

Bahrain

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Introduction

Overview of Education System

Bahrain celebrated the centennial of the establishment of its public education system in 2019—one hundred years since the first public school was founded and formal education began in Bahrain.¹ Since then, all residents have been integrated into the public school system free of charge, as designated in Article 7 of Bahrain Constitution.² The main objective of Bahrain's education policy is to offer to all citizens, without any type of discrimination, equal opportunities to receive education.³

The Ministry of Education in Bahrain is the official body responsible for devising and implementing the education policies for its government public schools, determining the general objectives of basic and secondary education, and allocating the system and the instructional time for all subjects.⁴ Private schools in Bahrain operate under the supervision of the Ministry of Education and are obligated to use the curriculum and textbooks approved by the Ministry covering the Arabic language for Arab students, Islamic studies for Muslim students, and the history and geography of Bahrain for all students. There are three types of private schools: national, foreign, and foreign community. Each school has its own curriculum, teaching plans, and textbooks, which must be approved by the Ministry of Education.

The Bahraini education system follows an education "ladder" of nine years (ages 6 to 15) for basic education, which comprises primary and intermediate stages. The primary stage includes Cycle 1 (Grades 1 to 3) and Cycle 2 (Grades 4 to 6), and the intermediate stage includes Cycle 3 (Grades 7 to 9). Together, these three cycles of basic education constitute compulsory education as stipulated in Article 6 of Bahrain's education law.⁵ All students are taught all subjects in regular classes, and upon completion of the intermediate stage and passing a series of examinations, students receive an intermediate stage certificate. Secondary education extends over three years (Grades 10 to 12) and offers two tracks: (1) a unification of academic tracks (scientific, literary, and commercial) and (2) a technical and vocational track. Successful students are granted a general secondary certificate at the end of the secondary stage in each of their majors.

In 2019, the number of basic education schools was distributed as shown in Exhibit 1.

Exhibit 1: Number of Basic Education Schools in Bahrain by Stage/Type⁶

Type of School	Total Number of Schools	Number of Boys' Schools	Number of Girls' Schools
Preschool (ages 3–5); noncompulsory	136	-	-
Primary	112	57	55
Primary-Intermediate	23	14	9
Intermediate	37	17	20
Secondary	32	13 (2 are intermediate-secondary)	19
Vocational	4	4	
Private	73 (nonsegregated)	-	-

Use and Impact of TIMSS

In TIMSS 2003 and TIMSS 2007, Bahrain participated in Grade 8 only; in TIMSS 2011, Bahrain participated in both Grades 4 and 8, and so on in subsequent cycles, enabling comparisons over time of mathematics and science achievement among Grade 4 and Grade 8 students. In TIMSS 2015, there was a notable increase of 45 points in Grade 8 students' mathematics performance, more than the increase seen in TIMSS 2011. In general, Bahrain's results in mathematics and science did not meet international standards, and there was gender inequality in mathematics and science achievement. Bahrain's TIMSS 2015 national report⁷ included an analysis of achievement results that revealed significant findings. The analysis examined students' performance (percentage of students answering correctly) on each item and compared it to the international average. This analysis aimed to determine the level of difficulty of each item and whether it was covered in the curriculum.

Another step was analyzing school-level performance for all government and private schools in the TIMSS content and cognitive domains, to identify shortfalls identified in students' performance and in mathematics and science instruction. A further step was comparing competencies and topics in the national curricula for mathematics and science with TIMSS 2019 competencies and topics, taking into consideration the analysis of Bahraini students' results. This process was intended to determine topics and competencies not fully included in the national curriculum or in need of reinforcement. Our major findings were as follows:

- Grade 4 Mathematics—Some topics in five TIMSS competencies were not included in the national curriculum, and some competencies were in need of reinforcement.
- Grade 8 Mathematics—Some topics in four TIMSS competencies were not included in the national curriculum, and some competencies were in need of reinforcement.
- Grade 4 Science—Some topics in four TIMSS competencies were not included in the national curriculum, and some competencies were in need of reinforcement.

- Grade 8 Science—Some topics in four TIMSS competencies were not included in the national curriculum, and some competencies were in need of reinforcement.

Private schools were monitored by a Ministry of Education team and supplied with TIMSS competencies to compare with their curricula.

The national report detected additional factors that may have affected students' achievement, including weaknesses in teaching and learning mathematics and science, students' and parents' lack of awareness of the importance of TIMSS in enhancing students' science skills, some students' unfamiliarity with TIMSS item types, and some students' difficulty reading and understanding some TIMSS items.

