The Hashemite Kingdom of Jordan

The National Center for Human Resources Development

Jordanian National Report on the
Trends in Math and Science Study (TIMSS) 2011

Supervised by

Prof. Dr. Abdullah Ababneh

Prepared by the Monitoring and Evaluation Team:

Dr. Khattab Abu Lebdeh   **Dr. Shereen Hamid**

Dr. Ahmad Altweisi   **Dr. Imad Ababneh**

Overview

The International Study on the "Trends in Math and Science Study 2011" for the evaluation of students' achievement in grades four and eight was implemented with the supervision of the International Association for the Evaluation of Educational Achievement (IEA) in Amsterdam / Netherland. (45) countries participated in the study, (11) of which are the following Arab countries: Jordan, Palestine, Lebanon, Tunisia, Morocco, Qatar, Syria, Bahrain, Oman, Saudi Arabia, and the United Arab Emirates. Moreover, (7694) Jordanian students participated in this study.

The National Center for Human Resources Development is pleased to present this report for the stakeholders to provide an excellent database that would need more research investigation to identify the school elements affecting students' achievement in Math and Science.

The National Center for Human Resources Development invites the university professors and researchers in Jordan to conduct more investigation on this data to contribute to the development of Math and Science, and teachers' preparation programs, the improvement of the school environment to improve students' achievement levels.

President

Prof. Dr. Abdullah Ababneh

Jordanian National Report on the Trends in Math and Science Study (TIMSS) 2011

Abstract

A sample of grade eight students in Jordan was selected from public schools, private schools, and UNRWA schools to participate in the International Study of Math and Science\2011. Students from grade eight in (45) countries participated in this study.

The participating Arab countries are: Jordan, Palestine, Lebanon, Tunisia, Morocco, Qatar, Syria, Bahrain, Oman, Saudi Arabia, and the United Arab Emirates. The Islamic countries are: Turkey, Iran, and Malaysia.

The Science questions covered the following areas: geology, biology, physics, and chemistry. The Math questions covered the following areas: Numbers, data representation, geometry, and algebra. The general results of every test for each country were extracted for the test as a whole as well as for its areas.

Regarding the science test, Jordanian students performed better than the Math test. Jordan ranked (28) among the participating countries. The performance average in science for Jordanian students was (449) compared to the international average which is (477), while the highest country was Singapore with an average of (590), and the lowest was Ghana with an average of (306). This means that the performance average of the Jordanian students is (28) scores less than the international average, which is statistically significant at (α = 0.05). At the Arab countries level, Jordan ranked third, and the Jordanian students' performance average in science was higher than the Arab average, which is (428) with statistical significance.

The performance averages in the four areas of the test were as follows: Geology (446), Biology (447), Physics (446), Chemistry (463), and all are below the international average which is (477).

Regarding the Jordanian students' results in the Math test, the performance average in math was (406) scores, noting that the overall average for all participating countries was (467) scores, the highest country was Korea with an average of (613) scores, while the lowest country was Ghana with an average of (331) scores.

The performance average in Math for the Jordanian students was below the international average with statistical significance, as Jordan ranked (35) at the international level and (6) at the Arab level. The results of the study showed that there is difference in the Jordanian students' achievement in Math and Science in 2011 than in 2007, for the favor of 2007, as the decline was (33) scores in science and (21) scores in Math. This is considered a serious issue affecting the educational system and need to be addressed by educators, politicians, decision-

makers, policy-makers and the society as a whole so that this decline comes to an end. Moreover, there is need to upgrade students' achievement to reach the international levels, so that they can obtain a privileged position in a highly competitive world.

The results of the study showed that females were better in Science and Math than males in all of the study's rounds in 1999, 2003, 2007, and 2011. Moreover, the results of the study showed that students in private schools were better than students in public schools, as and that students in urban areas were better than students in rural areas.

In sum, public schools are invited to benefit from the experiences of private schools to upgrade the level of education up to the private schools levels. However, private schools need to sustain their achievements and make more improvements to enhance the performance levels of their students.

On the other side, there is urgent need to give more attention for the males' school, as well as school in rural areas to improve the performance of students, and to realize justice between male and female students, and between rural and urban students.

Jordanian National Report on TIMSS 2011 Study

Executive summary

A sample of 8th grade Jordanian students participated in the Trends in International Mathematics and Science Study in the cycle of 2011 (TIMSS 2011) and the sample was selected from the MoE schools, private schools, and UNRWA schools. 45 countries participated in the study including Jordan. The set of Arab countries who participated in the study were: Jordan, Tunisia, Morocco, Bahrain, Saudi Arabia, Qatar, Oman, Syria, Lebanon, Palestine and the United Arab Emirates. The Islamic countries who participated in the study were: Turkey, Iran, and Malaysia.

The Science items covered the following content domains: Physics, Biology, Chemistry and Earth Science, while the Mathematics items covered the following content domains: Number, Algebra, Geometry and Data & probability. Moreover, the cognitive domains for both subjects were knowledge, Application and Reasoning and the performance of all countries was reported by subject, content domains & cognitive domains.

Jordan ranked 28 among the participating countries in science as its average performance is (449), while the international average is (477). The highest average is (590) for Singapore, & the lowest average is (306) for Ghana. Jordan ranked 3rd among the Arab countries, and its average in science is significantly higher than the Arab Average which is (428). Jordan's averages by content domain are as follows: Earth Science (446), Biology (447), Physics (446), and Chemistry (463), all of which are below the international average which is (477).

Jordan ranked 35 among the participating countries in Mathematics. The average performance in Mathematics for Jordan is (406), while the international average is (467). The highest average is (613) for Korea & the lowest average is (331) for Ghana. Jordan ranked 6th among the Arab countries in Mathematics and its average & the Arab average are not significantly different. Jordan's averages by content domains were as follows: Number (390), Algebra (432), Geometry (407) and Data & probability (379).

The results of the study showed a substantial decline in the performance of Jordanian students in: Math & Science in 2011 compared to the previous cycle in 2007. The magnitude of the decline was (21) scores in Mathematics and (33) scores in Science. The results also indicated the disparities in student performance by gender, location, and school authority across all cycles of the study in 1999, 2003, 2007, and 2011, and the proposed decline factors were discussed.

Educators, policy makers and planners and the whole society at large are invited to exert all efforts to address such decline and take all necessary actions to improve the quality of our educational system.

The study recommends that further studies need to be conducted to reveal the proposed factors of gabs & disparities in students' performance as well as raising the level of awareness on the importance of the study to improve students' performance in the next cycle of the study in 2015.

Table of Contents

Tables

Chapter One

Study's Description and Procedures

International Study of Math and Science / 2011"

"Trends in International Math and Science Study" (TIMSS 2011)

Educational research has been interested in conducting international studies since the early sixties with the aim of comparing students' achievement trends and levels all over the world, as well as discussing the factors affecting students' achievement and trends.

International studies enable the participating countries to better understand educational systems and help educational decision and policy makers identify valid and realistic standards of the educational achievement or performance to help monitor and evaluate the successes or failures of their educational systems.

International comparative studies on education expand the expertise of the participating countries to improve their national studies in terms of scale and evaluation of the educational achievement. These studies also enhance the confidence to disseminate studies that explain the factors affecting achievement in education, and generate new ideas contributing to improving the design and management of schools and classes. Moreover, such studies highlight new dimensions in the educational research in the participating countries, as well as providing objective non-biased discussions and assessment for educational innovations implemented through educational development plans and programs. This would enable these countries to avoid the shortcomings of these programs and to develop remedial plans to improve the performance of the educational systems.

The "International Study of Math and Science," carried out in 2011, is the latest study of a series of International evaluation studies. This study was implemented in (45) countries, including 11 Arab countries. This study aims at improving teaching and learning in math and science by providing data on student achievement in systems with varied educational practices and school environments.

International Study of Math and Science was applied in 2003 /2007/2011 for grades   eight and four. In 1999, the study was applied for grade eight only, and in 1995, it was applied for grades eight, four and twelve. Therefore, this study allows countries that have previously participated in the study, to measure the changes in their students' achievement.

Jordan participated in the study in 1999, as well as in 2003, 2007 and 2011. This report discusses in details the comparison of Jordanian students' performance levels in 1999, 2003, 2007, and 2011. The report also describes the performance levels in math and science in 2011, by the variables of gender (male, female), supervising authority (Ministry of Education, UNRWA, and special education), school location (urban, rural) strata sample study strata(exploratory schools / Ministry of Education, Madrasati / Ministry of Education, Ministry of Education, UNRWA, Private Education, Education Reform Support Project (ERSP)/ Ministry of Education).

Background

The Second International Assessment of Educational Progress (IAEP)

The first international study to evaluate students at age (13) in science and math was conducted in 1988. The following six countries participated in the study: Canada, Ireland, Korea, Spain, the United Kingdom, and the United States of America. The Second International Assessment of Educational Progress (IAEP) was conducted in 1991. This study included assessment of student achievement at the age of (9) years in science and math, as well as assessment of student at the age of (13) in science, math and geography. Jordan, along with nineteen countries, participated in the part of the assessment of students at the age of (13) in science and math. The participating countries were: Korea, Mozambique, Portugal, Scotland, the Soviet Union (13 Republics only), Spain, Switzerland (14 cantons only), Taiwan, Yugoslavia (Slovenia only), China (20 provinces only), England, France, Hungary, Ireland, Israel, Italy, Brazil, Canada (nine regions), and the United States of America. It should be noted that the American Center for Educational Testing Service (ETS) oversaw the first and second studies.

The Second International Study for Educational Progress aimed to compare student achievement in science and math in countries that vary in their cultural, economic, social and educational conditions to determine the impact of some factors related to the environment, school, home, and the educational environment on the achievement in science and math.

The number of Jordanian students participating in the study was (3168) students distributed as follows: (1588) in sciences (1580) in math.

The Sciences test consisted of (72) questions, covering the contents of the natural sciences, and earth and space sciences, biology, and the nature of science. The questions were distributed on the skills dealing with facts and scientific concepts and principles, and the students' use of concepts and scientific principles to solve simple problems, as well as the integration of scientific concepts and principles to solve complex problems.

Furthermore, the math test consisted of (76) questions covering five key math topics: numbers and calculations, measurement, geometry, data analysis, and algebra. The questions were distributed on three types of skills which are: understanding concepts, the use of procedural knowledge, solving mathematical problems.

The results of the study indicated that the level of performance of Jordanian students in science was low, with an average percentage of correct answers of (57%). The performance of Jordanian students ranked penultimate between Portugal (63%) and Brazil (52%). Besides, Jordanian student performance, on average, was significantly low compared to students' performance among the participating countries, with difference amounting to (10.5%) and much more noticeably low compared to the student's performance in the first ranking three countries: Korea (21% difference), Taiwan (19% difference), and Switzerland (17% difference).

Results showed that Jordanian students' performance slightly varies among the four content domains covered by the test, and significantly varies among the cognitive skills measured by the test. The best performance was in earth and space sciences, and the skill of knowledge of facts, concepts and scientific principles. The worst performance was in the nature of science and in

the skill of integrating knowledge in resolving complex problems. It should be noted that Jordanian students' performance in all content areas and in all cognitive skills was in the penultimate rank, just ahead of Brazil. In addition, the difference between the Jordan's performance average on one hand, and Israel, Italy and Slovenia on the other hand is (13%).

The study's results showed that the level of Jordanian students' performance in math compared with the students' performance of all participating countries was also low where the average of percentages of the correct answers in math was (40%), as is the case with the performance of Jordanian students in science. Jordanian students' performance in math ranked eighteenth out of twenty countries participating in math test. Mozambique ranked last with an average percentages of (28%), topped by Brazil with an average percentages of (37%). The average of Jordanian students' performance was significantly low compared to the performance average of student in the participating countries with a difference of (20%). In addition, Jordanian students' performance was very markedly low when compared with the average of students' performance in China, which ranked first with a difference of (40%). Students' performance differed by math content as it was the best in the domain of data analysis (46%), followed by geometry (44%), while the worst was in measurement (32%). For the cognitive skills, the performance was the best in conceptual understanding (45%), while it was the worst in solving mathematical problems (38%), and the performance in procedural knowledge was the same solving mathematical problems.

Third International Study of Math and Science in 1995

Third International Math and Science Study (TIMSS 1995)

Third International Study of Math and Science is the largest global study conducted so far with the aim of measuring students' achievement in math and science. The study was supervised by the International Association for the Evaluation of Educational Achievement and conducted by Boston College. This study was implemented for the third time in 1995 in more than 40 countries to measure the achievement of students at the age of (9), mostly in grades 3 and 4), students at the age of (13), (mostly in grades 7 and 8) and students in the final grade of the secondary school. Students were tested in math and science, and comprehensive information on the teaching and learning of math and science was collected from students, teachers and school principals. The number of tested students was more than half a million students, and questionnaires were distributed to thousands of teachers and principals.

The number of math questions was (151) question covering the following math contents: numbers, algebra, measurement, geometry, and data representation and probability, and proportionality. The test measured the following mental skills: knowledge, simple routine procedures, complex and routine procedures, and problem solving. About (80%) of the test items were of the multiple choice type, while other items (20%) were open question where students are required to form answers and write them down in a particular space, noting that most of these questions require short answers and others require long ones.

Sciences questions included (135), covering the following contents: earth sciences, biology, physics, chemistry, the environment, and the nature of science. The following mental skills

were measured: "understanding," "analysis and forming theories and solving problems", "the use of tools, routine procedures and scientific processes" and "exploring the natural world."

Math and science questions were distributed in eight booklets, each includes math and science questions and students have to answer one booklet. The total time for answering any of the eight booklets was (90) minutes.

Table (1) shows the performance averages of the countries participating in the "Third International Math and Science (TIMSS)/1995 for students in grades (7 and 8). Raw marks were transformed using a new scale of an average of (500) and of standard deviation of (100).

Table (1) shows that the countries with the top three ranks, by the performance average of grade (8) students in math are: Singapore, then Korea, followed by Japan. These countries have maintained the same order at grade (7) students. The performance of grade (8) students in Thailand and Israel was a Median of the performances of all nations. The countries that ranked at end of the list are: Iran (38), Kuwait (39), Columbia (40), and South Africa ranked (41).

The situation in science is somehow similar to math, as Singapore ranked first in grades (7) and (8), and South Africa ranked last. Iran ranked (37), while Kuwait ranked (39).

Third International Math and Science Study (Repeated) (TIMSS-R)

The results of the "Third International Math and Science Study / 1995" have significant impacts in the education sectors, as they raised national dialogues and have been translated into education development plans in many of the participating countries.

The performance levels of students in the participating countries in 1995 are recent data and so; some of these countries were interested in re-conducting this study. This offered Jordan with an opportunity for participating in the third study. It is worth mentioning that the study is repeated every four years, allowing the participating countries to monitor and evaluate the performance of their educational systems and compare it with the other countries of the world.

The "Third International Math and Science Study / 1995" was conducted again in 1998/1999 for grade (8) students (the test was implemented in Jordan in May /1999). Students were tested in math and science, and responded to a questionnaire on their classroom experiences, their attitudes towards math and science, and their family backgrounds. Teachers responded to a questionnaire on their academic preparation, their teaching practices, and their perspectives on many issues related to the teaching of math and science. Besides, school principals responded to the school questionnaire and provided information on the schools in terms of characteristics and sources.

The three Arab countries participating in the study are Jordan, Morocco, and Tunisia, while these countries did not participated in the previous study conducted in 1995.

Table (2) shows the performance average of the participating countries in science, and table (3) shows that the performance average in math. These tables show that Jordan's performance in

math and science was below the international average, as Jordan ranked (30) in science, and (32) in math.

Table (1)

Performance Average of the Participating Countries in 1995 in the third International Study on "Trends in Science and Math (TIMSS)" for Students in Grades Seven and Eight

Math				Science			
Grade Eight		Grade Seven		Grade Eight		Grade Seven	
Country	Average	Country	Average	Country	Average	Country	Average
Singapore	643	Singapore	601	Singapore	607	Singapore	545
Korea	607	Korea	577	Czech	574	Korea	535
Japan	605	Japan	571	Japan	571	Czech	533
Hong Kong	588	Hong Kong	564	Korea	565	Japan	531
Belgium (Fl)	565	Belgium (Fl)	558	Bulgaria	565	Bulgaria	531
Czechoslovakia	574	Netherlands	516	Slovenia	560	Belgium (Fl)	529
Switzerland	545	Bulgaria	514	Austria	558	Austria	519
Netherlands	541	Austria	509	Hungary	554	Hungary	518
Slovenia	541	Slovak	508	Britain	552	Netherlands	517
Bulgaria	540	Belgium (Fr)	507	Belgium (Fl)	550	Britain	512
Austria	539	Switzerland	506	Australia	545	Slovakia	510
France	538	Hungary	502	Slovakia	544	United States	508
Hungary	537	Russia	501	Russia	538	Australia	504
Russia	535	Ireland	500	Ireland	538	Germany	499
Australia	530	Slovenia	498	Sweden	535	Canada	499
Ireland	527	Australia	498	United States	534	Hong Kong	495
Canada	527	Thailand	495	Germany	531	Ireland	495
Belgium (Fr)	526	Canada	494	Canada	531	Thailand	493
Thailand	522	France	492	Norway	527	Sweden	488
Israel	522	Germany	484	New Zealand	525	Switzerland	484
Germany	509	Britain	476	Israel	524	Norway	483
New Zealand	508	United States	476	Hong Kong	522	New Zealand	481
Britain	506	New Zealand	472	Switzerland	522	Spain	477
Norway	503	Denmark	465	Scotland	517	Scotland	468
Denmark	502	Scotland	463	Spain	517	Iceland	462
United States	500	Latvia (LSS)	462	France	498	Romania	452
Scotland	498	Norway	461	Greece	497	France	451
Latvia (LSS)	493	Iceland	459	Iceland	494	Greece	449
Spain	487	Romania	454	Romania	486	Belgium (Fr)	442
Iceland	487	Spain	448	Latvia (LSS)	485	Denmark	439
Greece	484	Cyprus	446	Portugal	480	Iran	436
Romania	482	Greece	440	Denmark	478	Latvia	435
Lithuania	477	Lithuania	428	Lithuania	476	Portugal	428
Cyprus	474	Portugal	423	Belgium (Fr)	471	Cyprus	420
Portugal	454	Iran	401	Iran	470	Lithuania	403
Iran	428	Columbia	469	Cyprus	463	Columbia	387
Kuwait	392	South Africa	348	Kuwait	430	South Africa	317
Columbia	385			Columbia	411		
South Africa	354			South Africa	326		
International Average	**513**		**484**		**516**		**479**

Table (2)

The Performance Average of the Participating Countries in 1999 in the third International Study on "Trends in Science and Math (TIMSS)" in Science/ (Repeated)

Science		
Rank	**Country**	**Average**
1	Taiwan	569
2	Singapore	568
3	Hungary	552
4	Japan	550
5	Korea	549
6	Netherlands	545
7	Australia	540
8	Czech	539
9	Britain	538
10	Finland	535
10	Slovakia	535
10	Belgium	535
13	Slovenia	533
13	Canada	533
15	Hong Kong	530
16	Russia	529
17	Bulgaria	518
18	United States	515
19	New Zealand	510
20	Latvia	503
21	Italy	493
22	Malaysia	492
23	Lithuania	488
24	Thailand	482
25	Romania	472
26	Israel	468
27	Cyprus	460
28	Moldova	459
29	Macedonia	458
30	Jordan	450
31	Iran	448
32	Indonesia	435
33	Turkey	433
34	Tunisia	428
35	Chile	420
36	Philippines	345
37	Morocco	323
38	South Africa	243
	International Average	488

Average higher than Jordan's Average	
Average similar to Jordan's Average	
Average lower than Jordan's Average	

Table (3)

The Performance Average of the Participating Countries in 1999 in the third International Study on "Trends in Science and Math (TIMSS)" in Math / (Repeated)

Math		
Rank	Country	Average
1	Singapore	604
2	Korea	587
3	Taiwan	585
4	Hong Kong	582
5	Japan	579
6	Belgium	558
7	Netherlands	540
8	Slovakia	534
9	Hungary	532
10	Canada	531
11	Slovenia	530
12	Russia	526
13	Australia	525
14	Malaysia	520
14	Finland	520
16	Czech	519
17	Bulgaria	511
18	Latvia	505
19	United States	502

20	Britain	496
21	New Zealand	491
22	Lithuania	482
23	Italy	479
24	Cyprus	476
25	Romania	472
26	Thailand	469
27	Moldova	467
28	Israel	466
29	Tunisia	448
30	Macedonia	447
31	Turkey	429
32	Jordan	428
33	Iran	422
34	Indonesia	403
35	Chile	392
36	Alvpson	345
37	Morocco	337
38	South Africa	275
International average		487

Average higher than Jordan's Average	
Average similar to Jordan's Average	
Average lower than Jordan's Average	

"Trends in International Math and Science Study"(TIMSS 2003)

The study was carried out in (46) countries, including (9) Arab countries with the aim of improve teaching and learning in math and science.

Table (4) shows the performance average of participating countries in science, and Table (5) shows the performance average of participating countries in math. Jordan's performance average in Science was (475), and in math was (424), and Jordan ranked (26) in science and (33) in math.

Table (4)

The Performance Average of the Participating Countries in 2003 in the third International Study on "Trends in Science and Math (TIMSS)" in Science

Country		Average		Country		Average	
-1	Singapore	578	Δ	-24	Israel	488	
-2	Taiwan	571	Δ	-25	Bulgaria	479	
-3	Taiwan	558	Δ	**-26**	**Jordan**	**475**	
-4	Korea	556	Δ	-27	Moldova	472	
-5	Hong Kong	552	Δ	-28	Romania	470	
-5	Estonia	552	Δ	-29	Serbia	468	▽
-7	Japan	544	Δ	-30	Armenia	461	▽
-8	Britain	543	Δ	-31	Iran	453	▽
-9	Hungary	536	Δ	-32	Macedonia	449	▽
-10	Netherlands	527	Δ	-33	Cyprus	441	▽
-11	United States	527	Δ	-34	Bahrain	438	▽
-12	Australia	524	Δ	-35	Palestinian Authority	435	▽
-13	Sweden	520	Δ	-36	Egypt	421	▽
-13	Slovenia	520	Δ	-37	Indonesia	420	▽
-15	New Zealand	519	Δ	-38	Chile	413	▽
-16	Lithuania	517	Δ	-39	Tunisia	404	▽
-17	Belgium	516	Δ	-40	Saudi Arabia	398	▽
-18	Russia	514	Δ	-41	Morocco	396	▽
-19	Latvia	512	Δ	-42	Lebanon	393	▽
-19	Scotland	512	Δ	-43	Philippines	377	▽
-21	Malaysia	510	Δ	-44	Botswana	365	▽
-22	Norway	494	Δ	-45	Ghana	255	▽
-23	Italy	491	Δ	-46	South Africa	244	▽
International Average		**474**					

Average higher than Jordan's Average	
Average similar to Jordan's Average	
Average lower than Jordan's Average	

Table (5)

The Performance Average of the Participating Countries in 2003 in the third International Study on "Trends in Science and Math (TIMSS)" in Math

Country	Average			Country	Average	
Singapore	605	Δ		Armenia	Δ	478
Korea	589	Δ		Serbia	Δ	477
Hong Kong	586	Δ		Bulgaria	Δ	476
Taiwan	585	Δ		Romania	-	475
Japan	570	Δ		Norway	∇	461
Belgium	537	Δ		Moldova	-	460
Netherlands	536	Δ		Cyprus	∇	459
Estonia	531	Δ		Macedonia	∇	435
Hungary	529	Δ		Lebanon	∇	433
Malaysia	508	Δ		Jordan	∇	**424**
Latvia	508	Δ		Iran	∇	411
Russia	508	Δ		Indonesia	∇	411
Slovakia	508	Δ		Tunisia	∇	410
Australia	505	Δ		Egypt	∇	406
United States	504	Δ		Bahrain	∇	401
Lithuania	502	Δ		PA	∇	390
Sweden	499	Δ		Chile	∇	387
Scotland	498	Δ		Morocco	∇	387
Britain	498	Δ		Philippines	∇	378
Israel	496	Δ		Botswana	∇	366
New Zealand	494	Δ		Saudi Arabia	∇	332
Slovenia	493	Δ		Ghana	∇	276
Italy	484	Δ		South Africa	∇	264
International Average	**467**					

Average higher than Jordan's Average	
Average similar to Jordan's Average	
Average lower than Jordan's Average	

Trends in International Math and Science Study" (TIMSS 2007)

The study was carried out in (49) countries, including (12) Arab countries. Tables (6) and (7) show the performance average of the participating countries in science and math. The performance average of Jordanian students in Science was (482), and in math was (427). Jordan ranked (20) in science and (31) in math.

Table (6)

The Performance Average of the Participating Countries in 2003 in the third International Study on "Trends in Science and Math (TIMSS)" in Science

	Country	Average		Country	Average
1	Singapore	567	29	Iran	459
2	Taiwan	561	30	Malta	457
3	Japan	554	31	Turkey	454
4	Korea	553	32	Syria	452
5	England	541	32	Cyprus	452
6	Hungary	539	34	Tunisia	445
6	Czech	539	35	Indonesia	427
8	Slovenia	538	36	Oman	423
9	Hong Kong	530	37	Georgia	421
9	Russia	530	38	Kuwait	418
11	The United States	520	39	Columbia	417
12	Lithuania	519	40	Lebanon	414
13	Austria	515	41	Egypt	408
14	Sweden	511	41	Algeria	408
15	Scotland	496	43	Palestine	404
16	Italy	495	44	Saudi Arabia	403
17	Armenia	488	45	Morocco	402
18	Norway	487	46	El Salvador	387
19	Ukraine	485	47	Botswana	355
20	**Jordan**	**482**	48	Qatar	319
21	Malaysia	471	49	Ghana	303
21	Thailand	471		**Other participations**	
23	Serbia	470		Massachusetts / USA	556
23	Bulgaria	470		Minnesota / USA	539
25	Bahrain	467		Ontario / Canada	526
■	**International Average**	466		Columbia / Canada	526
26	Bosnia and	466		Quebec / Canada	507
27	Israel	465		Basque Country / Spain	498
28	Romania	462		Dubai / United Arab	489

	Average higher than Jordan's Average	
	Average similar to Jordan's Average	
	Average lower than Jordan's Average	

Table (7)

The Performance Average of the Participating Countries in 2007 in the third International Study on "Trends in Science and Math (TIMSS)" in Math

	Country	Average		Country	Average
1	Taiwan	598	25	Israel	461
2	Korea	597	■	The international average	451
3	Singapore	593	27	Bosnia and Herzegovina	456
4	Hong Kong	572	28	Lebanon	449
5	Japan	570	29	Thailand	441
6	Hungary	517	30	Turkey	432
7	England	513	31	Jordan	427
8	Russia	512	32	Tunisia	420
9	United States	508	33	Georgia	410
10	Lithuania	506	34	Iran	403
11	Czech	504	35	Bahrain	398
12	Slovenia	501	36	Indonesia	397
13	Armenia	499	37	Syria	395
14	Australia	496	38	Egypt	391
15	Sweden	491	39	Algeria	387
16	Malta	488	40	* Morocco	381
17	Scotland	487	41	Columbia	380
18	Serbia	486	42	Oman	372
19	Italy	480	43	Palestine	367
20	Malaysia	474	44	Botswana	364
21	Norway	469	45	Kuwait	354
22	Cyprus	465	46	El Salvador	340
23	Bulgaria	464	47	Saudi Arabia	329
24	Ukraine	462	48	Ghana	309
25	Romania	461	49	Qatar	307
	Other participations				
	Massachusetts / America	547		Columbia / Canada	509
	Minnesota / USA	532		Basque / Spain	499
	Dubai / UAE	528		Quebec / Canada	461
	Ontario / Canada	517			

* The sample did not achieve the required participation average

Average higher than Jordan's Average	
Average similar to Jordan's Average	
Average lower than Jordan's Average	

Math Test Questions in "Trends in Science and Math (TIMSS)/ 2011

The number of questions of the math test in "Trends in Science and Math (TIMSS)" 2007/ 2011 was (217) question, distributed on the following contents: numbers, algebra, geometry, and data.

The questions covered the expected skills and performances in the following areas of knowledge:

- Knowledge of facts and procedures (Knowledge).

- Application.

- Reasoning.

About (51%) of the test items are multiple choice, while (49%) of the test items were open questions as this type of questions requires students to form answers and write them in a particular space, (some questions require short answers and others require long answers). Table (8) shows the distribution of math questions by content and by question. Table (9) shows the distribution of questions by cognitive domain and by the type of question.

Table (8)

Distribution of Math Test Questions by Content by Question Type

Content	Multiple Choice Questions	Open Questions	Total of Questions	% of Scores
Numbers	(31)31	(36)30	(67)61	%29
Algebra	(37)37	(39)33	(76)70	%33
Geometry	(25)25	(19)18	(44)43	%19
Data	(25)25	(20)18	(45)43	%19
Total	**(118)118**	**(114)99**	**(232)217**	**%100**
Scores' Percentages		**%51**	**%49**	

Table (9)

Distribution of Math Test Questions by Cognitive Domain and by Question Type

Content	Multiple Choice Questions	Open Questions	Total of Questions	% of Scores
- Knowledge of facts and procedures	(53)53	(30)27	(83)80	%36
Application	(47)47	(44)38	(91)85	%39
Reasoning	(18)18	(40)34	(58)52	%25
Total	**(118)118**	**(114)99**	**(232)217**	**%100**
Scores' Percentages	**%51**	**%49**		

The total of marks is between brackets

Math and science questions were distributed in (28) clusters, and these clusters were distributed on (14) booklets, so that each student is given one booklet in the test following a random predefined procedure. Students answer the questions in (90) minutes distributed for two sessions with a 10-minute break. It should be noted that each booklet contains questions in math and other booklets contain questions of sciences. This means that students' achievement in math and science is measured by answering science and math questions in the first and second section of the test booklet.

Science Test Questions in "Trends in Science and Math (TIMSS)/ 2011

The number of questions of the science test in "Trends in Science and Math (TIMSS)" 2007/ 2011 was (217) question, distributed on the following contents: Biology, chemistry, physics, earth sciences. The questions covered the following areas of knowledge: knowledge of the facts, and the application, and reasoning.

(47%) of the test items are multiple choice, while (49%) of the test items were open questions as this type of questions requires students to form answers and write them in a particular space, (some questions require short answers and others require long answers). Table (10) shows the distribution of science questions by content and by question. Table (11) shows the distribution of questions by cognitive domain and by the type of question.

Table (10)

Distribution of Science Test Questions by Content by Question Type

Content	Multiple Choice Questions	Open Questions	Total of Questions	% of Scores
Biology	(38)38	(49)41	(87)38	%37
Chemistry	(22)22	(25)22	(47)44	%20
Physics	(29)29	(29)26	(58)55	%25
Earth sciences	(21)21	(21)18	(42)39	%18
Total	(110)110	(124)107	(234)217	%100
Scores Percentage	%47	%53		

Table (11)

Distribution of Science Test Questions by Cognitive Domain and by Question Type

Content	Multiple Choice Questions	Open Questions	Total of Questions	% of Scores
Knowledge of facts	%32	(76)73	(18)15	(58)58
Application	%44	(103)92	(63)52	(40)40
Reasoning	%24	(55)52	(43)40	(12)12
Total	%100	(234)217	(124)107	(110)110
Scores Percentage			%53	%47

The total of marks is between brackets

Tools of "Trends in Science and Math (TIMSS)/ 2011

Achievement test booklets

Math and science questions were distributed on (14) test booklet numbered from one to 14, so that each student of the study sample answers on booklet of the 14 booklets that are

previously identified for the student randomly. Each booklet includes questions on math and science. Some questions are multiple-choice questions, and others are open questions that require the student to write short answers or long ones.

The design of the achievement test depends on clusters of questions distributed on the test's booklets in an orderly manner. The cluster is a small set of questions developed together. All of the test questions were distributed on (28) clusters, half of which are math questions and the other half are science questions, and each question appears in one cluster only. In the process of distributing clusters of questions on the test's booklets, each cluster appears in two booklets and each booklet consists of two parts, each part contains two clusters in math or science as indicated in table (12).

Table (12)

Distribution of Test Item clusters for the Test Booklets

Booklet No.	Part One		Part Two	
1	M01	M02	S01	S02
2	S02	S03	M02	M03
3	M03	M04	S03	S04
4	S04	S05	M04	M05
5	M05	M06	S05	S06
6	S06	S07	M06	M07
7	M07	M08	S07	S08
8	S08	S09	M08	M09
9	M09	M10	S09	S10
10	S10	S11	M10	M11
11	M11	M12	S11	S12
12	S12	S13	M12	M13
13	M13	M14	S13	S14
14	S14	S01	M14	M01

S= Science cluster

M= Math cluster

Study's Questionnaires

The following four questionnaires were developed and implemented in the International Study for Math and Science / 2011 (TIMSS 2011):

1. Student's questionnaires: The student questionnaire included (21) item, and the students in the study sample answered it in about 40 minutes. The students' answers provided information on their family and academic background, and their attitudes and

aspirations and classroom practices for math and science teachers from the students' perspectives.

2. Math teacher's questionnaires: The math teacher questionnaire included (30) items and was answered by the math teachers of the students in the study sample in about 60 minutes. The answers in this questionnaire provided information on their scientific and academic backgrounds, their teaching practices and their attitudes towards teaching math.

3. Science teacher questionnaire: The science teacher questionnaire included (29) items and was answered by the science teachers of the students in the study sample in about 60 minutes. The answers in this questionnaire provided information on their scientific and academic backgrounds, their teaching practices and their attitudes towards teaching science.

4. The school's questionnaires: The school's questionnaire included schools (17) items, answered by the schools' principals of students in the study sample in about 45 minutes. This questionnaire provided information on the school environment, the teaching cadre, the curriculum, the study programs, the school facilities, and the training and development programs at the school, the time spent by students in the school, particularly the time spent in learning math and science, and the actions undertaken by the school to build relationships with the community and the parents.

The study sample

Specific procedures were followed in the selection of the study sample in line with the sampling manual developed for the study purposes. The Jordanian educational database was used as the basis for the sample selection. In the first phase, the sampling unit was the school, and in the second phase, one or two grade eight sections were randomly selected. Therefore, the sampling design is the "Two-Stage probability proportional-to-size (PPS) sampling technique."

The Statistics Centre in Canada (Statistics Canada is the responsible body for the study procedures and the sample selection. The National Center for Human Resources Development (NCHRD) provided the Center with the general framework of the Jordanian study population of the included all schools in the country and the schools including grade eight. The (NCHRD) also provided (Statistics Canada) with the following information on schools: school's national number, the supervising authority (Ministry of Education, UNRWA, and private education), the total number of grade eight students in each school, the number of grade eight sections, class size of each school, the school location (rural, city), the school sex (male, female, mixed), and the school stratastrata (exploratory, Madrasati, Education Reform Support Project (ERSP), Ministry of Education, UNRWA, and private education). In addition, the Statistics Centre in

Canada was provided with general information describing the educational system in Jordan, so that the Center selects the study sample by the Center in accordance with the international standards of the study sample.

The selection of the sample took into account the school size (the number of eighth grade students in the school) and the sex of the school, its location and the, and the sampling weights were calculated and taken into account in the results analysis. One or two grade eight sections were randomly selected each of the sample schools.

The final sample of the study consisted of (230) schools, randomly selected from the community schools in the country that contain grade eight schools. The total number of students in the study sample is (7694) students. Tables (13), (14), (15), (16), (17) show the distribution of the sample by the supervisory authority, location, school sex, gender, and the sampling strata.

Table (13)

**Distribution of Students and Schools of the
Study Sample (TIMSS 2011) by the Supervising Authority**

Supervising Authority	Student		Schools	
	No.	%	No.	%
Ministry of Education	6316	83	180	78
UNRWA	843	11	25	11
Private Education	535	7	25	11
Total	7694	100	230	100

Table (14)

**Distribution of Students and Schools of the
Study Sample (TIMSS 2011) by the School Location**

School location	Student		Schools	
	No.	%	No.	%
Urban	6202	81	180	78
Rural	1492	19	50	22
Total	7694	100	230	100

Table (15)

**Distribution of Students and Schools of the
Study Sample (TIMSS 2011) by the School Location**

School Sex	Student		Schools	
	No.	%	No.	%
Males	3315	43	101	44
Females	2566	33	71	31
Mixed	1813	24	58	25
Total	**7694**	**100**	**230**	**100**

Table (16)

**Distribution of Students and Schools
of the Study Sample (TIMSS 2011) by Gender**

Gender	Student	
	No.	%
Males	3604	47
Females	4090	53
Total	**7694**	**100**

Table (17)

Distribution of Students and Schools of the Study Sample (TIMSS 2011) by Strata

Strata	Student		Schools	
	No.	%	No.	%
Discovery / the Ministry	932	12	25	11
Ministry of Education	3145	41	100	43
UNRWA	843	11	25	11
Private Education	535	7	25	11
Madrasati / the Ministry	752	10	25	11
ERSP/ the Ministry	1487	19	30	13
Total	**7694**	**100**	**230**	**100**

Procedures of Implementing "Trends in Science and Math (TIMSS)/ 2011

All phases of the study were carried out in Jordan in close collaboration between the National Center for Human Resources Development and the Ministry of Education.

1. Translation of the study tools: A national team translated the achievement tests in math and science, the student's questionnaire, the math teacher's questionnaire, the science teacher questionnaire, and the school principal questionnaire to Arabic and adapted the

translated tools to suit the Jordanian environment. The translation has taken into account specific set of standards developed by the International Association for the Evaluation of Educational Achievement (IEA). In addition, guides were translated to ensure the control of the tools implementation, such as the study implementer manual, the Coordinator manual, and the correction manual. The translated tools were sent to the (IEA), (the study's supervisor) which is based in Amsterdam/ Netherlands, to be audited by specialized centers as well as the translations of other countries. The translation was sent back to Jordan to insert the required modifications, and the final form of the study tools was developed.

2. Printing the study Tools: After checking the accuracy of the study tools translation, the following tools were printed: (9000) test booklets, (9000) student questionnaire, (350) math teacher questionnaires, teacher (math), (350) science teacher questionnaires, (300) schools questionnaires, (100) implementer manuals, quality control manual, and (100) correction manual.

3. Training on the application: A workshop was held at the National Center for Human Resources Development to train the data collecters on the steps that must be followed in the process of collecting data from the field.

4. Data collection: Data was collected from the field in April / 2011 in accordance with specific instructions for this process, and for the purposes of controlling the quality of the study's application. A national team was formed to control the quality of the study. The team visited a group of schools that implemented the study to check the procedures carried out by the coordinators, the implementers, and the extent of their commitment to the study application instructions. In addition to the national team for the quality control, an international team last visited (10%) of the sample schools that were selected randomly) a sample of schools during the application period to ensure the compliance with the study application instructions by the implementers.

5. Correction: The achievement test booklets in math and science included open questions that require students to write short answers, while others require longer answers. A qualified team in math and science corrected the questions after receiving training on this process as stated in the manual prepared by the (IEA). (30) educational supervisor of math and science participated in the correction process that lasted for (20) days.

6. Data entry: The data collected from the field was saved on computer using software developed by the (IEA). Prior to the data entry process, a training workshop was held for a team of (14) people who entered the data.

7. Data processing: All of the participating countries sent their data to the International Study Center in Hamburg (a Data Processing Center), and this data was completed in the end of July in 2011. Advanced analysis methods were followed to derive common standards to compare students' performance averages in the participating countries in math and science. The study findings were disseminated in two international reports, one on math, and the other on science in December/2012.

Countries Participating in "Trends in Science and Math (TIMSS)/ 2011

Table (18) shows a group of countries participating in the study. The number of non-Arab international participations is (34), and number of Arab participations is (11) countries, while the number of non-international participations is (14) educational systems.

Table (18)

Participating Countries in "Trends in Science and Math (TIMSS)/ 2011

Non-Arab international participations				Arab participations		Non-international participations	
1	Armenia	18	Lithuania	1	Bahrain	1	Alberta / Canada
2	Australia	19	Macedonia	**2**	**Jordan**	2	Ontario / Canada
3	Chile	20	Malaysia	3	Lebanon	3	Quebec / Canada
4	Taiwan	21	New Zealand	4	Morocco	4	Abu Dhabi / UAE
5	England	22	Norway	5	Oman	5	Dubai / UAE
6	Finland	23	Romania	6	Palestine	6	Alabama / America
7	Georgia	24	Russia	7	Qatar	7	California / USA
8	Ghana	25	Singapore	8	Saudi Arabia	8	Colorado / America
9	Hong Kong	26	Slovenia	9	Syria	9	Connecticut / USA
10	Hungary	27	Sweden	10	Tunisia	10	Florida / Latino
11	Indonesia	28	Thailand	11	Emirates	11	Indiana / USA
12	Iran	29	Turkey			12	Massachusetts / USA
13	Israel	30	Ukraine			13	Minnesota / USA
14	Italy	31	United States			14	Carolina / USA
15	Japan	32	Botswana				
16	Kazakhstan	33	Honduras				
17	Korea	34	South Africa				

Chapter Two

Performance on the Science Test

Table (19) shows the overall performance averages of the students in the participating countries in the science test.

These results indicate that Jordan ranked (28) among the participating countries. Jordan's performance average is (28) scores below the international average and Jordan ranked third among the Arab countries participating in the study. However, Jordan's performance did not differ from the performance of Bahrain and Thailand.

Jordanian students excelled the students of the following (17) countries: Tunisia, Armenia, Saudi Arabia, Malaysia, Syria, Palestine, Georgia, Oman, Qatar, Macedonia, Lebanon, Indonesia, Morocco, Ghana, Botswana, Honduras, and South Africa.

The averages of the following (25) countries were higher than Jordan are: Singapore, Taiwan, Korea, Japan, Finland, Slovenia, Russia, Hong Kong, England, the United States, Hungary, Australia, Israel, Lithuania, New Zealand, Sweden, Italy, and Ukraine , Norway, Kazakhstan, Turkey, Iran, Romania, and the United Arab Emirates, and Chile.

Table (20) shows the performance averages of the Arab countries participating in the study, and Figure (1) shows the performance averages of the Arab countries in science. It should be noted that the performance average of Jordanian students in science was higher than the Arab averages with (21) scores and this difference is statistically significant. Jordan's average is higher than the average of the following participating Arab countries: Tunisia, Saudi Arabia, Syria, Palestine, Oman, Qatar, and Lebanon with statistical significance.

Table (19)

Performance Averages of Participating Countries in Science in   (TIMSS 2011)

	Country	Average		Country	Average
1	Singapore	590 Δ	23	Romania	465 Δ
2	Taiwan	564 Δ	24	United Arab Emirates	465 Δ
3	Korea	560 Δ	25	Chile	461 Δ
4	Japan	558 Δ	26	Bahrain	452
5	Finland	552 Δ	27	Thailand	451
6	Slovenia	543 Δ	**28**	**Jordan**	**449**
7	Russia	542 Δ	29	Tunisia	439 ▽
8	Hong Kong	535 Δ	30	Armenia	437 ▽
9	England	533 Δ	31	Saudi Arabia	436 ▽
10	United States	525 Δ	32	Malaysia	426 ▽
11	Hungary	522 Δ	33	Syria	426 ▽
12	Australia	519 Δ	34	Palestine	420 ▽
13	Israel	516 Δ	35	Georgia	420 ▽
14	Lithuania	514 Δ	36	Oman	420 ▽
15	New Zealand	512 Δ	37	Qatar	419 ▽
16	Sweden	509 Δ	38	Macedonia	407 ▽
17	Italy	501 Δ	39	Lebanon	406 ▽
18	Ukraine	501 Δ	40	Indonesia	406 ▽
19	Norway	494 Δ	41	Morocco	376 ▽
20	Kazakhstan	490 Δ	42	Ghana	306 ▽
21	Turkey	483 Δ	43	Botswana	404 ▽
	The international average	**477** Δ	44	Honduras	369 ▽
22	Iran	474 Δ	45	South Africa	332 ▽
	Other participations				
1	Massachusetts / USA	567 Δ	8	Florida / USA	
2	Minnesota / USA	553 Δ	9	Ontario / Canada	
3	Alberta / Canada	546 Δ	10	Quebec / Canada	530 Δ
4	Colorado / America	542 Δ	11	California / USA	521 Δ
5	Indiana / USA	533 Δ	12	Alabama / America	520 Δ
6	Connecticut / USA	532 Δ	13	Dubai / UAE	499 Δ
7	Carolina / USA	532 Δ	14	Abu Dhabi / UAE	485 Δ

Average higher than Jordan's Average	
Average similar to Jordan's Average	
Average lower than Jordan's Average	

Table (20)

Performance Averages of Participating Arab Countries in Science in (TIMSS 2011)

	Country	Performance average
	The international average	477 Δ
1	United Arab Emirates	465 Δ
2	Bahrain	452
3	Jordan	449
4	Tunisia	439 ∇
5	Saudi Arabia	436 ∇
6	Arab average	428 ∇
7	Syria	426 ∇
8	Palestine	420 ∇
9	Oman	420 ∇
10	Qatar	419 ∇
11	Lebanon	406 ∇
12	Morocco	376 ∇
	Dubai / UAE	485 Δ
	Abu Dhabi / UAE	461 Δ

Average higher than Jordan's Average	
Average similar to Jordan's Average	
Average lower than Jordan's Average	

Figure (**1**)

Performance Averages of the Arab Countries in Science
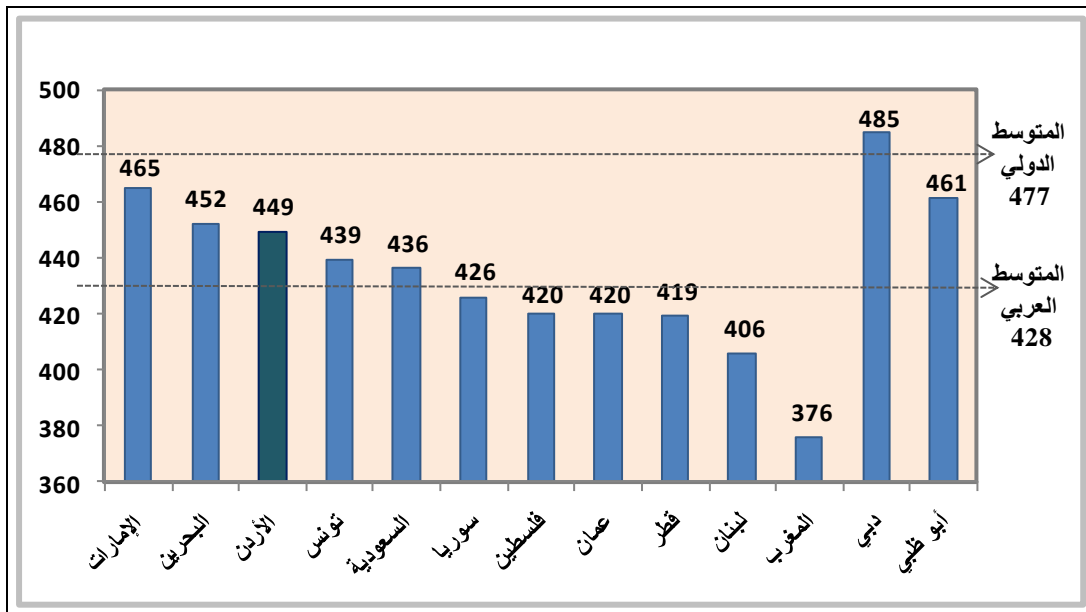
Performance in the Science Test by International Achievement Levels

The international study identifies the following four achievement levels:

− Advanced Achievement level in science, representing students who got 625 scores or more.

− High Achievement level in science, representing students who got 550 scores or more.

− Moderate Achievement level in science, representing students who got 475 scores or more.

− Low Achievement levelin Science, representing students who got 400 scores or more.

It should be noted that these levels are cumulative, i.e., students who reach a certain level, have already reached the levels below it. In other words, student who reached the high achievement level, have already reached the moderate and low levels, but were unable to reach the advanced level.

Advanced achievement level

Students who reached the advanced achievement level are able to:

− Understand and comprehend some abstract and compound concepts of science.

