

Introduction

Overview of the Education System

Jordan's education system is responsible for preparing Jordan's citizens to achieve their aspirations and meet the challenges of the future. To best accomplish these goals, the system has evolved over the past decade. The most important recent development has been the extension of the compulsory, free, basic education cycle from nine to ten years.

A central principle of Jordan's educational policy is centralizing the general planning and follow-up of the education system while decentralizing its administration.¹

Within the Ministry of Education, the Board of Education determines the curriculum and the ministry's divisions for monitoring, finance, and inspection have responsibility for auditing the school system.^{2, 3}

The Ministry of Education has been providing high-quality curricula, textbooks, and teacher manuals that meet international standards. These materials include improved content and form, emphasize critical and creative thinking as well as problem-solving skills, and link content to life experiences. The materials also help students apply information in their academic and everyday lives, as required by the present era of technical and scientific progress.

Jordan's education system consists of the following cycles:

- ◆ Kindergarten—This 2-year cycle begins at age 4. It includes preschool and is noncompulsory. Almost all schools are either privately operated or run by volunteers.
- ◆ Basic Education—This 10-year cycle begins at age 6. Basic education is compulsory, and the curriculum is the same for all students and evaluated annually. In Grades 8–10, students are classified and enrolled in different types of lower secondary education based on their marks.
- ◆ Secondary Education—This 2-year cycle provides specialized cultural, scientific, and vocational experiences that meet the

existing and anticipated needs of Jordanian society. At the end of basic education (Grade 10), students are classified into two major streams: the comprehensive (academic and vocational) secondary educational stream, and the applied secondary educational stream. The comprehensive program ends with the General Secondary Education Certificate Examination in the following specializations: an academic sub-stream (including scientific and literary specializations) and a vocational sub-stream (including industrial, commercial, agricultural, nursing, hotel management, and home economics). The applied secondary educational stream provides vocational education and training for skilled labor to meet the needs of society.

Educational statistics indicated that the number of students enrolled in schools in the 2010–11 school year was 1,652,094.⁴ The net enrollment rates were 37 percent in kindergarten, 98 percent in the basic cycle, and 76 percent in the secondary cycle.

The Ministry of Education has plans to expand and improve the quality of preschool education and to encourage the private sector to establish Kindergartens, indicating the importance of preprimary education. The Education Reform for the Knowledge Economy project is a government-supported effort to transform the education system at the early childhood, basic, and secondary levels in order to produce graduates with the skills needed for the knowledge economy. One component of the project promotes learning readiness in early childhood education and emphasizes targeted approaches to improving the availability and quality of early childhood learning opportunities. The project will directly assist in implementing a comprehensive approach to improving the scope and quality of essential early childhood services.^{5, 6}

Within its capabilities, the Ministry of Education has established a number of kindergartens, particularly in remote and underprivileged areas, in order to achieve the following goals:

- ◆ Provide children with an adequate educational environment and care for well-balanced educational growth;
- ◆ Help children acquire positive attitudes toward school for a smooth transition from home to school;
- ◆ Develop good health practices;
- ◆ Improve children's social relationships; and
- ◆ Enhance children's positive attitudes and love for school life.

One of the Ministry of Education's projects involves developing and updating curricula, and focusing on achieving excellence in mathematics and science. Special e-math and e-science projects are in place. E-math projects receive funding from the CISCO Learning Institute, and e-science projects are funded by the private sector, specifically the Fastlink Corporation.

Languages of Instruction

Jordan's official language is Arabic, which also is the main medium of instruction. However, English is commonly used and spoken in public and private schools in Jordan. French is the medium of instruction in some private schools.

Mathematics Curriculum in Primary and Lower Secondary Grades

Jordan has undergone several educational reforms since 1989, in which curricular revisions were a major component. In the latest project, Education Reform for the Knowledge Economy, the new curriculum was revised to focus on learning outcomes and knowledge economy skills. As a result, new textbooks in mathematics were produced for all grades and supplemented with e-content.

Curriculum content is aligned with the standards of the U.S.-based National Council of Teachers of Mathematics. The main topic areas are Number, Algebra, Geometry, Measurement, and Probability and Statistics. Students must demonstrate competence in knowing, applying, and problem-solving cognitive domains. In addition, students are expected to master the following skills for the knowledge economy: communication; information management; problem solving in real-life situations; and using symbols, figures, and graphs. The expectations for students in the basic cycle, Grades 1–10, are described as follows:⁷

- ◆ *Number*—Demonstrate knowledge of place value and the four arithmetic operations (addition, subtraction, multiplication, and division); solve problems by computation, estimation, or approximation; and compare and order fractions and decimals.
- ◆ *Algebra*—Evaluate expressions for given numeric values of variables; simplify or compare algebraic expressions to determine equivalence; model situations using expressions; evaluate equations or formulas given values of variables; solve simple linear equations and inequalities; recognize and write linear equations and inequalities, and solve problems using equations or formulas and functions.

