Education Reform for the Knowledge Economy (ERfKE) Project

Assessment of the Implementation of Information and Communication Technology in Jordanian Public Schools

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ICT in Jordan public schools: executive summary

The Jordan government has, in recent years, undertaken major initiatives to prepare the country for the information society. It was acknowledged that the economic health of the nation would depend heavily on being successful in preparing the current generations of students to be ready to work in digitized environments where the shelf-live of knowledge becomes increasingly shorter, where autonomy in updating knowledge and competencies is a major basic competency and in which cross-border cooperation and trading in virtual workspaces will become increasingly important.
In the past four years roughly 60 millions of USD's were invested in order to equip school with ICTs and to train teachers, while early 2004 plans for connectivity were launched that aim at providing broad-band Internet access to all governmental schools.
In light of the huge investments it was deemed necessary to carefully monitor the implementation and effectiveness of the intended changes. Therefore it was decided to start in the school year 2003/2004 an educational ICT-assessment. The objectives of this assessment are:

- To produce statistical indicators of the extent to which ICTs are integrated in the educational processes
- To show developments over time and to investigate to what extent these are comparable to other countries in the region and beyond
- To analyze which factors inhibit and/or promote the nature and speed of educational changes
- To study and document examples of educational innovations that are supported by ICTs, so that best practices can be identified and further disseminated to the system at large.

In Spring 2004 the first round of this assessment took place by conducting a survey among a sample of Jordan MOE schools. The main topics that were addressed concerned: infrastructure (hardware, software and connectivity), the use of ICT in the curriculum (pedagogical practices, ICT-related performance objectives, and the use of the Internet), staff development (school objectives and realization) and issues regarding management & organization. The design and instrumentation of this first round of the Jordan ICT-assessment was based on the methodology that was developed in the Second Information Technology in Education Study (SITES) that was run between 1998 and 2000 by the International Association for the Evaluation of Educational Achievement (IEA). This first round of the assessment provides base-line data for evaluating the changes that may occur in the forthcoming years. Moreover, by comparing the current situation in Jordan schools with those of other countries that took part in SITES, a first appreciation of the current situation is feasible. In addition, the current data can be compared with data that were collected in other international studies in which Jordan participated in TIMSS-R 1999 and TIMSS 2003.

The results of this first round of the Jordan ICT-assessment showed that in the past few years the access to ICTs in Jordan secondary schools has improved considerably. Almost all MOE schools had in Spring 2004 access to computers. About 70% of the schools possessed already in 2003 fifteen computers or more, which in 1999 was the case for almost none of the schools. In a typical school there was, in Spring 2004, one computer available for every 30 students. Although this number is relatively low when compared with other countries, it may be argued that since ICT does not have a long tradition in most Jordan schools, it is a fair number to start work on pedagogical objectives and piloting the implementation and integration of ICT in the education process. Further, it was observed that there exists a substantial variation between schools in terms of the availability of computers: from 1 computer for 15 students to 1 computer for 60 students. Most schools possess general purpose software of the kind that is usually provided together with computers that operate under Windows (Word processor, spreadsheet, PowerPoint, and Internet browser). However, the availability of software that is suited for applying ICT in school subjects was still quite low. In theory, a compensation for this might be the Internet, where many valuable educational source materials can be found (although not always in the national language and tuned to the specific curricular context of the schools). However, in Spring 2004, the access to the Internet was still very low in Jordan schools. In

the perception of educational practitioner the insufficient availability of hardware, software and connectivity are still major obstacles in realizing the schools' ICT related goals. Whether this concern is justified needs to be further investigated when (around October 2004) a selection of schools will be visited in order to determine to what extent there exists an imbalance between infrastructure, school vision, pedagogical practices, readiness of teachers to implement ICT, curricular orientations, and the like.

There are indications that Jordan schools tend to emphasize, in this stage of the introduction of ICT, learning about computers. This typically occurs in the first stage of introducing computers through which many countries have gone and which is followed by a stage of intensified integration in school subjects.
The results show that, in Jordan schools, emerging pedagogical practices are beginning to be realized. In this regard, the ambitions of Jordan schools are quite high, which points to a sound innovation spirit. It was also observed that in this respect great differences existed between schools: some schools seem to be much more innovation oriented than other schools. This observation is of interest for the second stage of the Jordan ICT-assessment, when the exact nature of innovation in schools can be investigated in-depth in order to determine what are the possible causes of these differences and what can be learned from this. In Spring 2004, the use of e-mail was still rather low, because, as mentioned above, many schools were not yet connected to the Internet. An important observation in connection with the integration of ICTs in the curriculum is that more than 80% of the school principals mentioned that a major obstacle is that teacher do not have enough time to prepare lessons in which computers are used.

A very crucial condition for changing pedagogical practices and integrating ICTs is that teachers and support staff need to be adequately trained in order to feel comfortable to apply ICTs in their daily instructional activities. A substantial number of school principals think that many teachers don't have yet the required knowledge and skills, despite the fact that almost all teachers have received some form of training. Also the technical resource persons in the schools, indicated that, although their technical knowledge was quite acceptable, only half of them indicated that they were well prepared regarding the didactical and organizational integration of computers. This is not a phenomenon that only existed in Jordan, it was observed in a substantial number of other countries.

After many years of exploring the possibilities for integrating ICT in education it seems that in countries which already started in the mid 1980s, the awareness has grown that, next to infrastructure, curricular flexibility and staff development, management & organizational factors play a crucial role in this process. School leaders, for instance, have a very important gate-keeping function in stimulating and steering global change processes in the school. This is only possible when they have a positive attitude towards ICTs and acknowledge the potential benefits of applying these new technologies. This may lead to stimulating the adoption of common vision in the school and establishing written policies in which objectives and trajectories towards further integration of ICTs in the learning processes are documented. From the data it appears that Jordan school principals have very high expectation regarding the benefits of ICTs: they expect increased achievements of students, they underscore the relevance of using the Internet and see ICTs as important for life long learning. Roughly 70% of the schools have written policies in which mainly issues like equity of access, computer related tasks and staff development have been specified. Most schools are aware that a common vision on ICTs in the school needs to be developed, but in a majority of cases (64%) it was indicated that this objective was only partially or not yet at all realized.

In summary, it appears that Jordan secondary schools are well underway to implement ICTs: the infrastructure is quickly becoming available and many educational actors are innovation oriented. However from the first stage of the Jordan ICT-assessment there are indications that continuous and

maybe intensified attention is needed for the following potential obstacles that were identified in the research report:

- Student: computer ratios.
- Connectivity.
- Curriculum (e.g. time for teachers).
- Staff development: pedagogy and ICTs.
- Development of a common vision on ICT in schools and the trajectory to the future.

Chapter 1: Background and design

This chapter contains a description of the political background regarding ICT and education in Jordan, the objectives of the study, concepts, indicators, research questions, and methodological issues (population definition, sampling procedures, and data collection)

Background

Since 2002 the Jordan government is striving for a major reform of the education system. The following four policy orientations were formulated:

- Structuring the educational system to ensure lifelong learning
- Ensuring responsiveness of the educational system to the economy
- Accessing and utilizing information and communication technologies to support effective learning and system management
- Ensuring quality learning experiences and environments

The ERfKE project takes place in the context of these policy orientations and is focused on:

- Reorienting education policy objectives and strategies and reforming governance and administrative systems
- Transforming education programs and practices to achieve the learning outcomes that are relevant for the knowledge economy
- Supporting the provision of quality physical learning environments
- Promoting learning readiness through expanded early childhood education

This project started in 2003 and during its initial stage consisted of equipping schools with ICT-infrastructure and the training of teachers.

One of the objectives of this project is to assess the outcomes of ICT deployment and utilization via benchmarking and in-depth qualitative analyses of what is actually happening at the educational floor in order to support the management and steering of the ongoing developments as well a tool for accountability towards the sponsors of the program. In order to achieve this monitoring objective, the intention is to repeat the IEA SITES-Modules 1 and 2, under the coordination of the National Centre for Human Resource Development (NCHRD) in Jordan. The SITES modules were international comparative studies that were conducted in over 25 countries and which offer benchmarks and in-depth analyses of innovative pedagogical practices that are supported by ICT.

Many studies have been carried out exploring the contribution that ICT can make to the processes of teaching the learning. Some have focused on students' outcomes, whereas others have focused on pedagogy. The Second Information Technology in Education Study (SITES), organized by the International Association for the Evaluation of Educational Achievement (IEA), was designed to make a further contribution to the growing body of evidence concerning the effective use of ICT within an educational context (Harris, 2002).

The very large expenditures being made by the Government of Jordan and the Ministry of Education in information and communications technology infrastructure require careful planning and coordination if the expenditure is to be translated into a real and measurable investment in education and learning. ICT hardware and software of appropriate specifications and standards for use by teachers and students in schools is the predominant vehicle for the transformation of all learning activities in the schools and will support, through advance in e-learning, the implementation of the new curriculum and assessment framework, the subsequence renewal of core curriculum, the use of on-line resources to support the implementation of the core curriculum, and the development and use of additional learning content, resources, and materials to supplement and expand learning through ICT. The start-up, exportation, and distribution through network capabilities of an e-learning portal "Eduwave" will create conditions where by rapid transformation of teaching practice and learning opportunity is possible across the country. This assessment study of the implementation of information and communications technology in schools will provide an essential evaluation of the impact of investment in ICT upon the quality and success of learning for students in both the basic and secondary cycles of public education.

In addition to the larger scale infrastructure initiatives, the Ministry of Education (MOE), at the current time is involved with some specifically targeted activities that are intended to build and support capacity in the utilization of ICT for teaching and learning. These activities include the Discovery Schools project, the Intel and world links teacher training programs, and the schools-on-line Project. This study will provide a timely opportunity for the assessment of the different impacts of these initiatives and will provide the data to guide the MOE decision-making about future policies procedures, and guidelines for the extended implementation of ICT within instructional learning settings and environments.

A great deal of theoretical and empirical work has been done for several decades regarding the impact of ICT on educational processes. The incorporation of ICT into the school has affected its functioning at multiple levels: new configurations of learning spaces and timetable have been created; innovative teaching methods have been devised; autonomous and active learning processes using the technology have been adopted, teachers' traditional roles have been expanded and included personal and group tutoring and guidance functions; and new ICT-based curricular solutions have been generated (Mioduser, Nash Micas, Tobin, and Frankish 2002).

Policy issues, concepts, indicators, and research questions

The conceptual framework of SITESM1 was designed as a collaborative activity by researchers from over 25 countries (Pelgrum & Anderson, 2002). They took into account policy documents, the research literature on ICT and developed a conceptual framework in which four areas were distinguished (curriculum, infrastructure, staff development and management/organization). This framework was used as basis for mapping indicators, generating research questions and the construction of instruments. For any country that wants to repeat Module-1 it is important to verify whether the concepts, indicators and research questions from M1 are still relevant, given the actual status of educational policies.

From Pelgrum &Anderson (2002) the following list of concepts and indicators can be extracted:

Curriculum

- Pedagogical practice paradigm (traditional versus life long learning)
- ICT-related instructional objectives
- Perceived ICT-related learning outcome expectations and learning opportunities
- Perceived opportunities for using ICT applications
- Perceived opportunities for using e-mail or the world wide web
- Perceived ICT-related opportunities regarding the merging pedagogical practices
- Perceived ICT-related opportunities regarding the traditional important paradigm

Infrastructure

- Hardware
    - Student: computer ratios
    - Hardware functionality
    - Peripherals
    - Access to communication facilities
    - Perceived obstacles regarding hardware infrastructure
- Software
    - Availability
    - Perceived obstacles
- Schools' investments in hardware and software

Staff development

- Problems with regard to staff qualifications
- Policies with regard to staff development and its realization
- Methods of transferring ICT-related knowledge
- Availability of ICT-training courses
- Respondents' self-ratings

Management and organization

- Attitudes and beliefs of school principals towards ICT
- Explicit school policies and existence of a common vision
- Use of ICT for monitoring student progress and for school administration
- Problems Realizing ICT Goals

Research questions

The SITESM1 data base, including the Jordan data that were collected in 2004, offers opportunities to address and investigate many different research questions. For the purpose of this first preliminary report, the following questions will be highlighted:

Infrastructure

1. Which percent of Jordan's MOE schools have access to ICT?
2. What is the quantity of equipment in schools that have access to ICT?
3. Which types of computers are available in schools?
4. To what extent do schools have access to the Internet?
5. Do schools experience a lack of equipment as major obstacle in realizing their ICT related goals?
6. To what extent is software available for a variety of school subjects?

Pedagogy and ICT

1. To what extent have schools adopted pedagogical objectives that are oriented on life long learning and is this related to the number of years that schools have experience with ICT?
2. Which ICT related performance-objectives are pursued by schools?
3. To what extent is the Internet used in schools for pedagogical purposes?
4. Which ICT-related learning opportunities do schools offer to students?