- Apply what they understand about the complex relationships between organisms, and link this relationship with the organisms' environment.

- Demonstrate their understanding of electricity, thermal expansion, sound, and material composition, properties, and physical and chemical changes, as well as understanding resources and environmental issues.

- Understand some of the scientific research issues.

- apply the physical principles in solving some of the quantitative issues.

- provide scientific explanations in writing to communicate and exchange them.

The following example shows a question of science for grade eight, which the majority of students reaching the advanced achievement level of (625) scores answered correctly.

**An example of a question answered by most
students in grade eight reaching the advanced achievement level**

Country	Percentage of Correct Answers			Content Domain: Chemistry
				Knowledge Domain: Knowledge
				Describing things that can be seen in a chemical reaction
England	59	(2.6)	▲	Ahmed put some powder in a test tube, then he added liquid to the powder and shock the tube test, and a chemical reaction happened.
New Zealand	50	(2.5)	▲	
America	46	(1.5)	▲	Describe two possible things that Ahmed might see when the reaction takes place
Taiwan	44	(2.0)	▲	
Russia	44	(2.4)	▲	1. Change in the heat
Singapore	44	(1.9)	▲	
Australia	42	(2.3)	▲	
Emirates	37	(1.3)	▲	
Finland	36	(2.3)	▲	
Hong Kong	35	(1.9)	▲	
Norway	32	(2.5)	▲	
Japan	30	(2.1)	▲	2. Gas bubbles
Saudi Arabia	30	(2.1)	▲	
Syria	30	(2.4)	▲	
Slovenia	30	(2.1)	▲	
Jordan	28	(2.0)	▲	
Ukraine	27	(2.5)		
International	24	(0.3)		
Bahrain	23	(1.4)		
Israel	23	(2.0)		The answer describes a student's response who received full marks for this question.
Korea	23	(1.6)		
Lebanon	22	(2.3)		

Qatar	22	(2.2)						
Lithuania	21	(1.9)						
Palestine	21	(1.8)						
Sweden	18	(1.5)	▼					
Tunisia	18	(1.6)	▼					
Kazakhstan	17	(2.0)	▼	Other Participations				
Romania	17	(1.6)	▼	Minnesota / USA	53	(2.6)	▲
Oman	17	(1.4)	▼	Massachusetts / USA	52	(3.4)	▲
Iran	17	(1.7)	▼	Indiana / USA	51	(3.2)	▲
Hungary	15	(1.4)	▼	Colorado / America	51	(3.7)	▲
Armenia	14	(1.5)	▼	Carolina / America	47	(3.8)	▲
Malaysia	10	(1.2)	▼	Quebec / Canada	44	(2.2)	▲
Italy	9	(1.3)	▼	California / USA	44	(3.6)	▲
Turkey	8	(1.2)	▼	Florida / USA	42	(3.8)	▲
Thailand	8	(1.3)	▼	Dubai / UAE	39	(1.8)	▲
Chile	7	(0.9)	▼	Abu Dhabi / UAE	39	(2.4)	▲
Indonesia	6	(0.9)	▼	Alabama / America	38	(4.1)	▲
Macedonia	5	(1.1)	▼	Connecticut / USA	37	(3.7)	▲
Morocco	4	(0.5)	▼	Alberta / Canada	37	(2.3)	▲
Georgia	3	(1.0)	▼	Ontario / Canada	32	(2.3)	▲
Ghana	1	(0.4)	▼				
Botswana	11	(1.0)	▼	Percentage is higher than the international average with statistical difference			▲
South Africa	8	(0.8)	▼	Percentage is lower than the international average with statistical difference			▼
Honduras	8	(1.3)	▼	Percentage is similar to the international average			

High achievement level:

Students who reached the advanced achievement level are able to:

- show their understanding of some concepts of scientific cycles, systems and principles.

- have some understanding of the earth processes, the solar system, the biological systems, population, reproduction, genetics and the organs composition and functions.

- show some understanding of the physical and chemical changes and the material composition.

- solve some physical issues related to light, heat, electricity and magnetism.

- show basic knowledge of key environmental issues.

- show some scientific inquiry skills.

- gather information and extract conclusions, interpret data using graphs, charts and tables, or through solving issues or providing brief scientific explanation showing the relationship between the cause and the effect.

The following example shows a question of science for grade eight, which the majority of students reaching the high achievement level answered correctly.

An example of a question answered by most students in grade eight reaching the high achievement level

Country	Percentage of Correct Answers		Content Domain: Physics
			Knowledge Domain: knowledge
			Description: To know what happens to the molecules of the liquid when cooling it
Korea	82	(1.4) ▲	What happens to the liquid molecules when cooling it?
Slovenia	80	(2.0) ▲	
Russia	77	(2.0) ▲	
Israel	75	(2.0) ▲	A becomes slower
Singapore	73	(1.8) ▲	
Finland	73	(2.0) ▲	B become faster
America	73	(1.5) ▲	
Sweden	72	(1.9) ▲	C decreases the number
Kazakhstan	71	(2.4) ▲	
New Zealand	70	(2.3) ▲	D decrease in size
Hungary	70	(2.1) ▲	
Norway	68	(2.8) ▲	
Bahrain	67	(2.1) ▲	
Ukraine	67	(2.6) ▲	
England	65	(2.3) ▲	
Turkey	63	(1.7) ▲	
Saudi Arabia	63	(2.0) ▲	
Australia	62	(2.1) ▲	
UAE	60	(1.3)	
Iran	60	(2.2)	
Armenia	59	(2.8)	
Romania	59	(1.9)	
Lithuania	59	(2.5)	
International average	58	(0.3)	
Georgia	56	(2.2)	
Italy	56	(2.5)	
Taiwan	56	(1.9)	
Malaysia	53	(2.2) ▼	**Other Participations**

Hong Kong	52	(2.2)	▼	Alberta / Canada	86	(1.6)	▲
Chile	51	(2.2)	▼	Massachusetts / USA	86	(2.2)	▲
Oman	50	(1.8)	▼	Ontario / Canada	83	(1.6)	▲
Japan	50	(2.3)	▼	Florida / USA	81	(3.6)	▲
Macedonia	49	(2.4)	▼	Indiana / USA	79	(2.7)	▲
Qatar	47	(2.1)	▼	Minnesota / USA	79	(2.7)	▲
Jordan	46	(1.9)	▼	Colorado / America	76	(2.4)	▲
Thailand	41	(1.9)	▼	Connecticut / USA	75	(2.4)	▲
Palestine	40	(1.8)	▼	Carolina / USA	71	(4.0)	▲
Syria	37	(2.1)	▼	California / Latino	71	(2.3)	▲
Lebanon	37	(2.5)	▼	Alabama / America	65	(3.4)	▲
Indonesia	35	(2.3)	▼	Quebec / Canada	65	(2.2)	▲
Morocco	33	(1.6)	▼	Abu Dhabi / UAE	61	(2.1)	
Tunisia	32	(2.1)	▼	Dubai / UAE	59	(2.2)	
Ghana	31	(1.8)	▼				
South Africa	47	(1.8)	▼	Percentage is higher than the international average with statistical difference			▲
Honduras	37	(2.3)	▼	Percentage is lower than the international average with statistical difference			▼
Botswana	36	(1.9)	▼	Percentage is similar to the international average			
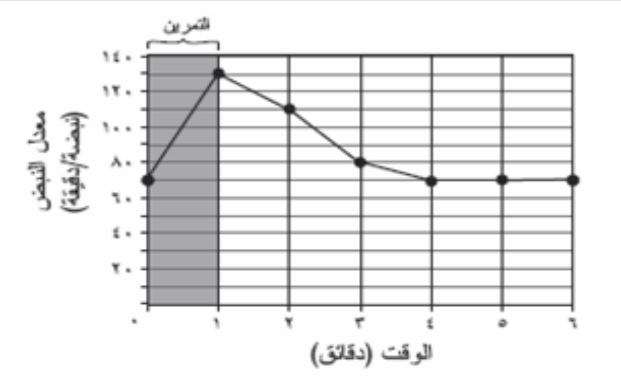
Moderate   achievement level:

Students who reached the moderate achievement level are able to:

- understand basic scientific knowledge and transfer it over a given range of topics.

- recognize some properties of the solar system, the water cycle, animals, and human health.

- know some facts about energy, strength, movement, reflection of light and sound.

- have basic knowledge of the solar system, earth operations, resources and environment.

- apply and share knowledge using tables, and derive information from data represented in flat or three-dimensional graphs.

The following example shows a question of science for grade eight, which the majority of students reaching the moderate achievement level answered correctly.

An example of a question answered by most students in grade eight reaching the average achievement level

Country	Percentage of Correct Answers			Content Domain: Biology
				Knowledge Domain: Conclusions
				Description: To differentiate the characteristics which only mammals have and other animals do not.
Japan	82	(1.7)	▲	Jamal measured his pulse rate before the exercise, and found that it was 70 beats per minute. Jamal exercised for one minute and then measured his pulse rate. Then he measured his pulse rate it every minute for several minutes. Later, he drew this chart to display the results.
Korea	80	(1.6)	▲	
Finland	80	(1.9)	▲	
Italy	79	(1.9)	▲	
Russia	75	(1.9)	▲	
Singapore	75	(1.6)	▲	
Sweden	75	(1.7)	▲	
Israel	74	(1.7)	▲	
Lithuania	74	(2.0)	▲	
Norway	73	(2.5)	▲	
America	73	(1.2)	▲	
Slovenia	71	(1.9)	▲	
England	69	(2.6)	▲	
Australia	66	(2.3)	▲	
Taiwan	64	(2.0)	▲	What can be deduced from these results?
New Zealand	62	(1.9)	▲	
Chile	62	(2.0)	▲	A The pulse rate rose of about 50 beats per minute
Romania	61	(1.9)		
Hong Kong	60	(2.3)		B The pulse rate took less time to decline than to rise
Malaysia	60	(1.8)		
Turkey	60	(1.9)		C The pulse rate was 80 beats per minute after 4 minutes.
The international	57	(0.3)		D The pulse rate returned to the normal average in less than 6 minutes
Ukraine	56	(3.0)		
UAE	54	(1.5)	▼	
Iran	51	(1.9)	▼	
Georgia	49	(2.6)	▼	
Tunisia	49	(2.1)	▼	
Hungary	48	(2.1)	▼	
Saudi Arabia	46	(2.3)	▼	Minnesota / USA	79	(2.5)	▲
Bahrain	46	(2.1)	▼	Massachusetts / USA	77	(2.8)	▲
Lebanon	46	(2.5)	▼	Carolina / USA	76	(3.2)	▲
Indonesia	46	(2.2)	▼	Indiana / USA	76	(2.3)	▲
Thailand	45	(2.1)	▼	Quebec / Canada	76	(2.0)	▲
Macedonia	45	(2.3)	▼	Connecticut / USA	75	(2.7)	▲
Kazakhstan	44	(2.3)	▼	Alberta / Canada	73	(2.1)	▲
Qatar	43	(2.2)	▼	Ontario / Canada	71	(2.2)	▲
Jordan	43	(2.3)	▼	Colorado / America	70	(3.0)	▲
Armenia	42	(2.2)	▼	Florida / USA	67	(3.9)	▲

Morocco	42	(1.4)	▼	California / USA	64	(2.5)	▲
Oman	42	(1.5)	▼	Alabama / America	60	(3.0)	
Palestine	38	(1.9)	▼	Dubai / America	57	(2.0)	
Syria	32	(2.6)	▼	Abu Dhabi / America	55	(2.2)	
Ghana	30	(1.5)	▼				
Botswana	48	(1.7)	▼	Percentage is higher than the international average with statistical difference			▲
Honduras	37	(2.1)	▼	Percentage is lower than the international average with statistical difference			▼
South Africa	31	(1.3)	▲	Percentage is similar to the international average			

Low achievement level:

Students who reached the low achievement level are able to:

- understand some facts about the physical and biological sciences.

- have some knowledge on the human body and on genetics.

- be familiar with some physiological phenomena that are relevant to everyday life.

- interpret three-dimensional graphs, and apply knowledge and physical facts in practical situations.

The following example shows a question of science for grade eight, which the majority of students reaching the low achievement level answered correctly.

An example of a question answered by most students in grade eight reaching the low achievement level

Country	Percentage of Correct Answers		Content Domain: Biology
			Knowledge Domain: Application
			Description: Genes are taken from both parents
Japan	95	(0.9) ▲	Twins are born. One is a boy and the other is a girl.
Finland	94	(1.0) ▲	
Korea	93	(0.9) ▲	What is the correct sentence regarding their genetic composition?
Singapore	92	(1.0) ▲	
Slovenia	91	(1.4) ▲	A The boy and the girl inherit the genetic traits of the father only
Jordan	91	(1.1) ▲	B The boy and the girl inherit the genetic traits of the mother only
America	90	(0.8) ▲	C The Boy and the girl inherits the genetic traits of both parents
Israel	90	(1.4) ▲	D The boy inherits the genetic traits of the father only and the girl inherits the genetic
Taiwan	89	(1.2) ▲	traits of the mother only
England	88	(1.7) ▲	

Country				Region			
Hong Kong	88	(1.5)	▲				
Russia	88	(1.5)	▲				
Italy	88	(1.6)	▲				
Hungary	87	(1.4)	▲				
Armenia	87	(1.4)	▲				
Tunisia	87	(1.2)	▲				
Ukraine	86	(2.2)	▲				
UAE	86	(1.0)	▲				
Australia	86	(1.5)					
Bahrain	85	(1.4)					
Saudi Arabia	85	(1.4)					
New Zealand	85	(1.6)					
Lithuania	84	(1.7)					
Turkey	84	(1.3)					
Palestine	84	(1.3)					
The international	83	(0.2)					
Sweden	83	(1.5)					
Romania	83	(1.5)					
Norway	82	(1.6)		Massachusetts / USA	95	(1.3)	▲
Qatar	82	(1.8)		Minnesota / USA	94	(1.1)	▲
Syria	81	(1.7)		Indiana / USA	92	(1.3)	▲
Oman	81	(1.2)	▼	Carolina / USA	91	(1.7)	▲
Morocco	80	(1.6)	▼	Connecticut / USA	89	(1.8)	▲
Chile	80	(1.5)	▼	Alberta / Canada	89	(1.3)	▲
Kazakhstan	79	(1.7)	▼	Colorado / America	89	(2.0)	▲
Thailand	77	(1.8)	▼	Alabama / America	88	(2.2)	▲
Georgia	76	(2.8)	▼	Florida / USA	87	(2.8)	
Lebanon	76	(2.2)	▼	Quebec / Canada	87	(1.5)	▲
Iran	75	(1.8)	▼	Ontario / Canada	87	(1.5)	▲
Indonesia	70	(2.3)	▼	California / Latino	86	(1.8)	
Ghana	69	(1.5)	▼	Abu Dhabi / UAE	86	(1.4)	
Malaysia	69	(1.7)	▼	Dubai / UAE	86	(1.8)	
Macedonia	63	(2.4)	▼				
South Africa	73	(1.2)	▼	Percentage is higher than the international average with statistical difference			▲
Honduras	66	(2.0)	▼	Percentage is lower than the international average with statistical difference			▼
Botswana	63	(1.6)	▼	Percentage is similar to the international average			

Table (21) shows the percentages of students who reached the achievement levels for all countries and table (22) shows the percentages of Arab students. These tables clearly show that the percentage of Jordanian students who reached the advanced level is (2%), and is less than the international percentage in this level, which is (4%), and is equal to the Arab percentage. Regarding the high achievement level, Jordan's percentage is (15%), which is less than the international percentage that is (21%), and is higher than the Arab percentage which is (11%).

For the moderate achievement level, Jordan's percentage is (45%), which is less than the international percentage that reached (52%), and is higher than the Arab percentage in this level which is (34%). Regarding the low achievement level, Jordan's percentage is (72%), and is less than the international percentage in this level, which is (79%), but is higher than the Arab percentage of the Arab countries in this level, which is (68%).

In sum, the percentages of the Jordanians students in the four achievement levels are better than the Arab median percentages, but are below the similar international percentages in all levels.

Table (21)

Percentages of Students by Performance Levels in Science for the Participating Countries

	Country	Advanced	High	Moderate(475)	Low		Country	Advanced	High	Moderate(475)	Low
1	Singapore	40	69	87	96	22	Kazakhstan	4	23	58	86
2	Taiwan	24	60	85	96	23	Bahrain	3	17	44	70
3	Korea	20	57	86	97	24	Qatar	3	14	34	58
4	Japan	18	57	86	97	25	Norway	3	22	62	90
5	Russia	14	48	81	96	26	Romania	3	16	47	78
6	England	14	44	76	93	27	**Jordan**	**2**	**15**	**45**	**72**
7	Slovenia	13	48	82	96	28	Macedonia	2	10	30	53
8	Finland	13	53	88	99	29	Oman	2	11	34	59
9	Israel	11	39	69	88	30	Armenia	1	12	37	66
10	Australia	11	35	70	92	31	Malaysia	1	11	34	62
11	America	10	40	73	93	32	Thailand	1	10	39	74
12	Hong Kong	9	47	80	95	33	Chile	1	12	43	79
13	New Zealand	9	34	67	90	34	Palestine	1	10	33	59
14	Hungary	9	39	75	92	35	Lebanon	1	7	25	54
15	Turkey	8	26	54	79	36	Saudi Arabia	1	8	33	68
16	Sweden	6	33	68	91	37	Georgia	0	6	28	62
17	Lithuania	6	33	71	92	38	Syria	0	6	29	63
18	Ukraine	6	29	64	88	39	Tunisia	0	5	30	72
19	Iran	5	21	50	79	40	Indonesia	0	3	19	54
20	UAE	4	19	47	75	41	Morocco	0	2	13	39
21	Italy	4	27	65	90	42	Ghana	0	1	6	22
							International	**4**	**21**	**52**	**79**
Participating countries in grade nine											
1	South Africa	1	4	11	25	3	Honduras	0	1	9	35
2	Botswana	1	6	26	55						
Other participations											
1	Massachusetts	24	61	87	96	8	Indiana / USA	10	43	78	95
2	Minnesota /	16	54	85	98	9	Dubai / UAE	7	28	57	79
3	Colorado /	14	48	80	96	10	California /	6	28	62	88

4	Connecticut /	14	45	74	92	11	Ontario /	6	35	76	96
5	Florida / USA	13	42	74	93	12	Quebec /	5	34	76	96
6	Carolina / USA	12	42	75	94	13	Alabama /	5	24	56	83
7	Alberta /	12	48	85	98	14	Abu Dhabi /	4	17	45	74

Table (22)

Performance Averages of Participating Arab Countries in Science in (TIMSS 2011)

	Country	Advanced (625)	High (550)	Moderate(475)	Low (400)
1	United Arab Emirates	4	19	47	75
2	Bahrain	3	17	44	70
3	Qatar	3	14	34	58
4	Jordan	2	15	45	72
5	Oman	2	11	34	59
6	Palestine	1	10	33	59
7	Lebanon	1	7	25	54
8	Saudi Arabia	1	8	33	68
9	Syria	0	6	29	63
10	Tunisia	0	5	30	72
11	Morocco	0	2	13	39
	Dubai / UAE	7	28	57	79
	Abu Dhabi / UAE	4	17	45	74
	Arab median	2	11	34	68
	International median	4	21	52	79

Level of Performance in the Science Test by Gender

Table (23) shows the performance averages in science test by gender for all countries, and Table (24) shows the performance averages of the participating Arab countries by gender.

Table (23)

Performance Averages in Science for the Participating Countries in (TIMSS 2011) by Gender

Rank	Country	Performance Average		Absolute difference	Rank	Country	Performance Average		Absolute difference
		Females	**Males**				**Females**	**Males**	
1	Taiwan	564	564	0(3.0)	24	Malaysia	434	419	**15(5.5)**
2	Norway	495	494	1(3.4)	25	Thailand	458	443	**15(4.9)**
3	Singapore	589	591	1(4.1)	26	Italy	493	508	**15(2.8)**
4	Hong Kong	536	534	2(4.6)	27	Chile	454	470	**16(3.6)**
5	Romania	466	464	2(3.4)	28	Turkey	491	475	**16(3.2)**
6	England	534	532	2(5.6)	29	Australia	511	527	**16(5.9)**
7	Sweden	511	508	3(3.0)	30	Tunisia	431	447	**17(2.6)**
8	Morocco	378	374	4(3.0)	31	Macedonia	417	399	**18(4.7)**
9	Kazakhstan	492	488	4(3.6)	32	Hungary	513	531	**18(3.7)**
10	Lebanon	404	408	4(6.7)	33	Armenia	446	428	**18(3.4)**
11	Slovenia	541	545	4(3.4)	34	New Zealand	501	522	**20(3.9)**
12	Ukraine	499	503	4(4.1)	35	UAE	477	452	**25(4.2)**
13	Korea	558	563	5(3.1)	36	Qatar	432	406	**26(10.7)**
14	Finland	555	550	5(2.7)	37	Saudi Arabia	450	424	**26(7.2)**
15	Iran	477	472	5(7.0)	38	Palestine	434	406	**27(6.8)**
16	Syria	424	429	6(5.2)	39	Ghana	290	320	**30(4.0)**
17	Russia	539	546	**7(2.9)**	40	Jordan	471	428	43(7.6)
18	Israel	519	512	7(4.2)	41	Bahrain	482	423	**59(4.4)**
19	Indonesia	409	402	**7(3.6)**	42	Oman	458	380	**78(4.9)**
20	Japan	554	562	**8(3.3)**	43	The international	**480**	**474**	**6 (0.9)**
21	Lithuania	518	510	**8(3.3)**	44	South Africa	335	328	7(4.5)
22	Georgia	425	415	**10(3.4)**	45	Botswana	410	399	**11(3.6)**
23	United States	519	530	**11(2.4)**	46	Honduras	360	380	**20(3.8)**
				Other participations					
1	Ontario / Canada	521	522	1(2.7)	8	Colorado / America	537	548	**11(4.5)**

2	Connecticut / USA	530	533	3(5.1)	9	Carolina / Latino	526	537	**12(4.7)**
3	Quebec / Canada	518	522	4(3.0)	10	California / USA	493	504	**12(4.0)**
4	Alberta / Canada	542	549	**6(2.5)**	11	Minnesota / USA	548	559	**12(3.8)**
5	Abu Dhabi / UAE	465	458	6(6.9)	12	Florida / USA	522	537	**15(6.8)**
6	Massachusetts / USA	564	570	7(3.6)	13	Indiana / USA	526	541	**15(4.0)**
7	Alabama / America	482	489	7(4.0)	14	Dubai / UAE	500	472	**28(9.3)**

The difference written in bold font is statistically significant at α = 0.05

The difference written in regular font is statistically insignificant at α = 0.05

Table (24)

Performance Averages in Science for the
Participating Arab Countries in (TIMSS 2011) by Gender

Rank	Country	Performance		Absolute difference	Rank	Country	Performance		Absolute difference
		Females	Males						
1	Morocco	378	374	4(3.0)	9	Jordan	471	428	43(7.6)
2	Lebanon	404	408	4(6.7)	10	Bahrain	482	423	**59(4.4)**
3	Syria	424	429	6(5.2)	11	Oman	458	380	**78(4.9)**
4	Tunisia	431	447	**17(2.6)**		Abu Dhabi /	465	458	6(6.9)
5	UAE	477	452	**25(4.2)**		Dubai / UAE	500	472	**28(9.3)**
6	Qatar	432	406	**26(10.7)**					
7	Saudi	450	424	**26(7.2)**		Arab average	440	416	**24(5.1)**
8	Palestine	434	406	**27(6.8)**		International	480	474	**6(0.9)**

The difference written in bold font is statistically significant at α = 0.05

The difference written in regular font is statistically insignificant at α = 0.05

At the international level, the males' average is (474), while the females' average is (480), and the difference between both averages is (6) scores and this difference is statistically significant in favor of females. At the Arab level, the males' average is (416), and the females' average is (440). The difference between both averages is (24) scores and in favor of females, and is statistically significant. At Jordan's level, the females' averaged is (471) and the males' average is (428); and so, the difference between both averages is (43) in favor of females and this difference is statistically significant. The excellence of females over males in the Jordanian educational system has become a serious issue that needs to be discussed to identify its

reasons, whether they are attributed to social factors, or that the females' schools are better than males' school. There is urgent need to review these factors to improve the males' performance levels to reach the females' performance levels.

Level of Performance in the Science Test by Content Domains

Table (25) shows the averages performance of the Arab countries by content domains of the science test. The performance average of Jordan in the content domain is as follows: Biology (446), Chemistry (463), Physics (446), Earth Sciences (436). These averages are higher than the similar Arab averages with statistical significance. The averages of Arab performance are as follows: Biology (424), Chemistry (430), Physics (427), Earth Sciences (419). These averages are all below the international average, which is (466) in all domains. When comparing the performance average of Jordan with the international averages by content domains, it is noted that the Jordanian average is lower than the international average in the four content domains (biology, chemistry, physics, earth sciences).

Table (25)

Arab Countries Averages in Science by Content

Country	Biology		Physics		Chemistry		Earth Sciences	
Emirates	463	(2.4)	464	(2.2)	461	(2.3)	466	**(2.5)**
Bahrain	449	(2.1)	448	(2.7)	457	(1.8)	451	**(1.8)**
Jordan	**447**	**(4.3)**	**463**	**(4.4)**	**446**	**(4.2)**	**436**	**(4.2)**
Tunisia	449	(3.0)	434	(3.3)	436	(3.7)	421	**(3.3)**
Saudi Arabia	430	(4.5)	428	(4.4)	437	(4.2)	441	**(3.5)**
Syria	425	(4.3)	424	(3.7)	426	(4.4)	414	**(4.8)**
Palestine	407	(3.9)	432	(4.0)	432	(3.8)	406	**(3.3)**
Oman	407	(3.6)	408	(3.5)	427	(3.3)	431	**(3.0)**
Qatar	411	(4.2)	416	(4.1)	426	(3.8)	408	**(3.8)**
Lebanon	395	(5.2)	435	(5.3)	405	(5.4)	365	**(6.4)**
Morocco	378	(3.0)	374	(2.2)	349	(2.5)	377	**(3.3)**
The international average	**467**	**(0.6)**	**469**	**(0.6)**	**467**	**(0.6)**	**466**	**(0.6)**
Arab average	**424**	**(1.1)**	**430**	**(1.1)**	**427**	**(1.1)**	**419**	**(1.1)**

Level of Performance in the Science Test by Cognitive Domains

Table (26) shows the averages performance of the Arab countries, by the knowledge domains in science. The performance average of Jordan in the knowledge domains are as follows: Knowledge (453), application (451), and reasoning (441). These averages are higher than the similar Arab averages and with statistical significance. The Arab performance averages are as follows: knowledge (428), application (428) and reasoning (420). These averages are all below the similar international averages which are (469), (468), (467), respectively.

Comparing the Jordan's performance average with the international averages by cognitive domains shows that Jordan's performance average is below the international averages with statistical significance.

Table (25)

Arab Countries Averages in Science by Content

Country	Knowledge		Application		Reasoning	
Emirates	471	(2.5)	464	(2.1)	456	**(2.6)**
Bahrain	457	(3.6)	450	(2.0)	449	**(1.9)**
Jordan	**453**	**(4.3)**	**451**	**(4.0)**	**441**	**(4.5)**
Tunisia	424	(2.3)	437	(2.2)	446	**(2.7)**
Saudi Arabia	448	(4.4)	432	(3.9)	424	**(3.5)**
Syria	441	(4.3)	426	(4.4)	402	**(5.1)**
Palestine	431	(3.6)	422	(3.6)	404	**(3.6)**
Oman	416	(3.4)	419	(3.3)	417	**(3.0)**
Qatar	418	(4.3)	420	(3.5)	409	**(4.4)**
Lebanon	381	(5.8)	408	(5.2)	408	**(5.6)**
Morocco	363	(2.7)	381	(1.9)	366	**(2.3)**
The international average	**469**	**(0.6)**	**468**	**(0.6)**	**467**	(0.6)
Arab average	**428**	**(1.1)**	**428**	**(1.1)**	**420**	(1.1)

Relative Difficulty of Science by Content Domain and by Cognitive Domain.

Table (27) shows the percentages averages of correct answers in science by content and by cognitive domains of science.

Jordan's averages by content are as follows: Biology (37%), chemistry (41%), physics (33%), and earth sciences (38%). These percentages reflect varying degree of difficulty by content, and the content of science can be ordered by the degree of difficulty at students starting from the most difficult to the easiest as follows: Physics, biology, earth sciences, chemistry. It should be noted that these percentages are below the similar percentages at the international level but are higher than the similar Arab percentage averages.

Table (27)

Average Percentages of Correct Answers in Science by Content and Cognitive Domains for the Arab Countries

	Country	Science	Science Content Domains				Science Cognitive Domains		
International Average		42(0.1)	Biology	Chemistry	Physics	Earth	Reasoning	Application	Knowledge
			42(0.1)	43(0.1)	38(0.1)	45(0.1)	49(0.1)	41(0.1)	33(0.1)
1	Emirates	39(0.4)	40(0.4)	41(0.5)	35(0.4)	43(0.5)	48(0.4)	38(0.4)	29(0.5)
2	Bahrain	38(0.3)	38(0.3)	39(0.4)	34(0.4)	40(0.4)	46(0.4)	36(0.3)	29(0.3)
3	Jordan	**37(0.6)**	**37(0.6)**	**41(0.7)**	**33(0.6)**	**38(0.7)**	**46(0.7)**	**36(0.7)**	**27(0.6)**
4	Qatar	34(0.5)	33(0.7)	35(0.6)	32(0.5)	36(0.5)	42(0.6)	33(0.5)	24(0.7)
4	Saudi	34(0.6)	33(0.6)	34(0.7)	31(0.6)	37(0.7)	44(0.6)	32(0.7)	23(0.6)
6	Palestine	33(0.5)	32(0.5)	37(0.5)	33(0.6)	33(0.6)	43(0.5)	32(0.6)	22(0.4)
6	Oman	33(0.4)	33(0.4)	33(0.4)	31(0.3)	37(0.4)	41(0.3)	32(0.4)	24(0.4)
6	Tunisia	33(0.4)	36(0.4)	32(0.5)	29(0.5)	32(0.4)	38(0.4)	32(0.4)	26(0.5)
Arab Average		33(0.2)	34(0.2)	35(0.2)	30(0.2)	35(0.2)	42 (0.2)	32(0.2)	24(0.2)
9	Syria	32(0.6)	34(0.6)	33(0.6)	28(0.7)	33(0.7)	42(0.6)	32(0.6)	20(0.7)
10	Lebanon	29(0.7)	29(0.7)	35(0.9)	28(0.7)	27(0.7)	36(0.7)	29(0.7)	21(0.8)
11	Morocco	25(0.2)	26(0.3)	26(0.3)	20(0.2)	28(0.3)	32(0.2)	24(0.3)	16(0.3)
	Dubai	43(0.4)	44(0.5)	45(0.5)	39(0.4)	47(0.6)	51(0.4)	42(0.5)	34(0.4)
	Abu Dhabi	38(0.7)	39(0.7)	40(0.7)	34(0.7)	42(0.9)	47(0.7)	38(0.7)	29(0.8)

Regarding the cognitive dimension, Jordan's percentages are (46%) in the knowledge domain, (36%) in the application domain, and (27%) in the scientific reasoning and thinking domain. These percentages show an arrangement of these areas by difficulty (from the most difficult to the easiest) as follows: reasoning, application, and knowledge. However, this arrangement is the same on the Arab and international levels. It should be noted that the Jordanian percentages are below the similar international percentages but are higher than all of the similar Arab percentages.

Jordan's Performance Levels by Content and by Gender

Table (28) shows that females' performance averages in science is (43) scores higher than the males' performance averages and this difference is statistically significant.

Table (28)

Averages of Jordanian Students Performance in Science by Content and Gender

Content	Males	Females	Absolute Difference
Biology	424(6.6)	472(4.6)	**48(7.7)***
Physics	439(6.7)	487(4.7)	**48(7.9)***
Chemistry	430(6.4)	463(5.1)	**34(8.2)***
Earth Sciences	418(6.5)	455(5.0)	**37(8.3)***
Science	**428(6.4)**	**471(4.3)**	**43(7.7)***

* The difference is statistically significant at (α = 0.05)

As table (28) shows, the differences between females' performance average and males' performance average in content (biology, chemistry, physic and earth sciences) are (48, 48, 34, 37) scores respectively and in favor of females and these differences are all statistically significant.

Jordan's Performance Levels by Cognitive domain and by Gender

Table (29) shows that the differences between the female' performance averages and males' performance averages in the scientific knowledge domains (knowledge, application, and reasoning) are (48, 37, 46) scores respectively and in favor of females, and these differences are all statistically significant.

Table (29)

Averages of Jordanian Students Performance in Science by Cognitive Domains and Gender

Domain	Males	Females	Absolute Difference
Knowledge	429(6.5)	478(4.9)	**48(7.9)***
Application	433(6.3)	470(4.2)	**37(7.3)***
Reasoning	419(7.1)	465(4.9)	**46(8.7)***
Science	**428(6.4)**	**471(4.3)**	**43(7.7)***

* The difference is statistically significant at (α = 0.05)

Jordan's Performance Levels by Content and by School's Location

Table (30) shows that the performance average of students in the urban areas is (35) scores higher than the performance average of students in the rural areas and this difference is statistically significant.

Table (30)

Averages of Jordanian Students Performance in Science by Content and School Location

Content	Rural areas	Urban areas	Absolute Difference
Biology	421(9.9)	455(4.6)	**34(10.9)***
Physics	436(10.4)	470(4.7)	**34(11.3)***
Chemistry	422(9.8)	453(4.4)	**31(10.6)***
Earth Sciences	411(9.5)	443(4.3)	**32(10.1)***
Science	**422(8.8)**	**457(4.3)**	**35(9.9)***

* The difference is statistically significant at (α = 0.05)

Table (30) shows that the differences between the performance averages of students in urban areas and the performance average of students in rural areas by content (biology, chemistry, physics, and earth sciences) are (34, 34, 31, 32) scores respectively, in favor of students in the urban areas and these differences are statistically significant.

Jordan's Performance Levels by Cognitive domain and by School's Location

Table (31) indicates that the differences between the performance averages of the urban areas and the performance averages of students in the rural areas and in the cognitive domains of science (knowledge, application, reasoning) are (33, 31, 36) scores respectively, in favor of students in the urban areas and these differences are statistically significant.

Table (31)

Averages of Jordanian Students Performance   in Science by Cognitive Domains and School Location

Cognitive Domains	Rural areas	Urban areas	Absolute Difference
Knowledge	428(9.8)	460(4.6)	**33(10.7)***
Application	427(8.9)	458(4.4)	**31(9.9)***
Reasoning	413(10.3)	449(4.7)	**36(11.3)***
Science	**422(8.8)**	**457(4.3)**	**35(9.9)***

Jordan's Performance Levels by Content and by Supervising Authority

Table (32) shows the performance averages in science and content domains by the supervisory authority. The authorities were ordered by the performance averages starting from the highest to the lowest as follows: Private education, the UNRWA, then the Ministry of Education. Table (33) shows the differences between these averages and their statistical significance as all differences reached the statistical significance level α = 0.05.

Table (32)

Averages of Jordanian Students   Performance in Science by Content and Supervising Authority

Content	Ministry of Education	Private Education	UNRWA
Biology	434(5.1)	505(9.6)	**479(5.5)**
Physics	449(5.3)	522(9.8)	**496(5.5)**
Chemistry	433(4.9)	501(9.6)	**479(5.6)**
Earth Sciences	423(4.9)	493(9.6)	**466(5.8)**
Science	**436(4.8)**	**505(9.5)**	482(5.6)

* The difference is statistically significant at (α = 0.05)

Table (33)

Differences between Performance Averages by Content and Supervising Authority

Science	Supervising Authority	Ministry of Education	Private Education	UNRWA
Biology	**Ministry of Education**	_	-	-
	Private Education	71(10.9)*	_	
	UNRWA	45(7.3)*	27(11.0)*	_
Chemistry	**Ministry of Education**	_	-	-
	Private Education	72(11.1)*	_	
	UNRWA	46(7.4)*	26(10.7)*	_
Physics	**Ministry of Education**	_	-	-
	Private Education	68(10.9)*	_	
	UNRWA	46(7.0)*	23(10.9)*	_
Earth Sciences	**Ministry of Education**	_	-	-
	Private Education	70(10.8)*	_	
	UNRWA	43(7.2)*	27(10.5)*	_
Science	**Ministry of Education**	_	-	-
	Private Education	70(10.7)*	_	
	UNRWA	46(7.0)*	23(10.8)*	_

* The difference is statistically significant at (α = 0.05)

Jordan's Performance Levels by Cognitive Domain and by Supervising Authority

Table (34) shows the performance averages in the cognitive domains of science by the supervising authority. The authorities were ordered by the performance averages starting from the highest to the lowest as follows: Private education, the UNRWA, then the Ministry of Education. Table (33) shows the differences between these averages and their statistical significance as all differences reached the statistical significance level α = 0.05.

Table (34)

**Averages of Jordanian Students Performance
in Science by Cognitive Domains and Supervising Authority**

Cognitive Domains	Ministry of Education	Private Education	UNRWA
Knowledge	440(5.2)	507(10.2)	**490(5.7)**
Application	438(4.8)	505(9.1)	**480(4.8)**
Reasoning	427(5.3)	503(9.4)	**473(5.7)**
Science	**436(4.8)**	**505(9.5)**	482(5.6)

Table (35)

Differences between Performance Averages by Cognitive Domains and Supervising Authority

Cognitive	Supervising	Ministry of Education	Private Education	UNRWA
Knowledge	Ministry of Education	–	-	-
	Private Education	67(11.6)*	–	
	UNRWA	50(7.0)*	16(11.5)	
Application	Ministry of Education	–	-	-
	Private Education	67(10.3)*	–	
	UNRWA	41(6.2)*	25(10.3)*	
Reasoning	Ministry of Education	–	-	-
	Private Education	76(10.9)*	–	–
	UNRWA	45(7.6)*	30(11.0)*	
Science	Ministry of Education	–	-	-
	Private Education	70(10.7)*	–	
	UNRWA	46(7.0)*	23(10.8)*	–

* The difference is statistically significant at (α = 0.05)

Jordan's Performance Levels by Content and by Project

Table (36) shows the performance averages in science by content and project. The projects are ordered by the performance averages starting from the highest to the lowest as follows: exploratory schools, Education Reform Support Project (ERSP), Madrasati, and the Ministry of Education schools that abandoned the projects. The same order remained in the all science contents. Table (37) shows the significant differences between these averages.

Table (36)

Averages of Jordanian Students Performance in Science by Content and Project

Content	Exploratory schools	Madrasati	Ministry of Education	(ERSP)
Biology	468(9.2)	433(8.1)	431(6.0)	**461(3.3)**
Physics	482(9.5)	448(7.6)	446(6.2)	**475(3.3)**
Chemistry	465(8.9)	435(7.6)	430(5.9)	**455(4.3)**
Earth Sciences	455(8.7)	422(7.8)	419(5.8)	**445(3.3)**
Science	**469(8.3)**	**434(7.9)**	**433(5.7)**	461(2.6)

Table (37)

Differences between Performance Averages by Content and Project

Science Content	Project	Exploratory schools	Madrasati	Ministry of Education	(ERSP)
Biology	Exploratory schools	-	-	-	-
	Madrasati	35(12.2)*	-	-	-
	Ministry of Education	37(10.9)*	2(9.9)	-	
	(ERSP)	7(9.8)	28(8.5)*	30(6.8)*	-
Chemistry	Exploratory schools	-	-	-	-
	Madrasati	33(12.2)*	-	-	-
	Ministry of Education	36(11.4)*	3(9.7)	-	
	(ERSP)	7(9.9)	26(8.3)*	29(7.0)*	-
Physics	Exploratory schools	-	-	-	-
	Madrasati	30(11.6)*	-	-	-
	Ministry of Education	35(10.7)*	5(9.6)	-	
	(ERSP)	10(9.7)	20(8.7)*	26(7.1)*	-
Earth Sciences	Exploratory schools	-	-	-	-
	Madrasati	33(11.6)*	-	-	
	Ministry of Education	35(10.1)*	2(9.8)	-	
	(ERSP)	10(9.2)*	23(8.5)*	26(6.7)*	
Science	Exploratory schools	-	-	-	
	Madrasati	35(11.5)*	-	-	
	Ministry of Education	36(10.1)*	1(9.7)	-	
	(ERSP)	8(8.6)	27(8.3)*	28(6.3)*	

* The difference is statistically significant at (α = 0.05)

Jordan's Performance Levels by Cognitive Domain and by Project

Table (38) shows the performance averages in science by the cognitive domain and the project. The projects are ordered by the performance averages starting from the highest to the lowest as follows: exploratory schools, Education Reform Support Project (ERSP), Madrasati, and the

Ministry of Education that have no projects. Table (39) shows the significant of differences among these averages. In general, the differences between Madrasati and the Ministry of Education are statistically insignificant, as well as the differences between exploratory schools, and the Education Reform Support Project (ERSP). However, the differences were statistically significant between the exploratory schools on the one hand and Madrasati or the Ministry of Education on the other hand. The differences between Education Reform Support Project (ERSP) on one hand and Madrasati or the Ministry of Education on the other hand were also statistical significance.

Table (38)
Averages of Jordanian Students Performance in Science by Cognitive Domains and Project

Cognitive Domains	Exploratory schools	Madrasati	Ministry of Education	(ERSP)
Knowledge	473(9.8)	439(8.4)	436(6.0)	**467(3.6)**
Application	468(8.5)	438(7.5)	435(5.7)	**462(3.2)**
Reasoning	462(9.1)	427(8.3)	424(6.4)	**454(3.7)**
Science	**469(8.3)**	**434(7.9)**	**433(5.7)**	461(2.6)

Table (39)
Differences between Performance Averages by Cognitive Domains and Project

Cognitive Domain Content	Project	Exploratory schools	Madrasati	Ministry of Education	(ERSP)
Knowledge	Exploratory schools	-	-	-	-
	Madrasati	34(12.6)*	-	-	-
	Ministry of Education	37(11.5)*	3(10.1)	-	
	(ERSP)	6(10.1)	28(8.8)*	31(6.9)	-
Application	Exploratory schools	-	-	-	-
	Madrasati	30(11.3)*	-	-	-
	Ministry of Education	33(10.2)*	3(9.3)	-	
	(ERSP)	6(8.9)	24(8.1)*	26(5.5)*	-
Reasoning	Exploratory schools	-	-	-	-
	Madrasati	35(12.3)*	-	-	-
	Ministry of Education	38(11.3)*	3(10.5)	-	
	(ERSP)	8(9.6)	27(9.1)*	30(7.7)*	-
Science	Exploratory schools	-	-	-	-
	Madrasati	35(11.4)*	-	-	-
	Ministry of Education	36(10.1)*	1(9.7)	-	
	(ERSP)	8(8.6)	27(8.3)*	28(6.3)*	-

* The difference is statistically significant at (α = 0.05)

Chapter Three

Performance on the Math Test

Table (40) shows the overall performance averages of the students in the participating countries in the math test.

These results indicate that Jordan ranked (35) among the (45) participating countries. Jordan's performance average is (24) scores below the international average and Jordan ranked six among the Arab countries group participating in the study.

Table (41) shows the performance averages of the Arab countries participating in the study, as shown in Figure (2) the performance average of the Arab countries in math. It should be noted that the performance averages of students in Jordan in math was equal to the Arab average.

On the Arab level, Jordanian performance in math for this session is unsatisfactory and is below the international average as Jordan's rank went down from second in the 2007 session, to sixth in the 2011 session. There is an urgent need to review the curriculum and the teaching methods to enhance the strengths and address the weaknesses to improve the performance of our students up to the international level.

Table (40)

Performance Averages of Participating Countries in Math in (TIMSS 2011)

	Country	Average		Country	Average
1	Korea	613 △	23	United Arab Emirates	456 △
2	Singapore	611 △	24	Turkey	452 △
3	Taiwan	609 △	25	Lebanon	449 △
4	Hong Kong	586 △	26	Malaysia	440 △
5	Japan	570 △	27	Georgia	431 △
6	Russia	539 △	28	Thailand	427 △
7	Israel	516 △	29	Macedonia	426 △
8	Finland	514 △	30	Tunisia	425 △
9	United States	509 △	31	Chile	416 △
10	England	507 △	32	Iran	415
11	Hungary	505 △	33	Qatar	410
12	Australia	505 △	34	Bahrain	409
13	Slovenia	505 △	35	Jordan	406
14	Lithuania	502 △	36	Palestine	404
15	Italy	498 △	37	Saudi Arabia	394 ▽
16	New Zealand	488 △	38	Indonesia	386 ▽
17	Kazakhstan	487 △	39	Syria	380 ▽
18	Sweden	484 △	40	Morocco	371 ▽

19	Ukraine	479 △	41	Oman	366 ▽
20	Norway	475 △	42	Ghana	331 ▽
21	Armenia	467 △	43	Botswana	397 ▽
	The international average	467 △	44	South Africa	352 ▽
22	Romania	458 △	45	Honduras	338 ▽

1	Massachusetts / USA	561 △	8	Florida / USA	513 △
2	Minnesota / USA	545 △	9	Ontario / Canada	512 △
3	Carolina / USA	537 △	10	Alberta / Canada	505 △
4	Quebec / Canada	532 △	11	California / USA	493 △
5	Indiana / USA	522 △	12	Dubai / UAE	478 △
6	Colorado / USA	518 △	13	Alabama / USA	466 △
7	Connecticut / USA	518 △	14	Abu Dhabi / UAE	449 △

Average higher than Jordan's Average	
Average similar to Jordan's Average	
Average lower than Jordan's Average	

Table (41)

Performance Averages of Participating Arab Countries in Math in (TIMSS 2011)

	Country	
	The international average	467 △
1	United Arab Emirates	456 △
2	Lebanon	449 △
3	Tunisia	425 △
4	Qatar	410
5	Bahrain	409
6	**Jordan**	**406**
7	Arab average	406
8	Palestine	404
9	Saudi Arabia	394 ▽
10	Syria	380 ▽
11	Morocco	371 ▽
12	Oman	366 ▽
	Dubai / UAE	478 △
	Abu Dhabi / UAE	449 △

Figure (2)

Performance Averages of the Arab Countries in Math
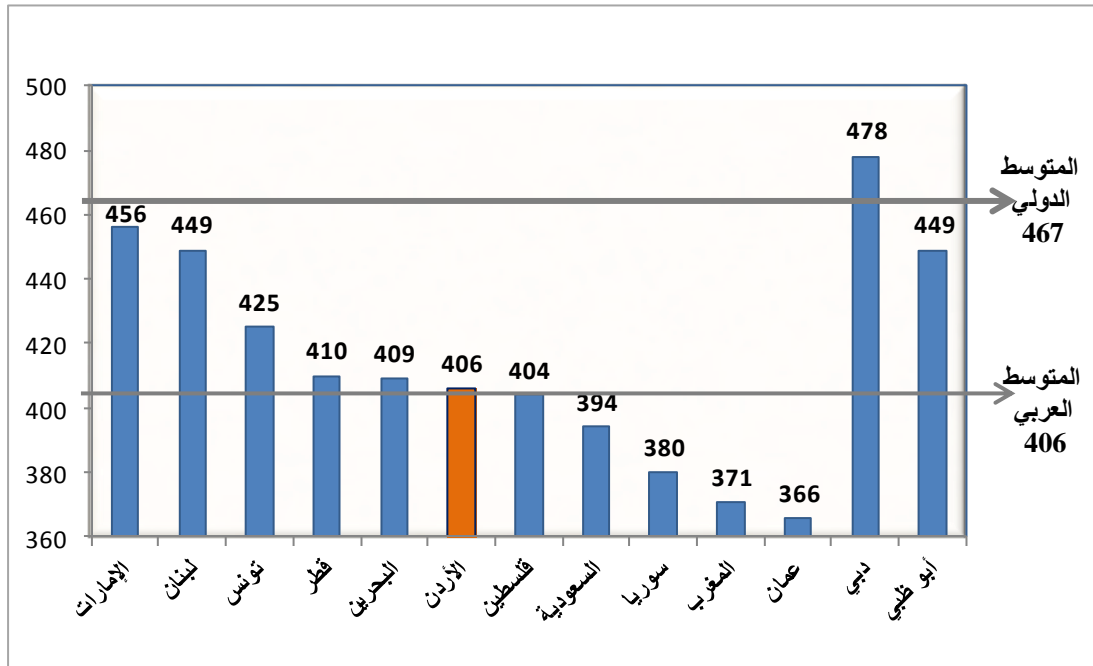
Performance in the math Test by International Achievement Levels

The international study identifies the following four achievement levels:

- Advanced achievement level in math, representing students who got 625 scores or more.

