Bulgaria

Marina Mavrodieva
Center for Assessment in Preschool and School Education

Introduction

Overview of Education System

The Bulgarian education system is centralized. The Ministry of Education and Science (MoES), a specialized body of the Council of Ministers, is charged with determining and implementing a unified government policy in the fields of education and science. The main functions of the MoES are to

- exercise control over all types of schools and kindergartens in the country;
- participate in forming the national strategy for the development of education;
- approve education documentation;
- manage the introduction of innovations and the supply of textbooks and manuals;
- define unified state education standards;
- establish, transform, and when necessary, close state and municipal schools;
- approve the establishment of private schools and kindergartens; and
- appoint the heads of the Regional Divisions of Education.

Each of Bulgaria's 28 administrative regions has a Regional Division of Education, a specialized body of the MoES that administers the education system regionally. These offices plan, coordinate, and monitor the functioning of each region's schools and kindergartens. The heads of these offices appoint the school principals in the different regions.

Each municipality has education departments that implement local education policy. Municipal departments are the supporting and managing bodies for preschool education but have only a supporting role in primary through upper secondary education.

Schooling in Bulgaria begins at age 7 with primary education and is compulsory through age 16. Children may begin at age 6 with parental approval if they are deemed ready for school. The school year begins in September, ends in June, and consists of 31 to 36 weeks, depending on level and grade.

According to the Preschool and School Education Act[1] (effective August 1, 2016), the Bulgarian education system is organized into the following stages:

- Kindergarten (International Standard Classification of Education [ISCED][2] Level 0) is for children ages 3 to 6 or 7. Preprimary education is now compulsory starting at

age 5. These "preparatory classes" may be organized both in kindergartens and in schools.

- Basic education comprises primary and lower secondary education:
  - Primary education (ISCED Level 1), which includes Grades 1 to 4, is for children ages 6 or 7 to 10 or 11.
  - Lower secondary education (ISCED Level 2) includes Grades 5 to 7. After completing seventh grade, students can apply for admission to specialized upper secondary schools or profiled classes (with additional instruction hours on specific subjects, such as foreign language or mathematics) in general schools.
- Upper secondary education (ISCED Level 3) comprises two stages:
  - Stage 1 includes Grades 8 to 10.
  - Stage 2 includes Grades 11 and 12.
- Postsecondary education is offered at universities and colleges. A bachelor's degree requires 4 years of study with an additional year or two for a master's degree. A doctoral degree requires 3 or 4 years of study beyond a master's degree.

Secondary education comprises two distinct tracks: secondary general (comprehensive and profile) and vocational education. Profile secondary schools offer additional lessons in certain profile subjects. For example, students in comprehensive schools that do not offer a mathematics profile study 2 academic hours of mathematics per week. In contrast, students in mathematics profile secondary schools may study up to 9 academic hours of mathematics per week. The mathematics profile curriculum does not cover significantly more mathematics content than the compulsory curriculum, but students in mathematics profile secondary schools devote more time to mathematical exercises, experiments, and problem-solving.

Use and Impact of TIMSS

Bulgaria participated in TIMSS 1995, TIMSS 1999, TIMSS 2003, and TIMSS 2007 at Grade 8. After skipping the TIMSS 2011 cycle, Bulgaria participated in TIMSS 2015, TIMSS 2019, and TIMSS 2023 at Grade 4. Bulgaria has participated in PIRLS since its inception in 2001.

Another important study in which Bulgaria has participated every third year since 2001 is the Programme for International Student Assessment (PISA). PISA frameworks focus on the practical application of student knowledge, and study results have shown that education in Bulgaria is theoretically oriented with little practical application.

These international studies made it clear that mathematics and science education in Bulgaria were in need of modernization. According to the international reports from these studies, the school year in Bulgaria was one of the shortest among participating countries, and the average number of hours students spent studying mathematics and science yearly was comparatively lower than that of other countries.

The Preschool and School Education Act[3] outlined the groundwork for education reforms in Bulgaria by aiming to improve the quality of school education and student outcomes, and to ensure students are well prepared when they eventually enter a competitive job market.

Education reform takes time to show effects. Due to the COVID-19 pandemic's negative impact on schooling, the implementation of the outlined goals and measures in the education system in Bulgaria was disrupted.

Bulgaria's participation in TIMSS, PIRLS, and PISA, among other international education studies, has also allowed its education professionals to develop expertise in assessment, evaluation, education research, and testing. Many publications, including articles, workshop publications, and media commentary, have discussed Bulgarian participation in TIMSS, and research connected with the achievement of Bulgarian students in TIMSS has been presented at conferences and meetings.