Staff development

1. To what extent are staff development facilities available in schools?
2. Do schools have adopted specific policies regarding staff development on ICT?
3. How is ICT related knowledge transferred in the school?
4. Which ICT-related courses are available for teachers?

Management and organization

1. To what extent do school leaders have positive attitudes regarding the added value of ICT?
2. Do schools have explicit written policies on ICT?
3. To what extent is there a common vision in schools on ICT-related goals?
4. What kind of measures did schools take to regulate the computer related activities in the school?
5. Are computers used for supporting the monitoring of student progress?
6. To what extent are infrastructural characteristics (electricity, telecommunication facilities, and available space in the school) experienced as serious obstacle for realizing the school's ICT related goals?

Population definitions and sampling design

In SITESM1, the population definitions and sampling design was summarized as follows:

> *''When designing Module-1 of SITES, it was necessary to make assumptions about the likely definitions of student populations that would be used in Module-3. It was expected that Module-3 would focus on three student populations that would be defined in terms of particular target grade levels (defined below in the sections on population definitions).*
>
> *The definition of target grades had implications for the instrument development. This was because the instruments were meant to collect information about the school context that might affect students at the target grade. For example, in school systems containing schools with grades extending from the lower to the upper secondary levels, the ICT infrastructure might be different for each of these levels, with the upper level perhaps having better access than the lower levels to more sophisticated machines and particular software.*
>
> *Also, in regard to collecting data about intended instructional objectives in the schools, it was considered important to specify to the respondents the particular target groups that the researchers had in mind. However, that said, participants in SITES Module-1 had to solve the dilemma of relevant school context characteristics not necessarily being restricted to students at particular grade levels. For instance, it was realized that whereas some schools might restrict the use of the available ICT*

infrastructure to particular grade levels, others might make no distinction at all. It therefore was decided to distinguish three types of questionnaire-items:

1. *Those referring to a single target grade;*
2. *Those referring to a grade range that included the target grade;*
3. *Those referring to the entire school.*

Decisions about the allocation of particular questionnaire items to each of these categories were made on the basis of consensus between the participating researchers. Moreover, NRCs were allowed to include an instruction to respondents that, whenever particular questionnaire items referred to a grade or grade range, answers might be provided as if they were posed in terms of 'the entire school'.

Populations

Even though the school was the unit of analysis for SITES Module-1, the school populations were defined in terms of the characteristics of students attending schools[1]*. As explained in the previous section, it was necessary to anticipate a student survey for SITES Module-3, and to define the populations in terms of schools with one of three types of student populations. Countries had to be able to collect data in at least one of these populations in order to participate in the study. Population 2 was considered as the core population. Those countries participating in only one population were urged to select population 2.*

A target age was defined for each population so as to provide a best comparative basis for comparing Module-1 and Module-3 data. The target age was then used (see points 1 and 2 under Population 2 below) to define the grade range and hence the schools constituting the population. The population definitions were as follows:

Population 2: To provide a basis for context information and trend data in Module-3, and to provide a basis for comparison with other IEA and OECD studies, it was agreed that the target age for population 2 would be '14 in the eighth month of the school year'. An effort will be made to ensure that testing in Module-3 coincides as much as possible with whenever the eighth month occurs in each participating country.

1. *The grade range was defined as the three grades within a school containing the most students of the target age (those aged 14 in the eighth month of the school year).*
2. *The schools in population 2 consequently were those schools containing all three grades. However, some schools, while falling within the grade range, did not have all three grades because they catered for students bounded by a particular level school (as is seen in 'middle schools'). In such instances, it was determined that the grade range would include the two grades within such schools that contained the most students of the target age.*

It should be pointed out that for some countries (for example, Bulgaria and Slovenia) the labeling of Population 2 as lower secondary was formally not correct, as the grade levels of part of this population are defined (in the formal education system) within the primary level. Although other labels (such as Middle School) were considered, it was ultimately decided to use lower secondary education because this terminology is consistent with the earlier IEA-Computers in Education studies, and because also the OECD and the European Commission use this terminology. Furthermore, it should be noted that in Singapore 'upper secondary education' refers to grades 9 and 10. Hence, for Singapore this level should be read as 'final school years'.

Sampling Criteria and Realized National Samples

The national centers participating in the study were required to submit national sampling plans that contained detailed proposals on defining the national populations and the procedures to be used for drawing the samples. The base criteria for national sampling were set as follows:

[1] More specifically, SITES Module-1 focussed on schools that used computers for instructional purposes.

1. *Schools using ICT to be selected on the basis of a probability proportional to the number of students from the desired target population;*
2. *The response rate to be at least 85% after one replacement; 70% in situations with no replacements for non-responding schools; and 70% for complete enumeration;*
3. *The minimum sample size to be 200 ICT-using schools per population level."*

The population definition in Jordan is: all schools in which students from grade 7 or higher are enrolled *and* which have a computer lab (operationalized as at least 15 computers).
The sampling frame for this study consisted of a list of all MOE-schools possessing computers and having students from grade 7 or higher enrolled. This resulted in a list of 1240 school, enrolling 351279 students. The total number of schools that enrol students in grade 7 in Jordan is 1862. This means that roughly 67% of the schools in Jordan have in 2004 access to computers. This is roughly as estimates that were made on the basis of the TIMSS-2003 data.
Next the sampling frame was stratified according to size as shown in Table 1.

Table 1.
Stratification of sampling frame and numbers of schools sampled per stratum

School size	**Percent of population**	**# schools**
<100	4%	7
100-200	14%	21
200-400	30%	45
400-600	20%	30
600-800	14%	22
800-1000	12%	18
>1000	6%	9
TOTAL	100%	152

This sample contains an equal distribution of male (68) and female schools (69) and it contains 15 mixed schools as well (15).
Although the sample size is less than 200 (as specified in SITESM1) due to the fact that the number of schools in the population is rather low the standard error for the statistics is still acceptable, because the expected standard error is 1.5.
Overall it can be concluded that the sampling design (sampling frame, sample size, and sampling procedures) was satisfactory.

Instruments
The instrumentation of SITES Module 1 consisted of a questionnaire for school principals (further referred to as 'principal questionnaire') and a questionnaire for a person in the school who was knowledgeable about the ICT infrastructure and its use. This last questionnaire is further referred to as 'the technical questionnaire'.
The content of these questionnaires is indicated in Table 2.

Table 2

Study topics with summaries of questionnaire content. Source: Pelgrum&Anderson (2002)

Topic	Principal questionnaire	Technical questionnaire
Curriculum	• ICT-related objectives of the school • Presence of types of teaching and learning practices • ICT attainment targets • Realization of ICT-related objectives	• Use of e-mail/WWW for instructional purposes • Percentage of students/teachers using WWW • Internet-related activities of students • Use of technology applications by students
Infrastructure	• Needs and priorities • Perceived obstacles • Expenditures • Hardware • Software • Maintenance	• Number and types of computers • Operating systems • Processor types • Access to e-mail/WWW • Existence and content of home page • Number of computers not in use • Availability of peripherals • Availability of software types • Availability of software for school subjects • Hard- and software- related obstacles
Staff development	• Prescriptions for teachers • Attendance by teachers • Expenditures on staff development	• Types of internal information exchange • Availability of in-house/external training courses • Self assessment of ICT skills
Management and organization	• Existence of written policies on ICT • ICT-related policy measures • Principal attitudes towards ICT • Use of ICT for administration/monitoring • Technical support infrastructure	• Priorities for external support
Innovative practices	• Most satisfying ICT-related learning activities	
Background information	• Gender, age, experience of principal • Own use and type of use of ICT • Enrollment figures • Area in which school is located • Years of experience with ICT	• Roles and tasks • Experience as computer coordinator • Gender • Age

During SITESM1 both questionnaires were translated in the national languages of the participating countries on the basis of guidelines that were described in a translation manual. Countries had to submit a translation report (describing the procedures, problems and solutions, potential deviations) for approval by the International Coordinating Centre.

The SITESM1 questionnaires were translated into Arabic by the local consultant. Next, several ICT-specialists and students who had a degree in English checked the translation. Moreover, a number of questions were added to the questionnaire, such as number of trained teachers and use of computers in various school subjects. The translated questionnaires were piloted in a group of university students who also had jobs as school principals and/or as teachers. These checks led to several adaptations in the translations, because it appeared that some words and sentences were interpreted differently by the 'respondents'.
On the basis of the inspection of the translation procedures it can be concluded that the translation were done with care and are acceptable.

Data collection
The data collection procedures for SITESM1 were documented in the so called 'Administration manual', in which was written: '….. *Procedures outlined in this manual have been designed to ensure that high quality, comparable data will be available for analyses. They are based on procedures, which have been proven effective in earlier studies of the International Association for the Evaluation of Educational Achievement (IEA) including CompED and TIMSS. It is of vital importance that NRCs direct the studies in their countries according to these procedures and that any foreseen deviation from these procedures be brought to the attention of the ICC prior to implementation*….'.

This manual contained a schedule of activities, which is shown in a form adapted to the Jordan situation in Table 3.

Table 3
Important activities and deadlines for the administration of the SITES questionnaires, Main Survey- adapted to the Jordan situation

A. Instruments	***B. Select sample***	***C. Data processing***	***Deadlines***
A.1 Translate instruments A.2 Approval of translation procedure by international consultant A.3 Duplicate instruments	B.1 Select school samples B.2 General information letter to schools by ministry B.3 Contacting schools*		B.1 April 1 B.2 March 15 B.3 April 10 A.1 April 1 A.2 April 5 A.3 April 6
A.4 Collect data in schools (by data collectors)		C.1 Receive codebooks, data entry software (DEM) and within country cleaning software (SPSS) C.2 Adapt DEM to include national option questions	A.4 April 15-29 C.1 April 1 C.2 April 10
A.5 Receipt of completed questionnaires	B.3 Reminder to schools	C.2 Start data entry	A.5 April 18-May2 B.3 not applicable C2. April 13
		C.3 Finishing data entry	May 2
		C.5 Data cleaning	May 2-5
		C.6 Data analysis	May 5-June 30
		C.7 Draft report	May 30

The data collection in Jordan has been done by sending data collectors to each of the sampled schools. These data collectors make sure that the questionnaires are completed and that any clarifications that are needed for answering the questions were provided to the respondents. A team of 15 data collectors were involved in this operation. Assuming that the administration of the questionnaires took one day per school and given the sample size of 150 schools this whole exercise were took 10 working days. The obvious advantage of this approach (although costly) is that it result in an almost 100% response rate and that the quality of the data will

be high, because the data collectors can at the spot clarify any problems that occur during the answering of the questions.

The data collectors were available and the planning was to start the data collection on April 18. In the preceding week a training session (see below) was organized. Moreover, in the same week a few schools (that were not part of the sample) were visited and the questionnaires were administered in order to double-check if any unforeseen problems may arise.
The data collection was run smoothly and no major problems occurred.

Outline of the content of this report

- As the report of the current survey is based on the questionnaires and indicators from SITESM1, the current report will frequently, where appropriate, extract for the description of instruments and indicators parts of texts from Pelgrum & Anderson (2002). In addition to the background and methodology of the study, in Chapter 2 indicators regarding the available ICT-infrastructure (hardware, software, and connectivity) will be reported. Chapter 3 deals with issues regarding the curriculum, such as: objectives, pedagogical activities, opportunities for students to learn about ICT, and the use of the Internet. Chapter 4 concerns staff development and indicators regarding the availability of courses and staff qualifications are reviewed. Chapter 5 contains indicators that are related to issues regarding the management and organization of ICTs in schools. Finally, in Chapter 6 a summary of the main findings is presented as well as reflections and recommendations that related to the recently published policy framework regarding ICTs in schools.

Chapter 2: Access to ICT

This chapter will provide answers to a number of questions about the ICT-infrastructure in schools by focussing the availability of hardware, software and connectivity as well as the extent to which school principals and technology coordinators experience the current situation as sufficient

Introduction

In order to describe the situation with regard to the introduction of ICT in Jordan schools in the year 2004, a first question is to what extent ICT is available in the school buildings.

The sampling frame for this study consisted of a list of all MOE-schools possessing computers and having students from grade 7 or higher enrolled. This resulted in a list of 1240 school, enrolling 351279 students. The total number of schools that enrolled students in grade 7 in Jordan is 1862. This means that roughly 67% of the schools in Jordan had in 2004 access to computers. This figure is roughly comparable with the situation in 1999 in for instance Belgium, the Czech Republic and Lithuania. It is expected that in Jordan this figure will change very quickly over the forthcoming years, as a result of the intensive governmental ICT-stimulation programs. The speed of developments amongst others can be inferred from a comparison of data from 1999 and 2003, which were collected in the IEA-TIMSS project. Figure 1 shows that the percent of schools that had access to ICT quickly improved over a period of 4 years.

