UNDP
TIMSS

Achievements of Arab Countries that Participated in the Trends in International Mathematics and Science Study (**TIMSS 2003**)

Arab TIMSS Regional Office

Data in the Booklet is extracted from the IEA International Reports (**TIMSS 2003**)

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Introduction

The Trends in International Mathematics and Science Study (TIMSS 2003) is the third cycle of the international mathematics and science assessments conducted on a four-year cycle (the first cycle was conducted in 1995 and the second one in 1999). TIMSS is carried out for fourth and eighth grades and provides data about trends in mathematics and science achievement over a period of time. TIMSS assesses achievement in countries all over the world and collects a rich array of information about the educational contexts for learning mathematics and science, with TIMSS 2003 involving 50 countries.

TIMSS is a study of the International Association for the Evaluation of International Association (IEA), an independent international cooperative of national research institutions and government agencies that has been conducting studies of cross-national achievement since 1959. In carrying out the study, the TIMSS and PIRLS International Study Center works closely with the IEA Secretariat in Amsterdam, the IEA Data Processing Center in Hamburg, Statistics Canada in Ottawa, and the Educational Testing Service in Princeton, New Jersey.

TIMSS also provides data about students' achievement in relation to different types of curricula, instructional practices, and schools environments. TIMSS enables participating countries to measure student performance in both mathematics and science through participating in the international tests, while also improving educational statistics to make them more policy relevant. Accordingly, participating countries are able to regularly evaluate the outcomes of educational reforms on the education systems, and to promote quality-oriented educational reforms based on the objective evaluation and assessment of existing institutions and policies in the participating countries. Furthermore, variations across a large number of participating countries provide a unique opportunity to study different approaches to educational practices and how they can improve achievements.

Moreover, TIMSS collects a rich array of contextual information about how mathematics and science learning takes place in all countries participating in the project. TIMSS requires students, teachers, and school principals to complete questionnaires about curriculum, schools, classrooms, and instructional practices. Such a data provides policy-makers, curriculum specialists, and even researchers with a dynamic and complete picture of implementation of educational policies and practices around the world.

TIMSS 1995 study compared mathematics and science achievements of students in 41 countries, one of which is an Arab country, Kuwait, whereas, three Arab countries participated in TIMSS 1999 study, including: Morocco, Tunisia, and Jordan.

TIMSS 2003 was administered at both the fourth and eighth grades. It provided a three year cycle trends at eighth grade for the cycles (1995, 1999 and 2003), and data over two points in time at fourth grade (1995 and 2003). Ten Arab countries participated in TIMSS 2003, including: Bahrain, Egypt, Jordan, Lebanon, Morocco, Palestinian National Authority, Saudi Arabia, Syria, Tunisia, and Yemen.

Following the release of the TIMSS 2003 International Report by the IEA, the United Nations Development Programme decided to prepare a report summarizing the achievements of Arab countries in TIMSS 2003, in full coordination with the Arab countries that participated in the study. This Report entitled "Achievements of the Arab Countries that Participated in the Trends in International Mathematics and Science Study (TIMSS 2003)" aims at providing Arab decision-makers with a comprehensive analysis of the performance and achievements of their respective countries in the TIMSS 2003 study.

The Report includes the results of 10 Arab countries that participated in TIMSS 2003 study. Eight countries participated at the eighth grade level (Bahrain, Egypt, Jordan, Lebanon, Palestinian National Authority, Saudi Arabia, and Syria), while Morocco and Tunisia participated at both eighth and fourth grades, and Yemen participated only at the fourth grade level.

TIMSS Main Objectives

1) Measuring student performance and other characteristics of the educational system through routine assessments and by participating in international in-depth investigations.
2) Improving educational statistics and making them policy relevant and accurate.
3) Evaluating the Arab educational systems in the participating countries on regular basis.
4) Determining the weaknesses of the Arab educational systems.
5) Ranking participating countries around an international average and key benchmarks.
6) Assisting Arab participating countries in synchronizing their educational policies and educational systems.
7) Acquiring a cadre of educators, administrators and researchers trained in sampling, data collection, test development, data cleaning, analysis, policy-making and reporting.

TIMSS Instruments

TIMSS 2003 study adopted a number of educational instruments in order to collect the required information and achieve TIMSS objectives. These tools include average achievement assessments, and surveys. Developing the TIMSS tests for 2003 was a cooperative venture involving all national research coordinators during the entire process.

In designing the tests, a group of item blocks were adopted. Fourteen blocks in mathematics as well as 14 blocks in science were developed. These items blocks were distributed among the tests booklets which reached 12 test booklets in mathematics and science. Moreover, these tests were developed. Tests were developed in a scientific way in line with the educational reform theories and tests development. The first version of the tests was experimented on a sample of students in most of the countries participating in the study. The final version of the test was developed based on the outcomes of the sample. Consequently, each country translated the tests from the English language to the language of the country (i.e., the language in which these subjects are taught). In the translation process, "cultural adaptation" was taken into consideration.

The key tools used in the study are: the student questionnaire; teacher questionnaire; school questionnaire; curriculum questionnaire; and tests booklets for mathematics and science.

TIMSS 2003 Study

Students targeted in TIMSS 2003 study were categorized as follows: (a) a sample of fourth grade students (average age is 9 years); and (b) a sample of eighth grade students (average age is 13 years).

The following table summarizes the sample of Arab countries that participated in TIMSS 2003 study at eighth grade level:

Number of Students	Number of Schools	Average Age of Students Sample	Country
Bahrain	14.1	67	4199
Egypt	14.4	217	7095
Jordan	13.9	140	4489
Lebanon	14.6	152	3814
Morocco	15.2	131	2943
Palestinian National Authority	14.1	145	5357
Saudi Arabia	14.1	155	4295
Syria	14.0	134	4895
Tunisia	14.8	150	4931

The following table summarizes the sample of Arab countries that participated in TIMSS 2003 study at fourth grade level:

Country	Average Age of Students Sample	Number of Schools	Number of Students
Morocco	11.0	197	4264
Tunisia	10.4	150	4334
Yemen	11.0	150	4205

Content Areas in Mathematics Assessments

The content areas in grade eight assessment are number, algebra, measurement, geometry, and data, whereas, the content areas in the fourth grade assessment are number, patterns and relationships, measurements, geometry, and data.

Content Areas in Science Assessments

The content areas in grade eight assessment are life science, physics, chemistry, earth science, environmental science, whereas, the content areas in the fourth grade assessment are life science, physical science, and earth science.

Student Achievement in Mathematics

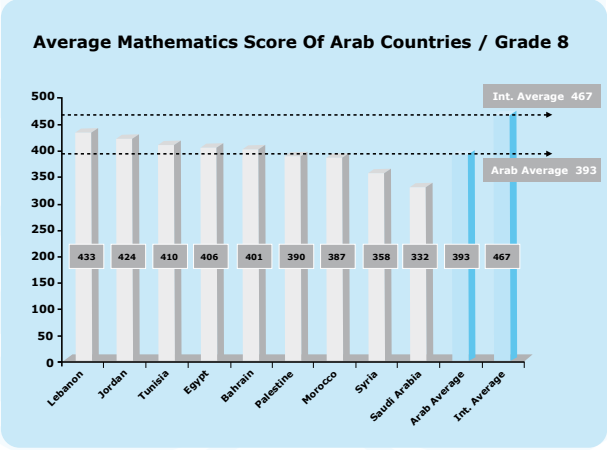
The international average of 467 in mathematics at eighth grade level was obtained by averaging across the mean scores for each of the 46 participating countries. As for the Arab average, a score of 393 was obtained, which is lower than the international average by 74 points.

The following table summarizes the achievement of Arab countries in mathematics at eighth grade level:

Average Achievement of Arab Students in Mathematics/Grade 8

Country	Average
Lebanon	433 (3.1)
Jordan	424 (4.1)
Tunisia	410 (2.2)
Egypt	406 (3.5)
Bahrain	401 (1.7)
Palestinian National Authority	390 (3.1)
Morocco	387 (2.5)
Syria	358 (3.7)
Saudi Arabia	332 (4.6)
Arab Average	393 (1.1)
International Average	467 (0.5)

( ) standard errtors appear in parentheses



Twenty six countries, of which 3 are Arab countries (Morocco, Tunisia and Yemen) participated in TIMSS 2003 study at fourth grade level, and an international average of 495 was obtained. The achievement average was calculated based on 25 countries, as Yemen's data was excluded since Yemen failed to implement the study accurately, particularly in relation to the study sample and low number of students covered in the study. Out of the 26 countries, Morocco ranked 24th, Tunisia ranked 25th, whereas

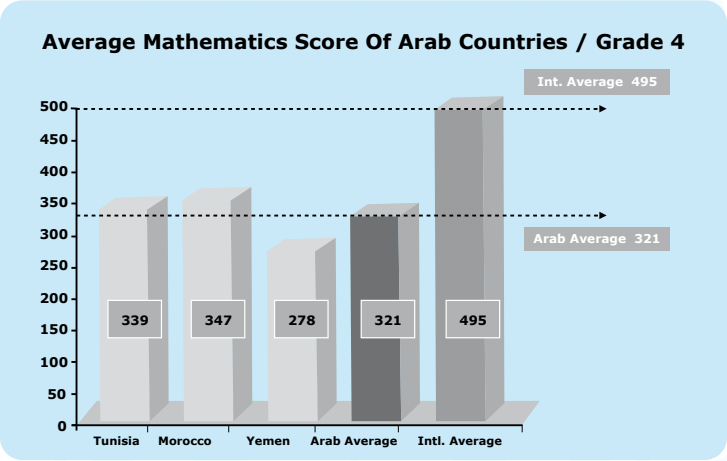
Yemen ranked 26th. The countries that ranked the first three were Singapore, Hong Kong, and Japan with an average of 594, 575, and 565, respectively.

The following table summarizes the achievement of Arab countries in mathematics at fourth grade level:

Average Achievement of Arab Students in Mathematics/Grade 4

Country	Average
Morocco	347 (5.1)
Tunisia Tunisia	339 (4.7)
Yemen	278 (7.4)
Arab Average	321 (3.4)
International Average	495 (0.8)

( ) standard errors appear in parentheses



Average Mathematics Achievement by Gender for Eighth Grade

Boys average achievement in mathematics for eighth grade differed from girls average achievement in the Arab countries that participated in TIMSS 2003. Girls outperformed boys in Bahrain and Jordan. In contrast, boys obtained better results in Lebanon, Tunisia and Morocco, whereas, similar achievements were obtained in Egypt, Syria, Palestinian National Authority, and Saudi Arabia.