- High achievement level in math, representing students who got 550 scores or more.

- Moderate achievement levels in math, representing students who got 475 scores or more.

- Low Achievement Levels in math, representing students who got 400 scores or more.

It should be noted that these levels are cumulative, i.e., students who reach a certain level, have already reached the levels below it. In other words, student who reached the high achievement level, have already reached the moderateand low levels, but were unable to reach the advanced level.

Advanced achievement level

Students who reached the advanced achievement level are able to:

Organize information and make generalizations, explain the solution strategies in problems that are related to non-routine situations. They are also able to organize information and make generalizations to solve problems, and apply the knowledge concerning numerical, geometry and algebra relations leading to the solution of issues (for example, relationships between fractions and decimals, and percentages and geometry properties, and algebra laws), as well as the ability to create equal formulas to algebra laws. Students who arrive at this level are able to:

- Solve non-routine issues.

- Resolve math problems that need more than one step.

- Solve verbal problems involving inverse operations.

- Reach conclusions and justify them.

The following example shows a sample of the questions that most students who reached this level answered correctly.

An example of a question answered by most students reaching the advanced achievement level in Math

Country	Percentage of Correct Answers		Content Domain: Geometry
			Knowledge Domain: Reasoning
			Description: To resolve a verbal problem on filling a three dimensional box of the cuboids shape
Taiwan	66	(1.8 ▲	Radi fills books of the same size in a box of the cuboids shape
Hong Kong	65	(2.1 ▲	
Korea	62	(2.0 ▲	What is the biggest number of books that can be placed inside the box?
Singapore	60	(1.9 ▲	
Japan	58	(1.8 ▲	Answer: 12
Russia	36	(2.6 ▲	
Israel	34	(2.4 ▲	
Kazakhstan	33	(2.5 ▲	
Lithuania	30	(2.0 ▲	
Australia	29	(2.3 ▲	
Finland	29	(2.3	
Malaysia	28	(2.1	
Slovenia	28	(2.6	
New Zealand	27	(2.3	
England	26	(2.3	
America	26	(1.5	
Armenia	25	(2.1	
International	**25**	**(0.3**	

Country	Value	SE		Other participations	Value	SE	
Ukraine	23	(2.7					
Norway	22	(2.0					
Italy	22	(2.1					
Romania	22	(2.1					
Hungary	21	(1.7	▼				
Sweden	20	(1.6	▼				
Emirates	20	(1.3	▼				
Turkey	20	(1.5	▼				
Thailand	16	(1.5	▼				
Chile	16	(1.5	▼	**Other participations**			
Macedonia	16	(2.0	▼	Quebec / Canada	49	(3.2)	▲
Georgia	15	(1.7	▼	Connecticut / USA	46	(3.6)	▲
Palestine	14	(1.7	▼	Colorado / USA	45	(3.6)	▲
Bahrain	14	(1.5	▼	Florida / USA	39	(2.4)	▲
Iran	14	(1.6	▼	Dubai / UAE	39	(2.4)	▲
Qatar	13	(1.5	▼	California / USA	36	(3.2)	▲
Tunisia	12	(1.5	▼	Abu Dhabi / UAE	34	(2.1)	▲
Saudi Arabia	12	(1.7	▼	Alabama / USA	33	(3.3)	▲
Indonesia	11	(1.5	▼	Quebec / Canada	32	(3.9)	
Oman	11	(0.9	▼	Connecticut / USA	32	(3.6)	▲
Lebanon	11	(1.8	▼	Colorado / USA	26	(2.0)	
Jordan	9	(0.9	▼	Florida / USA	22	(2.7)	
Syria	9	(1.5	▼	Dubai / UAE	19	(1.9)	▼
Morocco	8	(1.0	▼	California / USA	18	(2.2)	▼
Ghana	4	(1.0	▼				
Participants in Grade (9)							
Botswana	7	(1.1	▼	Percentage is higher than the international average with statistical difference			▲
Honduras	7	(1.2	▼	Percentage is lower than the international average with statistical difference			▼
South Africa	4	(0.5	▼	Percentage is similar to the international average			

High achievement level:

Students who reached the advanced achievement level are able to:

This level represents students who got (550) scores or more in the test. Eighth grades students who reached this level apply their understanding and knowledge in almost wide range of complex situations, as they can carry out the ordering process and links. They can make calculations related to regular and decimal fractions to resolve written math problems. They can also use their knowledge on geometry properties to solve math problems, as well as to identify and evaluate algebraic expressions, and solve algebraic equations of a single variable. Students who arrive at this level are able to:

- Apply their knowledge on math in many complex situations.

- Perform calculations on regular and decimal fractions, and negative integers.

- Solve simple algebraic problems, including calculating algebraic amount, and solve Linear equations in two variables.

- Calculate areas and sizes of simple geometric shapes.

- Solve on probability and interpretation of tabular and graphically represented data.

The following example shows a sample of the questions that most students who reached this level answered correctly.

**An example of a question answered by most
students reaching the high achievement level in Math**

Country	Percentage of Correct Answers			Content Domain: Numbers
				Knowledge Domain: Knowledge
				Description: Express a part as a percentage out of the whole, and calculating the part by knowing its percentage and by knowing the whole
Singapore	89	(1.2)	▲	
Korea	76	(1.9)	▲	Bader, Salem and Amin performed 20 tries to throw balls in a basket
Hong Kong	76	(2.4)	▲	
Taiwan	69	(1.7)	▲	Fill in the boxes below:
Japan	57	(2.2)	▲	
Israel	57	(2.1)	▲	Name No. of successful shots % of successful shots
Russia	55	(2.1)	▲	
America	54	(1.5)	▲	Bader 10 out of 20 50%
Australia	53	(2.6)	▲	Salem 15 out of 20 75%
Lithuania	53	(1.9)	▲	Amin 16 out of 20 80%
Sweden	51	(1.8)	▲	
Finland	50	(2.4)	▲	
Slovenia	49	(2.2)	▲	
England	48	(3.0)	▲	
New Zealand	46	(2.8)	▲	
Hungary	46	(2.5)	▲	
Italy	46	(2.3)	▲	
Norway	42	(2.4)		
Malaysia	42	(2.3)		
International average	37	(0.3)		
Emirates	37	(1.4)		
Kazakhstan	36	(2.5)		
Lebanon	35	(2.5)		
Armenia	34	(2.2)		
Turkey	33	(1.6)	▼	

Country	Value	(SE)		Other participations	Value	(SE)	
Ukraine	33	(2.7)					
Romania	26	(1.8)	▼				
Chile	26	(1.5)	▼	**Other participations**			
Qatar	24	(1.4)	▼	Quebec / Canada	81	(1.8)	▲
Macedonia	22	(2.0)	▼	Massachusetts / USA	79	(2.5)	▲
Bahrain	22	(1.7)	▼	Minnesota / USA	77	(2.7)	▲
Iran	22	(2.0)	▼	Alberta / Canada	75	(2.3)	▲
Indonesia	20	(1.9)	▼	Ontario / Canada	68	(2.1)	▲
Georgia	20	(2.0)	▼	Carolina / USA	62	(3.2)	▲
Tunisia	19	(1.7)	▼	Connecticut / USA	59	(2.8)	▲
Thailand	18	(2.1)	▼	Indiana / USA	59	(3.6)	▲
Palestine	18	(1.8)	▼	Florida / USA	58	(4.0)	▲
Syria	17	(1.9)	▼	Colorado / Latino	51	(3.5)	▲
Saudi Arabia	12	(1.6)	▼	Dubai / UAE	46	(1.8)	▲
Morocco	11	(0.8)	▼	California / USA	41	(3.1)	
Jordan	11	(1.2)	▼	Abu Dhabi / UAE	34	(2.6)	
Oman	10	(1.0)	▼	ALABAMA / Latino	31	(4.4)	
Ghana	8	(1.2)	▼				
Participants in Grade (9)							
Botswana	47	(2.0)	▲	Percentage is higher than the international average with statistical			
South Africa	18	(1.0)	▼	Percentage is lower than the international average with statistical			
Honduras	**11**	**(1.3)**	▼	Percentage is similar to the international average			

Moderate achievement level:

This level represents students who have received (475) scores or more in the test. Grade eight students who reached this level can apply their basic math cognitive in direct situations. They can also make additions and subtractions to solve written math problems of a single step, whether the numbers in that problem are Integers or fractional.

They can also find the value of unknown variable in a proportion, use the main properties of geometric shapes, to read and interpret graphs, tables, realize the main concepts of probability principles, and understand simple algebraic relations. Students who arrive at this level can:

- Apply basic mathematical knowledge in simple and straightforward situations.

- Perform addition, subtraction, and multiplication to solve verbal math problems of one step.

- Solve linear equations of one variable only,

- Identify basic concepts of probability.

- Read and interpret figures tables, maps and measurements.

The following example shows a sample of the questions that most students who reached this level answered correctly.

**An example of a question answered by most
students in grade eight reaching the average achievement level in Math**

Country	Percentage of Correct Answers			Content Domain: Algebra
				Knowledge Domain: Knowledge
				Description: To know the meaning of simple algebraic expression that includes addition and subtraction
Hong Kong	94	(1.3)	▲	
Korea	91	(1.3)	▲	What does X Y + 1 mean?
Singapore	91	(1.1)	▲	
Taiwan	90	(1.3)	▲	
Russia	89	(1.2)	▲	A Add 1 to Y and then multiply by X
Japan	87	(1.5)	▲	B Multiply X and Y by 1
Ukraine	81	(2.1)	▲	
America	80	(1.2)	▲	C Add X and Y then add 1
Armenia	79	(1.9)	▲	
Slovenia	76	(2.0)	▲	D Multiply X by Y then add 1
Lithuania	75	(2.3)	▲	
Israel	74	(2.0)	▲	
Kazakhstan	73	(1.9)	▲	
Hungary	73	(1.9)	▲	
Finland	72	(2.2)	▲	
England	72	(2.8)	▲	
Georgia	71	(1.8)	▲	
Australia	71	(2.3)	▲	
Jordan	69	(2.0)		
Emirates	66	(1.4)		
international average	65	(0.3)		
Italy	65	(2.0)		
Romania	65	(2.3)		
Macedonia	63	(2.5)		
Bahrain	62	(1.7)		
New Zealand	60	(2.3)		
Thailand	60	(2.5)	▼	
Lebanon	59	(2.6)	▼	**Other participations**
Turkey	58	(1.9)	▼	Massachusetts / USA ... 91 (1.9) ▲
Chile	58	(2.4)	▼	Minnesota / USA ... 88 (2.1) ▲
Saudi Arabia	57	(2.2)	▼	Florida / USA ... 88 (2.6) ▲
Palestine	56	(2.0)	▼	Indiana / Latino ... 86 (1.6) ▲

Country							
Qatar	55	(2.3)	▼	Carolina / USA	84	(2.1)	▲
Iran	55	(2.0)	▼	Connecticut / USA	83	(2.3)	▲
Sweden	53	(2.0)	▼	Ontario / Canada	81	(2.0)	▲
Tunisia	49	(1.8)	▼	California / USA	79	(2.8)	▲
Indonesia	48	(2.3)	▼	Alberta / Canada	78	(2.1)	▲
Syria	48	(2.2)	▼	ALABAMA / Latino	77	(2.9)	▲
Oman	47	(1.7)	▼	Colorado / Latino	76	(3.3)	▲
Malaysia	43	(2.0)	▼	Dubai / UAE	72	(1.6)	▲
Morocco	41	(1.6)	▼	Quebec / Canada	68	(2.0)	
Ghana	36	(1.8)	▼	Abu Dhabi / UAE	63	(2.5)	
Norway	36	(2.6)	▼				
Participants in Grade (9)							
Botswana	52	(1.7)	▼	Percentage is higher than the international average with statistical			
South Africa	30	(1.5)	▼	Percentage is lower than the international average with statistical			
Honduras	**26**	**(2.0)**	▼	Percentage is similar to the international average			

Low achievement level in the math test:

This level includes students who got (400) scores or more the test. Grade eight students who reached this level can do calculations of the integers, that is, they can make addition and subtraction and rounding in the case of integers. They can also make additions of decimal fractions of the same of decimals. They can also round integers to the nearest hundred, and they know some of the basic concepts and terminology. Students are at this level can:

- Perform calculations on positive integers.

- Round numbers that include two decimals to the nearest integer.

- Multiply numbers including two decimals by another number including three decimals using a calculator.

- Read and know information represented on a straight line.

The following example shows a sample of the questions that most students who reached this level answered correctly.

An example of a question answered by most
students in grade eight reaching the low achievement level in Math

Country	Percentage of Correct Answers	Content Domain: Numbering
		Knowledge Domain: Knowledge
		Description: To add two including two numbers, one includes two decimals and the other includes three decimals

				Other participations			
Singapore	94	(0.8)	▲				
Malaysia	91	(1.2)	▲				
Hong Kong	91	(1.5)	▲				
Kazakhstan	90	(1.8)	▲				
Lithuania	90	(1.5)	▲	**42.65+5.748 =**			
Russia	90	(1.2)	▲				
Taiwan	89	(1.1)	▲	**Answer: 48.398**			
America	89	(1.0)	▲				
Hungary	88	(1.3)	▲				
Italy	88	(1.6)	▲				
Korea	87	(1.5)	▲				
Slovenia	85	(1.7)	▲				
Armenia	84	(1.9)	▲				
Tunisia	82	(1.8)	▲				
Israel	82	(1.4)	▲				
Australia	82	(2.0)	▲				
Norway	81	(1.9)	▲				
Lebanon	81	(1.7)	▲				
Japan	81	(1.6)	▲				
Ukraine	80	(2.4)	▲				
Emirates	79	(1.2)	▲				
Sweden	79	(1.7)	▲				
England	79	(2.4)	▲				
Finland	79	(1.8)	▲				
International average	72	(0.3)					
Morocco	72	(1.7)					
Qatar	72	(1.5)					
New Zealand	70	(2.9)		**Other participations**			
Romania	69	(2.5)	▼	Massachusetts / USA	95	(1.3)	▲
Saudi Arabia	65	(2.5)	▼	Minnesota / USA	93	(1.6)	▲
Macedonia	65	(2.6)	▼	Florida / USA	93	(1.8)	▲
Georgia	64	(2.9)	▼	Alabama / America	92	(2.5)	▲
Thailand	64	(2.4)	▼	Connecticut / USA	91	(1.7)	▲
Chile	58	(2.2)	▼	Indiana / USA	90	(1.8)	▲
Indonesia	57	(2.2)	▼	Carolina / Latino	90	(2.5)	▲
Palestine	56	(1.9)	▼	Quebec / Canada	90	(1.4)	▲
Oman	49	(1.6)	▼	California / USA	89	(1.4)	▲
Turkey	48	(1.8)	▼	Alberta / Canada	86	(1.3	▲
Bahrain	43	(2.3)	▼	Ontario / Canada	85	(1.7	▲
Iran	42	(2.2)	▼	Colorado / America	82	(2.2	▲
Jordan	**36**	**(1.7)**	▼	Abu Dhabi / UAE	81	(2.1	▲
Ghana	36	(2.1)	▼	Dubai / UAE	80	(2.1	▲
Syria	31	(2.4)	▼				
Participants in Grade (9)							

Botswana	74	(1.4)		Percentage is higher than the international average with statistical	
Honduras	66	(2.3)	▼	Percentage is lower than the international average with statistical	
South Africa	**63**	**(2.0)**	▼	Percentage is similar to the international average	

The number between brackets is the standard error for the percentage

Table (42) shows the percentages of students who arrived the achievement levels for all countries, and table (43) shows the percentages of Arab students who reached the achievement levels. These tables clearly show that the percentage of Jordanian students who reached the advanced level is (0%), and is less than the international percentage of this level, which is (3%), and is less than the Arab which is (1%). Regarding the high achievement level, Jordan's percentage is (6%), which is less than the international percentage that is (17%), and is also less than the Arab percentage which is (7%). For the moderate achievement level, Jordan's percentage is (26%), which is less than the international percentage which is (46%), and is equal to the Arab percentage in this level. Regarding the low achievement level, Jordan's percentage is (55%), and is less than the international percentage in this level, which is (75%), but is higher than the Arab percentage in this level, which is (54%).

In sum, the distribution of Jordanians students in the four achievement levels is close to the Arab distribution, but it is below the international percentages in all levels. There is dire need to revise the math curricula, the teachers' professional development programs and the school environment to make the necessary improvements that enhance Jordanian students' performance up to the international level.

Table (42)

Percentages of Students by Performance Levels in Math for the Participating Countries

	Country	Advance (625)	High (550)	Moderate(475)	Low (400)		Country	Advance (625)	High (550)	Moderate(475)	Low (400)
1	Taiwan	49	73	88	96	22	Macedonia	3	12	35	61
2	Singapore	48	78	92	99	23	Georgia	3	13	36	62
3	Korea	47	77	93	99	24	Emirates	2	14	42	73
4	Hong Kong	34	71	89	97	25	Qatar	2	10	29	54
5	Japan	27	61	87	97	26	Iran	2	8	26	55
6	Russia	14	47	78	95	27	Malaysia	2	12	36	65
7	Israel	12	40	68	87	28	Thailand	2	8	28	62
8	Australia	9	29	63	89	29	Bahrain	1	8	26	53

9	England	8	32	65	88	30	Sweden	1	16	57	89
10	Hungary	8	32	65	88	31	Palestine	1	7	25	52
11	Turkey	7	20	40	67	32	Lebanon	1	9	38	73
12	America	7	30	68	92	33	Norway	1	12	51	87
13	Romania	5	19	44	71	34	Saudi Arabia	1	5	20	47
14	Lithuania	5	29	64	90	35	Chile	1	5	23	57
15	New Zealand	5	24	57	84	36	Jordan	**0**	**6**	**26**	**55**
16	Ukraine	5	22	53	81	37	Oman	0	4	16	39
17	Slovenia	4	27	67	93	38	Tunisia	0	5	25	61
18	Finland	4	30	73	96	39	Syria	0	3	17	43
19	Italy	3	24	64	90	40	Indonesia	0	2	15	43
20	Armenia	3	18	49	76	41	Morocco	0	2	12	36
21	Kazakhstan	3	23	57	85	42	Ghana	0	1	5	21
							International mediator	**3**	**17**	**46**	**75**

Participants in Grade (9)

1	South Africa	1	3	9	24	3	Honduras	0	1	4	21
2	Botswana	0	2	15	50						

Other Participations

1	Massachusetts /	19	57	88	98	8	Quebec / Canada	6	40	82	98
2	Carolina / Latino	14	44	78	95	9	Dubai / UAE	5	23	53	79
3	Minnesota / USA	13	49	83	97	10	California / USA	5	24	59	87
4	Connecticut / USA	10	37	69	91	11	Ontario / Canada	4	31	71	94
5	Florida / USA	8	31	68	94	12	Alberta / Canada	3	24	69	95
6	Colorado / USA	8	35	71	93	13	Alabama / America	2	15	46	79
7	Indiana / USA	7	35	74	95	14	Abu Dhabi / UAE	2	12	39	71

Table (43)

Percentages of Students by Performance Levels in Math for the Participating Arab Countries

	Country	Advance (625)	High (550)	Moderate(475)	Low (400)
1	United Arab Emirates	2	14	42	73
2	Qatar	2	10	29	54
3	Bahrain	1	8	26	53
4	Palestine	1	7	25	52
5	Lebanon	1	9	38	73
6	Saudi Arabia	1	5	20	47
7	Jordan	**0**	**6**	**26**	**55**
8	Oman	0	4	16	39
9	Tunisia	0	5	25	61
10	Syria	0	3	17	43
11	Morocco	0	2	12	36
12	Dubai / UAE	5	23	53	79
13	Abu Dhabi / UAE	2	12	39	71
	Arab mediator	**1**	**7**	**26**	**54**
	International mediator	**3**	**17**	**46**	**75**

Level of Performance in the Science Test by Gender

Table (44) shows the performance averages in math test by gender for all countries, and Table (45) shows the performance averages of the participating Arab countries by gender.

Table (44)

Performance Averages in Science for the Participating Countries in (TIMSS 2011) by Gender

Rank	Country	Performance Average		Absolute difference	Rank	Country	Performance Average		Absolute difference
		Females	Males				Females	Males	
1	Morocco	371	371	0(3.2)	24	Armenia	472	462	**10(3.1)**
2	Russia	539	539	1(2.9)	25	Syria	375	385	11(5.7)
3	Kazakhstan	486	488	2(3.3)	26	Italy	493	504	**11(2.9)**
4	Norway	476	473	3(3.1)	27	Romania	464	453	**11(3.6)**
5	England	508	505	3(5.6)	28	Qatar	415	404	11(9.5)
6	Georgia	430	432	3(4.0)	29	Lebanon	444	456	**12(4.7)**
7	Ukraine	478	481	3(4.4)	30	Indonesia	392	379	**13(4.0)**
8	United States	508	511	4(2.2)	31	Chile	409	424	**14(3.6)**
9	Sweden	486	482	4(2.4)	32	Saudi Arabia	401	387	15(8.9)
10	Finland	516	512	4(2.3)	33	Tunisia	417	433	**17(2.5)**
11	Slovenia	502	507	5(2.8)	34	Emirates	464	447	**17(4.2)**
12	Hungary	502	508	6(3.5)	35	Thailand	435	417	**18(4.4)**
13	Hong Kong	588	583	6(5.5)	36	New Zealand	478	496	**18(4.7)**
14	Taiwan	613	606	6(4.1)	37	Malaysia	449	430	**19(4.4)**
15	Korea	610	616	**6(3.1)**	38	Palestine	415	392	**23(7.0)**
16	Iran	411	418	7(8.1)	39	Ghana	318	342	**23(2.9)**
17	Macedonia	430	423	7(4.7)	**40**	**Jordan**	**420**	**392**	**28(7.4)**
18	Japan	566	574	8(4.1)	41	Bahrain	430	388	**43(4.0)**
19	Israel	520	512	8(4.4)	42	Oman	397	334	**63(4.6)**
20	Singapore	615	607	**9(3.5)**	43	The international	**469**	**465**	**4(0.9)**
21	Turkey	457	448	**9(3.5)**	44	South Africa	354	350	3(4.0)
22	Australia	500	509	9(6.9)	45	Botswana	403	390	**14(3.1)**
23	Lithuania	507	498	**9(3.0)**	46	Honduras	328	351	**23(3.5)**
Other participations									

Rank	Country	Female	Male	Abs. diff	Rank	Country	Fem	Male	Abs. diff
1	Ontario / Canada	512	512	0(3.1)	8	California / USA	491	494	3(4.1)
2	Quebec / Canada	531	532	0(2.7)	9	Colorado / America	516	520	4(3.4)
3	Minnesota / USA	545	545	0(3.9)	10	Connecticut / / Latino	520	516	4(4.5)
4	Alabama / America	467	465	2(3.9)	11	Massachusetts / USA	558	563	5(4.5)
5	Abu Dhabi / UAE	450	448	2(6.4)	12	Florida / USA	509	517	8(5.5)
6	Alberta / Canada	504	506	2(3.0)	13	Indiana / / Latino	518	526	**8(4.0)**
7	Carolina / USA	535	539	3(5.1)	14	Dubai / UAE	486	470	16(8.9)

The difference written in bold font is statistically significant at α = 0.05

The difference written in regular font is statistically insignificant at α = 0.05

Table (45)

Performance Averages in Math for the
Participating Arab Countries in (TIMSS 2011) by Gender

Rank	Country	Performance		Absolute differenc	Rank	Country	Performance		Absolute differenc
		Female	Male				Fem	Male	
1	Morocco	371	371	0(3.2)	9	Jordan	420	392	28(7.4)
2	Syria	375	385	11(5.7)	10	Bahrain	430	388	**43(4.0)**
3	Qatar	415	404	11(9.5)	11	Oman	397	334	**63(4.6)**
4	Lebanon	444	456	**12(4.7)**		Abu Dhabi / UAE	450	448	2(6.4)
5	Saudi	401	387	15(8.9)		Dubai / UAE	486	470	16(8.9)
6	Tunisia	417	433	**17(2.5)**					
7	Emirates	464	447	**17(4.2)**		Arab average	414	399	**15(2.6)**
8	Palestine	415	392	**23(7.0)**		International Average	469	465	**4(0.9)**

The difference written in bold font is statistically significant at α = 0.05

The difference written in regular font is statistically insignificant at α = 0.05

At the international level, the males' average is (465), while the females' average is (469), and the difference between both averages is (4) scores, and this difference is statistically significant at (α = 0.05). At the Arab level, the males' average is (399), and the females' average is (414). The difference between both averages is (15) scores and in favor of females, and is statistically significant at (α = 0.05). At Jordan's level, the females' averaged is (420) and the males' average is (392); and so, the difference between both averages is (28) in favor of females and this difference is statistically significant. The excellence of females over males in the Jordanian educational system has become a serious issue that needs to be discussed to identify its reasons, whether they are attributed to social factors, or that the females schools are better than males school. There is urgent need to review these factors to improve the males' performance levels to reach the females performance levels.

Level of Performance in the Math Test by Content Domains

Table (46) shows the averages performance of the Arab countries by the content domains of the math test.

Table (46)

Arab Countries Averages in Math by Content

Country	Numbers		Algebra		Geometry		Data and Probability	
Emirates	459	(2.2)	468	(2.2)	431	(2.4)	440	(2.4)
Lebanon	451	(3.8)	471	(3.8)	447	(3.8)	393	(5.2)
Tunisia	431	(2.8)	419	(2.9)	426	(3.2)	398	(3.3)
Qatar	408	(3.4)	425	(2.8)	387	(3.6)	390	(3.6)
Bahrain	397	(1.7)	424	(1.7)	398	(2.6)	407	(2.6)
Jordan	**390**	**(3.8)**	**432**	**(3.9)**	**407**	**(3.7)**	**379**	**(3.7)**
Palestine	400	(3.4)	419	(3.3)	416	(3.6)	368	(3.6)
Saudi Arabia	393	(4.8)	399	(4.9)	364	(5.3)	387	(5.1)
Syria	373	(4.0)	391	(4.9)	386	(5.0)	343	(4.7)
Morocco	379	(2.6)	357	(2.7)	390	(2.5)	332	(2.0)
Oman	351	(3.0)	383	(2.8)	377	(2.7)	342	(3.1)
International average	**459**	**(0.6)**	**463**	**(0.6)**	**454**	**(0.6)**	**450**	**(0.6)**
Arab average	**403**	**(1.1)**	**417**	**(1.1)**	**403**	**(1.1)**	**380**	**(1.1)**

The performance average of Jordan in the content domain is as follows: Numbers (390), Algebra (432), Geometry (407), Data and Probability (379). These averages are somehow close to the similar Arab averages. The averages of Arab performance are as follows: Numbers (403), Algebra (417), Geometry (403), Data and Probability (380). These averages are all below the international average, which are as follows: Numbers (459), Algebra (463), Geometry (454), Data and Probability (450). When comparing the performance average of Jordan with the

international averages by content, it is noted that the Jordanian average is lower than the international average in the four content domains with statistical difference. Therefore, upgrading the students' performance to reach the international levels requires making the necessary improvements to the curricula, teaching methods, and the school environment.

Levels of Performance in Math Test by Cognitive Domains

Table (47) shows the Arab Countries Averages in Math by Cognitive Domains.

Table (47): Arab Countries Averages in Math by Cognitive Domains

Country	Knowledge		Application		Analysis	
Emirates	467	(2.2)	442	(2.2)	449	(2.1)
Lebanon	464	(3.9)	436	(4.1)	426	(4.7)
Tunisia	425	(2.8)	421	(2.9)	423	(2.7)
Qatar	418	(2.9)	396	(3.3)	406	(3.3)
Bahrain	411	(2.4)	400	(2.4)	415	(2.1)
Jordan	405	(4.3)	397	(3.8)	416	(3.8)
Palestine	406	(3.5)	397	(3.5)	404	(4.1)
Saudi Arabia	402	(4.6)	375	(4.8)	388	(4.7)
Syria	374	(4.4)	379	(4.2)	371	(5.4)
Morocco	363	(2.2)	378	(1.9)	357	(2.7)
Oman	365	(3.0)	360	(3.0)	369	(2.8)
The international	**460**	**(0.6)**	**458**	**(0.5)**	**458**	**(0.6)**
Arab average	**409**	**(1.0)**	**398**	**(1.0)**	**402**	**(1.1)**

Jordan's performance averages in the cognitive domains are as follows: Knowledge (405), application (397), and analysis (416. These averages are similar to some extent to the average Arab countries in the knowledge and application domains. The differences between Jordan and Arab averages are not statistically significant where the Arab average performance is as follows: knowledge (409), application (398). Regarding analysis, the Jordanian average is higher than the Arab average, which was (402) with statistical significance. The Arab and Jordanian averages were below the international averages with statistical significance as the international averages are as follows: knowledge (460), application (458), and analysis (458).

Relative Difficulty of Math by Content Domain and by Cognitive Domain.

Table (48) shows the percentages averages of correct answers in science by content and by cognitive domains of Math.

Table (48): Average Percentages of Correct Answers in Math by Content and Cognitive Domains for the Arab Countries

	Country	Math	Math Content Domains				Math Cognitive Domains		
			Numbers	Algebra	Geometry	Data &Probability	Knowledge	Application	Analysis
	International Average	(0.1) 41	(0.1) 43	(0.1) 37	(0.1) 39	(0.1) 45	(0.1) 49	(0.1) 39	(0.1) 30
1	Emirates	(0.5) 37	(0.5) 40	(0.5) 34	(0.5) 32	(0.4) 41	(0.5) 48	(0.5) 33	(0.4) 25
2	Lebanon	(0.8) 34	(0.9) 37	(0.9) 35	(0.9) 33	(0.8) 31	(1.0) 47	(0.8) 31	(0.8) 21
3	Qatar	(0.5) 30	(0.6) 32	(0.6) 29	(0.5) 27	(0.6) 34	(0.6) 39	(0.5) 28	(0.5) 21
4	Palestine	(0.6) 29	(0.7) 29	(0.6) 27	(0.7) 30	(0.5) 30	(0.7) 37	(0.5) 27	(0.6) 20
4	Tunisia	(0.6) 29	(0.7) 32	(0.5) 25	(0.6) 29	(0.7) 32	(0.7) 37	(0.6) 28	(0.5) 20
4	Jordan	(0.5) 29	(0.6) 27	(0.6) 29	(0.6) 28	(0.6) 31	(0.7) 37	(0.5) 26	(0.5) 21
4	Bahrain	(0.3) 29	(0.3) 29	(0.4) 27	(0.4) 27	(0.4) 36	(0.4) 37	(0.3) 27	(0.4) 21
	Arab average	(0.2) 29	(0.3) 29	(0.2) 27	(0.3) 28	(0.2) 31	(0.3) 37	(0.2) 27	(0.2) 20
8	Saudi Arabia	(0.7) 26	(0.9) 28	(0.7) 24	(0.7) 24	(0.8) 31	(0.9) 35	(0.7) 24	(0.6) 18
9	Syria	(0.6) 25	(0.6) 24	(0.7) 24	(0.8) 25	(0.6) 26	(0.7) 31	(0.6) 24	(0.6) 17
10	Oman	(0.3) 24	(0.4) 23	(0.4) 23	(0.3) 25	(0.4) 27	(0.4) 31	(0.3) 22	(0.3) 17
11	Morocco	(0.2) 22	(0.3) 23	(0.3) 19	(0.4) 24	(0.3) 24	(0.3) 28	(0.3) 22	(0.2) 14
	Dubai / UAE	(0.5) 42	(0.6) 45	(0.6) 39	(0.6) 36	(0.5) 46	(0.5) 54	(0.6) 39	(0.6) 29
	Abu Dhabi / UAE	(0.8) 35	(0.9) 39	(0.9) 32	(0.8) 31	(0.8) 39	(0.9) 47	(0.9) 32	(0.8) 24

Jordan's averages by content are as follows: Numbers (27%), Algebra (29%), Geometry (28%), and Data and probability (31%). These percentages reflect the varying degree of difficulty by content. The content of Math can be ordered by the degree of difficulty at students starting from the most difficult to the easiest as follows: Numbers, Geometry, Algebra (29%) and Data

and probability. It should be noted that these percentages are below the similar percentages at the international level but are close to the similar Arab percentage averages.

Regarding the cognitive dimension, Jordan's percentages are (37%) in the knowledge domain, (26%) in the application domain, and (21%) in the analysis domain. These percentages show the arrangement of these areas by difficulty (from the most difficult to the easiest) as follows: analysis, application, and knowledge. However, this arrangement is the same on the Arab and international levels. It should be noted that the Jordanian percentages are all below the similar international percentages but are close to the similar Arab percentages.

Jordan's Performance Levels by Content and by Gender

Table (49) shows that females' performance averages in math is (28) scores higher than the males' performance averages and this difference is statistically significant.

Table (49)

Averages of Jordanian Students Performance in Math by Content and Gender

Content	Males	Females	Absolute Difference
Numbers	383(6.7)	398(4.4)	**14(8.5)**
Algebra	413(6.2)	451(4.2)	**39(7.5)***
Geometry	397(5.9)	417(4.4)	**20(7.5)***
Data and Probability	367(6.2)	393(4.1)	**27(7.6)***
Math	**392(5.9)**	**420(4.3)**	**28(7.4)***

* The difference is statistically significant at (α = 0.05)

Table (49) shows that the differences between females' performance average and males' performance average in content (Algebra, Geometry, Data and Probability) are (39, 20, 27) scores respectively and in favor of females and these differences are all statistically significant. However difference the between females' performance average and males' performance average in content (numbers) is (14) and is statistically insignificant.

Jordan's Performance Levels by Cognitive domain and by Gender

Table (50) shows that the differences between the female' performance averages and males' performance averages in the math cognitive domains (knowledge, application, and reasoning)

are (33, 20, 23) scores respectively and in favor of females, and these differences are all statistically significant.

Table (50)

Averages of Jordanian Students Performance in Math by Cognitive Domains and Gender

Domain	Males	Females	Absolute Difference
Knowledge	389(7.0)	422(4.8)	33(8.6)*
Application	388(6.1)	408(4.2)	20(7.5)*
Reasoning	404(5.9)	427(4.9)	23(7.9)*
Math	392(5.9)	420(4.3)	28(7.4)*

* The difference is statistically significant at (α = 0.05)

Jordan's Performance Levels by Content and by School's Location

Table (49) shows that the performance average of students in the urban areas is (35) scores higher than the performance average of students in the rural areas.

Table (51)

Averages of Jordanian Students Performance in Math by Content and School Location

Content	Rural areas	Urban areas	Absolute Difference
Numbers	366(9.5)	398(3.7)	32(10.0)*
Algebra	404(8.9)	439(4.1)	35(9.9)*
Geometry	382(8.9)	414(3.8)	32(9.7)*
Data and Probability	354(8.8)	387(3.9)	33(9.5)*
Math	378(8.1)	414(3.9)	35(9.0)*

* The difference is statistically significant at (α = 0.05)

Table (51) also shows that the differences between the performance averages of students in urban areas and the performance average of students in rural areas in algebra is (35) scores, in geometry is (32) scores, in numbers is (32) scores and in data and probability is (33) scores. All these scores are in favor of students in the urban areas and the differences are statistically significant.

Jordan's Performance Levels by Cognitive domain and by School's Location

Table (52) indicates that the differences between the performance averages of the urban areas and the performance averages of students in the rural areas in the cognitive domains of math

(knowledge, application, reasoning) are (37, 32, 30) scores respectively, in favor of students in the urban areas and these differences are statistically significant.

Table (52)

Averages of Jordanian Students Performance in Math by Cognitive Domains

Cognitive Domains	Rural areas	Urban areas	Absolute Difference
Knowledge	376(9.9)	413(4.4)	37(10.6)*
Application	372(8.4)	404(3.9)	32(9.1)*
Thinking and analysis	392(8.1)	422(3.9)	30(8.7)*
Math	378(8.1)	414(3.9)	35(9.0)*

* The difference is statistically significant at (α = 0.05)

Jordan's Performance Levels by Content and by Supervising Authority

Table (53) shows that the performance averages of private education students in math is (76) scores higher than the performance average of the Ministry of Education students, and is also (31) scores higher than the performance average of UNRWA students. The differences between the averages of UNRWA students and the Ministry of Education students is (45) scores and these differences are statistically at α = 0.05.

Table (53)

Averages of Jordanian Students
Performance in Math by Content and Supervising Authority

Content	Ministry of Education	Private Education	UNRWA
Numbers	377(4.5)	455(9.5)	422(7.3)
Algebra	419(4.6)	491(9.7)	461(6.4)
Geometry	394(4.4)	465(11.0)	436(6.7)
Data and Probability	367(4.4)	436(9.2)	410(8.2)
Math	392(4.4)	468(9.8)	437(5.7)

The situation is the same in terms of order and significance of differences among the averages at the level of the math content domains.

Table (54)

Differences between Performance Averages by Content and Supervising Authority

Science	Supervising Authority	Ministry of Education	Private Education	UNRWA
Numbers	**Ministry of Education**	-	-	-
	Private Education	78(10.7)*	-	
	UNRWA	46(8.2)*	32(11.9)*	-
Algebra	**Ministry of Education**	-	-	-
	Private Education	72(10.8)*	-	
	UNRWA	42(7.7)*	30(11.6)*	-
Geometry	**Ministry of Education**	-	-	-
	Private Education	70(11.9)*	-	
	UNRWA	41(7.7)*	29(12.7)*	-
Data and Probability	**Ministry of Education**	-	-	-
	Private Education	70(10.7)*	-	
	UNRWA	43(8.6)*	26(12.2)*	-
Math	**Ministry of Education**	-	-	-
	Private Education	76(10.9)*	-	
	UNRWA	45(6.9)*	31(11.4)*	-

* The difference is statistically significant at (α = 0.05)

Jordan's Performance Levels by Cognitive Domain and by Supervising Authority

Table (55) shows that the differences between the performance averages of the Ministry of Education students and the private education students in the cognitive domains of math (knowledge, application, reasoning) are (82,75,65) respectively in favor of private education students and are all statistically significant. The differences between private education students and UNRWA students in the same cognitive domains are (37, 32, 24) and are all statistically significant for the favor of private education students. (See table (56).

Table (55)

**Averages of Jordanian Students Performance
in Math by Cognitive Domains and Supervising Authority**

Cognitive Domains	Ministry of Education	Private Education	UNRWA
Knowledge	391(5.1)	472(9.5)	**435(6.9)**
Application	384(4.4)	459(8.9)	**427(6.4)**
Reasoning	404(4.4)	469(9.8)	**444(6.1)**
Math	**392(4.4)**	**468(9.8)**	**437(5.7)**

* The difference is statistically significant at (α = 0.05)

Table (56)

Differences between Performance Averages by Cognitive Domains and Supervising Authority

Cognitive	Supervising	Ministry of Education	Private Education	UNRWA
Knowledge	Ministry of Education	-	-	-
	Private Education	82(10.9)*	-	
	UNRWA	45(8.3)*	37(11.6)*	-
Application	Ministry of Education	-	-	-
	Private Education	75(9.9)*	-	
	UNRWA	43(7.4)*	32(10.9)*	-
Analysis	Ministry of Education	-	-	-
	Private Education	65(10.9)*	-	
	UNRWA	41(6.6)*	24(11.8)*	-
Science	Ministry of Education	-	-	-
	Private Education	76(10.9)*	-	
	UNRWA	45(6.9)*	31(11.4)*	-

* The difference is statistically significant at (α = 0.05)

When comparing the differences between the performance averages of UNRWA students and private education students, it was noted that all these differences are statistically significant at (α = 0.05) in favor of private education. In sum, the performance by content and by the supervising authority starting from the highest to the lowest as follows: private education, UNRWA, ministry of Education.

Jordan's Performance Levels by Content and by Project

Table (57) shows that the order of projects by performance averages in math starting from the highest to the lowest as follows: exploratory schools (426), Education Reform Support Project (ERSP) (410), the Ministry of Education schools (389), and Madrasati (388). The difference between the exploratory schools and the (ERSP) on one hand and the Ministry of Education schools, and Madrasati on the other hand is statistically significant, while the difference between the exploratory schools and the (ERSP) is statistically insignificant and the difference between same order remained in the all science contents. Table (37) shows the significant differences between the Ministry of Education schools, and Madrasati is statistically insignificant.

Table (57)

Averages of Jordanian Students Performance in Math by Content and Project

Content	Exploratory schools	Madrasati	Ministry of Education	(ERSP)
Numbers	406(8.3)	376(7.2)	374(5.2)	**389(3.6)**
Algebra	451(7.9)	413(6.4)	416(5.5)	**439(3.3)**
Geometry	422(8.0)	394(6.9)	392(5.2)	**408(3.8)**
Data and Probability	398(7.7)	367(6.6)	363(5.2)	**383(4.2)**
Math	**426(8.1)**	**388(8.4)**	**389(5.3)**	**410(2.7)**

Table (57) also shows the performance average by project and by math content. Table (58) shows the significance of differences between these averages. The differences between the averages at the level of math sub contents remained the same as they are in math, except that the difference in the content of numbers between the exploratory schools and the (ERSP) was statistically significant.

Table (58)

Differences between Performance Averages by Math Content and Project

Math Content	Project	Exploratory schools	Madrasati	Ministry of Education	(ERSP)
Numbers	Exploratory schools	-	-	-	-
	Madrasati	30(10.8)*	-	-	-
	Ministry of Education	33(9.9)*	2(8.6)	-	-
	(ERSP)	17(8.7)*	13(7.6)	16(6.3)*	-
Algebra	Exploratory schools	-	-	-	-
	Madrasati	38(10.2)*	-	-	-
	Ministry of Education	35(9.9)*	3(8.5)	-	-
	(ERSP)	12(8.6)	26(7.3)*	23(6.4)	-
Geometry	Exploratory schools	-	-	-	-
	Madrasati	29(10.6)*	-	-	-
	Ministry of Education	31(9.9)*	2(8.6)	-	-
	(ERSP)	14(8.5)	15(7.9)	17(6.7)*	-
Data and Probability	Exploratory schools	-	-	-	-
	Madrasati	31(10.0)*	-	-	-
	Ministry of Education	35(9.5)*	4(8.2)	-	-
	(ERSP)	15(8.3)	15(7.3)*	19(6.8)*	-
Math	Exploratory schools	-	-	-	-
	Madrasati	37(11.6)*	-	-	-
	Ministry of Education	37(9.9)*	0.7(9.9)	-	-
	(ERSP)	16(8.5)	22(8.8)*	21(6.1)*	-

* The difference is statistically significant at ($\alpha = 0.05$)

Jordan's Performance Levels by Cognitive Domain and by Project

Table (59) shows that performance averages by the cognitive domain were higher for the exploratory schools, followed the Education Reform Support Project (ERSP) followed by the performance averages of the Ministry of Education and Madrasati. Regarding the significance of differences between the performance averages by cognitive domain, table (60) shows that the statistically significant differences were between the exploratory schools and (ERSP) on one hand and Madrasati and the Ministry of Education on the other hand, while all other differences are statistically insignificant.

Table (59)
Averages of Jordanian Students Performance in Math by Cognitive Domains and Project

Cognitive Domains	Exploratory schools	Madrasati	Ministry of Education	(ERSP)
Knowledge	427(8.9)	386(8.9)	387(6.0)	410(3.0)
Application	414(7.9)	381(7.8)	381(5.2)	399(3.1)
Thinking and analysis	435(7.7)	402(7.4)	401(5.1)	417(4.2)
Science	426(8.1)	388(8.4)	389(5.3)	410(2.7)

Table (60)
Differences between Performance Averages by Cognitive Domains and Project

Cognitive	Project	Exploratory schools	Madrasati	Ministry of Education	(ERSP)
Knowledge	Exploratory schools	-	-	-	-
	Madrasati	41(12.6)*	-	-	-
	Ministry of	40(10.9)*	2(10.7)	-	-
	(ERSP)	17(9.4)	24(9.5)*	22(7.3)*	-
Application	Exploratory schools	-	-	-	-
	Madrasati	33(11.2)*	-	-	-
	Ministry of	33(9.8)*	0.2(9.3)	-	-
	(ERSP)	16(8.6)	18(8.4)*	18(6.6)*	-
Analysis	Exploratory schools	-	-	-	-
	Madrasati	33(10.4)*	-	-	-
	Ministry of	34(9.5)*	1(8.5)	-	-
	(ERSP)	18(8.4)	15(7.9)	16(6.1)*	-
Science	Exploratory schools	-	-	-	-
	Madrasati	37(11.6)*	-	-	-
	Ministry of	37 (9.9)*	0.7(9.9)	-	-
	(ERSP)	16(8.5)	22(8.8)*	21(6.1)*	-

* The difference is statistically significant at ($\alpha = 0.05$)

Levels of Performance in Science and Math by School and Directorate

(230) schools participated in this study, and the results were analyzed at the school's level. The performance average for every school in Math and the performance average for every school in

science and the performance average in both subjects together were calculated. The school's rank in science and the school's rank in Math and the school's rank in both subjects together were calculated. Patriarch Diodoros the First School in Aqaba directorate, which is one of the private sector schools, ranked first among all schools, and in both subjects. The students' performance in this school in Math is 533, and 596 in Science, and in both subjects together is 575.

Kreimeh Secondary School for Boys in the North Aghwar Directorate, which is a public school, ranked last. The students' performance averaged in this school in math is (251) and in science is (255), and in both subjects together is (253). (For more details, refer to annex (1), which shows the performance average and the directorates rank in math and in science and in both subjects together in TIMSS 2011).

Moreover, the data were analyzed at the participating directorates' level. (For more details on the participating directorates' performance levels and the number of schools in these directorates, refer to annex 2)

Chapter Four

Change in Achievement in Science in 1999 / 2003 / 2007 and 2011

Change in the Achievement of Sciences

Table (61) shows the Jordanian students performance averages in science by gender, school location and supervising authority.

Table (61)
Performance averages in science for Jordanian students
by gender, school location and supervising authority in the years 1999, 2003, 2007, 2011

	Year			
	1999	2003	2007	2011
The Country	450	475	482	449
Gender				
Males	442	462	466	428
Females	460	489	499	471
School Location				
Urban	456	478	484	457
Rural	436	468	476	422
Supervising Authority				
MoE	440	470	468	436
UNRWA	477	471	541	482
Private Education	540	541	527	505

Figures (3, 4, 5, and 6) show the changes in science performance in 1999/ 2003 /2007/ 2011 by gender, location and supervising authority at the country's level

Change in Achievement in Science in 1999 / 2003 / 2007 and 2011 at the country's level

Students performance average in science was (475) in 2003 compared to (450) in 1999. In 2007, students' performance average was (482) and in 2011 was (449). (Seefigure 3). The difference between the averages of 2007 and 2011 is (33) scores and this difference is statistically significant in favor of 2007.

It should be noted that Jordanian students' performance in 1999 was below the international level with statistical significance. Jordanian students' performance level increased to (475) in 2003, which is one score higher than the international average that was (474). It increased to (482) in 2007, which is (12) scores over the international average which was (466). However, in

2011, the Jordanian students' performance was less than their performance in 2003 and in 2007, but it was not statistically different from 1999. This is considered a serious issue affecting the educational system and need to be addressed by educators, politicians, decision-makers, policy-makers and the society as a whole so that this decline comes to an end. Moreover, there is need to upgrade students' achievement to reach the international levels, so that they can obtain a privileged position in a highly competitive world.

