United Arab Emirates

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Ministry of Education

Introduction

Overview of Education System

The Ministry of Education oversees all levels of education in the United Arab Emirates (UAE), including schools, colleges, and other higher education institutions. The Ministry aims to build and manage an innovative education system for a highly competitive knowledge society that includes all stages of life and meets the needs of the labor market. The education system includes both public and private sectors. The government fully finances public education, which is free to citizens at all levels.

The UAE education system includes a range of public and private schools for preuniversity education; these schools offer multiple curriculum options to suit the needs of citizens and residents. Residents can send their children to private schools, and registration is open to students residing in government schools after fulfilling certain conditions and paying specific fees. Every public school allocates a percentage of its vacancies to these students. The Ministry of Education oversees both public and private schools. Although it does not directly run private schools and does not bind them to a specific curriculum (except for Arabic language, social studies, and Islamic studies), it does develop general guidelines to which these schools adhere.[1]

In 2016, the Emirates Foundation for School Education was established in accordance with independent powers, according to Cabinet Resolution No. 8. The Foundation is responsible for enhancing the efficiency of the federal education sector and providing school education within the framework of the general policy of the country. It also implements policies, strategies, standards, and controls related to the education sector, including vocational and technical education and continuous education.

All public schools in the UAE operate under the supervision of the Ministry of Education through local branches or education districts in each emirate. In Abu Dhabi, Dubai, and Sharjah, the responsibility for overseeing private schools rests with the local education authorities alongside the Ministry, such as the Department of Education and Knowledge in Abu Dhabi, the Knowledge and Human Development Authority in Dubai, and the Sharjah Education Council.[2] Children who have not reached the required age for the first year of general education (Grade 1) can be admitted and enrolled in kindergarten for 2 years, KG1 and KG2, but enrollment is not

compulsory. The Ministry of Education in the UAE applies the following academic levels in government schools:

- foundation stage: elementary level/Cycle 1 (Grades 1 to 4)
- middle stage: Cycle 2 (Grades 5 to 8)
- secondary stage: Cycle 3 (Grades 9 to 12)

Public schools follow the unified Ministry curricula issued by the Ministry of Education, which is taught to students in academic educational tracks—such as general, elite, and advanced—and vocational tracks—such as applied technology high school (ATHS), institute of applied technology (IAT), applied, applied arts, aviation, engineering maintenance, and agriculture—as they meet students' needs, levels, and inclinations. Private schools choose their various curricula, including for mathematics and science subjects, according to the directives and standards of the Ministry of Education.

Use and Impact of TIMSS

The UAE participated in TIMSS 2023 as a country along with three benchmarking systems, Abu Dhabi, Dubai, and Sharjah. The sample in 2023 included all public schools plus a sample of private schools. As for previous cycles of TIMSS, the National and International Assessments Implementation Department at the Ministry of Education used the results of TIMSS 2019 to explore reasons for the average level of achievement of Grade 4 and 8 students in mathematics and science in the UAE through the following:

- providing the Curriculum Department with *TIMSS 2019 UAE Report* along with recommendations to revise the curricula
- launching the Research Grant Initiative, which is a competition for universities in the UAE to prepare a research paper exploring reasons for the average level of students' achievement based on *TIMSS 2019 UAE Report*

The Mathematics Curriculum in Primary and Lower Secondary Grades

The mathematics curriculum has been through several stages of reform since 2016–2017. Although it is still being updated, the curriculum has almost the same general features as the previous one. The curriculum was developed based on four content domains: Numbers, Algebra, Measurement and Geometry, and Data and Probability.

With a problem-solving perspective, the mathematics curriculum aims to help students acquire basic skills such as reading for understanding and reflection, developing an action plan and modifying it (if necessary), checking solutions, and reporting results. In addition, the content domain Financial Literacy was added to the curriculum in both Cycles 1 and 2.

As for the cognitive domains, the mathematics curriculum in the UAE follows a classification like the TIMSS framework: knowing, applying, and reasoning. Each student receives two books

from the Ministry of Education: a student book and an interactive student guide. By the end of fourth grade, students in public schools should have been taught the topics listed in Exhibit 1.