Average Mathematics Achievement by Gender/Grade 8

Country	Boys	Girls	Absolute Difference
Egypt	406	407	1
Syria	355	352	3
Palestinian National Authority	386	394	8
Lebanon	439	429	10 ▼
Saudi Arabia	336	326	10
Morocco	393	381	12 ▼
Tunisia	423	399	24 ▼
Jordan	411	438	27 ▲
Bahrain	385	417	33 ▲
Arab Average	393	394	1
International Average	466	467	1

▼ Girls outperformed boys
▲ Boys outperformed girls

Average Mathematics Achievement by Gender for Fourth Grade

When comparing boys and girls achievement in mathematics for fourth grade for countries that participated in TIMSS 2003, boys outperformed girls in Morocco and Yemen, whereas girls obtained higher achievement in Tunisia.

Average Mathematics Achievement by Gender/Grade 4

Country	Girls	Boys	Absolute Difference
Morocco	344	350	6
Tunisia	342	337	5
Yemen	275	282	7
Arab Average	320	323	3
International Average	495	496	1

Performance at International Benchmarks

The TIMSS mathematics achievement scale summarizes student performance on test items designed to measure a wide range of student knowledge and proficiency. In order to provide meaningful descriptions of what performance on the scale could mean in terms of the mathematics that students know and can do, TIMSS identified four points on the scale for use as international benchmarks. Accordingly, TIMSS identified four benchmarks – the advanced benchmark is 625, the high benchmark is 550, the intermediate benchmark is 475, and the low benchmark is 400.

At the eighth grade level, performance ranged from using relatively complex algebraic and geometric concepts and relationships at the advanced benchmark to having some basic Mhematical knowledge at the low benchmark. At the fourth grade level, students at

the advanced benchmark showed the ability to solve a variety of problems whereas those at the low benchmark demonstrated an understanding of whole numbers, the properties of basic geometric shapes, and how to read simple test graphs.

At both the eighth and fourth grades, the analysis of performance at these benchmarks in mathematics suggests that three primary factors appeared to differentiate performance among the four levels: (i) the mathematical operation required; (ii) the complexity of the numbers of number system; and (iii) the nature of the problem situation. For example, there is evidence that students performing at the lower end of the scale could add, subtract, and multiply whole numbers. In contrast, students performing at the higher end of the scale solved non-routine problems involving relationships among fractions, decimals, and percents; various geometric properties; and algebraic rules.

TIMSS 2003 International Benchmarks of Mathematics Achievement

Grade 8	Grade 4
Advanced International Benchmark-625	
Students can organize information make generalizations, solve non-routine problems, and draw and justify conclusions from data. They can compute percent change and apply their knowledge of numeric and algebraic concepts and relationships to solve problems. Students can solve simultaneous linear equations and model simple situations algebraically. Students can apply their knowledge of measurement and geometry in complex problem situations. They can interpret data from a variety of tables and graphs, including interpolation and extrapolation.	Students can apply their understanding and knowledge in a wide variety of relatively complex situations. They demonstrate a developing understanding of fractions and decimals and the relationship between them. They can select appropriate information to solve multi-step word problems involving proportions. They can formulate or select a rule for a relationship. They show understanding of area and can use measurement concepts to solve a variety of problems. Students show some understanding of rotation. They can organize, interpret, and represent data to solve problems.
High International Benchmark-550	
Students can apply their understanding and knowledge in a wide variety of relatively complex situations. They can order, relate, and compute with fractions and decimals to solve word problems, operate with negative integers, and solve multi-step word problems involving evaluating expressions, solving simultaneous linear equations, using a formula to determine the value of variable. Students can find areas and volumes of simple geometric shapes and use knowledge of geometric properties to solve problems. They can solve problems and interpret data in a variety of graphs and tables.	Students can apply their knowledge and understanding to solve problems. Students can solve multi-step word problems involving addition, multiplication, and division. They can use their understanding of place value and simple fractions to solve problems. They can identify a number sentence that represents situations. Students show understanding of three-dimensional objects, how shapes can make other shapes, and simple transformation in a plane. They can demonstrate a variety of measurement skills and can interpret and use data in tables and graphs to solve problems.
Intermediate International Benchmark-475	
Students can apply basic mathematics knowledge in straightforward situations. They can add, subtract, or multiply to solve one-step word problems involving whole numbers and decimals. They can identify representations of common fractions and relative sizes of fractions. They demonstrate understanding of properties of triangles and basic geometric concepts including symmetry and rotation. They recognize basic notions of probability. Students can read and interpret graph, tables, maps, and scales.	Students can apply basic mathematical knowledge in straightforward situations. Students can read, interpret, and use different representations of numbers. They can perform operations with three and four digit numbers and decimals. They can extend simple patterns and are familiar with a range of two-dimensional shapes and read and interpret different representations of the same data.
Low International Benchmark-400	
Students have some basic mathematical knowledge.	Students have some basic mathematical knowledge. Students have some basic mathematical knowledge. Students can demonstrate an understanding of whole numbers and can do simple computations with them. They demonstrate familiarity with the basic properties of triangles and rectangles. They can read information from simple bar graphs.

Percentages of Students Reaching International Benchmarks of Mathematics Achievement at Grades Four and Eight

Percentages of Arab students that achieved performance benchmarks are lower than the international average. The table below shows that the percentage of students reaching intermediate and low benchmarks is low; at the intermediate level, Jordan obtained the highest percentage of 30%, whereas, Saudi Arabia obtained the lowest percentage reaching 3%. As for the performance at the low benchmark, the highest percentage was for Lebanon at 68%, whereas the lowest was 19% for Saudi Arabia.

The results of eighth grade in mathematics showed that only a small percentage (less than 1%) of Arab students reached advanced benchmark achievement (as in Jordan and Egypt), as for the high benchmark achievement, the highest percentage was obtained by Jordanian students at 8% while Saudi students obtained 0%.

Percentages of Students Reaching TIMSS International Benchmarks in Mathematics/Grade 8

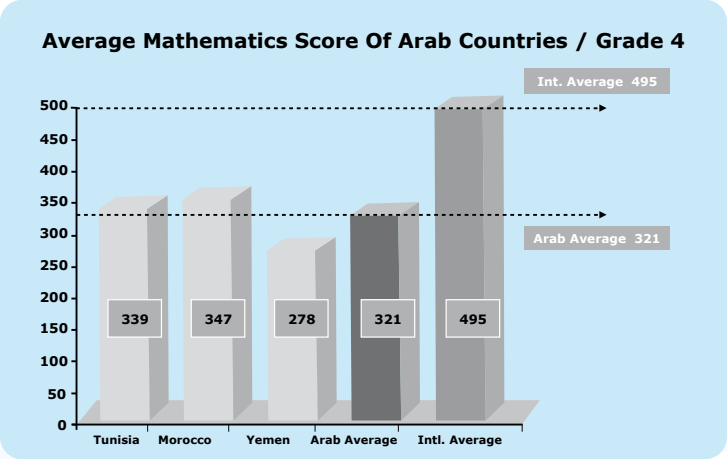
Country	Advanced (625)	High (550)	Intermediate (475)	Low (400)
Egypt	1	6	24	52
Bahrain	0	2	17	51
Lebanon	0	4	27	68
Saudi Arabia	0	0	3	19
Morocco	0	1	10	42
Tunisia	0	1	15	55
Palestine National Authority	0	4	19	46
Jordan	1	8	30	60
Syria	0	1	7	29
Arab Average	0	3	17	55
International Average	7	23	49	74

At fourth grade, only three Arab countries participated; Tunisia, Morocco, and Yemen. The results in mathematics were worse than the ones achieved at the eighth grade level. Concerning the performance at the international benchmark, the results were worse than ones achieved for eighth grade, as 76% of Arab students did not reach low benchmark compared to 18% at the international average.

The following table summarizes the percentages of students reaching the international benchmarks of mathematics achievement at fourth grade level:

Percentages of Students Reaching TIMSS International Benchmarks in Mathematics/Grade 4

Country	Advanced (625)	High (550)	Intermediate (475)	Low (400)
Tunisia	0	1	9	28
Morocco	0	1	8	29
Yemen	0	1	5	15
Arab Average	0	1	7	24
International Average	9	33	63	82



Variables related to the Achievement in Mathematics

Achievement scores in mathematics were linked to a number of variables related to student, teacher, school, curriculum, classroom, number of students in one class, school environment and security at school, social and economic background of the student and his family, in addition to teaching methods. All these variables assisted in analyzing the results of the study and identifying the weaknesses that assisted in formulating recommendations, which will help policy makers in the education sector to improve and reform the education sector, curriculum, and teaching methodologies.

Educational Resources that Students have in their Homes

TIMSS 2003 study focused on educational resources that students have in their homes. These resources include: (i) level of parental education; (ii) students' aspirations relative to parents' educational level; (iii) speaking the language of test at home; (iv) books in

the home; (v) computer and study desk/table in the home; and (vi) use of computer at home and at school.

TIMSS assessment has shown that in almost every country students from homes with extensive educational resources have higher achievement in mathematics than those with less advantaged backgrounds. Because for most children, parents are their first and probably most important educators, the level of education of the parents may be the most important educational resource in the home.

The study divided the level of parental education into five categories: finished university, finished post-secondary education but not university, finished upper secondary, finished lower secondary, and finished no more than primary.

Higher levels of parents' education are associated with higher eighth grade student achievement in mathematics in most of the Arab countries that participated in TIMSS 2003 study. The following table shows the levels of parental education and the students' achievement in mathematics for eighth grade:

Levels of Parental Education and the Students' Achievement in Mathematics/ Grade 8

Country	University Degree or more		Post Secondary Education		High School Diploma		Secondary Education		Primary Education or Less	
	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement
Bahrain	33	427	7	410	23	409	20	387	17	385
Egypt	24	464	0	--	11	433	29	398	36	387
Jordan	35	458	15	439	30	419	12	403	8	377
Lebanon	19	465	21	448	19	436	15	418	26	405
Morocco*	16	406	0	--	17	398	17	372	50	385
Palestinian National Authority	27	426	12	401	36	396	18	368	6	339
Saudi Arabia	27	363	0	--	12	339	19	322	41	320
Tunisia	11	437	12	437	16	419	17	406	44	397
Arab Average	24	431	8	427	21	406	18	384	29	374
Inter. Average	28	503	17	480	28	463	15	434	12	410

*Data are available for at least 70% but less than 85% of the students

Moreover, the study showed that students from homes with extensive literacy resources have higher achievement than those from less advantaged backgrounds. In addition to literacy resources such as books, TIMSS found that having study aids such as a computer or a study desk or table at home was associated with higher student achievement.