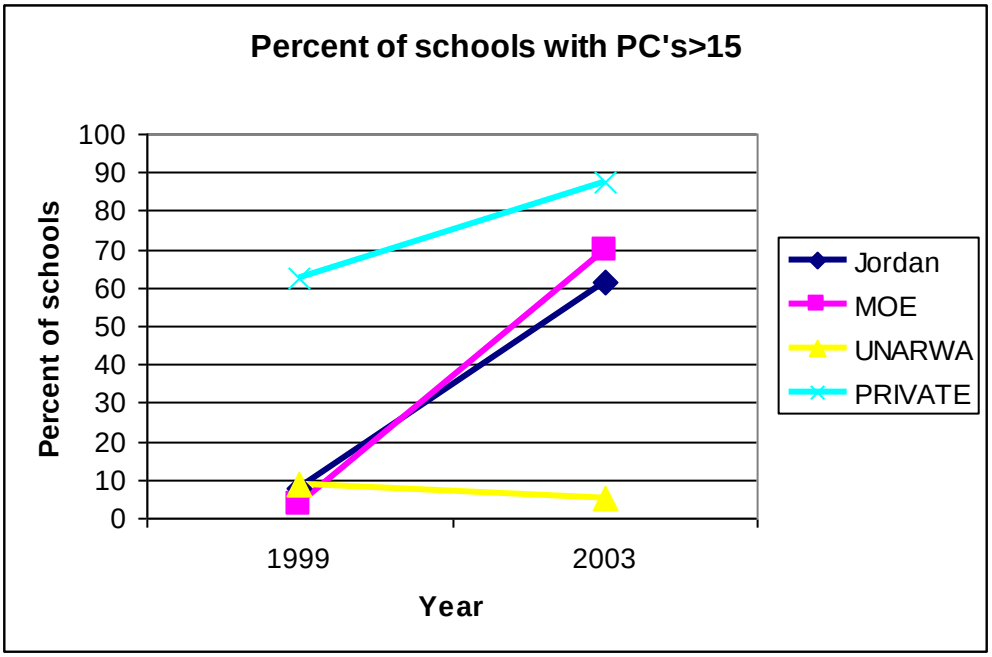


Figure 1. Percentage of schools where more than 15 PC's were available in 1999 and 2003.

In order to monitor the developments regarding the ICT-infrastructure, the current situation will in this chapter be reviewed on the basis of the following questions:

1. What is the quantity of equipment in schools that have access to ICT?
2. Which types of computers are available in schools?
3. To what extent do schools have access to the Internet?
4. Do schools experience a lack of equipment as major obstacle in realizing their ICT related goals?
5. To what extent is software available for a variety of school subjects?

The quantity of available equipment in Jordan secondary schools

A general basic indicator of hardware availability in schools is the number of PCs (or work-stations) that are available to students and/or teachers of the target grades[2] for teaching and/or learning purposes. In the technical questionnaire, respondents were asked to specify the total number of computers available to students in the target grades. Although it is possible to calculate the mean or median of this variable, doing so would be meaningless unless the size of the schools was taken into account.

One indicator of the extent to which students can access hardware in a school is the student:computer ratio. This ratio indicates how many students on the average have to share one computer and can be determined by dividing the total number of students in the school by the total number of computers available. A ratio of 30, for example, indicates that for every 30 students there is one computer available. Furthermore, if these 30 students spend about 30 hours in lesson time per week in their school, then each student, on average, could use a computer for one hour per week.

Obviously, there are different ways of calculating the ratio, perhaps by taking into account the non-using schools in a country, or counting all the computers in the whole school or in a particular range of grades, or determining the number of students that use the available equipment. Each of these measures has limitations. For example, calculating the student:computer ratio on the basis of the number of students in the grade range divided by the number of computers available for these students can result in a downwards biased (that is, in this case, a too favourable) estimate because students other than those from the target grades may be using the computers. Alternatively, if the ratio is calculated on the basis of the number of students in the whole school divided by the number of computers in the whole school, the estimate might be inaccurate for the students in the target grade range. The assumption here is that these students have access to the computers when, in fact, they may not; the computers may be available only to students from other grade levels. Such a situation can occur if, for example, lower and upper secondary schools share the same building and facilities but the computers are available only to upper secondary students. (This happens in schools where computer use is restricted to computer science courses such as programming.)

In order to capture these different situations, the technical questionnaire included a whole series of questions about available computer equipment for the grade range, the entire school, numbers of students using computers, and so on (see Appendix B, technical questionnaire, questions 15-24). After extensive analyses of the results it was concluded that the student:computer ratio could best be based on:

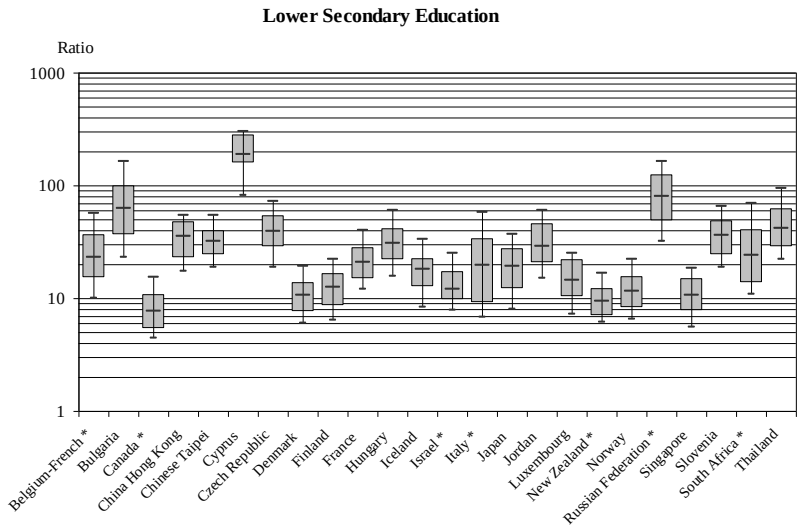
$$\text{Student:computer ratio} = \frac{\text{total number of students per school}}{\text{total number of computers available for student use in the whole school}}$$

The reasons for using this indicator were as follows:

- In many schools, the number of computers listed for the grade range appeared to be roughly the same as the number of computers for the whole school.
- The grade range definitions varied quite a lot between countries.

Figure 2 contains for Jordan and countries that participated in SITESM1 the box plots of the student:computer ratio's. The result shows that the median value for Jordan is 29, whereas in some other countries (e.g. West Europe) this ratio was much lower, while in other countries the ratio's were much higher (in particular the former East European countries).

[2] SITES Module-1 was conceived as producer of baseline information for SITES Module-3, in which samples of students at a particular grade level (the so-called target grade) will participate. In order to provide school-context information that is relevant for this group, Module-1 focused as much as possible on students at the target grade (see Chapter 1 for further explanations).



Notes: *: country did not satisfy all sampling criteria (see Chapter 1, Table 1.2). Boxes range from 25% lowest to 75% highest value; the horizontal line in the boxes represents the median; tiles show values for 10% and 90% of the cases. Because of the huge differences between countries, these box plots are presented on a logarithmic scale, the gridlines should be read as 1,2,3,…, 10, 20, 30, …,100, 200, 300, …

Figure 2 (was 4.1) Box plots of student:computer ratios in computer-using lower secondary education.

The availability of equipment has drastically improved in the period 1999-2003, as is shown in Figure 3, which is based on data collected in IEA-TIMSS. This change in particular occurred in the MOE-schools, while there is some indication (although caution is needed because of the low sample size) that the situation in UNARWA schools got worse.

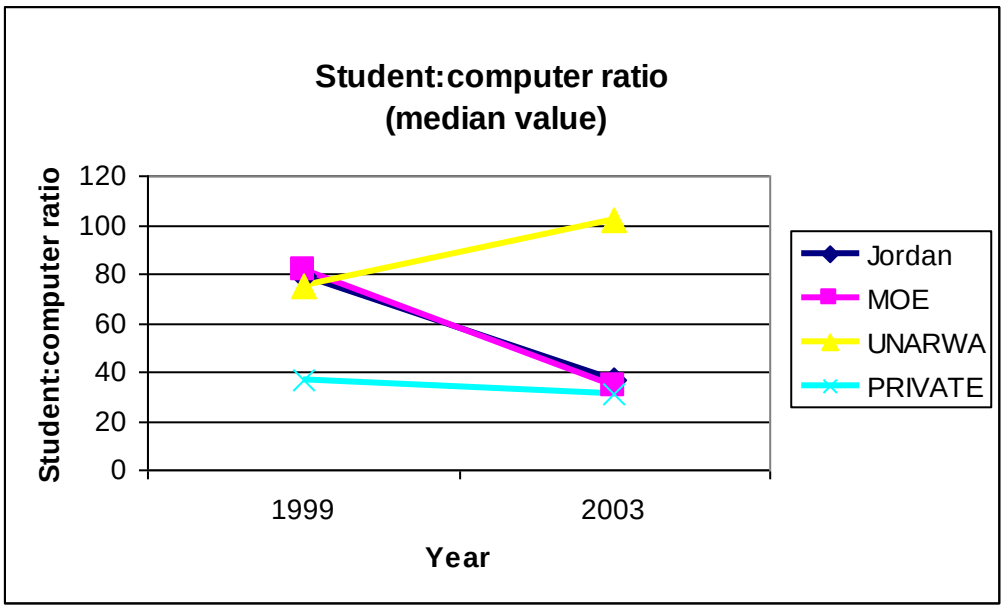


Figure 3. Median student:computer ratio's in 1999 and 2003 in Jordan secondary schools.

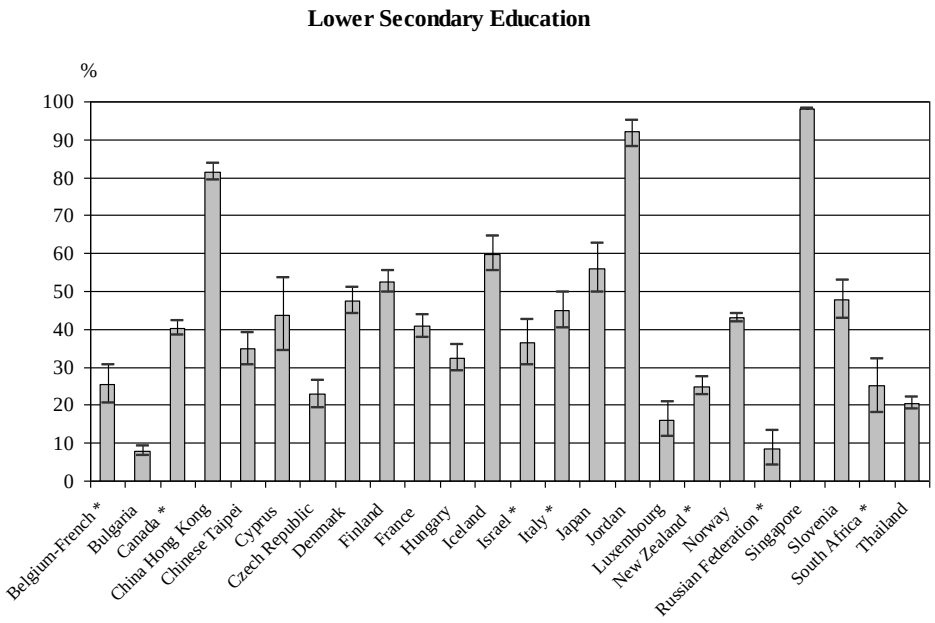
Types of computers

The student:computer ratio, although of interest to policy-makers (given that policy targets in many countries refer to planned ratios), is a rather crude indicator of the available ICT-infrastructure. More illuminating for the purpose of interpreting the ICT-related curriculum indicators that will be discussed in Chapter 3 are indicators

of the quality and (potential) functionality of the available equipment. Therefore, a next question to be addressed is which types of computers are available in Jordan schools.
One potential indicator of hardware functionality is the percentage of computers in schools that are suited for multimedia applications. The respondents who filled out the technical questionnaire were asked:

26. With respect to the total number of computers from question 20 (that is the number of computers available for the grade range): How many are multimedia computers (equipped with a CD-ROM and a sound card)?
Number of multimedia computers ☐

The average percentage of equipment suited for multimedia purposes is shown in Figure 4. The percentage of multimedia computers in Jordan secondary schools was roughly 95%, which indicates (also in comparison with the SITESM1 data) that schools possessed rather up to date equipment.



Notes: *: country did not satisfy all sampling criteria (see Chapter 1, Table 1.2). Top of bar displays 95% confidence interval. Missing boxes: data not available.