Exhibit 1: Mathematics Topics for Grade 4

Domain	Areas	Contents
Numbers	• whole numbers • expressions, simple equations, and relationships • fractions and decimals	• applying addition and subtraction concepts • number patterns • place value (through thousands), using place value to round • addition and subtraction (relating addition and subtraction, addition and subtraction strategies to 20, four-digit addition and subtraction, patterns, addition properties and subtraction rules, using related facts to add and subtract) • multiplication and division (understanding multiplication and division; patterns; applying multiplication and division; relating division and multiplication; multiples of 10, 100, and 1,000; • dividing by 10, 100, and 1,000; multiplication properties and division rules; rounding to estimate; times tables; products, multiplying with two-digit numbers; multiplication and division rules; factors and multiples; multiplying fractions by whole numbers; dividing by one-digit numbers) • fractions and decimals • operations with fractions and decimals • properties and equations • patterns and sequences • problem-solving
Measurement and Geometry	• measurement • geometry	• measurement and time (comparing and ordering lengths, nonstandard units of lengths, problem-solving, analog and digital time) • two-dimensional shapes and equal shares (square and rectangle, triangle and trapezoid, circle; comparing shapes, composite shapes; problem-solving; equal parts; halves; quarters) • three-dimensional shapes (cube, prism, cone, and cylinder; problem-solving; combining three-dimensional shapes) • time • geometric shapes and equal shares • metric units and volumes • perimeter and area • measurement and metric units

Exhibit 1: Mathematics Topics for Grade 4 (Continued)

Domain	Areas	Contents
Data	• reading, interpreting, and representing data • using data to solve problems	• organizing and using graphs (tally charts, problem-solving, making picture graphs and bar graphs, reading picture graphs and bar graphs) • data analysis • representing and interpreting data
Financial Mathematics	• money and transactions	• money (counting coins, value of coins and bills, making change, problem-solving)

By the end of eighth grade, students in public schools should have been taught the topics listed in Exhibit 2.

Exhibit 2: Mathematics Topics for Grade 8

Domain	Areas	Contents
Numbers	• integers • fractions and decimals • ratio, proportion, and percent	• place value • multiplying whole numbers • dividing by a two-digit divisor • adding and subtracting decimals • multiplying and dividing decimals • fractions and decimals • adding and subtracting fractions • multiplying and dividing fractions • ratios and rates • fractions, decimals, and percentages • computing with multidigit numbers • integers and the coordinate plane • ratios and proportional reasoning • percentage • integers • rational numbers • real numbers • problem-solving
Algebra	• expressions, operations, and equations • relationships and functions	• expressions and patterns • equations • functions and inequalities • equations with one variable • equations with two variables

Exhibit 2: Mathematics Topics for Grade 8 (Continued)

Domain	Areas	Contents
Geometry	• geometric shapes and measurements	• geometry (polygons, sides and angles of triangles; classifying triangles, circles, sides, and angles of quadrilaterals; classifying quadrilaterals; building three-dimensional figures; using models to find volume; volume of prisms; building composite figures; volume of composite figures; problem-solving investigation; making a model) • integers and the coordinate plane • area of parallelograms, triangles, and trapezoids; problem-solving investigation; drawing a diagram, area of irregular figures, composite figures; volume of rectangular prisms, triangular prisms, pyramids; surface area of rectangular prisms, pyramids; nets of triangular prisms, pyramids; volume and surface area of composite figures • geometric figures (complementary and supplementary angles; triangles; drawing three-dimensional figures; circumference, area of circles; area of composite figures, volume and surface area of pyramids) • functions • triangles and the Pythagorean theorem • transformations (translations, reflections, rotations) • congruence and similarity • volume and surface area (volume of cylinders, cones, and spheres; surface area of cylinders and cones) • tools of geometry (points, lines, and planes; linear measure, distance, and midpoints; proving theorems about line segments, angles of polygons, parallelograms, rectangles, rhombi, squares, trapezoids, and kites)
Data and Probability	• data • probability	• measurement • data • statistical measure (mean, median, and mode; measures of variation; mean absolute deviation; appropriate measures; line plots; histograms; box plots; shape of data distribution; collecting data; interpreting line graphs; selecting an appropriate display; using appropriate units and tools) • probability (theoretical and experimental probability, relative frequency, fair and unfair games, probability of compound events, permutations, independent and dependent events) • statistics (making predictions, recognizing misleading graphs and statistics, comparing populations) • scatter plots and data analysis

Exhibit 2: Mathematics Topics for Grade 8 (Continued)

Domain	Areas	Contents
Financial Literacy	• money and transactions	• sales tax, tips, and markup • discount • simple interest • compound interest • solving problems involving financial literacy, such as sales tax, tips, markups, discounts, simple interest, and compound interest

The Science Curriculum in Primary and Lower Secondary Grades

The science curriculum in the UAE is adapted from a McGraw-Hill series in which students build skills in content knowledge and cognition within integrated scientific content that covers four domains: Nature of Science and Technology; Earth and Space; Physical Sciences; and Life Sciences.[a]

