The Hashemite Kingdom of Jordan

National Center for Human Resources Development
(NCHRD)

Education Reform for the Knowledge Economy
(ERfKE 1)
Monitoring and Evaluation

Baseline Data Report

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Publications Series No. 141
2005

المملكـــة الأردنية الهاشمـــــــــــية

رقم الإيداع لدى دائرة المكتبة الوطنية

(٢٠٠٩/١١/٥٠٠١)

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General Background Indicators Related to Education

The current population of Jordan is approximately 5.5 million, with nearly 80 percent living in the four urban areas of Amman (40 percent), Irbid (18 percent), Zarka (15 percent) and Balqa (7 percent). The population is young. It is estimated that 38 percent of the population is less than 15 years of age. The population growth rate appears to be coming down but is still high at 2.78 percent. By 2012, the school-age population is predicted to increase from 1.5 million to nearly 2.0 million, a one-third increase in less than 8 years.

The literacy rate in Jordan is one of the highest in the Arab world. Some 91 percent of the population over age 15 is able to read and write. This is a solid achievement that bears witness to the high priority placed on the education sector over the past twenty years.

The 10-year Basic cycle is compulsory for all 6-16 year olds and provided free in public schools. The two years of secondary education are not compulsory but they are free for all students who wish to continue beyond the Basic cycle.

The quantitative growth rate of the educational system since 1960 has been remarkable. The number of Ministry of Education (MOE) schools increased from 714 in 1960 to 3,053 in 2003. The number of students in MOE schools increased during the same time period from 128,743 to 1,088,839. The 2001 gross enrollment rate (GER) for grades 1 to 10 was 94 percent and the net enrollment rate (NER) was 86.3 percent. Most students in the Basic cycle are enrolled in schools run by the MOE (73.5 percent), followed by the private sector (14.5 percent), UNRWA (11.2 percent) and other ministries (0.8 percent). Tables below show the most recent data.

Most secondary school students are enrolled in MOE schools (84.5 percent), with the remaining enrollments distributed across schools provided by other government ministries (5.5 percent), the private sector (8.7 percent) and UNRWA (0.3 percent). In 2001, the GER was 75.6 percent and the NER was 64.6 percent. Girls represent 50 percent of the enrollments in secondary schooling.

The budget of the Ministry of Education, as percentage of the government of Jordan's General Budget, has been raised from 7 percent in 1960 to 8.75 percent in 1990 to 11 percent in 1998 and to 13.5 percent (of total expenditures) in 2003[1].

Prior Reform Efforts

The first attempt at major educational reform began in 1973, when the Education Development Plan was constructed and adopted by the Government of Jordan. In retrospect, the resulting reforms were modest and had limited impact. Problems confronting the education system continued until the mid-1980s. After a critical review and assessment was undertaken between 1985 and 1987, a major Education Reform Program (ERP) was initiated under the Human Resources Development Sector Investment Loan Projects (HRDSIL I and HRDSIL II) with World Bank assistance. The reform programs included activities in curriculum development, textbook development, teacher and supervisory staff training, educational technology development, facility improvement and technical vocational education and training development. The overarching goal of the ERP was to enhance student achievement by (1) restructuring the

[1] Source: MOE Statistical Report 2003 and 2003 brochure

school system and improving the quality of teaching and learning; (2) developing an institutional structure responsive to the system's long-term qualitative and quantitative needs; and (3) developing the system's capacity to evaluate the ERP and sustain it on a self-renewing basis.

Current enrollment figures

Enrollment and drop-out rates will be used to monitor success in the education system and expected to be affected positively by ERfKE interventions.

Enrollment ratios				
		KG	Basic	Secondary
Gross	All	36.0%	93.8%	67.4%
	Male	37.0%	92.1%	64.8%
	Female	34.9%	95.7%	70.3%
Participation	All	50.7%	91.0%	53.7%
	Male	51.6%	88.9%	51.3%
	Female	49.8%	93.3%	56.3%
Net	All	33.1%	89.4%	59.4%
	Male	34.0%	87.5%	57.9%
	Female	32.1%	91.5%	61.0%

Source: MOE, 2003

The drop-out and repetition data at MOE schools by grade is:

		Repetition			Drop-Out		
		All	Male	Female	All	Male	Female
Overall		0.61	0.70	0.52	0.42	0.49	0.35
Basic Cycle	Grade	0.63	0.70	0.57	0.39	0.47	0.32
	1	0.35	0.35	0.36	0.15	0.16	0.14
	2	0.19	0.19	0.18	0.1	0.13	0.08
	3	0.17	0.18	0.17	0.08	0.09	0.06
	4	0.47	0.47	0.47	0.18	0.21	0.14
	5	0.72	0.82	0.63	0.23	0.31	0.15
	6	0.86	0.97	0.75	0.32	0.43	0.21
	7	1.01	1.14	0.88	0.48	0.61	0.36
	8	1.09	1.18	1.0	0.63	0.79	0.48
	9	1.21	1.28	1.15	0.94	1.11	0.77
	10	0.26	0.41	0.11	0.92	0.93	0.92
Secondary Cycle		0.43	0.65	0.24	0.57	0.6	0.55
	11	0.35	0.50	0.22	0.48	0.45	0.50
	12	0.50	0.79	0.25	0.66	0.74	0.59

Current education policies and processes

The intended goal of ERfKE is to change the structure and culture in education to achieve a major change. In order to observe that change, baseline information is gathered on the status of the followings:

1. Characteristics of the current education policies and strategies
2. How the current internal processes are conducted and integrated
3. Current format and level of interaction and communication among all parties in the education system
4. Current process and procedures in selecting processes and interventions
5. Current level of effectiveness of polices and encouraging innovations
6. The current education climate
7. Structure and effectiveness of the current incentives and its association with performance

Before ERfKE, the following guides were shaping policies and decisions at MOE: (i) Objectives and strategies are derived from national legislation, plans, and regulations along with any vision of an improved state, which underpins these. (ii) The annual planning cycle, through which funds are released to achieve objectives and solve problems; and (iii) Events – problems and opportunities that require decisions and new policies.

There are three levels at which policy- and decision-making systems and methods are used:

- Executive decision-making
- Decision-making at central directorate level; and
- Decision-making at field directorate level.

The current situation analysis pointed to some weaknesses and limitations of the current procedures.

Executive decision-making

The national structure of legislation and regulations shape the work of the executive level. When problems and queries reach the senior executives, first they are examined to see whether existing procedures, regulations and criteria can be applied to resolve the issue. While it is the norm that these issues, particularly where they involve individual employees, rarely reach a Minister's desk and are dealt with at lower levels, this may not always be the case within the MoE. The special individual concerns rose by political, parliamentary and media sources may require resolution at the executive level. Where existing procedures cannot resolve an issue, a committee is normally formed, not only to examine and answer the specific query but also often to establish principles and criteria (because of the lack of renewed and integrated education policies), so that a precedent for the future in such issues can be established. Committees also play an important part in the planning phase of new initiatives.

Outside the committee structure, there is no current system for providing systematic daily, weekly or monthly reports and/or briefings at the executive level. Also there is no solid (in terms of time and quality) system for providing regular, specific and up-to-date online summaries (e.g. statistical) and reports. The major regular data collection activity specifically for executive needs seems to be the "Briefing Papers" prepared before executive field visits. However, these are not used for post-visit analyses or information updates. Other than these, there is no systematized feedback from the field directorates.

Secretary-Generals receive annual plans from the managing directors (MDs) and provide a framework for tracking progress and assessing performance. However, performance indicators and benchmarks have not as yet been developed to facilitate performance appraisal. More generally, follow-up and monitoring procedures are inhibited by the lack of a national inspection system and an effective management information system. Currently there is no systematic approach or special unit to develop and maintain performance monitoring and the development of indicators. Before ERfKE, the central Ministry was not used to receiving regular feedback on system performance. Although there is a Research Directorate in MoE, it is not commissioned to undertake problem- or policy-focused research and other investigations. Also there was no research budget or competent research staff available to provide this type of decision support.

There is no specialization within the immediate executive support structures – their offices. Specialist's help (whether technical, research, planning or media relations), used to be obtained from the directorates. The culture of special advisers, common in many Ministries of Education, does not seem to be well established in MoE. It is clear the need for reinforcing an executive support within and across the directorates rather than building up a "specialist/special adviser" structure at the executive level, as recommended in the National Education Strategy.

One consequence of the current lack of systematic support at the executive level is the very heavy workload demanded of the MoE's most senior executives. The baseline situation could be summarized as lacking to:

- a focused strategic policy and planning structures,
- a systematic planning procedures, which are based on accurate and current evidence,
- a strong focus on quality improvement and strategic planning throughout the central Ministry, with much less involvement in operational matters, particularly at executive level.

Finance

There are internal procedures through Planning & Finance directorates, together with external control from Ministry of Finance. It is very complicated to provide forecasts, simulations and impact models of alternative models of educational expenditure and distribution. There are insufficient efforts to conduct long-term analyses of full implications of new initiatives (including donor assistance). Budget is aggregated and lacks a unified budget management & monitoring system, based on activity-based budgeting. Finances are aggregated or grouped in lumps, which make it almost impossible to get accurate, or actual (not estimated) figures for smaller groups. For example there are finances for basic education as a whole but hard to get it for one of the 10 basic years.

Examinations

Only teacher-based tests and national grade 12 (Tawjehi) examinations took place. Two parallel record systems (school and MOE). There is no comparison of examination outcomes and student performance on subject-by-subject, school-by-school and even class-by-class at the different levels: national, regional, and by gender. A national test is also conducted but not systematically analyzed. The country participated in international exams such as TIMSS 1999 and 2003 but curriculum and learning were assessed below international standards (although slightly above average in science).

Curriculum
It is a traditional content-based curriculum. There were insufficient activities to examine alternative curriculum development strategies & priorities and evaluate their impact. Curriculum was content-based and not based on a well-defined and planned set of learning outcomes and expected skills.

Schools
Separate planning routes for school building/upgrading programs, with no information on relative costs. There was no viable structure for conducting systematic cost-benefit analyses to identify options for building and equipping schools on cost-benefit basis. With current information or systems it is not easy to identify high-cost schools and school rationalization models. The school building, class orientation, material, furniture were not clearly based on learning or instructional theories.

Personnel
Statistics on student-teacher ratios and class size indicate that there has been teacher shortages and new teachers relatively untrained. Quality of teachers with degree from teacher education colleges is relatively low. Teacher appointments are not school-based and appraisals not used for quality assurance. It lacks a continuous process and a system to provide evidence of benefits of different models of teacher-training that enable comparisons between alternative models of teacher selection, deployment, and appraisal. The teacher is also not seriously involved in decision making especially in major issues related to their affairs, the curriculum, student performance, instructional creativity, and on setting up new educational policies.

Supplies
The current supply system is paper-based with no unified inventory control and ineffective distribution systems. There is no system for inventory management or analysis to compare alternative resource based on management models.

Information and data management
Despite the several initiatives and education reforms to effectively maintain and manage educational indicators and data, ERfKE started during a period in which the annual education statistics handbook takes up to two years to produce. Information is not systematically nor effectively used in decision making because accurate and real figures are not easily accessible. Data is not efficiently centralized and in most cases not electronically stored. Extracting information is mainly manual and not purely electronic.

Indicators related to policy and decision making at the school level are extracted from TIMSS 2003 study. Information was gathered from the school principal. Information on the following has been assessed:

1. The decisions in hiring and firing of teachers and incentives to hire, based on TIMSS 2003 results, are centralized and table 1 shows the difficulty level in filling vacancies:

Table 1: Difficulty level in hiring and filling teaching vacancies at school (percentages):

	Were no vacancies in this subject	Easy to fill vacancies	Somewhat difficult	Very difficult
a) Mathematics	28	50	17	5
b) Science	44	46	17	3
c) Computer science/ information technology	19	49	22	11

2. Schools don't use incentives (e.g., pay, housing, signing bonus) to recruit or retain teachers in the fields of: mathematics, science, and computer science. Table 2 shows the lack of incentive in this regard:

Table 2: Percentage of schools which does not currently use any incentives (e.g., pay, housing, signing bonus) to recruit or retain <eighth-grade>teachers in the following fields?

	Percentage
a) Mathematics	99
b) Science	99
c) Other	96

MOE and the directorates design school important goals, curriculum policies, content knowledge, teaching skills, information technology skills (centralized decision making process)

3. School management is the responsibility of the school principal under the directions of the MOE. Time allocation for the principal of a school is summarized in Table 3. The table shows the percentage of principal time spent on administrative duties (e.g. hiring, budgeting, scheduling); on instructional leadership (e.g., developing curriculum and pedagogy); supervising and evaluating teachers an other staff; teaching; on public relations and fundraising; and on doing other duties.

Table 3: Principal time spent on these activities:	**%**
a) Administrative duties (e.g., hiring, budgeting, scheduling)	**24**
b) Instructional leadership (e.g., developing curriculum and pedagogy)	**21**
c) Supervising and evaluating teachers and other staff	**24**
d) Teaching	**8**
e) Public relations and fundraising	**14**
f) Other	**10**
Average principal time on the job (years)	**5**

School schedule and assignments can be described as in Table 4:

Table 4: School schedule

Days per year is your school open for instruction	187
Instructional days per week	5 days

Teacher load (in a typical calendar week, the total number of single periods for which teachers are formally <scheduled/time-tabled/assigned>?	22
Minutes in a typical single period	45

Tables 6a and 6b show the faculty time including responsibilities outside the classroom and their interaction.