- ◆ *Geometry*—Recognize relationships between three-dimensional shapes and their two-dimensional representations; use visual and spatial inference to solve problems; and apply geometric transformation and symmetry to analyze mathematical problems.
- ◆ *Measurement*—Understand the characteristics that make things measurable, as well as measurement systems and operations; and apply techniques, tools, and formulas to determine appropriate measurements.
- ◆ *Probability and Statistics*—Organize and display data using tables, pictographs, bar graphs, pie charts, and line graphs; recognize and describe approaches to organizing and displaying data that could lead to misinterpretation; use data from experiments to predict the chances of future outcomes; and formulate questions that require appropriate data collection.

Science Curriculum in Primary and Lower Secondary Grades

Jordan's three most recent major education reforms also have focused on enhancing the science curriculum. In 2003, Jordan started a comprehensive approach to improve the scope and quality of the science curriculum. In 2006, a new science curriculum was introduced for Grades 1, 4, 8, and 10. One year later, the curriculum was phased-in for all other grades.

For Grades 1–8, there is an integrated curriculum, while in Grades 9 and 10, science is taught as four separate subjects: biology, chemistry, physics, and Earth science. The expectations for students in Grades 1–8 are described as follows:⁸

- ◆ *Force and Movement*—Acquire concepts, facts, and basic principles of force and movement, and understand their relationship; use laboratory equipment and instruments to explore concepts, facts, and various scientific measurements; follow safety rules and procedures in the classroom, school, and laboratory; and use oral and written communication skills and mathematical and physical representations to describe scientific concepts related to force and movement.
- ◆ *Matter and Energy*—Acquire concepts, facts, and basic principles related to matter and energy; recognize the work of God in the universe and understand that the universe's materials have significant impacts on our lives; investigate by using the scientific method; use laboratory materials and tools to explore science principles; and follow safety rules and procedures in the laboratory, classroom, school, and home.

- ◆ *Organisms and their Environments*—Show an understanding of the characteristics of living organisms and their needs, life cycles, and relationships with each other and their environments; and demonstrate knowledge and skills necessary to understand the nature of the human body and to maintain one’s health.
- ◆ *Meteorology*—Understand the components and characteristics of the atmosphere and its interaction with the Earth’s surface.
- ◆ *Terrestrial Materials*—Understand the components and characteristics of land and water systems, their interactions, and human impact on them.
- ◆ *Astronomy*—Understand the components of the universe, its characteristics and origin, and the physical laws governing it.
- ◆ *Earth’s History*—Describe Earth’s changes over time.
- ◆ *Geological Processes*—Understand geological processes and their role in the formation of topographic features and geological phenomena.
- ◆ *Oceans*—Understand that the oceans are a complex, dynamic system in which interactions occur among natural systems, minerals, and weather.

Instruction for Mathematics and Science in Primary and Lower Secondary Grades

For Grades 1–10, mathematics constitutes 15 percent of total instructional time. Students study mathematics five periods per week, with each period lasting 45 minutes. In each grade, 10 to 19 percent of total instructional time is allocated to science. Students receive science instruction three to five periods per week in Grades 1–8, and seven periods per week in Grades 9 and 10. Also, in Grades 9 and 10, physics, chemistry, and biology are allocated two periods per week, and Earth science is allocated one period per week.

Instructional Materials, Equipment, and Laboratories

The ministry provides regularly updated lists of equipment and laboratory tools required by the school curriculum. Some tools and pieces of equipment are purchased from external suppliers while others are produced locally. The materials and equipment are distributed to schools, and the ministry receives feedback with respect to modifying and updating school laboratories. Because the ministry emphasizes decentralization, schools allocate a portion of their budgets to purchasing some materials and equipment.

For all students in Grades 7–12, schools have quality materials and equipment to support instruction. Age-appropriate curriculum materials and equipment are used to implement effective teaching. An inventory review of all equipment is performed on a regular basis to ensure that materials remain up-to-date and that equipment and tools are in good condition.

Use of Technology

In a knowledge economy, the ability to use information and communication technology (ICT) is essential. In Jordanian education, ICT has become one of the most important tools for acquiring information, communicating with others, and developing new ideas.

Many schools in Jordan have high-speed Internet access, and students and teachers are able to take advantage of the technology in a variety of ways applicable to many subjects (e.g., English, Arabic, mathematics, science, and civics). Examples of using technology as a learning tool in Jordanian schools include the following:

- ◆ Using online material available for students and teachers at the ministry portal (e.g., science, mathematics, ICT, and English);
- ◆ Accessing information on the Internet;
- ◆ Creating graphs from data;
- ◆ Using educational software;
- ◆ Developing multimedia presentations; and
- ◆ Searching for references on a CD-ROM encyclopedia.