By the end of Cycle 1 (Grades 1 to 4), following the Ministry of Education curriculum, students in public schools will show mastery of scientific content in the structure of parts of the human body, plants, and animals; the structure of Earth's surface and certain components of space; forms and sources of energy; and states and interactions of matter in their surroundings. They will record observations, compare the results of prediction, and observe objects in their local environment; ask questions; and predict results and present them through investigations using images, diagram, models, and words. Exhibit 3 details the science content in Cycle 1. (The science curriculum was updated in 2019 after the TIMSS assessment. Therefore, Exhibits 3 and 4 list elements of the science curriculum from 2017.)

Exhibit 3: Science Content in Grades 1 to 4 (Cycle 1)

Domain	Contents
Nature of Science and Technology	• science operations in the construction of knowledge and understanding of areas of scientific content; models, laws, and scientific theories • explaining natural phenomena, and technological and engineering solutions within the framework of scientific and mathematical knowledge • science, engineering, and technology interaction; investigation skills and tools used by scientists; relationship between science, technology, and society

a See https://www.mheducation.com.sg/inspire-science for more information.

Exhibit 3: Science Content in Grades 1 to 4 (Cycle 1) (Continued)

Domain	Contents
Earth and Space	• Earth's location in the universe, relative locations of the Sun and other stars; patterns, motion of planet Earth, and human activities affecting Earth; patterns due to the movement of Earth in the solar system, causing seasons and adaptions to these changes • characteristics and movements of water contributing to the formation of Earth's surface and their impact on its systems • complex and dynamic interactions between Earth's spheres (lithosphere, hydrosphere, atmosphere, and biosphere) • regulators of weather and climate • objects' physical characteristics and bodies' movement on Earth and in space, and how forces change objects' motion, shape, stability, and application of knowledge to daily life
Physical Sciences	• classification of substances (elements, compounds, and mixtures); velocity, speed of bodies • uses and transformations of energy sources and methods of transfer between systems • energy conservation • matter and its transformations: material properties, diversity, states, changing states, and conservation of matter based on the molecular structure of matter; materials interacting or combining to make new materials • motion and rest (object's motion, changes in motion, or equilibrium); potential interactions behind all the forces between objects • energy transformations and uses in everyday life activities to achieve sustainable development, properties of light and its interaction with objects in the surrounding environment
Life Sciences	• comparing living and nonliving organisms, plants, and animals (growth and development of living organisms) • definition of structures of cells and systems enabling them to perform vital functions, mutual relations between body systems • the relationship between various species through fossils • biological diversity: similarities and differences • human interaction with the environment, impact of the environment on the population of organisms across generations, interactions of ecological systems, how living organisms obtain energy • genetic differences: characteristics of a generation and its preceding generation

By the end of Cycle 2 (Grades 5 to 8), following the Ministry of Education curriculum, students in public schools will show mastery of scientific content related to construction of the human body, functions of systems and organs, environmental and vital systems and their

interactions, the formation of Earth, Earth's history, and other components of the universe; the interaction between matter and energy and the forms of its transformations and sources; and the structure of matter, its changes, and its reactions. Students will also study heat transfer, properties of metals, characteristics and behavior of waves, reflection and refraction of light, physical and chemical properties, and types of bonds. Exhibit 4 details the science content in Cycle 2.

Exhibit 4: Science Content in Grades 5 to 8 (Cycle 2)

Domain	Contents
Nature of Science and Technology	• science operations in the construction of knowledge and understanding of areas of scientific content; models, laws, and scientific theories to explain natural phenomena • technological and engineering solutions within the framework of scientific and mathematical knowledge • interaction between science, engineering, and technology • investigation skills and tools used by scientists • relationship between science technology and society • potential interactions behind all forces between objects
Earth and Space	• human dependency on Earth's resources; ways living organisms alter Earth's processes and structures; effects of water, ice, wind, or plant cover on the weathering or erosion rate; complex and dynamic interactions within Earth's systems; solid mass, the hydrosphere, the atmosphere, and the biosphere; using the properties of rocks and minerals to determine the value of metals; interaction between ground systems leading to the formation of sedimentary, igneous, and metamorphic rocks; human activities influencing agriculture, industry, and daily life • Earth's location in the universe, evidence for the formation of the solar system, patterns caused by the movement of Earth in the solar system • the universe and the stars rotating in it, astronomical objects orbiting around the Sun, the big bang theory (foundations, evidence, distant galaxy motion, and the formation of matter in the cosmos), astronomical evidence related to light spectra • tectonic plates and system interactions through their movement, how motion of plates is responsible for most characteristics of continents and oceans, distribution of most rocks and minerals in Earth's crust • tides as the result of the Moon's gravity effect on Earth, how tides differentiate between eclipses and their relation to Earth's position versus the Moon and the Sun • classification of waves in daily life (e.g., mechanical, electromagnetic, or longitudinal and cross-sectional waves)