Figure (3)
Change in Achievement of Science in Jordan in 1999 / 2003/ 2007/ 2011
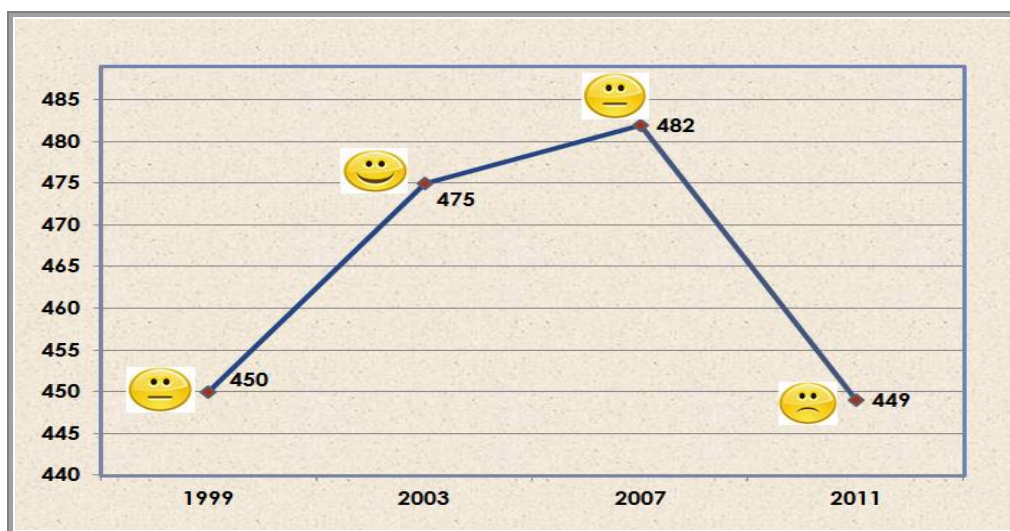
Changes in science achievement by gender

Figure (4) shows that females' performance average in science was (460) in 1999, and increased to (489) in 2003. It increased to (499) in 2007, but decreased to (471) in 2011. The difference between the performance averages in 2007 and 2011 was (28) and was statistically significant in favor of 2007.

Figure (4)
Change in Achievement of Science in Jordan in 1999/ 2003/ 2007/ 2011 by Gender
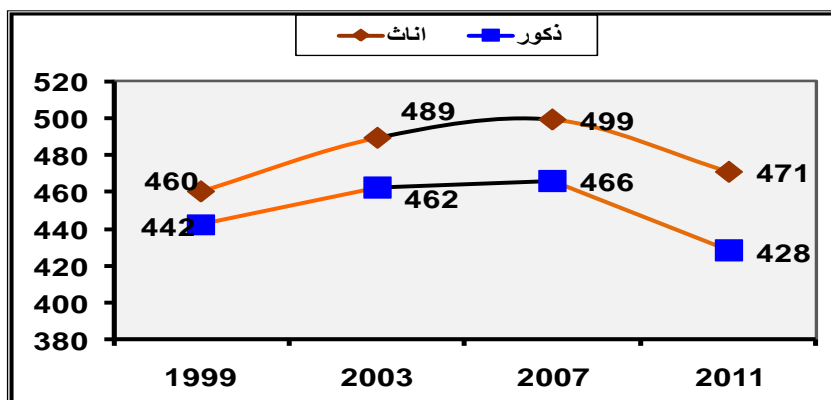
In 1999, males' performance average in science was (442), increased to (462) in 2003 and to (466) in 2007. This average decreased to (428) in 2011. The difference between the performance averages in 2007 and in 2011 is (38) scores in favor of 2007 and this difference is statistically significant.

Generally, females' achievement in science was better than males' achievement in 1999/ 2003, 2007/ 2011. In addition, the improvement at the females' achievements between 2003 and 2007 was better than the males' as it was (11) [1] scores in average compared to the improvement at males' achievements which was (4) scores. Although males and females showed decline in 2011, this decline was greater at males than it was at females.

Change in Achievement of Science by the Supervising Authority
Figure (5) shows that the performance average of MoE students was (440) in 1999 and increased to (470) in 2003. However, it decreased to (468) in 2007, and to (436) in 2011. The decline was (32) scores, and was statistically significant.
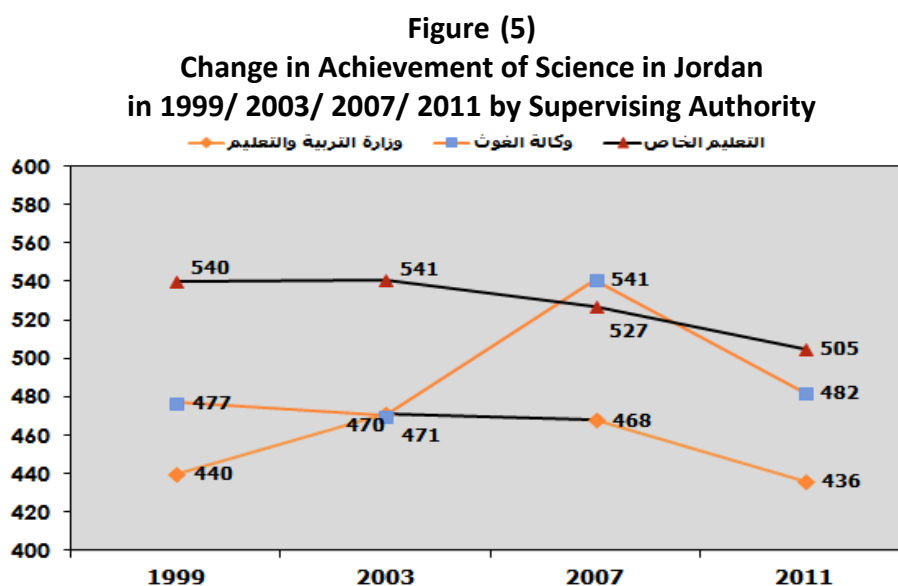
Figure (5)
Change in Achievement of Science in Jordan
in 1999/ 2003/ 2007/ 2011 by Supervising Authority

The private education students' performance average was (540) in 1999, and increased to (541) in 2003, but decreased to (527) in 2007, and decreased again to (505) in 2011. The decline was (22) score compared to 2007 and was statistically significant at (α = 0.05).

---
[1] Rounding errors may show some inconsistent differences

UNRWA students' performance average in science was (477) in 1999, decreased to (471) in 2003, then increased to (541) in 2007, and decreased again to (482) in 2011. This decline was (59) scores compared to 2007 and is statistically significant.

Consequently, it is clear that the most decline was at the UNRWA students, followed by the MoE students, then the private education students, and all these declines are statistically significant.

Change in Achievement of Science by Location

Figure (6) shows that the performance average of students in urban areas was (456) in 1999 increased to (478) in 2003, and increased again to (484) in 2007. This performance decreased to (457) in 2011. The decline was (27) scores in favor of 2007 and is statistically significant.

Figure (6)
Change in Achievement of Science in Jordan in 1999/ 2003/ 2007/ 2011 by Location

Statistically insignificant difference   Statistically significant difference
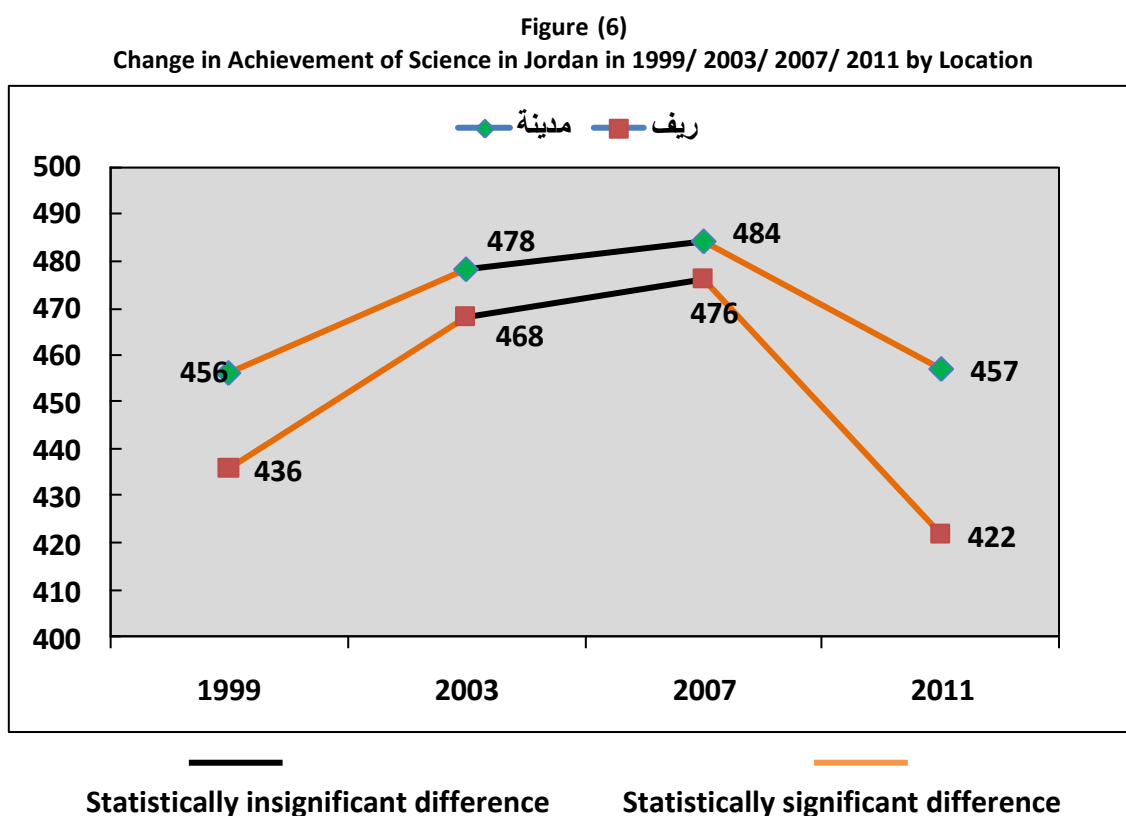
The performance average of students in rural areas in science was (436) in 1999, increased to (468) in 2003, and increased again to (476) in 2007. This performance decreased to (422) in 2011. This decline was (54) scores in favor of 2007 and this difference is statistically significant.

Although students in urban areas and in rural areas showed decline in 2011, this decline was more at students in rural areas than at students in urban areas.

It should be noted that the performance average of students in urban areas was higher than the performance average of students in rural areas in 1999, as well as in 2003 and in 2011. This indicates the need to provide more support to the rural schools and to improve the levels of students in rural areas to reach the levels of their peers in urban schools.

Change in the distribution percentages of students in the achievement levels in Science stations in 1995, 1999, 2003, 2007, 2011

Table (62) shows the change in the distribution percentages of students in international achievement levels in science in 1995, 1999, 2003, 2007, 2011.

Table (62)

Percentages of students by international achievement levels in science among participating countries in 1995, 1999, 2003, 2007, 2011

Country	Low (400)					Moderate(475)					High (550)					Advanced (625)				
	Year					Year					Year					Year				
	11	07	03	99	95	11	07	03	99	95	11	07	03	99	95	11	07	03	99	95
Singapore	96	93	95	95	99	87	80	85	84	91	69	61	66	60	64	40	32	33	29	29
Taiwan	96	95	98	96		85	83	88	86		60	60	63	61		24	25	26	27	
Korea	97	97	98	96	95	86	85	88	81	81	57	54	57	50	50	20	17	17	19	17
Japan	97	96	98	97	97	86	85	86	84	85	57	55	53	52	54	18	17	15	16	18
Russia	96	95	93	92	92	81	76	70	73	71	48	41	32	41	38	14	11	6	15	11
England	93	94	96	94	93	76	79	81	76	75	44	48	48	45	43	14	17	15	17	15
Slovenia	96	97	96		93	82	81	75		69	48	45	33		32	13	11	6		8
Australia	92	92	95		89	70	70	76		69	35	33	40		36	11	8	9		10
America	93	92	93	87	87	73	71	75	67	68	40	38	41	37	38	10	10	11	12	11
Hong Kong	95	92	98	96	90	80	77	89	80	70	47	45	58	40	33	9	10	13	7	7
New Zealand	90		94	88	89	67		73	66	67	34		35	35	34	9		7	10	9
Hungary	92	96	97	96	95	75	80	82	83	80	39	46	46	53	44	9	13	14	19	12
Finland	96			96		80			79		41			43		6			12	
Sweden	91	91	95		97	68	69	75		83	33	32	38		52	6	6	8		19
Lithuania	92	93	95	86	79	71	72	74	57	45	33	36	34	22	14	6	8	6	5	2
Ukraine	88	85				64	58				29	22				6	3			
Iran	79	76	77	72	81	50	41	38	38	43	21	14	9	11	11	5	2	1	1	1
Italy	90	88	87	86		65	62	59	59		27	24	23	26		4	4	4	6	
Bahrain	70	78	70			44	49	33			17	17	6			3	2	0		
Norway	90	87	91		94	62	58	63		72	22	20	21		32	3	2	2		6
Romania	78	77	78	78	77	47	46	49	50	51	16	16	20	21	22	3	2	4	5	5
Jordan	72	79	80	69		45	56	53	42		15	26	21	17		2	5	3	4	
Macedonia	53		72	73		30		42	46		10		13	17		2		2	3	
Oman	59	61				34	32				11	8				2	1			
Armenia	66		77			37		45			12		14			1		1		
Malaysia	62	80	95	87		34	50	71	59		11	18	28	24		1	3	4	5	
Thailand	74	80		87		39	48		54		10	17		18		1	3		2	
Chile	79		56	60		43		24	27		12		5	7		1		1	1	
Palestine	59	54	66			33	28	36			10	9	10			1	1	1		
Lebanon	54	55	48			25	28	20			7	8	4			1	1	0		
Georgia	62	61				28	27				6	5				0	0			
Syria	63	76				29	39				6	9				0	1			
Tunisia	72	77	52	68		30	31	12	25		5	4	1	3		0	0	0	0	
Indonesia	54	65				19	27				3	4				0	0			
Ghana	22	19	13			6	6	3			1	1	0			0	0	0		
Other participations																				
Massachusetts	96	96		93		87	84		75		61	56		43		24	20		15	
Minnesota	98	96			94	85	82			79	54	45			50	16	11			17
Connecticut	92			92		74			74		45			43		14			14	

Carolina	94			87		75			65		42			34		12			9	
Alberta	98			98	97	85			87	83	48			57	51	12			17	**17**
Indiana	95		96	93		78		79	76		43			40	44		10		8	14
Dubai	79	82				57	58				28	27				7	6			
Ontario	96	96	97	95	88	76	77	81	72	61	35	37	41	34	26	6	7	7	7	**5**
Quebec	**96**	**94**	**98**	**98**	**92**	**76**	**68**	**82**	**83**	**69**	**34**	**27**	**39**	**43**	**30**	**5**	**4**	**6**	**10**	**7**

Figure (7) shows the change in Jordanian students' percentages by international achievement levels in 1999, 2003, 2007, 2011

Figure (7)
Change in percentages of Jordanian students by international achievement levels in science in 1999, 2003, 2007, 2011

Regarding the international level, table (62) shows that the percentage of students who reached the advanced level in 2003, 2007 was (7%). This percentage went down by 2% compared to 1999. Jordan's percentage was 5% in 2007, while it was 3% in 2003, and 4% in 1999, which means that increased by 2% compared to 2003, and this increase is statistically significant. In 2011, this percentage was 2% in Jordan, which is less than all of the past years, and is less than the international percentage in 2011, which was 5% with statistical significance.

At the high achievement level, the international percentage was (30%) in 1999 and 2003, compared to (27%) in 2007. This percentage declined by (3%) in 2007 compared to 2003. Jordan's percentage at this level was (21%) in 2003 and (17%) in 1999. It increased to (26%) in 2007, which means that it increased by (5%) compared to 2003 and this increase is statistically significant. In 2011, the Jordanian percentage was (15%). Therefore, the decline size was (11%) compared to 2007, which is also less than the similar international percentage by (17%). These differences are statistically significant.

At the moderate achievement level, the international percentage was (56%) in 2007, (61%) in 2003 and (58%) in 1999. This percentage declined by (5%) in 2007 compared to 2003. Jordan's percentage at this level was (56%) in 2007, and was (53%) in 2003, which means that it increased by (3%) and this increase is statistically insignificant. In 2011, this percentage was (45%). Therefore, the decline size was (7%), and is statistically significant.

At the low achievement level, the international percentage was (80%) in 2007, (84%) in 2003 and (81%) in 1999. Thus, it decreased by (4%) in 2007 compared to 2003. Jordan's percentage at this level went down by (1%) in 2007 compared to 2003, as it went down from 80% in 2003 to 79% in 2007, but this decline is statistically insignificant. In addition, Jordan's percentage was (72%) in 2011 and the decline size was (7%) compared to 2007. It is noted that this decrease is the same compared to similar international level, which reached (79%), and these differences are statistically significant.

Change in Achievement in Math

Table (63) shows the performance averages in math for Jordanian students by gender, location and educational supervising authority in the years 1999/ 2003/ 2007/2011.

Table (63)
Performance Averages for Jordanian Students in Math by Gender,
School Location and the Supervising Authorities in 1999/ 2003/ 2007/ 2011

	Year			
	1999	2003	2007	2011
Country	428	424	427	406
Gender				
Males	425	411	417	392
Females	431	439	438	420
School Location				
Urban	432	430	431	414
Rural	413	414	418	378
Supervising Authority				
MoE	415	418	410	392
UNRWA	473	420	594	437
Private Education	506	509	483	468

Figures (8) ،(9) ،(10), (11) show the changes in Math achievement 1999/ 2003/ 2007/ 2011 by gender, location and supervising authority at the Kingdom's level.

Change in math achievement in the years 1999/ 2003/ 2007/ 2011 at the Country's Level.

Performance averages in math for Jordanian students were 428,424,427,406 in 1999/ 2003/ 2007/ 2011 respectively.(Seefigure (8)).

Figure (8)
Change in math achievement in Jordan in 1999/ 2003/ 2007/ 2011

Statistical analyses showed that the performance differences in 1999/2003/2007 were statistically insignificant. This reflects the stable performance of Jordanian students in 1999/2003/2007. However, the performance average in 2011 was (406) which is a sign of markedly decline of (21) scores compared to 2007, and this decline is statistically significant.

Jordanian students' results in math and international participations in the "Trends in Math and Science (TIMSS)" or in "Programme for International Student Assessment" (PISA) are below the international average. However, the result in 2011 reflected sharp decline compared to previous performance levels. This result requires serious revision of the educational system to maintain its previous achievements and progress to reach the international performance levels.

Change in the Achievement of Math by Gender

Figure (9) shows that female performance average in math was (431) in 1999 and increased to (439) in 2003. This average decreased to (438) in 2007 and decreased again to (420) in 2011. The statistical difference between the performance averages in 2007 and 2011 was (18) in favor of 2007, and this difference is statistically significant.

Figure (9)
Change in the Achievement of Math by Gender in 1999,2003,2007,2011
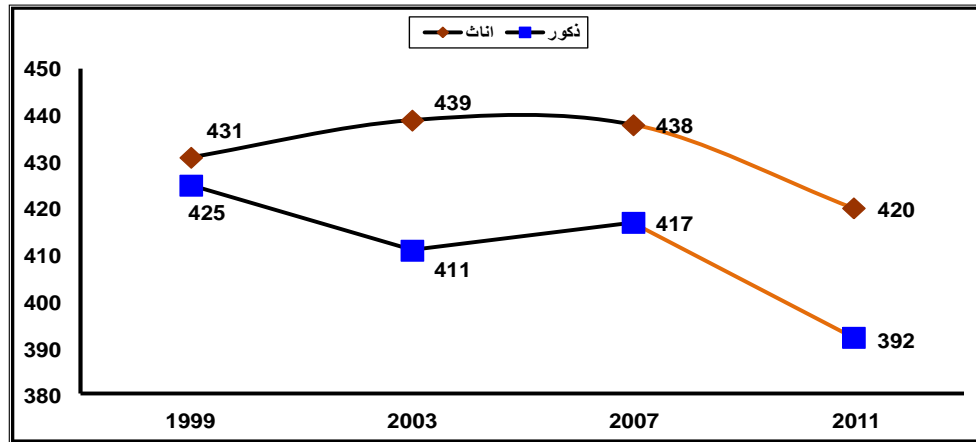
Statistically insignificant difference   **Statistically significant difference**

Male performance average in Math was (425) in 1999 but decreased to (411) in 2003. It increased to (417) in 2007, but decreased to (392) in 2011. The difference between the performance averages in 2007 and 2011 was (25) scores in favor of 2007, and this difference is statistically significant.

In sum, females' achievement in Math was better than males' achievement in 1999/ 2003/ 2007/ 2011. Although males and females showed decline in 2011, the decline size was more at males than females.

Change in the Achievement of Math by the School Location

Figure (10) shows that the performance average of students in rural areas was (413) in 1999 and increased to (414) in 2003. It increased again to (418) in 2007, then decreased to (378) in 2011. The difference between the performance averages in 2007 and 2011 was (40) scores in favor of 2011, and this difference is statistically significant.

Figure (10)

Change in the Achievement of Math by the School Location in 1999/ 2003/2007/ 2011
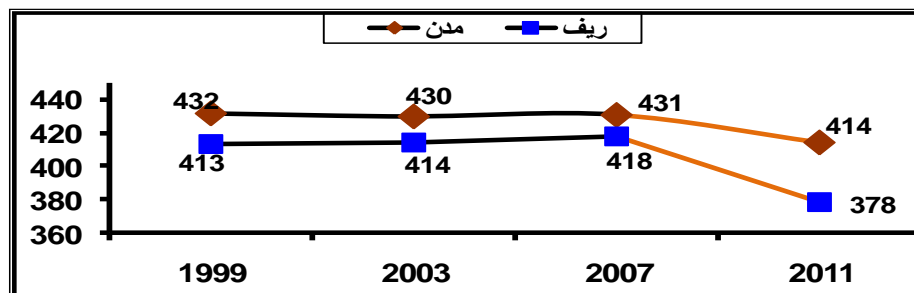
The performance average of students in urban areas in Math was (432) in 1999 but decreased to (430) in 2003. It increased to (431) in 2007, but decreased again to (414) in 2011. The difference between the performance averages in 2007 and 2011 was (17) scores in favor of 2007, and this difference is statistically significant.

Although students in urban areas and students in rural areas showed decline in 2011, but this decline was more at students in rural areas.

It should be noted that the performance average of students in urban areas was higher than the performance average of students in rural areas in Math in all of the past years. There is urgent need to provide more support to the rural schools and to improve the levels of students in rural areas to reach the levels of their peers in urban schools.

Change in the Achievement of Math by the Supervising Authority
Figure (11) shows that the performance average of the MoE students in Math was (415) in 1999 and increased to (418) in 2003 but decreased to (410) in 2007 and all these changes are statistically insignificant. It decreased again to (392) in 2011 by (18) scores, and this decline was statistically significance at ($\alpha = 0.05$)

Figure (11)
Change in Achievement of Math in Jordan in
1999/ 2003/ 2007/ 2011 by Supervising Authority
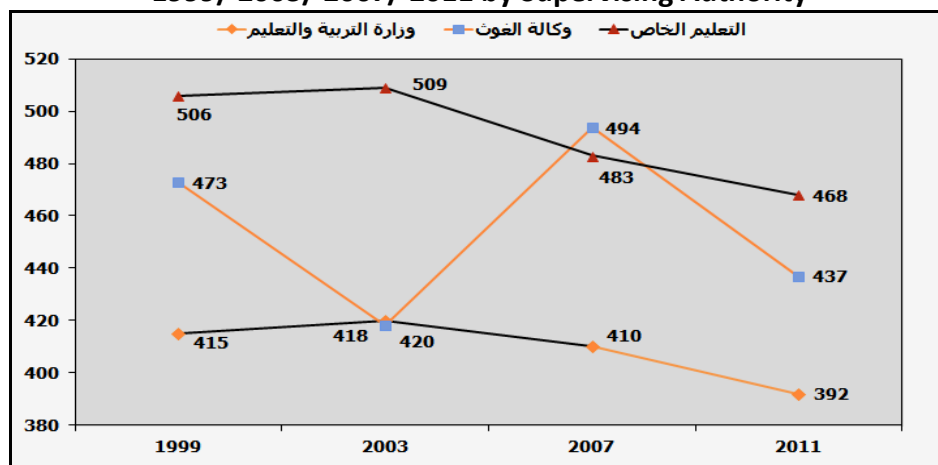
Statistically insignificant difference   **Statistically significant difference**

The performance average of private education students was (506) in 1999 and increased to (509) in 2003. The increase was (3) scores and did not reach the statistical significance at (α = 0.05). in 2007, it was (483) with a decrease of (26) scores. It decreased again to (468) in 2011 with a decline of (15) scores compared to 2007 and this decline is statistically significant.

The performance average of the UNRWA students in science was (473) in 1999, then it decreased to (420) in 2003. It increased to (494) in 2007 but decreased to (437) in 2011. The decline was (57) scores compared to 2007, and is statistically significant.

Generally, it is clear that the most decline was at the UNRWA students, followed by the MoE students, then the private education students and all these declines are statistically significant.

Change in the distribution percentages of students on achievement levels in Math in 1995, 1999, 2003, 2007, 2011

Table (64) shows change in the distribution percentages of students on international achievement levels in Math in 1995, 1999, 2003, 2007, 2011
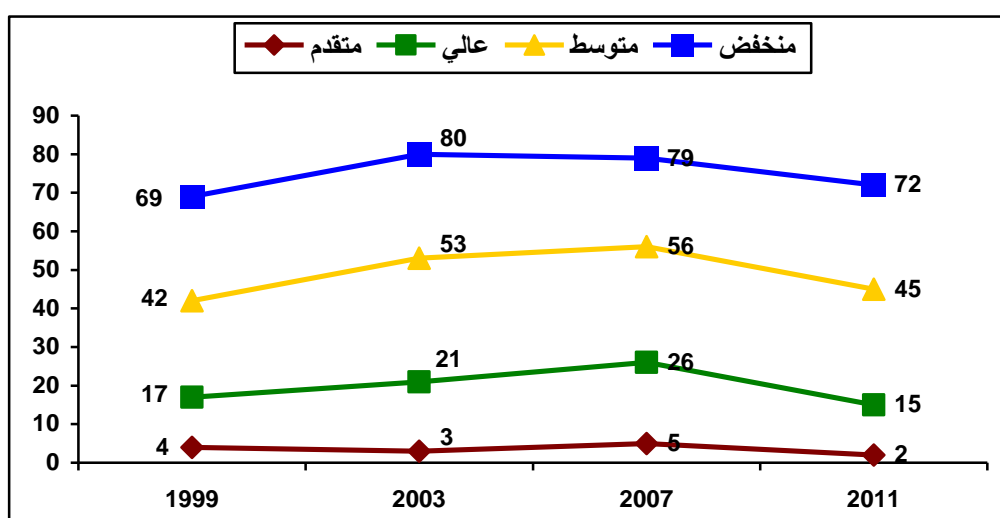
Table (64)
Percentages of students by international achievement
levels in Math in the participating countries in 1995/1999/ 2003/ 2007/ 2011

Country	Low (400)					Moderate (475)					High (550)					Advanced (625)				
	Year					Year					Year					Year				
	11	07	03	99	95	11	07	03	99	95	11	07	03	99	95	11	07	03	99	95
Taiwan	96	95	96	95		88	86	85	85		73	71	66	67		49	45	38	37	
Singapore	99	97	99	99	100	92	88	93	94	98	78	70	77	77	84	48	40	44	42	**40**
Korea	99	98	98	99	97	93	90	90	91	89	77	71	70	70	67	47	40	35	32	**31**
Hong Kong	97	94	98	98	96	89	85	93	92	88	71	64	73	70	65	34	31	31	28	**23**
Japan	97	97	98	98	98	87	87	88	90	91	61	61	62	66	67	27	26	24	29	**29**
Russia	95	91	92	93	93	78	68	66	73	73	47	33	30	39	38	14	8	6	12	**9**
Australia	89	89	90		90	63	61	65		68	29	24	29		33	9	6	7		**7**
England	88	90	90	88	87	65	69	61	60	61	32	35	26	25	27	8	8	5	6	**6**
Hungary	88	91	95	93	94	65	69	75	75	74	32	36	41	43	40	8	10	11	13	**10**
America	92	92	90	87	86	68	67	64	62	61	30	31	29	30	26	7	6	7	7	**4**
Romania	71	73	79	79	79	44	46	52	51	52	19	20	21	20	21	5	4	4	4	**4**
Lithuania	90	90	90	85	81	64	65	63	53	50	29	30	28	18	17	5	6	5	3	**2**
New Zealand	84		88	84	89	57		59	57	64	24		24	26	28	5		5	6	**6**
Ukraine	81	76				53	46				22	15				5	3			
Slovenia	93	92	90		90	67	65	60		60	27	25	21		22	4	4	3		**4**
Italy	90	85	86	82		64	54	56	53		24	17	19	21		3	3	3	4	
Armenia	76		82			49		54			18		21			3		2		
Macedonia	61		66	70		35		34	40		12		9	13		3		1	2	
Georgia	62	56				36	26				13	7				3	1			
Iran	55	51	55	61	59	26	20	20	26	24	8	5	3	6	4	2	1	0	1	**0**
Malaysia	65	82	93	93		36	50	66	70		12	18	30	36		2	2	6	10	
Thailand	62	66		79		28	34		45		8	12		17		2	3		3	
Bahrain	53	49	51			26	19	17			8	3	2			1	0	0		

Sweden	89	90	91		96	57	60	64		81	16	20	24		46	1	2	3		**12**
Palestine	52	39	46			25	15	19			7	3	4			1	0	0		
Lebanon	73	74	68			38	36	27			9	10	4			1	1	0		
Norway	87	85	81		90	51	48	44		64	12	11	10		26	1	0	0		**4**
Chile	57		41	46		23		15	16		5		3	4		1		0	1	
Jordan	**55**	**61**	**60**	**61**		**26**	**35**	**30**	**33**		**6**	**11**	**8**	**12**		**0**	**1**	**1**	**3**	
Oman	39	41				16	14				4	2				0	0			
Tunisia	61	61	55	78		25	21	15	34		5	3	1	5		0	0	0	0	
Finland	90			96		57			77		14			33		0			5	
Syria	43	47				17	17				3	3				0	0			
Indonesia	43	48				15	19				2	4				0	0			
Other participations																				
Massachusetts	98	95		92		88	82		69		57	52		33		19	16		8	
Carolina	95			87		78			59		44			27		14			6	
Minnesota	97	97		94		83	81		73		49	41		36		13	8		7	
Connecticut	91			90		69			68		37			33		10			9	
Indiana	95		94	93		74		68	71		35		27	32		7		5	7	
Quebec	98	97	99	99	99	82	78	88	93	90	40	37	45	60	54	6	8	8	18	**14**
Dubai	79	74				53	47				23	17				5	3			
Ontario	94	95	97	96	91	71	74	75	72	65	31	33	34	32	26	4	6	6	6	**3**
Alberta	**95**			97	97	69			81	79	24			40	39	3			7	6

Figure (12) shows the change in the percentages of Jordanian students by international achievement levels in Math in 1999/ 2003/ 2007/ 2011

Figure (12)
Change in percentages of Jordanian students by international achievement levels in Math in 1999/ 2003/ 2007/ 2011

Legend: متقدم عالي متوسط منخفض

Level	1999	2003	2007	2011
منخفض	61	60	61	55
متوسط	33	30	35	26
عالي	12	8	11	6
متقدم	3	1	1	0
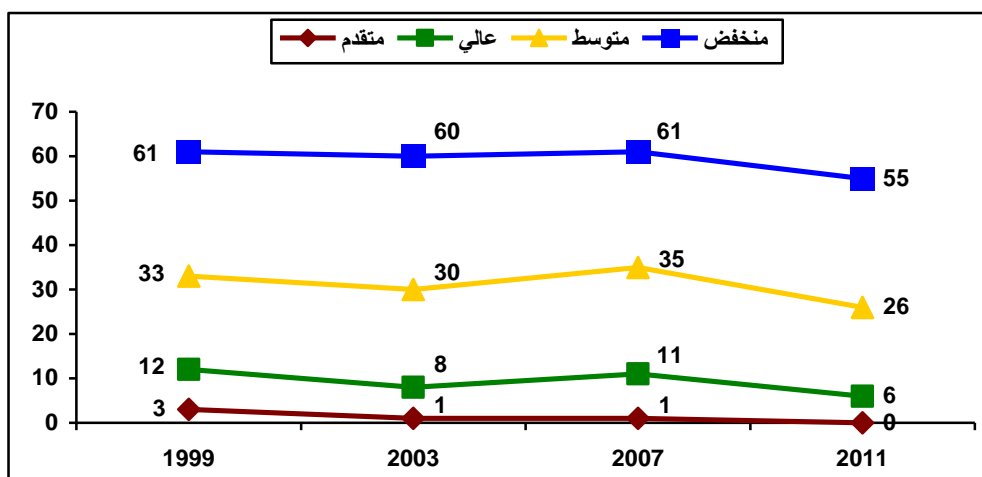
Table (64) shows that the percentage of students who reached the advanced level in Math in 2003 and 2007 was (8%) at the international level. This percentage decreased by (2%) compared to 1999, and by (3%) compared to 1995. Jordan's percentage was (1%) in 2003 and in 2007. This percentage decreased by (2%) compared to 1999. In 2011, it was (0%) which is less than 2007, and less than the similar international percentage in 2011 which was (3%).

At the high achievement level, the international percentage was (24%) in 2007, compared to (28%) in 2003, and so the difference is (4%) in favor of 2003.

In Jordan, this percentage was (11%) in 2007 and (8%) in 2003. Thus, this percentage increased by (3%) in 2007 compared to 2003, which is statistically significant. In 2011, the percentage was (6%) in Jordan. Thus, the decline size was (5%) in favor of 2007. It is also less than the similar International percentage by (11%) and these declines are statistically significant.

At moderate achievement level, the international percentage was (50%) in 2007, and (56%) in 2003. Thus, the difference between 2003 and 2007 was (6%) in favor of 2003. Jordan's percentage was (35%) in 2007 and (30%) in 2003 and this difference is statistically insignificant.

In 2011, Jordan's percentage was (26%), and so is less than 2007 by (9%) and less than the similar International percentage by (20%), and these differences are statistically significant.

At the low achievement level, the international percentage was (75%) in 2007, and(80%) in 2003, and so the difference was (5%) in favor of 2003.

Jordan's percentage was (61%) in 2007 compared to (60%) in 2003, and the difference between these percentages is statistically insignificant. In 2011, Jordan's percentage was (55%), and decline size was (6%) compared to 2007, and it is less than the similar international level by (20%), and these differences are statistically significant.

Chapter Five

Selected Characteristics of the Student, the Teacher &
the Principal and their relationship with the achievement in Math and Science

- **Variables Derived from the Student's Questionnaire.**
  - **Time spent by students in the completion of homework**

Table No. (65)
Time spent by students to complete their Science   homework and their achievement in this topic weekly

No.	Country	3 hr. and more		45m – 3 hr.		45 m or less	
		% Students' Percentage	Performance Average	% Students' Percentage	Performance Average	% Students' Percentage	Performance Average
1.	Jordan	8	447	32	464	61	456
2.	Palestine	7	388	31	424	62	427
3.	Bahrain	6	415	25	465	69	457
4.	Tunisia	4	416	20	428	76	445
5.	Qatar	4	398	28	445	68	414
6.	Oman	4	373	17	411	79	432
7.	UAE	4	443	25	479	71	464
8.	Saudi Arabia	3	401	14	425	83	441
9.	Dubai/UAE	4	462	33	502	63	481
10.	Abu Dubai/UAE	4	439	22	471	74	462
Arab Average		5	410	24	443	71	442
International Average		5	448	29	487	67	482

Table (65) shows the weekly time spent in the completion of science homework by grade 8 students in the Arab countries participating in (TIMSS). The results showed that 32% of Jordanian students spend more than 45 minutes and less than 3 hours to complete their science homework, and the performance average of those students was 464. Moreover, the results showed that 61% of Jordanian students spend 45 minutes or less to complete their Science homework weekly, and the performance average of these students was 456. The results also showed that 8% of Jordanian students spend 3 hours or more to complete their science homework, and their performance average was 447. On the Arab level, the percentages were as follows:

Three hours or more than 5%, more than 45 minutes and less than 24% 3 hours, 45 minutes or less, 71%, and the three categories of performance averages came in the same order: 410, 443, 442. At the international level, the percentages were as follows: 5%, 29%, 67%, and the performance average were: 448 487 482 respectively. The percentages and performance averages in science, at the Jordanian Arab, or international levels, show a curvilinear relationship between the student's time spent on homework and achievement in science,

noting that the most time spent on homework is accompanied by the lowest performance. This might be attributed to the fact that low performing students need more time to do their homework.

Table (66) shows that the time spent by grade 8 students in the Arab countries who participated in (TIMSS) to complete their Math homework weekly.

Table No. (66)
Time spent by students to complete their Math homework and their achievement in this topic weekly
The results showed that the percentages of Jordan in the three categories: 3 hours or more,

No.	Country	3 hr. and more		45m – 3 hr.		45 m or less	
		Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average
1.	Tunisia	21	420	43	431	37	424
2.	Lebanon	19	447	36	456	45	447
3.	Morocco	18	388	34	389	48	363
4.	Syria	16	385	37	400	47	368
5.	Palestine	13	383	30	409	57	412
6.	Bahrain	12	383	31	427	57	410
7.	Jordan	**12**	**405**	**36**	**419**	**52**	**409**
8.	Qatar	9	430	31	443	60	392
9.	UAE	9	455	31	469	60	452
10.	Oman	6	349	20	372	74	373
11.	Saudi Arabia	5	356	18	391	77	398
12.	Dubai/UAE	11	478	38	492	51	470
13.	Abu Dubai/UAE	9	449	29	459	62	446
Arab Average		13	401	32	419	56	404
International Average		15	464	38	478	48	460

more than 45 minutes and less than 3 hours, and 45 minutes or less were 12%, 36%, 52% respectively, and the performance average corresponding to these percentages were 405, 419 & 409, and on the Arab level, the percentages were 13%, 32%, 56% respectively and the performance average were 401, 419 & 404 respectively. On the international level, the percentages were 15%, 38%, 48%, respectively and the performance average were respectively 464, 474 & 460.

The values of the percentages and the performance average in Math at the Jordanian, Arab and international levels indicate a curvilinear relationship between the student's time spent on homework and achievement in Math noting that the greatest time is accompanied by the lowest performance in math.

Students' Engagement in the math classes
Students' engagement scale in Math lessons is derived based on their agreement on the following items that are included in the questionnaire:

1. I know the work the teacher expects from me to do.
2. I think of matters irrelevant to the classes .
3. I can understand my teacher easily.
4. My teacher gives me exciting things to do.

Table (67) shows the percentage distribution of students of Arab States on the students' engagement scale of students in math classes, which divides students into three categories "**engaged** ", **" engaged to some extent**" and **"not engaged"**.

Table (67)
Students' engagement in classes   and their achievement in Math

No.	Country	Engaged		Engaged to some extent		Not engaged	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Syria	47	395	45	372	8	361
2.	Morocco	45	387	47	363	8	354
3.	Jordan	44	435	48	393	8	369
4.	Tunisia	42	432	48	420	10	419
5.	Palestine	42	427	49	395	9	362
6.	Oman	38	401	54	355	9	311
7.	Lebanon	35	459	52	447	13	433
8.	UAE	31	473	54	450	14	444
9.	Bahrain	30	427	54	408	16	389
10.	Saudi Arabia	30	421	56	387	14	369
11.	Qatar	28	441	54	405	18	386
12.	Abu Dubai/UAE	30	471	55	442	15	434
13.	Dubai/UAE	29	488	54	477	16	466
Arab Average		37	427	51	400	12	382
International Average		25	484	54	468	21	449

The percentages of Jordanians students came as follows: 44% engaged, 48% engaged to some extent, and 10% were not engaged. At the Arab level the percentages were as follows: 37% engaged, 51%, engaged to some extent and 12% not engaged. At the international level the percentages were as follows: 25% engaged, 54% engaged to some extent, 21% not engaged. These percentages reflect a better level of engagement in math classes   at the Jordanian students compared to the Arab and international levels. The performance averages of students

at the Jordanian, Arab or international levels indicate a positive relationship between the achievement in Math and students' engagement in math classes.

Table (68) shows the distribution of Arab students' percentages on the students' engagement scale in science classes. The results showed that the degree of engagement of Jordanian students was better compared to the engagement of their counterparts on the Arab and international levels, and that the relationship between achievement in science and students' engagement in science classes is a direct relationship at the Jordanian, Arab and international levels.

Table No. (68)
Students' engagement in classes   and their achievement in Science

No.	Country	*Engaged		Engaged to some extent		Not engaged	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Tunisia	55	446	39	430	6	431
2.	Jordan	46	483	46	436	8	395
3.	Palestine	44	448	47	406	9	381
4.	Oman	42	460	50	406	8	349
5.	UAE	38	487	49	454	12	445
6.	Saudi Arabia	36	462	51	427	12	411
7.	Bahrain	34	479	51	447	15	428
8.	Qatar	32	464	51	409	17	378
	Dubai/UAE	39	501	48	482	13	461
	Abu Dubai/UAE	38	486	50	448	12	445
Arab Average		41	466	48	427	11	402
International Average		29	508	51	479	21	457

- **Teachers' Involvement of students in the classes**

This scale is built based on teachers' responses to four items:
1. Summarizing what students should have learned.
2. Using questions to explains reasons and elucidations.
3. Encouraging all students to enhance their performance.
4. Praising and recognizing students for exerting good efforts.

---

* See the definitions of the measurement categories in appendix (5)

Table (69) shows the distribution of percentages of Arab States students on the scale of Teachers' Involvement of students in the classes, which divides students into three categories according to the Teachers' Involvement of students in the classes. These categories are: **most of the classes**, **about half of classes**, and **some classes**. The results showed that 89% of Jordanian students are involved in most of the classes by science teachers and their performance average in Science was (451), which is better than the Arab average, but below the international average. The percentage of students who are involved in half of science classes by their teachers in Jordan was 9%, which is below Arab and international percentages. Students' performance average was (441), which is below the international average for students who fall into the same category. The results showed that 2% of the Jordanian students are engaged in some science classes by their teachers and this percentage come between the Arab and international percentages.

Table No. (69)
Students' participation in Science classes during teaching

No.	Country	Most of the classes		About half of classes		Some classes	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Palestine	94	422	6	398	0	~
2.	UAE	94	462	6	471	0	~
3.	Qatar	93	420	6	411	1	~
4.	Morocco	89	377	10	375	1	~
5.	Jordan	89	451	9	441	2	~
6.	Saudi Arabia	89	438	11	428	0	~
7.	Lebanon	88	406	11	404	1	~
8.	Syria	88	424	11	437	1	~
9.	Oman	85	422	15	406	0	~
10.	Bahrain	84	460	16	418	0	~
11.	Tunisia	83	438	14	439	4	437
12.	Dubai/UAE	95	484	5	411	0	~
13.	Abu Dubai/UAE	93	459	7	495	0	~
Arab Average		87	429	10	421	1	437
International Average		80	478	17	474	3	509

Table (70) shows that students' participation in math classes, as the percentage of the Jordanian students who are involved in about half of the classes was 13%, and in some classes was 1% .

Table No. (70)
Students' participation in Math classes during instruction

No.	Country	Most of the classes		About half of the classes		Some classes	
		Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average
1.	UAE	93	456	7	449	1	~
2.	Bahrain	90	413	9	378	1	~
3.	Palestine	90	405	10	397	1	~
4.	Qatar	89	417	11	363	0	~
5.	Syria	88	379	11	376	1	~
6.	Saudi Arabia	87	397	12	381	1	~
7.	Jordan	86	409	13	385	1	~
8.	Morocco	86	374	14	355	0	~
9.	Lebanon	86	452	12	437	3	433
10.	Tunisia	84	427	14	412	2	~
11.	Oman	82	373	17	334	1	~
12.	Dubai/UAE	95	447	5	505	0	~
13.	Abu Dubai/UAE	91	482	9	423	0	~
Arab Average		87	409	12	388	1	433
International Average		80	469	17	459	3	484

The results also indicated that the performance average of the Jordanian students who participated in most of the classes was better than students who participated in about half of the classes. Interestingly, students' performance average who participated in some classes was better at both the international and Arab levels and better than the performance average of students in other categories, both in Math or Science.

- **Students' confidence in learning**

The study derived a scale for student's confidence in his/ her ability to learn Science and Math. This scale divided students into three categories according to the degree of confidence: *high, moderate, and unconfident*. Table (71) shows the distribution of students' percentages by their confidence in their ability to learn science. Jordan percentages of on the three categories were as follows: 29%, 56% and 15% respectively. Jordanian students' performance average in science

according to these categories and in the same order as follows: 507, 440 and 40. These averages were the highest when compared to their counterparts in the participating Arab countries, but were lower than the similar international values. The performance averages on the Jordanian, Arab and international levels show a positive relationship between the achievement in science and students' confidence in learning.

Table (71)
Students' confidence in learning Science and achievement

No.	Country	*High		Moderate		Unconfident	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Tunisia	37	464	51	427	11	414
2.	Oman	29	487	57	407	14	360
3.	Jordan	29	507	56	440	15	407
4.	Saudi Arabia	29	481	54	426	17	401
5.	UAE	29	512	52	454	19	428
6.	Qatar	28	496	51	404	22	368
7.	Palestine	23	480	55	414	22	379
8.	Bahrain	23	511	52	450	25	418
9.	Dubai/UAE	32	528	50	474	18	446
10.	Abu Dubai/UAE	27	509	53	450	20	429
Arab Average		28	492	54	428	18	397
International Average		20	536	49	482	31	450

Table (72) shows the distribution of students' percentage by the degree of their confidence in their ability to learn math. Jordan's percentages in the three categories were as follows: 22%, 54%, 24% respectively. Jordan's performance averages in Math according to these categories were: 482, 399, 365, and on the Arab level the performance averages were as follows: 474, 405, 372, while on the international level the performance averages were as follows: 539, 478 & 435.
The values of the performance average by the degree of students' confidence in their ability to learn science or math indicate a positive relationship between the achievement in math and science on one hand and students' confidence in their ability to learn.

---

* See the definitions of the measurement categories in appendix (5)

Table (72)
Students' Confidence in Learning Math and Achievement in Math

No.	Country	High		Moderate		Unconfident	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Jordan	22	482	54	399	24	365
2.	Saudi Arabia	21	464	52	392	27	348
3.	UAE	20	516	53	451	27	422
4.	Lebanon	19	500	53	447	28	420
5.	Qatar	18	484	52	404	30	379
6.	Palestine	17	478	54	404	29	364
7.	Oman	17	457	59	362	24	322
8.	Bahrain	16	490	45	417	39	372
9.	Syria	15	426	56	382	29	359
10.	Tunisia	14	488	50	426	36	398
11.	Morocco	13	434	54	374	33	347
12.	Dubai/UAE	21	538	49	476	30	441
13.	Abu Dubai/UAE	20	512	54	443	26	413
Arab Average		17	474	53	405	30	372
International Average		14	539	45	478	41	435

- **Students' appreciation for the subject**

The study built the scale of the students' appreciation for science and Math and this scale divided students into three categories by the degree of appreciation for science and math: **high, moderate**, and **low**. Table (73) indicates that the distribution of Jordan's percentages on the three categories was as follows: 66%, 25% & 8% respectively. The performance averages in Science for Jordanian students by these categories were as follows: 468, 437, 403, and these averages were less than the similar international values. At the Jordanian level, the performance averages for the first two categories were higher than the Arab performance averages and were less than the Arab average in the last category.