In addition, many professional development programs for teachers, supervisors, and senior administrators focus on using technology, such as the International Computer Driving License, Intel’s Teach to the Future, and WordLinks. The Intel and WordLinks programs train and encourage teachers to employ project-based learning.

To support the needs of a variety of learning styles, the ministry has developed Knowledge Centers, or innovative school libraries, to enhance the student-centered approach to learning. The ministry has provided financial support to create these centers within schools, which offer a pleasant and welcoming environment for both students and teachers. Specifically, these centers have seating and study spaces for students as well as open access shelving

for books, newspapers, magazines, audio and video tapes, CDs, DVDs, and computer software.

Grade at Which Specialist Teachers for Mathematics and Science are Introduced

Starting from fourth grade, students are taught by specialist teachers in mathematics and science. At minimum, teachers should hold a bachelor's degree to instruct any subject which includes mathematics or science.

Homework Policies

Teachers usually give students homework at the end of each lesson, especially in mathematics and science courses. They usually start the next lesson by checking the assignment and giving students feedback. Some teachers score homework assignments and include homework as a component of student assessment. Teacher guides explicitly include homework assignments. In mathematics and science, homework assignments often take the form of problem sets, written reports, projects, or research on an assigned subject for discussion during the next lesson.

Teachers and Teacher Education

Teacher Education Specific to Mathematics and Science

The Ministry of Education in Jordan recognizes that improving the quality of education is a priority for the nation's development and therefore an ultimate goal to be achieved. Important tools in achieving this goal include developing the quality of teacher education through progressive reform of education policies and strategies, and improving teacher training.

Decision-makers in the ministry believe that the Jordanian education system must prepare and qualify young people to be critical thinkers who acquire life skills in a changing world.⁹ Thus, an urgent need of the Jordanian education system is to have highly qualified, competent teachers. The ministry has responded to this requirement by implementing the Education Reform for the Knowledge Economy (ERfKE) in two phases: ERfKE I in 2003–2009, and ERfKE II in 2010–2015. Key components in this reform are improved professional development and education, and improved learning resources.

The minimum requirement to be a teacher in Jordan is completing a bachelor's degree. Some of the specific requirements to teach mathematics and science include the following:

- ◆ Completion of a specific pre-service program for mathematics and science teachers;
- ◆ Teacher professional development, which is now a component considered during teacher certification; and
- ◆ Closer coordination with schools of education, to satisfy the requirements of the Ministry of Education for preparing competent mathematics and science teachers.

The efforts of the Ministry of Education Directorate of Training, Qualification, and Supervision concentrate on providing information to foster areas of strength and minimize areas of weakness in teachers. The directorate's ultimate goal is to help Jordanian students become innovative thinkers who can build their local community and participate in the development of the international community.

Requirements for Ongoing Professional Development

Through the implementation of the Education Reform for the Knowledge Economy project, teacher competencies are being developed, and a comprehensive teacher professional development plan is being prepared.

Monitoring Student Progress in Mathematics and Science

Assessment policies have been updated to ensure that classroom assessment practices conform with the Education Reform for the Knowledge Economy project, which places the student at the center of the learning process and focuses on each student's development as a responsible person and citizen within the knowledge economy. A set of assessment strategies and tools have been developed to monitor individual student progress, including performance-based assessment, observation, communication, reflection, checklists, rubrics, and learning logs. These are used to inform and generate grades, which are recorded along with grades collected from paper-and-pencil tests. New report cards have been designed to facilitate the new reporting system that focuses on basic skills and general learning competencies. Parents also receive supplemental information regarding their child's learning progress that may help them for future planning.¹⁰

According to regulations issued by the Directorate of Examinations and Tests, students in Grades 1–3 are promoted automatically unless a student earns less than 40 percent in mathematics and the Arabic language. Students in Grades 4–10 are promoted automatically as well, unless a student fails in four subjects. If a student fails in three subjects, he or she must pass a make-up examination with a score of at least 50 percent. However, students are promoted even upon failing the make-up examination after two retentions during basic education (Grades 1–10). Acceleration of students is possible after careful assessment, special tests, and interviews to ensure student capability. However, acceleration may not exceed two grades. In secondary education, promotion and retention is course-based, and students may take any individual test more than once to fulfill the requirements of the General Secondary Certificate Examinations.¹¹ The General Secondary Certificate Examinations are examinations for those who have finished twelve years of schooling. There are different versions—academic and vocational—which correspond to the stream completed in secondary education. High stakes are attached to these examinations because the results are used for higher education admission purposes.

Impact and Use of TIMSS

Jordan has participated in all TIMSS cycles since 1999, with the principal goals of evaluating the curriculum with reference to international benchmarks and assessing the capabilities of Jordanian students compared to their international peers.