Table 6: Teacher time allocation

Outside the formal school day, approximately how many hours per week normally a teacher spends on each of these activities? (not including the time already accounted)	
a) Grading student tests, exams, or other student work	4
b) Planning lessons	4
c) Administrative and record-keeping tasks including staff meetings	2
d) Other	1
How many students are in the TIMSS class?	34
How many minutes per week do you teach mathematics to the TIMSS class?	180
How many minutes per week do you teach science to the TIMSS class?	221

How often do you have the following types of interactions with other teachers?

Math teachers	**Never or almost never**	**2 or 3 times per month**	**1-3 times per week**	**Daily or almost daily**
a) Discussions about how to teach a particular concept	9	39	34	18
b) Working on preparing instructional materials	20	45	18	17
c) Visits to another teacher's classroom to observe his/her teaching	31	57	11	1
d) Informal observations of my classroom by another teacher -	56	34	7	3
Science teachers				
a) Discussions about how to teach a particular concept	5	31	41	22
b) Working on preparing instructional materials	5	45	26	25
c) Visits to another teacher's classroom to observe his/her teaching	34	63	2	1
d) Informal observations of my classroom by another teacher -	53	40	5	2

Current situation on availability/use of technology mastery level of skills at schools

Computers were used at schools or homes before the ERfKE project. Ministry of Education has also been collecting IT statistics at schools. Table 7 shows the 2003 statistics on availability and use if technology and ICT at schools. It contains data on the following indicators:

1. Percentage of schools with computers
2. Percentage of computers with Internet/Intranet
3. Computer to teacher and student ratios

Table 7(a): Performance Indicators			
	2003		
Current availability and use of technology and ICT at schools	**Number**	**Total**	**%**
Schools with computers	1,200	3,000	40%
Schools with Internet	30	3,000	1%
Schools with Intranet	110	3,000	4%
Computer-to-Teacher (overall not by school)	47,000	56,190	0.8
Source: MOE 2003-statistics unit			

Table 7(b): Performance Indicators			
Student-computer ratio	47,000	1,051,675	22
Average number of computers at school that can be used for educational purposes by students (TIMSS 2003)	16.3		

From TIMSS 2003, Table 8 shows data on the availability and use of hardware and software at school.

Table 8: Availability of ICT Resources	
Average, total number of computers at school that can be used for educational purposes by <eighth-grade> students?	**16**
% of computers has access to the Internet (e-mail or World Wide Web) for educational purposes?	
All	14
Most	4
Some	0
None	82
Percentage of schools with someone available to help teachers use information and communication technology for teaching and learning?	**Yes** 54
The person at school who helps teachers use information and communication technology for teaching and learning? (% of schools)	
A full-time school level coordinator (has no other job responsibility)	29
A library media specialist who also serves as computer coordinator	16

A teacher who also has the title of this type of coordinator	23
A teacher who provides leadership informally to other teachers	14
The principal or another school administrator	11
Other person	5

The perception of shortage in ICT material for instructions is characterized in Table 9.

Table 9: Is school's capacity to provide instruction affected by a shortage or inadequacy of the following ICT equipments:

	None	A little	Some	A lot
Computers for mathematics instruction	31	24	22	23
Computer software for mathematics instruction	31	24	23	23
Calculators for mathematics instruction	39	25	19	16
Audio-visual resources for math instructions	32	31	24	13
Computers for science instruction	30	26	23	22
Computer software for science instruction	30	23	24	23
Calculators for science instructions	35	36	14	16
Audio-visual resources for science instructions	23	34	23	19
Computer support staff	32	21	25	22

Students' usage of computers is estimated in Table 10:

Table 10 (a): Student's use of computers		
Do you ever use a computer? (Do not include PlayStation®, GameCube®, XBox®, or other TV/video game computers).		**Yes**
		96
Where do students use a computer?		
a) At home	45	55
b) At school*	83	17
c) At a library	12	88
d) At a friend's home	44	56
e) At an Internet café	33	67
f) Elsewhere	39	61
* might be for the required computer class		

Table 10 (b): Frequency of use a computer to do functions:					
	Every day	**At least once a week**	**Once or twice a month**	**A few times a year**	**Never**
a) I look up ideas and information for mathematics	23	32	14	11	21
b) I look up ideas and information for science	22	32	16	12	19
c) I write reports for school	15	23	23	17	21
d) I process and analyze data	26	28	16	13	18

From TIMSS 2003 the percentage of teachers using ICT for educational purposes are shown in Table 11.

Table 11: Teachers use of computers

Do students in the TIMSS class have:	**Yes**	**No**
computers available to use during their mathematics lessons?	5	95
Do any of the computers have access to the Internet?	35	65

In teaching mathematics to the TIMSS class, how often do you have students use a computer for the following activities?

	Every or almost every lesson	**About half the lessons**	**Some lessons**	**Never**
a) Discover mathematics principles and concepts	0	0	65	35
b) Practice skills and procedures	0	0	65	35
c) Look up ideas and information	0	0	65	35
d) Process and analyze data	0	0	35	65

Science

	Yes	**No**
Do students in the TIMSS class have computers available to use during their science lessons?	16	84
Do any of the computers have access to the Internet?	18	82

In teaching science to the <TIMSS class>, how often do you have students use a computer for the following activities?	**Never**	**Some lessons**	**About half the lessons**	**Every or almost every lesson**
a) Do scientific procedures or experiments	12	0	23	65
b) Study natural phenomena through simulations	14	0	46	40
c) Practice skills and procedures	14	0	45	42
d) Look up ideas and information	7	16	38	40
e) Process and analyze data	14	0	31	56

Current availability of KGs and ECD services

In this regard Table 12 shows:
1. Percentage of children attending KG
2. Percentage of children attending ECD services
3. Percentage of children taught by trained cadre
4. Number of trained cadre
5. Type and quality (strengths and weaknesses) of KG administration

Table 12: Current availability of KGs and ECD services	
	%
Net Enrollment Rate	33%
Gross Enrollment Rate	36%
Children attending KG	40%
Children taught by trained cadre	56%
Child-teacher ratio at KG/MOE	4%
Child-teacher ratio at KG/Kingdom	5%
Number of KGs	?
Number of public KGs in rural areas	0
Characteristics and types of material, furniture	?

Current indicators on ECD material and resources
1. Number of current standardized textbooks
2. Type of current textbooks used at KGs
3. Type and quality of ECD material
4. Type and current teaching methods
5. Type of teaching methodology

Other qualitative and quantitative information is available in the UNICEF's paper "status of ECD in Jordan 2003" (?)

Current physical infrastructure, conditions, issues and availability of school

Table 13 contains baseline data on the following:

1. Percentage of students in double shift
2. Percentage of schools with science labs
3. Percentage of crowded schools
4. Average number of students per square meter
5. Student teacher ratio
6. Percentage of school in need for rehabilitation
7. Shortage of schools
8. Student's regard for school property

Table 13: Current physical infrastructure, conditions, issues and availability of school		
Percentage of students in double shift	13%	
Percentage of students in rented class units	11%	
Percentage of schools with science labs	48%	
Percentage of overcrowded schools	46%	Student per square>1.2
Average number of students per square meter	0.74	
Average school size	351	TIMSS (780)
Student teacher ratio	19	
Student class-unit ratio	29	
Percentage of schools in need for rehabilitation	10%	
Percentage of school without heating/air-conditioning	100%	
Percentage of school without electricity	2%	
Shortage of schools (number of schools)	400	
Source: Education Statistics, MOE 2003		

Also the following two tables show the student-teacher and student-class ratios by governorates and urban-rural:

Student-Teacher Unit Ratio by Governorate and Controlling Authority in Urban and Rural Areas for the Year 2002/200			
Governorate	**Total**	**Urban**	**Rural**
Grand Total	18.7	21.5	15.6
Capital	21.8	23.4	16.9
Madaba	15.5	19	12.7
Zarqa	23	23.9	18.5
balqa	17.1	19.2	16.1
Irbid	18.4	19.6	17.5
Jarash	17.8	20.1	16.2
Ajloun	17.9	20.1	16.7

Mafraq	14.3	17.5	13.3
Karak	13.7	15.5	13.1
Tafila	14.5	15.5	13.9
Maan	13.6	16.5	11.3
Aqaba	20	23.8	12.8
Source: MOE 2003			

Student-Class Unit Ratio by Governorate and Controlling Authority in Urban and Rural Areas for the Year 2002/200			
Governorate	**Total**	**Urban**	**Rural**
Grand Total	**28.9**	**33.6**	**23.7**
Capital	**32.9**	**35.7**	**24.6**
Madaba	**24.6**	**30.9**	**19.7**
Zarqa	**33.9**	**35.4**	**26.7**
balqa	**26.1**	**30.5**	**24.2**
Irbid	**29.4**	**32.3**	**27.3**
Jarash	**25.8**	**30.6**	**22.7**
Ajloun	**27.3**	**32.3**	**24.8**
Mafraq	**21.6**	**26.9**	**19.9**
Karak	**23.2**	**27.6**	**21.8**
Tafila	**25.1**	**27.7**	**23.6**
Maan	**20.5**	**25.6**	**16.6**
Aqaba	**31.2**	**37.9**	**19.2**

From TIMSS 2003, we use the following baseline information about schools:

1. school condition and environment
2. school size
3. heating/lighting
4. instructional material

Also, Table 14 shows how the school capacity to provide information is affected by shortage or inadequacy of the following:

1. Instructional material
2. budget and supplied
3. school buildings and grounds
4. heating/cooling and lighting systems
5. Instructional space (e.g., classrooms)
6. Special equipment for handicapped students
7. Computers for instruction
8. Computer software for instruction
9. Library materials relevant to instruction

10. Audio-visual resources for instruction
11. Science laboratory equipment and material
12. Calculators for instructions
13. Teachers
14. Computer support staff

Table 14: Is school's capacity to provide instruction affected by a shortage or inadequacy of any of the following?

	None	A little	Some	A lot
a) Instructional materials (e.g., textbook)	26	14	18	42
b) Budget for supplies (e.g., paper, pencils)	36	35	21	8
c) School buildings and grounds	22	30	20	29
d) lighting systems, heating and cooling	17	24	30	29
e) Instructional space (e.g., classrooms)	24	19	31	26
f) Special equipment for handicapped students	40	21	17	22
g) Computers for mathematics instruction	31	24	22	23
h) Computer software for mathematics instruction	31	24	23	23
i) Calculators for mathematics instruction	39	25	19	16
j) Library materials relevant to mathematics instruction	23	51	20	7
k) Audio-visual resources for mathematics instruction	32	31	24	13
l) Science laboratory equipment and materials	20	17	22	42
m) Computers for science instruction	30	26	23	22
n) Computer software for science instruction	30	23	24	23
o) Calculators for science instruction	35	36	14	16
p) Library materials relevant to science instruction	24	46	21	10
q) Audio-visual resources for science instruction	23	34	23	19
r) Teachers	19	16	5	60
s) Computer support staff	32	21	25	22

Perception of teachers of school conditions is described in Table 15 about:

- School facility is in need of significant repair
- The school is located in a safe neighborhood
- I feel safe at this school
- The school's security policies and practices are sufficient

Table 15: Thinking about your CURRENT school, indicate the extent to which you agree or disagree with each of the following statements.

	Agree a lot	Agree	Disagree	Disagree a lot
a) This school facility (building and grounds) is in	28	41	26	5

need of significant repair				
b) A safe neighborhood	35	48	13	4
c) I feel safe at this school	36	51	9	4
d) This school's security policies and practices are sufficient	24	61	12	2

Current level of morale and enthusiasm to teaching and students self belonging at school

From TIMSS 2003, we obtained information on:

1. General school climate, learning environments, teachers' interest and morale, teacher job satisfaction, teachers' degree of success in implementing the school's curriculum and teachers understanding of goals (Table 16)

Table 16 (a): Principals perception of school climate (percentages)

	Very high	High	Medium	Low	Very Low
a) Teachers' job satisfaction	8	45	38	8	0.9
b) Teachers' understanding of the school's curricular goals	11	70	16	3	0
c) Teachers' degree of success in implementing the school's curriculum	20	64	14	2	0
d) Teachers' expectations for student achievement	8	51	38	4	0
e) Parental support for student achievement	4	17	50	24	5
f) Parental involvement in school activities	2	17	36	33	14
g) Students' regard for school property	4	42	37	13	5
h) Students' desire to do well in school	9	50	36	6	0

Table (b): Teachers perception of school climate: How teachers characterize each of the following within their school?