Table (74)
Students' appreciation for Science and achievement in Science

No.	Country	*High Value		Moderate Value		Low Value	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Oman	69	441	24	393	7	361
2.	Jordan	**66**	**468**	**25**	**437**	**8**	**403**
3.	Tunisia	62	441	27	436	12	438
4.	Palestine	62	437	27	406	11	379
5.	Saudi Arabia	53	446	32	433	15	419
6.	UAE	51	474	30	459	18	453
7.	Qatar	51	447	30	403	19	381
8.	Bahrain	49	473	31	447	21	430
9.	Dubai/UAE	52	494	29	479	19	476
10.	Abu Dubai/UAE	50	472	31	453	18	450
Arab Average		58	453	28	427	14	408
International Average		41	502	33	477	26	457

Table (74) shows the distribution of students' percentage by the degree of appreciation for math. The percentages of Jordan on the three categories were: 69%, 24% and 7%, and the total performance average in math for Jordanian students according to these categories were: 422, 393 and 340, while the similar Arab averages were: 421, 395 and 365. At the international level, they were: 482, 463 and 439, and all of which were higher than the Jordanian averages or and the similar Arab averages. The values of the performance average by the degree of students' appreciation of Math or science reflects the positive relationship between achievement in Math and science on one hand, and the students' degree of appreciation variable for the subject at the Jordanian, Arab, and international levels on the other hand.

---

* See the definitions of the measurement categories in appendix (5)

Table (74)
Students' appreciation for Math and achievement in Math

No.	Country	*High Value		Moderate Value		Low Value	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Morocco	78	380	18	351	4	334
2.	Jordan	69	422	24	393	7	340
3.	Oman	67	386	26	342	7	298
4.	Palestine	67	421	26	381	8	346
5.	Syria	65	392	27	367	8	346
6.	Tunisia	64	434	28	414	8	397
7.	UAE	54	466	36	451	11	427
8.	Lebanon	53	461	36	442	11	419
9.	Saudi Arabia	51	408	35	387	13	363
10.	Qatar	49	432	35	401	16	370
11.	Bahrain	48	425	36	411	16	372
	Abu Dubai/UAE	55	462	35	440	10	412
	Dubai/UAE	51	484	37	478	12	453
Arab Average		60	421	30	395	10	365
International Average		46	482	39	463	15	439

- **Student's attitude towards the subject**

The study built the scale of the students' attitudes towards science based on his/her responses on a five-item –scale, which is divided into three categories: *like, like to some extent*, and *dislike*. Table (75) shows the distribution of students' percentages by the categories of this variable and their achievement in science. Jordan's percentages for the three categories were as follows: 11%, 42% & 47% respectively. The Jordanian students' performance averages were as follows: 485, 430 & 420 respectively. These averages were higher than the Arab averages but less than the international averages.

---

*
 See the definitions of the measurement categories in appendix (5)

Table (75)
Student's inclination to Science and achievement

No.	Country	*Like		Like to some extent		Dislike	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Tunisia	56	450	37	426	8	422
2.	Jordan	47	485	42	430	11	420
3.	Oman	45	474	45	387	10	361
4.	Saudi Arabia	45	460	37	421	18	413
5.	UAE	43	496	40	447	17	433
6.	Palestine	38	459	46	405	16	385
7.	Qatar	36	479	44	393	19	373
8.	Bahrain	32	493	45	445	23	422
	Dubai/UAE	49	511	37	468	14	446
	Abu Dubai/UAE	40	494	41	443	19	436
Arab Average		43	475	42	419	15	404
International Average		35	515	44	472	21	450

Table (76) shows the distribution of students' percentages by the categories of students' love for and achievement in Math. Jordan's percentages at the three categories were as follows: 42%, 39% & 19% respectively, and Jordan's performance averages in Math by these categories were as follows: 422, 388 & 376 respectively. These averages were below the Arab and international averages and the relationship between the achievement in science or math and the students' love for the subject is positive at the Jordanian, Arab, and international levels.

---

* See the definitions of the measurement categories in appendix (5)

Table (76)
Student's inclination to Math and achievement in Math

No.	Country	*Like		Like to some extent		Dislike	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Morocco	48	398	40	353	12	340
2.	Jordan	42	442	39	388	19	376
3.	Oman	38	420	45	342	17	324
4.	Tunisia	38	448	40	415	23	405
5.	Syria	37	408	44	373	19	353
6.	Lebanon	35	475	43	441	21	425
7.	UAE	31	488	42	448	27	432
8.	Palestine	31	447	43	394	26	375
9.	Saudi Arabia	29	436	40	389	32	364
10.	Qatar	27	456	43	401	31	386
11.	Bahrain	24	454	38	413	38	381
	Abu Dubai/UAE	32	485	42	441	26	420
	Dubai/UAE	29	508	41	473	30	456
Arab Average		35	443	42	396	24	378
International Average		26	504	42	467	31	443

- **Educational Resources at Home**

According to this variable, students were distributed into three categories, ***many "resources"***, ***"some resources"***, and **"few resources."** Table (77) shows the distribution of students' percentage according to the categories of this variable and achievement in science. and percentages of Jordan on the three categories came the same order as follows: 6%, 67% & 27%, while at the Arab level was percentages were 7%, 63% & 31%, and at the international level they were:12%, 67% & 21%. The Jordanian students' performance averages in science by these categories were as follows: 488, 461& 421, and on the Arab level averages were: 481, 437& 395 while on the international level they were: 540, 480 & 422.

---

* See the definitions of the measurement categories in appendix (5)

Table No. (77)
Educational Resources availability at Home and Achievement in Science

No.	Country	*Many resources		Some resources		Few resources	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Qatar	17	472	74	419	10	329
2.	UAE	11	518	76	465	12	416
3.	Bahrain	9	514	78	456	14	405
4.	Saudi Arabia	6	472	61	445	32	414
5.	Jordan	6	488	67	461	27	421
6.	Lebanon	6	472	64	418	30	370
7.	Oman	5	489	57	440	38	388
8.	Palestine	4	474	63	433	33	391
9.	Tunisia	3	494	58	446	38	423
10.	Syria	3	448	52	433	45	419
11.	Morocco	3	448	38	391	59	366
	Dubai/UAE	15	546	76	482	9	415
	Abu Dubai/UAE	11	508	76	463	13	416
Arab Average		7	481	63	437	31	395
International Average		12	540	67	480	21	424

Table (78) shows the distribution of students' percentage by the educational resources variable and the achievement in math. Jordanian students' percentages were distributed on these three categories as follows: 6%, 61% & 32% respectively. At the Arab level, they were as follows: 7%, 63%, 32% respectively, and at the international level they were: 12%, 67%, 21% respectively. Jordanian students' performance averages in Math by the three categories were as follows: 447, 419 & 372, while on the Arab world these averages were as follows: 460, 416 & 374, while at the international they were as follows: 530, 470 & 415 all of which were higher than the Arab and Jordanian averages. This table indicates that the relationship between achievement in science or Math and the availability of educational resources at student's home is a positive relationship on the three levels.

---

*
 See the definitions of the measurement categories in appendix (5)

Table No. (78)
Educational Resources availability at Home and Achievement in Mathematic

No.	Country	*Many resources		Some resources		Few resources	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Qatar	17	463	74	409	10	330
2.	UAE	11	501	76	457	12	414
3.	Bahrain	9	476	78	412	14	365
4.	Saudi Arabia	6	428	61	403	32	370
5.	Jordan	6	447	67	419	27	372
6.	Lebanon	6	502	64	459	30	420
7.	Oman	5	436	57	386	38	332
8.	Palestine	4	452	63	416	33	378
9.	Tunisia	3	493	58	436	38	403
10.	Syria	3	408	52	387	45	371
11.	Morocco	3	455	38	392	59	357
	Dubai/UAE	15	529	76	475	9	417
	Abu Dubai/UAE	11	489	76	451	13	408
Arab Average		7	460	63	416	31	374
International Average		12	530	67	470	21	415

- **Students' lack of previous knowledge and skills necessary to acquire new ones**

According to this variable, students were distributed into three categories: "***Do not lack previous knowledge***", "***lack previous knowledge to some extent***" "***Lack previous knowledge to great extent***". Table (79) shows the distribution of students' percentage according to the categories of this variable and achievement in Science. Jordan's percentages on the three categories were as follows: 6%, 55% & 39% respectively, while at the Arab level these percentages were: 14%, 60% and 27% respectively, and on the international level they were: 20%, 61% & 19% respectively. Jordanian students' performance averages in science by these categories were as follows: 448, 459 & 435 respectively, and on the Arab and international levels averages they were: (446, 430, 413) and (496, 478, 455) respectively.

---

* See the definitions of the measurement categories in appendix (5)

Table (79)

Students' Lack of Previous Knowledge and Skills   **Necessary**

for Acquiring New Learning Experiences and Achievement in Science

No.	Country	Do not lack previous knowledge		lack of previous knowledge to some extent		Lack of previous knowledge to great extent	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	UAE	23	479	64	459	13	447
2.	Lebanon	18	421	65	408	17	379
3.	Qatar	18	451	62	420	20	384
4.	Bahrain	18	476	64	454	18	428
5.	Morocco	13	397	41	382	46	367
6.	Saudi Arabia	13	440	65	438	22	430
7.	Oman	12	438	59	419	30	413
8.	Tunisia	10	454	64	439	25	431
9.	Syria	10	441	64	427	26	417
10.	Palestine	9	465	52	423	39	407
11.	Jordan	6	448	55	459	39	435
	Dubai/UAE	26	511	62	470	12	467
	Abu Dubai/UAE	20	478	64	461	15	438
Arab Average		14	446	60	430	27	413
International Average		20	496	61	478	19	455

Table (80) shows the distribution of students' percentage by the categories of this variable and achievement in Math. Jordan's percentages on the three categories of this variable were as follows: 46%, 48% & 6% respectively, while on the Arab level the percentages were: 11%, 54%, 35% respectively, and on the international level they were: 392%, 412%, 392% respectively. Jordanian students' performance averages in Math by these categories were as follows: 428, 413& 395 respectively, and on the Arab level they were as follows: 392, 412, 420 respectively. At the international level the performance averages they were: 496, 478, 455 respectively, and all of which were higher than the similar Arab and Jordanian averages. The relationship between achievement in Math and the variable students' lack of previous knowledge and skills necessary for acquiring new ones and achievement in Math at the Jordanian, Arab and

international levels were an inverse (negative) relationship, while on Jordanian the level the relationship was curvilinear but not linear.

Table No. (80)
Students' Lack of Previous Knowledge and Skills   **Necessary**
for Acquiring New Learning Experiences and Achievement in Math

No.	Country	Do not lack of previous knowledge		lack of previous knowledge to some extent		Lack of previous knowledge to great extent	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average
1.	Lebanon	28	461	57	446	15	440
2.	Qatar	18	431	62	411	20	385
3.	UAE	14	472	72	457	15	430
4.	Morocco	11	399	38	385	51	355
5.	Saudi Arabia	10	405	57	401	33	383
6.	Bahrain	8	435	55	415	37	397
7.	Syria	8	395	60	382	32	369
8.	Oman	6	372	49	379	45	351
9.	Jordan	6	428	48	413	46	395
10.	Tunisia	5	419	54	431	40	417
11.	Palestine	5	400	43	417	53	395
12	Dubai/UAE	19	503	66	476	15	445
13	Abu Dubai/UAE	10	466	75	452	15	427
Arab Average		11	420	54	412	35	392
International Average		15	490	57	471	28	443

- **Students' Interruption or Lack of Interest during Classes**

According to these variables students were distributed into two categories: ("*few interruptions*", "*many interruptions*") and ("*Lack of interest to some extent*", "*Lack of interest to great extent*"). Table (81) shows the distribution of students' percentage by the categories of these variables on one hand, and the achievement in science on the other hand. Jordan's percentages on the categories of students' interruption variable and lack of interest variable were as follows : (70%, 30%) and (64%, 36%) respectively. On the Arab level, students'

interruption variable and lack of interest variable were as follows: (78%, 22%) and (71%, 29%) respectively. on the international level, the percentages were as follows: (83%, 17%) and (795, 21%) respectively. Jordanian students' performance averages in Science were as follows: (459, 425), (460. 429) respectively, and on the Arab level, they were (431, 415) and (435 409) respectively. On the international level, they were (481 462) for the students' interruption variable categories. The Jordanian performance averages were as follows: (76%, 24%) for the students' interruption variable categories and (64%, 36%) for the lack of interest variable categories. On the Arab level, the percentages were as follows: (79%, 21%) for the students' interruption variable and (66% 34%) for the lack of interest variable. On the international level, the percentages were (83%, 17%) for the students' interruption variable and (76%, 24%) the lack of interest variable.

Table (81)
Limited Teaching because of Students'   Interruption or Lack of Interest and Achievement in Science

No.	Country	Student's Interruptions				Lack of Interest			
		Few Interruptions		Many Interruptions		Lack of interest to some extent		Lack of interest to great extent	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average
1.	Bahrain	79	459	21	433	73	465	27	423
2.	Jordan	70	459	30	425	64	460	36	429
3.	Lebanon	84	407	16	403	84	408	16	394
4.	Morocco	73	376	27	377	53	384	47	368
5.	Oman	82	424	18	398	62	431	38	401
6.	Palestine	67	424	33	413	59	423	41	417
7.	Qatar	85	426	15	372	79	430	21	375
8.	Saudi Arabia	83	438	17	431	81	441	19	416
9.	Syria	76	428	24	421	67	433	33	412
10.	Tunisia	74	439	26	437	74	442	26	429
11.	UAE	84	464	16	450	80	468	20	438
	Abu Dubai/UAE	79	466	21	443	74	466	26	446
	Dubai/UAE	85	488	15	441	84	490	16	431
Arab Average		78	431	22	415	71	435	29	409
International Average		83	481	17	462	79	482	21	456

Jordanian students' performance average in Math by the students' interruption variable categories were (406, 405) respectively, and (414.391) by the lack of interest variable categories. On the Arab level, the averages were as follows: (410, 390) and (414, 414) respectively. At the international level the averages were as follows: (472, 444) and (475, 441) respectively. All these averages were higher than the similar Arab and international averages in math and science. Jordan's averages in science were higher than the Arab averages while in Math these averages were relatively the same. The relationship between achievement in Math or Science and these two was negative on the Jordanian, Arab and international levels.

Table (80)

Limited Teaching because of Students'   Interruption
or Lack of Interest and Achievement in Math

No.	Country	Student's Interruptions				Lack of Interest			
		Few Interruptions		Many Interruptions		Lack of interest to some extent		Lack of interest to great extent	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average
1.	Bahrain	76	420	24	377	62	424	38	387
2.	**Jordan**	**76**	**406**	**24**	**405**	**64**	**414**	**36**	**391**
3.	Lebanon	90	449	10	453	85	451	15	445
4.	Morocco	79	374	21	362	49	383	51	360
5.	Oman	86	370	14	340	59	376	41	351
6.	Palestine	61	406	39	402	55	403	45	406
7.	Qatar	78	420	22	368	76	425	24	359
8.	Saudi Arabia	82	401	18	370	74	400	26	383
9.	Syria	73	384	27	361	61	388	39	363
10.	Tunisia	75	425	25	425	59	429	41	419
11.	UAE	90	459	10	424	85	461	15	423
	Abu Dubai/UAE	89	452	11	428	82	453	18	435
	Dubai/UAE	93	481	7	424	92	482	8	417
Arab Average		**79**	**410**	**21**	**390**	**66**	**414**	**34**	**390**
International Average		**83**	**472**	**17**	**444**	**76**	**475**	**24**	**441**

- **Students' Suffering from Lack of Nutrition or Lack of Sleep**

Students were distributed by the lack of nutrition variable into two categories: ("*Don't suffer from lack of nutrition*" and "*Suffer from lack of nutrition at a moderate or high level*"). Both categories were titled in table (83) and in table (84) with "*never*", "*some or much*". Regarding the Lack of Sleep variable, they were distributed into two categories: ("*Do not suffer from lack of Sleep*" and " *Suffer from lack of Sleep at a moderate or high level* ").

Table (83) shows the distribution of students' percentage by the categories of the students' suffering from lack of nutrition or lack of sleep variables and the achievement in science. Jordan's percentages were as follows: (30%, 70%), (42%, 58%) respectively. On the Arab level the percentages were as follows: (45%, 55%) and (37%, 63%), and on the international level they were as follows: (64%, 36%) and (42%, 58) respectively.

Jordanian students' performance average in science according to the categories of these variables were as follows: (451,448) and (451, 448) respectively while on the Arab and international levels these averages were: (436, 421), (424, 435), (485, 461) and (484, 473) respectively.

Table (83)

Limited Teaching in Science because of   Students'
Suffering from Lack of Nutrition or Lack of Sleep

No.	Country	Nutrition				Sleep			
		Don't suffer from lack of nutrition		Suffer from lack of nutrition		Do not suffer from lack of Sleep		Suffer from lack of Sleep	
		Students' Percentage %	Performance Average	% Students' Percentage	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average
12.	Bahrain	53	469	47	436	31	473	69	445
13.	Jordan	**30**	**451**	**70**	**448**	**42**	**451**	**58**	**448**
14.	Lebanon	65	402	35	413	36	402	64	407
15.	Morocco	30	394	70	370	38	379	62	375
16.	Oman	38	424	62	417	47	424	53	416
17.	Palestine	24	436	76	416	27	415	73	423
18.	Qatar	52	439	48	395	34	452	66	401
19.	Saudi Arabia	39	436	61	437	23	439	77	436
20.	Syria	44	428	56	425	48	429	52	424
21.	Tunisia	56	446	44	429	44	439	56	439
22.	UAE	61	475	39	442	40	477	60	452
	Abu Dubai/UAE	60	469	40	452	39	469	61	456
	Dubai/UAE	64	506	36	434	47	503	53	461
Arab Average		**45**	**436**	**55**	**421**	**37**	**435**	**63**	**424**
International Average		**64**	**485**	**36**	**461**	**42**	**484**	**58**	**473**

Table (84) shows the percentage of students by the categories' variables of lack of nutrition and lack of sleep and by the achievement in Math. Jordan's percentages of the two variables were as follows: (27%, 73%) and (40%, 60%) respectively. At the Arab level, these percentages were as follows: (43%, 57%) and (40%, 60%) respectively. At the international level they were: (63%, 37%), (43%, 57%) respectively. The performance averages of Jordanian students' in Math by the categories of these two variables were as follows: (417,402) and (409, 404) respectively. At the Arab level the averages were as follows: (420, 396) and (415, 400) respectively. At the international level, they were as follows: (477, 449) and (477, 461) respectively. The international averages were higher than the similar Jordanian and Arab averages. in addition, international averages in science were the highest, and the Jordanian averages were higher than the Arab averages in science but these averages were nearly the same in Math.

It is worth mentioning that there is negative relationship between the lack of nutrition and the lack of Sleep variables on one hand and students' achievement on the other hand in Math and science at the Jordanian, the Arab and the international levels.

Table (84)
Limited Teaching in Math because of   **Students'**
Suffering from Lack of Nutrition or Lack of Sleep

No.	Country	Nutrition				Sleep			
		Don't suffer from lack of nutrition		Suffer from lack of nutrition		Do not suffer from lack of Sleep		Suffer from lack of Sleep	
		Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average
1.	Bahrain	47	437	53	386	33	439	67	396
2.	Jordan	27	417	73	402	40	409	60	404
3.	Lebanon	66	450	34	446	53	453	47	446
4.	Morocco	32	392	68	361	37	376	63	369
5.	Oman	36	382	64	357	56	375	44	354
6.	Palestine	19	422	81	400	18	408	82	403
7.	Qatar	56	431	44	382	39	426	61	398
8.	Saudi Arabia	37	403	63	391	28	400	72	393
9.	Syria	48	381	52	377	48	385	52	373
10.	Tunisia	51	437	49	412	46	425	54	425
11.	UAE	50	472	50	439	38	474	62	444
	Abu Dubai/UAE	43	465	57	439	31	466	69	444
	Dubai/UAE	63	498	37	440	51	494	49	458
Arab Average		43	420	57	396	40	415	60	400
International Average		63	477	37	449	43	477	57	461

Selected characteristics of teachers

• **Teachers' qualifications**

Table (85) shows the science teachers' qualifications in the Arab countries who participated in the study and averages of these qualifications' at the Arab and international levels. In Jordan, the percentage of students who receive education on science from teachers holding Master's degree or a higher degree was 12%, and the percentage of students who receive education on science from teachers holding the Bachelor's degree (BA) was 83%. In addition, 4% of students receive education on science from teachers holding diploma from community colleges, and 1% of students are being educated by science teachers who hold only the high school or secondary certificate. At the Arab level, the percentages were: 13% for the Master's degree or higher, 75% for the BA, 6% for the Community College Diploma and 6% for High School (General Secondary Certificate). At the international level the percentages were: 27%, 63%, 8% and 2% respectively.

Table (85)
Science Teachers' Qualifications

No.	Country	Master Degree and higher degrees	Bachelor degree	Diploma	General Secondary Certificate
1.	Bahrain	27	71	2	0
2.	Jordan	12	83	4	1
3.	Lebanon	9	83	6	2
4.	Morocco	4	39	0	57
5.	Oman	7	93	0	0
6.	Palestine	11	83	6	0
7.	Qatar	35	61	0	3
8.	Saudi Arabia	3	94	3	0
9.	Syria	1	65	32	2
10.	Tunisia	1	83	16	0
11.	UAE	28	71	1	0
	Abu Dubai/UAE	20	79	1	0
	Dubai/UAE	41	58	1	0
Arab Average		**13**	**75**	**6**	**6**
International Average		**27**	**63**	**8**	**2**

Table (86) shows the math teachers' qualifications in the participating Arab countries and the averages of these qualifications' at the Arab and international levels. In Jordan, the percentage of students who receive education on math from teachers who hold the Master's degree or a higher degree was 12%, and the percentage of students who receive education on math from teachers who hold the Bachelor's degree (BA) was 75%. Also, 12% of students receive education on math from teachers holding a community colleges diploma , and 1% of students are being educated by Math teachers who hold only the high school or secondary certificate. At the Arab level the percentages were: 11%, 70%, 11% and 8% respectively. At the international level the percentages were: 24%, 63%, 11% and 3% respectively.

Table (86)
Math Teachers' Qualifications

No.	Country	Master Degree and higher degrees	Bachelor degree	Diploma	General Secondary Certificate
1.	Bahrain	23	74	2	2
2.	Jordan	**12**	**75**	**12**	**1**
3.	Lebanon	4	72	18	7
4.	Morocco	1	19	0	80
5.	Oman	5	95	0	0
6.	Palestine	4	85	11	0
7.	Qatar	29	68	2	0
8.	Saudi Arabia	1	95	4	0
9.	Syria	13	45	41	1
10.	Tunisia	1	73	25	1
11.	UAE	26	70	4	0
	Abu Dubai/UAE	21	74	5	0
	Dubai/UAE	36	58	5	0
Arab Average		**11**	**70**	**11**	**8**
International Average		**24**	**63**	**11**	**3**

- **Teacher's Major specialization**

Table (87) shows the Science teachers' major specialization as well as the averages of percentages at the Arab and the international levels by the teacher's major specialization. The percentage of Jordanian students who receive education on science from teachers whose major specialization was science in addition to a higher education Diploma was 8%, and the performance average of the students' was 445. The percentage of students who receive education on science from teachers whose major specialization was science and hold Community College Diploma from a was 19% and the average of their achievement was 446.

Percentage of students who receive education on science from teachers whose major specialization was only Science was 9% and the average of their achievement was 448. 3% of students receive education on science from teachers majoring in other different specialties and their achievement was 473. 1% of students learn Science by teachers who hold only the high school or secondary certificate.

At the Arab level, the percentages were: 21%, 8%, 63%, 2% and 6% respectively and students' performance averages were: 434,438,426,421 and 423 respectively. At the international level, the percentages were: 28%, 11%, 51%, 8% and 2% respectively. Matching performance averages (excluding the last average) were: 480,470,478 and 476. The performance averages reveal that at the international level, the best and ideal major for science teachers was science specialization, in addition to a high diploma. However, this did not appear at the Jordanian and Arab levels.

Table (87)
Major Specialization of Science Teachers

No.	Country	Science + Education		Science + Community College Diploma		Science only		Other majors		Second Secondary certificate	
		Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average
1.	**Bahrain**	36	465	9	461	52	443	2	~	0	~
2.	**Jordan**	**8**	**445**	**19**	**446**	**69**	**448**	**3**	**473**	**1**	**~**
3.	Lebanon	32	415	4	408	59	403	4	392	2	~
4.	**Morocco**	**7**	**374**	**0**	**~**	**37**	**376**	**0**	**~**	**56**	**377**
5.	Oman	36	424	3	472	60	417	0	~	0	~
6.	**Palestine**	11	427	20	403	65	429	4	399	0	~
7.	Qatar	25	438	3	421	67	414	2	~	3	468
8.	**Saudi Arabia**	27	443	11	462	61	428	1	~	0	~
9.	Syria	16	423	3	431	73	425	5	419	2	~
10.	**Tunisia**	9	439	0	~	90	437	2	~	0	~
11.	UAE	24	477	12	437	62	461	2	~	0	~
	Abu Dubai/UAE	22	464	13	435	63	463	3	467	0	~
	Dubai/UAE	34	507	7	413	54	475	5	443	0	~
Arab Average		**21**	**434**	**8**	**438**	**63**	**426**	**2**	**421**	**6**	**423**
International Average		**28**	**480**	**11**	**470**	**51**	**478**	**8**	**476**	**2**	**~**

Table (88) shows the Math teachers' major specialization as well as the averages of percentages at the Arab and the international levels by the teachers' major specialization. The percentage of Jordanian students who receive education on math from teachers whose major specialization was Math in addition to a higher education Diploma was 9% and the performance average of these students was 424. The percentage of students who receive education on math from teachers whose major specialization was Math and hold a community college Diploma was 9% and the performance average of the students was 407. The percentage of students who receive education on math from teachers whose major specialization was only math was 80% and the performance average of the students was 404. 3% of students receive education on math from teachers majoring in other different specialties and 1% of students receive education on math by teachers who hold only general secondary certificate. At the Arab level, the percentages were as follows: 25%, 13%, 50%, 4% and 8% respectively and students' performance averages were as follows: 411,402,406,418 and 406 respectively. At the international level, the percentages were as follows: 32%, 12%, 41%, 12% and 3% respectively and the students' performance averages were: 471, 470, 468, 462 and 418. The performance averages indicate that the Jordanian and Arab levels were below the international level. The math percentages indicate the importance of the educational qualification besides the major specialization, as students who receive their education on math from teachers whose major specializations are math and education diploma are better with statistical significance than students who receive their education on math from teachers whose major specialization is math only.

Regarding science, the situation was not that clear as the averages of students' performance do no vary according to their teachers' majors or specialties. This indicates that there is weakness in the provision of teachers' qualification programs for science teachers.

Table (88)
Major Specialization of Math Teachers

No.	Country	Math + Education		Math + Community Diploma		Math only		Other majors		Second Secondary certificate	
		Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average	Students' Percentage %	Performance Average
1.	Bahrain	18	458	30	389	48	404	2	~	2	~
2.	Jordan	9	424	9	407	80	404	2	~	1	~
3.	Lebanon	43	448	2	~	37	452	11	454	7	439
4.	Morocco	5	373	0	~	12	360	3	365	80	373
5.	Oman	48	363	12	366	39	370	1	~	0	~

6.	Palestine	17	399	24	394	52	409	7	421	0	~
7.	Qatar	35	387	13	414	46	422	6	431	0	~
8.	Saudi Arabia	31	399	38	397	30	394	2	~	0	~
9.	Syria	17	379	2	~	71	380	8	361	1	~
10.	Tunisia	17	428	1	~	78	422	3	433	1	~
11.	UAE	37	467	7	449	53	448	3	464	0	~
	Abu Dubai/UAE	32	455	9	451	57	448	2	~	0	~
	Dubai/UAE	48	490	3	449	47	463	3	494	0	~
Arab Average		**25**	**411**	**13**	**402**	**50**	**406**	**4**	**418**	**8**	**406**
International Average		**32**	**471**	**12**	**470**	**41**	**468**	**12**	**462**	**3**	**418**

- **Teacher's Years of Experience**

Table (89) shows the categories for science teacher's years of experience, as well as the averages of those years for the teachers in the participating Arab countries and the international average of science teacher's years of experience.

The percentage of Jordanian students taught by teachers having 20 years of experience or above was 7%, while the percentage of Jordanian students who received education from teachers with 10 years of experience or less than 20 years was 22%. However, the percentage of those taught by teachers with 5 years of experience or less than 10 was 33%, but the percentage was 38% for Jordanian students taught by science teachers with years of experience less than 5. It is worth noting that the average of years of experience for science teachers in Jordan is mainly 8 years. The performance averages in science for Jordanian students taught by teachers by the years of experience, as mentioned before, were 453, 469, 449, 436. This indicates that the highest performance average for Jordanian students refers to the students taught by teachers having 10 years of experience and less than 20.

With reference to the Arab countries, the percentages were as follows: 19%, 34%, 25%, 22% respectively, while the performance averages of Arab students were 431 ‹433 ‹428‹ 419 respectively. At the international level, the performance averages of students were 480 ‹480 ‹ 475 ‹471 respectively. It should be noted that the years of experience average for the Jordanian science teachers is less than that of science teachers in the Arab countries, and the years of experience averages for the Jordanian teachers and for the Arabs teachers are lower than that of the International average.

Table 89
Years of Experience for Science Teachers

Country		20 years and above		10 years and less than 20		5 years and less than 10		Less than 5 years		Years of Experience Average
		Students percentage %	Performance Average	Students percentage %	Performance Average	Students percentage %	Performance Average	Students percentage %	Performance Average	
1	Bahrain	27	461	47	436	18	479	7	473	15
2	Jordan	**7**	**453**	**22**	**469**	**33**	**449**	**38**	**436**	**8**
3	Lebanon	18	418	26	420	29	390	27	405	11
4	Morocco	53	378	28	377	9	378	11	370	19
5	Oman	5	416	26	432	34	416	36	419	7

#	Country									
6	Palestine	14	413	40	437	26	427	20	384	11
7	Qatar	17	422	31	427	32	417	20	397	11
8	Saudi Arabia	9	446	53	443	20	427	19	424	12
9	Syria	13	431	21	428	23	437	43	421	9
10	Tunisia	30	453	38	437	28	425	3	415	15
11	United Arab Emirates	17	451	42	462	24	467	17	465	12
	Abu Dhabi /UAE	21	447	42	464	27	459	10	465	13
	Dubai /UAE	13	481	39	489	27	477	21	472	11
	Arab average	**19**	**431**	**34**	**433**	**25**	**428**	**22**	**419**	
	International average	**33**	**480**	**29**	**480**	**19**	**475**	**20**	**471**	**15**

Table (90) shows the categories of the math teacher's years of experience and shows the averages of those years for teachers of the participating Arab countries. The percentage of Jordanian students taught by teachers of math having 20 years of experience or above was 16% while students who received education from teachers with 10 years of experience or less than 20 years was 29%. However, the percentage of students taught by teachers with 5 years of experience or less than 10 was 29%, while the percentage of Jordanian students taught by math teachers with years of experience less than 5 was 26%.

It is worth noting that the years of experience average for math teachers in Jordan is 11 years. The Performance averages in science of Jordanian students taught by teachers by the years of experience were 406 ‹410 ‹394 ‹413 respectively. It is obvious that the highest average in performance refers to students taught by teachers having less than 5 years of experience.

With reference to the Arab countries, the percentages were as follows: 19%, 24%, 33%, 24% while the performance averages in math were 400 ‹401 ‹410, 413 respectively, and the performance averages were 458, 463, 470 ‹474 at the international level respectively. It should be noted that the years of experience average for math teachers in Jordan is less than that of the Arab countries as well as that of the international level. It is apparent that there is a positive relation between the variables of the years of experience in teaching math and students' achievement at both the Arab level and the international level while this relation did not appear at the Jordanian level.

Table(90)
Years of Experience for Math Teachers

Country	20 years and above		10 years and less than 20		5 years and less than 10		Less than 5 years		Years of Experience Average
	Students percentage %	Performance Average	Students percentage %	Performance Average	Students percentage %	Performance Average	Students percentage %	Performance Average	
1 Bahrain	19	433	54	404	17	403	10	430	14
2 Jordan	**16**	**406**	**29**	**410**	**29**	**394**	**26**	**413**	**11**
3 Lebanon	27	454	32	445	21	460	20	445	14
4 Morocco	69	374	11	373	5	358	15	363	22
5 Oman	7	362	25	385	46	363	21	360	9
6 Palestine	14	413	37	410	24	400	25	394	11
7 Qatar	23	432	36	425	25	388	16	386	13
8 Saudi Arabia	13	386	41	406	25	402	21	367	11
9 Syria	16	400	26	375	24	370	35	378	10
10 Tunisia	38	442	35	419	18	417	10	394	16
11 United Arab	24	442	36	455	26	461	14	467	13
Abu Dhabi	25	456	30	433	29	456	16	463	14
Dubai /UAE	19	443	42	491	25	488	13	471	13
average for Arab States	24	413	33	410	24	401	19	400	13
average for International	36	474	28	470	19	463	18	458	16

- **Teacher's Teaching Ability**

Table (91) shows the distribution of students' percentages by their teachers confidence in their ability to teach science as they are divided into two main categories: (highly confident and slightly confident). The percentage of students taught by science teachers having high confidence in their ability to teach this subject was 63%, and was 37% for students taught by science teachers having slight confidence. The performance average for Jordanian students in science by the variable of the science teachers' confidence in teaching science) was (446,451) respectively. Regarding the Arab level , the percentages were (74%, 26%) respectively and the performance averages were 418,430 respectively. At the international level, the percentages were (73%, 27%) respectively and the performance average were 467,479 respectively.

Table (91)
Science Teachers' Confidence in their Ability to Teach Science

Country	*Highly Confident		Slightly Confident	
	Students percentage	Performance Average	Students percentage	Performance Average

---

*See the definitions of the measurement categories in appendix (5)

		%		%	
1	United Arab Emirates	87	464	13	449
2	Qatar	86	426	14	372
3	Lebanon	83	411	17	378
4	Oman	83	420	17	417
5	Saudi Arabia	76	439	24	429
6	Tunisia	74	440	26	434
7	Bahrain	71	458	29	442
8	Palestine	68	421	32	419
9	Syria	65	421	35	435
10	Jordan	63	451	37	446
11	Morocco	60	379	40	372
	Dubai /UAE	92	487	8	405
	Abu Dhabi /UAE	86	462	14	458
	average for Arab States	74	430	26	418
	average for International States	73	479	27	467

Table (90) shows students' percentages by their teachers' confidence in their ability to teach math. The percentage of Jordanian students taught by math teachers having high confidence in their ability to teach math was 66% ,yet it was 34% for students who were taught by math teachers having slight confidence in their teaching ability. The performance averages for Jordanian students in math by the variable of the teachers' confidence to teach math (highly confident and slightly confident) were (401,408) respectively. Regarding the Arab level, the percentages were 73% and 27% respectively, and 76%, 24% at the international level respectively. The performance average were (490,411) at the Arab level respectively, and (456, 470) at the international level respectively. It is worth mentioning that there is a positive relation at the Jordanian, Arab and International levels between the level of teachers' confidence in their ability to teach both science and math and the students' achievement.

Table (92)
Math Teachers' Confidence in their Ability to Teach Science

Country		*Highly Confident		Slightly Confident	
		Students' percentage %	Performance average	Students' percentage %	Performance average
1	United Arab Emirates	85	419	15	358
2	Qatar	81	463	19	423
3	Lebanon	81	370	19	349
4	Oman	80	455	20	433
5	Saudi Arabia	73	402	27	376
6	Tunisia	73	421	27	388
7	Bahrain	69	409	31	394
8	Palestine	67	380	33	376
9	Syria	66	375	34	365
10	Jordan	**66**	**408**	**34**	**401**
11	Morocco	61	422	39	428
	Dubai /UAE	86	486	14	414
	Abu Dhabi /UAE	77	458	23	422
	Arab average	**73**	**411**	**27**	**390**
	International average	**76**	**470**	**24**	**456**

- **Teacher's Job Satisfaction**

This variable divides teachers into three categories: satisfied, fairly satisfied and dissatisfied by the level of teachers' satisfaction with their jobs as teachers.

Table (93) shows the distribution of students' percentages by the level of satisfaction at their science teachers with their jobs and at the Arab and international levels as well. The percentage of Jordanian students taught by science teachers being satisfied with their jobs was 28%, and 51% for students who were taught by teachers who are fairly satisfied, and was 21% for Jordanian students taught by teachers who were dissatisfied with their jobs.

The performance averages for Jordanian students in science were (425, 451, 463) respectively. For the percentages at the Arab countries level, they were 48%,42%,10% respectively and their performance averages were (434,424,414) respectively. Regarding the international level, the percentages were 47%, 45%, 8% respectively and the performance averages were 474,481,473 respectively.

---

* See the definitions of the measurement categories in appendix (5)

Table(93)
Job Satisfaction for Science Teachers

Country		*Satisfied		Fairly Satisfied		Dissatisfied	
		Students percentage %	Performance Average	Students percentage %	Performance Average	Students percentage %	Performance Average
1	Syria	62	426	35	427	4	414
2	Qatar	57	429	38	403	5	421
3	Saudi Arabia	56	442	39	427	6	442
4	United Arab Emirates	56	465	38	457	7	459
5	Bahrain	52	469	30	442	18	424
6	Palestine	50	423	41	418	9	417
7	Tunisia	49	438	46	441	5	420
8	Lebanon	43	416	50	405	7	350
9	Morocco	39	380	49	374	12	377
10	Oman	37	423	50	421	14	408
11	**Jordan**	**28**	**463**	**51**	**451**	**21**	**425**
	Abu Dhabi /UAE	61	460	33	456	7	485
	Dubai /UAE	58	487	36	476	6	419
	Arab average	**48**	**434**	**42**	**424**	**10**	**414**
	International average	**47**	**481**	**45**	**474**	**8**	**473**

Table (94) shows the distribution of students' percentages by the level of satisfaction at their science teachers with their jobs. The percentage of Jordanian students taught by teachers being satisfied with their jobs was 31%, and was 52% for students taught by math teachers being fairly satisfied, and was 81% for Jordanian students taught by teachers dissatisfied with their jobs.

The Performance average for Jordanian students in math were (415,403, 399) respectively. At the Arab level, they were (8%, 46%, 46%) respectively, and the similar performance averages were (414, 400, 396) respectively. Regarding the international level, the percentages were (47%, 45%, 7%) respectively, and the performance averages were (473, 464, 462) respectively.

It is noted that the there is a positive correlation between the teacher's level of satisfaction and students' performance at the Jordanian, Arab and International levels for science and math, noting that the Arab and Jordanian averages are lower than the similar international level.

---

* See the definitions of the measurement categories in appendix (5)

Table (94)
Job Satisfaction for Math Teachers

Country	*Satisfied		Fairly Satisfied		Dissatisfied	
	Students percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average
1 Qatar	66	421	31	387	3	395
2 Syria	62	382	35	370	3	402
3 United Arab Emirates	58	462	39	448	4	424
4 Saudi Arabia	54	401	37	394	9	363
5 Tunisia	48	426	47	423	5	432
6 Palestine	41	403	54	404	5	414
7 Bahrain	41	437	46	392	13	386
8 Oman	36	383	52	363	12	326
9 Morocco	36	381	49	365	15	368
10 Lebanon	34	448	61	453	6	427
11 Jordan	**31**	**415**	**52**	**403**	**18**	**399**
Dubai /UAE	65	483	32	469	3	392
Abu Dhabi /UAE	51	454	44	447	5	434
Arab average	**46**	**414**	**46**	**400**	**8**	**396**
International average	**47**	**473**	**45**	**464**	**7**	**462**

- **Teacher's Working Conditions**

This study derived a variable to measure the teacher's working conditions. Based on that, three categories of students were realized. The first one refers to students taught by teachers who have no problems in their job environment, the second category represents students who were taught by teachers with slight job problems and the last group belonged to students who received education on science by teachers with mild problems in their job environment.
Table (95) shows the percentages of students by the teacher's job environment and students' performance averages in science.

The percentage of Jordanian students taught by teachers having no problems in their job environment was 17%, and was 37 for students taught by teachers having slight problems, and was 46% for those taught by teachers having mild problems in their jobs. Jordanian students' performance average related to this particular variable following the aforementioned sequence (**No Problems, Slight Problems, Mild Problems)** were (484, 453, 432 respectively. On the other

---

*See the definitions of the measurement categories in appendix (5)

hand, the percentages for the same variable at the Arab level were 20%, 44%, 36% respectively and the similar performance averages were 448, 427, 420 respectively. Nevertheless, the percentages at the international level were 20%, 48%, 32% respectively, and the similar performance averages were 489, 477, 473 respectively.

Table (95)
Teacher Working Conditions and Achievement in Science

Country	*No Problems		Slight Problems		Mild Problems	
	Students Percentage %	Performance Average	Students percentage %	Performance Average	Students Percentage %	Performance Average
1 Qatar	51	420	34	408	16	435
2 Lebanon	37	427	45	399	19	383
3 United Arab Emirates	36	467	44	457	19	460
4 Bahrain	25	495	37	451	38	427
5 Saudi Arabia	20	448	48	437	32	428
6 Jordan	**17**	**484**	**37**	**453**	**46**	**432**
7 Palestine	12	437	49	422	39	413
8 Syria	12	423	45	428	42	425
9 Tunisia	11	442	47	439	42	437
10 Oman	9	439	34	431	57	410
11 Morocco	7	443	25	374	68	371
Dubai /UAE	45	501	43	464	12	450
Abu Dhabi /UAE	29	463	52	456	19	467
Arab average	**22**	**448**	**40**	**427**	**38**	**420**
International average	**20**	**489**	**48**	**477**	**32**	**473**

Table (96) shows the percentages of students by the teacher's job environment variable and the students' performance averages in math.

The percentage of Jordanian students taught by teachers having no problems in their job environment was 14%, and was 41% for students taught by teachers having slight problems, and 45% for those taught by teachers having mild problems in their jobs. The performance averages for Jordanian students by this variable following the aforementioned sequence (No Problems, Slight Problems, Mild Problems**)** were 419,412,396 respectively.

On the other hand, the percentages for the same variable at the Arab level were 20%,44%,36% respectively, and their performance averages were 399, 405, 430 respectively. Nevertheless, the percentages at the international level were 21%, 49%, 31% and the equivalent performance averages were 476,467,464 respectively.

---

*
See the definitions of the measurement categories in appendix (5)

The students' performance averages in science and math at the Jordanian and Arab levels are lower than those at the international level. Moreover, there is a negative relation between students' performance and their teachers' problems in their job environment in math and science both subjects at the Jordanian, Arab and International levels.

Table (96)
Teacher's Working Conditions and Students' Achievement in Math

Country	*No Problems		Slight Problems		Mild Problems	
	Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average
1 Qatar	47	410	41	408	11	409
2 United Arab Emirates	36	470	44	445	20	450
3 Lebanon	33	470	53	440	14	439
4 Bahrain	25	460	44	392	31	396
5 Saudi Arabia	**14**	**419**	**41**	**412**	**45**	**396**
6 Jordan	13	416	49	425	38	427
7 Palestine	13	430	51	391	36	388
8 Syria	13	366	41	389	47	374
9 Tunisia	10	399	51	413	39	394
10 Oman	9	396	38	372	53	356
11 Morocco	4	490	34	372	62	362
Dubai /UAE	46	495	43	466	11	438
Abu Dhabi /UAE	36	459	43	441	21	452
Arab average	**20**	**430**	**44**	**405**	**36**	**399**
International average	**21**	**479**	**49**	**467**	**31**	**464**

- **School Safety and System**

Table (97) shows the distribution of students' percentages by the school safety and system and this variable was divided into three categories: safe and organized, fairly safe and organized and unsafe and disorganized. The percentage of Jordanian students by this variable were 36%, 53%, 11% respectively, and the performance average in science were 466, 446, 406 respectively. Regarding the Arab level, students' percentages were 45%, 48%, 6% respectively, and the similar performance averages were 441, 420, 385 respectively. Regarding the international level, the percentages were 45%, 50%, 6% respectively and their performance averages were 488, 470, 457 respectively.

---

* See the definitions of the measurement categories in appendix (5)

Table (97)
School Safety and System and Students
Achievement in Science from the Teacher's Perspective

Country		*Safe and Organized		Slightly Safe and Organized		Unsafe and Disorganized	
		Students percentage %	Performance Average	Students percentage %	Performance Average	Students percentage %	Performance Average
1	United Arab Emirates	64	469	34	448	2	~
2	Qatar	63	430	35	398	2	~
3	Syria	60	428	37	424	3	425
4	Lebanon	49	426	46	393	5	338
5	Saudi Arabia	49	443	48	433	3	391
6	Oman	44	432	52	415	3	350
7	Bahrain	42	490	56	428	2	~
8	Palestine	37	423	57	422	5	370
9	Jordan	**36**	**466**	**53**	**446**	**11**	**406**
10	Morocco	31	392	54	371	15	367
11	Tunisia	22	447	59	437	18	435
	Dubai /UAE	75	495	24	431	1	~
	Abu Dhabi /UAE	57	464	40	456	3	442
	Arab average	**45**	**441**	**48**	**420**	**6**	**385**
	International average	**45**	**488**	**50**	**470**	**6**	**457**

Table (98) shows the distribution of students' percentages by school safety and system from the teacher's point of view and the students' performance averages in math. The percentage of Jordanian students by this variable were 36%, 59%, 5% respectively and the performance average in math were 418, 403, 355 respectively. At the Arab level, students' percentages were 45%,48% ,7% respectively while their performance averages were 419, 402, 382 respectively. At the international level, the percentages were 45%, 49%, 6% and the performance averages were 479,458,445 respectively. The performance averages by the school safety and system at the Jordanian and the Arab levels were lower than those at the international level. It is noted here that there is a positive relation between the school safety and system variable and the average performance in science and math at the Jordanian, Arab and international levels.

---

* See the definitions of the measurement categories in appendix (5)

Table (98)
School Safety and system and Students'
Achievement in Math from the Math Teacher's Perspective

Country		*Safe and Organized		Fairly Safe and Organized		Unsafe and Disorganized	
		Students percentage %	Performance average	Students percentage %	Performance Average	Students Percentage %	Performance Average
1	Qatar	68	421	29	384	3	396
2	United Arab Emirates	68	465	31	435	1	~
3	Syria	60	386	38	366	2	~
4	Saudi Arabia	51	405	46	386	2	~
5	Bahrain	49	429	47	396	4	345
6	Lebanon	39	466	53	443	8	411
7	Oman	36	403	54	407	10	385
8	Palestine	36	403	54	407	10	385
9	Jordan	**36**	**418**	**59**	**403**	**5**	**355**
10	Morocco	26	399	59	364	16	355
11	Tunisia	22	419	61	427	17	424
	Dubai /UAE	80	483	18	453	2	~
	Abu Dhabi /UAE	62	457	38	439	0	~
	Arab average	**45**	**419**	**48**	**402**	**7**	**382**
	International average	**45**	**479**	**49**	**458**	**6**	**445**

- **School Focus on Achievement from the Teacher's Perspectives**

Table (99) shows the distribution of students' percentages by the extent of the school's focus on achievement from the teacher's point of view. This particular variable is classified into three categories: the school focuses very highly on achievement, the school focuses highly on achievement, and the school moderately focuses on achievement. According to these categories, the percentages of Jordanian students were 4%, 54%, 42% while the performance averages of students in science were 463, 458, 436 respectively. However, these percentages were 6%, 47%, 46% and the performance averages in science were 467, 438, 410 at the Arab level. At the international level, the percentages were 5%, 50%, 46% and the performance averages in science were 504, 487, 463 respectively.

---

* See the definitions of the measurement categories in appendix (5)

Table (99)
School Focus on Achievement and
achievement in Science from the Science Teacher's Perspective

Country	*Very High Focus		High Focus		Moderate Focus	
	Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average
1 Qatar	16	431	58	432	26	380
2 United Arab Emirates	9	490	66	465	25	440
3 Saudi Arabia	9	468	52	443	39	420
4 Bahrain	9	548	47	460	44	428
5 Oman	7	454	53	440	40	388
6 Lebanon	5	455	50	429	45	374
7 Syria	4	429	46	436	50	417
8 Jordan	**4**	**463**	**54**	**458**	**42**	**436**
9 Palestine	2	~	52	423	46	417
10 Tunisia	2	~	24	438	74	436
11 Morocco	1	~	19	397	80	370
Dubai /UAE	14	508	68	488	18	423
Abu Dhabi /UAE	9	498	58	461	33	448
Arab average	**6**	**467**	**47**	**438**	**46**	**410**
International average	**5**	**504**	**50**	**487**	**46**	**463**

Table (100) shows the distribution of students' percentages by the extent the school focuses on achievement from teacher's point of view. This particular variable is classified into three categories: very highly, highly, and moderately. The percentages of Jordanian students were 5%, 50%, 45% respectively, while the averages performance of students in math were 447, 416,390 respectively. However, at the Arab level, these percentages were 6%, 47%, 46% respectively and their performance averages in math were 453, 417, 389 respectively. At the international level, the percentages were 5%, 48%, 47% and the performance averages in math were 506 ‹478 ‹452.