As a direct result of participation in the TIMSS assessments, committees were formed to revise the mathematics and science curricula. Also, released TIMSS items from previous cycles (1995, 1999, 2003, and 2007) have been used in the development of new textbooks for mathematics and science.

One of the major impacts of TIMSS in Jordan has been the development of teacher guides. Student responses from TIMSS 1999, 2003, and 2007 were studied thoroughly and used to prepare teacher guides in mathematics and science. These teacher guides are currently being used in teacher education programs and appear to have had a positive effect on student achievement in science. These teacher guides include the following topics:

- ◆ Identification of student errors on the assessment, their types, and how the errors occurred;

- ◆ Suggested questions and tasks that may help students become aware of how errors occur; and
- ◆ Suggested learning strategies, such as remedial tasks, which might help students deal with errors.

TIMSS has played a vital role in the development of the Education Reform for the Knowledge Economy project. The results of TIMSS 2003 were used as a baseline for the project, and TIMSS 2007 provided a new set of data that helped measure change in student achievement. TIMSS will continue providing valid and reliable data for monitoring and evaluating reform projects across time. Lastly, the results of TIMSS have elicited a great deal of interest in Jordan from educators, policy-makers, and the media because Jordan was one of the countries in which students achieved the international average in science but below the international average in mathematics. TIMSS results also have prompted the National Center for Human Resources Development (NCHRD) to produce a series of reports related to TIMSS, including the following:¹²

- ◆ *Performance Levels of Jordanian Eighth-grade Students in Math and Science with Respect to the Availability of Educational Resources: A Comparative Study;*
- ◆ *Mathematics Teachers' Guide Manual;*
- ◆ *Science Teachers' Guide Manual;*
- ◆ *Analysis of Students' Errors in the Context of TIMSS 1999: The Case of Jordan;*
- ◆ *An Analysis of the Obstacles to Science Teaching that Affected Jordanian Students' Performance in TIMSS 1999;*
- ◆ *Comparison of Jordanian Educational Policies with High Achieving Countries: Singapore, Taiwan and Japan; and*
- ◆ *Personal and Family Factors Discriminating Between High- and Low-achieving Eighth-grade Jordanian Students in TIMSS 1999.*

Suggested Readings

Lietz, P., Wagemaker, H., Neuschmidt, O., & Hencke, J. (Eds.). (2008). *Educational issues in the Middle East North Africa region: Outcomes of the IEA Arab region training seminar series 2006/2007*. Hamburg: International Association for the Evaluation of Educational Achievement. Retrieved from http://www.iea.nl/fileadmin/user_upload/Publications/Electronic_versions/Lietz_etal_2008.pdf

Abdul-Hamid, H., Abulibdeh, K.M., & Patrinos, H.A. (2011). *Assessment testing can be used to inform policy decisions: The case of Jordan*. World Bank Policy Research Working Paper No. 5890. Washington, DC: World Bank.

Toukan, K., Al-Noaimi, T., & Odibat, A. (2006). *National education strategy*. Amman, Jordan: Ministry of Education, Directorate of Education.

References

- 1 Ministry of Education. (2006). *National education strategy*. Amman: Author.
- 2 Ministry of Education. (2003). *Education reform for the knowledge economy (ERfKE) project*. Amman: Author.
- 3 Ministry of Education. (2006). *National education strategy*. Amman: Author.
- 4 Department of Statistics. (2011). *JorInfo 1.0*. Retrieved from <http://jorinfo.dos.gov.jo/Default.aspx>
- 5 Ministry of Education. (2003). *Education reform for the knowledge economy (ERfKE) project*. Amman: Author.
- 6 Royal Hashemite Court. (n.d.). *The education reform for knowledge economy (ERfKE)*. Retrieved from http://www.kingabdullah.jo/index.php/en_US/initiatives/view/id/81.html
- 7 Ministry of Education. (2005). *النتائج العامة والخاصة للرياضيات مرحلة الاساسي والثانوي* [Outcomes for mathematics: Primary and secondary education]. Amman: Author.
- 8 Ministry of Education. (2005). *مرحلة التعليم الاساسي النتائج العامة والخاصة* [Primary education: General and special outcomes for science]. Amman: Author.
- 9 Ministry of Education. (2003). *Education reform for the knowledge economy (ERfKE) project*. Amman: Author.
- 10 Ministry of Education. (2006). *الإطار العام للتقويم والتعليم* [General framework for curriculum and evaluation]. Amman: Author.
- 11 Ibid.
- 12 National Center for Human Resources Development. (2010). *Research*. Amman: Author. Retrieved from <http://www.nchrd.gov.jo/contactus/tabid/87/language/ar-JO/Default.aspx>