On average, internationally, about 60% of eighth-grade students reported having a computer at home, and a slightly greater percentage of fourth-grade students at 65%. The mathematics achievement difference between students with a computer at home and those without was substantial on average – 39 scale score points at eighth grade and 27 points at fourth grade. Greater percentages of students reported having a study desk or table at home; 83% and 80% at eighth and fourth grades, respectively. Having such a study facility was associated with higher average mathematics achievement at both grades – a 35 point difference at eighth grade and a 27 point difference at fourth grade.

The percentage of Arab students that have desks fluctuated from one country to another; from 80% for Bahrain and Egypt to 61% for Saudi Arabia at the eighth grade level, and between 64% for Tunisia and 52% for Morocco. Still, these percentages are lower than the percentages achieved at the international average, 83% and 80% for eighth and fourth grades, respectively. As for the availability of computers, the study showed that most of the Arab countries do not have computers; the percentage of students who have computers did not exceed 50%, except in three countries (Bahrain 81%, Lebanon 59%, and Saudi Arabia 57%). Still, these percentages are lower than the international average of 60%.

The following table shows the percentage of eighth grade students in each country that has a computer or study desk or table, together with their mathematics achievement:

Computer and Study Desk (Table) in the Home/Grade 8

Country	Have Computer		Do Not Have Computer		Have Study Desk/Table		Do Not Have Study Desk/ Table	
	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement
Bahrain	81	407	19	379	80	407	20	382
Egypt	16	443	84	403	80	423	20	360
Jordan	41	454	59	407	73	435	27	400
Lebanon	59	444	41	419	71	440	29	418
Morocco	18	391	82	388	73	392	27	379
Palestinian National Authority	41	409	59	380	77	396	23	377
Saudi Arabia	57	342	43	320	61	341	39	321
Tunisia	22	432	78	404	73	415	27	398
Arab Average	42	415	58	388	74	406	27	379
Inter. Average	60	479	40	440	83	473	17	438

The following table shows the percentage of fourth grade students in each country that has a computer or study desk or table at home, together with their mathematics achievement:

Computer and Study Desk (Table) in the Home/Grade 4

Country	Have Computer		Do Not Have Computer		Have Study Desk/Table		Do Not Have Study Desk/ Table	
	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement
Morocco	20	354	80	352	52	361	48	344
Tunisia	26	365	74	336	64	357	36	325
Arab Average	23	360	77	344	58	359	42	335
Inter. Average	65	505	35	478	80	502	20	476

Having a computer at home does not necessarily mean that students have access to it, TIMSS also asked students where they actually use a computer at home, at school, or some other place. Results showed that the use of computers by fourth grade students is weak compared to the international level, as for eighth grade students, results showed that students, on average, reported using a computer at school.

At eighth grade, 23% of students on average, across countries reported using a computer both at home and school. Twenty-two percent reported using a computer at home but not at school, 26% using one at school but not at home, and 14% at some other place. Whereas, 15% of grade eight students reported that the do not use a computer at all.

The following table summarizes the responses of eighth grade students that reported using a computer at both home and school:

Use of Computer/Grade 8

Country	Use Computer at both Home and School		Use of Computer at Home Only		Use of Computer at School Only		Use of Computer Only at Places other than School and Home		Do not use Computer at all	
	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement
Lebanon	39	459	16	416	21	426	14	408	10	417
Jordan	35	449	10	429	43	413	7	393	4	412
Bahrain	31	418	45	403	8	383	10	377	6	379
Palestinian National Authority	26	398	18	410	33	378	13	379	10	397
Egypt	18	419	5	393	62	403	8	393	7	437
Morocco	15	375	17	386	21	388	28	393	20	393
Saudi Arabia	12	360	46	339	5	332	12	311	25	321
Tunisia	5	422	20	430	16	408	23	413	36	399
Arab Average	23	413	22	401	26	391	14	383	15	394
Inter. Average	39	485	18	470	19	441	10	422	14	420

At fourth grade, 12% of students on average reported using a computer both at home and school. Twenty-five percent reported using a computer at home but not at school, 7% using one at school but not at home, and 15% at some other place. Whereas, 42% of grade four students reported that they do not use a computer at all. The following table summarizes the responses of fourth grade students that reported using a computer at both home and school:

Use of Computer/Grade 4

Country	Use Computer at both Home and School		Use of Computer at Home Only		Use of Computer at School Only		Use of Computer Only at Places other than School and Home		Do not use Computer at all	
	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement
Morocco	16	339	25	355	7	336	15	353	37	353
Tunisia	7	331	24	364	7	326	15	376	46	323
Arab Average	12	335	25	360	7	331	15	365	42	338
Inter. Average	43	505	20	497	11	481	9	460	18	470

How Much of Their Out-of-School Time Do Students Spend on Homework During the School Week?

TIMSS study also looked at the time (out-of-school time) students spend on homework during the school week, as one of the major ways that students can consolidate and extend classroom learning is to spend time out of school studying or doing homework in school subjects. Homework assignments can reinforce classroom learning, and, by providing a challenge, can encourage students to extend their understanding of the subject matter. Homework also provides students who are having trouble keeping up with their classmates an opportunity to review material taught in class.

To summarize the amount of time usually devoted to mathematics homework in each country, TIMSS constructed an index of the time students spend doing mathematics homework that assigns students to a high, medium, or low level on the basis of the frequency and the amount of mathematics homework they are assigned each week. Students at the high level reported that they were assigned more than 30 minutes of mathematics homework at least 34- times per week. Students at the low level were reportedly assigned not more than 30 minutes of mathematics homework twice per week. The middle level included all other response combinations.

At the eighth grade level, results indicated that 28% of students are in the high level category compared to the international average of 26%, while 59% and 12% are at the medium and low level categories, respectively, compared to the international average of 54% and 19%, respectively. On the other hand, at the fourth grade, results indicated that 33% of students are in the high level category compared to the international average of 26%, while 54% and 24% are at the medium and low level categories, respectively, compared to the international average of 56% and 26%, respectively.

How Confident are Students in their Ability to Learn Mathematics?

TIMSS created an index of students' self-confidence in learning mathematics in order to investigate how students think of their abilities in mathematics. This index is based onstudents responses to four statements about their mathematics ability (I usually do well in mathematics; mathematics is more difficult for me than for many of my classmates; mathematics is not of my strengths; and I learn things quickly in mathematics). Accordingly, students who agreed a little or agreed a lot with all four statements, on average, were assigned to the high level of the index, while students who disagreed a little or disagreed a lot with all four, on average, were assigned to the low level. The medium level includes all other possible combinations of responses.

On average, internationally, 40% of students had high self-confidence in learning mathematics at the eighth grade level compared to 22% who showed low self-confidence. At the fourth grade level, 55% of students had high self-confidence in learning mathematics in comparison with 11% who showed low self-confidence.

As for the Arab average, the percentage of students in the high level category exceeded the international reached 45% compared to 15% who showed low self-confidence at the eighth grade level. At the fourth grade level, 55% of students had high self-confidence in learning mathematics in comparison with 7% who showed low self-confidence.

The Mathematics Curriculum

How Much Instructional Time is intended for Mathematics?

Many countries designate in their intended curriculum the percentage of total instructional time that should be devoted to mathematics as well as other subjects at different grade levels. The percentage of instructional time designated for mathematics in the intended curriculum for grades 2, 4, 6, and 8 for the Arab countries is shown in the following table:

Percentage of Instructional Time designated for Mathematics for Grades Two, Four, Six, and Eight

Country	Grade Two	Grade Four	Grade Six	Grade Eight
Bahrain	--	16	16	16
Egypt	--	20	18	18
Jordan	20	18	15	12
Lebanon	--	17	17	15
Morocco	17	15	15	15
Palestinian National Authority	17	17	15	15
Saudi Arabia	14	16	16	12
Syria	--	15	15	12
Tunisia	10	15	15	17
Yemen	17.3	--	--	--

Extent to which the National Curriculum include TIMSS Mathematics Topics

TIMSS study adopted a number of concepts and methodologies related to mathematics that were the basis for preparing the tests including the following topics: numbers, algebra, measurement, geometry, and data for grade eight, and number, patterns and relationships, measurements, geometry, and data for grade four. Results indicated that there is a positive correlation between the extent to which the national curriculum include TIMSS mathematics assessment topics and the average achievements of students in these topics.

On average, internationally, across participants at the eighth grade, 70% of the assessment topics were intended for all or almost all students and a further 6% for only the more able students. In only six countries were less than half of the topics included in the eighth grade curriculum, of which are two Arab countries (Lebanon and Tunisia). At the fourth grade level, 59% of the TIMSS 2003 mathematics topics were included in the intended curriculum for all or almost all students, and a further 9% for only the more able students.

Teachers of Mathematics

What are the Requirements for Being a Mathematics Teacher?

The study identified a number of variables related to mathematics teachers in the participating countries and set the qualifications that each teacher should have in order to teach mathematics. The following tables present the country-level responses about the requirements for being certified or licensed to teach mathematics at the eighth and fourth grades. Countries were asked about five requirements, including supervised practical experience (practicum), passing an examination, obtaining a university degree, completion of a probationary period, and completion of an induction program.

Requirements for Being a Mathematics Teacher/Grade 8

Country	Pre-Practicum & Supervised Practicum	Passing and Examination	University Degree or Equivalent	Completion of a Probationary Teaching Period	Completion of an Induction Program
Bahrain	●	●	●	●	○
Egypt	○	○	●	○	○
Jordan	○	○	●	○	○
Lebanon	○	●	○	○	●
Morocco	○	●	○	○	○
Palestinian National Authority	○	○	●	○	○
Saudi Arabia	●	●	●	●	●
Tunisia	●	●	○	●	○
Syria	●	●	●	○	○

● *Country reported Yes for the particular option*

○ *Country reported No for the particular option*

Requirements for Being a Mathematics Teacher/Grade 4

Country	Pre-Practicum & Supervised Practicum	Passing and Examination	University Degree or Equivalent	Completion of a Probationary Teaching Period	Completion of an Induction Program
Morocco	○	●	○	●	●
Tunisia	●	●	○	●	○
Yemen	●	○	○	●	●

● *Country reported Yes for the particular option*
○ *Country reported No for the particular option*

Characteristics of Mathematics Teachers

TIMSS looked at the characteristics of mathematics teachers at both the eighth and fourth grades, including their gender, age, certification status, and number of years of teaching experience. On the international average, results indicated that larger percentages of students were taught mathematics by female teachers than male teachers, particularly at the fourth grade. At the eighth grade, on average, 37% of the students were taught mathematics by females and 63% by males in the Arab countries that participated in the study, whereas, at the fourth grade, on average, 41% of the students were taught by females and 59% by males.