	Very high	High	Medium	Low	Very low
a) Teachers' job satisfaction	2	24	41	22	11
b) Teachers' understanding of the school's curricular goals	9	64	22	5	0
c) Teachers' degree of success in implementing the school's curriculum	13	50	32	6	0
d) Teachers' expectations for student achievement	15	36	39	8	3
e) Parental support for student achievement	2	3	40	40	16
f) Parental involvement in school activities	3	7	28	36	26
g) Students' regard for school property	2	19	44	22	13
h) Students' desire to do well in school	4	20	49	20	8
Science					
a) Teachers' job satisfaction	5	17	42	22	13
b) Teachers' understanding of the school's curricular goals	13	51	30	5	1

c) Teachers' degree of success in implementing the school's curriculum	16	51	29	4	0
d) Teachers' expectations for student achievement	16	40	33	9	2
e) Parental support for student achievement	2	6	45	32	16
f) Parental involvement in school activities	2	4	31	35	28
g) Students' regard for school property	1	15	37	34	14
h) Students' desire to do well in school	3	18	53	19	8

2. General students' characteristics at school that include level of student self belonging at school, students desire to do well, teachers' expectations for student achievement, and students' desire to do well in school are described in Table 17.

On students' self-confidence and valuing mathematics and science:

Table 17: How much do you agree with these statements about learning science?

	Agree a lot	**Agree a little**	**Disagree a little**	**Disagree a lot**
a) I usually do well in science	60	33	4	3
b) I would like to take more science in school	59	32	7	3
c) Science is more difficult for me than for many of my classmates	18	31	22	29
d) I enjoy learning science	61	27	8	4
e) Sometimes, when I do not initially understand a new topic in science, I know that I will never really understand it	23	25	21	32
f) Science is not one of my strengths	15	30	19	37
g) I learn things quickly in science	46	38	11	5

Table 18: How much do you agree with these statements about science?

	Agree a lot	**Agree a little**	**Disagree a little**	**Disagree a lot**
a) I think learning science will help me in my daily life	70	24	4	3
b) I need science to learn other school subjects	47	39	9	5
c) I need to do well in science to get into the <university> of my choice	67	21	8	3
d) I would like a job that involved using science	44	36	11	8
e) I need to do well in science to get the job I want	61	26	9	5

Table 19: How much do you agree with these statements about learning mathematics?

	Agree a lot	Agree a little	Disagree a little	Disagree a lot
a) I usually do well in mathematics	47	42	6	5
b) I would like to take more mathematics in school	52	34	9	5
c) Mathematics is more difficult for me than for many of my classmates	22	31	23	23
d) I enjoy learning mathematics	51	30	10	9
e) Sometimes, when I do not initially understand a new topic in mathematics, I know that I will never really understand it	31	26	18	26
f) Mathematics is not one of my strengths	19	30	19	32
g) I learn things quickly in mathematics	36	41	13	9

Table 20: How much do you agree with these statements about mathematics?

	Agree a lot	Agree a little	Disagree a little	Disagree a lot
a) I think learning mathematics will help me in my daily life	73	21	3	3
b) I need mathematics to learn other school subjects	53	36	7	4
c) I need to do well in mathematics to get into the university of my choice	72	18	6	3
d) I would like a job that involved using mathematics	37	40	12	11
e) I need to do well in mathematics to get the job I want	62	26	7	5

Table 21: How much do you agree with these statements about your school?

	Agree a lot	Agree a little	Disagree a little	Disagree a lot
a) I like being in school	67	24	4	5
b) I think that students in my school try to do their best	56	31	8	5
c) I think that teachers in my school care about the students	61	22	10	7
d) I think that teachers in my school want students to do their best	73	17	5	5

Table 22: In school, did any of these things happen during the last month?

	Yes	No
a) Something of mine was stolen	58	42

b) I was hit or hurt by other student(s) (e.g., shoving, hitting, kicking)	61	39
c) I was made to do things I didn't want to do by other students	64	36
d) I was made fun of or called names	61	39
e) I was left out of activities by other students	63	37

Table 23: On a normal school day, how much time do you spend before or after school doing each of these things?

	No time	Less than 1 hour	1-2 hours	More than 2 but less than 4 hours	4 or more hours
a) I watch television and videos	20	28	29	13	11
b) I play computer games	42	29	16	6	7
c) I play or talk with friends	19	39	22	9	10
d) I do jobs at home	17	33	28	12	9
e) I work at a paid job	65	16	9	4	6
f) I play sports	20	42	20	8	10
g) I read a book for enjoyment	30	40	20	6	4
h) I use the internet	67	14	9	4	6
i) I do homework	8	19	34	19	20

Table 24: During this school year, how often have you had extra lessons or tutoring in mathematics that is not part of your regular class? (percentage)

Every or almost every day	12
Once or twice a week	16
Sometimes	21
Never or almost never	51

Teachers provided information about school attendance in Table 25:

Table 25: School attendance

On a typical school day, what percentage of students is absent from school for any reason?

Less than 5%	84
5 to 10%	13
11 to 20%	3.3
More than 20%	0

Of the students who were enrolled in your school at the start of this school year, about what percentage is still enrolled?

96 to 100%	84
90 to 95%	11
80 to 89%	2
Less than 80%	4

What percentage of the students in your school enrolled after the beginning of the school year?	
Less than 5%	75
5 to 10%	17
11 to 20%	4
More than 20%	5

3. General parental characteristics to support learning: parental support for student achievement, parental involvement in school activities. Expectations from parental and their involvement are shown in Table 26.

Table 26: Does your school expect parents to do the following	**Yes**	**No**
a) Attend special events (e.g., science fair, concert, sporting events)	86	14
b) Raise funds for the school	21	79
c) Volunteer for school projects, programs, and trips	41	59
d) Ensure that their child completes his/her homework	70	30
e) Serve on school committees (e.g., select school personnel, review school finances)	24	76

Current curriculum and Current instructional practices

The current curriculum is information based and is not based on clear and well-defined learning outcomes targeting special skills. Teachers rely on textbook and supplementing material are rarely existing. Its quantity and quality are described below.

From TIMSS 2003,

- Group ability: The following table shows the percentage of student by their perception of group work in mathematics and science (Table 27):

Table 27: Students' perception of group work

	Every or almost every lessons	about half the lessons	Some lessons	Never
In science: We work in small groups on an experiment or investigation	40	21	28	20
In mathematics: We work together in small groups	21	17	28	34

- Schools don't organize mathematics/science instruction for students with different levels of ability. As shown in Table 28 students study the same curriculum

Table 28: Do you group students by ability? (percentage)

	Yes	No
within their mathematics classes	12	88
within their science classes	15	85

- Participation in extra curricula activities: Table 29 shows the percentage of schools which offer enrichments or remedial activities in mathematics and science.

Table 29: Does school do any of the following for students?

	Yes	No
a) Offer enrichment mathematics	57	43
b) Offer remedial mathematics	89	11
c) Offer enrichment science	55	45
d) Offer remedial science	88	12

Tables (30) and (31) show the structure and type of instructional activities which are used in science and mathematics lessons.

Table 30: How often do you do these things in your science lessons?

	Every or almost every lessons	About half the lessons	Some lessons	Never

a) We watch the teacher demonstrate an experiment or investigation	48	20	28	5
b) We formulate hypotheses or predictions to be tested	32	31	25	12
c) We design or plan an experiment or investigation	30	26	33	12
d) We conduct an experiment or investigation	30	25	34	12
e) We work in small groups on an experiment or investigation	40	21	28	20
f) We write explanations about what was observed and why it happened	40	26	25	10
g) We study the impact of technology on society	28	25	28	19
h) We relate what we are learning in science to our daily lives	46	25	21	9
i) We present our work to the class	42	24	23	11
j) We review our homework	55	21	17	7
k) We listen to the teacher give a lecture-style presentation	69	16	11	5
l) We work problems on our own	54	26	16	4
m) We begin our homework in class	26	20	28	27
n) We have a quiz or test	23	19	38	21

Table 31: How often do you do these things in your mathematics lessons?

	Every or almost every lesson	About half the lessons	Some lessons	Never
a) We practice adding, subtracting, multiplying, and dividing without using a calculator	50	9	18	23
b) We work on fractions and decimals	34	24	38	4
c) We interpret data in tables, charts, or graphs	39	25	31	5
d) We write equations and functions to represent relationships	43	27	25	4
e) We work together in small groups	21	17	28	34
f) We relate what we are learning in mathematics to our daily lives	43	21	22	14
g) We explain our answers	64	19	14	4
h) We decide on our own procedures for solving complex problems	56	22	17	5
i) We review our homework	62	19	13	6

j) We listen to the teacher give a lecture-style presentation	70	15	10	5
k) We work problems on our own	55	25	16	4
l) We begin our homework in class	28	19	28	25
m) We have a quiz or test	22	17	40	21
n) We use calculators	12	8	26	55

On homework, Tables 32-35 show the type, frequency, and expected effort for mathematics and science:

Table 32: How often does your teacher give you homework in mathematics?	
Every day	54
3 or 4 times a week	29
1 or 2 times a week	10
Less than once a week	5
Never	2

When your teacher gives you mathematics homework, about how many minutes are you usually given?	
Fewer than 15 minutes	27
15–30 minutes	43
31–60 minutes	20
61–90 minutes	5
More than 90 minutes-	7

How often does your teacher give you homework in science?	
Every day	23
3 or 4 times a week	31
1 or 2 times a week	31
Less than once a week	13
Never	2

When your teacher gives you science homework, about how many minutes are you usually given?	
Fewer than 15 minutes	24
15–30 minutes	39
31–60 minutes	24
61–90 minutes	8
More than 90 minutes	6

Frequency of homework:

Table 33: How often do you assign the following kinds of science homework	**Always or almost**	**Sometimes**	**Never or almost**

to the <TIMSS class>?	always		never
a) Doing problem/question sets	57	42	1
b) Finding one or more applications of the content covered	28	64	8
c) Reading from a textbook or supplementary materials	45	46	9
d) Writing definitions or other short writing assignments	36	56	7
e) Working on projects	4	62	34
f) Working on small investigations or gathering data	20	65	16
g) Preparing reports	22	61	17

Table 34: How often do you assign the following kinds of mathematics homework to the TIMSS class?

	Always or almost always	Sometimes	Never or almost never
a) Doing problem/question sets	81	17	2
b) Gathering data and reporting	2	68	30
c) Finding one or more applications of the content covered	10	74	16

Table 35: How often do you do the following with the mathematics homework assignments?

	Always or almost always	Sometimes	Never or almost never
a) Monitor whether or not the homework was completed	83	17	0
b) Correct assignments and then give feedback to students -	72	28	0
c) Have students correct their own homework in class	68	24	8
d) Use the homework as a basis for class discussion	53	46	2
e) Use the homework to contribute towards students' grades or marks	30	66	4

Table 36: How often do you do the following with the science homework assignments?

	Always or almost always	Sometimes	Never or almost never
a) Monitor whether or not the homework was completed -	89	12	0
b) Correct assignments and then give feedback to students	81	19	0

c) Have students correct their own homework in class	56	30	14
d) Use the homework as a basis for class discussion	41	56	4
e) Use the homework to contribute towards students' grades or marks	38	52	9

Problems facing teaching in relation to their classroom activities and instructions are solicited in Tables 37 and 38, for science and mathematics classes respectively:

Table 37: In your view, to what extent do the following limit how you teach science

	Not applicable	Not at all	A little	Some	A lot
a) Students with different academic abilities	2	4	18	29	48
b) Students who come from a wide range of backgrounds (e.g., economic, language)	18	9	28	36	11
c) Students with special needs (e.g., hearing, vision, speech impairment, physical disabilities, mental or emotional/psychological impairment)	33	18	17	27	5
d) Uninterested students	5	2	16	29	48
e) Low morale among students	5	6	31	38	21
f) Disruptive students Resources	16	12	24	37	12
g) Shortage of computer hardware	32	15	12	19	22
h) Shortage of computer software	26	13	10	19	33
i) Shortage of support for using computers	26	14	11	17	32
j) Shortage of textbooks for student use	50	23	15	7	4
k) Shortage of other instructional equipment for students' use	15	9	31	32	13
l) Shortage of equipment for your use in demonstrations and other exercises	12	11	26	37	13
m) Inadequate physical facilities	12	9	22	37	20
n) High student/teacher ratio	16	7	14	24	36

Table 38: In your view, to what extent do the following limit how you teach mathematics?