Figure 4 Bars and 95% confidence interval of average percentages of multimedia computers for the grade range in computer-using schools-primary, lower, and upper secondary education.

Table 4

*Average percentages (and standard errors) of computers equipped with different processor types and different operating systems at the grade range-**lower secondary education***

Country	% INTEL Pent.+Mac 103+higher	% 386/486SX/DX,Mac up to 68030	% 16-BIT Compat. AT/XT80286	% 8-BIT Compatible,APPLE2/2E	% Wind.95/98,WinNT,MacOS7,5+	% Wind.3.0/3.1,OS/2,Mac-OS <7.5	% MS DOS(3.1-7.0)without Wind.	% Other Operating Systems
Belgium-French *	35 (3,0)	50 (3,2)	9 (1,8)	6 (1,8)	40 (3,2)	40 (3,2)	19 (2,6)	1 (0,7)
Bulgaria	12 (1,0)	27 (1,3)	30 (1,3)	31 (1,6)	15 (1,1)	23 (1,2)	34 (1,4)	31 (1,6)
Canada *	48 (1,4)	40 (1,2)	10 (0,8)	1 (0,3)	55 (1,2)	38 (1,1)	17 (1,0)	8 (1,1)
China Hong Kong	84 (1,3)	16 (1,3)	0 (0,2)	0 (0,0)	81 (1,1)	18 (1,2)	5 (1,0)	1 (0,4)
Chinese Taipei	63 (1,9)	35 (1,9)	2 (0,6)	0 (0,3)	73 (1,9)	19 (1,7)	7 (1,0)	2 (0,9)
Cyprus	51 (8,5)	49 (8,5)	0 (0,0)	~	57 (6,1)	65 (6,3)	0 (0,0)	0 (0,0)
Czech Republic	32 (3,3)	59 (3,5)	6 (1,7)	4 (1,4)	47 (2,9)	55 (3,0)	16 (2,5)	6 (1,7)
Denmark	45 (2,8)	51 (2,9)	3 (0,7)	1 (0,5)	53 (2,1)	53 (2,1)	6 (1,4)	0 (0,3)
Finland	57 (1,3)	36 (1,3)	5 (0,6)	2 (0,5)	55 (1,7)	40 (1,6)	5 (0,7)	0 (0,0)
France	45 (1,6)	46 (1,6)	6 (0,8)	3 (0,6)	47 (1,6)	43 (1,6)	10 (1,1)	0 (0,2)
Hungary	48 (2,0)	43 (2,0)	7 (1,0)	2 (0,6)	46 (2,3)	46 (2,5)	17 (2,0)	4 (1,1)
Iceland	71 (1,8)	27 (1,8)	1 (0,2)	1 (0,3)	76 (1,6)	19 (1,4)	1 (0,2)	8 (1,6)
Israel *	42 (5,5)	48 (5,5)	7 (3,0)	2 (1,8)	44 (3,7)	56 (3,9)	14 (3,2)	7 (2,7)
Italy *	52 (2,6)	32 (2,4)	12 (2,0)	4 (1,2)	57 (2,5)	27 (2,3)	17 (2,1)	0 (0,3)
Japan	43 (3,4)	33 (3,4)	22 (2,9)	2 (1,2)	42 (3,2)	8 (1,9)	47 (3,3)	13 (2,6)
Jordan	97 (1,2)	2 (0,9)	1 (0,8)	0 (0,1)	83 (2,9)	0 (0,1)	2 (1,1)	8 (2,2)
Luxembourg	75 (3,3)	24 (3,2)	1 (0,7)	0 (0,0)	69 (3,9)	31 (3,7)	1 (0,5)	0 (0,0)
New Zealand *	53 (1,6)	43 (1,5)	3 (0,4)	1 (0,2)	57 (1,6)	35 (1,7)	2 (0,4)	5 (0,9)
Norway	48 (1,2)	48 (1,2)	2 (0,3)	2 (0,3)	60 (0,6)	39 (0,7)	3 (0,3)	1 (0,2)
Russian Federation *	15 (3,1)	18 (3,6)	10 (2,8)	57 (4,8)	17 (3,4)	11 (2,8)	20 (3,8)	38 (4,6)
Singapore	96 (0,1)	4 (0,1)	0 (0,0)	0 (0,0)	95 (0,0)	18 (0,4)	0 (0,0)	1 (0,1)
Slovenia	61 (2,5)	37 (2,5)	1 (0,3)	0 (0,3)	79 (2,3)	21 (2,3)	0 (0,2)	2 (0,9)
South Africa *	40 (4,4)	43 (4,6)	13 (3,2)	4 (2,0)	49 (4,8)	21 (4,1)	30 (4,4)	0 (0,3)
Thailand	52 (1,6)	43 (1,6)	4 (0,7)	2 (0,5)	54 (1,6)	20 (1,3)	22 (1,4)	0 (0,2)

Moreover, as is illustrated in Table 4 there existed in Jordan a high degree of standardization as most schools have roughly the same processor types and operating systems.

Access to the Internet

The Internet and WWW are probably the most visible ICT innovations of the past 10 years. The ability of citizens and schools to access the Internet is rapidly increasing. Many governments formulated in the past explicit plans to equip schools with access to the Internet before or shortly after the year 2000. Although, as Pelgrum & Anderson (2002) showed, quite a number of the countries participating in SITES Module-1 had adopted such policies in 1998, many had not. The SITES researchers therefore asked a number of questions in order to determine if schools had *access* to the Internet for instructional purposes and to what extent the school computers could be connected simultaneously to the Internet.

Table 5 shows the percentages of schools that indicated they had access to the Internet for instructional purposes. It should be noted, however, that the actual percentages of schools that had access to the Internet but used it for purposes other than instruction are likely to be higher.

Table 5

Percentages of students whose schools had access to the internet for instructional purposes, average percentages of computers (standard errors in brackets) with simultaneous access to e-mail and/or to WWW-lower secondary education

Country	Access to the Internet	% simultaneous access e-mail	% simultaneous access WWW
Belgium-French *	41	33 (4,9)	36 (4,9)
Bulgaria	26	19 (3,1)	19 (3,1)
Canada *	98	55 (1,2)	61 (1,1)
China Hong Kong	80	45 (2,1)	49 (2,0)
Chinese Taipei	62	67 (2,7)	68 (2,4)
Cyprus	11	39 (21,0)	50 (21,1)
Czech Republic	33	39 (4,9)	40 (4,9)
Denmark	85	39 (2,5)	43 (2,4)
Finland	96	67 (1,8)	71 (1,5)
France	55	15 (1,8)	18 (1,9)
Hungary	41	46 (3,5)	45 (3,3)
Iceland	100	67 (2,1)	71 (2,0)
Israel *	53	37 (4,3)	36 (4,1)
Italy *	73	16 (1,9)	18 (2,1)
Japan	58	14 (3,0)	20 (3,8)
Jordan	37	60 (5,6)	66 (4,9)
Luxembourg	79	35 (7,4)	50 (6,3)
New Zealand *	89	39 (2,1)	32 (1,9)
Norway	81	38 (0,8)	41 (0,8)
Russian Federation *	4	7 (5,9)	7 (5,2)
Singapore	100	23 (0,4)	25 (0,3)
Slovenia	85	51 (3,4)	52 (3,4)
South Africa *	52	47 (6,3)	34 (6,0)
Thailand	25	30 (3,4)	30 (3,4)

Notes: *: country did not satisfy all sampling criteria. See Appendix D for rules of thumb for estimating the standard errors for percentages. Standard error (se): value ± 2*se provides 95% confidence interval for the population. See Appendix D for rules of thumb for estimating the standard errors for

Table 5 indicates that in Jordan 37% of the secondary schools had, in Spring 2004, access to the Internet. While in these schools slightly more than 50% of the computers could be simultaneously connected to the Internet. In comparison with other countries where these data were collected 5 years ago, these figures are showing that connectivity of schools was in Jordan in Spring 2004 not yet very favourable.

Obstacles as perceived by educational practitioners

From the above one may infer that, although the past years have shown major changes with regard to the ICT infrastructure in Jordan school, the number of computers was still rather low (30 students per computer), while the connectivity to the Internet was also relatively still relatively low. Therefore, it is worthwhile to address research question four "Do schools experience a lack of equipment as major obstacle in realizing their ICT related goals?". In order to investigate this question, the respondents (principals as well as technology coordinators) the following questionnaire item was presented:

Indicate whether or not you consider each of the following to be **major obstacles** affecting the realization of your school's computer-related goals for students in grades *-*.

Table 6 contains the percentages of respondents who checked each of the obstacles that were presented to the school principals.

Table 6
Table G.7.2
Percentages of students whose school principals reported that a particular problem was a major obstacle in realizing the school's ICT-related objectives for students in the grade range-lower secondary education

Country	1. Not enough computers available	2. Not enough copies software	3. Not enough variety of software	4. Insufficient teacher-time	5. Difficult to integrate in instruc.	6. Not enough supervision staff	7. Scheduling comp. time	8. Difficult use low achieving stud.	9. WWW: no time school schedule	10. WWW: no time teach. explores	11. Not enough space to locate	12. Lack of interest of teachers	13. Teachers lack knowledge/skills	14. Not enough training opportun.	15. No plan prevent theft/vandalis.	16. Lack support school board	17. Telecom infrastructure weak	18. Major obstacles: other
Belgium-French *	85	75	55	47	67	65	60	16	56	51	37	27	73	37	19	1	22	4
Bulgaria	95	63	77	33	52	41	49	16	30	31	23	17	71	61	11	9	20	14
Canada *	69	46	55	69	57	41	68	12	21	61	27	21	64	62	8	17	32	6
China Hong Kong	80	88	77	83	57	59	73	24	56	60	58	21	62	69	26	14	31	6
Chinese Taipei	60	70	57	59	71	69	46	38	25	25	20	26	59	54	26	18	21	2
Cyprus	90	49	55	72	88	77	58	32	51	46	56	19	75	44	18	33	44	7
Czech Republic	83	36	52	57	67	52	52	13	34	32	28	45	69	19	14	29	11	12
Denmark	65	34	53	17	65	39	40	32	37	52	31	7	65	41	18	8	5	2
Finland	72	37	48	49	46	40	70	13	21	42	28	30	79	38	6	14	7	3
France	72	66	54	48	76	55	58	20	47	45	27	41	85	48	9	3	18	11
Hungary	70	55	56	46	57	44	49	13	35	39	26	18	68	41	6	0	29	8
Iceland	63	32	52	50	32	50	74	4	37	51	23	25	40	39	4	14	19	5
Israel *	65	62	67	60	42	42	65	20	45	32	28	26	63	29	33	8	28	7
Italy *	54	50	11	57	57	49	42	17	53	51	31	26	45	50	18	9	26	6
Japan	63	51	67	70	42	60	45	10	41	3	15	29	60	49	12	25	41	4
Jordan	88	80	72	82	64	72	79	65	64	66	35	34	61	49	28	51	43	6
Luxembourg	65	33	14	41	81	83	62	53	70	23	46	59	80	29	22	17	9	26
New Zealand *	64	38	34	76	70	26	71	13	26	63	34	18	69	54	6	1	11	10
Norway	77	34	52	54	66	39	42	12	28	36	17	17	70	49	14	27	14	~
Russian Federation *	92	69	80	37	53	46	68	~	~	~	42	25	69	41	8	65	26	8
Singapore	63	46	76	78	43	62	66	15	57	66	44	18	42	17	23	1	21	5
Slovenia	71	52	64	37	39	47	63	37	54	36	33	15	60	14	6	4	17	5
South Africa *	76	64	57	59	58	51	42	45	40	29	52	57	58	34	11	14	9	4
Thailand	90	75	79	57	40	77	64	35	42	34	21	20	71	65	24	64	35	6

Notes: *: country did not satisfy all sampling criteria. ~: no data collected. See Appendix D for rules of thumb for estimating the standard errors for percentages.

As Table 6 shows, the highest percentages occurred for the following obstacles:

1- Insufficient number of computers (88%).
4- Insufficient time for teachers to prepare lessons in which computers are used (82%).
2- Not enough copies of software for instructional purposes (80%).
7- Problems in scheduling enough computer time for different classes (79%).
3- Not enough types (variety) of software (72%).
5- Difficult to integrate computers in classroom instruction practices (72%).

From this outcome it may tentatively be inferred that insufficient hardware- and software infrastructure was experienced by many school principals as a major obstacle for realizing the school's ICT-related goals. These obstacles were also mentioned by a very large group of principals in some other countries (Belgium – French, China Hong Kong, China Taipei, Cyprus, and Russian Federation)

As shown in Table 7, the answers of the technology coordinators provide a similar picture, while in addition the lack of technical support and weak infrastructure were mentioned.

