# Abu Dhabi, UAE

*Abu Dhabi Department of Education and Knowledge*

## Introduction

### Overview of Education System

In recent years, the United Arab Emirates (UAE) has been working toward a more knowledge-based economy with the goal of becoming a global knowledge hub. Central to this goal is the focus on quality education, with review, evaluation, and reform as key priorities for the Emirate. By investing in education, the country's leaders are establishing an education system underpinned by the core belief of creating an advanced, cohesive, harmonious society that makes provision for "a cutting-edge education catering for lifelong learners."[1]

The Ministry of Education (MOE) oversees the education system in the UAE from preschool to postgraduate programs, both public and privately funded. The Emirates Schools Establishment (ESE) operates as an autonomous federal entity within the public K–12 schooling sector. The mission of the ESE is to improve the effectiveness of public schools in the UAE through the provision of a positive learning environment.[2]

The Abu Dhabi Department of Education and Knowledge (ADEK) oversees the education process and is responsible for developing and regulating the private, charter, and nursery school sectors in the Emirate of Abu Dhabi. It also monitors the progress of students and evaluates the efficiency of the education system in each school, including championing inclusivity opportunities for People of Determination (POD) through its mainstream and specialized schools.[3] ADEK is committed to supporting charter and private schools in developing and implementing an inclusive education system that inspires and enables all students to achieve success and fulfillment in all aspects of their school lives. Charter schools were introduced in 2018 as a strategic public-private partnership dedicated to public school students. Charter schools offer an American curriculum[a] in education from kindergarten to Grade 12 as students progress through the system.[4]

The public school curriculum is described in further detail in the United Arab Emirates (UAE) chapter of the *TIMSS 2023 Encyclopedia*.

### Use and Impact of TIMSS

Abu Dhabi education authorities are strongly committed to ensuring that students receive a world-class education. Great emphasis is placed on international assessments that focus on science, technology, engineering, and mathematics (STEM) subjects essential in the pursuit of

a See https://www.adek.gov.ae/en/Education-System/Private-Schools/Curriculum/American-Curriculum#:~:text=Most%20American%20curriculum%20schools%20in,Generation%20Science%20Standards%20for%20Science for more information about the American curriculum used by schools in Abu Dhabi.

a knowledge-based economy. The 2019 TIMSS results allowed the MOE and ADEK to compare academic achievements internationally and to identify areas of improvement.

TIMSS 2023 was the international assessment's eighth assessment cycle and the fourth time that Abu Dhabi participated as a benchmarking entity. Students from private and public schools participated, showcasing diverse international curricula and varying levels of success. The assessments yielded valuable comparative data, facilitated informed decision-making, and drove continuous improvement in teaching and learning practices. Private schools received school reports that encapsulated the Emirate of Abu Dhabi's performance at Grade 4 and Grade 8. These reports offered detailed results across subjects and content/cognitive domains. School leaders and teachers were empowered to leverage this data for targeted interventions, support, and overall improvement strategies. There are few places in the world with more diverse schools than Abu Dhabi, so these reports enabled the schools to calibrate themselves by curricula where necessary.

Each comprehensive report also assisted in identifying schools' strengths and areas for improvement, providing a basis for comparison with regional and international cohorts, curricula, and global benchmarks. Mathematics and science departmental leads were familiarized with the frameworks and engaged in professional development to work collaboratively on each content domain and topic area in depth.

## The Mathematics Curriculum in Primary and Lower Secondary Grades

### American Curriculum (US) and Charter Schools

Many American curriculum schools and all charter schools follow the US Common Core State Standards (CCSS) for mathematics.[5] The CCSS stipulates both content standards and mathematical practices that describe the processes and proficiencies required for success. In Grade 4, the focus is on three main areas: multidigit multiplication and division, fractions equivalence and simple computation (addition, subtraction, multiplication), and analysis of geometric figures. By Grade 8, the three critical areas requiring focus are expressions, linear equations, and systems of linear equations; functions and their use in quantitative relationships; and the analysis of two 3-dimensional shapes, including similarity and congruency, and the Pythagorean theorem.