	Not applicable	Not at all	A little	Some
Students				
a) Students with different academic abilities	1	2	19	40
b) Students who come from a wide range of backgrounds (e.g., economic, language)	16	13	27	33

c) Students with special needs, (e.g., hearing, vision, speech impairment, physical disabilities, mental or emotional/psychological impairment)	29	8	33	21
d) Uninterested students	3	2	16	33
e) Low morale among students				
f) Disruptive students	11	18	27	32
Resources				
g) Shortage of computer hardware	34	13	17	13
h) Shortage of computer software -	32	8	16	10
i) Shortage of support for using computers	26	8	17	16
j) Shortage of textbooks for student use	46	30	9	10
k) Shortage of other instructional equipment for students' use	9	9	35	35
l) Shortage of equipment for your use in demonstrations and other exercises	13	12	32	33
m) Inadequate physical facilities	15	17	22	24
n) High student/teacher ratio	11	12	21	17

Time on task and coverage of content is described in Tables 39 and 40 :

Table 39: By the end of this school year, approximately what percentage of teaching time will you have spent during this school year on each of the following science content areas

	%
a) Life science (e.g., types, characteristics, and classification of living things; structure/function and life processes in organisms; reproduction and heredity; diversity, adaptation and natural selection; ecosystems; and human health)	25
b) Chemistry (e.g., classification, composition and particulate structure of matter; properties and uses of water; acids and bases; and chemical change)	24
c) Physics (e.g., physical states and changes in matter; energy types, sources and conversions; heat and temperature; light; sound and vibration; electricity and magnetism; forces and motion)	25
d) Earth science (e.g., Earth's structure and physical features; Earth's processes, cycles and history; the solar system and universe)	15
e) Environmental science (e.g., changes in population; use and conservation of natural resources; and changes in environments)	9
f) Other	2

Table 40: By the end of this school year, approximately what percentage of teaching time will you have spent during this school year on each of the following mathematics content areas?

a) Number (e.g., whole numbers, fractions, decimals, ratio, proportion, percent)	25
b) Geometry (e.g., lines and angles, shapes, congruence and similarity, spatial relationships, symmetry and transformations)	21
c) Algebra (e.g., patterns, equations and formulas, relationships)	22
d) Data (e.g., data collection and organization, data representation, data interpretation, probability)	13
e) Measurement (e.g., attributes and units, tools, techniques and formulas)	13
f) Other	5

Teacher's perception on content of the science and mathematics curricula is shown in tables 41 and 42:

Table 41: Teacher's feedback about the science curriculum

	Mostly taught before this year	Mostly taught this year	Not Yet taught or just introduced
A. Biology			
a) Classification of organisms on the basis of a variety of physical and behavioral characteristics	16	82	3
b) The major organ systems in humans and other organisms	44	48	8
c) How the systems function to maintain stable bodily conditions	31	46	23
d) Cell structures and functions	54	26	20
e) Photosynthesis and respiration as processes of cells and organisms, including substances used and produced	36	54	10
f) Life cycles of organisms, including humans, plants, birds, insects	54	20	26
g) Reproduction (sexual and asexual), and heredity (passing on of traits), inherited versus acquired/learned characteristics	42	14	45
h) The role of variation and adaptation in survival/extinction of species in a changing environment	44	12	44
i) The interaction of living organisms in an ecosystem (energy flow, food chains and food webs, food pyramids, and the effects of change upon the system)	53	25	22
j) Cycling of materials in nature (water, carbon/oxygen cycle, decomposition of organisms)	56	17	27
k) Causes of common infectious diseases, methods of infection/transmission, prevention, and the body's natural resistance and healing capabilities	36	10	54
l) Preventive medicine methods (diet, hygiene, exercise and lifestyle)	47	11	42
B. Chemistry			
a) Classification and composition of matter (physical and chemical characteristics, pure substances and mixtures, separation techniques)	39	52	9
b) Properties of solutions (solvents, solutes, effects of temperature on solubility)	58	22	20
c) Particulate structure of matter (molecules, atoms, protons, neutrons, and electrons)	20	78	2
d) Properties and uses of water (composition, melting/boiling points, changes in density/volume)	62	19	19

e) The properties and uses of common acids and bases	23	38	40
f) Chemical change (transformation of reactants, evidence of chemical change, conservation of matter)	25	46	29
g) The need for oxygen in common oxidation reactions (combustion, rusting) and the relative tendency of familiar substances to undergo these reactions	17	75	9
h) Classification of familiar chemical transformations as releasing or absorbing heat/energy	17	23	63
C. Physics			
a) Physical states and changes in matter (explanations of properties including volume, shape, density and compressibility in terms of movement/distance between particles)	59	29	12
b) The processes of melting, freezing, evaporation, and condensation(phase change by supplying/removing heat; melting/boiling points; effects of pressure and purity of substances)	62	23	16
c) Energy types, sources, and conversions, including heat transfer	17	67	16
d) Thermal expansion and changes in volume and/or pressure	35	27	39
e) Basic properties/behavior of light (reflection, refraction, light and color, simple ray diagrams)	7	86	7
f) Properties of sound (production by vibration, transmission through media, ways of describing sound (intensity, pitch), relative speed)	4	94	2
g) Electric circuits (flow of current, types of circuits – open/closed, parallel/series) and relationship between voltage and current	9	88	3
h) Properties of permanent magnets and electromagnets	69	23	8
i) Forces and motion (types of forces, basic description of motion), use of distance/time graphs	8	83	9
j) Effects of density and pressure	42	26	32
D. Earth Science			
a) Earth's structure and physical features (Earth's crust, mantle, and core; topographic maps)	32	53	16
b) The physical state, movement, composition, and relative distribution of water on the Earth	27	28	45
c) The Earth's atmosphere and the relative abundance of its main components	25	12	63
d) Earth's water cycle (steps, role of sun's energy, circulation/renewal of fresh water)	66	21	22

e) Processes in the rock cycle and the formation of igneous, metamorphic, and sedimentary rock	55	18	28
f) Weather data/maps, and changes in weather patterns(e.g., seasonal changes, effects of latitude, altitude and geography)	36	5	59
g) Geological processes occurring over billions of years (e.g., erosion, mountain building, plate movement)	27	29	44
h) Formation of fossils and fossil fuels	35	59	6
i) Explanation of phenomena on Earth based on position/movement of bodies in the solar system and universe (e.g., day/night, tides, year, phases of the moon, eclipses, seasons, appearance of sun, moon, planets, and constellations)	57	13	31
j) The physical features of Earth compared with the moon and other planets(e.g., atmosphere, temperature, water, distance from sun, period of revolution/rotation, ability to support life)	40	8	52
k) The sun as a star	65	9	26
E. Environmental Science			
a) Trends in human population and its effects on the environment	27	15	58
b) Use and conservation of natural resources(renewable/non-renewable resources, human use of land/soil and water resources)	22	57	21
c) Changes in environments (role of human activity, effects/prevention of pollution, global environmental concerns, impact of natural hazards)	25	32	43

Table 42: Teacher's feedback about the Mathematics curriculum

A. Number	**Mostly taught before this year**	**Mostly taught this year**	**Not yet taught or Just introduced**
a) Whole numbers including place value, factorization, and the four operations	76	24	0
b) Computations, estimations, or approximations involving whole numbers	81	18	1
c) Common fractions including equivalent fractions, and ordering of fractions	78	20	1
d) Decimal fractions including place value, ordering, rounding, and converting to common fractions (and vice versa)	64	35	1
e) Representing decimals and fractions using words, numbers, or models (including number lines)	71	29	0

f) Computations with fractions	77	22	0
g) Computations with decimals	75	24	1
h) Integers including words, numbers, or models (including number lines), ordering integers, addition, subtraction, multiplication, and division with integers	71	29	1
i) Ratios (equivalence, division of a quantity by a given ratio)	68	32	0
j) Conversion of percents to fractions or decimals, and vice versa	61	38	1
B. Algebra			
a) Numeric, algebraic, and geometric patterns or sequences (extension, missing terms, generalization of patterns)	10	42	49
b) Sums, products, and powers of expressions containing variables	22	77	1
c) Simple linear equations and inequalities, and simultaneous (two variables) equations	9	87	34
d) Equivalent representations of functions as ordered pairs, tables, graphs, words, or equations	7	91	1
e) Proportional, linear, and nonlinear relationships (travel graphs and simple piecewise functions included)	7	16	77
f) Attributes of a graph such as intercepts on axes, and intervals where the function increases, decreases, or is constant	2	12	85
C. Measurement			
a) Standard units for measures of length, area, volume, perimeter, circumference, time, speed, density, angle, mass/weight	51	46	4
b) Relationships among units for conversions within systems of units, and for rates	80	17	3
c) Use standard tools to measure length, weight, time, speed, angle, and temperature	67	23	11
d) Estimations of length, circumference, area, volume, weight, time, angle, and speed in problem situations (e.g., circumference of a wheel, speed of a runner)	59	32	9
e) Computations with measurements in problem situations	45	32	23
f) Measurement formulas for perimeter of a rectangle, circumference of a circle, areas of plane figures (including circles), surface area and volume of rectangular solids, and rates	54	42	4

g) Measures of irregular or compound areas (e.g., by using grids or dissecting and rearranging pieces)	51	26	23
h) Precision of measurements (e.g., upper and lower bounds of a length reported as 8 centimeters to the nearest centimeter)	62	22	16
D. Geometry			
a) Angles - acute, right, straight, obtuse, reflex, complementary, and supplementary	82	19	0
b) Relationships for angles at a point, angles on a line, vertically opposite angles, angles associated with a transversal cutting parallel lines, and perpendicularity	77	20	3
c) Properties of angle bisectors and perpendicular bisectors of lines	46	51	3
d) Properties of geometric shapes: triangles and quadrilaterals	40	60	0
e) Properties of other polygons (regular pentagon, hexagon, octagon, decagon)	72	17	11
f) Construct or draw triangles and rectangles of given dimensions	79	19	2
g) Pythagorean theorem (not proof) to find length of a side	10	88	2
h) Congruent figures (triangles, quadrilaterals) and their corresponding measures	47	53	0
i) Similar triangles and recall their properties	64	35	1
j) Cartesian plane - ordered pairs, equations, intercepts, intersections, and gradient	4	77	19
k) Relationships between two-dimensional and three-dimensional shapes	11	32	58
l) Line and rotational symmetry for two-dimensional shapes	7	9	84
m) Translation, reflection, rotation, and enlargement	5	10	85
E. Data			
a) Organizing a set of data by one or more characteristics using a tally chart, table, or graph	38	22	40
b) Sources of error in collecting and organizing data (e.g., bias, inappropriate grouping)	9	7	84
c) Data collection methods (e.g., survey, experiment, questionnaire)	12	15	73
d) Drawing and interpreting graphs, tables, pictographs, bar graphs, pie charts, and line graphs	70	17	14
e) Characteristics of data sets including mean, median, range, and shape of distribution (in general terms)	30	12	58

f) Interpreting data sets (e.g., draw conclusions, make predictions, and estimate values between and beyond given data points)	16	14	70
g) Evaluating interpretations of data with respect to correctness and completeness of interpretation	15	12	73
h) Simple probability including using data from experiments to estimate probabilities for favorable outcomes	19	51	30

The following Table shows baseline information of high importance to on the level of belief of a math teacher. It contains the percentage of teachers by the level of agreement to a set of teaching strategies in mathematics such as:

- More than one representation (picture, concrete material, symbols, ...)
- Solving mathematics problems often involves hypothesizing, estimating, testing, and modifying findings
- Learning mathematics/science mainly involves memorizing
- There are different ways to solve most mathematical problems
- Few new discoveries in science/mathematics are being made
- Modeling real-world problems is essential to teaching science/mathematics

To what extent do you agree or disagree with each of the following statements?

Mathematics	**Agree a lot**	**Agree**	**Disagree**	**Disagree a lot**
a) More than one representation(picture, concrete material, symbols, etc.) should be used in teaching a mathematics topic	53	46	1	0
b) Mathematics should be learned as sets of algorithms or rules that cover all possibilities	17	65	14	4
c) Solving mathematics problems often involves hypothesizing, estimating, testing, and modifying findings	29	55	16	0
d) Learning mathematics mainly involves memorizing	2	9	34	56
e) There are different ways to solve most mathematical problems	36	58	7	0
f) Few new discoveries in mathematics are being made	11	64	23	2
g) Modeling real-world problems is essential to teaching mathematics	43	52	5	0
Science				
a) More than one representation (picture, concrete material, symbols, etc.) should be used in teaching a science topic	70	30	0	0
b) Solving science problems often involves hypothesizing, estimating, testing, and modifying findings	31	61	7	0
c) Learning science mainly involves memorizing	1	10	53	37

d) There are many ways to conduct scientific investigation	31	67	2	0
e) Getting the correct answer is the most important outcome of a student's scientific experiment	10	41	35	14
f) Scientific theories are subject to change	29	53	11	8
g) Science is taught primarily to give students the skills and knowledge to explain natural phenomena	52	44	4	0
h) Modeling natural phenomena is essential to teaching science	38	58	3	0
i) Most scientific discoveries have no practical value	3	2	34	61

Examinations

Tables 43-46 show the frequency and type of examinations used to evaluate student performance in mathematics and science.

Table 43: How often do you give a science test or examination?

About once a week	2
About every two weeks	26
About once a month	53
A few times a year	19
Never	0

What item formats do you typically use in your science tests or examinations?

Only constructed-response	3
Mostly constructed-response	29
About half constructed-response and half objective (e.g., multiple-choice)	65
Mostly objective	3
Only objective	0

Table 44: How often do you include the following types of questions in your science tests or examinations?

	Never or almost never	Sometimes	Always or almost always
a) Questions requiring understanding of concepts, relationships, and processes	79	21	0
b) Questions involving hypotheses and conclusions	15	75	10
c) Questions based on recall of facts or procedures	50	44	6

On Mathematics:

Table 45: How often do you give a mathematics test or examination?

	% of teachers
About once a week	4
About every two weeks	21
About once a month	75
A few times a year	0
Never	0

What item formats do you typically use in your mathematics tests or examinations?

	% of teachers

Only constructed-response	9
Mostly constructed-response	27
About half constructed-response and half objective (e.g., multiple-choice)	60
Mostly objective	5
Only objective	0

Table 46: How often do you include the following types of questions in your mathematics tests or examinations?

	Always or almost always	Sometimes	Never or almost never
a) Questions involving application of mathematical procedures	89	11	0
b) Questions involving searching for patterns and relationships	22	74	4
c) Questions requiring explanations or justifications	17	70	14

Current process for certification and evaluation of teachers

The following table shows the academic qualification of teachers at public schools.

