

Egypt

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Introduction

Overview of the Education System

In light of Egypt's political, economic, and social conditions, the Egyptian government is keen to provide a distinguished education service in a huge learning system consisting of 23,567,060 students and about 1,025,842 teachers, representing about 56,569 schools.¹ The education system in Egypt relies on centralization in making decisions related to education policies, study systems, curricula, time frame for teaching and preparing curricula, student evaluation systems, teacher recruitment, training, and promotion. The education system also depends on decentralization in the implementation of teaching processes, technical supervision and follow-up of teachers, procedures for monitoring and evaluating students in their transition to higher classes, and other factors. Hence, education decisions at the national level are made by the Minister of Education, and executive decisions are issued at the governorate level by the Undersecretary of the Ministry of Education in the governorate.²

Egypt's education system is a combination of three cultural and religious heritages—namely, Islamic (traditional), secular Egyptian (Westernized), and British (neocolonial). The socioeconomic status of the people of Egypt is reflected in the education system, which is supported by a firm belief that education is crucial for the national development of the country and its citizenry. Education in Egypt is key in terms of academic achievement and also in instilling cultural values, which act as strong forces in bringing about individual development and character. Al-Azhar plays a pivotal role in shaping Egypt's educational, religious, and cultural life. The Al-Azhar curriculum is a parallel Islamic academic system that offers the same curriculum as public schools but with a stronger emphasis on learning the Qur'an and studying Islamic theology.

The education system consists of three stages: (1) kindergarten and primary education, (2) preparatory education, and (3) secondary education. There are many tracks of Egyptian education, among them (1) governmental schools, including public schools and foreign language public schools; (2) private schools, including schools with an Arabic curriculum and foreign language schools; and (3) international schools, including American, British, French, and other schools. The mathematics and science methodologies offer two unified approaches, and there are no fundamental differences between them in government schools or private schools in terms of the curriculum, the number of class periods, the educational activities accompanying the

teaching, and the criteria and systems of student assessment that are carried out according to the examination criteria issued by the National Center for Examinations and Educational Evaluation. Two mathematics and science curricula are taught in international schools based on the education program adopted by the school; therefore, their teaching methods, students' tasks, and evaluation systems may differ.

In public and private (Arabic) schools, mathematics and science at the fourth and eighth grades are taught in the mother tongue, which is Arabic. Teaching in experimental language public schools depends on the main language of the program. Teaching in private (language) schools and in international schools is in the language approved in the school; it varies between English, French, and German.

Use and Impact of TIMSS

TIMSS provides a valuable resource for a comparative evaluation of education systems and criterion references in the participating countries, and it provides an opportunity for self-evaluation of the education system. It determines the factors that led to a certain level of performance and assesses the extent of change in student achievement, enabling the preparation of education development plans and reform.

Egypt's participation in TIMSS implements the development plans pursued by the Ministry of Education to achieve a set of goals, the most important of which are:

- Representing the Arab Republic of Egypt in international events, to benefit from the experiences and the experiences of other countries participating in the study
- Investing in developing human resources, to raise the level of students scientific and intellectual achievement
- Contributing to the development of the education process by developing curricula, teaching methods, and the professional performance of teachers and school administrators, and raising education awareness among parents and community at large
- Comparing the performance of students after applying the new curricula with the previous performance of students, and determining the impact of changing courses

Egypt participated in TIMSS in 2003, 2007, 2015, and 2019, with about 7,000 eighth grade students participating in each cycle.

TIMSS results help educators, teachers, and officials focus on the levels of questions asked in the classroom and in the tests prepared by teachers who seek to stimulate student thinking, in an attempt to simulate global tests. They also enrich the curricula, decisions, and activities in mathematics and science teaching with questions and methods that develop higher thinking skills. TIMSS experience also help students prepare for national tests in mathematics and science in the fourth and eighth grades.

Participation in TIMSS helps educators develop test criteria and an item bank to produce tests to be used by teachers in classrooms and at the local and national levels.

The Mathematics Curriculum in Primary and Lower Secondary Grades

The mathematics curriculum for the fourth grade (first³ and second⁴ semesters), consists of the following topics:

- Calculation: large numbers, such as thousands, millions, billions, operations on large numbers, multiples, divisibility, factors, prime numbers, common factors, largest common factor, common multiples, smallest common multiple, decimals, decimal numbers, rounding, and line representation
- Geometry: the relationship between two straight lines and some engineering constructions, such as polygons and triangles, and their applications, congruence, measurement, and visual patterns
- Statistics and Probability

The mathematics curriculum for the eighth grade (first⁵ and second⁶ semesters) consists of the following topics:

- Algebra: real numbers, cubic roots, nonrelativistic numbers, operations on real numbers, operations on square roots, operations on cubic roots, applications, solving first-degree equations and inequalities in one variable, the relationship between two variables, the slope of a straight line and life applications, the analysis of the triple magnitude on the image of a complete square, the analysis of the difference between the two cubes, the analysis of the sum of two cubes and the difference between them, the analysis by division, and analysis by completing the square and solving the second degree equation in one variable algebraically
- Probability
- Statistics: data collection and organization, ascending and descending aggregate iterative tables and their graphical representation, mean, median, and mode
- Geometry: triangle averages, isosceles triangles and symmetric axes, contrast concept, comparison of angle measurements in a triangle, comparing the lengths of the sides of a triangle, asymmetric triangles, areas of geometrical shapes, similarities and projections, and the inverse of the Pythagorean theorem and Euclid's theory

