

# Azerbaijan

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## Introduction

### *Overview of Education System*

The education system in the Republic of Azerbaijan operates in accordance with numerous laws and legislative acts, including the Constitution of the Republic of Azerbaijan; the 2009 Law on Education of the Republic of Azerbaijan; education decrees, orders, and decisions; regulations of the Ministry of Education; other normative legal acts relating to education; and international agreements.<sup>1</sup> The Constitution guarantees every citizen the right to education, and the government guarantees free compulsory primary and secondary education. As education in Azerbaijan is regarded as the basis for the development of society and the state, it has a strategic significance and priority. Azerbaijan's education system is built on democratic and secular national and international values.

The Ministry of Education of the Republic of Azerbaijan is the central executive body that implements and regulates the government's education policy and manages the education processes. The Ministry cooperates with central and local executive bodies, local authorities, international and nongovernmental organizations, other individuals, and legal entities. The Ministry is responsible for:

- Implementing a single education policy throughout the country
- Developing the education system in predetermined directions
- Providing state control over the quality of education, regardless of legal status and property type
- Organizing mental health services and social or pedagogical care
- Studying and disseminating advanced pedagogical practice and achievements in pedagogical and psychological sciences
- Identifying and training talented students
- Promoting innovative teaching methods and efficient management tools for school principals and education staff
- Strengthening education materials, facilities, and services

All citizens are entitled to nine years of compulsory general secondary education. Exhibit 1 presents the stages and levels of education stated in the Law on Education.

Azerbaijan organizes schools into two types, based on their ownership: public schools belong to the state and do not directly seek outside funding; private schools require direct funding in the form of education fees.

### Exhibit 1: Levels of Education in Azerbaijani Schools<sup>2</sup>

| Level of Education   |                 | Description  |
|----------------------|-----------------|--|
| Preprimary           |                 | Encompasses children from birth to age 6 and is not compulsory. It is provided in nurseries (children under age 3), kindergartens (children ages 3 to 5 or 6), and schools (children ages 5 to 6).   |
| Primary              |                 | Compulsory level of education that begins at age 6 and covers the first four years (Grades 1 to 4).  |
| General Secondary    | Lower Secondary | Also compulsory and covers groups of students at the ages of 10 to 15 (Grades 5 to 9). At the end of Grade 9, students take final assessments to receive a document that is considered as a basis for continuing to the next level of education. After completing this level, students may choose to continue with vocational education.   |
|                      | Upper Secondary | Includes students up to age 17 (Grades 10 and 11) and is not compulsory. After completing this stage, students must pass the final state attestation and receive a Certificate of General Secondary Education.   |
| Primary Vocational   |                 | Students who have completed lower secondary education can enroll in a six-month, one-year, or two-year primary vocational education program leading to a certificate. The duration of the program is two years for Grade 11 graduates and three years for Grade 9 graduates.   |
| Secondary Vocational |                 | Admission to this level requires passing an examination administered by the State Examination Center. Students who are admitted to secondary vocational education institutions from the base of general secondary education (Grade 9) also get full secondary education. A document on secondary vocational education gives the right of admission to institutions of higher education and is treated as a sub-bachelor's diploma. |
| Higher Education     | Baccalaureate   | Graduates at the baccalaureate level who have completed higher education receive a bachelor's degree. The duration of the programs leading to the bachelor's degree is normally four years.  |
|                      | Magistrate      | The duration of a full-time master's degree program is two years.  |
|                      | Doctorate       | The duration of the programs leading to the degree of doctor of philosophy or doctor of science (introduced by the 2009 Law on Education) is three to four years.  |

### Use and Impact of TIMSS

When Azerbaijan participated in TIMSS 2011, its results were lower than expected, as the national education reform program that began in 2008 had not yet been implemented in fourth grade. Azerbaijan skipped the TIMSS 2015 cycle but did participate in the 2016 Progress in International Reading Literacy Study (PIRLS) to gather additional data to inform planned changes to the teaching and learning process. The Ministry of Education of the Republic of Azerbaijan also initiated a state program to enhance mathematics achievement in primary schools, beginning with Grade 1 students in 2016. More than 100,000 students benefitted from this program before it was implemented in 2019 in Grade 4 with the cohort of students that participated in TIMSS 2019.

