geometry and Measurements	• know the properties of inner and outer corners of a polygon • differentiate and describe parallelograms, rectangles, squares, rhombuses, and trapezoids according to their properties; find their area • solve problems by applying the theorem of phases • know the property of the trapezoidal center line • describe the sine, cosine, tangent, and cotangent of an acute angle • find the value of the sine, cosine, tangent, and cotangent of angles 30°, 45°, and 60° • use the Pythagorean theorem and apply the following: o solve right triangles by applying the Pythagorean theorem • use the coordinate method of solving geometric problems • calculate the area of a rectangle, parallelogram, triangle, rhombus, and trapezoid; calculate the area of polygons
Geometry and Measurements	• draw the equation of a straight line and a circle • understand vectors and perform actions on them • distinguish angles in a circle (central angle, angles formed by chords and secants), determine the measure of the degree • determine the intersection of a straight line and a circle • find the intersection of two circles • know the characteristics of the circumference and diameter of a circle

The Science Curriculum in Primary and Lower Secondary Grades

The subject science is taught for 1 hour per week in Grade 1, 2 hours per week in Grades 2 to 4, and 3 hours per week in Grade 6. In accordance with Order of the Ministry of Preschool and School Education of the Republic of Uzbekistan No. 125, physics is taught 2 hours per week in Grades 7 to 11, and astronomy is taught 1 hour per week in Grade 11.[11]

Geography and economics are taught as follows: In Grades 7 to 10, the subject Basics of Economic Knowledge is taught 2 hours per week. Students in Grades 8 and 9 get an additional 0.5 hour per week for the subject Basics of Economic Knowledge, with topics specified (added) by the subject teacher and which are indicated in the class journal. Geography is taught 2 hours per week in Grades 6 to 10 and 1 hour per week in Grade 11.

In Grade 8, chemistry and biology are taught for 2 hours per week.

The science block module encompasses biology, geography, physics, and chemistry, ensuring their interconnectedness. The subjects included in the block module are crucial for developing students' natural-scientific, technical, ecological, and economic literacy, as well as fostering critical and creative thinking.

The main purposes of the science block module are to form a system of theoretical and practical knowledge about the nature, causes, and interrelations of phenomena and processes occurring in living and nonliving things; the stages of development in nature, including the evolution of living organisms; the natural and scientific foundations of modern technology and technology; the interconnection and influence of nature and society; scientific foundations of the economical use of natural resources; and the essence and importance of a healthy lifestyle.

The integration of the sciences allows students to understand nature as a whole, creating a unified natural-scientific view of the universe. At the same time, interdisciplinary integration is aimed at forming in students the opportunities and challenges of modern scientific and technical progress, the essence of environmental problems, ways of rational use of nature, principles of a healthy lifestyle, and skills to use in everyday life.

Exhibits 3 to 7 present the science learning outcomes for each content domain in Grade 4 and Grade 8.

Exhibit 3: Learning Outcomes for Grade 4 Students in Science

Content Domain	Description
Nature	• know the characteristics of a living organism • compare the growth and development of plants and animals • learn about the digestive system of living organisms • compare growth and reproduction processes in plants and animals
The Structure of Organisms	• learn that the cell is the smallest unit • know that the human body has a system of organs, circulation, respiration, movement, and control
Our Planet	• have a general knowledge of major landforms: mountains, plains and their types, undersea terrain, deserts, rivers, mountains, grasslands
Natural Resources	• learn about sedimentary and igneous rocks, their formation, erosion of rocks under the influence of water, and wind and living organisms • get information about soil formation and its protection, distinguish types of rocks • learn about the classification of minerals into groups and the major mineral deposits in the country
Weather and Water	• predict the weather based on the positions of the Sun and the Moon, the appearance of clouds, the movements of birds, and the direction of smoke coming out of the sky • know about the circulation of water, its impact, and its importance on Earth
A Journey Through Our Homeland	• know about maps and map elements • determine the location of regions on the map of Uzbekistan • know about the nature of Tashkent city, Tashkent region, Namangan, Andijan, Fergana, Samarkand, Jizzakh, Syrdarya, Bukhara Navoi, Kashkadarya, Surkhandarya, Khorezm region, and the Republic of Karakalpakstan