The study also showed that, in general, the mathematics teaching force around the world and in the Arab countries is quite experienced. Mathematics teachers reported 14 years of experience and 17 years of experience at both the eighth and fourth grades, respectively. Given their years of teaching experience, it follows that the majority of the eighth-grade and the fourth-grade students were taught mathematics by teachers in their 30s and 40s. The following tables show mathematics teachers' gender, age, certification and number of years of teaching at both the eighth and fourth grade levels:

Mathematics Teachers' Gender, Age, Certification and Number of Years of Teaching/Grade 8

Country	Percentage of Students by Teachers Characteristics							
	Gender		Age				Have Full Certificate	Number of Years of Teaching
	Female	Male	29 years or under	30-39 years	40-49 years	50 years or older		
Bahrain	50	50	36	44	17	3	84	11
Egypt	14	86	11	56	31	1	99	14
Jordan	49	51	31	47	19	3	76	11
Lebanon	46	54	22	31	29	18	51	15
Morocco	15	85	8	21	60	11	100	--
Palestinian National Authority	49	51	41	29	27	3	70	10
Saudi Arabia	42	58	43	38	14	5	96	10
Tunisia	32	68	23	42	23	12	91	12
Arab Average	37	63	27	39	28	7	83	14
Inter. Average	58	42	17	30	30	23	88	16

-- *Data are available for less than 50% of the students*

Mathematics Teachers' Gender, Age, Certification and Number of Years of Teaching/Grade 4

Country	Percentage of Students by Teachers Characteristics							
	Gender		Age				Have Full Certificate	Number of Years of Teaching
	Female	Male	29 years or under	30-39 years	40-49 years	50 years or older		
Morocco	36	64	24	20	47	9	96	15
Tunisia	46	54	11	46	24	19	21	18
Arab Average	41	59	18	33	36	14	59	17
Inter. Average	80	20	19	31	29	21	85	16

What Preparation Do Teachers Have for Teaching Mathematics?

Highest Educational Level of Mathematics Teachers

Mathematics teachers were categorized according to their academic qualifications: (a) the first category includes the teachers who have a postgraduate degree (second university degree); (b) second category includes teachers who finished university or equivalent; (c) the third category includes teachers who finished post secondary education but not university; (d) the fourth category includes teachers who have finished upper secondary schooling; and (e) the fifth category includes teachers who did not complete upper secondary schooling.

The following tables present teacher's highest level of education. On the international level, even through the percentages were somewhat higher at the eighth grade than the fourth grade, approximately two-thirds of the eighth and fourth grade students were taught mathematics by teachers having at least a university degree or equivalent. At eighth grade, internationally, 59% of the students were taught by teachers with a university degree and 17% by teachers who had coursework beyond the initial university degree. At the fourth grade, 52% of the students were taught by teachers with a university degree and another 13% by teachers with coursework beyond that degree.

As for the Arab countries that participated in the study at the eighth grade level, most of the mathematics teachers are concentrated in the second category, i.e., those who finished a university degree or equivalent. On the contrary, at the fourth grade level, most of the mathematics teachers finished only upper secondary schooling.

Highest Educational Level of Mathematics Teachers/Grade 8

Country	Percentage of Students by their Teachers' Educational Level				
	Beyond Initial University Degree	Finished University or Equivalent	Finished Post Secondary Education but not University	Finished Upper Secondary Schooling	Did not Complete Upper Secondary Schooling
Bahrain	6	84	9	0	0
Egypt	1	99	0	0	0
Jordan	7	72	21	0	0
Lebanon	--	--	--	--	--
Morocco	2	5	7	72	13
Palestinian National Authority	7	78	15	0	0
Saudi Arabia	6	84	9	0	0
Tunisia	61	32	2	5	0
Arab Average	14	65	9	11	2
International Average	17	59	20	4	0

Highest Educational Level of Mathematics Teachers/Grade 4

Country	Percentage of Students by their Teachers' Educational Level				
	Beyond Initial University Degree	**Finished University or Equivalent**	**Finished Post Secondary Education but not University**	**Finished Upper Secondary Schooling**	**Did not Complete Upper Secondary Schooling**
Morocco	1	23	4	54	18
Tunisia	2	7	43	48	1
Arab Average	2	15	22	51	10
Inter.Average	13	52	22	11	1

Preparation to teach Mathematics

The study also looked at teachers' major area or areas of study during their postsecondary education (education-mathematics, mathematics, education-science, science, education-general, or others). For the Arab countries, at the eighth grade, on average, the majority of the teachers studied mathematics (72%) and mathematics education (57%). As for the fourth grade, data was only available for Tunisia, which indicates that 67% of teachers have primary/elementary education without a major or specialization in mathematics or science.

Professional Development Opportunities for Teachers in Mathematics and Science

The following table presents schools' reports about the opportunities provided to teachers in five major areas: supporting implementation of the official curriculum, supporting school-level goals, improving content knowledge, improving technical skills, and using technology. Within each area, schools reported the frequency of teachers' involvement.

Professional Development Opportunities for Teachers in Mathematics and Science/Grade 8

Country	Percentage of Students by their School's Report of Teachers' Involvement in Professional Development Opportunities in Mathematics and Science														
	Supporting Implementation of National or Regional Curriculum			Designing or Supporting the School's own Improvement Goals			Improving the Content of Knowledge			Improving Technical Skills			Using Information & Communications Technology for Educational Purposes		
	3 times or more a year	12- times a year	never	3 times or more a year	12- times a year	never	3 times or more a year	12- times a year	never	3 times or more a year	12- times a year	never	3 times or more a year	12- times a year	never
Bahrain	60	23	16	66	19	16	67	26	7	87	7	6	44	35	22
Egypt	88	8	3	88	9	3	94	5	2	95	3	1	85	9	6
Jordan	39	41	20	41	40	19	51	40	9	49	41	10	29	31	39
Lebanon	24	37	39	38	34	28	39	33	28	47	30	24	34	29	38
Morocco*	12	24	64	2	32	66	12	33	55	23	43	35	8	23	69
Palestinian National Authority	56	33	11	58	32	10	62	34	5	67	26	6	35	32	33
Saudi Arabia	20	27	54	37	28	35	41	30	30	39	38	22	29	23	48
Tunisia	27	26	47	31	33	37	59	25	16	62	23	15	29	32	40
Arab Average	41	27	32	45	28	27	53	28	19	59	26	15	26	27	37
Inter. Average	31	40	29	42	39	20	46	42	12	48	40	12	36	38	25

*****indicates that data are available for at least 50% but less than 70% of the students*

Professional Development Opportunities for Teachers in Mathematics and Science/Grade 4

Country	Percentage of Students by their School's Report of Teachers' Involvement in Professional Development Opportunities in Mathematics and Science														
	Supporting Implementation of National or Regional Curriculum			Designing or Supporting the School's own Improvement Goals			Improving the Content of Knowledge			Improving Technical Skills			Using Information & Communications Technology for Educational Purposes		
	3 times or more a year	12- times a year	never	3 times or more a year	12- times a year	never	3 times or more a year	12- times a year	never	3 times or more a year	12- times a year	never	3 times or more a year	12- times a year	never
Morocco*	6	16	78	9	19	72	15	27	58	16	31	53	7	33	20
Tunisia*	29	31	39	37	45	18	49	38	13	56	35	9	3	5	92
Arab Average	17	24	59	23	32	45	32	33	36	36	33	31	5	19	56
Inter. Average	27	36	36	38	42	20	39	43	17	45	40	15	38	36	26

***** *indicates that data are available for at least 70% but less than 85% of the students*

Classroom Characteristics and Instruction

Although the school provides the general context for learning, it is in the classroom setting and through guidance by the teacher that most instruction and learning take place. The study collected data and information about class size, various limitations on instruction, instructional time, instructional emphases given different mathematics topics, and classroom activities. Information is also presented about the use of calculators and computers in mathematics lessons, the role of homework, and the reliance on different types of assessment approaches.

How do the Characteristics of Mathematics Classrooms Impact Instruction?

The study looked at the relationship between the class size and student achievement. For eighth grade, classes were divided into four categories: first category covered class size of 1- 24 students; second category covered class size of 25 -32 students; third category covered class size of 33- 40 students; and last category covered class size of 41 students or more. Classes at the fourth grade were also divided into four categories; 1 -19 students; 20 -26 students; 27 -32 students; and 33 or more students.

The overall average class size was 30 students for eighth grade and 26 students for fourth grade at the international level. Whereas the Arab average, it was 34 students for eighth grade and 31 students for fourth grade. For eighth grade, students in the first category achieved the highest average achievement in mathematics compared to other categories at both the international and Arab levels. As for fourth grade students, internationally, the highest average achievement in mathematics was in the third category, whereas, it was in fourth category at the Arab average level.

Percentage of Time in Mathematics Class Devoted to TIMSS Content Areas during the School Year

The study also looked on how mathematics instructional time is allocated across the five major content areas assessed by TIMSS 2003. At the eighth grade, on average, internationally, the two areas receiving about one-fourth of the instructional time each were algebra with 27% and geometry with 26%. Number was next with 21%, while measurement and date each were given 10% and other topics 6%. At fourth grade the profile was much different. As would be anticipated, number received the largest amount of mathematics instructional time at 38%, on average, internationally.

At the eighth grade level, for the Arab average, data for Morocco were deleted as it was available for less than 50% of the students. As for the remaining Arab countries, the highest percentage registered was in geometry as the average exceeded the international average for this topic of 26% in four countries (Lebanon 35%, Tunisia 33%, Saudi Arabia 29% and Bahrain 27%). The lowest percentage was in data, although it was higher than the international average of 10% except for Tunisia who achieved 7%.

What Instructional Strategies are used in Mathematics Classes?

1) Textbook Use in Teaching Mathematics

On average, internationally, about two-thirds of the eighth and fourth grade students (65-66%) had teachers who reported using textbooks as the primary basis of their lessons, whereas 32% of the eighth grade students and 29% of the fourth grade students, teachers reported using textbooks as a supplementary resource. As for the Arab average, for 59% of the students, teachers reported using textbooks as the primary basis of their lessons at the eighth grade level, while for 39%, teachers reported using textbooks as supplementary resource.

2) Use of Calculators and Computers in Teaching Mathematics

In most of the countries participating in the study (28 / 45), their national curriculum allow the use of calculators in mathematics lessons, and 23% of teachers indicated that they don't allow their students to use calculators and most of them are from the countries that their national curriculum do not require the use of calculators.