Exhibit 4: Science Content in Grades 5 to 8 (Cycle 2) (Continued)

Domain	Contents
Earth and Space	• characteristics and movements of water from Earth's surface and their impact on its systems, water changes and motion in the atmosphere as determinants of local weather patterns and severe weather (hurricanes and thunderstorms) • natural hazards influencing individuals and communities • geological events of Earth and its history (analysis of rock strata and fossil register)
Physical Sciences	• particulate nature of matter to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter; chemical and physical properties of substances • motion and forces: potential interactions behind all the forces between objects • energy: stability of physical systems (types, conservation, energy transferred between objects or systems); energy transformations, uses in everyday activities • molecular structure of matter in the interpretation of material properties, diversity, states, changing states, and conservation • physical properties of the elements of groups (alkali metals, alkaline Earth metals, halogens, and noble gases) in the periodic table and their uses in life, physical properties and chemical properties of substances, relationship between the atomic structure of an element and its location in the periodic table using simple models, concept of motion and rest, changes in motion
Life Sciences	• sexual and asexual reproduction; plant life cycle, including seedless plant life cycles, flowers, and seeds; animal life cycle, including complete and incomplete metamorphosis, fertilization in animals • ecosystem: food chains, food webs, food pyramids; photosynthesis and energy flow in ecosystems; consumers and producers: how plants and algae use energy from the Sun to produce food through photosynthesis • adaptation and survival for animals and plants • characteristics of life; classification of living organisms: defining the principles of taxonomy and taxonomic relationships (e.g., race, species, class); types of invertebrates and chordates • technology to explore cells and cell theory; structures of organelles and their main functions; diffusion and osmosis and their role in cells • animal behavior: interaction with other animals, interrelationships within and between species and their environment, sustaining biodiversity • animal reproduction and plant diversity; plant reproduction and plant processes; heredity and genetic traits • types of food groups and their importance • body systems: digestive and excretory (process of digestion and excretion); respiratory and circulatory systems; maintaining body systems

Teacher Professional Development Requirements and Programs

The Ministry of Education has created the Teachers Training Institute, which is responsible for all teacher training. Compulsory training for all teachers has been conducted in cooperation with the Ministry of Education's Curriculum Division. Mathematics and science teachers are trained mostly in the following three aspects:

- pedagogical development
  - managing students' behavior
  - green education
  - artificial intelligence (AI) integration in education
  - sustainability
  - foreseeing the future
  - e-platforms (national and international)
  - learning communities inside schools
- subject-related aspects
  - content
  - integrating technology in the classroom
  - teaching strategies for math and science
  - curriculum overview
  - planning for teaching math and science
  - science, technology, engineering, and mathematics (STEM) integration in teaching math and science
- assessment
  - assessment policy overview
  - creating question items for math and science
  - summative assessment strategies
  - formative assessment strategies
  - using the SwiftAssess application for creating question items
  - effective use of assessment tools in Microsoft Teams
  - electronic assessments for math and science

In-service professional development opportunities include strengthening educators' teaching strategies for distance learning.

A training program provided by ACER has been implemented in the UAE. ACER's Assessment Leader Program (AAP) is an internationally recognized flagship qualification in assessment practice and a sought-after accredited qualification. As a practice-based course, it supports both schools and the education system in establishing high-quality assessment practice.[b] The AAP consists of 11 modules grouped into four units, with each unit spread over 4 weeks. Taking holidays into account, this means a commitment of roughly 13.5 months.

b See https://www.acer.org/ae/assessment for more information.

Monitoring Student Progress in Mathematics and Science

The Emirates Standardized Test (EmSAT) was established to develop assessments that will improve the quality of learning and ensure standards for qualifications are met through a unified measurement system to assess science, mathematics, and language development.[3] The data gathered from EmSAT ensure that all candidates have met demonstrable standards of learning before engaging in further study or entering the workforce. The assessment system provides reliable and valid data to schools and senior leadership to improve the overall success of student learning in support of government economic development plans for building a knowledge-based economy.