TIMSS findings were expected to serve as an external measure of the success of the first phase of the reform program, which focused on mathematics. (The next phase of the program will address languages and science and will be assessed in PIRLS 2021 and TIMSS 2023.) Targeting the reform in this way enabled officials to direct resources to a single goal: raising outcomes in mathematics by improving teaching and learning materials, teacher training, and other resources. For example, the initiative organized a number of capacity-building measures for primary school teachers, and primary school students received additional teaching and learning materials. In total, the Ministry of Education has spent more than \$1 million per year on the program. This targeted approach, perhaps not surprisingly, appears to have produced imbalanced results for Azerbaijani students in TIMSS 2019, with mathematics outcomes looking significantly different from science outcomes. The Minister of Education will be analyzing TIMSS 2019 data in depth to both evaluate the impact of the current program and to plan for the next phase of national education reform.

## The Mathematics Curriculum in Primary and Lower Secondary Grades

The mathematics curriculum sets out the main objectives of math teaching in general education schools and defines all activities to achieve overall learning outcomes. It also focuses on the opportunities and needs of each student. The document is intended for teachers, school directors, textbook authors, parents, and the general public. The mathematics curriculum is the basis of the guidelines for preparing manuals and teaching aids, planning teaching material, identifying training methods, and preparing teacher training. This education program with results-based content standards includes regular assessment of student achievement to ensure that the standards are adopted. Although its main goal is to advance student achievement, it emphasizes the need to empower students to acquire the necessary skills in daily life.

The process of identifying content standards keeps in focus the balance of key learning outcomes for the subject (computational procedural skills, cognitive comprehension, and problem solving). The current education program provides basic learning outcomes through interaction between content and activities to determine what the students need to know and do.

At the end of fourth grade, a student should:<sup>3</sup>

- Demonstrate an understanding of the structure of numbers, as well as the interactions between numbers, and recognize simple fractions and gives explanations
- Demonstrate and use understanding of the meaning, properties, and interactions of arithmetic operations
- Demonstrate estimation skills when performing arithmetic operations on numbers and problems
- Use mathematical expressions and give explanations
- Compare numerical expressions and solve simple equations
- Express simple functional dependencies and provide comments

- Solve simple problems related to direction and distance concepts and provide schematic interpretations
- Know some of the properties of simple geometric figures and use them to solve problems
- Compare the same quantities and interpret the result of the comparison
- Measure quantities using measurement units and tools, and evaluate the results
- Select and apply the appropriate method for data analysis
- Make predictions based on collected information; understand and implement a simple assumption concept

The following standards and substandards are organized by content areas:

### 1. Numbers and Operations

- 1.1. Demonstrate an understanding of numbers, their structure, and the relationships between them, and recognize simple fractions
  - 1.1.1. Read and write numbers in the millions
  - 1.1.2. Determine the value of a digit while writing a number based on the concepts of place and place value
  - 1.1.3. Write the result of compared numbers up to 1 million using  $>$ ,  $<$ ,  $=$
  - 1.1.4. Indicate numbers up to 1 million as the sum of place values
  - 1.1.5. Describe numbers up to 1 million in different equivalent forms
  - 1.1.6. Model simple fractions
  - 1.1.7. Compare fractions with the same denominators
  - 1.1.8. Describe the parts of a quantity using fractions
- 1.2. Demonstrate comprehension of arithmetic properties and the relationship between them
  - 1.2.1. Use arithmetic properties during calculations
  - 1.2.3. Demonstrate knowledge of algorithms used in multiplication and division of one-, two-, and three-digit written numbers
  - 1.2.4. Perform divisions with remainder
- 1.3. Demonstrate estimation skills while performing arithmetic operations
  - 1.3.1. Conduct verbal and written calculations on multidigit numbers
  - 1.3.2. Use interactions between operations to verify the results of the calculations
  - 1.3.3. Find a number according to a fraction and a fraction according to a number
  - 1.3.4. Solve simple and, at most complex, four-dimensional problems
  - 1.3.5. Round numbers up to 1 million
  - 1.3.6. Determine the approximate results of arithmetic operations