As for Arab countries, five countries (Bahrain, Lebanon, Morocco, Saudi Arabia, and Tunisia) out of eight, their national curriculums do indicate the use of calculators in teaching mathematics. For eighth grade, mathematics teachers in Bahrain, Jordan, Saudi Arabia, and Tunisia do not allow their students to use calculators, whereas teachers in Egypt, Palestine, Morocco, and Lebanon allow their students to use calculators. As for fourth grade, 97% of teachers in Tunisia indicated that they do not allow their students to use calculators.

Twenty six countries and tweleve countries indicated that their national curriculum require the use of computers in teaching mathematics. Most of these countries achieved high results in the study; however, 68% of teachers at eighth grade level and 58% at fourth

grade level indicated that computers are not available for use. As for the Arab countries at the eighth grade level, three countries Egypt, Jordan and Palestine) pointed out that the national curriculums urge the use of computers, however, a high percentage of teachers indicated that computers are not available.

School Contexts for Learning and Instruction

Social and Economic Background of Students

The study looked at the social and economic background of students in their schools. Internationally, about one-fifth of eighth grade students (22%), on average, attended schools with few students (less than 10%) from economically disadvantaged homes, 26% attended schools with 26- 50% economically disadvantaged students, and 31% attended schools with more than 50% economically disadvantaged students. There was a considerable variation across countries, however, in some countries, more than half of the students (52% to 85%) attended schools were the majority of the students came from disadvantaged homes. These included four Arab countries; Lebanon, Morocco, Palestine, and Tunisia.

At the fourth grade, 34% of the students, on average, attended schools with few students (less than 10%) from economically disadvantaged homes, 25% attended schools with 11% to 25% disadvantaged students, 18% attended schools with 26% to 50% economically disadvantaged students, and 24% attended schools with more than 50% economically disadvantaged students. Among all the countries participating at the fourth grade, 75% of students in Morocco attended schools where the majority of the students came from disadvantaged homes.

Internationally, on average, at the eighth grade, mathematics achievement for students in schools with few students coming from economically disadvantaged homes was 57 scale-score points greater than that for students attending schools with more than half their student population from disadvantaged homes (496 vs. 439). At the fourth grade, this difference was also substantial – 47 points (515 vs. 468). Same results could be noticed for the Arab countries, as the difference reached 56 points (the highest was in Egypt) for eighth grade, whereas it reached 59 points at the fourth grade level (the highest was in Tunisia).

It is worth noting that the social and economic background of students play an important role in specifying average achievement. The following tables present principals' reports on the percentage of students in their schools coming from economically disadvantaged homes and their average achievements:

Principals' Reports on the Percentage of Students in their Schools Coming from Economically Disadvantaged Homes/Grade 8

Country	Schools according to percentages of students from economically disadvantaged homes							
	From 0 to 10%		From 11 to 25%		From 26 to 50%		More than 50%	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Bahrain	16	423	20	397	33	408	31	381
Egypt	11	448	24	410	23	393	42	392
Jordan	14	453	22	422	24	424	40	417
Lebanon	8	415	17	454	15	449	61	426
Morocco	0	--	5	380	16	390	79	384
Palestinian National Authority	6	407	11	389	28	394	55	387
Saudi Arabia	19	346	28	336	29	320	24	324
Tunisia	10	439	15	427	17	410	59	400
Arab Average	11	419	18	402	23	399	49	389
Inter. Average	22	496	26	476	21	460	31	439

-- *Insufficient data to report achievement*

Principals' Reports on the Percentage of Students in their Schools Coming from Economically Disadvantaged Homes/Grade 4

Country	Schools according to percentages of students from economically disadvantaged homes							
	From 0 to 10%		From 11 to 25%		From 26 to 50%		More than 50%	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Morocco*	3	352	4	338	18	337	75	352
Tunisia	20	387	16	334	15	337	49	318
Arab Average	12	370	10	336	17	337	62	335
Inter. Average	34	515	25	498	18	486	24	468

* *Data available for at least 70% but less than 85% of students*

School Environment

The School establishes the appropriate environment for learning. To measure the extent to which schools offer a positive school climate. TIMSS 2003 created two indices, one to measure the views of principals and the other to measure the views of the teachers. On a scale ranging from high to very low, the index was based on principals' characterizations of the following: (i) teachers' job satisfaction; (ii) teachers' understanding of the schools' curricular goals; (iii) teachers' degree of success in implementing the schools' curricula; (iv) teachers' expectations for students' achievement; (v) parental support for student's achievement; (vi) parental involvement in schools' activities; (vii) students' regard for school property; and (viii) students' desire to do well in school. Students in the high category attended schools where the principals averaged high or very high reports for each aspects of school climate. Students whose principals characterized school climate as medium were placed in the medium category and whose principals characterized the school climate as low or very low were placed in the low category.

The following tables present the results of the index of principals' perception of the school climate for grades eight and four for the Arab countries participating in TIMSS 2003:

Index of Principals' Perception of School Climate/Grade 8

Country	High		Medium		Low	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Egypt	26	418	62	402	12	402
Jordan	18	455	71	420	11	404
Lebanon	18	457	63	439	19	398
Palestinian National Authority	14	413	77	389	8	361
Saudi Arabia	14	313	68	334	18	336
Bahrain	11	413	74	400	15	394
Morocco*	3	374	37	389	59	385
Tunisia	1	--	30	421	69	405
Arab Average	13	406	60	399	26	386
Inter. Average	15	495	67	466	18	446

* *Data available for at least 50% but less than 70% of students*

-- *indicates data to report achievement*

Index of Principals' Perception of School Climate/Grade 4

Country	High		Medium		Low	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Morocco*	3	431	41	344	57	349
Tunisia	9	380	49	350	42	316
Arab Average	6	406	45	347	50	333
Inter. Average	23	515	66	492	11	468

***** *Data available for at least 70% but less than 85% of students*

The following tables present the results of the index of mathematics teachers' perception of the school climate for grades eight and four for the Arab countries participating in TIMSS 2003:

Index of Mathematics Teachers' Perception of School Climate/Grade 8

Country	High		Medium		Low	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Lebanon	21	449	56	432	23	419
Egypt	19	431	58	403	22	390
Bahrain	7	405	49	406	43	396
Palestinian National Authority	8	405	66	390	26	388
Jordan	7	490	55	425	38	412
Tunisia	6	427	50	414	44	404
Saudi Arabia	6	355	59	332	34	335
Morocco	4	398	25	386	71	389
Arab Average	10	420	52	399	38	392
Inter. Average	10	486	60	471	30	450

Index of Mathematics Teachers' Perception of School Climate/Grade 4

Country	High		Medium		Low	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Morocco	4	381	34	343	62	347
Tunisia	6	390	58	345	36	321
Arab Average	5	386	46	344	49	334
Inter. Average	20	512	67	494	13	473

School Safety

Since school safety is central for providing an environment conducive to learning, TIMSS 2003 asked both teachers and students to characterize their perceptions of safety in their schools. TIMSS used teachers' responses to create an index, called the index of mathematics teachers' perceptions of safety in the schools, and accordingly, were categorized into three categories (high, medium and low). TIMSS also used students' responses to create the index of students' perception of being safe in the schools, and accordingly, were categorized into three categories (high, medium and low).

Internationally and also for Arab countries, responses indicated that there was a positive relationship between teachers' reports of school safety and improvement of mathematics achievement. The percentages of teachers' perception of safety in schools in the Arab countries are high compared to the international average, particularly at the eighth grade level. This percentage reached 87% at grade eight (e.g. Bahrain and Egypt) and 79% at grade four. Lowest percentages were registered in Morocco (55% and 47% at grades eight and four, respectively) and Palestine (51%).

As for the percentages of students' perception of safety in schools, internationally, on average, eighth grade students reported a greater sense of security than did fourth grade students. In the Arab countries that participated in the study, the percentage of students who perceives that the degree of security in school is low is quite high, and exceeds the international average for most countries. It reached 61% in Jordan for grade eight and 27% in Tunisia for grade four.

Student Achievement in Science

The international average of 474 in science at eighth grade level was obtained by averaging across the mean scores for each of the 46 participating countries. The mean scores for the four benchmarking participants were not included in calculating the average. As for the Arab average, a score of 419 was obtained, which is lower than the international average by 55 points.

At the eighth grade level, results reveal substantial difference in science achievement across the Arab countries participating in the study; at the time that Jordan and Bahrain achieved scores of 475 and 438, respectively, Morocco and Lebanon achieved a low achievement scoring 396 and 393, respectively. Students' achievements in Jordan,

Bahrain, Palestine, and Egypt were higher than the Arab average, whereas, Syria, Tunisia, Saudi Arabia, Morocco, and Lebanon lower than the Arab average. It is worth noting that three of the Arab countries participating in TIMSS 2003, previously participated in TIMSS-R 1999, these countries are Jordan, Morocco, and Tunisia. Comparing the 2003 achievements of these countries with 1999 achievements, Jordan's achievement was higher by 25 points, progressing from 450 in TIMSS 1999 to 475 in TIMSS 2003.

The following table summarizes the average achievement of Arab countries in science at eighth grade level:

Average Achievement of Arab Students in Science/Grade 8

Country	Average
Jordan	475 (3.8)
Bahrain	438 (1.8)
Palestinian National Authority	435 (3.2)
Egypt	421 (3.9)
Syria	411 (3.7)
Tunisia	404 (2.1)
Saudi Arabia	398 (4.0)
Morocco	396 (2.5)
Lebanon	393 (4.3)
Arab Average	419 (1.1)
International Average	474 (0.6)

( ) *standard errors appear in parentheses*

Twenty six countries of which three Arab countries (Tunisia, Morocco, and Yemen) participated at the fourth grade level. At the fourth grade, the international average of 489 was obtained by averaging across the mean score for all the participating countries, this average was calculated based on 25 countries.

The Arab average achievement is lower than the international average by 200 points. The following table summarizes the average achievement of Arab countries in science at fourth grade level:

Average Achievement of Arab Students in Science/Grade 4

Country	Average
Tunisia	314 (5.7)
Morocco	304 (6.7)
Yemen	250 (9.2)
Arab Average	289 (4.2)
International Average	489 (0.9)

( ) *standard errors appear in parentheses*

Average Science Achievement by Gender for Eighth Grade

Boys average achievement in science for eighth grade differed from girls average achievement in the Arab countries that participated in TIMSS 2003. Boys outperformed girls in Syria, Morocco, and Tunisia. In contrast, girls obtained better results in Saudi Arabia, Jordan, and Palestine, whereas, similar average achievements were obtained in Egypt and Lebanon.