Academic Qualification of teachers at MOE			
	Kindergarten	**Basic**	**Secondary**
Less than G.S.C	0%	0.03%	0.7%
G.S.C	1%	0.09%	0.8%
Diploma	77%	31%	11%
BA or BSc	22%	63.6%	73%
Higher Diploma	0%	3.4%	9%
MA	0%	1.8%	5.3%
PhD	0%	0.08%	0.2%

The following two tables show the readiness levels of teachers to teach across the mathematics and science content areas.

Table : Mathematics teacher's perception of readiness to teach the following topics:

	Very ready	**Ready**	**Not ready**
A. Number			
a) Representing decimals and fractions using words, numbers, or models (including number lines)	65	33	1
b) Integers including words, numbers, or models (including number lines); ordering integers; and addition, subtraction, multiplication, and division with integers	70	28	3
B. Algebra			
a) Numeric, algebraic, and geometric patterns or sequences (extension, missing terms, generalization of patterns)	49	50	1
b) Simple linear equations and inequalities, and simultaneous (two variables) equations	69	30	1
c) Equivalent representations of functions as ordered pairs, tables, graphs, words, or equations	74	22	3
d) Attributes of a graph such as intercepts on axes, and intervals where the function increases, decreases, or is constant	52	43	5
C. Measurement			
a) Estimations of length, circumference, area, volume, weight, time, angle, and speed in problem situations (e.g., circumference of a wheel, speed of a runner)	52	47	1
b) Computations with measurements in problem situations (e.g.,	54	42	4

add measures, find average speed on a trip, find population density)			
c) Measures of irregular or compound areas (e.g., by using grids or dissecting and rearranging pieces)	47	46	7
d) Precision of measurements (e.g., upper and lower bounds of a length reported as 8 centimeters to the nearest centimeter)	52	44	4
D. Geometry			
a) Pythagorean theorem (not proof) to find length of a side	80	19	1
b) Congruent figures (triangles, quadrilaterals) and their corresponding measures	71	26	3
c) Cartesian plane - ordered pairs, equations, intercepts, intersections, and gradient	72	23	5
d) Translation, reflection, rotation, and enlargement	41	46	13
E. Data			
a) Sources of error in collecting and organizing data (e.g., bias, inappropriate grouping)	22	54	24
b) Data collection methods (e.g., survey, experiment, questionnaire)	30	43	27
c) Characteristics of data sets including mean, median, range, and shape of distribution (in general terms)	50	36	15
d) Simple probability including using data from experiments to estimate probabilities for favorable outcomes	53	32	15

Table : Science teacher's perception of readiness to teach the following topics

A. Biology	**Very ready**	**Ready**	**Not ready**
a) Major organs and organ systems in humans and other organisms (structure/function, life processes that maintain stable bodily conditions)	50	46	4
b) Cells and their functions, including respiration and photosynthesis as cellular processes	50	46	3
c) Reproduction (sexual and asexual) and heredity (passing on of traits, inherited versus acquired/learned characteristics)	40	55	5
d) Role of variation and adaptation in survival/extinction of species in a changing environment -	46	50	5
e) Interaction of living organisms and the physical environment in an ecosystem (energy flow, food webs, effect of changes , cycling of materials)	50	47	3
B. Chemistry			
a) Classification and composition of matter (characteristics of elements, compounds, mixtures)	67	31	2
b) Particulate structure of matter (molecules, atoms, protons, neutrons, and electrons)	75	25	0
c) Properties of solutions (solvent, solute, concentration/dilution, effect of temperature on solubility)	63	25	1

d) Properties and uses of common acids and bases -	51	45	4
e) Chemical change (transformation of reactants, evidence of chemical change, conservation of matter, common oxidation reactions - combustion and rusting) -	55	43	2
C. Physics			
a) Physical states and changes in matter (explanations of properties in terms of movement/distance between particles; phase change by supplying/removing heat/energy, thermal expansion and changes in volume and/or pressure)	52	45	4
b) Energy types, sources, and conversions, including heat transfer	52	44	4
c) Basic properties/behaviors of light (reflection, refraction, light and color, simple ray diagrams) and sound (production by vibration, transmission through media, relative speed of light and sound)	44	51	5
d) Electric circuits (flow of current; types of circuits - opened/closed and parallel/series; current/voltage relationship)	58	36	7
e) Forces and motion (types of forces, basic description of motion, use of distance/time graphs, effects of density and pressure	45	49	6
D. Earth Science			
a) Earth's structure and physical features (Earth's crust, mantle and core; use of topographic maps)	40	52	8
b) Earth's processes, cycles and history (rock cycle; water cycle; weather patterns; major geological events; formation of fossils and fossil fuels)	37	56	7
c) Earth in the solar system and the universe (phenomena on Earth - day/night, tides, phases of moon, eclipses, seasons of Earth compared to other bodies; the sun as a star)	48	43	9
E. Environmental Science			
a) Trends in human population and its effects on the environment	40	51	9
b) Use and conservation of Earth's natural resources (renewable/non-renewable resources, human use of land/soil and water resources)	52	41	7
c) Changes in environments (role of human activity, global environmental concerns, impact of natural hazards)	42	50	8

The following tables are based on TIMSS 2003 and show the baseline data on the following:

1. highest level of formal education that a teacher completed:
   - Percentage with less than high school or equivalent
   - Percentage with high school diploma or equivalent
   - Community college or equivalent (two years)
   - Three years community college
   - BA/BS
   - Above BA/BS

Teacher highest degree achieved:

	Mathematics	Science
a) Complete <ISCED 5A, first degree>	74	90
b) Complete a probationary period	16	9
c) Complete a minimum number of education courses	12	5
d) Complete a minimum number of mathematics courses-	20	8
e) Pass a licensing examination	9	4

2. Years of pre-service teacher training:
   - Less than one year
   - One year
   - Two years
   - Three years
   - Four years
   - Five years
   - More than 5 years

How many years of pre-service teacher training did you have?

	Math	Science
0 years	38	14
1 year	9	3
2 years	24	20
3 years	2	17
4 years	22	39
5 years	5	6
More than 5 years	0	0

Areas of major for math and science teachers are shown in the following Table:

During your <post-secondary> education, what was your major or main area(s) of study? (Math)

	Yes	No
a) Mathematics	76	24
b) Mathematics Education	23	78
c) Science	5	95
d) Education – Science	0	100
e) Education – General	0	100
f) Other	8	92

During your <post-secondary> education, what was your major or main area(s) of study? (science)

	Yes	No
a) Biology	15	85
b) Physics	18	82
c) Chemistry	25	75
d) Earth Science	5	95
e) Education - Science	33	67
f) Mathematics	0	100
g) Education –	0	100

Mathematics		
h) Education – General	0	100
i) Other	10	90

Requirements to satisfy in order to become math teachers

- Obtained BA plus teaching diploma for basic cycle and BA plus high diploma for secondary level. Tables in first section of the report show the percentage of teachers by qualification.

Teaching certificate:

- Percentage of students taught by a teacher with a teaching license of certificate
- Type of license:
  - Permanent
  - Provisional certification
  - Emergency certificate
  - Other

Percent of teachers have a teaching license or certificate?	**77%**
Percentage of teachers by type of license or certificate they hold.	
<Full certificate>	28
<Provisional certificate>	0
<Emergency certificate>	**0**
Other	**2**

Frequency of use of the following types of interactions with other teachers:

- Discussions about how to teach a particular concept
- Working on preparing instructional materials
- Visits to another teacher's classroom to observe his/her teaching
- Informal observations of class room by another teacher

How often do you have the following types of interactions with other teachers?

Math teachers	**Never or almost never**	**2 or 3 times per month**	**1-3 times per week**	**Daily or almost daily**
a) Discussions about how to teach a particular concept	9	39	34	18
b) Working on preparing instructional materials	20	45	18	17
c) Visits to another teacher's classroom to observe his/her teaching	31	57	11	1
d) Informal observations of my classroom by another teacher -	56	34	7	3

How often do you have the following types of interactions with other teachers?

Science teachers	**Never or almost**	**2 or 3 times**	**1-3 times per week**	**Daily or almost**

	never	per month		daily
a) Discussions about how to teach a particular concept	5	31	41	22
b) Working on preparing instructional materials	5	45	26	25
c) Visits to another teacher's classroom to observe his/her teaching	34	63	2	1
d) Informal observations of my classroom by another teacher -	53	40	5	2

As shown the percentages on the method by which teachers and their practices are assessed:

- observations by the principal or senior staff
- observations by inspectors or other persons external to school
- student achievement
- Teacher peer review

Methods used to evaluate the practice of mathematics teachers?

a) Observations by the principal or senior staff	98%
b) Observations by inspectors or other persons external to the school	96%
c) Student achievement	86%
d) Teacher peer review	83%

Methods used to evaluate the practice of science teachers?

	Yes	No
a) Observations by the principal or senior staff	97	3
b) Observations by inspectors or other persons external to the school	95	5
c) Student achievement	86	14
d) Teacher peer review	78	22

Current level of training and teacher development functions

From TIMSS, we find:

1. Teachers involvement in professional developmental opportunities:
    a. Supporting the implementation of the national or regional curriculum
    b. Designing or supporting the school's own improvement goals
    c. Improving content knowledge
    d. Improving teacher skills
    e. Using information and communication technology for educational purposes

During this school year, how often have teachers been involved in professional development opportunities for mathematics and science targeted at the following?

	Never	1 to 2 times	3 to 5 times	6 to 10 times	More than 10 times
a) Supporting the implementation of the national or regional curriculum	21	41	22	11	6
b) Designing or supporting the school's own improvement goals	20	45	20	12	4
c) Improving content knowledge	10	40	32	12	6
d) Improving teaching skills -	13	41	25	16	5
e) Using information and communication technology for educational purposes	42	31	14	6	8

2. Participation in professional development in the following areas:
    i. Mathematics content
    ii. Mathematics pedagogy/instruction
    iii. Mathematics curriculum
    iv. Integrating information technology in mathematics
    v. Improving student's critical thinking or problem solving skills
    vi. Mathematics assessment

In the past two years, have you participated in professional development in any of the following?

	Yes	No
a) Mathematics content -	46	54
b) Mathematics pedagogy/instruction	70	30
c) Mathematics curriculum	46	54
d) Integrating information technology into mathematics	34	66
e) Improving students' critical thinking or problem solving skills	57	43
f) Mathematics assessment	45	55

In the past two years, have you participated in professional development in any of the following?

	Yes	No
a) Science content	48	52
b) Science pedagogy/instruction	70	30
c) Science curriculum	42	58
d) Integrating information technology into science	35	65
e) Improving students' critical thinking or inquiry skills	57	43
f) Science assessment	49	51

Readiness of students to school

Indicators in this area are:

1. Percentage of children at the different level of readiness to school
2. Percentage of children at the different level of readiness in the following: physical well-being and motor development, social and emotional development, approaches to learning, language development, cognition and general knowledge controlling for KG attendance and by region and gender. Four levels of school readiness were identified for children in the country. The readiness levels are defined as:

Level 1: The child is developing readiness slowly, he/she is not ready to school; the skills, knowledge or behavior is absent or rarely observed demonstrated by the child.

Level 2: The child is approaching readiness, he/she is in progress; the skills, knowledge or behavior is emerging and is not demonstrated by the child consistently.

Level 3: The child is ready for school; he/she is almost proficient; the skills, knowledge or behavior is partially demonstrated by the child but appeared that it will be mastered soon.

Level 4: The child is fully ready for school, he/she is proficient; the skills, knowledge or behavior is firmly within the child's range of performance.