The Mathematics Curriculum in Primary and Lower Secondary Grades

The curriculum for all subjects in Bulgaria is centralized and determined by the MoES. There is a single curriculum for primary and lower secondary education, which is compulsory for all students. All students are required to study the same topics at the same level of difficulty with the same workload (study hours).

The Bulgarian State Education Content Standards for all subjects were approved by the MoES. These standards outline what students are expected to know and be able to do by the end of each level of schooling (primary, lower secondary, and Stage 1 and Stage 2 of upper secondary). Instructional programs for every subject were developed for each grade level, stipulating topics of study, as well as skill objectives.

The main topics of the primary school mathematics curriculum (Grades 1 to 4) are natural numbers and geometrical figures. The curriculum includes a basic introduction to reading, using, and interpreting data from tables, graphs, and diagrams. Primary school students do not study fractions or decimals, except for $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{10}$ (i.e., the concept of division by 2, 3, 4, and 10).

Exhibit 1 presents mathematics content standards, expected learning outcomes, and core topics for students at the end of Grade 4.

Exhibit 1: Mathematics Expected Learning Outcomes at the End of Grade 4

Area of Content/ Competency	Expected Learning Outcomes
Numbers	• read and write natural numbers and know the decimal numbering system, and compare and order natural numbers • add and subtract natural numbers • multiply and divide by one- and two-digit numbers, and understand the connection between components of arithmetic operations • know the order of operations and the function of parentheses, and solve numeric equations with up to three operations • know the Roman numeric system • understand the concept of fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{10}$
Geometrical figures	• know geometric shapes (straight and curved lines, rays, line segments, angles, triangles, rectangles, squares, circumference) and their elements • distinguish types of shapes (angles and triangles) • draw line segments by given length and angles by given degree measurement • draw triangles, squares, and rectangles on a square grid
Measurement	• know units of measurement for length (millimeter, centimeter, meter, kilometer), weight (gram, kilogram, ton), time (second, minute, hour, day, week, month, year, century), money (Bulgarian currency), and angles (degree), and how to convert units of measurement • know units of measurement for area (mm^2, cm^2, m^2, km^2, daa) • measure line segments and angles • convert uniform metric units • calculate perimeter of a triangle and a rectangle, and calculate area of a rectangle
Modeling	• use numerical expressions to build mathematical models for situations represented by *n* more, *n* less, *n* times more, or *n* times less • model real-world situations using mathematical equations (trade problems and problems involving the perimeter and area of polygons) • analyze the content and interpret the results of solved problems • make educated guesses using organized real-world data

In accordance with the national mathematics curriculum, students in Grades 5 and 6 study rational numbers, focusing on fractions and decimals in Grade 5 and negative numbers in Grade 6. In geometry, students in Grades 5 and 6 study the main properties of certain three-dimensional figures, as well as formulas for surface and volume and the area of a triangle. The curriculum includes reading, using, and interpreting data from tables, graphs, and diagrams.

Grade 7 is a milestone in the study of mathematics in Bulgaria. Students begin the study of algebra with the introduction of algebraic expressions, linear equations, and inequalities. They are given a formal, axiomatic introduction to the study of geometry and begin to study congruent triangles and the application of their properties.

The mathematics curriculum in Grade 8 covers the study of numbers, beginning with the introduction of irrational numbers and square roots; solving quadratic equations, using the set of real numbers; the basic idea of functions followed by the study of linear functions and $y = ax^2$; and solving simultaneous linear equations and inequalities. The geometry curriculum includes vectors and geometric transformations, as well as certain properties of angles connected with a circle.

Mathematics content standards, expected outcomes, and core topics for students in lower secondary grades can be found on the website of the MoES.[4]

The Science Curriculum in Primary and Lower Secondary Grades

The science curriculum in Grades 2 to 6 treats science as one general integrated subject. In Grade 2, science is known as The World Around Us, and in Grades 3 to 6, it is known as Man and Nature.

In Grade 4, Man and Nature is structured according to three distinct subject areas in physical, chemical, and biological modules. The main requirements for students in Grade 4 are summarized according to *Bulgarian State Education Content Standards* following the *Preschool and School Education Act*, which are guiding and compulsory documents for all schools.

The science programs of study prescribe the following:

- content fields, called content cores
- national attainment targets, or expected learning outcomes, by content field
- science content by topic, concepts, context, activities, and interdisciplinary links
- specific methods and forms of assessment
- recommended teaching methods and guidelines

Exhibit 2 presents science content standards, expected learning outcomes, and core topics for students at the end of Grade 4.