Table 7

Table G.8.2

Percentages of students whose technology coordinators reported that a particular problem was a major obstacle in realizing the school's ICT-related objectives for students in the grade range-lower secondary education

Country	1. Insufficient number of computers	2. Insufficient peripherals	3. Outdated local school network	4. Not enough copies of software	5. Software too complicated to use	6. Software not adaptable enough	7. Lack info about software	8. Softw. not in language instruc.	9. Software culturally incompatible	10. Softw. curriculum incompatible	11. WWW: not enough simult. acc.	12. WWW: slow netw. performance	13. WWW: complicated to connect	14. Materials WWW poor quality	15. WWW: Insuffic. techn. support	16. WWW: Difficult finding info	17. WWW: Information overload	18. WWW: mail baskets overload	19. WWW: not enough connections	20. Lack of technical assistance	21. Lack administrative assistance	22. Stud. know more than teachers	23. Quality teacher training too low	24. No plans prevent theft/vandal.	25. Weak infrastruct.(telecomm..)
Belgium-French *	73	56	53	66	6	26	55	12	10	22	65	23	16	6	25	32	20	3	31	38	5	34	25	17	33
Bulgaria	90	82	80	47	6	40	30	26	6	11	48	24	13	2	19	12	6	1	24	48	6	20	29	9	23
Canada *	62	42	29	53	13	30	36	4	4	15	40	52	8	10	51	21	32	3	26	68	16	49	48	13	33
China Hong Kong	66	56	67	84	12	51	42	44	37	61	66	52	9	8	59	17	16	3	54	83	39	20	51	24	50
Chinese Taipei	60	68	51	76	9	39	32	16	6	28	32	67	1	22	32	10	9	0	30	42	29	3	18	17	42
Cyprus	96	77	67	52	12	28	27	41	4	14	57	3	2	2	23	5	5	2	11	35	23	23	35	39	49
Czech Republic	76	66	41	35	5	14	35	7	2	2	59	24	10	2	15	5	6	5	29	30	3	39	13	9	21
Denmark	60	43	30	34	11	14	41	8	23	16	45	16	6	20	20	44	34	3	32	44	16	55	33	16	20
Finland	70	47	20	50	16	22	37	11	14	16	34	19	2	15	25	32	49	6	30	47	19	14	34	16	17
France	72	67	57	71	14	16	59	5	5	7	72	27	9	8	38	23	22	2	34	60	11	33	46	16	25
Hungary	66	58	49	69	4	27	40	30	12	17	35	18	4	6	45	12	3	1	36	47	6	17	19	8	34
Iceland	60	35	23	40	11	10	29	33	9	11	26	21	3	6	33	15	11	3	29	40	31	21	25	11	20
Israel *	62	54	45	43	8	54	28	10	10	11	57	34	11	12	28	24	17	3	37	45	6	35	47	32	30
Italy *	52	39	35	52	11	27	29	13	6	6	54	22	7	8	35	19	16	4	37	44	46	43	43	24	36
Japan	60	54	56	65	16	29	30	1	2	1	66	13	10	6	31	24	18	1	34	50	33	2	14	13	57
Jordan	86	76	66	61	20	22	46	31	26	25	71	57	58	36	52	40	32	27	39	65	31	22	53	34	66
Luxembourg	55	32	30	38	0	0	41	20	12	18	24	0	0	9	29	12	29	0	24	72	11	28	20	43	15
New Zealand *	69	45	33	48	13	27	38	3	10	24	56	31	7	15	47	31	39	3	41	62	24	50	47	9	31
Norway	71	57	45	46	16	18	30	4	7	8	56	26	5	9	30	36	38	2	49	53	10	36	39	19	25
Russian Federation *	86	91	65	53	4	35	37	14	8	15	~	~	~	~	~	~	~	~	~	63	20	18	13	5	30
Singapore	61	36	60	48	13	67	36	1	26	53	75	51	11	9	60	34	39	24	42	77	22	32	30	34	50
Slovenia	59	47	48	37	3	27	48	24	22	22	63	32	3	6	16	14	17	1	52	23	7	55	33	8	37
South Africa *	69	53	49	49	13	32	39	22	15	26	59	30	9	9	34	20	20	8	29	49	31	33	51	13	16
Thailand	91	89	76	76	22	27	45	32	14	24	62	33	16	6	43	20	7	3	33	70	31	6	16	23	35

Notes: *: country did not satisfy all sampling criteria. ~: no data collected. See Appendix D for rules of thumb for estimating the standard errors for percentages.

The obstacles that were relatively frequently mentioned by the technology coordinators were:

1- Insufficient number of computers (86%).
2- Insufficient peripherals (printers, scanners, transviewers) (76%).
11- Insufficient computers with simultaneous access to the Internet/WWW (71%).
25- Weak infrastructure (telecommunications, electricity, available room space, etc.) (66%).
3- Outdated or lack of school network or LAN (66%).
20- Not enough technical assistance for operating and maintaining computers and/or insufficient help for solving technical problems with ICT (66%).
4- Not enough copies of software for instructional purposes (61%).

These obstacles were also mentioned by a very large group of technology coordinators in some other countries (Bulgaria, Cyprus, Hungary, China Hong Kong, Thailand, China Taipei, and Russian Federation).

Availability of software

An important aspect of the ICT infrastructure in schools concerns software. The two main categories of software distinguished for SITES Module-1 were (1) general purpose software and (2) school subject-specific software. The importance of this distinction was documented by Pelgrum and Schipper (1993), who showed that the integration of computers in the school curriculum was associated with the availability of subject-specific educational tool software. In other words, the more educational tool software available, the more computer use was integrated into the learning of subjects. However, the extent to which general-purpose programs was available was shown to be associated with an emphasis on an informatics type of curriculum. In order to determine which types of software are available in Jordanian schools, the technology coordinators were asked the following question:

In your school, which of the following types of software are available for teaching and learning (in grades *-*) on at least one computer?

– Tick all that are available.

1- Word processing, desktop publishing
2- Spreadsheet
3- Database
4- Graphics: presentation, no professional drawing
5- CAD (computer aided design), CAM (computer aided manufacturing)
6- Statistical/mathematical programs
7- Programming languages
8- Accounting, book keeping, financial software
9- Drill and practice programs
10- Tutorial programs (for self learning)
11- Simulations (e.g. real world simulations)
12- Educational games
13- Recreational games/other games
14- For exams/tests/constructing tests/administrating tests
15- Internet browser
16- E-mail software
17- Encyclopedia on CD-ROM
18- Video/audio/authorware
19 -Music composition
20- Presentation software (e.g. PowerPoint)
21- Software supporting Microcomputer Based Laboratories

Table 8 presents summative data drawn from the answers to this question. From an inspection of this table, it appears that lower secondary schools in Jordan possessed general purpose software for presentation (e.g. PowerPoint, 91%), Word processing and/or desktop publishing (89%), Spreadsheet (89%), Graphics presentation, Professional drawing (89%), Database (86%), and Programming languages (80%). These results are very close to the results for most of the other countries.

Table 8

Table G.5.2

Percentages of students whose schools possessed particular types of software for use at the grade range-lower secondary education

Country	1. Word proc./desktop publish.	2. Spreadsheet software	3. Data base software	4. Graphics: presentation	5. Computer aided design/manifact.	6. Statist./mathematical programs	7. Programming languages	8. Accounting,book keeping,financ.	9. Drill and practice programs	10. Tutorial program, self learning	11. Real world simulations	12. Educational games	13. Recreational/other games	14. Exams/tests/test construction	15. Internet browser	16. E-mail software	17. Encyclopedia on CD-ROM	18. Video/audio authorware	19. Music composition	20. Presentation (e.g. Powerpoint)	21. Softw. Microcomp. Based Lab.
Belgium-French *	86	67	50	38	8	19	26	8	61	37	8	26	18	8	45	39	44	32	1	34	1
Bulgaria	86	63	49	48	1	6	64	4	15	19	5	25	66	10	27	27	15	9	6	19	11
Canada *	100	97	90	81	48	44	54	38	68	63	35	55	34	41	94	72	90	31	29	79	14
China Hong Kong	93	91	81	65	5	7	84	2	13	24	4	28	28	7	81	71	35	8	3	76	2
Chinese Taipei	96	71	37	61	9	1	8	1	24	26	1	44	38	8	78	66	4	9	6	66	1
Cyprus	75	15	5	82	13	0	11	0	13	9	11	17	31	0	10	11	18	1	0	12	5
Czech Republic	96	86	55	67	4	18	39	16	65	81	9	64	76	42	39	37	42	4	6	32	5
Denmark	100	100	92	80	3	79	12	18	89	55	38	76	56	13	85	79	90	34	34	59	18
Finland	100	100	88	93	16	33	88	13	51	30	11	60	47	11	97	89	84	31	31	66	13
France	99	96	76	69	60	27	15	6	52	33	13	32	19	15	54	48	86	14	12	51	20
Hungary	96	91	53	62	2	17	51	9	39	54	4	45	68	14	50	45	38	34	16	61	2
Iceland	100	99	64	94	1	79	22	4	80	87	16	91	78	16	96	94	53	22	16	91	5
Israel *	96	94	55	66	24	44	33	10	39	63	30	65	40	10	45	39	54	22	9	73	36
Italy *	91	90	62	35	28	65	72	26	38	26	16	14	10	11	54	53	51	27	8	57	19
Japan	97	95	71	66	9	46	54	3	54	18	37	38	27	11	39	35	43	21	33	28	5
Jordan	89	89	86	89	6	19	80	14	12	16	9	28	53	13	71	47	39	35	8	91	15
Luxembourg	96	96	87	69	24	37	48	15	25	0	11	21	28	5	87	59	81	23	15	73	20
New Zealand *	100	99	95	84	59	57	51	43	61	53	48	69	41	29	82	80	96	23	60	77	15
Norway	98	99	73	69	1	48	14	8	89	39	7	87	66	5	70	77	85	32	26	79	1
Russian Federation *	43	30	27	41	1	10	42	0	46	30	2	40	48	27	1	4	4	0	5	10	1
Singapore	100	96	84	92	49	60	27	33	86	82	41	89	61	41	86	72	90	52	20	98	25
Slovenia	99	92	40	84	56	56	71	13	74	43	48	79	77	30	88	86	73	12	8	84	12
South Africa *	86	82	74	51	16	30	48	22	40	31	13	44	47	17	41	45	53	6	9	40	1
Thailand	92	75	68	43	4	14	5	0	17	40	1	19	52	17	22	17	12	19	8	60	3

Notes: *: country did not satisfy all sampling criteria. See Appendix D for rules of thumb for estimating the standard errors for percentages.

Figure 5 offers a more condensed presentation of the data relating to software availability. The figure shows that the median percentage of available types of software for Jordanian lower secondary schools was comparable to most other countries.

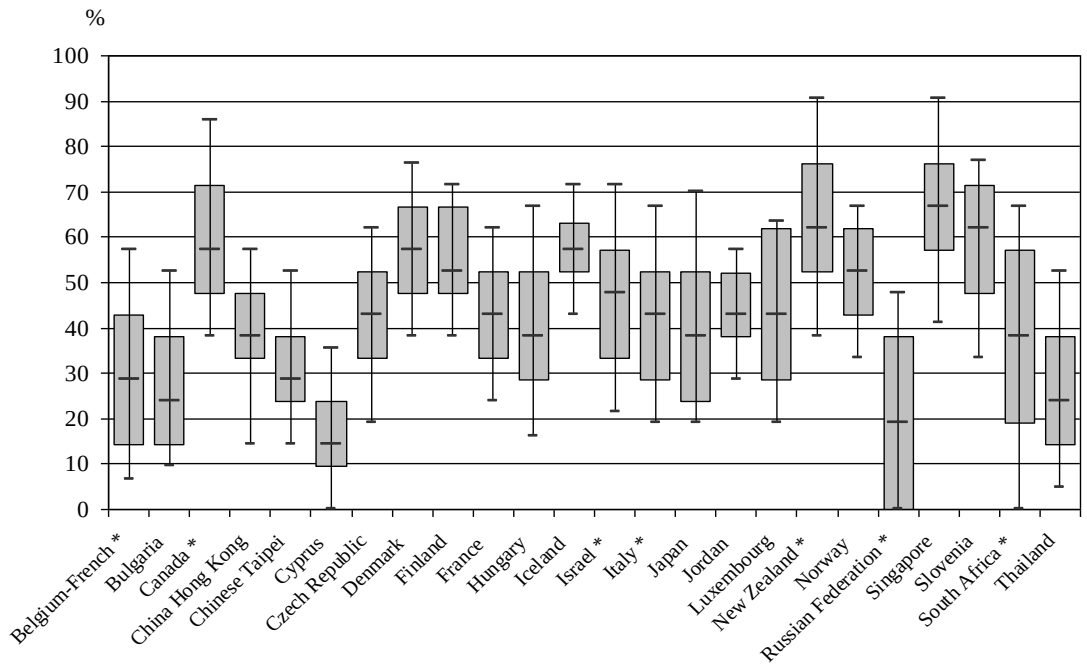


Figure 5 Box plots of availability of types of software for use at the grade range (lower secondary education (average percentage available from a list of 21 types).