The Science Curriculum in Primary and Lower Secondary Grades

The science curriculum for the fourth grade (first⁷ and second⁸ semesters) consists of the following topics:

- Measurement tools
- The three states of matter and their transformations
- Physical properties and changes
- The movement of the stars, planets, Sun, Earth, and Moon
- Atmosphere and weather

- Human digestive system
- Human respiratory system
- The cell as the building unit of an organism
- The importance of sunlight to living beings
- Strength and influence
- Energy pictures and transformations
- Electricity

The science curriculum for the eighth grade (first⁹ and second¹⁰ semesters) consists of the following topics:

- Periodicity of elements and their properties—attempts to classify the elements, properties of the elements in the periodic table, main groups, and water
- Atmosphere and protection of the Earth—atmospheric layers, ozone layer corrosion, and overheating
- Excavations and species protection from extinction—excavation and extinction
- Periodic movement—vibratory and wave motion
- Sound and light—the properties of sound waves and their reflection, the wave nature of light and its reflection and refraction
- Reproduction and continuity of diversity—reproduction in plants and humans

Professional Development Requirements and Programs

Teaching mathematics and science at the fourth and eighth grades requires many skills, such as good planning for teaching, developing appropriate teaching methods for educational subjects, creating classroom-assistive activities for the course, using appropriate teaching aids, investing in extracurricular activities, classroom interaction with students, time management, class management, and conducting extracurricular activities, and developing a monitoring and evaluation methodology to ensure outstanding academic achievement.

Therefore, mathematics teaching should be based on:

- Developing thinking and build the capacity for abstraction
- Developing the ability to solve familiar and new situations
- Taking everyday life as a reference for teaching and learning
- Developing realism concepts
- Learning to ask the right questions and how to get information
- Learning skills in appreciation, abstraction, and generalization¹¹

Science education should also be based on:

- Identifying scientific facts and concepts that help in understanding and interpreting natural phenomena

- Developing trends toward research, viewing, observing, experimenting, and comparing, analyzing, and verifying information
- Knowing the environment and understanding the phenomena involved in it and harnessing science to reform and preserve it
- Introducing healthy rules and good habits¹²

Mathematics and science teachers are prepared in the Faculties of Science and Education, and graduates earn a bachelor's degree in science and education, making them qualified to work as an assistant teacher. They then receive professional training to advance from an assistant teacher to a first teacher, an expert teacher, and a senior teacher, under the supervision of the Professional Academy for teachers.¹³ Throughout their careers, teachers receive many directives and participate in development programs aimed at raising their level of professional competence. They also have access to postgraduate studies in education.

Monitoring Student Progress in Mathematics and Science

Students in mathematics and science classes are evaluated at the fourth and eighth grades through their work during the year, as well as oral tests, classroom and extracurricular activities, participation in classroom activities, regularity in studying and attending classes according to the school timetable, first test and second semester tests, and a second round test for students who fail the first round of testing. These assessments are carried out at the school level. There are no tests conducted at the national level.

In the current period, and keeping pace with the development efforts by the Ministry of Education, the evaluation method has evolved from a culture of competitive tests to continuous formative evaluation, which aims to determine the extent of a student's acquisition of knowledge, skills, and attitude by comparing the student with students in other schools and even other districts. The Ministry also moved from assessing student levels by making judgments and giving grades to denoting evaluations using a color system. The Ministry of Education is trying to change the culture of education from studying for tests to studying to acquire a higher level of thinking.

Special Initiatives in Mathematics and Science Education

There are many initiatives focusing on mathematics and science, including those related to education policies, including education initiatives to encourage students to develop their performance and tasks in science and mathematics, as follows:

- The formation of activity groups at the school level—the mathematics group and the science group are each concerned with encouraging students to excel in mathematics and science and to pursue a mathematics or science career in the future.
- Mathematics and science competitions at schools and within districts stimulate teaching and learning processes in mathematics and science, and recognize winners with prizes.

Winning students may participate in international competitions, such as the Mathematics Olympiad and Kangaroo Competition.

- Extra assistant effort within schools to foster student achievement in mathematics and science.
- Establishing schools for students who excel in mathematics, science, and technology, at Grade 10, to emphasize achievement in mathematics and science and to train future scientists.
- Holding workshops under the supervision of the Ministry of Education to develop mathematics and science curricula in the light of international trends.
- Implementing Intel's initiative to use technology in teaching.
- The participation of the Education Discovery company in a professional development program for science, technology, engineering, and mathematics (STEM) teachers to provide them with the skills necessary to create an interactive work environment inside and outside the classroom that contributes to STEM development.
- Establishing the Egyptian Knowledge Bank and producing an educational multimedia library.
- Casio Middle East's initiative to train 28,000 Egyptian teachers in the latest technological trends in mathematics and science.
- The National Center for Examinations and Educational Evaluation's package of training programs to build the capacities of teachers and mentors of mathematics and science at the national level in light of TIMSS results.
- Many studies and research in the field of evaluating mathematics and science teachers in light of TIMSS results.

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