### British Schools (National Curriculum in England)

British schools use the national curriculum for England, which is organized into key stages.[6] During Key Stage 2, which includes Year 5 (Grade 4), the focus of mathematics teaching and learning is to develop students' confidence in using whole numbers and place value and calculating with the four arithmetic operations, including the use of number facts. Students become more fluent with calculations, including both written and mental approaches, and solving problems, including those with simple fractions and decimals. Their understanding

of shape and space increases with students developing accuracy in drawing and measuring, extending mathematical reasoning proficiency, and using analysis with shapes, their properties, and ensuing relationships. Year 9 (Grade 8) mathematics is taught during the Key Stage 3 phase and requires students to "work mathematically" through the processes of developing fluency, reasoning mathematically, and solving problems. Students have opportunities to deepen their knowledge, skills, and understanding of the following mathematical content strands: number, algebra, ratio, proportion, rates of change, geometry and measures, probability, and statistics.

### International Baccalaureate Schools

Within the structure of the International Baccalaureate (IB), students in Grade 4 are placed in the Primary Years Programme (PYP),[7] while those in Grade 8 participate in the Middle Years Programme (MYP).[8] In the PYP, mathematics is predominantly taught through interdisciplinary themes that use inquiry-based learning and integrate learning across the subjects. In Grade 8, students study mathematics within a context that allows for authentic problem-solving and the application of mathematical skills and knowledge.

### Indian Schools (Central Board of Secondary Education and Kerala State Education)

The Indian mathematics curriculum, developed by the National Council of Educational Research and Training (NCERT), is relatively prescriptive with an emphasis on memorization, particularly in the lower grade levels. In Class IV (Grade 4), students study a range of domains with a particular focus on number concepts. In Class VIII (Grade 8), the curriculum suggests a shift beyond algorithms to establishing an understanding of mathematical concepts and problem-solving within real-world contexts. The strands within the Grade 8 curriculum include the number system, algebra, ratio and proportion, geometry, mensuration, data handling, and introduction to graphs.[9]

## The Science Curriculum in Primary and Lower Secondary Grades

### American Curriculum (US) and Charter Schools

Similar to the mathematics context, many US licensed and charter schools adopt the Next Generation Science Standards (NGSS) relevant to a specific US state and adapt them to meet the needs of their students within the Abu Dhabi context. In Grade 4, students learn about energy, waves, and information; structure, function, and information processing; and Earth's systems. Grade 8 curricula are incorporated into the standards for middle schools, and students study content and processes within the disciplines of the physical sciences, earth and space sciences, and engineering design.

### British Schools (National Curriculum in England)

In Year 5 (Grade 4) within Key Stage 2, students have opportunities to experience scientific principles and learn about the world around them. Using scientific inquiry to observe patterns and relationships, students ask questions, take measurements, and analyze data. Throughout the teaching of content, practical scientific methods, processes, and skills are embedded as part of the "working scientifically" framework. The study of science at the secondary level (Grade 8) within Key Stage 3 encourages students to develop an understanding of the three scientific disciplines: biology, chemistry, and physics. Students need to be able to connect the various disciplines and develop an understanding of the big ideas that are the foundation of scientific knowledge and understanding. Students are encouraged to use experimentation and modeling to develop and evaluate explanations, facilitating the use of critical and creative thought.

### International Baccalaureate Schools

The PYP is a curriculum *framework* rather than a set of standards. The approach used for the PYP is for science to be taught through interdisciplinary themes that emphasize the use of inquiry-based learning within authentic contexts.