In order to understand the extent to which schools possessed software specifically dedicated to school subjects, the following question was included in the technical questionnaire:

For which of the following subjects (or subject areas) is educational software available in your school for use in grades *-*?

Exclude programming languages or office programs (like word processing and spreadsheet programs) as educational software.

- ***Tick all subjects (or subject areas) for which software is available (including software for multidisciplinary approaches).***

1- Mathematics
2- Physics
3- Chemistry
4- Biology/life science
5- Earth science
6- Language/mother tongue
7- Foreign language(s)
8- Creative arts (music, visual arts)
9- History
10- Civics
11- Economics
12- Geography
13- Vocational subjects
14- Computer education/informatics
15- Multidisciplinary projects or activities

Table 9 shows that the availability of subject specific software was still relatively low in Jordan secondary schools and comparable to the situation in 1999 in Bulgaria, Cyprus, Russia and Thailand (see also Figure 6, for a more condensed picture).

Table 9
Table G.6.2
Percentages of students whose schools possessed software for school subjects for use at the grade range-lower secondary education

Country	1. Mathematcis	2. Physics	3. Chemistry	4. Biology/Life science	5. Earth Science	6. Language/Mother tongue	7. Foreign Language	8. Creative arts	9. History	10. Civics	11. Economics	12. Geography	13. Vocational subjects	14. Comp. education/Informatics	15. Multidisciplinary projects
Belgium-French *	52	13	10	29	15	72	36	6	10	0	8	20	23	36	6
Bulgaria	19	14	9	15	4	2	17	11	3	0	2	9	1	37	2
Canada *	77	29	26	50	33	39	32	34	36	9	12	57	27	53	31
China Hong Kong	44	37	24	31	9	36	30	15	23	14	7	23	6	63	6
Chinese Taipei	13	15	11	9	9	7	19	14	1	1	0	1	23	72	6
Cyprus	4	0	0	0	0	1	4	5	4	0	0	1	13	13	27
Czech Republic	86	75	67	71	11	75	67	17	40	7	2	78	7	49	4
Denmark	96	76	59	41	15	93	82	47	24	46	11	60	3	27	29
Finland	67	54	57	49	~	42	86	24	29	18	16	30	14	47	15
France	68	23	15	40	28	53	40	22	33	8	3	35	13	36	15
Hungary	44	36	30	26	11	21	44	23	23	3	1	29	2	52	5
Iceland	89	34	17	37	25	90	88	26	26	41	5	63	4	55	28
Israel *	79	51	28	58	39	59	66	25	47	15	5	47	22	23	22
Italy *	81	51	28	19	14	36	45	19	16	8	16	14	26	47	24
Japan	76	~	~	~	~	39	47	50	~	1	~	~	77	40	6
Jordan	20	40	13	13	11	15	20	8	7	9	8	9	7	24	24
Luxembourg	53	18	15	23	~	15	0	13	8	0	3	54	18	43	18
New Zealand *	72	41	34	47	30	52	46	52	33	3	43	43	~	39	18
Norway	85	26	18	27	5	86	70	26	29	37	5	51	16	19	10
Russian Federation *	28	23	10	9	1	12	23	10	13	0	1	10	5	38	4
Singapore	99	99	99	91	74	98	13	72	98	63	~	98	64	66	43
Slovenia	69	91	70	71	70	85	74	38	40	2	2	57	13	48	13
South Africa *	51	18	16	26	11	24	6	5	16	0	1	24	17	27	12
Thailand	18	10	10	10	8	9	26	6	3	11	1	4	4	40	8

Notes: *: country did not satisfy all sampling criteria. ~: no data collected. See Appendix D for rules of thumb for estimating the standard errors for percentages.

As reported above, the relatively low availability of subject related software was also experienced by the respondents as a major obstacle for realizing the ICT related goals of the school.

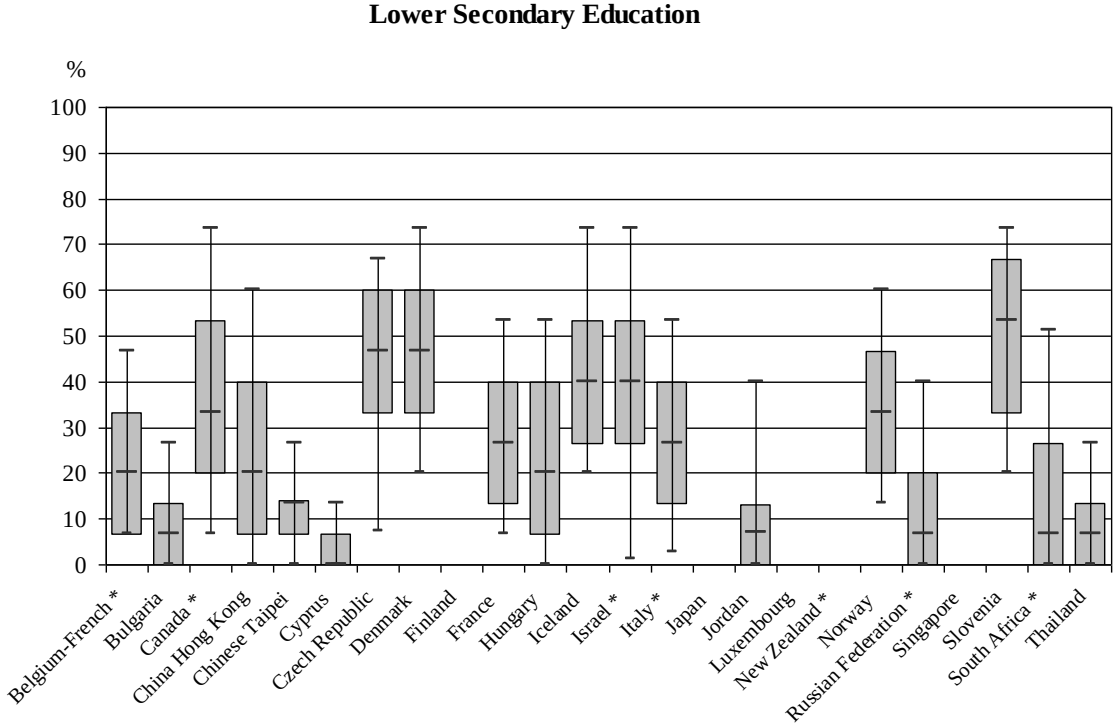


Figure 6 Box plots of software coverage of schools subjects, for use at the grade range). Average across schools of percentage available from a list of 15 school subjects (lower secondary education)

Summary

The results that were presented in this chapter showed that very rapid developments took place over the past couple of years regarding the ICT-infrastructure in Jordan secondary schools. All MOE schools now posses rather modern computers and laser printers. The student:computer ratio (17 students per computer*) was experienced by most respondents as insufficient for realizing the ICT related goals of the school. General purpose software is generally available in almost all schools. However, the availability of specific school subject related software was still rather low. Also the connectivity to the Internet was still relatively low and realized for roughly 1/3 of all MOE-schools. Most respondents indicated that a lack of Internet connection was a major problem. Some of the problems schools faced in implementing ICT concerned the lack of resources, notably insufficient teacher time for preparing computer lessons, and not enough time to work with computers. Respondents also pointed to the mismatch between available software and instructional practices. The recent governmental initiatives will probably result in quick changes in the forthcoming years.

* Based on MOE data

Chapter 3: Curriculum

This chapter will address questions regarding ICT and the curriculum. It is argued that next to infrastructure, the integration of ICT in the curriculum in the school system at large is a main challenge for which worldwide solutions are sought. It is expected that the educational paradigm of schools need to change in order to accommodate the application of ICT. This chapter examines to what extent the objectives of Jordan schools reflect elements of this new paradigm and to what extent these are already realized as well as how school principals experience the contribution of ICT to realize these objectives.

Introduction

In some recent policy documents (European Commission) it is argued that ICT-infrastructure nowadays is not anymore the highest concern with regard to ICT in education. Rather the challenging problem that needs to be solved is how ICT can be integrated in the daily learning activities of students. Integration of ICT in the curriculum of existing subjects is a problem which has bothered educational policy makers for a long time, because it appeared since the early days of introducing ICT in education, that developments in this area are taking place very slowly or not at all. This was for instance reflected in comparing the frequency of use of computers in mathematics learning. As shown in Table 10, between 1995 and 1999 hardly any change occurred, except in a few countries (e.g. Singapore).

Table10. Percentage of students, in 1995 and 1999 and the differences (DIFF) between these years, indicating that they never used computers for mathematics (source: Pelgrum&Plomp, 2003)

% never use				% never use			
Country	*1995*	*1999*	*DIFF*	*Country*	*1995*	*1999*	*DIFF*
Portugal	97	--	--	Greece	83	--	--
Ireland	96	--	--	Canada	82	67	15
Colombia	95	--	--	Switzerland	82	--	--
Slovak Republic	94	95	1	Iceland	81	--	--
Belgium (Fl)	94	93	1	Netherlands	81	80	1
Russian Fed.	94	97	3	New Zealand	79	73	6
Belgium (Fr)	94	--	--	Romania	78	93	15
Korea	93	83	10	Philippines	78	80	2
Spain	93	--	--	Kuwait	78	--	--
Iran, Islamic Rep.	92	96	4	Australia	77	71	6
Hungary	92	92	0	Japan	77	76	1
Lithuania	92	--	--	Israel	76	67	9
Latvia (LSS)	91	95	4	Cyprus	73	81	8
Thailand	91	85	6	South Africa	70	--	--
Hong Kong	91	75	16	United States	69	61	8
Singapore	90	46	44	Austria	62	--	--
Slovenia	89	81	8	Sweden	61	--	--
Czech Republic	88	84	4	Scotland	53	--	--
Norway	88	--	--	England	45	46	1
France	88	--	--	Denmark	40	--	--
Germany	84	--	--				

Pelgrum & Anderson (2002) argued that the integration of ICT in learning requires a shift in pedagogical paradigm. The traditional educational paradigm does not allow for much flexibility to apply ICT. On the other hand, schools also have a task to prepare students to operate equipment and software. Hence, tin this chapter the following questions are featured:

1. To what extent have schools adopted pedagogical objectives that are oriented on life long learning and is this related to the number of years that schools have experience with ICT?
2. Which ICT related performance-objectives are pursued by schools?
3. To what extent is the Internet used in schools for pedagogical purposes?
4. Which ICT-related learning opportunities do schools offer to students?

Pedagogical paradigms

To investigate the extent to which schools had adopted particular pedagogical practices, a list of statements was used. These statements as well as the stem of the related question are shown in Table 11.

Table 11.

Question and statements about the presence of pedagogical practices in the school.

To what extent is each of the following aspects of teaching and learning present in your school?

(Answers alternatives were 'not at all', ' to some extent', 'a lot.')

1. Students developing abilities to undertake independent learning
2. Providing weaker students additional instruction
3. Organizing teaching and learning so that differences in entrance level, learning pace, and learning route are taken into account.
4. Students learning to search for information, process data, and present information.
5. The emphasis in learning is on the development of skills.
6. Students working on the same learning materials at the same pace and/or sequence.
7. Teachers keeping track of all student activities and progress.
8. Students being largely responsible for controlling their own learning Progress.
9. Students learning and/or working during lessons at their own pace.
10. Students involved in cooperative and/or project-based learning.
11. Students determining for themselves when to take a test.
12. Students learning by doing.
13. Combining parts of school subjects with one another (multidisciplinary approach).

Table 12 shows the percentages of students whose principals indicated that each of practices was present 'a lot' in the school.

Table 12 Percentages of students whose school principals indicated that pedagogical practices were present a lot in the school – lower secondary education.