Exhibit 2: Science Expected Learning Outcomes at the End of Grade 4

Area of Content/ Competency	Expected Learning Outcomes
Substances, bodies, and organisms	• distinguish substances by their properties and uses • differentiate nonliving things from living things by their characteristics • classify plants (e.g., trees, bushes, and grasses) and animals (e.g., mammals, birds, reptiles, amphibians, fish, and insects) • give examples of major groups of organisms living in water and on land, and their adaptive characteristics • know that Earth is a planet in our solar system and the Sun is the main source of heat and light for Earth
Phenomena and processes in nature	• name the basic life processes in organisms: nutrition, respiration, movement, reproduction, and growth • explore changes in water states and in the water cycle (via diagram) • describe the motion of bodies and organisms and the behavior of sound and light through examples • connect changes in day and night and in seasons on Earth with Earth's motion • give examples of the need for energy in living organisms, everyday life, and industry
Man and health	• describe human organs and basic life processes in the human body • understand principles of hygiene and a healthy way of life (e.g., healthy diet, infectious and noninfectious diseases) • identify substances and behavior harmful to human health • identify common environmental pollutants • identify human actions that can affect the balance of nature and describe possible courses of action for environmental protection
Observation, experimentation, and inquiry	• share observations of living and nonliving things in the natural world (following a given plan or guidelines) • carry out simple experiments with objects, substances, and plants • measure the temperature of air, water, and the human body • read data from charts, diagrams, tables, and graphs

In Grade 7, the science curriculum is split into three distinct subjects: Physics and Astronomy, Chemistry and Environmental Protection, and Biology and Health Education. Together, The World Around Us (Grade 2), Man and Nature (Grades 3 to 6), Physics and

Astronomy, Chemistry and Environmental Protection, and Biology and Health Education (Grades 7 and 8) cover the core education domains of Natural Sciences and Ecology.

Geography is taught as a component of Geography and Economics, which is pertinent to the education domains of Social Sciences, Civic Education, and Religion.

Science (Physics and Astronomy, Chemistry and Environmental Protection, and Biology and Health Education) and geography content standards, expected outcomes, and core topics for students in lower secondary grades can be found on the website of the MoES.[5]

Teacher Professional Development Requirements and Programs

In Bulgaria, there are five levels of postgraduate professional qualification for actively employed teachers, the first level being the highest and the fifth the lowest. These qualifications are not mandated and can be completed at any time at the teacher's own discretion. The requirements for completing each level are nationally regulated. The qualifications are conferred by the Departments for In-Service Teacher Training, affiliated with three of Bulgaria's universities.

Several universities in Bulgaria have departments for professional development and enhancing teacher qualifications. These departments offer qualification courses and conduct qualification degree examinations for teachers. Teachers primarily receive professional development through periodic updates on pedagogical knowledge, new instructional methods, and the use of information and communications technology (ICT) in education. Teachers may then take examinations to acquire professional qualification degrees, which lead to salary increases. Master's degree programs generally are designed for actively employed teachers as part of their ongoing professional development, but they also are open to applicants who are not actively teaching.

Ordinance No. 15 of August 2019[6] regulates teachers' continual professional development and allows other educational and training institutions to offer qualification courses and programs for teachers after being approved by the MoES.

Teachers' continuous professional development opportunities are usually limited once teachers enter the profession. They may attend one or two short-term courses (1 or 2 days each) during the academic year on varying topics, such as teaching methods, student assessment, and specific subject content material. Teachers rarely attend long-term training courses, as they would have to take a temporary leave of absence (i.e., one term) to do so.

Monitoring Student Progress in Mathematics and Science

In 2005, the MoES created the Center for Assessment in Preschool and School Education (CAPSE) in order to fulfill the need for an official national testing agency that designs and conducts national assessments of the education system according to national assessment standards.

Assessment throughout the education system is carried out both internally and externally. While internal assessments are administered by teachers, external assessments are administered locally by school principals, regionally by Regional Divisions of Education, and nationally by the MoES. The regulations of the system of evaluation stipulate the types of assessment to be used for each subject. Assessments may include oral, written, and/or practical examinations.

Examinations designed to test academic subject knowledge may be administered to individual students, groups of students, or entire classes. The required number of examinations depends on the number of hours spent studying a particular subject. Subjects with only 1 hour of instruction time per week or every 2 weeks use an annual grade but no term grade.