Average Science Achievement by Gender/Grade 8

Country	Boys	Girls	Absolute Difference
Egypt	421	422	1
Lebanon	395	392	3
Syria	413	402	11
Morocco	403▲	392	11
Palestinian National Authority	428	441▲	13
Saudi Arabia	391	407▲	16
Tunisia	416▲	392	24
Jordan	462	489▲	27
Bahrain	423	453▲	29
Arab Average	417	421	4
International Average	477▲	471	6

▲ Average is high and gender difference statistically significant

Average Science Achievement by Gender for Fourth Grade

When comparing boys and females achievement in science for fourth grade for countries that participated in TIMSS 2003, girls outperformed boys in Morocco, Tunisia and Yemen. Both the international and the Arab averages were in favor of boys with a difference of 1 and 7 points, respectively.

Average Science Achievement by Gender/Grade 4

Country	Boys	Girls	Absolute Difference
Morocco	303	306	2
Tunisia	312	316	4
Yemen	247	260	14
Arab Average	287	294	7
International Average	488	489	1

Performance at International Benchmarks

The TIMSS science achievement scale also summarizes student performance on test items designed to measure a wide range of student knowledge and proficiency. In order to provide meaningful descriptions of what performance on the scale could mean n terms of the mathematics that students know and can do, TIMSS identified four points on the scale for use as international benchmarks. Accordingly, TIMSS identified four benchmarks – the advanced benchmark is 625, the high benchmark is 550, the intermediate benchmark is 475, and the low benchmark is 400.

At the eighth grade level, performance ranged from demonstrating a grasp of some complex and abstract science concepts at the advanced benchmark to recognizing some facts from the life and physical sciences at the low benchmark.

At the fourth grade level, students at the advanced benchmark can apply knowledge and understanding in beginning scientific inquiry whereas those at the low benchmark demonstrated just some elementary knowledge of earth, life, and physical sciences.

At both the eighth and fourth grades, the analysis of performance at these benchmarks in science suggests that five primary factors appeared to differentiate performance among the four levels: (i) the depth and breadth of content knowledge; (ii) the context of the problem (progressing from practical to more abstract); (iii) the level of scientific investigation skills; (iv) the complexity of diagrams, graphs, and tables; and (v) the completeness of written responses. For both grades, student performance at the lower benchmarks is characterized by elementary knowledge of basic science facts, whereas at the advanced benchmarks students can, in addition, draw on more abstract conceptual knowledge and engage in scientific inquiry.

TIMSS 2003 International Benchmarks of Science Achievement

Grade 8	Grade 4
Advanced International Benchmark-625	
Students demonstrate a grasp of some complex and abstract science concepts. They can apply knowledge of the solar system and earth features, processes, and conditions, and apply understanding of the complexity of living organisms and how they relate to their environment. They show understanding of electricity, thermal expansion, and sound, as well as the structure of matter and physical and chemical properties and changes. They show understanding of environmental and resource issues. Students understand some fundamentals of scientific investigation can apply basic physical principles to solve some quantitative problems. They can provide written explanations to communicate scientific knowledge.	Students can apply knowledge and understanding in beginning scientific inquiry. Students demonstrate some understanding of earth's features and processes and the solar system. They can communicate their understanding of structure, function, and life processes in organisms and classify organism according to major physical and behavioral features. They demonstrate some understanding of physical phenomena and properties of common materials. Students demonstrate beginning scientific inquiry knowledge and skills.
High International Benchmark-550	
Students demonstrate conceptual understanding of some science cycles, systems, and principles. They have some understanding of earth's processes and the solar system, biological systems, populations, reproduction and heredity, and structure and function of organisms. They show some understanding of physical and chemical changes, and the structure of matter. They solve some basic physics problems related to light, heat, electricity, and magnetism, and they demonstrate basic knowledge of environmental issues. They demonstrate some scientific inquiry skills. They can combine information to draw conclusions, interpret information in diagrams, graphs and tables to solve problems, and provide short explanations conveying scientific knowledge and cause/effect relationships.	Students can apply knowledge and understanding to explain everyday phenomena. Students demonstrate some knowledge of earth structure and processes and the solar system ad some understanding of plant structure, life processes, and human biology. They demonstrate some knowledge of physical states, common physical phenomena, and chemical changes. They provide brief descriptions and explanations of some everyday phenomena and compare, contrast, and draw conclusions.
Intermediate International Benchmark-475	
Students can recognize and communicate basic scientific knowledge across a range of topics. They recognize some characteristics of solar system, water cycle, animals, and human health. They care acquainted with some aspects of energy, force, and motion, light reflection, and sound. Students demonstrate elementary knowledge of human impact on and changes in the environment. Students can apply and briefly communicate knowledge, extract tabular information, extrapolate from data presented in a simple linear graph, and interpret pictorial diagrams.	Students can apply basic knowledge and understanding to practical situations in the sciences. Students demonstrate knowledge of some basic facts about earth's feature and processes and the solar system. They recognize some basic information about human biology and health and show some understanding of development and life cycles of organisms. They know some basic facts about familiar physical phenomena, states, and changes. They apply factual knowledge to practical situations, interpret pictorial diagrams, and combine information to draw conclusions.
Low International Benchmark-400	
Students recognize some basic facts from the life and physical sciences. They have some knowledge of human body and heredity, and demonstrate familiarity with some everyday physical phenomena. Students can interpret some pictorial diagrams and apply knowledge of simple physical concepts to practical situations.	Students have some elementary knowledge of the earth, life, and physical sciences. Students recognize simple facts presented in everyday language and context about earth's physical features, the seasons, the solar system, human biology, and the development and characteristics of animals and plants. They recognize facts about a range of familiar physical phenomena – rainbows, magnets, electricity, boiling, floating, and dissolving. They interpret labeled pictures and simple pictorial diagrams and provide short written response to questions requiring factual information.

Percentages of Students Reaching International Benchmarks of Science Achievement at Grades Four and Eight

The following table summarizes the percentage of Arab countries of students reaching the international benchmarks of science achievement at grade eight levels.

Percentages of Arab students that achieved performance benchmarks in science are lower than the international average. The table shows that the percentage of students reaching intermediate and low benchmarks is low with the exception of Jordan and Bahrain; at the intermediate level. Results indicated that almost half of the students in most of the countries did not even achieve the low benchmark in science and only 3% of the students in Jordan reached advanced benchmark and it was 1% in both the Palestinian National Authority and Egypt. Twenty one percent of students reached the high benchmark in Jordan, and this percentage is closer than the international average (25%).

Percentages of Students Reaching TIMSS International Benchmarks in Science/Grade 8

Country	Advanced (625)	High (550)	Intermediate (475)	Low (400)
Egypt	1	10	33	59
Bahrain	0	6	33	70
Lebanon	0	4	20	48
Saudi Arabia	0	1	15	49
Morocco	0	1	13	48
Tunisia	0	1	12	52
Palestinian National Authority	1	10	36	66
Jordan	3	21	53	80
Syria	0	4	22	56
Arab Average	6	25	54	78
International Average	1	6	26	59

At fourth grade, only three Arab countries participated; Tunisia, Morocco, and Yemen. The results achieved by these countries were worse than the ones achieved by the other countries participating in the study at the fourth grade level. About 76% of Arab students did not reach any of the four benchmarks compared to less than 20% at the international average.

The following table summarizes the percentages of students reaching the international benchmarks of science achievement at the fourth grade level:

Percentages of Students Reaching TIMSS International Benchmarks in Science/Grade 4

Country	Advanced (625)	High (550)	Intermediate (475)	Low (400)
Tunisia	0	2	10	27
Morocco	0	1	9	24
Yemen	0	1	9	20
Arab Average	7	30	63	82
International Average	0	1	9	24

Variables Related to the Average Achievement in Science

Educational Resources that Students have in their Homes

TIMSS assessment has shown that in almost every country students from homes with extensive educational resources have higher achievement in science and in other subjects than those with less advantaged backgrounds. TIMSS 2003 focused on just few central variables: (i) level of parental education; (ii) student' educational aspirations; (iii) speaking the language of test at home; and (iv) having a range of study aids in the home and computer use at home and at school.

Because for most children, parents are their first and probably most important educators, the level of education of the parents may be the most important educational resource in the home. The study divided the level of parental education into five categories: finished university, finished post-secondary education but not university, finished upper secondary, finished lower secondary, and finished no more than primary.

The higher levels of parents' education are associated with higher eighth grade student achievement in science in most of the Arab countries that participated in TIMSS 2003 study. On average across the Arab countries, the percentages of eighth-grade students reporting that the highest level of education attained by either parent was as follows: finished university (24%); finished post secondary education but not university (8%); finished high school diploma (21%); finished secondary education (18%); and no more than primary education (29%). The following table shows the levels of parental education and the students' achievement in science for eighth grade:

Country	University Degree or more		Post Secondary Education		High School Diploma		Secondary Education		Primary Education or Less	
	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement
Bahrain	33	462	7	446	23	449	20	426	17	421
Egypt	24	482	0	--	11	452	29	413	36	403
Jordan	35	506	15	488	30	475	12	455	8	428
Lebanon	19	434	21	417	19	405	15	375	26	349
Morocco*	16	413	0	--	17	405	17	388	50	397
Palestinian National Authority	27	469	12	443	36	441	18	420	6	385
Saudi Arabia	27	424	0	--	12	404	19	391	41	390
Tunisia	11	426	12	424	16	411	17	403	44	393
Arab Average	24	452	8	444	21	430	18	409	29	396
Inter. Average	28	507	17	487	28	472	15	442	12	416

* Data are available for at least 70% but less than 85% of the students

-- Insufficient data to report achievement

Moreover, the study showed that students from homes with extensive literacy resources have higher achievement than those from less advantaged backgrounds. In addition to literacy resources such as books, TIMSS found that having study aids such as a computer or a study desk or table at home was associated with higher student achievement.

On the international average indicates that about 60% of eighth-grade students, on average, reported having a computer at home, and a slightly greater percentage of fourth-grade students at 65%. The science achievement difference between students with a computer at home and those without was substantial on average – 35 scale score points at eighth grade and 27 points at fourth grade. Greater percentages of students reported having a study desk or table at home; 83% and 80% at eighth and fourth grades, respectively.

The percentage of Arab students that have desks fluctuated from one country to another; from 80% for Bahrain and Egypt to 61% for Saudi Arabia at the eighth grade level, and between 64% for Tunisia and 52% for Morocco. As for the availability of computers, the study showed that most of the Arab countries do not have computers; the percentage of students who have computers did not exceed 50%, except in three countries (Bahrain 81%, Lebanon 59%, and Saudi Arabia 57%). Still, these percentages are lower than the international average of 60%.