Table F.1.2

*Percentages of students whose school principals indicated that pedagogical practices were present **a lot** in the school-lower secondary education*

Country	1. Independent learning by students	2. Weaker students: addit. instruc.	3. Differences in entrance level	4. Students learn info-search	5. Emphasis on development skills	6. Same materials, same pace	7. Teach. tracks all stud. activities	8. Stud. responsible own learning	9. Students work on own pace	10. Cooperative projects students	11. Stud. determine self taking test	12. Students learn by doing	13. Parts school subjects combined	Emerging pedagogical practice	Trad. important pedag. practice
Belgium-French *	28	27	10	36	33	18	19	21	16	17	2	10	13	53 (1.3)	50 (1.8)
Bulgaria	45	12	27	46	57	20	47	21	23	22	2	29	15	50 (1.0)	61 (1.1)
Canada *	46	39	29	71	51	25	62	13	18	34	3	46	14	63 (0.5)	71 (0.6)
China Hong Kong	4	14	15	7	8	33	18	1	1	14	1	7	3	36 (0.5)	52 (0.8)
Chinese Taipei	22	17	36	22	37	41	26	15	22	14	7	44	7	51 (1.1)	64 (1.3)
Cyprus	27	30	23	18	37	28	57	20	29	48	0	51	6	49 (3.2)	55 (4.1)
Czech Republic	15	30	31	34	51	20	60	17	23	5	1	31	33	56 (0.9)	69 (1.1)
Denmark	44	72	41	58	56	2	41	3	27	55	3	11	29	69 (0.8)	61 (1.0)
Finland	27	26	20	57	43	23	79	19	14	12	0	44	6	59 (0.7)	73 (0.9)
France	20	37	15	35	38	28	47	5	10	13	2	17	7	51 (0.9)	64 (1.2)
Hungary	65	42	51	55	52	4	50	45	44	13	1	32	29	69 (0.9)	58 (1.1)
Iceland	8	52	41	23	50	16	69	15	39	10	0	6	4	60 (0.7)	67 (1.2)
Israel *	20	40	22	29	24	16	40	10	25	29	3	16	13	57 (1.5)	57 (1.7)
Italy *	24	25	19	31	26	7	25	8	15	12	2	32	16	52 (1.3)	54 (1.4)
Japan	5	1	2	7	11	14	12	3	7	6	1	16	3	29 (1.1)	44 (1.4)
Jordan	31	20	28	34	48	10	39	12	9	22	10	37	15	52 (1.4)	59 (1.5)
Luxembourg	16	24	29	41	59	38	46	6	11	12	0	24	10	52 (2.5)	72 (3.1)
New Zealand *	39	32	25	68	46	23	56	6	12	26	2	44	7	60 (0.7)	69 (0.9)
Norway	64	57	36	56	21	0	27	16	29	57	1	32	44	71 (0.3)	43 (0.4)
Russian Federation *	31	23	29	35	66	21	51	14	41	15	7	31	14	50 (2.2)	67 (2.4)
Singapore	15	36	22	24	34	46	50	9	5	14	0	21	4	52 (0.3)	69 (0.1)
Slovenia	46	30	27	45	15	20	33	37	28	23	10	30	29	61 (1.5)	56 (1.6)
South Africa *	38	37	21	44	53	29	53	12	11	28	1	38	9	52 (2.3)	67 (2.5)
Thailand	37	20	42	13	51	46	60	24	34	32	1	46	12	58 (0.7)	75 (0.9)

Notes: *: country did not satisfy all sampling criteria. Last two columns: average values and standard errors (in brackets) for indicators of the emerging and traditionally important pedagogical practice paradigma. Standard error (se): value ± 2*se provides 95% confidence interval for the population. See Appendix D for rules of thumb for estimating the standard errors for percentages.

The answers of Jordan school principals show indications that in a substantial number of schools (roughly 1/3) innovative pedagogical practices are occurring, such as: students learn by doing, independent learning by students, learning to search for information, process data and present information.
The box plot in Figure 7 provides a condensed summary of the median values per country and dispersion within countries of indicators of emerging and the traditionally important practices.

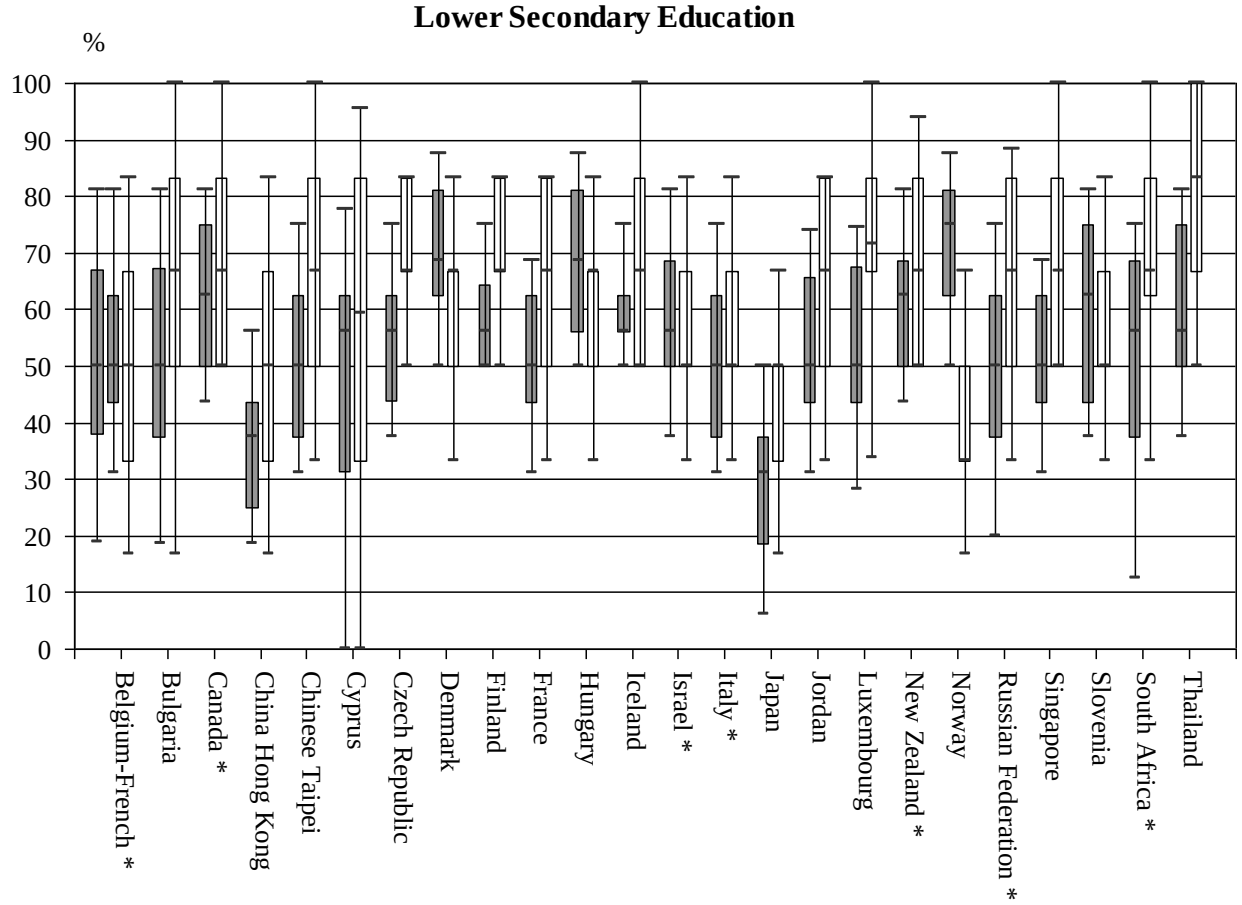


Figure 7. Box plots of indicators concerning the emerging and traditionally important pedagogical practices paradigm
Figure 7 reveals that the median score for the emerging pedagogical practices for Jordan secondary schools is 52%, which is comparable with other countries. Low median values on the indicator were observed particularly for China Hong Kong and Japan. The median value for Jordan secondary schools for the traditionally important practices is higher than the emerging practices, which is consistent with most countries.

A currently widely held belief is that the implementation of emerging pedagogical practices may be facilitated by applying ICT. A possible hypothesis that may be derived from this belief is that schools that have used ICT for a large number of years may have higher scores on the emerging pedagogical practices indicator than schools that had started only relatively recently. This breakdown (as shown in Figure 8) does not lend support to this hypothesis: the indicator of the traditional pedagogical paradigm tends to increase, while the emerging pedagogical practice indicator tends to decrease. This finding clearly deserves further investigation.

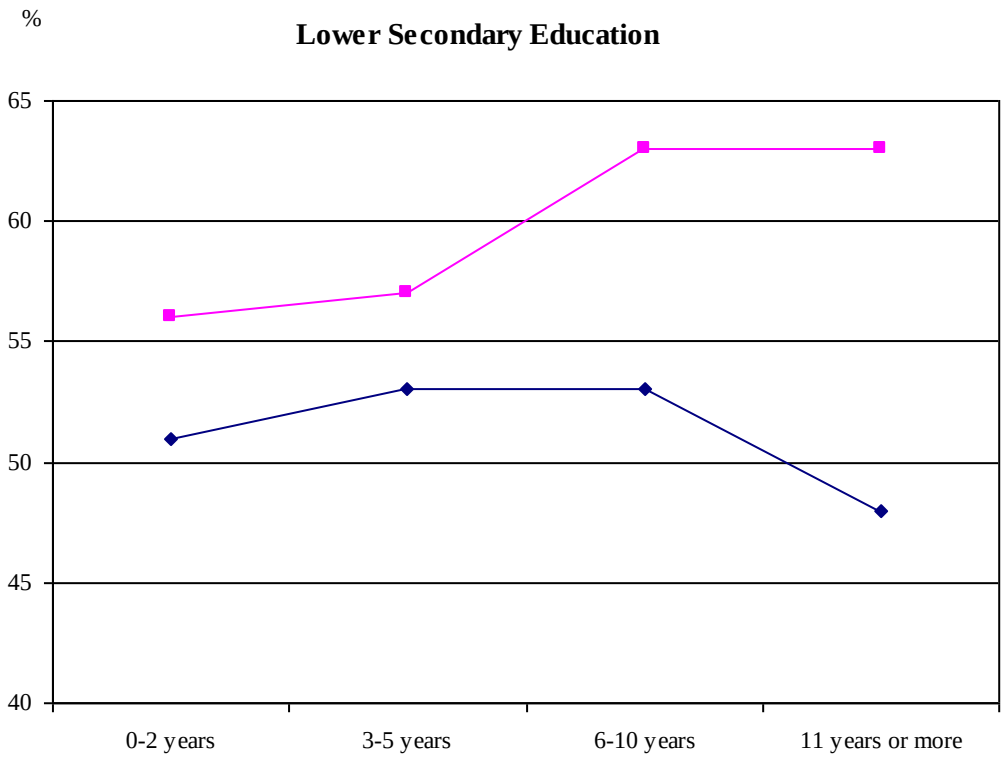


Figure 8 Breakdown of indicators of the emerging and traditionally important paradigm with regard to number of years that schools at lower secondary level had been using ICT for instructional purposes (*for Jordan school only*).

ICT related performance objectives

In order to answer research question 2 ("Which ICT related performance-objectives are pursued by schools?"), the school principals were asked two questions (see Table 13). The first concerned the goals that were important in determining the current use of ICT in the schools. The second deals with the adoption by schools of ICT-related policy goals on aspects of instruction (teaching and/or learning).

Table 13.
Questions and statements about ICT-related instructional objectives of schools.

A. How important were each of the following goals in determining how computers are now used at your school?

Answer options: ‘not important’, ‘important’, ‘very important’.

1. To prepare students for future jobs.
2. To improve student achievement.
3. To promote active learning strategies.
4. To individualize student learning experiences.
5. To encourage more cooperative and project-based learning.
6. To develop student independence and responsibility for own learning.
7. To give students drill and practice exercises.
8. To make the learning process more interesting.

B. The following statements concern the use of computers in different aspects.

1) Is this a policy goal in your school?

Answer options: ‘no’, ‘yes’.

1. One or more computers available in every classroom.
2. Teachers use computers in their instructional practice.
3. Using software for students with learning problems.
4. Encouraging students' learning on their own with the computer/encouraging independent learning with the aid of computers.
5. Students using computers as supportive learning aids (e.g. searching, analyzing, and presenting information).
6. Students use e-mail.
7. Students access external databases via the Internet/WWW.
8. Cooperation with other schools in the area of computers.

Table 14 present the percentages of students at schools were the A-items and B-items were answered with respectively ‘very important’ and ‘yes’.

Table 14. Percentages of students whose principals indicated that particular instructional objectives were very important (A1-A8) and percentages answering that policy goals were present (B1-B8) lower secondary education.