Regarding the Jordanian, Arab and international levels, there is a positive relation between the students' achievement and the level of school focus on achievement in math and science.

Table (100)

School focus on Achievement and   **Students'**

Achievement in Math from the Teacher's Perspective

	Country	*Very High Focus		High Focus		Moderate Focus	
		Students' percentage %	Performance average	Students' percentage %	Performance average	Students' percentage %	Performance average
1	Qatar	19	440	54	413	27	380
2	United Arab Emirates	11	500	62	457	26	430
3	Saudi Arabia	8	406	54	406	38	376
4	Bahrain	5	505	43	428	52	384
5	Oman	5	417	54	385	41	334
6	Jordan	**5**	**447**	**50**	**416**	**45**	**390**
7	Lebanon	4	496	53	465	43	427
8	Syria	3	409	45	386	52	371
9	Morocco	2	~	23	393	76	363
10	Palestine	1	~	51	406	47	403
11	Tunisia	0	~	24	437	76	421
	Dubai /UAE	15	499	54	444	30	434
	Abu Dhabi /UAE	11	533	66	479	23	436
	Arab average	**6**	**453**	**47**	**417**	**48**	**389**
	International average	**5**	**506**	**48**	**478**	**47**	**452**

▪ **Selected Features Derived from the Principal's Questionnaire**

● **Time Allocated to Teach Science**

Table (101) shows the time allocated to teach science throughout the scholastic year, and the time allocated for all other subjects. The total number of hours allocated for teaching all subjects in Jordan was 1041 hours while the Arab level exceeds this number by 15 hours. Nevertheless, the total number of hours allocated for teaching all subjects in Jordan exceeds the international level by 10 hours. Regarding the time allocated to teach science, the number of hours assigned to teach science annually was 134 hours which is higher than time allocated for teaching science at the Arab level by 8 hours, and less than the time allocated for teaching science at the international hours by 24 hours.

---

*See the definitions of the measurement categories in appendix (5)

Table No (101)
Total Time Allocated for Teaching and Teaching Science

	Country	Total Time Allocated for Teaching (Hours/ annually)	Number of Hours Allocated for Teaching Science (annually_
1	Oman	1044	161
2	Syria	811	150
3	Morocco	1303	144
4	Jordan	1041	134
5	Qatar	1054	131
6	Bahrain	1019	130
7	Saudi Arabia	1050	124
8	United Arab Emirates	1046	115
9	Palestine	918	107
10	Tunisia	1299	64
11	Lebanon	1028	–
	Dubai /UAE	1022	125
	Abu Dhabi /UAE	1045	111
	Arab average	**1056**	**126**
	International average	**1031**	**158**

Table (102) shows the time allocated to teach math throughout the scholastic and the time allocated for teaching all other subjects in Jordan for grade 8. Regarding the time allocated to teach math, the number of hours assigned to teach math annually was 130 hours which is lower than the time allocated for teaching math at the Arab level by 15 hours, and is less than the time allocated for teaching science at the international hours by 8 hours.

Table No (100)
Total Time Allocated to Teach Science

	Country	Total Time Allocated to Teach All Subjects Hours/annually	Number of Hours Allocated to teach Math annually
1	Lebanon	1028	178
2	Qatar	1054	162
3	Oman	1044	161
4	United Arab Emirates	1046	157
5	Morocco	1303	148
6	Bahrain	1019	142
7	Palestine	918	134
8	Saudi Arabia	1050	134
9	Tunisia	1299	131
10	Jordan	**1041**	**130**
11	Syria	811	118
	Dubai /UAE	1045	158
	Abu Dhabi /UAE	1022	155

	Arab average	1056	145
	International average	1031	138

- **School Location**

School location was defined in this study in terms of the number of population in the location of the school. Therefore, this variable was divided into three categories: school in an area inhibited by more than 10.0000 citizens, an area inhibited by 15001 to 100000 citizens, and an area inhibited by less than or equal to 15000 citizens. Table (103) shows the percentages of students by this variable and their performance in science. The percentage of Jordanian students were 26%,31%, 42% respectively, and their performance averages in science were 461, 454, 441 respectively. At the Arab level, the percentages were 29%, 31%, 40% respectively, and the performance averages were 443, 427, 419 respectively. At the international level, the percentages were 37%, 28%, 35% respectively and the performance averages of students' were 492, 473, 463 respectively.

Table (103)
School Location and Achievement in Science

Country	More than 100000		15001 to from 1000		15000 Fewer or equal to 1500	
	Students Percentage %	Performance Average	Students percentage %	Performance Average	Students percentage %	Performance Average
1 Bahrain	17	453	42	448	41	459
2 Jordan	**26**	**461**	**31**	**454**	**42**	**441**
3 Lebanon	21	434	37	399	42	393
4 Morocco	47	383	32	376	21	359
5 Oman	8	461	21	432	70	411
6 Palestine	22	422	35	412	43	426
7 Qatar	29	450	32	421	39	404
8 Saudi Arabia	57	444	18	437	24	416
9 Syria	26	432	26	423	47	424
10 Tunisia	16	451	44	443	39	428
11 United Arab Emirates	48	483	23	451	30	445
Abu Dhabi/UAE	43	484	26	438	31	450
Dubai /UAE	66	495	16	509	18	438
Arab average	**29**	**443**	**31**	**427**	**40**	**419**
International average	**37**	**492**	**28**	**473**	**35**	**463**

Table (104) shows the percentages of students by the school location variable and the students' achievement in math. The performance averages in math for Jordanian students were 419,411,397 respectively. At the Arab level, the performance averages were 396, 405, 396

respectively. At the international level the averages for students' performance were 492,473,463 respectively. These numbers indicate that the Jordanian averages in science were higher than those at the Arab level but below the averages at the international level. Regarding math, the averages of both the Arab and the Jordanian levels were close yet below the averages at the international level. To sum up, there is a positive relation between the number of people living in area where school is located and students' achievement at the Jordanian, Arab and international levels.

Table (104)
School Location and Achievement in Math

Country	More than 100000		15001 to 15000 from 1000		Fewer or equal to 1500	
	Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students percentage %	Performance Average
1 Bahrain	17	412	42	404	41	418
2 Jordan	**26**	**419**	**31**	**411**	**42**	**397**
3 Lebanon	21	469	37	445	42	440
4 Morocco	47	380	32	370	21	353
5 Oman	8	422	21	377	70	355
6 Palestine	22	408	35	397	43	407
7 Qatar	29	441	32	413	39	395
8 Saudi Arabia	57	403	18	395	24	369
9 Syria	26	385	26	374	47	380
10 Tunisia	16	444	44	430	39	410
11 United Arab Emirates	48	474	23	444	30	435
Abu Dhabi/UAE	43	472	26	427	31	436
Dubai /UAE	66	488	16	497	18	432
Arab average	**29**	**423**	**31**	**405**	**40**	**396**
International average	**37**	**484**	**28**	**463**	**35**	**450**

● **Student Economic Background**

This study classified the student's economic background into three major levels: high, moderate and low. Table (105) shows the relation between the student economic background and his / her achievement in science. The Jordanian percentages by this variable were 32%, 25%, 43% respectively, and the performance averages were 474, 449, 431 respectively. At the Arab level , the percentages were 40%, 24%, 35% respectively while the performance averages were 444, 435, 416 respectively. On the other hand, the percentages at the international level were 32%, 33%, 36% and the performance percentages were 501, 481, 458 respectively.

Table (No. 105)
Student Economic Background and Achievement in Science

	Country	*High		Moderate		Low	
		Students' percentage %	Performance average	Students' percentage %	Performance average	Students' percentage %	Performance average
1	Bahrain	45	457	28	456	27	444
2	Jordan	**32**	**474**	**25**	**449**	**43**	**431**
3	Lebanon	21	466	34	413	45	387
4	Morocco	6	416	13	396	81	367
5	Oman	43	440	26	413	31	395
6	Palestine	44	426	23	419	33	411
7	Qatar	81	412	16	466	3	425
8	Saudi Arabia	40	446	30	437	29	427
9	Syria	37	431	27	438	36	417
10	Tunisia	23	449	29	446	48	428
11	United Arab Emirates	70	468	17	450	13	446
	Abu Dhabi/UAE	76	465	17	443	7	455
	Dubai /UAE	71	492	12	459	16	439
	Arab average	**40**	**444**	**24**	**435**	**35**	**416**
	International average	**32**	**501**	**33**	**481**	**36**	**458**

Table (106) shows the correlation between the student economic background and his/her achievement in math. The Jordanian performance averages were 431, 402, 388. At the Arab level, the performance percentages were 423, 412, 396 respectively, and 494, 471, 448 respectively at the international level. It is noted that the Jordanians averages in science are higher than those of the Arab countries. As for math, the Jordanian averages as well as of Arab countries were below the international averages which indicates a positive relation between the student economic background and his / her achievement in science and math at the Jordanian, Arab and international levels.

---

* See the definitions of the measurement categories in appendix (5)

Table (No.106)
Student Economic Background and Achievement in Math

	Country	*High		Moderate		Low	
		Students percentage %	Performance Average	Students percentage %	Performance Average	Students Percentage %	Performance Average
1	Bahrain	45	420	28	408	27	395
2	Jordan	**32**	**431**	**25**	**402**	**43**	**388**
3	Lebanon	21	491	34	455	45	435
4	Morocco	6	422	13	393	81	361
5	Oman	43	386	26	360	31	339
6	Palestine	44	411	23	402	33	393
7	Qatar	81	403	16	448	3	435
8	Saudi Arabia	40	405	30	394	29	382
9	Syria	37	388	27	392	36	371
10	Tunisia	23	439	29	432	48	411
11	United Arab Emirates	70	459	17	442	13	441
	Abu Dhabi/UAE	76	453	17	429	7	446
	Dubai /UAE	71	484	12	449	16	434
	Arab average	**40**	**423**	**24**	**412**	**35**	**396**
	International average	**32**	**494**	**33**	**471**	**36**	**448**

- **School Focus on Achievement in Science from Principal's Perspective**

The school focus on achievement from the principal's perspective variable is classified into three categories: very high focus, high focus and moderate focus. Table (107) shows the distribution of the students' percentages in the participating Arab countries and the students performance averages by this variable. The percentages of Jordanian students were 5%, 56%, 39% respectively, while the averages for students' performance in science were 479, 459, 431 respectively. At the Arab level, these percentages were 7%, 49%, 44% respectively, and the performance averages in science were 463, 436, 409 respectively. At the International level, the percentages were 7%, 53%, 41% respectively and the equivalent performance averages in science were 504, 486, 460 respectively.

---

* See the definitions of the measurement categories in appendix (5)

Table No (107)
School Focus on Achievement and Achievement in Science from Principal's Perspective

Country	*Very High		High		Moderate	
	Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students percentage %	Performance Average
1 Qatar	27	461	57	404	16	388
2 United Arab Emirates	17	505	63	463	20	433
3 Oman	7	453	67	429	25	383
4 Saudi Arabia	7	466	48	439	45	428
5 Jordan	**5**	**479**	**56**	**459**	**39**	**431**
6 Syria	4	402	39	439	57	420
7 Bahrain	4	552	57	468	40	420
8 Morocco	3	442	26	394	71	367
9 Palestine	3	410	52	423	46	418
10 Lebanon	2	~	59	431	39	371
11 Tunisia	1	~	18	452	82	436
Dubai/UAE	28	528	59	480	13	417
Abu Dhabi	13	501	64	463	22	433
Arab average	**7**	**463**	**49**	**436**	**44**	**409**
International average	**7**	**504**	**53**	**486**	**41**	**460**

Table (108) shows the percentages of students in the participating Arab countries and their performance averages in Math. The performance averages of Jordanian students in math according to this variable were 439, 415, 389 respectively, while the performance averages at the Arab level were 440, 415, 389 respectively. At the International level, the performance averages were 495, 477, 499 respectively. These averages show that the Jordanian average in science were higher than those of the Arab countries, yet both averages were lower than the international level. As for math, the Jordanian and Arab averages were close but still lower than those of international averages. In addition, there is a positive relation between the variable of the school's focus on achievement and students' achievement in science.

---

* See the definitions of the measurement categories in appendix (5)

Table (108)
School Focus on Achievement in Math from Principal's Perspective

Country	*Very High		High		Moderate	
	Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average
1 Qatar	27	453	57	395	16	378
2 United Arab Emirates	17	497	63	453	20	426
3 Oman	7	407	67	373	25	332
4 Saudi Arabia	7	442	48	396	45	383
5 Jordan	**5**	**439**	**56**	**415**	**39**	**389**
6 Syria	4	350	39	394	57	373
7 Bahrain	4	522	57	425	40	375
8 Morocco	3	450	26	393	71	360
9 Palestine	3	404	52	408	46	400
10 Lebanon	2	~	59	467	39	424
11 Tunisia	1	~	18	443	82	421
Dubai/UAE	28	519	59	470	13	418
Abu Dhabi	13	495	64	449	22	422
Arab average	7	440	49	415	44	387
International average	7	495	53	477	41	449

●**Availability of Computers for Teaching and Achievement in Science**

Table (109) shows the availability of computers for teaching science. This variable includes four categories: availability of a computer for (1−2) students, availability of a computer for (3−5) students, and availability of a computer for 6 students and more, and no computers at the school. The percentages for the Jordanian students were 31%, 41%, 26%, 2% while the performance averages were 442, 454, 451. At the Arab level, the percentages were 26%, 29%, 38%, 6% and the performance averages were 434, 432, 426, 396. However, at the international level, the percentages were 40%, 28%, 28%, 4% and the performance averages were 481%,480%,474%,408.

Table (No.109)
Availability of Computers for Teaching and Achievement in Science

Country	Computer per(1-2) students		Computer per (3-5) students		Computer per 6 students and more		Schools without computers	
	Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average
1 Bahrain	32	456	35	456	26	446	7	414
2 Jordan	**31**	**442**	**41**	**454**	**26**	**451**	**2**	**~**
3 Lebanon	38	422	40	405	16	405	5	347
4 Morocco	6	404	10	393	70	373	13	372
5 Oman	47	427	34	415	15	419	4	429
6 Palestine	25	452	21	433	49	405	5	378
7 Qatar	44	435	48	409	7	410	1	~
8 Saudi Arabia	14	440	17	453	37	430	32	435
9 Syria	8	415	24	436	68	424	1	~
10 Tunisia	5	414	10	441	86	441	0	~
11 United Arab Emirates	37	465	41	458	21	480	1	~
Dubai/UAE	36	459	42	459	20	467	2	~
Abu Dhabi	45	490	32	474	23	511	0	~
Arab average	26	434	29	432	38	426	6	396
International average	40	481	28	480	28	474	4	408

Table (110) shows the availability of computers for teaching math. The percentages for Jordanian students were 399, 413, 406 respectively. At the Arab level, the performance averages were 413, 412, 404, 375 respectively. However, the performance averages were 472, 472, 467, 396 respectively at the international level. The relation between the availability of computers and the students' achievement in science and math was positive at the Arab and international levels while it was a curved relation at the Jordanian level.

Table (110)
Availability of Computers in relation to student's achievement in math

Country		a computer per(1-2) students		a computer per(3-5) students		a computer per 6 students and more		a school without computers	
		Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average
1	Bahrain	32	414	35	414	26	397	7	368
2	Jordan	**31**	**399**	**41**	**413**	**26**	**406**	**2**	**~**
3	Lebanon	38	461	40	451	16	449	5	395
4	Morocco	6	405	10	394	70	368	13	364
5	Oman	47	373	34	359	15	369	4	373
6	Palestine	25	433	21	416	49	390	5	362
7	Qatar	44	422	48	406	7	407	1	~
8	Saudi Arabia	14	404	17	415	37	386	32	389
9	Syria	8	371	24	390	68	377	1	~
10	Tunisia	5	399	10	426	86	427	0	~
11	United Arab Emirates	37	457	41	449	21	469	1	~
	Dubai/UAE	36	450	42	445	20	452	2	~
	Abu Dhabi	45	482	32	467	23	501	0	~
	Arab average	26	413	29	412	38	404	6	375
	International average	40	472	28	472	28	467	4	396

● **School Discipline**

The study divided school discipline into three categories: schools with no discipline problems, schools with minor discipline problems and schools with moderate discipline problems. Table (111) shows this variable in relation to achievement in science. Jordanian percentages were 8%, 54%, 38% respectively, while performance averages for Jordanian students were 463, 452, 442 respectively.

At the Arab level the percentages were 16%, 49%, 35% respectively and the performance averages were 442, 426, 421 respectively. At the international level, the percentages were as follows: 16%, 66%, 18% respectively and the performance averages were 492, 477, 452 respectively.

Table (111)
Study Discipline and Achievement in Science

Country		*No Discipline Problems		Minor Problems	Discipline	Mild Discipline Problems	
		Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average
1	Qatar	34	437	52	406	14	408
2	United Arab Emirates	25	491	56	456	19	452
3	Oman	23	451	49	412	28	408
4	Saudi Arabia	23	439	47	440	30	432
5	Lebanon	20	406	63	411	17	383
6	Bahrain	16	480	61	450	23	441
7	Palestine	12	443	56	418	32	417
8	Jordan	**8**	**463**	**54**	**452**	**38**	**442**
9	Morocco	6	416	39	365	55	380
10	Tunisia	4	434	37	435	60	442
11	Syria	3	404	27	441	70	422
	Dubai/UAE	43	500	44	480	13	452
	Abu Dhabi	19	494	64	455	17	449
	Arab average	**16**	**422**	**49**	**426**	**35**	**421**
	International average	**16**	**492**	**66**	**477**	**18**	**452**

Table (112) shows the school discipline variable and achievement in math. The Jordanian performance averages for Jordanian students were 416, 409, 400 respectively, and at the Arab level were 418, 404, 400 respectively, while at the international level they were 483, 467, 437 respectively.

It is noted that Jordanian schools show a lower degree of discipline in comparison with Arab countries and international ones. As for performance averages for Jordanian students, they were better than those of Arab countries, yet lower than international level in science and math. The students' performance averages for Jordanian and Arab students were quite close.

The performance averages by the school discipline variable indicated a positive relation between the degree of school discipline and achievement in science or math at the Jordanian, Arab and international levels. The relation was also positive in science at the Jordanian and international levels while it was a curved one at the Arab level.

---

* See the definitions of the measurement categories in appendix (5)

Table 112
School Discipline and Achievement in Math

	Country	*No Discipline Problems		Minor Discipline Problems		Mild Discipline Problems	
		Students Percentage %	Performance Average	Students Percentage %	Performance Average	Students Percentage %	Performance Average
1	Qatar	34	420	52	402	14	401
2	United Arab Emirates	25	482	56	448	19	442
3	Oman	23	395	49	357	28	355
4	Saudi Arabia	23	400	47	395	30	391
5	Lebanon	20	449	63	454	17	432
6	Bahrain	16	436	61	406	23	399
7	Palestine	12	426	56	402	32	400
8	Jordan	**8**	**416**	**54**	**409**	**38**	**400**
9	Morocco	6	414	39	360	55	375
10	Tunisia	4	414	37	421	60	428
11	Syria	3	349	27	394	70	376
	Dubai/UAE	43	491	44	474	13	443
	Abu Dhabi	19	481	64	443	17	434
	Arab average	**16**	**418**	**49**	**404**	**35**	**400**
	International average	**16**	**483**	**66**	**467**	**18**	**437**

---

* See the definitions of the measurement categories in appendix (5)

Chapter Six
The Decline Factors

Jordan has participated in TIMSS in the last four sessions 1999,2003,2007,2011. The results of last two sessions (2007, 2011) have revealed the significant decline in students' performance in math and science as shown in table (113).

Students' performance in math has declined by 21 marks and 33 marks in science. Male's performance has went down to 25 marks in math and 38 marks in science whereas females' performance has decreased 28 marks in science and 18 marks in math. It is worth mentioning that males' performance in both math and science has recorded a higher decline in comparison with females' performance. According to the school location, the performance of students in rural areas has dropped by 40 marks in math and 54 marks in science. Shedding the light on students in the urban areas, the table shows that students' performance has fallen to 17 marks in math and 27 in science. Therefore, the decline at the students in urban areas was more than the decline at students in urban areas in science and math. In addition, the performance averages of students in the urban areas were higher than those of the students in the rural areas with statistical significance. Students' performance averages in science were better than in math at all levels.

UNRWA students' performance recorded the highest decline among other schools. Their performance have gone down to 57 marks in math and 59 marks in science. It is noteworthy that students' performance in MoE schools declined 18 marks in math and 32 in science. Having a look at private schools, students' performance has recorded the lowest decline in both subjects. Their performance has declined 17 marks in math and 22 marks in science. To sum up, according to the supervising authority, students of private schools have the best performance, followed by students of UNRWA schools and then the MoE schools.

One can conclude that :
- UNRWA students' performance has the highest decline followed by the MoE schools and then the private schools.
- Males have a higher decline than females.
- Students of rural schools have a higher decline than students of the city.

Table No (113)
Decline size in Math and Science in 2007, 2011 by Selected Characteristics of Jordanian Students

		Math decline	Science decline
Supervising Authority	MoE	18	32
	Private Education	17	22
	UNRWA	57	59
	The whole kingdom	21	33
Sex	Males	25	38
	Females	18	28
	The whole kingdom	21	33
Location	City	17	27

	Rural areas	40	54
	The whole kingdom	21	33

This chapter will focus on a group of variables related to students, teachers and school principals. The chapter will present a comparison between 2007 and 2011 to investigate if the variables have an effect on this decline in 2011 from the results of 2007.

- Students' Economic Background

Table No (114) shows students' performance averages in math and science according to students' economic performance in TIMSS 2007, 2011. The table indicates the following:

- There is no substantial difference in students' performance between 2007 and 2011.
- The number of students coming from low class in 2011 has risen from 1% (2007) to 43%.
- The number of students coming from high class in 2011 has risen from 2% (2007) to 32%.
- The number of students coming from middle class in 2011 has fallen 3% compared to 2007 (25%).

There is a positive relation between students' performance in math and science and their economic backgrounds.

Table No (114)
Performance averages in Math and Science, and the percentages of Jordanian students by their economic background indicator in TIMSS for 2007 ,2011.

Subject	Year	High class		Middle class		Low class	
		Percentage %	Average	Percentage %	Average	Percentage %	Average
Math	2011	32	431	25	402	43	388
	2007	30	450	28	423	42	412
Science	2011	32	474	25	449	43	431
	2007	30	503	28	477	42	470

- Teacher's working conditions

Table (115) shows average of Jordanian students' performance in both math and science in 2077,2011 according to teacher's working conditions.

The table pinpoints the following :

- Science teacher's working conditions are better in 2011 than in 2007.

- The percentage of science teachers who feel that their working conditions are bad has risen up from 8% in 2007 to 46% in 2011.
- The percentage of math teachers who feel that their working conditions are bad has recorded 45% in 2007 and 2011.

There is a positive correlation between students' performance in math and science and teacher's working conditions.

Table No (115)
Performance averages in math and science , and the percentages   of students by teacher's working conditions indicator in TIMSS 2007,2011.

Subjects	Year	High		Moderate		Poor	
		Percentage %	Average	Percentage %	Average	Percentage %	Average
Math	2011	14	419	41	412	45	396
	2007	6	468	48	425	45	424
Science	2011	17	484	37	453	46	432
	2007	5	470	58	489	38	471

- **Safe school**

Table (116) shows the Jordanian students' performance averages in math and science in 2007, 2011 by the safe school indicator. The table indicates the percentage of students classified by the safe school indicator in 2011 as follows: 36% high, 59% moderate, and 5% low. In 2007, they were 53%, 38% and 9% respectively. These percentages indicate that schools are less safer in 2011 than in 2007. It is worth mentioning that there is a positive correlation between students' performance and the safe school variable in 2007, 2011.

Table No (116)
Performance average   in math and science, and the percentages of students by safe school indicator in TIMSS 2007 ,2011

Subject	Year	High		Moderate		Low	
		Percentage %	Average	Percentage %	Average	Percentage %	Average
Math	2011	36	418	59	403	5	355
	2007	53	445	38	417	9	394

Science	2011	36	466	53	446	11	406
	2011	53	500	38	474	9	442

- **Teacher's experience**

Table No (117) shows the performance average of students' in math and science in 2007 ,2011 according to the teacher's experience. Math teachers have 11 years experience in 2011 vs. 10 years in 2007. Science teachers have 8 years experience in 2011 vs. 9 years in 2007. Generally, there is no substantial difference in years of experience for both math and science teachers in 2007 and 2011.

Table No (117)
The performance average in math and science , and the percentages of students' by teacher's years of experience school indicator in TIMSS 2007 and 2011.

Subject	Year	Years of experience
Math	2011	11
	2007	10
Science	2011	8
	2007	9

- There is no substantial difference in teachers of math and science experience in 2007and 2011.

- **Teacher's educational level**

Table (118) shows the percentages of Jordanian teachers by their educational levels in 2007 and 2011. The number of math teachers having masters degree or higher was 12% in 2011 and was 13% in 2007. The number of teachers having bachelor degree in 2011 was 75%, and was 76% in 2007. Other teachers who have community colleges diploma were 13% in 2011 and 11% in 2007. The similar percentages in science in 2011 were 12% masters degree, 83% bachelor degree and 5% community colleges diploma while these percentages were 9%, 86%, 4% respectively in 2007.

Table No (118)
Percentages of Jordanian teachers by the educational level indicator in 2007 and 2011

Subject	Year	M.A or higher	B.A	Diploma
Math	2011	12	75	13

	2007	13	76	11
Science	2011	12	83	5
	2007	9	86	4

- Teachers' educational levels were close in 2007 and 2011.

Subject Value at Student

Table (119) shows the students' performance averages in math and science between 2007 and 2011 by the students' attitudes. The number of students who highly appreciate math in 2011 was 69%, while the ones who moderately appreciate math 24%, and 7% for those who don't appreciate math.

The table shows that the students' performance averages in math were 422, 393, 349 respectively. In 2007, the percentages in math were 92% , 6% and 2% respectively.

Table No (119)
Performance averages for Jordanian students
in math and science in 2007 and 2011 by subject value at Students indicator

Subject	Year	High		Moderate		Low	
		Percentage %	Average	Percentage %	Average	Percentage %	Average
Math	2011	69	422	24	393	7	340
	2007	92	390	6	370	2	–
Science	2011	66	468	25	437	8	403
	2007	88	491	10	446	2	-

- Students' attitudes towards math and science in 2007 were obviously better than 2011.

Teaching Hours for Students
Table (120) shows the number of hours allocated for teaching math and science during 2007 and 2011. 130 hours were allocated for teaching math in 2011 and 141 hours in 2007. This means that there is a decline in the numbers of hours allocated in 2011 if compared to 2007.

Table No (120)
Total Hours of Teaching Math and Science in 2007 and 2011.

	Year	Teaching hours
Math	2011	130
	2007	141

	2011	134
Science	2007	141

- A decline in the number of teaching hours during 2011 in comparison with 2007.

- **Teachers' preparation for teaching**

Table No (121) shows percentages of students whose teachers are fully prepared for teaching math and science. The results showed that 84% were fully prepared to teach math for 2011 and 89% in 2007.

By the math content, the percentages for the numbers content were as follows: 92% in 2011 vs. 94% in 2007. Algebra content has reached 92% in 2007 and in 2011. Geometry was 87% in 2011 vs. 85% in 2007. Statistics and probabilities content was 51% in 2011 vs. 84% in 2007.

2011 Results showed that 77% of science teachers are fully prepared to teach and 70% in 2007. According to the scientific content, biology content has reached 79%, 76% in 2011 and 2007 respectively and in chemistry content 84% for the year 2011and 76% in 2007. In physics, in 2011 it was 87% , and iit was 74% in 2007.In geology content , it was 67% in 2011 and 64% in 2007.

Table No (121)
Percentages of students who feel that their teachers well-prepared for teaching math and science

Subject	Year	Math	Numbers	Algebra	Geometry	Statistics and probabilities
Math	2011	84	92	92	87	51
	2007	89	94	92	85	84
	Year	Science	Biology	Chemistry	Physics	Geology
Science	2011	77	79	84	78	67
	2007	70	67	76	74	64

The total of the percentages reflects a decline in math and progress in science as shown below:
- The preparation of math teachers for the year 2007 was better than 2011.
- The preparation of math teachers for the year 2011 has declined noticeably in statistics and probabilities content in comparison with 2007.
- The preparation of science teachers in 2011 was better than 2007.

- **Availability of resources**

Table (122) shows performance averages of Jordanian students' according to the availability of resources for 2007 and 2011. Students were divided into three categories: high ,moderate and poor. In 2011 , the number of students who have available resources at schools in math are as follows: 10%, 80%, 11% respectively and in 200724% ,69% ,7% respectively .

Table No (122)

Performance Averages and percentages for Jordanian students by the availability of educational resources for teaching math and science indicator 2007,2011

Subject	Year	High		Moderate		Poor	
		Percentage %	Average	Percentage %	Average	Percentage %	Average
Math	2011	10	423	78	402	12	419
	2007	21	439	70	423	9	428
Science	2011	10	470	80	444	11	469
	2007	24	496	69	476	7	490

The students' performance averages in math according to the categories were 423, 402, 419 in 2011 and 439, 423, 428 in 2007 whereas in science 470, 444, 469 in 2011, and 496,476,490 in 2007. These percentages indicate the following:
- The availability of resources for teaching both math and science were better in 2007 than in 2011.
- Most students study at schools having some resources for teaching math and science at a moderate level. Their performance averages in both subjects were below the average of schools having more resources or having poor resources.

- **Availability of computers**

Table No (123) shows the Jordanian students' performance by the availability of computers at schools to be used for teaching math and science.

The results reveal that 53% of students study math at schools having computers in 2011 while in 2007 the percentage was 79%. Students' performance averages by the availability of computers was as follows: 407, 406 in 2011 and 435 ,420 in 2007.

Regarding science, the performance averages in 2011 by this variable 457 vs. 441. In 2007 these averages were 478 and 474. These percentage and averages show that in 2007, the number of computers available for teaching was better than in 2011 in both subjects. This means there is a positive relation between having computers for teaching and students' achievement in math and science regardless of the study's session.

Table No (123)
Performance Averages and percentages for Jordanian students by the availability of computers at schools used in teaching math and science

Subject	Year	Yes		No	
		Percentage %	Average	Percentage %	Average
Math	2011	53	407	47	406
	2007	79	435	21	420
Science	2011	49	457	51	441
	2007	79	487	21	474

The following implications can be drawn regarding the factors that witnessed notable changes in TIMSS in 2011:

- The availability of computers for teaching math in 2011.
- Using computers does not affect students' performance in math (an indicator on the lack of available computers are the schools).
- The availability of computers for teaching science in 2011 is less than 2007.
- There is a positive effect for using computers on students' achievement in science.

Decline size according to percentile
Table No (124) shows the percentile distribution in math and science according by year. Figures (13),(14) show the distribution of percentile in 2007,2011 for science and math respectively.

Table No (124)
The Distribution of Percentile in Math and Science by Year

Subject	Year	Percentile 5	Percentile 10	Percentile 25	Percentile 50	Percentile 75	Percentile 90	Percentile 95
Math	2011	232	271	340	413	479	528	556
	2007	253	290	356	433	503	556	584
Science	2011	258	307	388	463	522	568	595
	2007	308	349	416	491	554	601	627

The percentiles 5,10,25,50,75,90,95 were calculated in math and science for 2007 and 2011, then the differences among the similar percentiles were also calculated as measurement for the decline size by percentiles. The decline size in science was 50,42,28,28,32,33,32. These declines reflect a difference in the decline size by the students' abilities. The students of low performance have the highest decline 50 ,42 while students with high performance have ranked the second in the decline size 33, 32. Students with moderate levels have the lowest decline as the decline size at the 50, 25 percentiles was (28).
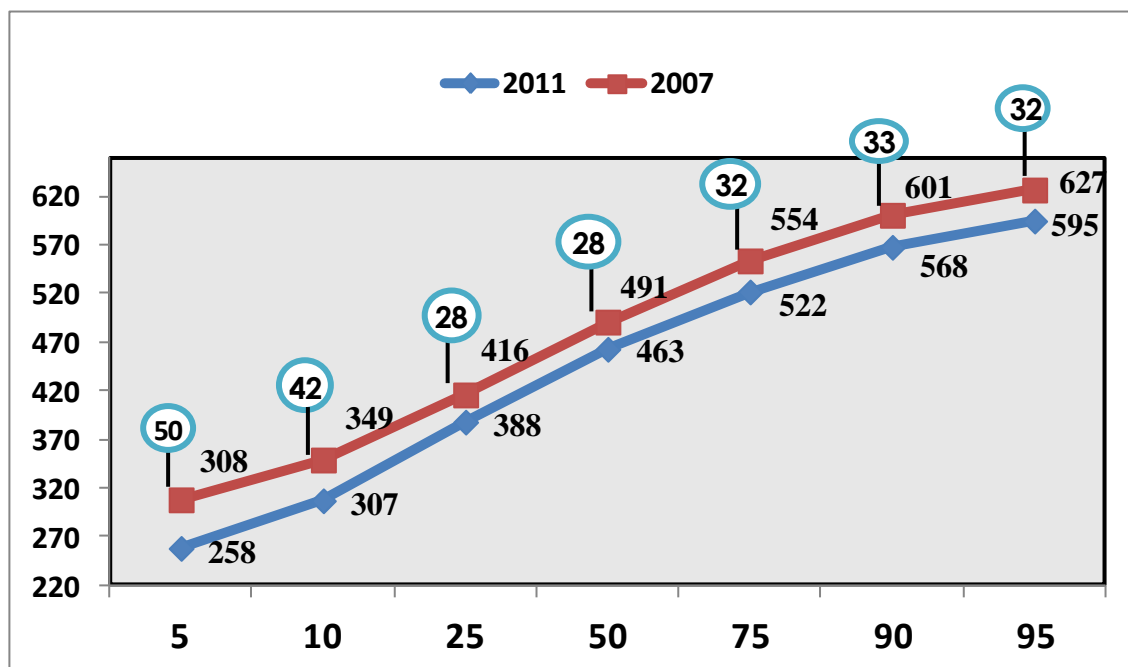
Figure

(13)
Distribution of Percentile in Science

On the contrary, in Math, the highest decline was recorded for students of high achievement levels, followed by students with moderate ability and finally the students with low achievement levels who scored the lowest decline.
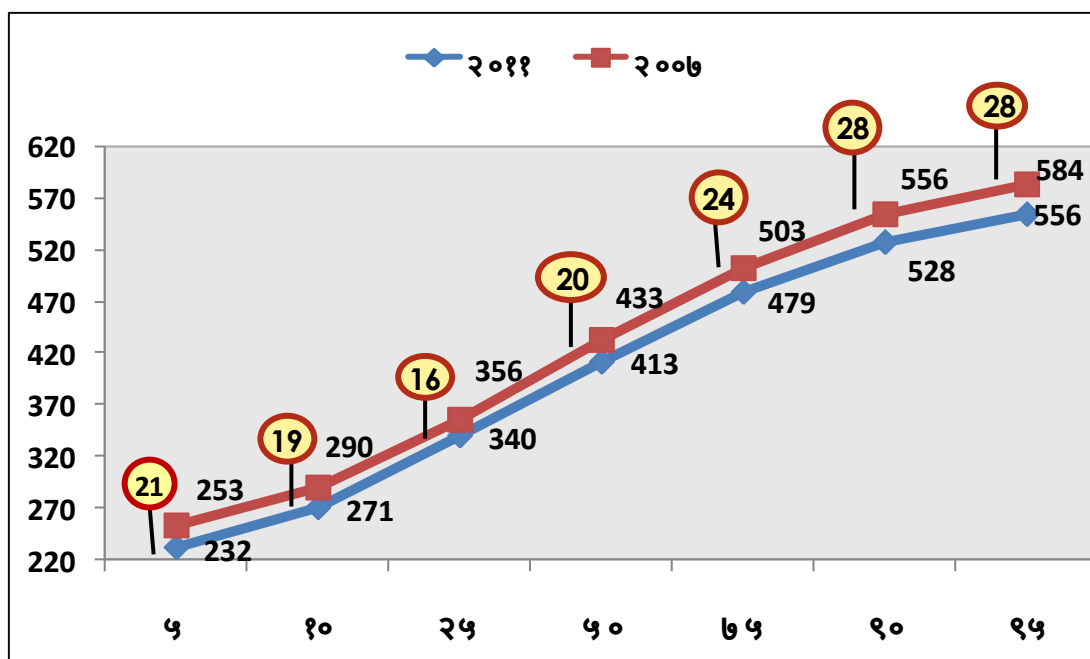
Figure (14)
Distribution of percentile in math

International Change in Achievement

Countries participating in TIMSS were categorized into three categories by the difference in students' achievement in math and science for 2007 and 2011. The change is considered progress in the difference between the performance averages was statistically significant in favor of 2011, and is considered a decline if it was statistically significant in favor of 2007. If the difference does not show any statistical significance, then the change is considered stable. Table (123) shows the difference in students' performance in TIMSS in 2007, 2011 by the participating countries. Table (123) shows the change in achievement in science in TIMSS 2007 and TIMSS 2011 by the participating countries in grade 8.

Table No (125)
Change in Achievement in Science in TIMSS 2007, 2011
by Countries Participating in both Sessions / Eighth Grade

Progress	Stable	Decline
Iran	Australia	Bahrain
Italy	Taiwan	Hungary
Korea	Britain	Indonesia
Norway	Georgia	Jordan
Palestine	Ghana	Malaysia
Russia	Hong Kong	Syria

Singapore	Japan	Thailand
Ukraine	Lebanon	
	Lithuania	
	Oman	
	Romania	
	Slovenia	
	Sweden	
	Tunisia	
	USA	

Table No (126) shows the difference in students' performance in math. The following eight countries have made progress in science: Iran, Italy, Korea, Norway, Palestine, Russia, Singapore and Ukraine, while the following ten countries have made progress in math: Bahrain, Taiwan , Georgia ,Italy, Korea, Norway , Palestine , Russia, Singapore and Ukraine.

Table no (126)

Change in achievement in math in TIMSS   2007,2011 by countries participating in both sessions / eighth grade

Progress	Stable	Decline
Bahrain	Australia	Hungary
Taiwan	Britain	Jordan
Georgia	Hong Kong	Malaysia
Italy	Indonesia	Sweden
Korea	Iran	Syria
Norway	Japan	Thailand
Palestine	Lebanon	
Russia	Lithuania	
Singapore	Oman	
Ukraine	Romania	
	Slovenia	
	Tunisia	
	USA	

Fifteen countries have stable performance in science, and eleven countries have stable performance in math. The following eleven countries stable performance in both subjects: Australia , Britain , Hong Kong , Japan , Lebanon , Lithuania , Oman , Romania , Slovenia ,Tunisia and the USA. Five countries have decline in their performance in both subjects: Hungary , Jordan , Malaysia , Syria, and Thailand.

To sum up, the total number of factors that encounter a substantial change in 2007, 2011 which are considered as proposed decline factors in 2011:

- Safe school has declined to 36% in 2011 whereas it was 53% in 2007.
- Students' positive attitudes towards math and science has declined to 20% in 2011 in comparison with 2007.
- The number of hours allocated for teaching math has gone down 11 hours which is equivalent to 15 classes whereas the number of hours in science has declined to 7 which is equivalent to 9 classes, in addition to 14 classes for both subjects because of the teachers' strike in 2011.
- The resources for teaching math and science have declined in 2011 in comparison with 2007. The decline was 11% in math and 14% in science.
- Schools having computers as a teaching tool have declined to 30% in science and 26% in math.
- 18% of students performance was below the guessing level in 2011. This indicates that either students' were not serious during the exam or unability to know the correct answer which leads them to guess.

It is worth mentioning that the education issue becomes more complex and difficult to explain. In addition to the above-mentioned results, 2011 has encountered abnormal conditions compared to 2007.

To have a more detailed view about the reasons and factors behind the decline in students' performance in math and science, the common items of 2007 and 2011 questionnaires were analyzed and the results will be displayed according to the used questionnaires; school questionnaire, science teacher questionnaire, math teacher questionnaire and student questionnaire. New variables are being derived through the items of questionnaires to reach new valid and reliable scales which are better than measuring the traits of every item alone.

1- Results of school questionnaire

The common items in the school questionnaire in 2007, 2011 were identified then the averages of all items were calculated as well as the difference between the averages of every item in 2007 and in 2011 and the statistical significance of these differences using T-test for the independent samples. Table No (127) shows the results of the analysis.

Table No (127)
Results of school questionnaire in 2007 and 2011 in TIMSS

Item	Item no	Item	Average		difference	Function level $\alpha = 0.05$
			2011	2007		
BCBG01	1	What is the total number of enrolled students until 1.4.2011?	603.1	546.72	56.4	
BCBG02	2	What is the total number of eighth grade students until 1.4.2011?	84.2	72.1	12.1	⬚
	3	What is the percentage of your students economic level according to the following social levels?				
BCBG03A	(أ	Poor social level	40.53	46.66	6.13	
BCBG03B	(ب	Moderate social level	35.54	19.53	16.01	⬚
BCBG08A	أ-8	Is there a science lab in your school for eighth grade students?	0.84	0.92	0.08	
BCBG08B	ب-8	Are science teachers being helped in the lab while doing experiments?	0.93	0.85	0.08	⬚
	9	To what extent is your school able to do in the following:				
		School general resources				
BCBG09AA	أ–	learning resources (textbook s)	1.83	0.18	1.65	⬚
BCBG09AB	ب–	Stationary (papers and pencils)	1.74	0.57	1.17	⬚
BCBG09AC	ج–	School buildings and playgrounds	1.67	1.28	0.39	⬚
BCBG09AD	د–	Heating equipment , conditioning ,and lighting	1.62	2.03	0.41	⬚
BCBG09AE		Spaces for learning (classrooms)	1.92	1.09	0.83	⬚
	.	Math teaching resources				
BCBG09BB	ب–	Computers for teaching math	1.32	1.62	0.30	⬚
BCBG09BC	ج–	Software for teaching math	1.43	1.49	0.06	
BCBG09BD	د–	Library resources for teaching math	1.21	1.27	0.06	
BCBG09BE	هـ–	Audio-visual aids for teaching math	1.11	2.03	0.92	⬚
BCBG09BF	و–	Calculators for teaching math	1.17	1.43	0.26	⬚
	.	Science teaching resources				
BCBG09CA	أ–	Teachers majoring in science	2.01	0.54	1.47	⬚
BCBG09CB	ب–	Computers for teaching science	1.58	1.38	0.20	
BCBG09CC	ج–	Software for teaching science	1.42	1.42	0	
BCBG09CD	د–	Library resources for teaching science	1.35	1.32	0.03	
BCBG09CE	هـ–	Audio-visual aids for teaching science	1.19	1.75	0.56	⬚
BCBG09CF	و–	Calculators for teaching science	1.12	1.43	0.31	⬚
	10	How often does your school demand parents of the following?				
BCBG10BA	أ–ب	Voluntary participation in projects ,programs and school trips.	0.67	0.78	0.11	
BCBG10BB	ب–ب	Joining school's committees	0.81	0.45	0.36	⬚

Item	Item no	Item	Average		difference	Function level $\alpha = 0.05$
			2011	2007		
	11	How do you evaluate the following?				
BCBG11A	أ–	Teachers' satisfaction about their work	2.68	2.86	0.18	
BCBG11B	ب–	Teachers knowledge about curriculum objectives	2.89	2.97	0.08	
BCBG11C	ج–	Teachers' success in curriculum implementation	3.05	3.10	0.05	
BCBG11D	د–	Teachers' expectations about students' performance	2.57	2.72	0.15	
BCBG11E	هـ–	Parents' support towards students' performance	2.03	2.13	0.10	
BCBG11F	و–	Parents' participation in school activities	1.95	2.13	0.18	
BCBG11G	ز–	Students' ability to keep the school equipment	2.12	2.46	0.34	⬚
BCBG11H	ح–	students' willingness in hardworking	2.36	2.65	0.29	⬚
	12-أ	To what extent , are the following items considered a problem for the eighth grade students?				
BCBG12AA	أ–	Late arrival to school	1.09	1.40	0.31	⬚
BCBG12AB	ب–	Absence without an excuse	1.28	1.32	0.04	⬚
BCBG12AC	ج	Riots in the classrooms	1.41	1.12	0.29	⬚
BCBG12AD	د	Cheating	1.28	0.95	0.33	⬚
BCBG12AE	هـ–	Insulting and abusing	1.38	1.02	0.36	⬚
BCBG12AF	و	Destruction	1.45	0.94	0.51	⬚
BCBG12AG	ز	Robbery	1.00	0.65	0.35	⬚
BCBG12AH	ح	Threatening and verbal insulting among students (including written words , electronic mails)	1.21	0.94	0.27	⬚
BCBG12AI	ط	Physical abuse towards other students	1.02	0.57	0.45	⬚
BCBG12AJ	ي	Threatening , verbal abuse towards teachers and staff such as written words ,e-mails)	0.81	0.38	0.43	⬚
BCBG12AK	ك	Physical abuse towards teachers and staff	0.72	0.15	0.57	⬚
	ب	To what extent, do you consider one of the following is a problem?				
BCBG12BA	أ–ب	Late arrival and early departure	1.28	0.55	0.73	⬚
BCBG12BB	ب–ب	Absence	1.67	0.77	0.90	⬚
	13	Does your school do any of the following to evaluate eighth grade teachers' performance in math ?				
BCBG13A	أ–	Notes of school principal , principal assistant ,teacher.	1.00	0.98	0.02	
BCBG13B	ب–	Notes of supervisors and other people outside the school.	0.95	0.98	0.03	
BCBG13C	ج–	Students' achievement	0.98	0.95	0.03	
BCBG13D	د–	Discussion with a colleague teacher	0.77	0.77	0	
	14	Does your school do any of the following to evaluate eighth grade teachers' performance in math ?				
BCBG14A	أ–	Notes of school principal , principal assistant ,teacher.	1.00	0.98	0.02	
BCBG14B	ب–	Notes of supervisors and other people outside the school.	0.94	0.97	0.03	

Item	Item no	Item	Average		difference	Function level $\alpha = 0.05$
			2011	2007		
BCBG14C	ج-	Students' achievement	0.98	0.93	0.05	⍰
BCBG14D	د-	Discussion with a colleague teacher	0.77	0.80	0.03	
	15	To what extent does the school have difficulty in filling job vacancies for teachers of eighth grade?				
BCBG15A	أ-	Math	0.96	1.15	0.19	
BCBG15B	ب-	Science	0.76	1.09	0.33	⍰
	16	Does your school give any incentives (rank allowance, accommodation, rewards , or smaller classes) to encourage teachers of eighth grade to continue teaching at school?				
BCBG16A	أ-	Math	0.15	0.19	0.04	
BCBG16B	ب-	Science	0.12	0.20	0.08	
BCBG16C	ج-	Others	0.25	0.24	0.01	

The differences in factors leading to the decline in 2011 in comparison with 2007 are as follows:
- The total number of eighth grade students.
- Audio-visual teaching aids for math.
- Calculators for teaching math.
- Audio-visual teaching aids for science.
- Calculators for teaching science.
- Students' attitudes towards preserving school facilities and equipment.
- Students' willingness in hardworking.
- Riots in the classroom.
- Cheating
- Insulting and abuse.
- Robbery
- Threatening and verbal abuse among students.
- Physical abuse towards other students.
- Threatening and verbal abuse towards teachers or staff including written words and e-mails.
- Physical abuse towards teachers and staff.
- Teachers' late arrival and early departure.
- Teachers' absence

The following factors for 2011 decline can be drawn through the school questionnaire which was filled by the school principal: The schools in 2011 were much more crowded than in 2007. The number of audio-visual aids as well as calculators for teaching math and science is very few in 2011. Students are also more careless towards school equipment and facilities in 2011 than in 2007. All other factors such as abuse , cheating , robbery ,riots, physical abuse have risen in 2011. Teachers' absence and their late arrival to schools and early departure to their homes has increased in 2011 compared to 2007.