Students in Grade 8 use the scientific framework from the MYP to investigate issues through research, observation, and experimentation. They are required to work both independently and collaboratively. Students focus on the three disciplines of biology, chemistry, and physics; however, some schools may choose to include additional scientific disciplines, such as environmental, sport, and health sciences.[10]

### Indian Schools (Central Board of Secondary Education and Kerala State Education)

Science in Grade 4 uses an integrated approach incorporating many subjects, with students studying themes such as family and friends, food, shelter, water, travel, and things we make and do. In Grade 8, science is taught through the following cross-disciplinary themes: food, materials, the world of the living, moving things, people and ideas, how things work, natural phenomena, and natural resources. Science remains an integrated subject until later when the separate disciplines of the physical sciences, life sciences, earth and space sciences, and engineering design are taught.[11]

## Teacher Professional Development Requirements and Programs

### Professional Development Requirements

Continuous professional development is a strategic priority for private and charter education in Abu Dhabi. Each school is required to provide every member with a minimum of 25 hours of planned professional development.[12] This is monitored through licensing and inspection visits. Schools are required to furnish evidence to support professional development hours that have been utilized in line with the strategic goals of the organization.

In 2021, the UAE teaching license became a requirement for education professionals. All teachers working across public and private schools must hold a UAE teacher's license to work legally in the country.[13]

ADEK expects that all teachers be adequately equipped to provide effective instruction and follow-up support to every child as he or she learns new concepts and skills. Depending on the curriculum, specialist teachers are introduced during middle school or Key Stage 3; however, timing varies from school to school according to curricula. In addition to the school's professional development program, ADEK offers opportunities to enhance the capabilities of specialized departments. These opportunities are held offsite and generally enable the creation of action plans and the development of resources according to the organization's strategic priorities. By availing of these resources, schools can align themselves with the regulatory body's vision for improvement and growth.

## Monitoring Student Progress in Mathematics and Science

In recent years, the implementation of standardized benchmarking assessments (SBAs) has become a mandatory policy for all private and charter schools. The choice of SBAs aligns with the respective curricula, and ADEK oversees and tracks the academic progress and achievements of students in mathematics and science within the private and charter sectors. SBAs play a pivotal role in Abu Dhabi, as they assess fundamental skills crucial to every student's education journey, including their proficiency in science and technology, ultimately shaping their competitiveness in the global workforce.

Beyond SBAs, most Abu Dhabi schools actively participate in external national and international examinations tailored to their specific licensed or accredited mathematics and science curricula. These examination outcomes are centrally monitored and made accessible through a digital platform, providing a transparent channel for parents, students, and teachers to review and analyze the academic achievements of students.

In a noteworthy development in 2023, ADEK announced its inaugural awards program aimed at recognizing schools and individuals who have significantly contributed to enhancing the overall quality of education across the education ecosystem. The program will include categories based on achievement in international assessments like TIMSS and PIRLS.[14]

## Special Initiatives in Mathematics and Science Education

Rize Enrichment Programs (RIZE) are after-school programs designed to expose students to new 21st-century-relevant subjects such as artificial intelligence (AI), strengthen core existing ones such as math, and teach culturally significant subjects such as Arabic language, as well as help with university preparation and applications, making students ready for the future.[15] Open to all public and charter school students (Grades 1 to 12) in Abu Dhabi, Al Ain, and Al Dhafra, RIZE offers free after-school sessions 4 days a week. The programs are designed to stand as a testament to the commitment to advance science and mathematics education

in the region. These sessions are led by specialized teachers who are adept in innovative teaching strategies and enabled to empower students through a comprehensive and immersive educational experience.

RIZE learning journeys also offer students an opportunity to travel to national and international centers of excellence. Beyond academic excellence, this program is instrumental in deepening students' critical thinking, developing practical skills, and fostering collaborative teamwork.

## Suggested Reading

OECD. (2019). *TALIS 2018 results: Teachers and school leaders as lifelong learners* (Vol. I). OECD Publishing. https://doi.org/10.1787/1d0bc92a-en

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