In early 2017, a committee under His Excellency the Minister of Education,⁸ composed of senior policy officials, was tasked with developing a procedural plan based on significant findings from the TIMSS 2015 national report. Some of the procedures agreed upon and recommended by the committee are as follows:

- Cover all the required topics for Grade 4 and Grade 8 by merging mathematics and numeracy practice books into new practice books for each grade
- Integrate TIMSS released items into the new mathematics practice books
- Rearrange geometry topics within grade textbooks
- Integrate TIMSS released items into students' science practice books with some adjustments in content
- Integrate science content relating to the missing topics into the national curriculum
- Develop strategies for teacher professional development to improve student achievement
- Increase instructional time for mathematics and science in basic education
- Implement a daily period to strengthen reading skills

TIMSS results since 2003 have indicated that students may be reluctant to participate in the study, because it does not impact their individual grades. The Public Relations and Media Directorate has therefore implemented a social and public media campaign to make students and parents aware of the study's importance.⁹

The Mathematics Curriculum in Primary and Lower Secondary Grades

Ministry of Education specialists adapted and translated Bahrain's mathematics and science national curricula from a McGraw-Hill series.¹⁰ Based on results from the TIMSS 2015 national report, Bahrain modified its national curriculum¹¹ by rearranging topics from one grade to another, filling in missing concepts and skills using released items,¹² and gathering required topics from teachers' guides and numeracy practice books. Fourth and eighth grade students who participated in the TIMSS 2019 assessment were taught the newly introduced revised national mathematics curriculum. The main goal of this curriculum is to ensure all students' proficiency in the basics of mathematics by frequently engaging them in solving problems graded in difficulty to

develop their conceptual understanding and ability to recall facts, apply knowledge accurately, and reason mathematically.

The newly introduced curriculum was built upon findings from the TIMSS 2015 national report; it aims to cover the missing topics required for Grades 4 and 8 and focuses on elements from the Cognitive domain. For example, in the previous curriculum, students were taught only the odd and even numbers up to two digits in Grade 1, while the Grade 4 teacher’s guide and Grade 5 numeracy practice book included odd and even numbers up to four digits. The new curriculum shifts this content to the new student practice book and adds some released items. Also, teachers were advised and trained to use content from their guides during instruction. Another example of modifying the national mathematics curriculum is the shifting of content on multiples and factors from Grade 5 to Grade 4. Exhibits 2 and 3 present mathematics content areas and competencies¹³ for Grades 4 and 8 in the modified national curriculum.

Exhibit 2: Grade 4 Mathematics Content Areas and Competencies in the Modified National Curriculum

Content Area	Competencies
Numbers and Operations (whole numbers up to seven digits)	<ul style="list-style-type: none"> ▪ Read, write, and express numbers up to 1,000,000 ▪ Represent numbers in different ways ▪ Understand place value and the relationship between numbers ▪ Order and compare numbers ▪ Solve problems involving odd and even numbers ▪ Multiples and factors of numbers
Fractions and Decimals	<ul style="list-style-type: none"> ▪ Recognize fractions as parts of a whole unit or parts of a collection ▪ Read, write, identify, and determine equivalent fractions ▪ Compare and represent fractions on a number line ▪ Understand decimal place value and rounding ▪ Define decimals using words and numbers ▪ Represent decimals on a number line ▪ Compare, read, and write decimals ▪ Identify the relationship between decimals and fractions
Arithmetic Operations	<ul style="list-style-type: none"> ▪ Understand the four basic arithmetic operations (+, -, ×, ÷) and how they relate to one another ▪ Compare arithmetic operations in terms of properties used in calculations ▪ Add and subtract simple fractions with like and unlike denominators ▪ Solve problems including those set in a real life context ▪ Compute with numbers and estimate using the four arithmetic operations
Algebra	<ul style="list-style-type: none"> ▪ Identify number patterns and the relationship between patterns (numbers or terms) ▪ Extend and generate patterns ▪ Recognize variables ▪ Write simple algebraic expressions to solve for one unknown missing number or operation in a number sentence ▪ Represent real life situations using models, symbols, pictures, and words

Content Area	Competencies
Geometry	<ul style="list-style-type: none"> Identify and draw points, lines, rays, line segments, angles, triangles, and quadrilaterals Draw and distinguish between parallel, perpendicular, and intersecting lines Explore the properties of two- and three-dimensional geometric shapes Determine the line of symmetry in two-dimensional shapes Recognize congruence with and distinguish between geometric transformations (i.e., translation, reflection, and rotation)
Measurement	<ul style="list-style-type: none"> Recognize measurement units Choose the appropriate units to measure and estimate lengths, mass, and volume, and to solve problems involving perimeters, areas, and volume for simple figures like a polygon Identify certain types and sizes of units Read scales
Data Analysis and Probability	<ul style="list-style-type: none"> Collect, organize, represent, and display data in graphs Read and interpret data in pictographs, bar graphs, line graphs, and pie charts Explore and differentiate among certain, possible, and impossible events Conduct probability experiments Observe and record experiment results