Here are the baseline data:

Table R1: Percentages of children at each of the four levels of school readiness

Level of Readiness	Percent
Level 1	.2%
Level 2	6.2%
Level 3	55.7%
Level 4	37.9%
Sample size	2645

Table R2: School readiness of children with respect to their social skills and behavior

Level of Readiness	Percent
Level 1	2.5
Level 2	12.5
Level 3	46.5
Level 4	38.5

Table R3: School readiness of children with respect to their awareness of self and environment	
Level of Readiness	Percent
Level 1	1.2
Level 2	11.9
Level 3	47.7
Level 4	39.2

Table R4: School readiness of children with respect to their cognitive skills	
Level of Readiness	Percent
Level 1	.5
Level 2	5.1
Level 3	31.5
Level 4	62.9

Table R5: School readiness of children with respect to their Language and communication skills	
Level of Readiness	Percent
Level 1	1.5
Level 2	17.4
Level 3	51.1
Level 4	30.0

Table R6: School readiness of children with respect to their physical development	
Level of Readiness	Percent
Level 1	.5
Level 2	5.8
Level 3	35.2
Level 4	58.6

Table R7: School readiness of children **by gender.**		
Level of Readiness	Female	Male
Level 1	.2	.1
Level 2	6.6	5.8
Level 3	55.7	55.7
Level 4	37.5	38.4

Table R8: School readiness of children controlling for kindergarten enrollment		
Level of Readiness	Yes	No
Level 1	.1	.3
Level 2	4.0	13.3
Level 3	52.1	67.6
Level 4	43.8	18.8

Table R9: School readiness of children by the type of kindergarten enrolled at (private or public)		
Level of Readiness	Public	Private
Level 1	.4	.1
Level 2	3.4	4.1
Level 3	57.7	51.1
Level 4	38.5	44.8

Table R10: School readiness of children by location (urban or rural)		
Level of Readiness	**Urban**	**Rural**
Level 1	.1%	.2
Level 2	3.8%	9.0
Level 3	52.8%	59.3
Level 4	43.3%	31.5

Table R11: School readiness of children by region (north, middle, south)			
Level of Readiness	North	Middle	South
Level 1	.2%	.2%	0
Level 2	6.4%	6.1%	6.2%
Level 3	59.8%	52.9%	53.6%
Level 4	33.7%	40.9%	40.2%

Table R12: School readiness of children by **socioeconomic status**				
Level of Readiness	Family Income (JD)			
	Less than 299	300-599	600-899	More than 900
Level 1	.2%	0	0	0
Level 2	7.0%	3.5%	1.1%	0
Level 3	60.3%	45.9%	35.2%	71.4%
Level 4	32.4%	50.7%	63.7%	28.6%

Table R13: School readiness of children by father education						
Level of Readiness	**Illiterate**	**Lower basic**	**Upper Basic**	**Secondary**	**Diploma**	**University**
Level 1	1.2%	0	.2	.1%	0	0
Level 2	14.7%	10.8%	9.1%	4.8%	3.1%	1.3%
Level 3	66.5%	64.8%	60.2%	54.8%	51.5%	44.6%
Level 4	17.6%	24.4%	30.5%	40.2%	45.4%	54.0%

Table (R14): School readiness of children mother's education						
Level of Readiness	**Illiterate**	**Lower basic**	**Upper Basic**	**Secondary**	**Diploma**	**Univ.**
Level 1	.8%	0	.2%	.1%	0	0
Level 2	17.3%	12.3%	7.2%	4.2%	1.8%	.8%
Level 3	66.2%	63.4	63.6%	54.7%	46.2%	40.9%
Level 4	15.6%	24.3%	28.9%	41.0%	51.9%	58.3%

Table (R15) Correlation matrix for family size, number of siblings, and total scores of school readiness.	
Variables	Scores of school readiness
Family size	-.15 (.000)
Number of siblings	-.16 (.000)

Table R16: School readiness of children in local communities where KGs have been newly established	
Level of Readiness	Percent
Level 1	.3
Level 2	7.3
Level 3	63.2
Level 4	29.1

Table R17: School readiness of children in local communities with respect to their social skills and behavior	
Level of Readiness	Percent
Level 1	2.5
Level 2	14.3
Level 3	52.3
Level 4	30.9

Table R18: School readiness of children in local communities with respect to their awareness of self and environment	
Level of Readiness	Percent
Level 1	1.0
Level 2	14.5
Level 3	45.4
Level 4	39.1

Table R19: School readiness of children in local communities with respect to their cognitive skills	
Level of Readiness	Percent
Level 1	.6
Level 2	6.9
Level 3	34.9
Level 4	57.6

Table R20: Readiness of children to school in local communities with respect to their Language and communication skills	
Level of Readiness	Percent
Level 1	1.9

Level 2	21.4
Level 3	53.8
Level 4	22.9

Table R21: Readiness of children to school in local communities with respect to their physical development	
Level of Readiness	Percent
Level 1	.4
Level 2	5.3
Level 3	34.7
Level 4	59.6

Achievement level and characteristics of current graduate from the different cycles

The current student achievement situation in the basic skill proposed in ERfKE at the different grades and education cycle are estimated/measured through three major tools and dimensions:

1. National Exams (MOE and NCHRD)
2. Trends in International Mathematics and Science Study
3. Tawjihi results
4. level of mastery of the knowledge economy skills (such as problem solving, critical thinking, ICT skills)
5. level of reading and writing skills
6. level in science skills
7. level in math skill

For the 8th grade we use TIMSS 2003, for the 12th grade we use the 2003 Tawjihe data and for the other grades we use both the NCHRD's national test 2004 (for 4th grade) and the national assessment test by MOE.

Data from Tawjihi which is an assessment proxy for the quality of the graduate of schooling system. The 2003 indicators on language (Arabic and English), mathematics, and science (chemistry, physics, biology, and geology):

1. Percentage of students at the different level of reading achievement by grade
2. Percentage of students at the different level of mathematics by grade
3. Percentage of students at the different level of science by grade

Another way is to develop a new assessment test based on the new curriculum and skills and conduct as soon as possible for grades 10 and 12):

Table T1: Achievement of student in the Tawjihi Examination – ARABIC Language (all Jordan)

	Percent
Low	.6
Level 2	1.4
Level 3	11.8
Level 4	53.3
High	32.8

Table T2: Achievement of student in the Tawjihi Examination – ENGLISH (all Jordan)

	Percent
Low	4.5
Level 2	6.0
Level 3	15.7
Level 4	32.0
High	41.8

Table T3: Achievement of student in the Tawjihi Examination – Math (all Jordan)

	Percent
Low	13.8
Level 2	21.1
Level 3	35.4
Level 4	19.0
High	10.7

Table T4: Achievement of student in the Tawjihi Examination – PHYSICS (all Jordan)

	Percent
Low	18.0
Level 2	11.3
Level 3	32.2
Level 4	24.8
High	13.8

Table T5: Achievement of student in the Tawjihi Examination – CHEMISTRY (all Jordan)

	Percent
Low	6.8
Level 2	10.7
Level 3	28.4
Level 4	26.6
High	27.6

Table T6: Achievement of student in the Tawjihi Examination – BIOLOGY (all Jordan)

	Percent
Low	9.0
Level 2	8.5
Level 3	24.1
Level 4	25.6
High	32.8

Table T7: Achievement of student in the Tawjihi Examination - GEOLOGY (all Jordan)

	Percent
Low	6.3
Level 2	7.6
Level 3	27.4
Level 4	31.7
High	27.0

Table T8: Achievement of student in the Tawjihi Examination – ARABIC (without private schools)

	Percent
Low	.6
Level 2	1.4
Level 3	11.9
Level 4	54.7
High	31.5

Table T9: Achievement of student in the Tawjihi Examination – ENGLISH (without private schools)	
	Percent
Low	4.8
Level 2	6.6
Level 3	17.1
Level 4	32.7
High	38.8

Table T10: Achievement of student in the Tawjihi Examination – PHYSICS (without private schools)	
	Percent
Low	18.6
Level 2	12.0
Level 3	32.9
Level 4	24.3
High	12.3

Table T11: Achievement of student in the Tawjihi Examination – CHEM (without private schools)	
	Percent
Low	7.0
Level 2	11.3
Level 3	29.6
Level 4	27.0
High	25.1

Table T12: Achievement of student in the Tawjihi Examination – BIOLOGY (without private schools)	
	Percent
Low	9.1
Level 2	9.0
Level 3	25.1
Level 4	25.9
High	30.9

Table T13: Achievement of student in the Tawjihi Examination – GEOLOGY (without private schools)	
	Percent
Low	6.4
Level 2	7.9
Level 3	28.6
Level 4	32.1
High	25.1

The following Tables show the indicators from the NCHRD's national test (2004).

Overall by levels:

Percentage of students by competency levels in language

	Comprehension	Writing	Grammar	Dictionary
Unacceptable level	23%	33%	18%	27%
Modest	73%	35%	25%	58%
Master	5%	32%	57%	15%

Percentage of students by competency levels in Mathematics

	Knowledge and application of mathematical procedures	Problem solving	Mathematical thinking and communication
Unacceptable level	41%	70%	17%
Modest	49%	26%	57%
Master	10%	4%	26%

4th Grade Students' Performance on the Arabic Test in 2004			
	N	Mean	Std.
GRAMMAR	1348	65.1	30.1
WRITING	1348	45.5	35.2
COMPREHESION	685	36.0	22.3
DICTIONARY USE	685	37.6	43.8
TOTAL SCORE	1348	48.0	24.9

Arabic Test Scores of the MOE 4th Grade Students			
	N	Mean	Std.
GRAMMAR	1014	63.5	30.8
WRITING	1014	43.2	34.7
COMPREHESION	516	35.6	22.5
DICTIONARY USE	516	37.4	44.4
TOTAL SCORE	1014	46.6	25.2

Arabic Language Test Scores of the 4th Grade Female Students			
	N	Mean	Std.
GRAMMAR	634	69.68	27.02
WRITING	634	52.81	34.56
COMPREHESION	319	39.73	21.46
DICTIONARY USE	319	42.63	45.04
TOTAL SCORE	634	53.42	24.01

2004 Arabic Language Test Scores of the 4th Grade Male Student			
	N	Mean	Std.
GRAMMAR	714	60.97	32.04
WRITING	714	39.08	34.51
COMPREHESION	366	32.76	22.53
DICTIONARY USE	366	33.19	42.17
TOTAL SCORE	714	43.12	24.76

2004 Arabic Language Test Scores of the Grade 4 Students in Urban School			
GRAMMAR	916	67.63	28.83
WRITING	916	48.71	34.98
COMPREHESION	464	38.23	22.12
DICTIONARY USE	464	40.19	44.03
TOTAL SCORE	916	50.83	24.48

2004 Arabic Language Test Scores of the 4th Grade Rural School Students			
GRAMMAR	432	59.63	31.94
WRITING	432	38.8	34.72
COMPREHESION	221	31.3	21.98
DICTIONARY USE	221	32.12	42.74
TOTAL SCORE	432	41.88	24.84

And in mathematics:

Math Test 3 (General Competency in Math Problem Solving) at the National Level

Competency	N	Mean	Std
TOTM3P	417	30.1	16.8
NUMBERP	417	35.3	18.4
GEOMETRP	417	17.8	19.9
GEOSTE1P	417	18.1	28.6
GEOSTE2P	417	17.7	21.0
NUMSTE1P	417	48.4	23.5
NUMSTE2P	417	25.5	19.5
STEP1P	417	40.8	22.3
STEP2P	417	21.4	16.3

Math Test 3 (Problem Solving) for Male Fourth Graders in 2004			
Competency	N	Mean	St.
TOTM3P	217	31.2	16.2
NUMBERP	217	36.1	18.2
GEOMETRP	217	19.7	19.6
GEOSTE1P	217	21.0	29.0
GEOSTE2P	217	19.0	21.1
NUMSTE1P	217	49.0	23.3
NUMSTE2P	217	26.4	19.5
STEP1P	217	42.0	22.0
STEP2P	217	22.5	16.0

Math Test 3 (Problem Solving) for Female Fourth Graders in 2004			
Competency	N	Mean	Std
TOTM3P	200	28.9	17.4
NUMBERP	200	34.5	18.6
GEOMETRP	200	15.9	20.1
GEOSTE1P	200	15.0	27.9
GEOSTE2P	200	16.3	20.8
NUMSTE1P	200	47.8	23.8
NUMSTE2P	200	24.6	19.5
STEP1P	200	39.6	22.5
STEP2P	200	20.1	16.6

Math Test 3 (Problem Solving) for Urban School Grade 4 Student			
Competency	N	Mean	Std
TOTM3P	292	30.8	16.5
NUMBERP	292	36.0	17.8
GEOMETRP	292	18.8	20.0
GEOSTE1P	292	19.0	28.5
GEOSTE2P	292	18.7	21.4
NUMSTE1P	292	49.2	23.6
NUMSTE2P	292	26.1	18.8
STEP1P	292	41.7	22.2
STEP2P	292	22.0	16.2

Math Test 3 (Problem Solving) for the Rural School Grade 4 Student			
Competency	N	Mean	Std
TOTM3P	125	28.3	17.5
NUMBERP	125	33.7	19.6
GEOMETRP	125	15.6	19.5
GEOSTE1P	125	16.0	28.8
GEOSTE2P	125	15.4	19.9
NUMSTE1P	125	46.6	23.3
NUMSTE2P	125	24.1	20.9
STEP1P	125	39.0	22.3
STEP2P	125	19.8	16.6

Math Test 3 (Problem Solving) Scores of the MOE Grade 4 Students			
Competency	N	Mean	Std
TOTM3P	313	28.57	15.65
NUMBERP	313	33.87	17.42
GEOMETRP	313	16.18	18.31
GEOSTE1P	313	15.97	27.15
GEOSTE2P	313	16.29	19.71
NUMSTE1P	313	46.88	22.85
NUMSTE2P	313	24.12	18.94
STEP1P	313	39.15	21.45
STEP2P	313	19.80	15.40

National Assessment (MOE)

Data from the National Test, which is conducted by ministry of education, annually will be used as part of the baseline data on student achievement. The exam covered the following:

6 subjects for 10th grade (10% or 9545 students)
2 subjects for 4th grade (5% or 5773)
6 subjects for 8th grade (5% or 5358)
Practical applications for 11th Grade

For the baseline, performance data in languages (Arabic and English), mathematics and science will be used for the 4th, 8th, and 10th grades.