2- Results of students' questionnaire

Common items of student's questionnaire in 2007 and in 2011 are identified. The averages of these common items were calculated using T-test for the independent samples. Table (128) shows the results of this test. The differences in 2011 which led to such a decline were in the following areas:

Table (128)
Results of student questionnaire in TIMSS 2007,2011

Item	Item No	Item	Average		Difference	Function level $\alpha = 0.05$
			2011	2007		
BSBG01	1	Are you a male or female ?	0.49	0.48	0.01	
BSBG03	3	How much Arabic do you speak at home?	2.60	2.63	0.03	
BSBG04	4	How many books do you have at home apart from magazines, newspapers and school textbooks?	56.22	62.24	6.02	▯
	5	Do you have any of the following at home?				▯
BSBG05A	a)	Computer	0.80	0.66	0.14	▯
BSBG05C	b)	A desk	0.67	0.63	0.04	▯
BSBG05E	c)	Internet	0.43	0.24	0.19	▯
BSBG05F	d)	Digital camera	0.34	0.31	0.03	▯
BSBG05G	e)	An automatic washing machine	0.65	0.69	0.04	▯
BSBG05H	f)	Central heating	0.33	0.28	0.05	▯
BSBG05I	g)	Air condition	0.43	0.32	0.11	▯
BSBG06A	6-أ	What is your mother's academic background or the one who plays her role in taking care of you?	2.25	2.01	0.24	▯
BSBG06B	6-ب	What is your father's academic or the one who plays his role in taking care of you?	2.39	2.14	0.25	▯
BSBG07	7	What is the highest academic level do you expect yourself to attain?	3.53	3.58	0.05	
	12	What is your opinion about your school?				
BSBG12A	أ)	I like to be at school	2.46	2.51	0.05	
	13	How often do the following happen to you this year?				
BSBG13A	أ)	Verbal insult	0.32	0.12	0.2	▯
BSBG13B	ب)	My colleagues exclude me from doing activities and playing	0.26	0.14	0.12	▯
BSBG13D	د)	My properties are stolen	0.28	0.19	0.09	▯
BSBG13E	ه)	Being hit , injured by other students	0.18	0.11	0.07	▯
BSBG13F	و)	Students forced me to do things I don't want to do	0.11	0.52	0.41	▯
	14	Regarding math, do you agree with the following ?to what extent?				
BSBM14A	أ)	I find it exciting to learn math	2.32	2.34	0.02	
BSBM14C	ب)	Learning math is boring	1.06	0.96	0.10	▯
BSBM14E	ج)	I like math	2.22	2.27	0.05	

Item	Item No	Item	Average 2011	2007	Difference	Function level $\alpha = 0.05$
	16	Regarding math, do you agree with the following ?to what extent?				
BSBM16A	(أ	I do very well in math	2.49	2.15	0.34	✓
BSBM16B	(ب	Learning math is more difficult for me than my colleagues	1.52	1.34	0.18	✓
BSBM16C	(ج	I am not so good at math	1.50	1.04	0.46	✓
BSBM16D	(د	I learn math quickly	2.26	2.10	0.16	✓
BSBM16J	(ه	Learning math will help me in my everyday life	2.67	2.70	0.03	✓
BSBM16K	(و	I have to learn math in order to understand other subjects	2.52	2.51	0.01	
BSBM16L	(ز	I have to do very well at math in order to join university	2.72	2.65	0.07	✓
BSBM16M	(ح	I have to do very well at math in order to access the job I want	2.62	2.55	0.07	✓
	17	Regarding science, do you agree with the following ?to what extent?				
BSBS17F	(ج	I like science	2.45	2.42	0.03	
	19	Regarding science, do you agree with the following ?to what extent?				
BSBS19A	(أ	I do very well in science	2.61	2.52	0.09	✓
BSBS19B	(ب	Learning science is more difficult for me than my colleagues	1.32	2.61	1.29	✓
BSBS19C	(ج	I am not so good at science	1.37	0.91	0.46	✓
BSBS19D	(د	I learn science quickly	2.42	2.22	0.20	✓
BSBS19J	(ه	Learning science will help me in my everyday life	2.69	2.64	0.05	✓
BSBS19K	(و	I have to learn science in order to understand other subjects	2.49	2.43	0.06	
BSBS19L	(ز	I have to do very well at science in order to join university	2.60	2.56	0.04	
BSBS19M	(ح	I have to do very well at science in order to access the job I want	2.50	2.48	0.02	
BSBM20A	**20-أ**	How much math homework does your teacher demand you?	3.15	3.30	0.15	
BSBM20B	**20-ب**	Once your math teacher assign you a homework, how much time do you spend for doing it?	24.60	30.94	6.34	✓
BSBS21A	**21-أ**	How much science homework does your teacher demand you?	2.67	2.96	0.29	✓
BSBS21B	**21-ب**	Once your science teacher assign you a homework, how much time do you spend for doing it?	24.52	30.32	5.8	✓

Fields of decline according to student's questionnaire:
- The number of books available at student's home.
- A desk or table for studying.
- An automatic washing machine at student's house.

- The highest academic level student expect to attain.
- Verbal insult.
- Being excluded from playing and doing activities.
- Student's properties are stolen.
- Being hit or injured by other classmates.
- Learning math is boring.
- Students' attitudes and motivation for learning math.
- Learning math is more difficult for me than my colleagues.
- Being not so good at math.
- Learning math will help students in their daily life.
- Being not so good at science.
- The time allocated for doing math homework.
- The number of science homework given to students.
- The time allocated for doing science homework.

The data concluded from student's questionnaire which was filled out by eighth grade students revealed the factors that witnessed actual change in 2011 in comparison with 2007 as follows:
In 2011, the existence of books, desks, and an automatic washing machine were better than in 2007.

Students in 2011 are less ambitious than students of 2007 as revealed in their expectations of their highest levels of education.

3- Results of math teacher questionnaire.

The common items of teacher's questionnaire in 2007 and in 2011 were identified, and the averages of the common items were calculated using T-test for the independent samples. Table (129) shows the results of this test. The real differences in 2011 which led to such a decline were in the following areas:
- Teacher's major specialization: education- math.
- Cooperation with teachers in planning and preparing for school subjects.
- Parents' participation in school activities.
- Students' respect of school equipment.
- Students' success at school.
- The safety of school location.
- Feeling secured at school.
- Overcrowded classrooms.
- The lack of convenient workplace (planning for lessons ,cooperation and meetings).
- The number of students per section.
- Naughty students.
- Careless students.
- Integrating what they learn to their daily life.
- Identifying teacher's own method in solving complex exercises.
- How many exams are done in the field of math ?

- Questions that need special mathematical procedures.
- In the last two years, did the teacher participate in professional development in the field of mathematical content?
- In the last two years, did the teacher participate in professional development in the field of math teaching methods?
- In the last two years, did the teacher participate in professional development in the field of math curriculum?
- In the last two years, did the teacher participate in professional development in the field of integrating technology and math?
- In the last two years, did the teacher participate in professional development in the field of improving critical thinking?
- In the last two years, did the teacher participate in professional development in the field of math assessment?
- Readiness towards teaching the relation between the 3-D shapes and representing them in a two-dimensional ones.

Table No (129)

Results of math teacher questionnaire in TIMSS 2007,2011

| Item | Item No | Item | Average | | Difference | Function level |
			2011	2007		$\alpha = 0.05$
BTBG01	1	How long have you been working as a teacher?	9.91	10.56	0.65	
BTBG02	2	Are you a male or female?	0.51	0.52	0.01	
BTBG03	3	How old are you ?	36.68	34.83	1.85	
BTBG04	4	What is the highest educational level you have attained through formal education?	3.85	3.91	0.06	
	5	What is your major at university ?				
BTBG05A	(أ	Math	0.89	0.86	0.03	
BTBG05F	(ب	Educational – math	0.18	0.44	0.26	⬚
BTBG05G	(ج	Educational – science	0.02	0.03	0.01	
BTBG05H	(د	Educational – general	0.04	0.21	0.17	⬚
BTBG05I	(ه	Other majors	0.05	0.18	0.13	⬚

	6	**How do you evaluate the following?**				
BTBG06A	(أ	Teachers' satisfaction about their work	2.66	2.61	0.05	
BTBG06B	(ب	Teachers' recognition of the curriculum objectives	3.08	2.91	0.17	⬚
BTBG06C	(ج	Degree of students' success in implementing school curriculum	2.99	2.87	0.12	
BTBG06D	(د	Teachers' expectations about students' attainment	2.58	2.54	0.04	
BTBG06E	(ﻫ	Parental support in school activities	1.73	1.63	0.10	
BTBG06F	(و	Parental participation in school activities	1.54	1.30	0.24	⬚
BTBG06G	(ز	Students' respect for school property	1.95	1.71	0.24	⬚
BTBG06H	(ح	Students' desire towards success	2.43	1.95	0.48	⬚
	7	**According to your current school situation , do you agree or disagree towards the following?**				
BTBG07A	(أ	The school is located in a safe area	2.49	2.31	0.18	⬚
BTBG07B	(ب	I feel secured in school	2.58	2.34	0.24	⬚
BTBG07C	(ج	Security procedures at school	2.23	2.17	0.06	
	8	**In your current school, what is the degree of seriousness towards** **the following problems?**				
BTBG08A	(أ	The school building needs maintenance	0.72	0.75	0.03	
BTBG08B	(ب	Overcrowded classrooms	1.01	1.25	0.24	⬚
BTBG08D	(ث	The lack of convenient workplace (planning for lessons ,cooperation and meetings).	0.90	1.21	0.31	⬚
	10	**What kind of interaction is there among teachers?**				
BTBG10A	(أ	Discussing how to teach a certain topic.	1.33	1.49	0.16	
BTBG10B	(ب	Cooperation in planning , and preparing educational materials.	1.07	1.33	0.26	⬚
BTBG10D	(ج	Class visits to exchange experiences in teaching	0.84	0.90	0.06	
BTBG12	12	The number of students in the classroom	35.38	32.99	2.39	⬚

	15	**In your opinion, to what extent do the factors hinder the teaching method for this section?**	1.83	1.78	0.05	
BTBG15D	(ج	Special needs students whether physical ,mental or psychological disability	1.93	1.97	0.04	
BTBG15E	(د	Naughty students	1.94	1.97	0.03	
BTBG15F	(ه	Careless students	1.95	1.94	0.01	
	19	Since you are teaching math for this section, how often do you have to repeat the following?				
BTBM19F	(ح	Applying facts, concepts, and procedures to solve mathematical problems.	1.88	1.89	0.01	
BTBM19G	(خ	Give proper explanations for mathematical exercises	1.84	1.93	0.09	
BTBM19H	(ط	Integrating what they learn to their daily life.	1.73	1.59	0.14	⍰
BTBM19I	(ي	Identifying their own method in solving problems.	1.89	1.93	0.04	
BTBM19J	(ك	Solving problems that have no direct clear method.	1.96	1.94	0.02	
BTBM21A	21-أ	Are students allowed to use the calculator?	1.80	1.74	0.06	
	21-ب	How often do students use the calculator in doing the following activities?				
BTBM21BA	ب.	Checking the answers	1.83	1.93	0.10	⍰
BTBM21BB	ب.	Doing mathematical calculations	1.84	1.79	0.05	
BTBM21BC	ب.	Doing complicated mathematical calculations	1.77	1.77	0	
BTBM21BD	ب.	Recognizing concepts related to numbers	1.83	1.78	0.05	
	22-ج	How often do you ask your students to use computers during math lessons?	1.93	1.97	0.04	
BTBM22CA	ج أ	Discovering mathematical concepts and principles	1.94	1.97	0.03	
BTBM22CB	ج ب	Practicing skills and procedures	1.95	1.94	0.01	
BTBM22CC	ج ج	Searching for ideas and information				
BTBM22CD	ج د	Processing and analyzing data	1.88	1.89	0.01	
	23	The following list consist of the main topics in TIMMS (math).Choose the item that has been fully				

		taught at school . In case the item has been taught before eighth grade or part of it has been taught in the first semester choose "it has been taught before" . If the topics are not included yet in the curricula choose "it has not been taught yet or it has not been included yet".				
	●	Numbers				
BTBM23AA	(أ	Doing calculations on integer numbers and rounding them .				
BTBM23AB	(ب	Concepts related to common fractions and the basic relevant calculations	1.73	1.59	0.14	⬚
BTBM23AC	(ج	Concepts related to decimal fractions and the basic relevant calculations	1.89	1.93	0.04	
BTBM23AD	(د	Natural numbers representation ,comparing and ordering them	1.96	1.94	0.02	
	●	**Algebra**	1.80	1.74	0.06	
BTBM23BA	(أ	Numerical , geometric , algebraic patterns and progression				⬚
BTBM23BB	(ب	Simplifying and calculating algebraic expressions	1.39	1.07	0.32	⬚
BTBM23BC	(ج	Linear equations and inequalities	1.35	1.21	0.14	⬚
BTBM23BE	(د	Representing functions in different ways.	1.28	1.03	0.25	⬚
	●	**Geometry**				
BTBM23CB	(أ	Angles' and geometric shapes' properties	1.33	1.57	0.24	⬚
BTBM23CC	(ب	Congruent triangles and similar triangles	0.72	0.81	0.09	
BTBM23CE	(ه	Representing points on Cartesian plane	1.69	1.02	0.67	⬚
BTBM23CF	(و	Rotation , reflection , translation	1.58	0.42	1.16	⬚
	●	**Data and probabilities**				
BTBM23DA	(أ	Representing data in tables, diagrams, bars, etc.	1.70	1.38	0.32	⬚
BTBM23DB	(ب	Interpreting data such as coming up with conclusions	1.20	0.74	0.46	⬚
BTBM23DC	(ج	Guessing the probabilities of results	1.33	0.59	0.74	⬚

	24	**What about the time allocated in percentage for each topic?**				
BTBM24A	(أ	Numbers including: integer , common fractions, percentage , decimal fractions , Ratios and proportions	26.0	24.9	1.1	
BTBM24B	(ب	Algebra (equation , patterns, functions)	25.9	27.0	1.1	
BTBM24C	(ج	Geometry (angles, shapes, etc.)	22.6	21.9	0.7	
BTBM24D	(د	Data and probabilities (organizing data and representing them)	16.0	13.1	2.91	⬚
BTBM24E	(ه	Other topics	9.5	13.2	3.7	⬚
	26	To what extent do you use the following resources to follow up students' progress in math				
BTBM26A	(أ	Ongoing assessment for students	1.67	1.62	0.05	
BTBM26B	(ب	Teacher- made classroom tests and readymade tests in the textbook	1.71	1.75	0.04	
BTBM26C	(ج	National and regional attainment tests	1.38	1.25	0.13	
BTBM27	27	How often do you test your students in math?	2.56	3.00	0.44	⬚
	28	Questions depending on memorizing procedures				
BTBM28A	(أ	Questions depending on implementing mathematical procedures	1.41	1.51	0.10	
BTBM28B	(ب	Questions depending on finding out patterns and relations	1.75	1.87	0.12	⬚
BTBM28C	(ج	Questions depending on justification and explanation	1.21	1.21	0	
BTBM28D	(د	Did you participate in professional development in the last two years ?	1.25	0.98	0.27	⬚
	29	Math content				
BTBM29A	(أ	Math teaching methods	0.24	0.57	0.33	⬚
BTBM29B	(ب	Math curriculum	0.36	0.78	0.42	⬚

BTBM29C	(ج	Integrating ICT in math	0.20	0.62	0.42	⍰
BTBM29D	(د	Improving critical thinking and problem solving skills	0.38	0.65	0.27	⍰
BTBM29E	(ه	Math assessment	0.40	0.67	0.27	⍰
	30	Are you ready to teach the following topics? In case the topic is not included in the 8th grade curriculum or if you are not responsible for teaching the topic choose " inapplicable"				
	●	**Numbers**				
BTBM30AA	(أ	Doing calculations on integer numbers and rounding them .	1.89	1.94	0.05	
BTBM30AE	(ه	Solving exercises on percentages and ratio and proportion	1.85	1.90	0.05	
	●	**Algebra**				
BTBM30BA	(أ	Numerical , geometric , algebraic patterns and progression	1.83	1.78	0.05	
BTBM30BB	(ب	Simplifying and calculating algebraic expressions	1.93	1.97	0.04	
BTBM30BD	(د	Simultaneous linear equations	1.94	1.97	0.03	
BTBM30BE	(ه	Representing functions in different ways.	1.95	1.94	0.01	
	●	**Geometry**				
BTBM30CA	(أ	Angles' and geometric shapes' properties	1.88	1.89	0.01	
BTBM30CB	(ب	Congruent triangles and similar triangles	1.84	1.93	0.09	
BTBM30CC	(ج	Representing points on Cartesian plane	1.73	1.59	0.14	⍰
BTBM30CD	(د	Using suitable measuring tools in calculating circumference and size of shapes	1.89	1.93	0.04	
BTBM30CE	(ه	Identifying points on Cartesian plane	1.96	1.94	0.02	
BTBM30CF	(و	Rotation , reflection , translation	1.80	1.74	0.06	
	●	Data and probabilities				
BTBM30DA	(أ	Representing data in tables, diagrams, bars, etc.	1.83	1.93	0.10	⍰

BTBM30DB	(ب	Interpreting data such as coming up with conclusions	1.84	1.79	0.05	
BTBM30DC	(ج	Guessing the probabilities of results	1.77	1.77	0	

The data included in the questionnaire which was filled by eighth grade Math teachers who participated in the study, revealed the following factors as causes of decline in 2011 compared with 2007, and these factors can be summarized as follows:

- Math teachers in 2011 were less qualified compared with their peers in 2007.
- Low degree of cooperation among Math teachers in the domains of planning and selection of teaching materials in 2011 compared with level of cooperation among their peers in 2007.
- Decline in parents' participation in school activities in 2011 compared with the level of their participation in 2007.
- Lack of students' loyalty to maintain school properties in 2011 compared with their loyalty in 2007.
- Decrease in students' interest and willingness to succeed in their study in 2011 compared with the level of their interest in 2007.
- High rate of schools situated in unsafe regions in 2011 compared with 2007, as well as the teachers' feeling of insecurity in these schools.
- Overcrowded classrooms and inconvenient work environment for teachers in 2011 compared with 2007.
- Increase in the number of students in the eighth grade in 2011 compared with 2007.
- High percentage of tiresome and careless students in 2011 compared with 2007.
- Math teachers in 2011 do not emphasize the correlation between Math and the real life situations and they do not focus on Math applications compared with their peers in 2007.
- Low participation of Math teachers in professional development in the content of this subject besides the poor utilization of teaching methods and techniques and inclusion of ICT in teaching Math compared with their peers in 2007.
- Lack of teachers' interest in enhancing students' critical thinking and assessing their learning achievement.

4- Results of the Science Teacher Questionnaire

The common items in 2007 and in 2011 were identified and the averages were calculated for all items. The difference between the two averages for every item in 2007 and in 2011 was calculated as well as the statistical significance for these differences using T test for the independent samples.

Table 130 shows the results of this analysis. The differences leading to this decline in 2011 compared to 2007 were in the following domains:

- Teachers' awareness of the curricula objectives as approved by your school.
- Level of teachers' ability to apply approved curricula.

- Students' loyalty to maintain school properties.
- Students' willingness to study and succeed.
- Location of the school in a safe region.
- Feeling safe in the school.
- Lack of convenient work environment for teachers (to prepare for the lessons or to hold meetings).
- Discussing how to teach a specific subject.
- Cooperating in planning and selecting teaching materials.
- How many students are in this section?
- Watching natural scenery and describe what they see.
- Preparing experiments and conducting research.
- Urging students to memorize mathematical facts and principles.
- Using scientific formulas and rules to solve ordinary mathematical problems.
- Providing explanations for mathematical problems.
- Linking what the students learn with the real and daily life.
- Do students in this section use computer/computers during Science lessons?
- Making scientific experiments.
- Continuous assessment of students' work.
- Classroom tests.
- Professional development in the content domain.
- Professional development regarding teaching methods and techniques.
- Professional development regarding ICT utilization.
- Professional development to enhance students' critical thinking and upgrade their research skills.
- Professional development in the domain of assessing Science subject.

Table (130)

Results of the Science Teacher Questionnaire in (2007-2011) in TIMSS

Item Code	Item No.		Average		Difference	Function Level $\alpha = 0.05$
			2011	2007		
BTBG01	1	How long have you been working as a teacher?	8.97	7.92	1.05	
BTBG02	2	Are you a male or female?	0.56	0.53	0.03	
BTBG03	3	How old are you?	33.47	33.66	0.19	
BTBG04	4	What is the highest educational level you have attained through formal education?	4.03	4.00	0.03	
	5	What is your major at university?				
BTBG05A	(ٔ	Math	0.07	0.53	0.46	￰

BTBG05B	(ب)	Biology	0.24	0.52	0.28	⍰
BTBG05C	(ج)	Physics	0.38	0.65	0.27	⍰
BTBG05D	(د)	Chemistry	0.26	0.62	0.36	⍰
BTBG05E	(ه)	Geology	0.15	0.36	0.21	⍰
BTBG05F	(و)	Educational-Math	0.02	0.06	0.04	
BTBG05G	(ز)	Educational-Science	0.27	0.37	0.10	
BTBG05H	(ح)	Educational-General	0.04	0.20	0.16	⍰
BTBG05I	(ط)	Other Majors	0.07	0.16	0.09	⍰
	6	How do you evaluate the following?				
BTBG06A	(أ)	Teachers' satisfaction about their work	2.63	2.50	0.13	
BTBG06B	(ب)	Teachers' recognition of the curriculum objectives	2.79	3.02	0.23	⍰
BTBG06C	(ج)	Degree of students' success in implementing school curriculum	2.76	2.98	0.22	⍰
BTBG06D	(د)	Teachers' expectations about students' attainment	2.52	2.62	0.10	
BTBG06E	(ه)	Parental support in school activities	1.65	1.84	0.19	
BTBG06F	(و)	Parental participation in school activities	1.43	1.61	0.18	
BTBG06G	(ز)	Students' respect for school property	1.70	2.03	0.33	⍰
BTBG06H	(ي)	Students' desire towards success	2.02	2.51	0.49	⍰
	7	According to your current school situation , do you agree or disagree towards the following?				
BTBG07A	(أ)	The school is located in a safe area	2.21	2.41	0.2	⍰
BTBG07B	(ب)	I feel secured in school	2.33	2.57	0.24	⍰
BTBG07C	(ج)	Security procedures at school	2.13	2.22	0.09	
	8	In your current school, what is the degree of seriousness towards the following problems?				
BTBG08A	(أ)	The school building needs maintenance	0.71	0.74	0.03	
BTBG08B	(ب)	Overcrowded classrooms	1.16	1.09	0.07	
BTBG08D	(ج)	The lack of convenient workplace (planning for lessons ,cooperation and meetings).	1.10	0.94	0.16	⍰

	10	What kind of interaction among teachers?				
BTBG10A	(أ	Discussing how to teach a certain topic?	1.62	1.40	0.22	⍰
BTBG10B	(ب	Cooperation in planning, and preparing educational materials?	1.72	1.16	0.56	⍰
BTBG10D	(ج	Class visits to exchange experiences in teaching	0.74	0.86	0.12	
BTBG12	**12**	The number of students in the classroom	35.37	33.13	2.24	⍰
	15	In your opinion, to what extent do the factors hinder the teaching method for this section?				
BTBG15D	(ج	Students with special needs(such as physical and mental disabilities, psychological disorders).	0.84	0.89	0.05	
BTBG15E	(د	Tiresome and troublesome students	1.09	1.05	0.04	
BTBG15F	(ه	Careless students	1.16	1.16	0	
	19	**To what extent do you usually ask students to do the following during Science lessons?**				
BTBS19A	(أ	Watch natural phenomenon and describe what they see.	1.68	2.14	0.46	⍰
BTBS19B	(ب	Watch you while you are explaining an experiment or how to make a research.	2.24	2.29	0.05	
BTBS19C	(ج	Prepare to make an experiment or a research.	1.73	1.44	0.29	⍰
BTBS19D	(د	Make experiments or researches.	1.76	1.74	0.02	
BTBS19E	(ه	Read textbooks or other learning resources.	1.89	1.95	0.06	
BTBS19F	(و	Ask students to memorize facts and principles.	2.19	2.63	0.44	⍰
BTBS19G	(ز	Use scientific formulas and rules to solve ordinary problems.	2.23	2.64	0.41	⍰
BTBS19H	(ح	Provide explanations for problems.	2.13	2.69	0.56	⍰
BTBS19I	(ط	Link what they learn with real life situations.	2.42	2.73	0.31	⍰
BTBS21A	**21-أ**	**Are computers available for utilization during Science lessons?**	0.82	0.51	0.31	⍰
BTBS21B	**21-ب**	**Is a computer linked to the Internet.**	0.93	0.77	0.16	
	21-ج	**How many times do you ask students to do their activities on the computer during Science lessons?**				

BTBS21CA	أ ج	Do exercises related to skills and procedures.	1.38	1.22	0.16	
BTBS21CB	ب ج	Look for ideas and information.	1.82	1.65	0.17	
BTBS21CC	ج ج	Do scientific experiments.	1.15	1.52	0.37	⬛
BTBS21CD	د ج	Study natural phenomenon through simulation.	1.34	1.15	0.19	
BTBS21CE	هـ ج	Data processing and analysis.	1.16	1.33	0.17	
	22	**Choose the answer that relates to the time allocated for each subject, and if this subject was part of the school textbook before the eighth grade, answer: it was taught before this year". If the subject was taught during the first semester, answer "most of it was taught this year" and if it was introduced after that, answer "it has not been taught yet or included recently".**				
	●	**Biology**				
BTBS22AA	(أ	Body organs(structure, function and stable health of the body).	1.58	1.42	0.16	
BTBS22AB	(ب	Cells and their functions, including respiration and photosynthesis as related to cells' operations.	1.57	1.18	0.39	⬛
BTBS22AC	(ج	Reproduction (sexual and asexual) and genetics (inherited characteristics and traits compared with acquired /learned characteristics).	1.42	1.18	0.24	⬛
	●	**Chemistry**				
BTBS22BA	(أ	Matter classifications, its composition and structure (elements, compounds, mixtures, molecules, atoms, protons, neutrons and electrons).	1.33	1.40	0.07	
BTBS22BB	(ب	Solutions (solvent soluble material, concentration of the substance and mitigating the effect of temperature on the solubility).	1.44	1.32	0.12	
BTBS22BC	(ج	Characteristics of common Acid and Base solutions .	1.26	0.95	0.31	⬛
BTBS22BD	(د	Chemical transformation (material interaction, evidence of chemical transformation, maintaining the matter and common oxidation reactions - such as combustion, rust and pollution).	1.29	1.18	0.11	
	●	**Physics**				

BTBS22CA	(أ	Physical states of the matter and related transformation relating thereto (characteristics regarding atoms' motion and the distance between them , the transformation of the state , thermal expansion and other changes in the size and / or pressure.	1.36	1.37	0.01	
BTBS22CB	(ب	Forms and transformations of energy and transformations, temperature and its degrees.	1.49	1.19	0.3	▨
BTBS22CC	(ج	Characteristics and traits of light (reflection and refraction of light , colors and graphic of simple radiation) and sound (traveling through media and sound module, degree and its frequency and speed).	1.11	1.13	0.02	
BTBS22CD	(د	Electric circuit (current flow, types of circuits, and the relationship between the current / voltage) and the characteristics of the permanent magnets and electric magnets and methods of utilization.	0.91	1.04	0.13	▨
BTBS22CE	(ه	Powers and motion (types of powers and a basic description of the motion and the effects of density and pressure).	1.30	1.10	0.2	▨
	●	**Geology**				
BTBS22DA	(أ	Structure and its topography (the earth's crust, nucleus and water formation, percentage of its distribution and air composition).	1.37	1.17	0.2	▨
	23	**By the end of this year, what is the percentage of time allocated to teach this section for all topics related to Science content?**				
BTBS23A	(أ	Biology (such as structure / function, life developments, breeding / genetics, natural evolution , ecosystems and human health).	22.6	20.7	1.9	▨
BTBS23B	(ب	Chemistry (such as matter classification and characteristics of chemical transformation).	24.9	26.5	1.6	
BTBS23C	(ج	Physics (such as natural states/matter transformation, light, sound, electricity and magnetism, powers and motion).	30.0	30.7	0.7	
BTBS23D	(د	Biology (such as the structure of the earth , evolution and resources, the solar system and the universe).	16.5	15.8	0.7	
BTBS23E	(ه	Other topics	5.8	6.3	0.5	
	25	**To what extent do you focus on the following to follow up**				

		students' progress in learning Science?				
BTBS25A	(أ	Continuous evaluation of students' work.	1.50	1.68	0.18	⬜
BTBS25B	(ب	Classroom tests (prepared by teachers or included in textbooks).	1.66	1.80	0.14	⬜
BTBS25C	(ج	National /regional tests relating to students' achievement.	1.35	1.37	0.02	
BTBS26	**26**	**How many times do you make Science tests for this section?**	2.52	2.90	0.38	⬜
	27	**How many times do you include the following questions in Science tests?**				
BTBS27A	(أ	Questions based on recognizing concepts and facts.	1.65	1.56	0.09	
BTBS27B	(ب	Questions based on implementation of knowledge and understanding.	1.79	1.71	0.08	
BTBS27C	(ج	Question restricted to hypothesis and design of scientific research.	1.00	0.90	0.10	
BTBS27D	(د	Questions based on explanations and justifications.	1.43	1.27	0.16	⬜
	28	**Have you participated in professional development in one of the following domains over the last two years?**				
BTBS28A	(أ	Science content.	0.25	0.58	0.33	⬜
BTBS28B	(ب	Education/ Methods of teaching Science.	0.42	0.78	0.36	⬜
BTBS28C	(ج	Syllabus of Science.	0.25	0.66	0.41	⬜
BTBS28D	(د	ICT inclusion in Science.	0.32	0.59	0.27	⬜
BTBS28E	(ه	Development students' critical thinking and their research skills.	0.50	0.74	0.24	⬜
BTBS28F	(و	Assessment of Science content.	0.33	0.54	0.21	⬜
	29	**Are you prepared to teach the following topics related to Science? If this topic is not part of the eighth grade syllabus or if you are not responsible for teaching this topic, answer "inapplicable".**				
	●	**Biology**				
BTBS29AA	(أ	Body organs(structure, function and stable health of the body).	1.64	1.77	0.13	⬜

BTBS29AB	(ب	Cells and their functions, including respiration and photosynthesis as related to cells' operations.	1.65	1.78	0.13	⍰
BTBS29AC	(ج	Reproduction (sexual and asexual) and genetics (inherited characteristics and traits compared with acquired /learned characteristics).	1.63	1.81	0.18	⍰
	●	**Chemistry**				
BTBS29BA	(أ	Matter classifications, its composition and structure (elements, compounds, mixtures, molecules, atoms, protons, neutrons and electrons).	1.85	1.77	0.08	
BTBS29BB	(ب	Solutions (solvent soluble material, concentration of the substance and mitigating the effect of temperature on the solubility).	1.77	1.68	0.09	
BTBS29BC	(ج	Characteristics of common Acid and Base solutions .	1.55	1.79	0.24	⍰
BTBS29BD	(د	Chemical transformation (material interaction, evidence of chemical transformation, maintaining the matter and common oxidation reactions - such as combustion, rust and pollution).	1.81	1.76	0.05	
	●	**Physics**				
BTBS29CA	(أ	Physical states of the matter and related transformation relating thereto (characteristics regarding atoms' motion and the distance between them , the transformation of the state , thermal expansion and other changes in the size and / or pressure.	1.75	1.77	0.02	
BTBS29CB	(ب	Forms and transformations of energy and transformations, temperature and its degrees.	1.78	1.81	0.03	
BTBS29CC	(ج	Characteristics and traits of light (reflection and refraction of light , colors and graphic of simple radiation) and sound (traveling through media and sound module, degree and its frequency and speed).	1.75	1.67	0.08	
BTBS29CD	(د	Electric circuit (current flow, types of circuits, and the relationship between the current / voltage) and the characteristics of the permanent magnets and electric magnets and methods of utilization.	1.69	1.67	0.02	
BTBS29CE	(ه	Powers and motion (types of powers and a basic description of the motion and the effects of density and pressure).	1.75	1.64	0.11	
	●	**Geology**				

BTBS29DA	(أ	Structure and its topography (the earth's crust, nucleus and water formation, percentage of its distribution and air composition).	1.46	1.78	0.32	⍰
BTBS29DD	(د	The Earth as part of the solar system and the universe (natural phenomenon, the day, the night, the lunar eclipse , seasons and the Earth's natural characteristics compared with other objects and the sun as a star.	1.54	1.67	0.13	⍰

The data provided by the questionnaire filled by eighth grade Science teachers who participated in the study, revealed the following factors as causes of decline in 2011 compared with 2007, and these factors can be summarized as follows:

- The understanding of the Science teachers of the objectives of the subject curricula in 2011 was low compared with their peers in 2007.
- Science teachers in 2011 also were less successful than their peers in 2007 in the applications of school curricula.
- Students in 2011 were less loyal to maintain school properties compared with 2007, and their interest to succeed in school was also less than their colleagues in 2007.
- Schools in 2011 were less safe compared with the situation in 2007, and teachers of Science said they felt insecure in 2011 compared with 2007.
- Teachers in 2011 work in less convenient location compared with 2007, and the level of cooperation among them was low compared with 2007.
- Overcrowded classrooms in 2011 compared with 2007.
- Teachers in 2011 do not give students the opportunity to: watch natural scenery compared with 2007, conduct experiments and research, participate in problem solving, and link what they learn with real life style.
- Utilization of computers in Science lessons was low in 2011 compared with 2007.
- Science teachers in 2011 do not focus on continuous assessment of students' work and they are less interested in conducting class tests compared with their colleagues in 2007.
- Low rate of teachers' participation over the last two years in training courses related to professional development in the domain of content and teaching methods, ICT inclusion in teaching, enhancing critical thinking, and students' assessment.

Derived Variables
TIMSS study derived new standards based on a set of items, and these indicators or benchmarks are characterized by a higher degree of validity and reliability compared with the constituent items. The common indicators between 2007, 2011 were identified, and the averages of all indicators were calculated. The difference between the two averages for each indicator was also calculated in 2007 and in 2011 as well as the statistical significance of these differences using T-test for independent samples. Table (131) shows the results of this analysis. The differences leading to the decline in 2011 compared with 2007, and this applies to the following:

- Time spent by students to do their Math homework.
- Time spent by students to do their Science homework.
- The number of hours devoted to teaching Science in one scholastic year.
- Cooperation among Math teachers to improve and upgrade education.
- The feeling of safety and security and the school system from the viewpoint of a Math teacher.
- Teachers' willingness to teach data from the viewpoint of a Math teacher.
- The number of hours devoted to teaching Math in one scholastic year.
- Cooperation among science teachers to improve and upgrade education.
- The feeling of safety and security and the school system from the viewpoint of a Science teacher.
- The number of hours devoted to teaching Science in one scholastic year.

The derived indicators provided by the study suggest the following causes as difference factors in 2011 compared with 2007, and they can be summarized as follows:

-Students spend less time in doing their Math and Science homework in 2011 compared with 2007.

- The number of hours devoted to teach Math and Science in 2011 was less than hours allocated to these subjects in 2007.

- The degree of cooperation among Math and Science teachers in 2011 was less than the degree of cooperation among them in 2007.

- It seems that the school environment from the point of view of Science and Math teachers of the eighth grade was safer in 2007 compared with 2011.

Table (131)
Derived Variables for 2007-2011 in TIMSS

Variable	Variable Text	Average		Difference	Significance $\alpha = 0.05$
		2007	2011		
Student Questionnaire					
BSDMWKHW	Time spent by students to do their Math homework.	1.14	0.59	0.55	⍰
BSDSWKHW	Time spent by students to do their Science homework.	1.01	0.47	0.54	⍰
School Questionnaire					
BCDGSRS	Impact of shortage in teaching materials for Science.	1.12	1.01	0.11	⍰
BCDGMRS	Impact of shortage in teaching materials for Math.	1.16	1.01	0.15	⍰
BCDG06HY	number of hours devoted to teaching in one scholastic year.	1102.66	1041.08	61.58	⍰
Math Teacher Questionnaire					

Variable	Variable Text	Average		Difference	Significance $\alpha = 0.05$
		2007	2011		
BTDGCIT	Cooperation among Math teachers to upgrade education.	1.29	1.10	0.19	▯
BTDGTWC	Work environment for Math teacher.	1.39	1.30	0.09	
BTDGSOS	School safety and security from the viewpoint of Math teacher.	1.70	1.29	0.41	▯
BTDM30NU	Readiness of Math teachers to teach numbers.	94.11	91.59	2.52	
BTDM30AL	Readiness of Math teachers to teach Algebra.	91.67	92.46	0.79	
BTDM30GE	Readiness of Math teachers to teach Geometry.	84.90	87.09	2.19	
BTDM30DT	Readiness of Math teachers to teach data.	83.75	51.19	32.56	▯
BTDMYIT	Number of hours devoted to teach Math in one scholastic year.	141.35	129.78	11.57	▯
Science Teacher Questionnaire					
BTDGCIT	Cooperation among Science teachers to upgrade education.	1.38	1.15	0.23	▯
BTDGTWC	Work environment for Science teacher.	1.33	1.28	0.05	
BTDGSOS	School safety and security from the viewpoint of Science teacher	1.68	1.26	0.42	▯
BTDS29BI	Readiness of Science teachers to teach Biology.	78.61	68.20	10.41	▯
BTDS29CH	Readiness of Math teachers to teach Chemistry.	76.85	83.60	6.75	
BTDS29PH	Readiness of Math teachers to teach Physics.	78.69	77.71	0.98	
BTDS29ES	Readiness of Math teachers to teach Geology.	65.25	67.35	2.1	
BTDSYIT	Number of hours devoted to teach Science in one scholastic year	140.95	133.83	7.12	▯

To get indicators with acceptable degree of validity and reliability, the following indicators were derived from the study questionnaires:
1. Economic and social level
2. Students' problems
3. Good teaching
4. Teaching obstacles
5. Teacher's problems
6. School problems
7. Using computer

For more information on the items that these indicators included, see Annex (4) as shown. Table (132) shows the correlation coefficients for these indicators with the achievement in

math by year. The correlation coefficients show negative correlation between any of the following indicators: The students' problems, teaching obstacles, teachers problems, and the school problems and achievement in math in 2007 and in 2011, and they were all statistically significant at (α = 0,01)

Table (132)
Correlation of the indicators in Math by Year

Indicator	Year	
	2007	**2011**
Economic and social level	.234**	.293**
Students' problems	-.029**	-.217**
Good teaching	.047**	.055**
Teaching obstacles	-.144**	-.023**
Teacher's problems	-.104**	-.103**
School problem	-.133**	-.041**
Using computer	.061**	.008**

Correlation is statistically significant at (α = 0,01)

Moreover, the coefficients correlation between any of the following indicators were positive: Economic and social level, good teaching, the use of computers and achievement in math in both years of the study 2007.2011 and all of which were statistically significant at (α = 0.01). These indicators are can be ordered according to the strength of the relationship between them and achievement starting from the strongest to the weakest in 2007 as follows:

Economic and social levels, teaching obstacles, school's problems, teacher's problems, using computers, good teaching, and students' problems. In 2011,the order was as follows: Economic and social level, students' problems, teacher's problems, good teaching, school's problems, teaching obstacles, the use of computers.

To find out the relative importance of these indicators and their impact on the achievement in math, multiple regression analysis was used, where all indicators were introduced in the model as independent variables and achievement in mathematics as dependent variable. Table (133) shows the results of this analysis.

Table (133) shows that the teaching obstacles indicator was not statistically significant at (α=0.01) in 2011, while all other indicators were statistically significant. In 2007, all indicators were statistically significant at (α=0.01).

Table (133)
Multiple Regression Coefficients for Standardized and Non Standardized Indicators and the Standard Error and T- Value and its Statistical Significance in Math by Year

Indicator	2007					2001				
	Non Standardized Coefficient		Standardized Coefficient	T-Value	Statistical Significance	Non Standardized Coefficient		Standardized Coefficient	T- Value	Statistical Significance
	B	Standard Error	Beta			B	Standard Error	Beta		
Fixed	437.522	1.264		346.025	.000	381.893	1.196		319.233	.000
Economic	9.448	.148	.193	63.62	.000	12.314	.129	.270	95.563	.000

	B	Std. Error	Beta	t	Sig	B	Std. Error	Beta	t	Sig
and social levels				4						
teaching obstacles	-3.629	.289	-.037	-12.580	.000	-14.599	.211	-.195	-69.100	.000
school's problems	4.456	.301	.044	14.782	.000	3.148	.293	.030	10.745	.000
teacher's problems	-20.889	.504	-.125	-41.464	.000	-.418	.571	-.002	-.732	.464
using computers	-5.602	.323	-.053	-17.339	.000	-9.313	.353	-.075	-26.394	.000
good teaching	-2.351	.097	-.077	-24.131	.000	-.927	.069	-.038	-13.370	.000
students' problems	3.387	.617	.017	5.486	.000	2.723	.555	.014	4.905	.000
R2	.083					.135				

The descending order of the indicators in terms of their relative importance in 2007 was as follows: economic and social levels, teaching obstacles, school's problems, teacher's problems, good teaching, students' problems and using computers,. In 2011 the indicators' order was as follows: economic and social level, students' problems, teacher's problems, school's problems, good teaching, using computers.

The difference of the relative importance of these indicators and the value of the Standardized Coefficient beta B indicate that the impact of students' problems on the achievement increased in 2011, five times more than it was in 2007. This might reflect one of the decline factors in math achievement. The impact of teacher's problems on achievement increased in 2011, one and half times than it was 2007. This also indicates that the teacher's problems might be another factor in math achievement.

Table (134) shows the coefficients correlation for these indicators with science achievement by year. The coefficients correlation showed negative relation among any of the following indicators: students problems, teaching obstacles, teacher's problems, school problems on one hand and the achievement in science on the other hand in 2007 and in 2011, and all were statistically significant at ($\alpha = 0.01$). The coefficients correlation were positive among any of the following indicators: economic and social levels, good teaching, using computers on one hand and the achievement in science on the other hand in 2007 and in 2011 and were statistically significant at ($\alpha = 0.01$) except for good teaching that was not statistically significant in 2007.

Table (134)

Correlation of the indicators in Science by Year

Indicator	Year	
	2007	**2011**
Economic and social level	.241**	.223**
Students' problems	-.095**	-.240**

Good teaching	.020	.041**
Teaching obstacles	-.021**	-.066**
Teacher's problems	-.044**	-.173**
School problem	-.142**	-.096**
Using computer	.044**	.010**

**Correlation is statistically significant at (α = 0,01)

These indicators are can be ordered according to the strength of the relationship between them and achievement in science starting from the strongest to the weakest in 2007 as follows: Economic and social levels, school's problems, students' problems, teacher's problems, using computers, teaching obstacles, good teaching. In 2011,the order was as follows: Students' problems, economic and social level, teacher's problems, school's problems, teaching obstacles, good teaching and the use of computers.

To find out the relative importance of these indicators and their impact on the achievement in science, multiple regression analysis was used, where all indicators were introduced in the model as independent variables and the achievement in science as a dependent variable. Table (135) shows the results of this analysis.

Table (135) shows that the good teaching indicator was not statistically significant at (α=0.01) in 2007, while all other indicators were statistically significant. In 2011, all indicators were statistically significant at (α=0.01).

Table (133)
Multiple Regression Coefficients for Standardized and Non Standardized Indicators and the Standard Error and T- Value and its Statistical Significance in Science by Year

Indicator	2007					2001				
	Non Standardized Coefficient		Standardized Coefficient	T- Value	Statistical Significance	Non Standardized Coefficient		Standardized Coefficient	T- Value	Statistical Significance
	B	Standard Error	Beta			B	Standard Error	Beta		
Fixed	472.801	1.119		422.549	.000	470.748	1.188		396.112	.000
Economic and social levels	10.786	.143	.229	75.375	.000	9.086	.132	.198	68.925	.000
teaching obstacles	-8.448	.279	-.090	-30.257	.000	-15.584	.215	-.207	-72.432	.000
school's problems	.312	.216	.004	1.448	.148	1.148	.193	.018	5.950	.000
teacher's problems	-2.029	.375	-.016	-5.417	.000	-5.757	.328	-.050	-17.577	.000
using computers	1.564	.285	.017	5.493	.000	-12.950	.296	-.129	-43.801	.000
good teaching	-3.965	.108	-.116	-36.549	.000	-2.630	.096	-.080	-27.472	.000
students' problems	+1.554	.590	+.008	-2.631	.009	+.534	.565	-.003	+.944	.345
R2	.081					.129				

The descending order of the indicators in terms of their relative importance in 2007 was as follows: economic and social levels, school's problems, teaching obstacles, students' problems,

teacher's problems, teaching obstacles, using computers and good teaching. In 2011, the indicators' order was as follows: students' problems, economic and social level, teacher's problems, school's problems, teaching obstacles, good teaching, and using computers.

The difference of the relative importance of these indicators and the value of the Standardized Coefficient beta B indicate that the impact of the teacher's problems on the achievement in science increased in 2011, seven times more than it was in 2007. Moreover, the impact of students' problems increased almost twice in 2011 than in 2007 while the impact of teaching obstacles in 2011 increased about three times than it was in 2007.

These results show that the following factors are proposed decline factors in science achievement in 2011 compared to 2007: teacher's problems, students' problems, and teaching obstacles. Furthermore, TIMSS and NAfKE studies agreed that the teacher's problems is a highly proposed factor in the students' achievement in 2011 than it was in 2007.

Table (134) shows the coefficients correlation for these indicators with science achievement by year. The coefficients correlation showed negative relation among any of the following indicators: students problems, teaching obstacles, teacher's problems, school problems on one hand and the achievement in science on the other hand in 2007 and in 2011, and all were statistically significant at ($\alpha = 0.01$). The coefficients correlation were positive among any of the following indicators: economic and social levels, good teaching, using computers on one hand and the achievement in science on the other hand in 2007 and in 2011 and were statistically significant at ($\alpha = 0.01$) except for good teaching that was not statistically significant in 2007.

Chapter Seven
Conclusions and Recommendations

For more than two decades, Jordan has always been keen on participating in international studies. This participation was for the first time in 1991, and continues until the present time. These studies provide good opportunity to assess education quality by comparing our educational system with educational systems of the participating countries and to benefit from their experiences in developing the Jordanian educational system and improving students' learning achievement. Jordan has already taken part in these international studies in 1991, 1999, 2003, 2007, 2011 and got the following ranks in Math:

18 out of a total of 19 countries in 1991.

32 out of a total of 38 countries in 1999.

33 out of a total of 46 countries in 2003.

31 out of a total of 49 countries in 2007.

35 out of a total of 45 countries in 2011.

In Science students' performance was:

18 out of a total of 19 countries in 1991.

30 out of a total of 38 countries in 1999.

26 out of a total of 46 countries in 2003.

20 out of a total of 49 countries in 2007.

28 out of a total of 45 countries in 2011.

At the Arab level, Jordan came in the first rank in Science in 1999, 2003, 2007. However, Jordan ranked third in the last study conducted in 2011. In Math, Jordan got the second rank in 1999, 2003, and 2007, but ranked sixth in the last study conducted in 2011.

The findings of the study showed a decline of (21) points in Math and (33) points in Science at the country's level by comparing the results of the last two sessions of the study (2007 and 2011).

The decline size varied according to gender, school location and the supervising authority. The decline of male students' performance was 25 points in Math and 38 points in Science, whereas for the females it was less at 18 points in Math and 28 points in Science. It is worth mentioning that the performance of females in these two subjects was better than their male peers in 2007 and 2011.