Exhibit 3: Grade 8 Mathematics Content Areas and Competencies in the Modified National Curriculum

Content Area	Competencies
Numbers and Operations (integers, rational numbers, and real numbers)	<ul style="list-style-type: none"> Develop and understand integers Recognize rational, irrational, and real numbers Distinguish between fractions and decimals Represent numbers on a number line Classify, compare, and order numbers Understand ratios, proportions, and percentages Carry out operations when solving problems Use factors and multiples in solving problems Calculate powers of numbers and square roots Compute and estimate using equivalent fractions and percentages; use these computations and estimations in solving problems Compute length, including side lengths of similar triangles, and in solving real life problems
Algebra	<ul style="list-style-type: none"> Extend and generalize numeric, algebraic, and geometric patterns or sequences including finding the missing terms Use relations and functions Simplify and evaluate algebraic expressions Explore properties of linear functions in tables, words, equations, inequalities, and graphs Solve linear equations, linear inequalities, and simultaneous linear equations algebraically in two variables including real life situations Interpret, relate, and generate representations of nonlinear (quadratic) functions in tables, graphs, or words

Content Area	Competencies
Geometry	<ul style="list-style-type: none"> Recognize the geometric properties of angles and geometric shapes (e.g., triangles, quadrilaterals, and other common polygons) Differentiate between two- and three-dimensional shapes and use their properties in solving problems Use geometric transformations to explore the properties of symmetry, similarity, and congruence Use Pythagorean theorem and properties of shapes in solving problems Use geometric models to represent numerical and algebraic relationships
Measurement	<ul style="list-style-type: none"> Recognize metric and customary units Demonstrate understanding of relationships among units Identify appropriate units for measuring angles, lines, area, circumference, and volume Compute and estimate area, circumference, perimeters, and volume
Data Analysis and Probability	<ul style="list-style-type: none"> Read and represent data displayed in different forms (e.g., line plots, tables, and bar graphs) Describe and compare different representations of the same data Calculate the mode, median, and range from a set of data Determine and estimate theoretically and empirically the probability of an outcome Use the probability of a particular outcome to solve problems

The Science Curriculum in Primary and Lower Secondary Grades

Bahrain's science curriculum is adapted from the McGraw-Hill series,¹⁴ which covers all TIMSS competencies. However, a few changes due to adaptation and translation have affected the content and, more specifically, the cognitive domain in the national curriculum. For instance, all human health topics were removed from the national science curriculum content domain, as they already appear under another subject (Family Education). Similarly, some Earth science concepts were omitted, as they appear under Social Studies. Nevertheless, Bahrain's national science curriculum was modified based on findings from the TIMSS 2015 national report to cover all competencies and strengthen competencies in need of reinforcement. Because modifying a curriculum involves immense work and time, an immediate resolution was ordered at the same time modifications to the mathematics curriculum took place. Missing competencies were incorporated into students' practice books alongside appropriate released items.¹⁵ Exhibits 4 and 5 present the science content areas and competencies in the modified national curriculum.¹⁶

Exhibit 4: Grade 4 Science Content Areas and Competencies in the Modified National Curriculum

Content Area	Competencies
Nature of Science	<ul style="list-style-type: none"> Develop understanding of the nature of science Use scientific processes and procedures to explore and explain events and phenomena
Physical Science (physics and chemistry)	<ul style="list-style-type: none"> Identify concepts related to motion and its relationship to force and work, energy, energy forms, sources Relate energy transfer to the state of matters