Over the last few years, standardized national tests have become the leading form of external assessment. The results of these tests provide policymakers with indicators regarding the state of the education system as a whole. Student achievement is evaluated according to the objectives outlined in the curriculum for each grade and subject.

At the beginning of first grade, students are evaluated to determine their level of readiness for school. These results help teachers differentiate students' individual needs. Until the end of third grade, only qualitative indicators are used for entry and exit level evaluations of students at the beginning and end of the school year, respectively.

In Grades 4 to 12, student knowledge and skills are evaluated on a scale with five levels based on qualitative and quantitative indicators: Excellent (6), Very Good (5), Good (4), Fair (3), and Poor (2). Students complete their grade level if their annual grades average Fair (3) or higher. Term and annual grades reflect students' academic performance throughout the year. Upon completing fourth grade, students receive a certificate of completed primary education. Upon completing seventh grade, students receive a certificate of completed basic education.

At the end of primary education, students who receive a final grade of Poor (2) in a subject still progress to the next grade level, during which teachers will work with them individually. In Grades 5 to 12, students who receive a grade of Poor (2) are required to pass a correction examination. Students who fail the examination must repeat the grade level. The MoES launched a program financing additional school hours for students falling behind, as well as talented students, to encourage all students to take an active role in their education.

During the 2006–2007 academic year, national assessments based on the Bulgarian State Education Content Standards were introduced for all fourth-grade students in public and private schools in four subjects: Bulgarian Language and Literature, Mathematics, Man and Nature, and Man and Society. As of the 2019–2020 academic year, national assessments in fourth grade are conducted only in Bulgarian Language and Literature and in Mathematics. The MoES also conducts a national assessment in seventh grade in the core subject areas of Bulgarian Language and Literature and Mathematics. These national examinations are also used for enrollment in specialized secondary schools.

During the 2007–2008 academic year, national matriculation examinations were introduced as a requirement for receiving a secondary education diploma. Students are required to take an examination in Bulgarian Language and Literature and another from among 13 subjects (mathematics, geography, physics, chemistry, biology, history, philosophy, informatics, ICT, music, art, entrepreneurship, and different foreign languages) or in their vocational qualification subject. In addition to conducting their own entrance examinations, some colleges and universities offer admission based on national matriculation examination results. Students who wish to attend an institute of higher education are required to pass the two compulsory matriculation examinations to receive a diploma of completed secondary education.

Student assessment policies in Bulgaria have undergone several changes in the last several years as part of broader reform efforts introduced by the Preschool and School Education Act. Bulgaria introduced a new student assessment framework in 2016, the *State Educational Standard for the Evaluation of the Results of Student Learning* (Ordinance No. 11 of September 2016),[7] which provides detailed instructions regarding the organization and administration of assessments. This document includes aims to align student assessment practices with a competency-based approach, namely by encouraging a greater focus on diagnosing and monitoring student progress throughout the school year. The framework establishes the main types (normative, criterion, and mixed) and forms (diagnosis, prognosis, certification, information, motivation, selection) of assessment, as well as how to organize classroom- and school-level assessment, national external assessments, state matriculation examinations, and the certification of learning across education phases.

Ordinance No. 11 of September 2016[8] introduces some important changes to Bulgaria's more traditional student assessment approaches, including the use of qualitative grading and diagnostic assessments in classrooms. However, student assessment continues to focus on traditional summative tests with a narrow emphasis on achievement over learning. This has important implications for Bulgarian students, as it encourages an educational approach that undermines progress in the classroom.

Special Initiatives in Mathematics and Science Education

The MoES organizes various competitions in mathematics and science to meet the needs of students who have the capacity and motivation to study these subjects in greater depth. In addition to the National Olympiad, there are several other competitions in mathematics or science at the national or regional level during the school year.

Many schools organize extracurricular activities in mathematics and science to help students prepare for these competitions. In this way, schools foster the study of mathematics and science, and encourage students to pursue careers in mathematics, science, and technology.

The MoES offers training for talented students in mathematics and science in Grades 5 to 12 within the framework of the With Care for Each Pupil program to prepare them for local, national, and international competitions. This training is offered in schools as an extracurricular

activity, normally at the end of the regular school day or on the weekend. Two other modules of the program target the education needs of low-achieving students and are designed to support learning and improve student outcomes.

Suggested Reading

Ministry of Education and Science. (2021). *Strategic framework for development of education, teaching and learning in the Republic of Bulgaria, (2021–2030)*. https://www.mon.bg/nfs/2021/03/strategicheska-ramka_obrobuuchene_110321.pdf

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