Arabic - 4th Grade

Overall performance was 61% (with standard deviation of 20). The average performance for male students was 59% (std=20) and for females was 64% (std=19) but the difference was not statistically significant. The areas tested included:

Knowing and understanding

- Memorization
- Differentiating
- Explaining
- Conclusion
- Critical thinking
- Reasoning

Higher order thinking skills

- Enjoying text
- Conversion
- Construction of words

Performance by subject was as follows: The average in reading was 59%, in poems and songs was 73%, and in writing was 61%. Less than 50% of students answered the following items correctly:

- ability to construct sentence (6.4%)
- ability to explain words (24%)
- differentiating between words (12%)
- ability to use words to fit in text

Math – 4th grade

Performance in knowing and understanding was less than 57% and included:

- memorization
- reading and constructing table and graphs
- identifying and applying routine operations

Performance in higher order thinking items was 53% and included:

- Converting pictures and graphs to symbols

- Logic

Average overall performance was 56% (std=15) with 55% for males and 58% for females 58 and the difference was statistically significant in favor of females. Performance by topics was:

- in numbers and operations it was 59%
- in Geometry it was 55%
- in measurement it was 61%
- in algebra (fractions) it was 49%

Students faced difficulty in the following items:

- For numbers:
  - Factoring
  - Subtraction (borrowing....)
  - Series
  - Real applications to math problems
- Geometry
  - Identifying points on a triangle
  - Identifying special features in a graph
  - Adding length of a triangle
- Fractions
  - Equal fractions
  - Fraction of a whole number
  - Ordering fractions
- Measurements
  - Identifying the time
  - Converting measurements

Arabic – 8th Grade

Lower order thinking skills

- Memorization
- Differentiating between items
- Control over the use of words
- Explaining meaning
- Understanding
- Conclusion
- Reasoning

Higher order thinking skills

- Understanding text in a poem or story line
- Converting words
- Constructing words

Subjects:

Overall the average was 56% (std=18). The average for male students was 53% (std=18) and for female was 6 0% (std= 18) but the difference was not statistically significant. Average by subject was:

- Reading (55%)
- Grammar (57%)
- Application (59%)

Lowest performance (more than 50% of students answered it correctly) was observed in the following items:

- Meanings (31%)
- Comprehension (36%)
- Using Arabic dictionary (36%)
- Recalling of information read (28%)
- In Grammar: Identifying verbs and words and its use (39% and 43%), grammar (30%), verbs and grammar (46%)
- In applications (using vowels -39%, spelling 46%)
- Writing 30%

English – 8th grade

Knowledge and understanding

- Knowing words (reading, writing and understanding meaning)
- Identifying the theme of a sentence

Using words

- Using language rules
- Using numbers
- Using English dictionary

Higher order thinking skills

- Criticizing text
- Finishing incomplete text

Subjects

Overall, the average was 45% (std=19), for males was 41% and 48% for females. In reading was 52%, writing 41%, making sentences was 40%, knowing words (49%), spelling was 47%, pronunciation 44%, numbering (44%), and using English dictionary was 45%. Poor performance was observed in the following areas:

- Verb tenses (28%)
- Phrasing questions (21%)
- Comparing adjectives and conditional sentences (29%, 33%)
- Reasoning (30%)

Math – 8th Grade
The average was 41% (with std. = 11), for males it was 41% and females 40%. In memorization it was 44%, 35% in higher order thinking skills, 54% in numbers, 46% in fractions, 37% in geometry, 36% in algebra, 41% in statistics, ratios (35% in relative comparisons).

Science – 8th Grade
The following skills were assessed:

Knowing and understanding
- Memorization
- Using theories and numerical operations
- Describing
- Explanation of phenomena

Higher order thinking skills
- Searching for information, using, and presenting
- Using theory in new situations and settings
- Explaining
- Conclusions and predictions

The average overall was 44% (std = 16.8, 42% for males and 45% females). The average in biology was 47%, 39% in physics, and 45% in chemistry and geology.

Arabic – 10th grade
Overall average was 49% (std=17). Areas in which less than 50% got it wrong were:
- Ordering words (average was (37%)
- Understanding text (45%)
- Mastering words (35%)
- Classifying text (38%)
- Explaining words (30%)
- Constructing new tenses (35%)
- Understanding meaning (22%)
- Extracting knowledge from text (39%)
- Deep understanding of text (32%)

In grammar the average was 38%, 48% in applications, and 47% in reading.

English – 10th grade
The overall average was 42% (std=17) and females (46%) were significantly ahead of males (39%). The average in using dictionary was 47%, 48% in numeration, 33% was altajzea, words 43% (choosing between words 22%), building phrases 37%, writing 41%, reading 47%, grammar 26%, reporting speech 31%, using verb tenses 30%, and understanding the conclusion of a text was 28%.

Math – 10th grade
Overall 40% (with std. of 16), 43% for males and 46% for females. Performance by topic was as follows:

Numbers 47%
Fractions 44%
Sets 38%
Measurement 27%
Geometry 37%
Algebra (42%)
Statistics 44%
Ratios (39%)
Shapes 50%
Algebra 39% (polynomials)
Problem solving and critical thinking 29%
Charts and graphs 45%

Science 10th grade

The overall average was 44.8% (std=16.6) and by topic was:

Biology 49%
Physics (47%)
Chemistry and Geology 38%

Summary of overall performance in the National Assessment

Grade/Subject	Performance	4th Grade	8th Grade	10th Grade
Arabic	Average	62%	56%	49%
	Lower order thinking skills	61%	56%	46%
	Higher order thinking skills	57%	59%	40%
English	Average		45%	42%
	Lower order thinking skills		48%	44%
	Higher order thinking skills		41%	40%
Math	Average	56%	41%	40%
	Lower order thinking skills	57%	44%	45%
	Higher order thinking skills	53%	35%	29%
Science	Average		44%	45%
	Lower order thinking skills		46%	46%
	Higher order thinking skills		38%	41%

Assessment of the effectiveness of curriculum

In order to capture baseline data on student performance and on the effectiveness of the current curriculum, the Trends in International Mathematics and Science Study (TIMSS) will be used. TIMSS 2003 is an international assessment tool which was conducted also two times in the past (1995, 1999 and Jordan participated in it in 1999). TIMSS is rich in data and in addition to student (eighth graders or 14 years-old) performance in the math and science curriculum, the study captured information on school conditions and environments and on teachers. For baseline data the following indicators are used:

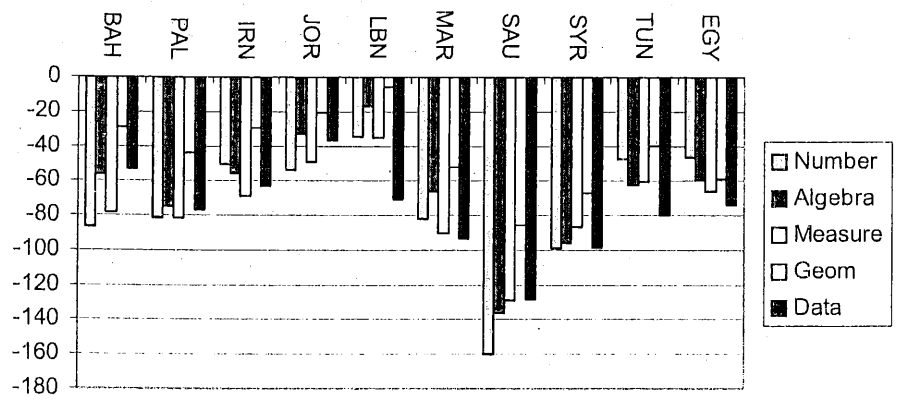
1. Overall performance of students in math and science at the eighth grade
2. Percentage of children at each level of competency in math and science. The Appendix shows the definitions of the international benchmarks in competency level.
3. Performance by content domains
4. Performance by cognitive domains
5. Performance by gender, urban/rural and school type (private, public, UNRWA)

Mathematics								
	Overall	Male	Female	Urban	Rural	Public	Private	UNRWA
	424	411	438	430	414	420	506	418
% of students at lowest international benchmarks	60							
% Level 2	30							
% Level 3	8							
% of students at the advanced benchmarks	1							
Average in Numbers	413	401	426					
Algebra	434	410	426					
Measurement	418	420	441					
Geometry	446	438	455					
Statistics	430	418	452					
Rank	33/46							

Achievement by science international benchmarks across countries (percentage of students)					
	Below the lowest level	Low International Benchmark	Intermediate International Benchmark	High International Benchmark	Advanced international Benchmark
Intl. Avg.	26%	25%	26%	16%	7%
Lebanon	32%	41%	23%	4%	0%
Jordan	40%	30%	22%	7%	1%

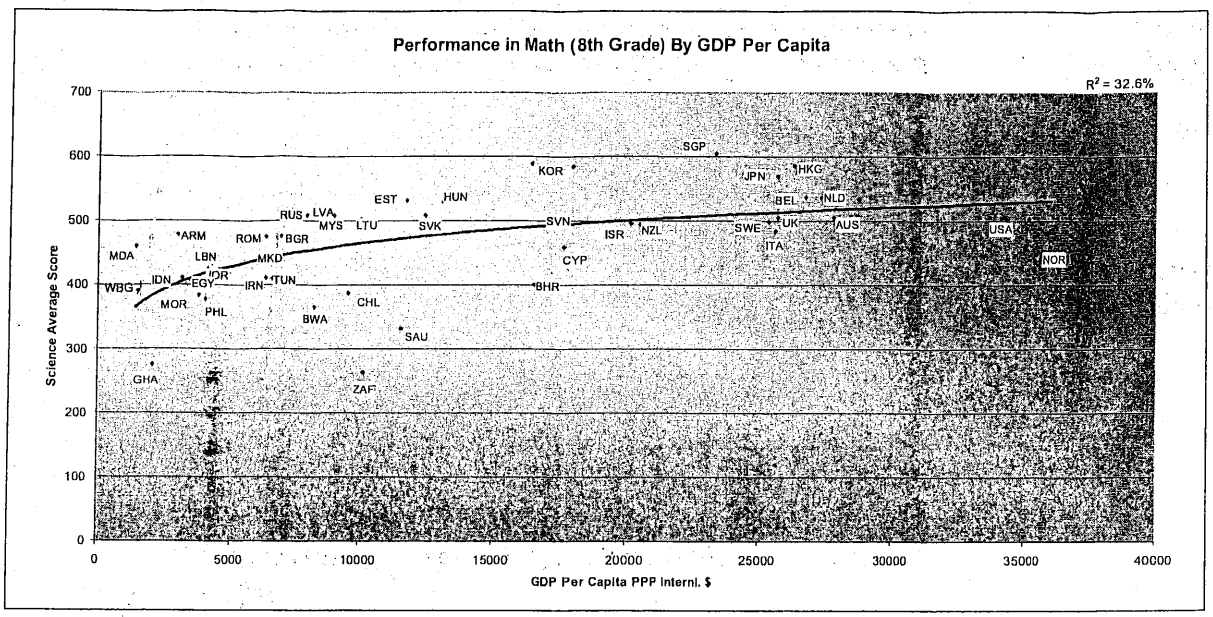
Iran	45%	35%	17%	3%	0%
Tunisia	45%	40%	14%	1%	0%
Egypt	48%	28%	18%	5%	1%
Bahrain	49%	34%	15%	2%	0%
Palestine	54%	27%	15%	4%	0%
Morocco	58%	32%	9%	1%	0%
Syria	71%	22%	6%	1%	0%
Saudi Arabia	81%	16%	3%	0%	0%

Performance of countries in the different content areas of mathematics in comparison to the international average in the subject matter



The performance in mathematics relative to other countries and controlling for GDP per capita is shown in the figure below:

Performance in mathematics



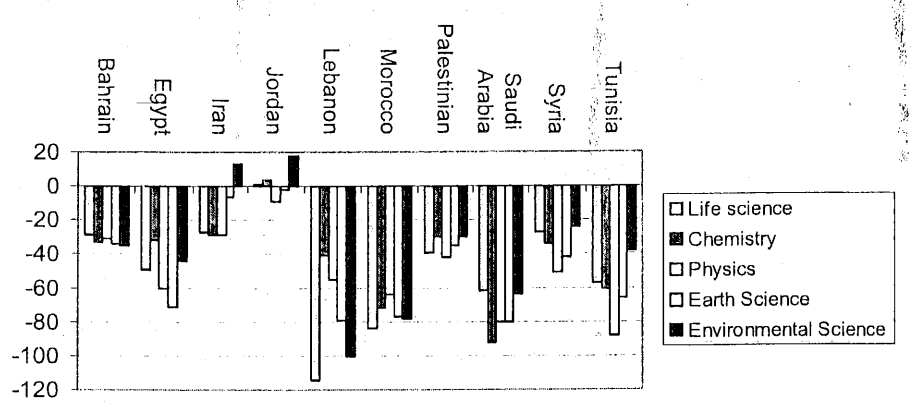
	Science							
	Overall	Male	Female	Urban	Rural	Public	Private	UNRWA
	475	462	489	478	468	470	541	471
% at the low international benchmarks	80							
% at the intermediate international benchmarks	53							
% at the high international benchmarks	21							
% at the advanced international benchmarks	3							
Biology	475	458	493					
Chemistry	478	461	496					
Physics	465	457	474					
Geology	472	466	478					
Environment	492	479	507					
Rank	26/46							

The following table shows a comparison to Middle East and North African Countries on the levels the performance was:

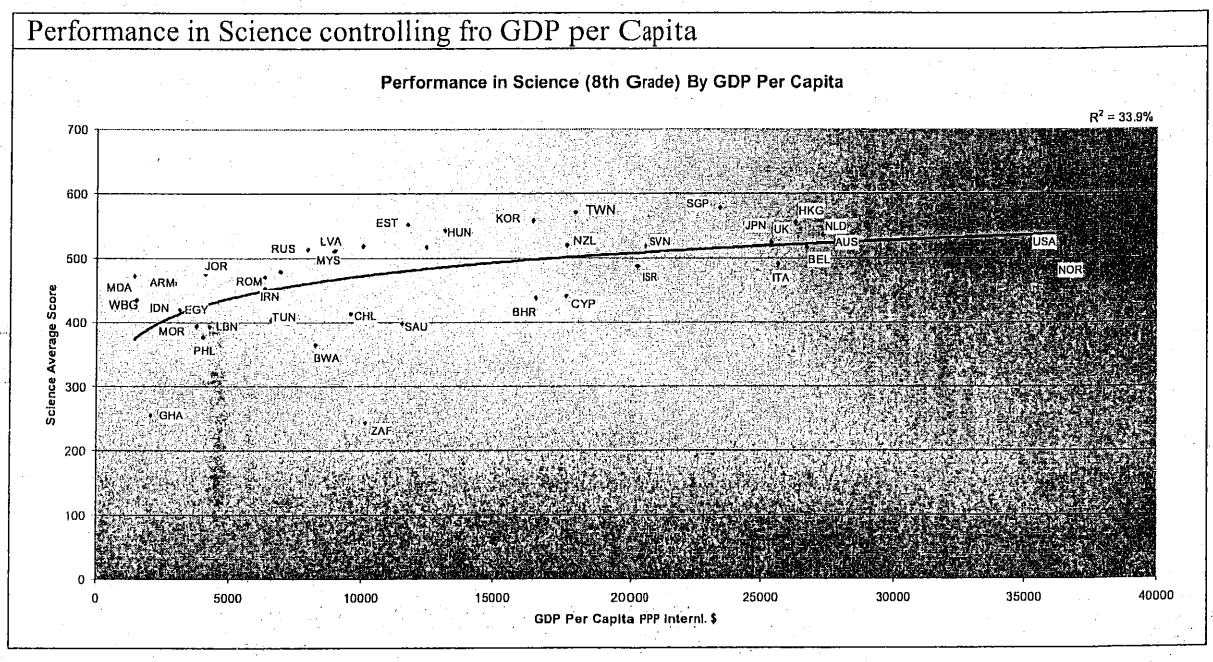
Achievement by science international benchmarks across countries (percentage of students)

	Below the lowest level	Low International Benchmark	Intermediate International Benchmark	High International Benchmark	Advanced international Benchmark
Jordan	20%	27%	32%	18%	3%
Intl. Avg.	22%	24%	29%	19%	6%
Iran	23%	39%	29%	8%	1%
Bahrain	30%	37%	27%	6%	0%
Palestine	34%	30%	26%	9%	1%
Egypt	41%	26%	23%	9%	1%
Syria	44%	34%	18%	3%	1%
Tunisia	48%	40%	11%	1%	0%
Saudi Arabia	51%	34%	14%	1%	0%
Lebanon	52%	28%	16%	4%	0%
Morocco	52%	35%	12%	1%	0%

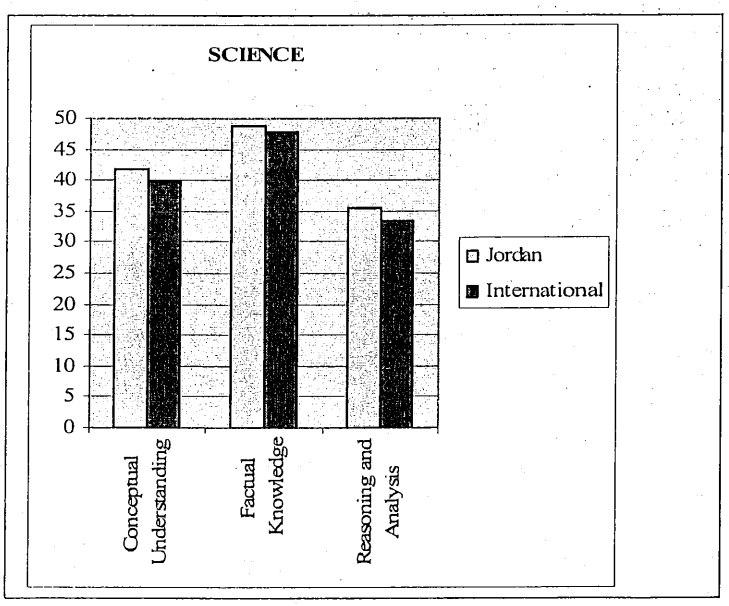
Performance of countries in the different content areas of science in comparison to the international average in the subject matter

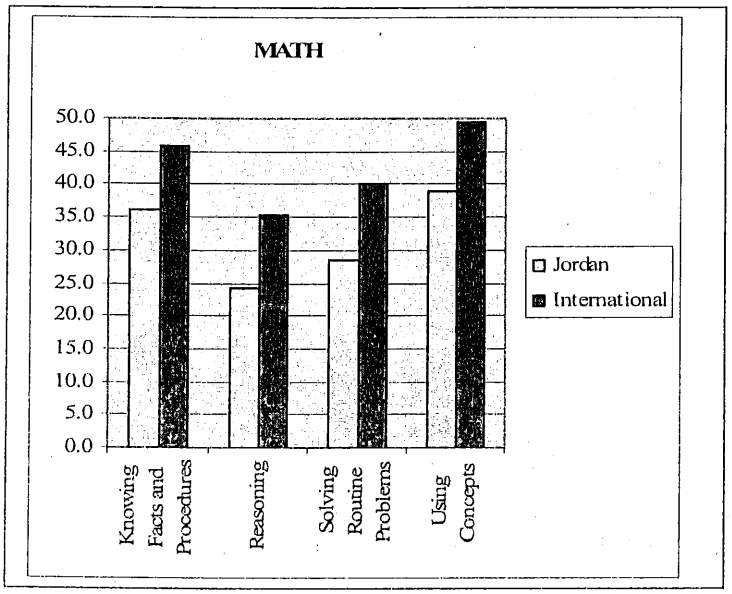


Performance in Science controlling fro GDP per Capita



In terms of competency level related to ERfKE, the following graphs show the current competency levels in the math and science subjects.




MATH
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Knowing Facts and Procedures
Reasoning
Solving Routine Problems
Using Concepts
Jordan
International

Recommendations

One area that is not very strong in the current baseline information is the achievement data. Although there is data from three major assessments of students' learning in the country, the structures and the objectives of the new reform were not considered in the design at that time. In addition to the fact that these assessments were not constructed nor implemented based on the new national learning outcomes there are serious drawbacks:

1. Although Tawjihi is systematically conducted, it is not designed to measure the mastery levels in pre-identified skills similar to the ones proposed by ERfKE. It does not fully quantify or represent how much the graduating students mastered based on well-designed learning outcomes and objectives. The exam was designed and is used as a criterion to branch students out and for their admission into the different degree programs in higher education.
2. The national exam by NCHRD, although it is designed to measure the skills of student in math and science it cannot be used because it lacks the sampling representation as the latest included a very small sample and only for grade 4.
3. The national exam by MOE is not designed to measure skills. It covers the curriculum but learning outcomes and expected competencies are not seriously or scientifically used in the construction of the exam.
4. Content/construct validity and reliability of these examinations are not statistically or scientifically checked in the frame of ERfKE and in terms of its applicability to measure competencies of students.
5. These tests are not sufficient to provide a solid assessment of the competencies of students at the different stages of the educations system.

Introducing new competencies and learning objectives; restructuring and enhancing the curriculum and enriching it with e-learning content; and training teachers on the modified pedagogy and instructional practices with the use of ICT require that we have a stronger and well-designed national assessment test. Hence we recommend that MOE in collaboration with NCHRD design a new instrument (some material of the old exams could be used) and to be conducted similar to the previously conducted procedure. This assessment function will significantly strengthen the achievement data in the baseline and will be used as a reference point to evaluate the ERfKE project. Also, this new national test based on the new vision for the knowledge economy, after it is designed, will be conducted annually (or bi-annually) and will be an important component of the evaluation process.

Timing:

Time is not in our side as we are not exactly at the beginning of the project. But since the new curriculum has not been implemented yet we recommend that this national assessment be held as soon as possible.

Instrument:

The instrument needs to be constructed based on a psychometric and scientific procedure. The initial efforts should focus on redesigning new tests under the scope and changes in the curriculum and should stem from the intended skills and learning competencies and outcomes. Examination is an important component of ERfKE. As a first exercise to the experts who are

currently being recruited to help in this task could start working with the MOE to design a new national instrument that is skills based. The exam needs to be constructed to assess against well-defined learning outcomes/objectives and competencies and in a way to measure trends.

It is important that this instrument be comprehensive and targets learning in addition to skills like problem solving, critical thinking, and communication. It is recommended that it cover languages (Arabic and/or English), mathematical, and scientific fluency. It is also recommended to cover the four critical points of the basic (for example 4^{th}, 8^{th}, 10^{th}, and 12^{th} grades).

A representative random sample of schools and student will be selected and participate in this assessment. In addition to the test results it will be valuable if additional information is obtained about the school (including teachers and resources) and students at the participating sites.

Responsibilities:

In order to speed the process we recommend that the procedure that is currently used by MOE to conduct the national examination be used.

(1) The examination unit at MOE will conduct the exam operations
(2) The examination unit will work to develop a new instrument and pilot it
(3) NCHRD will play an advisory role in helping in sampling and technical issues related to assessment
(4) The examination unit of MOE to conduct the test similar to the way they did previously
(5) NCHRD will be responsible for data coding and analysis after the data is collected.

Appendix: International benchmarks in mathematics and science

Levels of Mathematics and Science		
	Mathematics	**Science**
Lowest International Benchmark	*Students have some basic mathematical knowledge.*	*Students recognize some basic facts from the life and physical sciences.* They have some knowledge of the human body and heredity, and demonstrate familiarity with some everyday and demonstrate familiarity with some everyday heredity physical phenomena. Students can interpret some pictorial diagrams and apply knowledge of simple physical concepts to practical situations.
Intermediate International Benchmark	*Students can apply basic mathematical knowledge in straightforward situations.* They can add, subtract, or multiply to solve one-step word problems involving whole numbers and decimals. They can identify representations of common fractions and relative sizes of fractions. They understand simple algebraic relationships and solve linear equations with one variable. They demonstrate understanding of properties of triangles and basic geometric concepts including symmetry and rotation. They recognize basic notions of probability. They can read and interpret graphs, tables, maps, and scales.	*Students can recognize and communicate basic scientific knowledge across a range of topics.* They recognize some characteristics of the solar system, water cycle, animals, and human health. They are acquainted with some aspects of energy, force and motion, light reflection, and sound force and motion, light reflection, and sound energy. Students demonstrate elementary knowledge of human impact on and changes in the environment. They can apply and briefly communicate knowledge, extract tabular information, extrapolate from data presented in a simple linear graph, and interpret pictorial diagrams.
High International Benchmark	*Students can apply their understanding and knowledge in a wide variety of relatively complex situations.* They can order, relate, and compute with fractions and decimals to relate, and compute with fractions and decimals to order solve word problems, operate with negative integers, and solve multi-step word problems involving	*Students demonstrate conceptual understanding of some science cycles, systems, and principles.* They have some understanding of Earth's processes and the solar system, biological systems, populations, reproduction and heredity, and structure and function of organisms. The structure and function of organisms. The heredity show some understanding of physical and

	proportions with whole numbers. Students can solve simple algebraic problems including evaluating expressions, solving simultaneous linear equations, and using a formula to determine the value of a variable. Students can find areas and volumes of simple geometric shapes and use knowledge of geometric properties to solve problems. They can solve probability problems and interpret data in a variety of graphs and tables.	chemical changes, and the structure of matter. They solve some basic physics problems related to light, heat, electricity, and magnetism, and they demonstrate basic knowledge of major environmental issues. They demonstrate some scientific inquiry skills. They can combine information to draw conclusions; interpret information in diagrams, graphs and tables to solve problems; and provide short explanations conveying scientific knowledge and cause/effect relationships.
Advanced International Benchmark	*Students can organize information, make generalizations, solve non-routine problems, problems and draw and justify conclusions from data.* They can compute percent change and apply their knowledge of numeric and algebraic concepts and relationships to solve problems. Students can solve simultaneous linear equations and model simple situations algebraically. They can apply their knowledge of measurement and geometry in complex problem situations. They can interpret data from a variety of tables and graphs, including interpolation and extrapolation.	*Students demonstrate a grasp of some complex and abstract science concepts.* They can apply knowledge of the solar system and of Earth features, processes, and conditions, and apply understanding of the complexity of living organisms and how they relate to their environment. They show understanding of electricity, thermal expansion, and sound, as well as the structure thermal expansion, and sound, as well as the structure electricity of matter and physical and chemical properties and changes. They show understanding of environmental and resource issues. Students understand some fundamentals of scientific investigation and can apply basic physical principles to solve some quantitative problems. They can provide written explanations to communicate scientific knowledge.