Content Area	Competencies
	<ul style="list-style-type: none"> ▪ Describe light nature ▪ Relate physical phenomena (shadows, reflections, and rainbows) to the behavior of light ▪ Describe physical phenomena's relationship to the behavior of sound (echoes, object vibrations) ▪ Demonstrate knowledge relating to the electricity and simple electrical systems ▪ Recognize simple electrical circuits in different shapes (heat, light, and sound) ▪ Identify electrical conductors and isolators) ▪ Describe a variety of mixtures ▪ Explain how mixtures can be prepared physically ▪ Define the states and characteristics of matter ▪ Explore changes in matter (e.g., through heating and cooling)
Human Health	<ul style="list-style-type: none"> ▪ Relate transmission of common contagious diseases to human contact, symptoms, prevention
Life and Environmental Science	<ul style="list-style-type: none"> ▪ Describe differences between living and nonliving things ▪ Identify the structures and functions of living things including common characteristics such as, reproduction, heredity, growth, and the need for water and air ▪ Recognize physical and behavioral characteristics, diversity, and adaptation ▪ Classify living things into major groups (e.g., mammals, insects, birds, and plants) ▪ Develop basic knowledge of human life and the surrounding environment ▪ Identify the effects of the environment on physical features of animals and plants ▪ Recognize and compare the life cycles stages and reproduction in plants and animals ▪ Demonstrate knowledge about plant and animal reproduction and their characteristics ▪ Determine and describe strategies that enable plants and animals to reproduce and increase their offspring to survive in different environments ▪ Specify features of plants and animals inherited from their parents and acquired

Exhibit 5: Grade 8 Science Content Areas and Competencies in the Modified National Curriculum

Content Area	Competencies
Nature of Science	<ul style="list-style-type: none"> ▪ Develop understanding of the nature of science ▪ Use scientific processes and procedures to explore and explain events and phenomena
Life Science and Environment	<ul style="list-style-type: none"> ▪ Identify the characteristics of different groups of organisms and their inherited features ▪ Recognize the basics of classifying body structures that help organisms survive in their environment ▪ Describe the major organ systems ▪ Acquire basic knowledge in the physiological processes in animals ▪ Recognize animals' responses to their environment and external responses that maintain their body stable conditions ▪ Acquire knowledge regarding structure and functions of cells ▪ Explain an organ system forming from groups of cells with specialized structures and functions ▪ Determine and understand photosynthesis and cellular respiration

Content Area	Competencies
	<ul style="list-style-type: none"> ▪ Recognize variations as the basis for a natural selection ▪ Identify fossils as evidence of changes in life over time ▪ Explain similarities and differences among species and fossils defining changes that have occurred in living things over time ▪ Define and understand the life cycles and patterns of growth and development of different kinds of organisms ▪ Recognize sexual reproduction, inheritance, and characteristics in plants and animals ▪ Define organisms' traits (DNA) ▪ Identify and describe the flow of energy in ecosystems
Science, Technology, and Society	<ul style="list-style-type: none"> ▪ Understand the interaction among science, technology, and society
Physical Science (physics and chemistry)	<ul style="list-style-type: none"> ▪ Identify concepts related to motion, its relationship to force, and its effects ▪ Recognize simple machines and their mechanisms ▪ Define speed as change in position (distance) and acceleration as change in speed over time ▪ Define the relationship between speed and direction ▪ Recognize the effect of different forces (e.g., pressure, floating, sinking) ▪ Identify Newton's first and second laws of motion and how friction affects motion ▪ Explain Newton's third law of motion describing the phenomenon of weightlessness. ▪ Develop understanding of forms of energy, conservation of energy, heat transfer, and thermal conductivity ▪ Identify the properties of light and sound ▪ Describe processes involved in changes in states of matter ▪ Relate states of matter to distance and movement among particles ▪ Identify particles and molecules ▪ Recognize the periodic table of elements ▪ Differentiate between the physical and chemical properties of matter ▪ Classify substances according to their physical properties ▪ Recognize the characteristics of chemical changes, matter and energy, and chemical bonds ▪ Describe a variety of mixtures and explain how they can be prepared physically ▪ Identify the properties of conductors and the flow of electricity in electrical circuits ▪ Recognize the properties of sound and relate them to common phenomena, such as echo ▪ Identify and describe the properties of magnets and electromagnets ▪ Describe the use of permanent magnets and electromagnets in daily life
Earth and Space Science	<ul style="list-style-type: none"> ▪ Develop understanding of the earth's internal structure and the physical characteristics of the distant parts involved, including the distribution of water on Earth in terms of its physical state ▪ Recognize the components of earth's atmosphere and its atmospheric conditions ▪ Describe the general geological processes in the rock cycles ▪ Specify changes to the Earth's surface resulting from geological events and the formation of fossils and fossil fuels ▪ Acquire the concepts of weather and climate ▪ Interpret weather map patterns to identify different climates

Content Area	Competencies
	<ul style="list-style-type: none"> ▪ Relate climate and seasonal relations in weather patterns to global and local factors and describe evidence for climate changes ▪ Demonstrate knowledge about managing Earth's resources and discuss the advantages and disadvantages of different energy sources such as coal ▪ Define methods of conserving Earth's resources and waste management ▪ Identify the use of land and water and explain the importance of water conservation ▪ Describe the observable phenomena from Earth resulting from the movement of Earth and the Moon ▪ Identify the properties of the Sun, Earth, stars and moons

Professional Development Requirements and Programs

Educating teachers to align the modified curriculum with teachers' instruction is of the utmost importance in implementing developmental trends. Hence, in light of findings from the TIMSS 2015 national report related to weaknesses in teaching and learning, modern strategy objectives¹⁷ have been established in teaching mathematics and science, taking into consideration educating teachers on topics newly added to the modified mathematics and science curricula.