Exhibit 3: Learning Outcomes for Grade 4 Students in Science (Continued)

Content Domain	Description
Solar System and Earth	• know the movement of the Moon around Earth and the Sun, and the movements of Earth • learn about craters, asteroids, comets, meteorites, changes in the appearance of the Moon, and terrestrial and giant planets; divide the planets into terrestrial (Mercury, Venus, Earth, Mars) and giant planets (Jupiter, Saturn, Uranus, Neptune) • learn about the planets' locations and orbits in the solar system
Action	• learn about the relationship between velocity, time, and distance of objects and their units of measurement • distinguish between acceleration, deceleration, stopping, directional change, and types of oscillatory motion • explain the solution of movement issues through examples in life processes • explain the types of motion (straight line, rotation, vibration) with examples
Electrical Events	• learn about the causes of the occurrence of electrocution of objects and their interaction • study and give examples of the importance of electricity in daily life • explain with examples how electrical energy can be converted to other forms of energy

Exhibit 4: Learning Outcomes for Grade 8 Students in Chemistry

Content Domain	Description
Competence of Scientific Literacy	• know and interpret chemical substances, their properties, and aggregate state • know about the atom and its structure, as well as its composition • describe a chemical element's symbol, name, atomic mass, and chemical formula • explain chemical reactions and phenomena • describe acids and their chemical properties • get information on the date of creation of the periodic table of chemical elements • have an understanding of the chemical elements in the human body and their role • know about useful geologic chemical compounds

Exhibit 4: Learning Outcomes for Grade 8 Students in Chemistry (Continued)

Content Domain	Description
Practical Competence	• know and follow the rules of use of chemical equipment and substances • separate a pure substance from a composition of mixtures • formulate and name a formula on the basis of valency • explain the change of the aggregate state of substances, observe the chemical processes that occur in everyday life • perform simple experiments based on chemical reactions and draw conclusions • prepare presentation materials on water protection, chemical elements in the human body • solve simple (logical) problems of interdisciplinary relevance, which are oriented to practice (competence) in the subject area

Exhibit 5: Learning Outcomes for Grade 8 Students in Physics

Content Domain	Description
Competence of Scientific Literacy	• explain the essence of mechanical, electrical, and magnetic processes • know the basic quantities related to mechanics, electricity, and magnetism and explain their units • differentiate between mechanical and electrodynamic forces in nature and know their formulas • distinguish the similarities and differences between gravitational, electrical, and magnetic fields • explain processes in mechanical motion based on the laws of mechanics
Practical Competence	• observe processes related to mechanics, electricity, and magnetism • apply the principles of mechanics, electricity, and magnetism in practice • solve problems related to the formulas of mechanics, electricity, and magnetism • measure quantities related to mechanics, electricity, and magnetism using instruments • conduct experiments related to mechanics, electricity, and magnetism and draw conclusions

Exhibit 6: Learning Outcomes for Grade 8 Students in Biology

Content Domain	Description
General Domain	• understand and explain human anatomy, physiology, and hygiene • know the structure and function of the human body; the shape, structure, and reproduction of cells; and the structure and location of tissues • understand the structure of the cell and the main processes of its life activity; know the characteristics related to human labor activity, upright walking, and social living; explain the development of the human body • understand that blood is a component of the body's internal environment and know blood groups and their properties • know and explain the circulatory system and its main functions • know how to evaluate the impact of physical exercise on the cardiovascular system; study and observe it in laboratory practice; view it with multimedia; conduct experiments with a stopwatch, stethoscope, and tonometer; and prepare conclusions • know how to determine the necessary amount of protein, carbohydrates, fat, and calories in a daily diet using a table; study it in laboratory practice; conduct experiments; observe; and prepare conclusions
General Domain	• know and explain the basic information about the structure and function of sensory organs • generally explain the mechanisms of physiological and biochemical processes occurring in the human body • develop the skill to create and discuss problematic (puzzle) situations related to topics with other students and the teacher and solve them • know how to use acquired knowledge in new situations and create problematic situations