Regarding the school location, the figures show that there was a decrease of (17 points) in the performance of students living in urban areas in Math and a decline of (27 points) in Science. As for students living in rural areas, the decline was higher at (40) points in Math and (54) points in Science. It is worth mentioning that the performance of students in the urban areas was better than those in rural areas in 2007 and 2011 regardless of the subject. Regarding the supervising authority, the highest decline was at the UNRWA students at (57) points in Math and (59) points in Science, followed by the MoE schools at (18) points in Math and (32) points in Science. The lowest decline was in the private schools as the students' performance fell only at (17) points in Math and at (22) points in Science.

The study explored the causes and factors that led to such decline by identifying the variables with statistically significant changes in 2007 and 2011. This decline could be attributed to the following:

1. **General factors**: These factors were derived from more than one item in order to be a more valid and reliable measurement for the trait we plan to measure. These include:
   - Students' attitudes towards Math and Science were better in 2007 compared with 2011.
   - There was a decline in the number of hours allocated for teaching Math and Science in 2011 compared with 2007.
   - There were less available resources to teach Math and Science in 2011 compared with their availability in 2007.
   - Low percentage of computers' utilization in teaching Math and Science in 2011 compared with 2007.
   - The level of security and safety at the school is lesser in 2011 compared with 2007.
   - The lack of seriousness of students in 2011 to answer Math test questions, since the percentage of students' performance in Math was below the standard or equal to 18%. It should be noted that this percentage may reflect their obvious weakness in Math, as most of them gave inappropriate answers to the questions.
   - Students spend less time in doing their Math and Science homework in 2011 compared with 2007.
   - Cooperation among teachers in 2011 was poor compared with 2007.

2. **Factors related to schools:** These factors were derived from the school questionnaire which was filled by the school principal.
   - Schools in 2011 were more crowded compared with 2007.
   - Less Visual and audio resources for teaching Math and Science in 2011 compared with 2007.
   - There was an increase in the number of students who make troubles in classrooms and cheat in exams besides the verbal abuse towards their teachers in 2011 compared with 2007.
   - Absence among teachers, teachers' late arrival to school and early leave were higher in 2011 compared with 2007.

3. **Factors related to teachers**: These factors were derived from the Math and Science teachers questionnaires.

   Math teacher questionnaire:
   - Math teachers in 2011 were less qualified compared with 2007.
   - Poor participation of students' parents in school activities in 2011 compared with 2007.
   - Decline in the level of students' loyalty to maintain school properties in 2011 compared with 2997.
   - Students' willingness to pass in Math test became lower in 2011 compared with 2007.
   - Low percentage of school security and safety in 2011 compared with 2007 as well as the feeling of insecurity of Math teachers.

- Overcrowded classrooms and inconvenient place for learning in 2011 compared with 2007.
- Higher rate of tiresome and careless students in 2011 compared with 2007.
- Math teachers are less interested in linking Math with real life situations in 2011 compared with their peers in 2007.
- Math teachers give less focus on Math applications compared with their peers in 2007.
- Low level of Math teachers' participation in the professional development activities (relating to Math content, teaching methods and techniques and ICT inclusion) in 2011 compared with 2007.
- Math teachers' interest to enhance critical thinking and students' achievement assessment is declining in 2011 compared with 2007.
- Math teachers' readiness in 2011 to teach some mathematical topics such as the relationship between the three-dimensional shapes and their representation in two dimensions was below its level in 2007.

Science Teacher Questionnaire
- Science teachers' understanding of the curricula objectives in 2011 is below its level in 2007.
- Science teachers are less successful and skilful in applying approved curricula in 2011 compared with their peers in 2007.
- Students' willingness to pass in Science test became lower in 2011 compared with 2007.
- Decline in the level of students' loyalty to maintain school properties in 2011 compared with 2007.
- Low percentage of school security and safety in 2011 compared with 2007 as well as the feeling of insecurity of Math teachers.
- Overcrowded classrooms and inconvenient place for learning in 2011 compared with 2007.
- Science teachers are less interested in giving students the opportunity to: watch natural scenery, make experiments and conduct research, explain the problems they learn and link what they learn with real life situations in 2011 compared with 2007.
- Low level of Science teachers' participation in the professional development activities (relating to Math content, teaching methods and techniques and ICT inclusion) in 2011 compared with 2007.
- Science teachers' interest to enhance critical thinking and students' achievement assessment is declining in 2011 compared with 2007.
- Fewer computers were available for utilization in teaching Science in 2011 compared with 2007.
- Science teachers do not give much interest to continuous assessment of students' performance and class tests in 2-11 compared with 2007.

4. **Factors related to students:** These factors were derived from the student questionnaire.
   - Students in 2011 were less optimistic in 2011 compared with their peers in 2007.

- Students in 2011 were exposed to insult, ridicule or verbal abuse, theft and were beaten by their colleagues in a much higher degree in 2011 compared with 2007.
- Students in 2011 are less interested in learning Math compared with their peers in 2007.
- More students in 2011 think that Math is a boring subject compared with their peers in 2007.
- Students in 2011 spend less time in doing their homework compared with 2007.

It is worth mentioning that 2011 witnessed unusual conditions that affected the learning environment and students' discipline.

Actually, the data provided by TIMSS study showed that there are proposed factors behind the dramatic decline in students' results relating to students, their families, teachers, principals, schools and the community. It is imperative that we exert intensive efforts to get out from this dilemma since the investment of Jordan is its human resources. Therefore, all teachers, principals, administrators, students, the local community and the Ministry of Education are invited to plan actively to address this imbalance. It is also a must that all parts of the Ministry of Education, its policy makers, planners, and other stakeholders, take these decline factors into consideration to design realistic, applicable, and relevant and logical policies to restore the strength and soundness of our educational system at the Arab level and achieve satisfactory ranks at the international level. The NCHRD has developed an initial plan to support the MoE in taking the necessary measures to seriously participate in the international upcoming participation in the study. (See annex 3).

The findings of the study revealed that female students' performance in Math and Science was better than males in 199, 2003, 2007 and 2011 respectively. Given that the curricula are the same for male and females, the Ministry has to explore the cause of this decline and see the reason behind the difference in their performance. The problem could be related to the quality of teachers and school administrative staff in the boys' schools.

It is also advisable to study the gap between the performance of male and female students by focusing on collecting qualitative data besides the quantitative data. Moreover, the study showed that the students' results in Math and Science in rural areas was better than in the urban areas .Nonetheless, schools in rural areas are still in need of more support to reach the level of the schools in the urban areas. The provision of qualified teachers requires providing teachers with incentives to retain them and encourage them to stay in rural schools. It was also clear from the findings that the results of students in Math and Science in the private schools in 2011 were better than their peers in the MoE schools, and the students' performance in the UNRWA schools in 2011 was higher than the MoE schools in Math and science.

Generally, the MoE schools should benefit from the expertise of the private schools to upgrade students' education level and apply a systematic monitoring and accountability process at public schools.

TIMSS provides a huge database collected from students, teachers and school administrators, and this data is distinguished with its high quality in terms of validity and reliability in addition to its relevance to international comparisons. It is imperative that researchers in universities and research centers conduct further analysis and study available database to enable decision-makers and educational policy planners to introduce the required educational innovations.

Such innovations will hopefully help upgrade our educational system, stop the decline in students' results and develop their performance levels.

Annexes

Annex (1): Performance Averages and Schools Ranks in Math and Science and in both Subjects in TIMSS 2011

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Patriarch Diodoros 1st	Aqaba	Private Sector	553	596	575	1	1	1
Amawi Neighborhood Secondary School	Amman Center	MoE	532	586	559	5	2	2
Islamic Scientific College / females / Jabal Amman	Amman Center	Private Sector	533	563	548	4	5	3
Alittihad / females / Tariq	Aljamaa' Province	Private Sector	524	571	548	7	3	4
Islamic Center Society Basic School – Jabal Alameerah Rahma	Zarqa 1st	Private Sector	528	566	547	6	4	5
International Pioneers Academy / Secondary / males	Aljamaa' Province	Private Sector	533	556	545	3	6	6
University 1st School / males	Aljamaa' Province	Private Sector	536	552	544	2	7	7
Rosary / Shmeisani	Amman Center	Private Sector	517	552	535	8	8	8
Bint Uday Comprehensive Secondary Mixed School	Aljamaa' Province	MoE	514	551	533	9	9	9
Queen Noor Al Hussein Secondary / females	Amman Center	MoE	492	537	515	13	11	10
Roman Catholic School for Boys	Zarqa	Private Sector	496	532	514	11	17	11
National Orthodox / Alashrafieh	Amman Center	Private Sector	499	528	513	10	20	12
Nozha Females Preparatory fourth	UNRWA - North Amman	UNRWA	493	533	513	12	15	13
Alatheer Schools	Qweismeh Province	Private Sector	487	537	512	15	12	14

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Prince Hamzah Bin Al Hussein	Wadi Seer Province	Private Sector	484	539	511	20	10	15
Tamadur bint Amr Basic School/ Girls	Zarqa 1st	MoE	485	533	509	18	16	16
Natefah Basic School/ Girls	Irbid Center	MoE	484	527	506	19	21	17
Alqusoor Preparatory School	UNRWA North Amman	UNRWA	480	529	505	21	19	18
Jandaweel Comprehensive Secondary School /Girls	Wadi Seer Province	MoE	485	524	505	17	23	19
Cordoba International	Qweismeh Province	Private Sector	486	521	503	16	25	20
Modern Education	Marka Province	Private Sector	471	530	500	29	18	21
Mansheya Comprehensive Secondary School for Girls	Kerak Center	MoE	466	534	500	32	14	22
Hafsa bint Omar Basic School for Girls	Ramtha	MoE	478	518	498	25	26	23
Alzuhoor Prepartory School for Females	UNRWA Amman South	UNRWA	474	521	498	28	24	24
Abdullah bin Qais Al-Harthi Basic School for Boys	Aqaba	MoE	477	518	497	26	27	25
Der Latins (National Patriarchate School	Marka Province	Private Sector	480	512	496	22	32	26
Hussein Preparatory School for Females	UNRWA-Amman North	UNRWA	455	536	495	48	13	27
Qadisiyah Mixed Secondary School	Bseirah Province	MoE	463	527	495	37	22	28
Alaal Secondary Comprehensive School for Boys	Irbid Center	MoE	479	507	493	23	36	29

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Alnukhbeh / males	Aljamaa' Province	Private Sector	488	497	492	14	53	30
Princess Rahma Bint El Hassan Basic School for Girls	Amman Center	MoE	476	506	491	27	39	31
Swaileh Preparatory School for Males	UNRWA-Amman North	UNRWA	463	518	490	40	28	32
Halle Bint Khuweiled Secondary School for Girls	Salt Center	MoE	465	515	490	35	29	33
Albaqa' Seond Preparatory School for Males	UMRWA-Amman North	UNRWA	478	502	490	24	45	34
Umm Habiba Secondary School For Girls	Wadi Seer Province	MoE	462	515	488	41	30	35
Alhashemi Second Preparatory School for Males	UNRWA-Amman North	UNRWA	462	511	486	42	34	36
Altanweer Private School	Qweismeh Province	Private Sector	458	511	485	44	33	37
Irbid Model Secondary Mixed School	Irbid Center	Private Sector	463	506	484	38	41	38
Sakhrah Comprehensive Secondary School for Boys	Ajloun	MoE	464	505	484	36	42	39
Faisal 1st Basic School for Boys	Aqaba	MoE	469	499	484	30	51	40
Aljazae'r Basic School for Females	Amman Center	MoE	465	498	482	33	52	41
Western Shmeisani Basic School for Girls	Amman Center	MoE	457	506	481	46	40	42
Nozha Third Preparatory for Males	UNRWA-Amman North	UNRWA	455	507	481	47	38	43

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Marka Second Preparatory School for Females	UNRWA-Zarqa'	UNRWA	452	510	481	52	35	44
Um Manei' Basic Mixed School	Aljamaa' Province	MoE	458	504	481	45	43	45
Khalda Comprehensive Secondary School for Girls	Aljamaa' Province	MoE	459	502	481	43	46	46
Waqas Females Preparatory School	UNRWA-Irbid	UNRWA	446	513	480	59	31	47
Deir Abi Sa'eed Comprehensive Secondary School for Girls	Alkourah	MoE	451	507	479	53	37	48
Alkhader Modern Schools	Marka Province	Private Sector	463	494	478	39	55	49
Marka Fourth Preparatory School for Females	UNRWA-Zarqa'	UNRWA	465	491	478	34	61	50
Umm Kulthum Comprehensive Secondary School	Zarqa 1st	MoE	453	500	476	50	47	51
Zaid bin Haritha Secondary School for Boys	Kerak Center	MoE	452	499	476	51	48	52
Israa' Basic School for Girls	Amman Center	MoE	451	499	475	54	50	53
Scientific Reyadah School	Aljamaa' Province	Private Sector	466	481	474	31	82	54
Erwiem Secondary School for Girls	Tafeeleh	MoE	442	503	473	65	44	55
Saham Mixed Secondary Comprehensive	Bani Kenaneh	MoE	446	499	472	60	49	56
Waqas Males Preparatory School	UNRWA-Irbid	UNRWA	454	485	470	49	66	57
Kufur Ebeil Comprehensive Secondary School for Girls	Alkourah	MoE	441	497	469	67	54	58
Nahawand Basic Mixed	Ramtha	MoE	445	493	469	63	56	59

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Qmeim Comprehensive Secondary School for Boys	Altaibeh and Alwasteyeh Provinces	MoE	449	486	468	55	62	60
Oxford	Aljamaa' Province	Private Sector	442	492	467	66	58	61
Alhashemi First Preparatory School for Females	UNRWA-Amman North	UNRWA	445	483	464	61	71	62
Sakeb Comprehensive Secondary School for Boys	Jerash	MoE	447	482	464	57	77	63
Abu Bakr Basic School for Boysl	Irbid Center	MoE	449	479	464	56	86	64
Angara basic School for Boys	Ajloun	MoE	446	481	463	58	83	65
Enbeh Secondary Comprehensive School for Boys	North Mazar Province	MoE	444	483	463	64	73	66
Huwara Basic School for Girls.	Irbid Center	MoE	432	491	462	83	59	67
Nahawand basic mixed	Zarqa 1st	MoE	441	482	461	68	75	68
Albaqa' First Preparatory School for Females	UNRWA-Amman North	UNRWA	430	493	461	84	57	69
Um Aljmal Secondary Comprehensive Mixed School	East North Badia	MoE	437	486	461	73	63	70
Mahes Secondary School for Girls	Salt Center	MoE	438	485	461	71	67	71
Thaher Alsaroo Comprehensive Secondary School for Girls	Jerash	MoE	438	482	460	70	76	72
Alkhansa' Secondary Comprehensive Mixed School	Aljamaa' Province	MoE	434	485	460	78	65	73
Thaher Alsaroo Basic School for Boys	Jerash	MoE	439	480	459	69	84	74
Zabbud Basic Mixed School	Na'our Province	MoE	433	485	459	81	64	75

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Martyer Faisal 2nd College	Military Education	Ministry of Defense	434	484	459	79	69	76
Albaqa' third Preparatory School for Males	UNRWA-Amman North	UNRWA	436	482	459	75	78	77
Dar AlSalaam Secondary Mixed School	Marka Province	MoE	435	483	459	77	72	78
Queen Zein Al Sharaf School Comprehensive Secondary School for Girls	Aqaba	MoE	435	481	458	76	81	79
Abu Bakr Basic School for Boys	Mafraq Center	MoE	433	482	458	82	74	80
Zmal Secondary Comprehensive Mixed	Alkourah	MoE	433	481	457	80	80	81
Princess Alia Bint Al Hussein Secondary Mixed School	Mafraq Center	MoE	424	491	457	93	60	82
AlRusaifa first female Preparatory School	UNRWA-Zarqa'	UNRWA	436	478	457	74	89	83
Nusseibeh Bint Ka'eb Basic School for Females	Amman Center	MoE	428	484	456	86	70	84
Alrmeimeen Secondary School for Girls	Salt Center	MoE	427	485	456	87	68	85
Yadodeh First Secondary School for Boys	Qweismeh Province	MoE	429	479	454	85	85	86
Aljadeedah Secondary School for Boys	Kerak Center	MoE	445	461	453	62	112	87
Greek Orthodox Secondary School - Fuhais	Salt Center	Private Sector	437	468	452	72	99	88
Tamadur bint Amr First Secondary School for Girls	Rusiafah	MoE	421	482	451	99	79	89
Almanahel Secondary School	Zarqa	Private Sector	421	478	450	97	87	90
Khaleda Qurashiyyah Secondary Mixed School	Salt Center	MoE	419	478	448	105	88	91

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Amman New Camp 2nd Preparatory School for Females	UNRWA-Amman South	UNRWA	419	477	448	104	90	92
Bushra Secondary Comprehensive Mixed School	Irbid Center	MoE	421	474	448	98	92	93
Fatima Alzahra' Comprehensive Secondary School for Girls	West North Badia	MoE	418	475	447	106	91	94
Allan Secondary School for Girls	Salt Center	MoE	422	470	446	96	95	95
Rajeb Comprehensive Secondary School for Girls	Ajloun	MoE	425	468	446	89	100	96
Aisha Albaoniah Secondary Comprehensive for Girls	Zarqa 1st	MoE	423	469	446	94	96	97
Ali Redha Alrikabi Basic School for Boys	Aljamaa' Province	MoE	424	467	446	92	101	98
Juwaideh Secondary School for Girls	Qweismeh Province	MoE	425	466	446	90	102	99
Zarqa' Alyamamah Basic School for Girls	Zarqa	MoE	426	464	445	88	106	100
Fatima Alzahra Basic Mixed	Jerash	MoE	415	473	444	110	93	101
Almuaqqer Comprehensive Secondary School for Girls	Mid Badia / Muaqqer Province	MoE	410	473	441	119	94	102
Jaber Bin Hayyan Basic School for Boys	Rusiafah	MoE	425	457	441	91	117	103
Husniyah First Secondary School for Girls	Qweismeh Province	MoE	412	468	440	116	97	104
Saffanah Bint Hatem First Secondary School for Girls	Marka Province	MoE	417	463	440	108	107	105
Jubaiha Secondary School for Boys	Aljamaa' Province	MoE	418	461	439	107	111	106
Sakib Comprehensive Secondary School for Girls	Jerash	MoE	412	462	437	113	110	107
Abu Huraira Basic School for Boys	Amman Center	MoE	419	454	437	103	122	108

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Hatem Comprehensive Secondary School for Girls	Bani Kenaneh	MoE	408	465	437	121	103	109
Ruqayyah Bint Alrasool Secondary Mixed School	Amman Center	MoE	407	464	436	123	105	110
Allfarouk Secondary School for Boys	Wadi Seer Province	MoE	421	451	436	100	130	111
Zaid bin Haritha Secondary School for Boys	Salt Center	MoE	411	460	436	117	113	112
Prince Rashid Basic School for Boys	Amman Center	MoE	423	448	435	95	135	113
Jabal Amman Basic School for Girls	Amman Center	MoE	412	458	435	115	115	114
Marka 1st Preparatory School for Males	UNRWA-Zarqa'	UNRWA	420	447	433	102	140	115
Albara' bin Malik Secondary School For Boys	Na'our Province	MoE	420	446	433	101	141	116
Amenah Bint Alarqam Basic for females	Zarqa 1st	MoE	401	464	433	133	104	117
Alfadeen Basic Mixed School	Mafraq Center	MoE	398	468	433	139	98	118
Alsafwah Model Basic Mixed School	Mafraq Center	Private Sector	416	450	433	109	132	119
Ebein Eblien Comprehensive Secondary School for Girls	Mafraq Center	MoE	408	458	433	122	116	120
Mastabeh Comprehensive Secondary School for Girls	Jerash	MoE	411	454	432	118	124	121
Almanarah Basic Mixed	Marka Province	MoE	404	460	432	127	114	122
Um Ma'abad Secondary School for Girls	Amman Center	MoE	412	452	432	111	128	123
Bader Alkubrah Comprehensive Secondary School for Girls	Zarqa 1st	MoE	401	462	432	134	109	124
Umm Shuraik Alansariyeh Secondary Mixed School	Zarqa 2nd	MoE	399	462	431	136	108	125

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Irbid City 3rd Preparatory School	UNRWA-Irbid	UNRWA	405	455	430	126	119	126
Hadeeqat Tunis Basic Mixed School	Irbid Center	MoE	408	451	430	120	129	127
Yarmouk Secondary School for Girls	Amman Center	MoE	402	454	428	130	123	128
Naifeh Secondary School for Girls	Marka Province	MoE	402	453	427	132	125	129
Irbid City 3rd Preparatory School for Males	UNRWA-Irbid	UNRWA	412	441	426	112	151	130
Mobes Secondary Mixed School	Ein Albasha	MoE	405	447	426	125	139	131
Nusseibah Almazeniah Basic School for girls	Rusiafah	MoE	404	446	425	128	142	132
Um Albasateen Secondary School for Girls	Na'our Province	MoE	398	451	425	137	131	133
Sakhrah Comprehensive Secondary School for Girls	Ajloun	MoE	395	453	424	146	126	134
Princess Haya Bint Al Hussein Basic Mixed School	Na'our Province	MoE	396	452	424	145	127	135
Alashrafieh Secondary School for Girls	Amman Center	MoE	393	455	424	149	120	136
Um Alamad Basic School for Boys	Salt Center	MoE	403	444	424	129	146	137
Petra Basic Mixed School	Amman Center	MoE	397	449	423	143	134	138
Alqimmah 2nd School	Wadi Seer Province	Private Sector	407	439	423	124	152	139
Princess Taghreed Secondary exploratory Mixed School	Qweismeh Province	MoE	390	456	423	153	118	140
Althleil Secondary Comprehensive Mixed School	Zarqa 2nd	MoE	397	448	422	144	136	141
Rusaifa 3rd Preparatory School for Males	UNRWA-Zarqa'	UNRWA	400	444	422	135	145	142

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Kafr Almaa' Comprehensive Secondary School for Girls	Alkourah	MoE	397	447	422	142	138	143
Thaghret Aljubb Comprehensive Secondary School for Boys	West North Badia	MoE	402	441	421	131	150	144
Um Amarah Secondary School for Girls	Sahab Province	MoE	391	450	420	151	133	145
Ekremah Secondary School for Boys	Zarqa 2nd	MoE	412	428	420	114	164	146
Abu Alanda Secondary School for Girls	Qweismeh Province	MoE	385	455	420	163	121	147
Omar Almukhtar Basic for Boys	Irbid Center	MoE	398	441	419	141	149	148
Alhashemiah Secondary School for Girls	Aqaba	MoE	393	445	419	148	143	149
Ajnadeen Basic School for Girls	Irbid Center	MoE	388	447	418	160	137	150
Shajaret Aldurr Basic School for Girls	Amman Center	MoE	388	445	416	159	144	151
Amrawah Secondary School for Boys	Ramtha	MoE	398	435	416	138	156	152
Shukri Sha'sha'a Secondary School for Boys	Amman Center	MoE	395	435	415	147	155	153
Jerash Camp ist Preparatory School for Boys	UNRWA-Irbid	UNRWA	389	435	412	155	154	154
Alazraq Secondary Mixed School	Zarqa 2nd	MoE	379	443	411	167	147	155
Abu Obeida Basic School for Boys	Marka Province	MoE	398	424	411	140	169	156
Akka Basic School for Girls	Irbid Center	MoE	390	430	410	152	162	157
Marj Alhamam Secondary School for Boys	Wadi Seer Province	MoE	388	431	410	158	160	158
Aliskan Secondary Mixed School	Ma'an	MoE	382	434	408	164	157	159
Der Alliyat Comprehensive Secondary School for Girls	Jerash	MoE	373	443	408	178	148	160
Prince Talal Basic School for Boys	Zarqa 1st	MoE	389	424	406	157	167	161

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Ebein Basic School for Boys	Ajloun	MoE	390	423	406	154	171	162
Hariemah Comprehensive Secondary School for Boys	Bani Kenaneh	MoE	385	427	406	162	165	163
Alashrafieh 2nd Preparatory School for boys	UNRWA-Amman South	UNRWA	386	424	405	161	170	164
Qweismeh Secondary School for Girls	Qweismeh Province	MoE	376	433	405	171	158	165
Almabrookeh Comprehensive Secondary School for Girls	West North Badia	MoE	377	432	404	170	159	166
Hassan ibn Thabit Basic School for Boys	Marka Province	MoE	391	416	404	150	178	167
Manshyet Alsultah Secondary Mixed School	West North Badia	MoE	369	438	404	184	153	168
Alkhawarizmi Basic School for Boys	Zarqa 1st	MoE	389	418	403	156	175	169
Na'our Comprehensive Secondary School for Boys	Na'our Province	MoE	381	425	403	165	166	170
Juwayriyah Bint Alhareth Basic School for Girls	Rusiafah	MoE	375	430	403	172	161	171
Jawa First Secondary School for Boys	Qweismeh Province	MoE	374	429	401	177	163	172
Bilal bin Rabah Basic School for Boys	Marka Province	MoE	377	424	401	169	168	173
Um Alhieran First Secondary School for Boys	Qweismeh Province	MoE	375	422	398	173	173	174
Jameel Shaker Secondary School for Boys	Wadi Seer Province	MoE	378	417	398	168	177	175
Qafqafa Secondary School for Boys	Jerash	MoE	369	422	396	183	172	176
Belela Comprehensive Secondary Mixed School for Girls	Jerash	MoE	374	414	394	174	179	177

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Albairooni First Basic School for Boys	Rusiafah	MoE	380	404	392	166	188	178
Ibn Khafajah Basic School for Boys	Zarqa 1st	MoE	366	417	391	190	176	179
Um Qseir Secondary Comprehensive Mixed School	Mid Badia / Aljeezah Province	MoE	363	419	391	194	174	180
Zaha' Eddin Alhamoud Comprehensive Secondary School for Boys	Bani Ebeid	MoE	369	413	391	186	180	181
Aqraba Comprehensive Secondary School for Boys	Bani Kenaneh	MoE	371	409	390	182	181	182
Zarqa' 1st Preparatory School for Boys	UNRWA-Zarqa'	UNRWA	372	407	389	180	183	183
Khalidiya Secondary Mixed School	West North Badia	MoE	369	409	389	185	182	184
Prince Abdullah Basic for Boys	Zarqa 1st	MoE	374	402	388	176	191	185
Almugheir Comprehensive Secondary School for Girls	Irbid Center	MoE	366	407	387	189	185	186
Alturrah Secondary School for Boys	Ramtha	MoE	374	396	385	175	194	187
Amman New Camp First Preparatory School for Males	UNRWA-Amman South	UNRWA	365	404	385	191	186	188
Sammou' Basic School for Boys	Alkourah	MoE	363	404	384	193	187	189
Alameen Basic School for Boys	Aljamaa' Province	MoE	359	407	383	196	184	190
Abdullah Ben Rawahah First Basic School for Boys	Amman Center	MoE	368	398	383	187	193	191
Ramtha Secondary School for Boys	Ramtha	MoE	364	402	383	192	190	192
Talha bin Obeid-Allah Basic School for Boys	Marka Province	MoE	367	396	381	188	196	193

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Abdul Malik bin Marwan Secondary School for Boys	Marka Province	MoE	362	399	381	195	192	194
Alribat Mixed Secondary School	Zarqa 2nd	MoE	357	404	380	198	189	195
Alizz ibn Abd al-Salam Secondary School for Boys	Marka Province	MoE	371	389	380	181	199	196
Alhassan Albasri Basic for Boys	Marka Province	MoE	372	385	378	179	203	197
Alyoubeel Althahabi Secondary School for Boys	Marka Province	MoE	359	394	377	197	197	198
Alkindi Basic for Boys	Marka Province	MoE	349	389	369	201	198	199
Aljeezah Secondary Comprehensive Mixed School	Mid Badia / Aljeezah Province	MoE	339	396	368	207	195	200
Mu'tasim Basic for Boys	Marka Province	MoE	351	384	367	200	204	201
Alma'mooniah Eastern Basic School for Boys	Madaba	MoE	349	386	367	202	201	202
Yaqout Alhamwi Basic School for Boys	Zarqa 1st	MoE	341	383	362	204	206	203
Alfosfat Secondary School for Boys	Tafeeleh	MoE	336	387	362	208	200	204
North Shouneh Basic Mixed School for Boys	North Aghwar	MoE	354	368	361	199	213	205
Rehana Bint Zaid Secondary Mixed School	Zarqa 2nd	MoE	340	381	361	206	207	206
Sa'eed bin Musayyib Basic School for Boys	Zarqa 1st	MoE	335	379	357	210	209	207
Aseed bin Hudayer First Secondary School for Boys	Rusiafah	MoE	330	384	357	211	205	208
Alhusseiniya Secondary Comprehensive Mixed School	South Badia	MoE	326	385	356	215	202	209
Alshajarah Secondary School for Boys	Ramtha	MoE	343	368	355	203	212	210

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Erainbah West Secondary School for Boys	Mid Badia / Aljeezah Province	MoE	329	378	354	212	210	211
Garandal Secondary School for Boys	Tafeeleh	MoE	326	379	353	214	208	212
Ein Al-Basha Secondary School for Boys	Ein Albasha	MoE	336	368	352	209	211	213
Abu Naseer Secondary School for Boys	Ein Albasha	MoE	340	362	351	205	216	214
Rasheed First Secondary School for Boys	Rusiafah	MoE	324	367	345	218	214	215
Altheibeh West Comprehensive Secondary School for Boys	Mid Badia/ Almuwaqqer Province	MoE	322	363	343	219	215	216
Mafraq Second Basic School for Boys	Mafraq Center	MoE	319	357	338	220	217	217
Um Aljmal West Comprehensive School for Boys	East North Badia	MoE	317	356	336	221	218	218
Almajar Basic Mixed School	Jerash	MOE	326	346	336	216	221	219
Ibn Alanbari Basic School for Boys	Zarqa 2nd	MoE	325	342	333	217	222	220
Alalamiah Second School for Boys / Airport Road	Wadi Seer Province	Private Sector	327	339	333	213	224	221
Ibn Hisham Basic School for Boys	Rusiafah	MoE	310	352	331	222	220	222
Dherar Secondary School for Boys	Deir Alla	MoE	305	355	330	225	219	223
Rasoon Comprehensive Secondary School for Boys	Ajloun	MoE	309	338	324	223	225	224
Khalid bin Waleed Basic School for Boys	Zarqa 1st	MoE	306	335	320	224	227	225
Muqbleh Basic School for Boys	Jerash	MoE	293	335	314	226	226	226
Umm Rummaneh Secondary School for Boys	Zarqa 2nd	MoE	284	339	312	227	223	227
Rawdhat Prince Mohammed Comprehensive Secondary School for Boys	Mafraq Center	MoE	282	309	296	228	228	228

School	Directorate	Supervising Authority	Average			Rank		
			Math	Science	Both Subjects	Math	Science	Both Subjects
Almashareh Secondary School for Boys	North Aghwar	MoE	256	266	261	229	229	229
Karima Secondary School for Boys	North Aghwar	MoE	251	255	253	230	230	230

Annex (2): Performance Averages and Directorates Ranks in Math and Science and in both Subjects in TIMSS 2011

Directorate	Average			Rank			No. of Schools
	Math	Science	Both Subjects	Math	Science	Both Subjects	
Bseirah Province	463	527	495	1	1	1	1
UNRWA- Amman North	460	509	485	2	2	2	10
Kerak Center	454	498	476	3	3	3	3
Altaibeh and Alwasteyeh Provinces	449	486	468	4	4	4	1
Aqaba	443	486	465	5	6	5	5
North Mazar Province	444	483	463	7	5	6	1
Aljamaa' Province	438	482	460	8	7	7	13
Military Education	434	484	459	6	8	8	1
Salt Center	426	477	452	9	11	9	8
Amman Center	429	474	451	10	9	10	21
Wadi Seer Province	427	468	447	11	10	11	8
UNRWA-Irbid	421	466	444	13	14	12	5
UNRWA- Zarqa'	424	463	444	15	12	13	6

Directorate	Average			Rank			No. of Schools
	Math	Science	Both Subjects	Math	Science	Both Subjects	
Irbid Center	422	465	444	14	13	14	11
Alkourah	417	467	442	12	15	15	5
UNRWA- Amman South	411	457	434	16	16	16	4
Na'our Province	406	452	429	17	17	17	5
Bani Kenaneh	402	450	426	19	19	18	4
Ajloun	405	446	426	21	18	19	7
Qweismeh Province	396	451	423	18	21	20	11
Sahab Province	391	450	420	20	23	21	1
Ramtha	401	437	419	24	20	22	7
Zarqa 1st	395	438	416	23	22	23	17
Jerash	391	436	413	25	24	24	11
West North Badia	387	439	413	22	25	25	5
Ma'an	382	434	408	26	27	26	1
Marka Province	382	418	400	30	26	27	17

Directorate	Average			Rank			No. of Schools
	Math	Science	Both Subjects	Math	Science	Both Subjects	
East North Badia	377	421	399	29	28	28	2
Mafraq Center	371	422	396	28	29	29	6
Tafeeleh	368	423	396	27	31	30	3
Mid Badia/ Almuwaqqer Province	366	418	392	31	33	31	2
Bani Ebeid	369	413	391	32	30	32	1
Rusiafah	366	411	389	33	32	33	7
Zarqa 2nd	362	406	384	34	34	34	8
Ein Albasha	361	392	376	36	35	35	3
Mid Badia / Aljeezah Province	344	398	371	35	37	36	3
Madaba	349	386	367	37	36	37	1
South Badia	326	385	356	38	38	38	1
Deir Alla	305	355	330	39	39	39	1
North Aghwar	287	296	292	40	40	40	3

Annex (3): Future Steps

The next steps can be summed up in the preparations to participate in international study throughout the duration of the study. This means identifying the study population and providing it with the appropriate training. For example, Jordan will participate in TIMSS 2015 and PISA 2015. The required data will be collected s for TIMSS in April, and in May for PISA, and the population for these studies can be identified as follows :

- Regarding TIMSS, the study population participating in the study is now in grade six. Regarding PISA, the study population is now in grade eight. Therefore, the training period should be organized as follows:

	TIMSS	PISA
2012/2013 The second semester	Grade 6	Grade 8
2013/2014	Grade 7	Grade 9
2014/2015	Grade 8	Grade 10

- Questions of the previous sessions of TIMSS and PISA, that are allowed to be revealed, are classified by grades, subject content and mental skill, and then are employed in the teaching process and in the quizzes and exams.
- Taking advantage of the guides prepared by the centre in previous sessions and employing them in teaching and testing.
- Introducing the questions of international tests in the new editions of textbooks and giving attention to such questions.
- Presenting the results of recent studies on the directorate level to provide awareness on the relevance of these studies.
- Training a team from the Ministry of Education on TIMSS and PISA studies to transfer this experience to the directorates, schools, teachers, students and the local community.
- Providing the Ministry of questions with the Arabic version of questions in previous sessions, that are allowed to be revealed, and classifying them by content and mental skills.
- Preparing a guide of PISA 2009.
- Preparing a guide of TIMSS 2011.
- Developing an incentive system at the levels of the teachers, students, principals, schools, and directorates to ensure serious participation in the study as well as constructive competition among all participants.
- Conducting a pilot test prior to every international study to make the study population familiar with the test.

Training:
- Establishing a unit ate the Educational Training Center to be responsible for the international tests profile and to follow up the implementation of the procedural plans prepared by the Ministry.

- Including international tests activities in the training programs materials.
- Informing supervisors on different models of previous sessions' questions as well as discussing these questions with teachers during training and the evaluation process.
- Including the international test questions in questions referred to by teachers during training and testing.
- Enhancing oriented training to take advantage of international tests, and institutionalizing this training starting from grades six and seven for the next session.

Curriculum:
- Attempting to include samples of questions as activities or enrichment questions in the evaluation sections in the Math textbooks.
- Developing a brochure on TIMSS questions and providing the answers for a part of the questions, whereas discussing the other part during the remedial and enrichment classes.

The Media:
- Developing a media plan at the schools' level to provide awareness for students, teachers and parents on international and national studies.
- Developing a proposal on providing incentives for students, teachers, principals and supervisors of schools whose students obtain good results.

Annex (4)
Derived Indicators and Relevant Items

Indicators	Item Code	Item
Students' Economic and Social Level (Students' Questionnaire)	BSBG05B	A desk
	BSBG05E	Internet
	BSBG05F	Digital camera
	BSBG05G	Automatic washing machine
	BSBG05H	Central heating
	BSBG05I	Air condition
	BSBG04	How many books do you have at home apart from magazines, newspapers and school textbooks?
	BSBG06A	What is your mother's academic background or the one who plays her role in taking care of you?
	BSBG06B	What is your father's academic background or the one who plays his role in taking care of you?
Students' Problems (Students' Questionnaire)	BSBG13A	Exposed to Irony or verbal insult
	BSBG13B	My colleagues exclude me from doing activities and playing
	BSBG13D	My properties are stolen
	BSBG13E	Being hit , bullied or injured by other students
	BSBG13F	Students forced me to do things I don't want to do
Good Teaching (Math Teacher's Questionnaire)	BTBM19G	Give proper explanations for students' answers
	BTBM19I	Approving students' method in solving problems
	BTBM19J	Solving problems that have no direct clear method of solution.
Teaching Obstacles (Math Teacher's Questionnaire)	BTBG15D	Special needs students with physical ,mental or psychological disability
	BTBG15F	Careless students
Teacher's Problems (Math Teacher's Questionnaire)	BTBG08A	The school building needs maintenance
	BTBG08B	Overcrowded classrooms
	BTBG08D	Lack of convenient workplace (planning for lessons and cooperation with and meeting students).
Good Teaching (Science Teacher's Questionnaire)	BTBS19A	Watch natural phenomenon and describe what they see.
	BTBS19B	Watching you while you are explaining an experiment or how to make a research.
	BTBS19C	Preparing for or designing an experiment or a research.
	BTBS19D	Make experiments or researches.
	BTBS19E	Read textbooks or other learning resources.
Teaching Obstacles (Science Teacher's Questionnaire)	BTBG15D	Special needs students whether physical ,mental or psychological disability
	BTBG15E	Naughty students
	BTBG15F	Careless students
School Problems (Science Teacher's Questionnaire) (Principal's Questionnaire)	BCBG09AA	learning resources (textbooks)
	BCBG09AB	Stationary (papers and pencils)
	BCBG09AC	School buildings and playgrounds
	BCBG09AD	Heating equipment , conditioning ,and lighting
	BCBG09AE	Spaces for learning (classrooms)
	BCBG09BB	Computers for teaching math
	BCBG09BC	Software for teaching math
	BCBG09BD	Library resources for teaching math
	BCBG09BF	Calculators for teaching math

Indicators	Item Code	Item
	BCBG09CA	Teachers majoring in science
	BCBG09CB	Computers for teaching science
	BCBG09CC	Software for teaching Science
	BCBG09CD	Library resources for teaching Science
	BCBG09CG	Equipment for Teaching Science

Annex (5)

Measurement Categories definitions

- **Measurement of students' involvement in lessons**

Involved: The student is considered involved in math lessons if his mark on the measurement is not less than 11.4 which indicates his approval of three items at a large extent and his approval at a low degree of the other two items.

Involved: The student is considered involved in science lessons if his mark on the measurement is not less than 11.2 which indicates his approval of three items at a large degree and his approval at a low degree of the other two items.

Not involved : The student is considered not involved in math lessons if his mark on the measurement is not more than 8.3 which indicates his disapproval of three items at a low degree, and his approval at a low degree of the other two items .

Not involved : The student is considered not involved in science lessons if his mark on the measurement is not more than 8.4 which indicates his disapproval of three items at a low degree, and his approval at a low degree of the other two items.

Involved to some extent: The student is considered involved to some degree in math classes if he was not between the involved students category or the not involved students category.

Involved to some extent: The student is considered involved to some degree in science classes if he was not between the involved students category or the not involved students category.

Measurement of students' confidence in learning math

High confidence: The students'confidence in learning math is considered high if his score at the measurement is not less than 12.0, which indicates his approval at a large degree of five items out of the nine items that form the measurement and his approval at a low degree of the remaining four items.

High confidence: The students' confidence in learning science is considered high if his score at the measurement is not less than 11.5, which indicates his approval at a large degree of five items out of the nine items that form the measurement and his approval at a low degree of the remaining four items.

No confidence: The student is considered with no confidence in learning math if his score at the measurement is not more than 9.4, which indicates his disapproval at a low degree of five items

out of the nine items that form the measurement and his approval at a low degree of the remaining four items.

No confidence: The student is considered with no confidence in learning science if his score at the measurement is not more than 9.0, which indicates his disapproval at a low degree of five items out of the nine items that form the measurement and his approval at a low degree of the remaining four items.

Moderate confidence : The student confidence is considered moderate if he is not between the students in the categories of "high confidence" or the categories of "no confidence".

Measurement of students' appreciation of math or science

High value: The student is considered giving high value for math if his score on the measurement is not less than 10.3 , which indicates his approval to a large degree of three items of the six items that form the measurement and his approval to a low degree of the other three items.

High value: The student is considered giving high value for science if his score mark on the measurement is not less than 10.5, which indicates his approval to a large degree of three items of the six items that form the measurement and his approval to a low degree of the other three items.

Low value: The student is considered giving low value for math if his score on the measurement is not more than 7,9, which indicates his disapproval to a low degree of three items of the six items that form the measurement and his approval to a low degree of the other three items.

Low value: The student is considered giving low value for science if his score on the measurement is not more than 8.6, which indicates his disapproval to a low degree of three items of the six items that form the measurement and his approval to a low degree of the other three items.

Average value: the student is considered giving an average value of math if he is not between the students who give high value or low value for mathematics.

Average value: the student is considered giving an average value of science if he is not between the students who give high value or low value of mathematics.

Measurement of students' love for learning math or science

The student likes learning math: The student is considered that he does not like learning math if his score on the measurement is not less than 11.3 , which indicates his approval to a large degree of five items and his approval to a low degree of the remaining two items.

The student likes learning science: The student is considered that he does not like learning science if his score on the measurement is not less than 10.8 , which indicates his approval to a large degree of five items and his approval to a low degree of the remaining two items.

The student does not like learning math: The student is considered that he likes learning math if his score on the measurement is not less than 9.0, which indicates his approval to a large degree of five items that form the measurement and his approval to a low degree of the remaining two items.

The student does not like learning science: The student is considered that he likes learning science if his score on the measurement is not less than 8.4 , which indicates his approval to a large degree of five items and his approval to a low degree of the remaining two items

The student likes learning math to some extent: The student is considered that he likes learning math to some extent if he was not between the categories of students who like learning math or do not like learning math.

The student likes learning science to some extent: The student is considered that he likes learning science to some extent if he was not between the categories of students who like learning math or do not like learning math.

Measurement of students' confidence in learning math.

High confidence: The students' confidence in learning math is considered high if his score on the measurement is not less than 12.0 , which indicates his approval of five items out of the nine items to a large degree that form the measurement and his approval to a low degree on the remaining four items.

High confidence: The students' confidence in learning science is considered high if his score on the measurement is not less than 11.5, which indicates his approval of five items out of the nine items to a large degree that form the measurement and his approval at a low degree on the remaining four items.

No confidence: The student is considered of having no confidence in learning math if his score on the measurement is no more than 9.4, which indicates his disproval with a low degree of the five items out of the nine items that form the measurement and his approval at a low degree to the remaining four items.

No confidence: The student is considered of having no confidence in learning science if his score on the measurement is no more than 9.0, which indicates his disproval with a low degree of the five items out of the nine items that form the measurement and his approval at a low degree to the remaining four items.

Moderate confidence: The student confidence is considered of having moderate confidence if he does not fall between the categories of students who have high confidence or who have no confidence.

Measurement of educational resources at home

Many resources: The student is considered having many resources if his score on the measurement is not less than 12.5 which indicates the student's response that he has more than 100 books at home, that he has two educational certificates at home, and that one of his parents has completed his study at university.

Few resources: The student is considered having few resources if his score on the measurement is not more than 8.2, which indicates the student's response that he has more than 25 books or less at home, that he has no educational certificates at home, and that any of his parents did not exceed the secondary stage in his studies.

Some resources: The student is considered having some resources if he is not between the categories of student who have many resources or have few resources.

Measurement of confidence in the teacher's ability to teach

Great confidence: The teacher is considered having high confidence in teaching math if his score on the measurement is not less than 9.2, which indicates that the teacher uses three teaching strategies 3 out of 5 strategies with great confidence and uses the remaining two strategies with moderate confidence.

Great confidence: The teacher is considered having high confidence in teaching science if his score on the measurement is not less than 9.3, which indicates that the teacher uses three teaching strategies 3 out of 5 strategies with great confidence and uses the remaining two strategies with moderate confidence.

Some confidence : The teacher is considered having some confidence in the teaching of math if he does not have great confidence.

Measurement of teacher's job satisfaction.

Satisfied: The math teacher or science teacher are considered satisfied with their jobs if their scores on the measurement is not less than 10.4 , which indicates the teacher approval at a

large degree of three items out of the six items that form the measurement and his approval at a low degree on the remaining three items.

Not satisfied: The math teacher or science teacher are considered not satisfied with their jobs if their scores on the measurement is not more than 7.0, which indicates the teacher disapproval at a low degree of three items out of the six items that form the measurement and his approval at a low degree on the remaining three items

Satisfaction to some extent: The teacher is considered "somewhat satisfied" if he is not between the categories of teachers who have satisfaction from their job or teachers who have no satisfied with their jobs.

Measurement of the teachers' working conditions.

No problems: The math teacher or the science teacher are considered having no problems if their score on the measurement is not less than 11.7, which indicates that the teacher responded to the three areas out of the five areas that form the measure as "*not a problem*", and that it is a minor problem for the two remaining areas.

Moderate problems: The math teacher or the science teacher is considered having moderate problems if his relationship on the measurement is not more than 8.9, which indicates that the teacher responded to three areas out of the five areas that form the measure as "*moderate problem*", and as a minor problem for the two remaining areas.

Minor problems: The math teacher or a science teacher is considered having minor problems if he is not betweenthe categories of teachers who have no problems, or the teachers who have minor problems.

Measurement of the teacher's working conditions

Safe and organized: The school is considered safe and organized if the math teacher or the science teacher score on the measurement is not less than 10.7, which indicates his approval to a large degree on three items out of the five items that make up the measurement, and his approval to a low degree of the remaining two items.

Unsafe and organized: The school is considered unsafe and organized if the math teacher or the science teacher on the measurement is not more than 6.8, which indicates his disapproval at low degree to three items out of the five items that form the measurement, and his approval at a low degree of the remaining two items.

Somehow safe and organized: The school is considered somehow safe and organized if it is not between the categories of safe and organized schools or the unsafe and organized schools.

Measurement of the school's focus on achievement from the teacher's point of view

Very high focus: The school's focus on achievement is considered very high if the teacher's score on the measurement was 13.6, which indicates the teacher's response on three areas out of the five areas that form the measurement as "*very high*" and on the remaining two areas as "*high*".

Average focus: The school's focus on achievement is considered moderate if the teacher score on the measurement is 9.5, which indicates the teacher's response on the three areas on three areas out of the five areas that form the measurement as "*moderate*" and on the two remaining areas as "*high*".

High focus: The school's focus on achievement is considered "high" if it was not between the schools of very high focus or the schools of moderate focus.

Measurement of the student's socio-economic background.

High: The school is considered with high socio - economic background if more than 25% of the students in the school belong to rich families, and no more than 25 % of the students belong to poor families.

Low: The school is considered with low socio - economic background if more than 25 % of the students in the school belong to poor families, and no more than 25 % of the students belong to rich families.

Moderate: The school is considered with moderate socio-economic background if the school is not between the schools of the high category and the schools of the category.

Measurement of the school's focus on achievement from the principal's point of view

Very high focus: The school's focus on achievement is considered very high if the principal's score on the measurement is 13.3, which indicates his response on the three areas of the five areas that form the measurement at a very high degree, and on the remaining two fields at a high degree.

Average focus: The school's focus on achievement is considered average if the principal's score on the measurement is 9.2, which indicates his response on the three areas of the five areas that form the measurement at an average degree, and on the remaining two fields at a high degree.

High focus: The school's focus on achievement is considered high if it was not between the categories of very high focus and of average focus.