Since the second semester of 2017, the Directorate of Curricula, in cooperation with the Directorate of Training and Professional Development, conducted a 45-hour workshop for basic education mathematics and science teachers. Other workshops were held for senior mathematics and science teachers in all schools in all three cycles, to educate them in techniques to transfer their expertise to teachers they supervise in their own schools.

A personalized training plan was drawn up for each teacher to ensure that the methods of instruction were properly adapted. The development programs and workshops focused on instructional methods for the newly added topics in the modified curricula, aspects of the Cognitive domain, and students' ability to read and understand the questions. Also, the Directorate of Curricula and the Directorate of Training and Professional Development formed a team of highly qualified mathematics and science teachers, along with mathematics and science curricula specialists and educational supervision directorates. This team is tasked with supervising all teachers of basic education to ensure they apply their personalized plans properly. Team members also take initiative, if required, in teaching the class with the presence of the classroom teacher as way of providing direct training and to help the teachers design and formulate instructional questions.

Monitoring Student Progress in Mathematics and Science

Article 4 of the Law of the Educational Evaluation of Basic Education,¹⁸ specifies two types of educational assessment: (1) formative and (2) summative. In formative assessments, which comprise 30 percent of a students' overall evaluation, a teacher applies numerous procedures that fulfill the educational status requirement to measure the various competencies, skills, values, and attitudes. The education assessment system categorizes the relative weights of the formative assessment for mathematics and science in basic education. Exhibits 6 and 7 presents these relative weights.

Exhibit 6: Relative Weights (Percentages) of Components of the Mathematics Formative Assessment, Cycle 2

Regular Classroom Observation		Projects and Reports		Quizzes	Student's Performance File	Total
Classroom behavior	Practical performance	Project/report	Oral presentation			
6	4	4	2	10	4	30

Exhibit 7: Relative Weights (Percentages) of Components of the Science Formative Assessment, Cycle 2

Regular Classroom Observation		Projects and Reports		Quizzes	Student's Performance File	Total
Classroom behavior	Practical performance	Project/report	Oral presentation			
5	10	4	2	5	4	30

The education evaluation system for basic education specifies two types of summative evaluation:

- Initial summative evaluation (20 percent), which relates to the two midterm examinations
- Final summative evaluation (50 percent), which relates to the final exams

Article 4 of the Royal Decree requires the Education and Training Quality Authority (BQA) to review the quality of the performance of education.¹⁹ Students in basic education participate in national examinations administered by BQA in four core subjects—mathematics, science, Arabic, and English—to evaluate students' learning progress. These examinations are administered yearly at the end of the Cycle 2 (Grade 6). In 2018, the Ministry of Education and the BQA agreed to allocate 50 percent of Grade 6 students' second semester final exam scores as follows: 25 percent from the Ministry final exams scores and 25 percent from the national examinations scores. BQA also administers examinations to Grade 12 students in Arabic, English, and problem solving that count as 12.5 percent of a student's total score.

Special Initiatives in Mathematics and Science Education

In conjunction with the aforementioned actions of the policy committee, the national curriculum was modified and applied in all schools, and teachers were educated in workshops on new teaching strategies and to improve subject expertise. Other workshops were held to educate senior teachers of mathematics and science in basic education on changes in the curricula, and to form a team of trainers from the most efficient and experienced teachers that practiced teaching in the presence of the classroom teachers.

One major indicator taken into consideration was the difference in achievement between girls and boys. This achievement gap led the Ministry to conduct several workshops for senior male

teachers and to begin monitoring their performance in class rigorously. Moreover, school instruction time was changed for all subjects,²⁰ increasing the number of mathematics periods from five periods per week to six. In addition, the length of each mathematics period was increased from 50 to 60 minutes. One science period per week was added in Cycles 1 and 2 (from three periods to four), and in Cycle 3, science periods were increased from four to five. The length of each science period in all three cycles was also increased from 45 to 50 minutes. Finally, in response to findings from the TIMSS 2015 national report regarding some students' difficulties reading and understanding TIMSS items, the committee instituted a daily 30-minute period in all basic and secondary schools dedicated to strengthening students' reading skills.

Suggested Readings

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