Exhibit 7: Learning Outcomes for Grade 8 Students in Geography

Content Domain	Description
Competence of Scientific Literacy	• understand the relief forms of Central Asia and Uzbekistan and their development patterns • know the geological history of Central Asia and Uzbekistan • know the major mineral deposits in Uzbekistan and neighboring countries • describe the characteristics of the feeding and water patterns of the rivers in Central Asia and Uzbekistan and know the geographical location, important natural features, and economic significance of major rivers and lakes • understand the necessity of building reservoirs in the region and rules for their use

Exhibit 7: Learning Outcomes for Grade 8 Students in Geography (Continued)

Content Domain	Description
Competence of Scientific Literacy	• know the main air masses affecting the climate of Central Asia and Uzbekistan, their directions and periods of entry, and the weather processes they cause • understand the law of natural changes from plains to mountains in Uzbekistan and its significance • know the population size of Central Asia, its uneven distribution, and the geographic factors influencing it • know the past and present state of the political map of Central Asia • understand the particular urgency of the environmental problems of the Aral Sea and the Aral Sea region
Practical Competence	• identify the highest mountains and the deepest depressions and basins using elevation and depth scales on a physical map • mark the most important mountains, plateaus, basins, plains, deserts, and major mineral deposits in Central Asia on an unlabeled map • solve problems related to timekeeping and time zones • correctly apply the names of geographical objects, major relief forms, and water bodies in Central Asia and Uzbekistan • analyze the ecological-geographical processes occurring in Central Asia and Uzbekistan and their impact on the population and economy • express views on environmental protection issues in Central Asia and Uzbekistan

Teacher Professional Development Requirements and Programs

The professional development process is carried out through the organization of a system of continuous professional development of managers, teachers, and specialists in the public education system (hereinafter, public education staff/employees).[12]

The following forms of education are used in continuous professional development:

- education that is separate from production[a]
- education that is inseparable from production[b]
- distance learning
- dual education
- independent learning
- alternative forms of professional development

a This refers to an employee studying at a specialized educational institution that is completely separate from the employee's workplace and regular work schedule.

b This refers to an employee receiving education at a specialized educational institution during the employee's free time (e.g., when students are on vacation, during teachers' methodical days) or directly at their workplace.

Professional development of staff is carried out by the territorial administration of public education or specialized education organizations directly on the orders of the Ministry.

It is mandatory for employees to master professional development programs for a certain period of time each year and collect a certain amount of credits. The total annual duration of staff training is set at a minimum of 30 hours for managers and specialists of the secondary education system and at least 36 hours for teaching staff.

Students who have fully mastered the program of the refresher course are issued a document (certificate) issued by the educational institution that organized the course, which is electronically generated as a state standard certificate and certified by electronic signature or its alternative (e.g., QR code, barcode).

In addition, an electronic platform can be used to ensure continuous professional development. The trainee reads and masters each training module included in the curriculum and programs of continuous professional development, carries out control work on the training module, and is evaluated by the electronic platform (credit scores are given).[13]

Monitoring Student Progress in Mathematics and Science

In order to ensure the quality of student education and manage learning outcomes in accordance with state education standards for general secondary education, the following types of control are carried out in general education institutions:[14]

- Current control is carried out in the form of surveys or tests to regularly monitor the knowledge, skills, and abilities of students.
- Midterm control is carried out at the end of the quarter after part of the curriculum is taught to assess the knowledge, skills, and abilities of students. It takes the form of written control work or tests.
- Staged control is carried out at the end of the academic year in the form of oral or written exams and tests, on the basis of which the final grade of the student is determined and a decision is made whether to transfer the student to the next grade.
- Final control is carried out in the form of a final state certification after the completion of basic secondary education and secondary education.