## 2. Algebra and Functions

- 2.1. Use mathematical expressions in calculations
  - 2.1.1. Use the sequence of operations in calculating mathematical expressions
  - 2.1.2. Identify symbols that ensure the accuracy of interactions
  - 2.1.3. Use different numbers, variables, and symbols; write various number sentences with the help of arithmetic operations
- 2.2. Compare number sentences and solve simple equations
  - 2.2.1. Write result of compared number sentences using the symbols  $>$ ,  $<$ ,  $=$
  - 2.2.2. Solve simple equations
  - 2.2.3. Use equations in mathematical modeling of a problem
  - 2.2.4. Use inequalities to compare quantities
- 2.3. Express simple functional dependencies mathematically
  - 2.3.1. Explain how one of the dependent variables influences the other
  - 2.3.2. Coordinate simple functional dependencies with real life issues
  - 2.3.3. Explain the functional dependencies between different quantities (price, amount, value, speed, time, distance, labor productivity, duration of work, scope of work)
  - 2.3.4. Express the dependencies between quantities using formulas with letters

## 3. Geometry

- 3.1. Solve simple questions about direction and distance concepts based on drawings
  - 3.1.1. Explain own impressions about the movement of items and figures
  - 3.1.2. Define opening forms of cubes, rectangular prisms, cylinders, spheres, and cones
  - 3.1.3. Describe the appearance of items and figures from different aspects
- 3.2. Demonstrate knowledge of the properties of simple geometric figures
  - 3.2.1. Demonstrate understanding of perimeter and area of a polygon
  - 3.2.2. Classify simple geometric figures
  - 3.2.3. Use geometric shapes to model a solution
  - 3.2.4. Read, write, compare, and list irrational numbers; apply the properties of actions on clusters

At the end of the 8th grade, a student should be able to:

- Read, write, compare, and list irrational numbers; apply the properties of actions on clusters
- Apply the properties of the square root of a real number, which is not negative; simplify the numerical expressions of a square root
- Apply the properties of ratios and proportions, and the formulas of interest, to solve problems

- Estimate numerical expressions in a square root and compare the results with the value obtained by applying computational techniques
- Construct and solve a square equation according to a real life situation, solve simple problems of linear inequality, and solve variations within a module sign and linear inequalities
- Construct the medians of a given triangle; construct a straight perpendicular line to a given straight line; apply the Pythagorean theorem; evaluate the trigonometric functions of some angles; calculate the area of a triangle, parallelogram, rhombus, and trapezoid
- Apply the rotation of figures; construct a figure that is congruent with a given figure in regard to symmetry and rotation
- Find the coordinates of a midpoint by the coordinates of the edge points; write the equation of a straight line crossing two given points
- Recognize and use international measuring units, such as barrel, shaft, and Fahrenheit
- Systematize collected data according to specificity; find quantities that characterize the limits of change in numerical data
- Find the probability of the output of two independent and dependent events and apply the multiplication rule to calculate probabilities

## The Science Curriculum in Primary and Lower Secondary Grades

At the end of fourth grade, students should be able to:

- Demonstrate awareness of their rights, respect the rights and freedoms of other people, and show a sensitive attitude to the people surrounding them; express their personal opinions on these issues
- Explain the most important safety regulations on protection of human life and health
- Demonstrate honesty, justice, humanism, and compassion; explain their views on these moral issues
- Use economic knowledge in everyday life
- Observe and comment on natural phenomena with a sensitive and caring attitude toward nature and ecology
- Interpret events in society according to their age

The science curriculum focuses on four content areas:<sup>4</sup>

- Nature and Us
- Individuals and Society
- Morality
- Health and Safety

The learning outcomes of these content areas at the primary education level (Grades 1 to 4) are as follows:

- Nature and Us
  - Sees herself/himself as a part of nature
  - Understands the importance of learning about nature
  - Can use the knowledge and skills acquired in contact with nature
  - Explains the structure of the human body and the functioning of its main organs in a simple way
  - Develops and presents simple projects to improve the environmental condition of the area
  - Provides a simple geographical description of the area and nature of Azerbaijan
- Individuals and Society
  - Can describe a person as a social being
  - Knows that people are formed in different communities and tolerates these differences
  - Connects with the idea of working within a family budget to the state budget
  - Understands the benefits of working together, can create a team with friends to solve certain issues
  - Demonstrates basic knowledge about Azerbaijan, its attributes, and its structural forms
  - Knows her/his rights, uses them, and respects the rights of others
- Morality
  - Follows interpersonal communication etiquette consciously, expresses a critical attitude towards unethical behavior
  - Demonstrates moral qualities through actions and behavior with family, at school, and in the community
  - Knows the scientific and religious worldviews about the origin of the world
  - Understands the spiritual values that religions promote and distinguishes them from superstition
- Health and Safety
  - Takes responsibility for some health-related issues and protection
  - Recognizes harmful habits that are in conflict with a healthy lifestyle
  - Uses street signs when walking outdoors
  - Recognizes the factors that threaten the security of life and follows safety rules in daily life
  - Is able to use individual and collective protection tools in emergency situations

At the end of eighth grade, a student should be able to meet the following objectives in physics:<sup>5</sup>

- Explain the nature and regularities of thermal and electromagnetic (electrical) phenomena; create and solve simple problems
- Solve issues concerning the application of physical quantities characterizing an electric field
- Differentiate substances by their physical properties; create and solve simple problems
- Differentiate the aggregate states of a substance due to the structure, movement, and interaction of molecules
- Build and solve the problems of electrical interactions in nature-related systems
- Conduct experiments on thermal and electrical phenomena, measure physical quantities, perform calculations
- Explain the work principle of thermal techniques and assess the role of physical science in its creation

At the end of eighth grade, a student should be able to meet the following objectives in biology:<sup>6</sup>

- Interpret the areas of science that study human beings, the formation levels of their organisms
- Conduct experiments to study the structure of living things
- Compile a family tree
- Interpret the biological processes taking place in the human body and perform mathematical calculations on them
- Differentiate psychological concepts inherent in living things
- Explain the rules of health protection; provide basic first aid
- Explain the influence of environmental factors on the human body
- Prepare a presentation on the protection of the environment and the effects of pollution

The content areas for chemistry are:

- Substance and Material World
- Chemical Events
- Experiments and Modeling
- Chemistry and Life

At the end of eighth grade, a student should be able to meet the following objectives in chemistry:<sup>7</sup>

- Interpret the structure of substances and processes occurring in electrolyte solutions; solve problems
- Explain the correctness of reactions related to major inorganic compounds and make calculations

- Conduct observations and experiments on major inorganic compounds, develop models of their molecules
- Explain the role of processes in solvents and electrolyte solutions in life and provide information on sources of environmental pollution
- Prepare abstracts on the basic laws of chemistry and prominent scientists in the field of atomic structure

## Professional Development Requirements and Programs

Azerbaijan has no compulsory professional development requirements or programs. If there is a need for professional development, schools send teachers to attend related professional development courses.

## Monitoring Student Progress in Mathematics and Science

Teachers give quizzes to students in class after each mathematics and science unit and conduct summative assessments at the end of each semester.

## Special Initiatives in Mathematics and Science Education

The following special schools and projects promote and focus on mathematics and science learning in Azerbaijan:

- STEAM Project in 42 schools<sup>8</sup>
- Mathematics, Physics, and Informatics Lyceum in Baku and its branches in regions
- Chemistry–Biology Lyceum in Baku and its branches in regions
- Center for Special Talented Students, which focuses on mathematics and science classes

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