Results are reported to education agencies at both candidate and agency levels. EmSAT is a vertically scaled battery of assessments to measure student growth in a longitudinal assessment system in core areas of language (English, Arabic), science, and mathematics. All EmSAT results reflect knowledge and skills students develop over time—across grades—and link these results to readiness for further study or a career. EmSAT results are reported on a four-digit vertical scale that summarizes the achievement of students from multiple administration levels. EmSAT provides instructionally insightful and actionable results. It also describes student performance in terms of three EmSAT reporting categories: Below Expectations, Meets Expectations, and Exceeds Expectations.

As a set of standardized electronic tests based on national standards for measuring and evaluating student performance in the UAE, the test is administered in centers approved by the Ministry of Education. There are three types of EmSAT tests: Baseline (to measure proficiency in Arabic, English, mathematics, and science for students in Grade 1), Advantage (to measure proficiency in Arabic, English, mathematics, and science for students in Grades 4, 6, 8, and 10), and Achieve G12 (optional for students in Grade 12)/Achieve (for students who have completed the secondary stage of education). For the Achieve tests, available subjects to be measured are Arabic, English, physics, mathematics, computer science, chemistry, and biology.

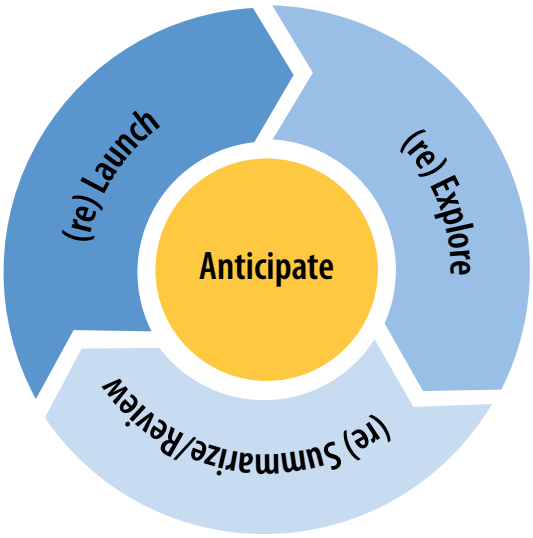
In addition to the EmSAT, a combination of continuous school-based assessments and centralized assessments is used to measure students' acquisition of knowledge and skills, as well as their ability to apply them in everyday life.[4] The goal of assessment should be to use a student-centered approach that encourages students to become self-directed and reflective learners.[5]

Special Initiatives in Mathematics and Science Education

Several initiatives have been pioneered over the years to promote the acquisition of numeracy and problem-solving skills in Cycles 1 and 2. Recently, digital platforms and adaptive tools have become prominent as ways to offer mathematics intervention strategies; these tools include ALEKS, Matific, MAP Growth, and many more. In addition, the Reveal Math ethos and Be Curious tools have been adopted in schools that implement the Reveal Math program[c] (see Exhibit 5), where a balance of skills and content is emphasized.

c See https://www.mheducation.com/prek-12/program/microsites/MKTSP-GIP20M0.html for more information.

Exhibit 5: Program Principles Based on Reveal Math



Finally, training strategies for both Cycles 1 and 2 have focused on getting back to hands-on learning in mathematics classes with the use of manipulative and hands-on learning tools.

Special initiatives to develop students' achievement in science are based on the *Assessment Policy Guide: Academic Year 2024–2025*. The overarching theme is the importance of student-centered assessments, which should identify what a student knows and can do at various points in time to enable teachers to tailor their teaching and learning to encourage growth.[6]

Suggested Reading

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3 Ministry of Education. (2017). *The Emirates standardized test (EmSAT) to replace CEPA at universities*. Retrieved from https://www.moe.gov.ae/En/MediaCenter/News/pages/emsat.aspx

4 Emirates Schools Establishment. (2024). *Assessment policy guide: Academic year 2024–2025* (p. 3). https://www.ese.gov.ae/En/MediaCenter/Documents/EN/Assessment%20Policy%20Guidebook%20Book%202024-25%20ENG%20ver7.pdf

5 Emirates Schools Establishment. (2024). *Assessment policy guide: Academic year 2024–2025* (p. 4). https://www.ese.gov.ae/En/MediaCenter/Documents/EN/Assessment%20Policy%20Guidebook%20Book%202024-25%20ENG%20ver7.pdf

6 Emirates Schools Establishment. (2024). *Assessment policy guide: Academic year 2024–2025* (p. 2). https://www.ese.gov.ae/En/MediaCenter/Documents/EN/Assessment%20Policy%20Guidebook%20Book%202024-25%20ENG%20ver7.pdf