The following table shows the percentage of eighth grade students in each country that has a computer or study desk or table, together with their science achievement:

Computer and Study Desk (Table) in the Home/Grade 8

Country	Have Computer		Do Not Have Computer		Have Study Desk/Table		Do Not Have Study Desk/ Table	
	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement
Bahrain	81	443	19	422	80	443	20	424
Egypt	16	458	84	418	80	440	20	367
Jordan	41	502	59	459	73	487	27	448
Lebanon	59	409	41	373	71	403	29	374
Morocco	18	398	82	398	73	401	27	390
Palestinian National Authority	41	455	59	425	77	442	23	420
Saudi Arabia	57	407	43	388	61	408	39	384
Tunisia	22	418	78	400	73	409	27	390
Arab Average	42	436	58	410	73	429	27	400
Inter. Average	60	484	40	449	83	480	17	446

The following table shows the percentage of fourth grade students in each country that has a computer or study desk or table at home, together with their science achievement:

Computer and Study Desk (Table) in the Home/Grade 4

Country	Have Computer		Do Not Have Computer		Have Study Desk/Table		Do Not Have Study Desk/ Table	
	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement	%of Students	Average Achievement
Morocco	20	327	80	307	52	323	48	298
Tunisia	26	348	74	309	64	334	36	297
Arab Average	23	338	77	308	58	329	42	398
Inter. Average	65	499	35	472	80	496	20	470

How Much of Their Out-of-School Time Do Students Spend on Homework During the School Week?

To summarize the amount of time usually devoted to science homework in each country, TIMSS also constructed an index of the time students spend doing science homework that assigns students to a high, medium, or low level on the basis of the frequency and the amount of science homework they are assigned each week. Students at the high level reported that they were assigned more than 30 minutes of science homework at least 3- 4 times per week. Students at the low level were reportedly assigned not more than 30 minutes of science homework twice per week. The middle level included all other response combinations.

At the eighth grade level, results indicated that 52% of the students are in the middle level category compared to the international average of 44%, whereas 15% are categorized in the high level compared to the international average of 13%.

Time Students Spend on Science Homework/Grade 8

Country	High Level		Middle Level		Low Level	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Jordan	19	466	52	478	29	499
Bahrain	13	426	56	441	31	445
Tunisia	9	398	35	400	56	411
Saudi Arabia	8	382	61	402	31	403
Palestinian National Authority	21	433	56	442	23	441
Lebanon*	16	376	45	387	39	417
Egypt	23	416	64	436	13	430
Morocco	14	391	47	396	39	408
Arab Average	15	411	52	423	33	432
Inter. Average	13	458	44	466	43	467

*****_Data related only to the biology_

How Confident are Students in their Ability to Learn Science?

To investigate how students think of their abilities in science, TIMSS created an index of students' self-confidence in learning science. This index is based on students responses to four statements about their science ability (I usually do well in science; science is more difficult for me than for many of my classmates; science is not of my strengths; and I learn things quickly in science). Accordingly, students who agreed a little or agreed a lot with all four statements, on average, were assigned to the high level of the index, while students who disagreed a little or disagreed a lot with all four, on average, were assigned to the low level. The medium level includes all other possible combinations of responses.

On average, internationally, almost half (48%) of eighth grade students in the single-science countries had high self-confidence in learning science. The percentages ranged from a high of 69% in Tunisia to a low of 20% in Japan. At the fourth grade level, 59% of students had high self-confidence in learning science at compared to 9% who showed low self-confidence.

As for the Arab average, the percentage of students in the high level category exceeded the international average and reached 58% compared to 7% who showed low self-confidence at the eighth grade level. At the fourth grade level (Tunisia and Morocco), 57% of students had high self-confidence in learning science compared to 8% who showed low self-confidence.

The Science Curriculum

How Much Instructional Time is intended for Science?

Many countries designate in their intended curriculum the percentage of total instructional time that should be devoted to science as well as other subjects at different grade levels. The percentages of instructional time designated for science in the intended curriculum for grade 2, 4, 6, and 8 for the Arab countries is shown in the following table:

Percentage of Instructional Time designated for Science for Grades Two, Four, Six, and Eight

Country	Grade Two	Grade Four	Grade Six	Grade Eight
Bahrain	--	10	10	13
Egypt	--	9	11	11
Jordan	10	12	12	15
Lebanon	--	15	15	Life & earth sciences 5, chemistry 5, physics 5
Morocco	6	6	6	14
Palestinian National Authority	13	10	14	Environment & Hygiene 5.6, Technology & Applied Science 5.6
Saudi Arabia	7	7	10	12
Syria	--	15	15	20
Tunisia	10	5	7	8
Yemen	7	--	--	--

Teachers of Science

What are the Requirements for Being a Science Teacher?

The study also identified a number of variables related to science teachers in the participating countries and set the qualifications that each teacher should have in order to teach science. The following tables present the country-level responses about the requirements for being certified or licensed to teach science at the eighth and fourth grades.

Countries were asked about five requirements, including supervised practical experience (practicum), passing an examination, obtaining a university degree, completion of a probationary period, and completion of an induction program.

Requirements for Being a Science Teacher/Grade 8

Country	Pre-Practicum & Supervised Practicum	Passing and Examination	University Degree or Equivalent	Completion of a Probationary Teaching Period	Completion of an Induction Program
Bahrain	●	●	●	●	○
Egypt	○	○	●	○	○
Jordan	○	○	●	○	○
Lebanon	○	●	○	○	●
Morocco	○	●	○	●	○
Palestine	○	○	●	○	○
Saudi Arabia	●	●	●	●	●
Tunisia	●	●	●	●	○
Syria	●	●	●	○	○

● *Country reported Yes for the particular option*
○ *Country reported No for the particular option*

Requirements for Being a Science Teacher/Grade 4

Country	Pre-Practicum & Supervised Practicum	Passing and Examination	University Degree or Equivalent	Completion of a Probationary Teaching Period	Completion of an Induction Program
Morocco	●	●	○	○	--
Tunisia	●	●	●	●	○
Yemen	●	○	○	●	○

● *Country reported Yes for the particular option*
○ *Country reported No for the particular option*

Characteristics of Science Teachers

TIMSS looked at the characteristics of science teachers at both the eighth and fourth grades, including their gender, age, certification status, and number of years of teaching experience. On the international average, results indicated that larger percentages of students were taught science by female teachers than male teachers, particularly at the fourth grade. At the eighth grade, on average, 54% of the students were taught science by females and 46% by males in the Arab countries that participated in the study, whereas, at the fourth grade, on average, 49% of the students were taught by female teachers and 51% by male teachers.

The study also showed that, in general, the science teaching force around the world and in the Arab countries is quite experienced. On average, science teachers reported 11 and 17 years of experience at both the eighth and fourth grades, respectively. Given their years of teaching experience, it follows that the majority of the eighth-grade and the fourth-grade students were taught science by teachers in their 30s and 40s. The following tables show science teachers' gender, age, certification and number of years of teaching at both the eighth and fourth grade levels:

Science Teachers' Gender, Age, Certification and Number of Years of Teaching/ Grade 8

Country	Percentage of Students by Teachers Characteristics							
	Gender		Age				Have Full Certificate	Number of Years of Teaching
	Female	Male	29 years or under	30-39 years	40-49 years	50 years or older		
Bahrain	52	48	27	58	14	1	94	9
Egypt	62	38	16	59	23	1	100	13
Jordan	48	52	33	45	15	7	70	11
Lebanon	71	29	45	27	20	8	45	11
Morocco	34	66	17	29	46	7	88	15
Palestinian National Authority	52	48	35	36	21	8	83	9
Saudi Arabia	43	57	45	37	16	2	95	9
Tunisia	70	30	24	45	19	12	96	11
Arab Average	54	46	30	42	22	6	84	11
Inter. Average	60	40	20	30	28	22	87	15

Science Teachers' Gender, Age, Certification and Number of Years of Teaching/ Grade 4

Country	Percentage of Students by Teachers Characteristics							
	Gender		Age				Have Full Certificate	Number of Years of Teaching
	Female	Male	29 years or under	30-39 years	40-49 years	50 years or older		
Morocco*	52	48	23	21	46	10	91	15
Tunisia	46	54	11	46	24	19	21	18
Arab Average	49	51	17	34	35	15	56	17
Inter. Average	79	21	20	31	29	21	84	16

***** *indicates that are available for at least 50% but less than 70% of the Students*

What Preparation Do Teachers Have for Teaching Science?

Highest Educational Level of Science Teachers

Science teachers were also categorized according to their academic qualifications: (a) the first category includes the teachers who have a postgraduate degree (second university degree); (b) second category includes teachers who finished university or equivalent; (c) the third category includes teachers who finished post secondary education but not university; (d) the fourth category includes teachers who have finished upper secondary schooling; and (e) the fifth category includes teachers who did not complete upper secondary schooling.

The following tables present science teachers' highest level of education. On the international level, even through the percentages were somewhat higher at the eighth grade than the fourth grade, approximately two-thirds of the eighth and fourth grade students were taught science by teachers having at least a university degree or equivalent. At eighth grade, internationally, 57% of the students were taught by teachers with a university degree and 22% by teachers who had coursework beyond the initial university degree. At the fourth grade, 52% of the students were taught by teachers with a university degree and another 13% by teachers with coursework beyond that degree.

As for the Arab countries that participated in the study at the eighth grade level, most of the science teachers are concentrated in the second category, i.e., those who finished a university degree or equivalent, representing 66%. On the contrary, at the fourth grade level, most of the science teachers finished only upper secondary schooling, representing 52%.

Highest Educational Level of Science Teachers/Grade 8

Country	Percentage of Students by their Teachers' Educational Level				
	Beyond Initial University Degree	Finished University or Equivalent	Finished Post Secondary Education but not University	Finished Upper Secondary Schooling	Did not Complete Upper Secondary Schooling
Bahrain	10	88	2	0	1
Egypt	8	92	0	0	0
Jordan	13	78	8	0	1
Lebanon	--	--	--	--	--
Morocco	2	32	16	44	5
Palestine	10	73	16	1	0
Saudi Arabia	3	85	10	2	0
Tunisia	81	17	1	1	0
Arab Average	18	66	8	7	1
Inter. Average	22	57	18	3	0

-- *Insufficient Data*

Highest Educational Level of Science Teachers/Grade 4

Country	Percentage of Students by their Teachers' Educational Level				
	Beyond Initial University Degree	Finished University or Equivalent	Finished Post Secondary Education but not University	Finished Upper Secondary Schooling	Did not Complete Upper Secondary Schooling
Morocco*	0	22	2	56	20
Tunisia	2	7	43	48	1
Arab Average	1	15	23	52	11
Inter. Average	13	52	22	11	1

* *Data provided from 50% - 70% of Students*

Preparation to Teach Science

TIMSS 2003 looked at teachers' major area or areas of study during their postsecondary education. At the eighth grade, on average, internationally, 82% of students had teachers who studied a science subject – biology, physics, chemistry, or earth science, whereas for the Arab average was higher at 85%. Science education was also a popular opinion, with 37% of students, on average internationally, were taught by teachers with science education as a major, while the Arab average was 39%. Less common teachers majors for science teachers were general education (taken by teachers of 25% students, internationally, and 16% as an Arab average). As for the fourth grade, data was only available for Tunisia, which indicates that 67% of teachers have primary/elementary education without a major or specialization in mathematics or science.