The Ministry of Preschool and School Education establishes the procedure for conducting staged control examinations and final certifications of students of general education institutions. In addition, educational institutions are accredited.[15]

Certification is the main form of state control in the evaluation of activities by educational institutions. It determines the content, level, and quality of training in educational institutions in accordance with state education standards and state education requirements and curricula. Certification is carried out in two stages: internal and external evaluation of the activities of educational institutions.

Internal evaluation consists of self-evaluation by educational organizations.

In general secondary and specialized secondary education institutions, students' proficiency levels are assessed for compliance with national education standards and curricula.

The process of monitoring in the internal assessment process is carried out according to the following steps:

- For control work on the subjects specified in the internal evaluation process, the texts of the test, written work, dictation, and creative statements are prepared and examined by the district departments of Preschool and School Education in the form of multiple variants.
- Control works that have passed expertise are packed in envelopes, sealed, and delivered to the chairman of the internal evaluation commission. Control work adopted by the commission is subject to internal evaluation.[16]

Special Initiatives in Mathematics and Science Education

"On Measures to Improve the Quality of Continuous Education and Scientific Research and Innovation in the Fields of Chemistry and Biology,"[17] approved by decree PD-4805 of the President of the Republic of Uzbekistan, specifies gradually introducing teaching through experimentation and testing from the 2021–2022 academic year, and replacing separate subjects such as world studies, natural history, geography, biology, and physics with the single subject science from Grades 1 to 6.

The hours for science lessons in primary school are taught by primary school teachers (leaders) and in Grade 6, by teachers of physics, biology, and geography who have successfully completed a training course organized by the National Institute of Pedagogical Skills Named After A. Avloni. According to the resolution of the Ministry of Preschool and School Education, the Ministry of Finance, and the Ministry of Health of the Republic of Uzbekistan, Nos. 8-mh, 28-, and 124/1, respectively, and Regulation on the Procedure for Completing Classes and Forming Tariff Lists in General Education Institutions (registered by the Ministry of Justice of the Republic of Uzbekistan on June 30, 2020, registration number 3271), the allocation is based on the priority sequence specified in clause 15 of the regulation. In accordance with this resolution, the science subject is being introduced gradually.

In accordance with Decree PD-4708 of the President of the Republic of Uzbekistan, "On Measures to Improve the Quality of Education and Develop Scientific Research in the Field of Mathematics,"[18] mathematics was designated as one of the priority areas for the development of science in 2020. During the intervening period, a number of systematic efforts have been undertaken to elevate the education of science and mathematics to a new level of quality, including the following:

- Conditions have been created for the invitation of compatriot mathematicians working in leading scientific centers and for conducting international research.
- A system of incentives for the work of youth winners of international science Olympiads and their coaches has been introduced.

- In order to ensure the integration of higher education and scientific research, a new and modern building for the V. I. Romanovskiy Institute of Mathematics of the Academy of Sciences has been constructed in Tashkent. The funding for fundamental research in the field of mathematics has been increased by 1.5, and supercomputers, modern equipment, and instruments have been purchased using budgetary funds.
- The institute of trainee researchers has been introduced as the initial stage in the training of personnel with scientific degrees.
- In order to swiftly address priority issues in the field of science and to enhance the integration of science, education, and production at the government level, the Republican Council on Science and Technology has been established under the chairmanship of the Prime Minister of the Republic of Uzbekistan.

Suggested Reading

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[11] Order No. 125 of the Ministry of Preschool and School Education of the Republic of Uzbekistan. (2023, May 15). *On approval of the basic curriculum for secondary schools for the 2023–2024 academic year*.

[12] Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 25. (2022, January 17). *On approval of the regulation on the procedure for organizing the system of continuous professional development of public education*. Retrieved from www.lex.uz

[13] Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 25. (2022, January 17). *On approval of the regulation on the procedure for organizing the system of continuous professional development of public education*. Retrieved from www.lex.uz

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