Classroom Characteristics and Instruction

How do the Characteristics of Science Classrooms Impact Instruction?

The study looked at the relationship between the class size and student achievement. For eighth grade, classes were divided into four categories: first category covered class size of 1- 24 students; second category covered class size of 25 -32 students; third category covered class size of 33- 40 students; and last category covered class size of 41 students or more. Classes at the fourth grade were also divided into four categories; 1- 19 students; 20- 26 students; 27- 32 students; and 33 or more students.

The overall average class size was 31 students for eighth grade and 26 students for fourth grade at the international level. Whereas the Arab average, it was 35 students for eighth grade and 30 students for fourth grade (data was only available for Tunisia). For eighth grade, students in the first and second categories achieved the highest average achievement in science compared to other two categories at both the international and Arab levels. As for fourth grade students, internationally, the highest average achievement in science was in the third category, whereas, it was in the third and fourth categories at the Arab average level.

How Much Time is devoted to Science Instruction?

Internationally, on average, 117 hours was the total time allocated for teaching science at the eighth grade level, whereas it reached 67 hours at the fourth grade level. On the other hand, for the Arab average, 115 hours was the total time allocated for teaching science at the eighth grade level. Total sum of hours fluctuated from one Arab country to another, the highest average was in Jordan (135 hours) and the lowest was in the Palestinian National Authority (101 hours).

What Instructional Strategies are used in Science Classes?/How are Computers used in Science Class?

Across the countries, 25 participants at the eighth grade and 12 at the fourth grade reported that their science curriculum contained statements about computer use and yet access to computers remains a challenge in many countries. The following table shows the Arab countries with national policies on computer use, the percentages of students whose teachers reported that computers were not available, and the percentages of students using computers for various activities in about half of the lessons or more:

Computer Use in Science Class/Grade 8

Country	National Curriculum Contains Policies/ Statements about the Use of Computers	% of Students whose Teachers reported that Computers are not available	% of Students whose Teachers reported on Computer Use about Half of the Lessons or More				
			Doing Scientific Procedures of Experiments	Studying Natural Phenomena through Simulations	Practicing Skills and Procedures	Looking Up Ideas & Information	Processing & Analyzing Data
Bahrain	●	44	3	3	10	22	7
Egypt	●	--	--	--	--	--	--
Jordan	●	82	1	3	3	4	2
Lebanon	○	83	3	2	4	9	7
Morocco	○	86	0	0	1	2	1
Palestinian National Authority	●	69	5	3	4	7	1
Saudi Arabia	○	80	3	6	6	9	4
Tunisia	○	65	4	5	7	9	7
Arab Average		73	3	3	5	9	4
International Average		62	2	2	3	6	3

● *Country reported Yes for the particular option*

○ *Country reported No for the particular option*

-- *Insufficient Data*

School Contexts for Learning and Instruction

Social and Economic Background of Students

At eighth grade, on average, internationally, science achievement for students in schools with few students coming from economically disadvantaged homes was 51 scale-score points greater than that for students attending schools with more than half their student population from disadvantaged homes (500 vs. 449). At the fourth grade, this difference was also substantial – 43 points (505 vs. 462). However, the difference reached was only 28 points (the highest was in Egypt and the lowest was in Lebanon) for eighth grade, whereas it reached 35 points at the fourth grade level (the highest was in Tunisia).

It is worth noting that the social and economic background of students play an important role in specifying average achievement. The following tables present principals' reports on the percentage of students in their schools coming from economically disadvantaged homes and their average achievements:

Principals' Reports on the Percentage of Students in their Schools Coming from Economically Disadvantaged Homes/Grade 8

Country	Schools according to percentages of students from economically disadvantaged homes							
	From 0 to 10%		From 11 to 25%		From 26 to 50%		More than 50%	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Bahrain	16	454	20	434	33	444	31	424
Egypt	11	457	24	428	23	405	42	408
Jordan	14	499	22	474	24	476	40	468
Lebanon	8	374	17	422	15	417	61	383
Morocco	0	--	5	387	16	393	79	397
Palestinian National Authority	6	457	11	437	28	444	55	428
Saudi Arabia	19	406	28	403	29	392	24	386
Tunisia	10	429	15	418	17	400	59	395
Arab Average	11	439	18	425	23	421	47	411
Inter. Average	22	500	26	484	21	469	31	449

-- *Insufficient data to report achievement*

Principals' Reports on the Percentage of Students in their Schools Coming from Economically Disadvantaged Homes/Grade 4

Country	Schools according to percentages of students from economically disadvantaged homes							
	From 0 to 10%		From 11 to 25%		From 26 to 50%		More than 50%	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Morocco*	3	301	4	305	18	284	75	312
Tunisia	20	371	16	312	15	310	49	289
Arab Average	12	336	10	309	17	297	62	301
Inter. Average	34	505	25	492	18	478	24	462

* *Data available for at least 70% but less than 85% of students*

School Climate

The School establishes the appropriate environment for learning. To measure the extent to which schools offer a positive school climate. TIMSS 2003 created two indices, one to measure the views of principals and the other to measure the views of the teachers. On a scale ranging from high to very low, the index was based on principals' characterizations of the following: (i) teachers' job satisfaction; (ii) teachers' understanding of the schools' curricular goals; (iii) teachers' degree of success in implementing the schools' curricula; (iv) teachers' expectations for students' achievement; (v) parental support for student's achievement; (vi) parental involvement in schools' activities; (vii) students' regard for school property; and (viii) students' desire to do well in school. Students in the high category attended schools where the principals averaged high or very high reports for each aspects of school climate. Students whose principals characterized school climate as medium were placed in the medium category and whose principals characterized the school climate as low or very low were placed in the low category.

The following tables present the results of the index of principals' perception of the school climate for grades eight and four for the Arab countries participating in TIMSS 2003:

Index of Principals' Perception of School Climate/Grade 8

Country	High		Medium		Low	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Egypt	26	430	62	418	12	415
Jordan	18	502	71	472	11	452
Lebanon	18	421	63	402	19	347
Palestinian National Authority	14	456	77	434	8	410
Saudi Arabia	14	380	68	400	18	402
Bahrain	11	453	74	436	15	429
Morocco*	3	393	37	399	59	395
Tunisia	1	--	30	412	69	399
Arab Average	13	434	60	422	26	406
Inter. Average	15	499	67	473	18	455

***** *Data available for at least 50% but less than 70% of students*
-- *Insufficient data to report achievement*

Index of Principals' Perception of School Climate/Grade 4

Country	High		Medium		Low	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Morocco*	3	399	41	299	57	308
Tunisia	9	367	49	331	42	281
Arab Average	6	383	45	315	50	295
Inter. Average	23	510	66	486	11	457

***** *Data available for at least 70% but less than 85% of students*

The following tables present the results of the index of science teachers' perception of the school climate for grades eight and four for the Arab countries participating in TIMSS 2003:

Index of Science Teachers' Perception of School Climate/Grade 8

Country	High		Medium		Low	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Lebanon	20	415	55	402	25	360
Egypt	20	441	60	419	20	406
Bahrain	11	459	50	440	39	430
Palestinian National Authority	10	452	67	435	23	428
Jordan	7	513	54	481	39	460
Tunisia	6	408	54	404	40	401
Saudi Arabia	5	395	52	406	43	387
Morocco	1	--	30	407	68	396
Arab Average	10	440	53	424	37	409
Inter. Average	10	496	60	477	30	460

Index of Science Teachers' Perception of School Climate/Grade 4

Country	High		Medium		Low	
	% of Students	Average Achievement	% of Students	Average Achievement	% of Students	Average Achievement
Morocco	6	377	28	303	66	302
Tunisia	6	367	58	325	36	287
Arab Average	6	372	43	314	51	295
Inter. Average	20	506	66	488	14	467

School Safety

Since school safety is central for providing an environment conducive to learning, TIMSS 2003 asked both teachers and students to characterize their perceptions of safety in their schools. TIMSS used teachers' responses to create an index, called the index of mathematics teachers' perceptions of safety in the schools, and accordingly, were categorized into three categories (high, medium and low). TIMSS also used students' responses to create the index of students' perception of being safe in the schools, and accordingly, were categorized into three categories (high, medium and low).

Internationally and also for Arab countries, responses indicated that there was a positive relationship between teachers' reports of school safety and improvement of mathematics achievement. The percentages of teachers' perception of safety in schools in the Arab countries are high compared to the international average, particularly at the eighth grade level. This percentage reached 85% at grade eight (e.g. Egypt) and 79% at grade four. Lowest percentages were registered in the Palestinian National Authority (54%) and Morocco (51%), at grades eight and four, respectively.

As for the percentages of students' perception of safety in schools, internationally, on average, eighth grade students reported a greater sense of security than did fourth grade students. In the Arab countries that participated in the study, on average, the percentage of students who perceives that the degree of security in school is high reached 39%, however, it is lower than the international average of 48% at the eighth grade level. As for the fourth grade, on average, 51% of students perceive that the degree of security in school is medium in the Arab countries compared to an international average of 42% also in the medium category.

Recommendations

The Report's key recommendations focus on the issues related to improving the educational systems and policies in the Arab countries participating in this project. These recommendations include: (1) encouraging decision-makers in the Arab participating countries to provide financial and technical support to TIMSS national teams to ensure that the study is successfully implemented; (2) calling on the establishment of an Arab Board for Educational Evaluation that is entrusted with spreading awareness on educational reforms and benefiting from the results of the international educational reform studies, as well as preparing similar studies in the Arab region; (3) calling on the higher education institutions to encourage Arab researchers at universities and research institutes to make use of available data in the TIMSS study in conducting researches on improvement and modernization of educational policies and systems; and (4) revising mathematics and science examinations to meet international standards.

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