Table F.2.2

Percentages of students whose school principals indicated that particular instructional objectives were very important (A1-A8) and percentages answering that policy goals were present (B1-B8)- lower secondary education

Country	A1. Prepare students for future jobs	A2. Improve student achievement	A3. Promote active learning	A4. Individualize learning	A5. Encourage cooperative learning	A6. Develop independent learning	A7. Give drill and practice exercises	A8. Make learning more interesting	B1. More computers in every class	B2. Teach. use comp. for instruc.	B3. Use by retarded studnets	B4. Encourage independent learning	B5. Use as supportive learning aids	B6. Students use e-mail	B7. Stud. access external data bases	B8. Cooperation with other schools	Objectives emerging	Objectives traditional. import.
Belgium-French *	37	14	51	44	26	51	23	32	24	91	83	62	83	41	78	56	51 (1.5)	68 (1.4)
Bulgaria	52	27	30	24	34	48	44	56	35	76	35	71	82	59	62	62	67 (0.8)	65 (0.9)
Canada *	45	42	50	33	22	32	12	51	58	78	72	70	84	59	82	54	57 (0.7)	65 (0.7)
China Hong Kong	32	33	49	22	23	42	17	38	53	87	57	85	85	69	81	65	60 (0.6)	70 (0.6)
Chinese Taipei	30	23	31	45	22	29	38	59	31	80	58	80	68	80	81	44	62 (1.1)	64 (1.3)
Cyprus	36	11	37	54	66	41	28	36	5	33	23	67	51	20	35	27	49 (3.2)	66 (4.7)
Czech Republic	48	12	40	28	9	35	33	40	12	78	60	65	68	31	46	55	61 (1.1)	59 (1.3)
Denmark	38	8	42	40	37	38	34	33	47	88	77	68	89	62	84	50	55 (1.3)	66 (1.3)
Finland	42	17	22	25	19	28	11	26	74	96	87	92	98	94	98	87	52 (1.1)	72 (1.0)
France	21	28	36	35	21	44	30	39	40	94	86	78	91	50	75	57	51 (1.3)	67 (1.3)
Hungary	64	11	15	19	8	36	14	28	37	89	60	82	91	76	85	84	60 (1.1)	65 (1.2)
Iceland	66	22	34	34	31	42	37	55	89	82	96	82	97	85	93	70	68 (1.0)	70 (1.2)
Israel *	49	53	55	48	57	67	39	66	27	97	79	92	89	58	71	56	71 (1.8)	77 (2.0)
Italy *	50	28	43	23	29	28	47	25	35	93	50	72	87	46	72	58	66 (1.4)	65 (1.7)
Japan	10	2	54	44	18	29	6	37	11	81	38	67	59	23	36	31	32 (1.4)	58 (1.5)
Jordan	52	40	39	37	48	44	35	64	18	74	13	84	89	21	19	49	70 (1.6)	71 (1.4)
Luxembourg	32	0	14	24	26	37	15	29	74	86	72	62	100	86	100	86	41 (3.6)	67 (2.7)
New Zealand *	31	57	54	27	16	42	7	39	47	87	78	75	95	74	88	56	55 (0.9)	67 (1.1)
Norway	26	15	33	38	22	26	5	40	63	93	99	87	93	71	90	69	45 (0.4)	68 (0.4)
Russian Federation *	35	19	32	28	18	24	18	49	53	37	57	33	35	62	62	43	58 (1.7)	46 (2.0)
Singapore	64	36	69	46	55	63	5	65	61	95	64	89	95	70	82	62	59 (0.2)	80 (0.3)
Slovenia	43	29	59	48	43	51	38	77	49	93	66	90	93	79	89	78	65 (1.7)	80 (1.2)
South Africa *	55	31	26	18	25	37	18	37	20	71	47	66	71	49	57	51	55 (2.6)	54 (2.9)
Thailand	55	33	53	65	36	49	19	49	16	70	36	62	63	26	42	69	63 (0.9)	70 (0.9)

Notes: *: country did not satisfy all sampling criteria. Last two columns: average values and standard errors (in brackets) for indicators of the emerging and traditionally important objectives. Standard error (se): value ± 2*se provides 95% confidence interval for the population. See Appendix D for rules of thumb for estimating the standard errors for percentages.

Table 14 reveals that, (for Jordan secondary schools), the 'very important' goals (the A-items) were, *to make the learning process more interesting (64%), to prepare students for future jobs (52%), to encourage more cooperative and project-based learning (48%)* this results is comparable with most of the other countries. The following observations can be made regarding the B-items (as highlighted in Table 14):

1. A very high percentage of Jordanian students were at schools that were:
   - striving to use computers as supportive learning aids (e.g. searching, analyzing, and presenting information) (89%).
   - encouraging students' learning on their own with the computer/encouraging independent learning with the aid of computers (84%).
   - teachers use computers in their instructional practice (74%).

   These results are comparable with most of the other countries.
2. Low percentages of Jordanian students were attending schools that adopted objectives with regard to communication (Students access external databases via the Internet/WWW (19%); Students use e-mail (21%)), which is the lowest percentage comparing with all other countries. This finding is plausible, because many Jordan schools did not yet have access to the Internet.
3. Jordan school principals mentioned very seldom the objective to use software for students with learning problems (13%) and to make one or more computers available in every classroom (18%).

The goal statements listed in Table 14 contain objectives that may be qualified as emerging versus traditionally important. It was hypothesized that A3, A4, A5, A6 , B6, B4, B5, and B8 might be combined into an indicator of emerging objective, while A1, A2, and A7 would be manifest traditionally important objectives.

Figure 9 contains the box plots for the indicators of emerging and traditionally important ICT-related objectives for secondary education level. It shows that emerging ICT-related objectives had been adapted to a high degree in for example, Israel and Singapore. For Jordan it was on average when compared with other countries.

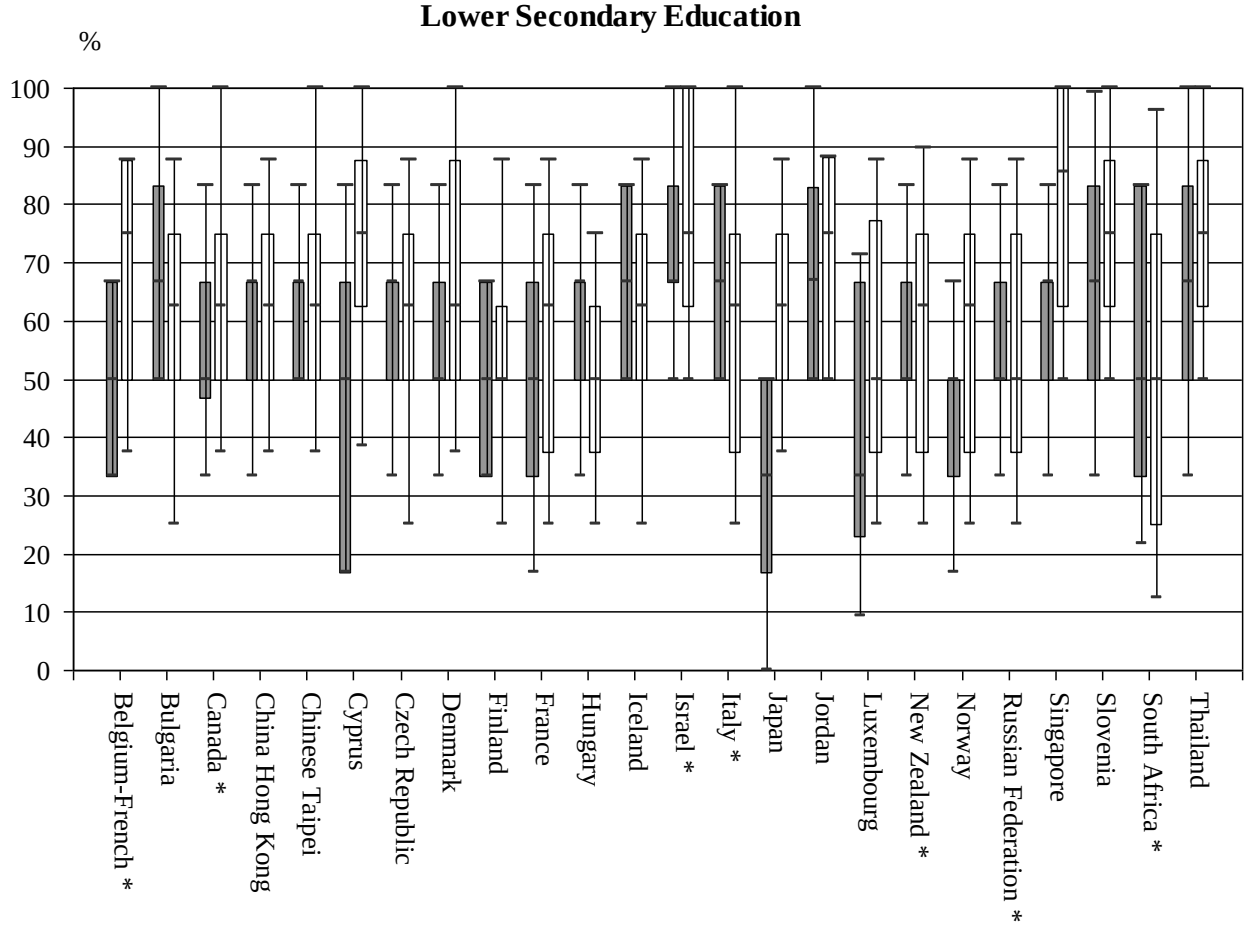


Figure 9 Box plots of indicators concerning the emerging and traditionally important objectives

With regard to expectations about the outcomes of learning about ICT, school principals were requested to indicate, on the basis of the school's objectives, which of the following skills students should have acquired by the time they had reached the end of the target grade:

1. Operating a computer (saving files, printing, keyboarding)
2. Writing documents with a word processor (typing, editing, layout)
3. Making illustrations with graphical programs
4. Calculating with spreadsheet programs (sheet creation, using formulas)
5. Writing simple programs (in e.g. Logo, Pascal)
6. Communicating via e-mail with teachers and other students
7. Sending, searching for, and using electronic forms of information
8. Other

Table 15 contains percentages of students at schools where principals checked each of the items in this list. The table also contains the percentages of total number of items that were checked (these were averaged across the schools for each country).

Table 15
Table 3.3.2
*Percentage of students whose school principals indicated that students should have acquired particular ICT related skills at the end of the target grade-**lower secondary education.***
Last column: average values and standard errors (between brackets) for indicators of ICT skill coverage

Country	1. Operating a computer	2. Word processing	3. Illustrating with graphics	4. Calculating with spreadsheets	5. Writing simple programs	6. Communicating via e-mail	7. Use electronic information	ICT skill coverage
Belgium-French *	82	49	32	14	26	32	35	39 (2.1)
Bulgaria	87	65	37	19	38	25	19	41 (1.7)
Canada *	95	94	49	44	9	51	76	60 (0.8)
China Hong Kong	94	85	42	43	59	55	55	62 (1.6)
Chinese Taipei	99	92	80	30	10	70	66	64 (1.3)
Cyprus	74	44	72	6	10	29	22	37 (5.0)
Czech Republic	96	93	62	66	22	33	36	58 (1.4)
Denmark	99	98	64	77	3	62	79	69 (1.2)
Finland	97	91	47	37	10	71	74	61 (1.6)
France	99	97	49	68	5	48	61	61 (1.1)
Hungary	98	89	65	53	51	28	44	61 (1.4)
Iceland	96	90	56	38	5	52	54	56 (2.5)
Israel *	94	92	73	69	21	36	35	60 (2.2)
Italy *	89	83	23	61	50	29	27	52 (1.7)
Japan	75	64	51	20	11	13	7	34 (1.6)
Jordan	96	85	79	32	62	36	32	60 (1.9)
Luxembourg	100	95	40	33	12	57	82	60 (4.8)
New Zealand *	99	98	63	58	10	46	67	63 (1.4)
Norway	89	88	25	61	4	49	70	55 (0.9)
Russian Federation *	42	21	27	19	30	4	6	21 (2.6)
Singapore	97	99	89	42	10	67	73	68 (1.7)
Slovenia	51	73	79	75	55	79	79	70 (1.9)
South Africa *	83	68	40	34	16	30	26	42 (3.0)
Thailand	90	80	36	28	12	10	10	38 (1.1)

It is evident from Table 15 that most important ICT-related skills for a majority of students in Jordan secondary schools were:

1. Operating a computer (saving files, printing, keyboarding) (96%)
2. Writing documents with a word processor (typing, editing, and layout) (85%)
3. Making illustrations with graphical programs (79%)
4. Writing simple programs (in e.g. Logo, Pascal) (62%).

These results are comparable with most of the other countries. On the other hand, the following items were mentioned less frequently by principals in Jordan:

1. Calculating with spreadsheet programs (sheet creation, using formulas) (32%)
2. Sending, searching for, and using electronic forms of information (32%)
3. Communicating via e-mail with teachers and other students (36%)

The overall index in Table 15 suggests that the highest expectations with regards to students' ICT-related skills were observed in Denmark, Singapore, and Slovenia, while the lowest expectations existed in Japan and the Russian Federation.

Use of the Internet

In this section the following question will be addressed: "To what extent is the Internet used in schools for pedagogical purposes?" From Figure 10 one may infer that Jordanian secondary school students were least likely to be in schools using email and the WWW for instructional purposes when comparing with most other countries.

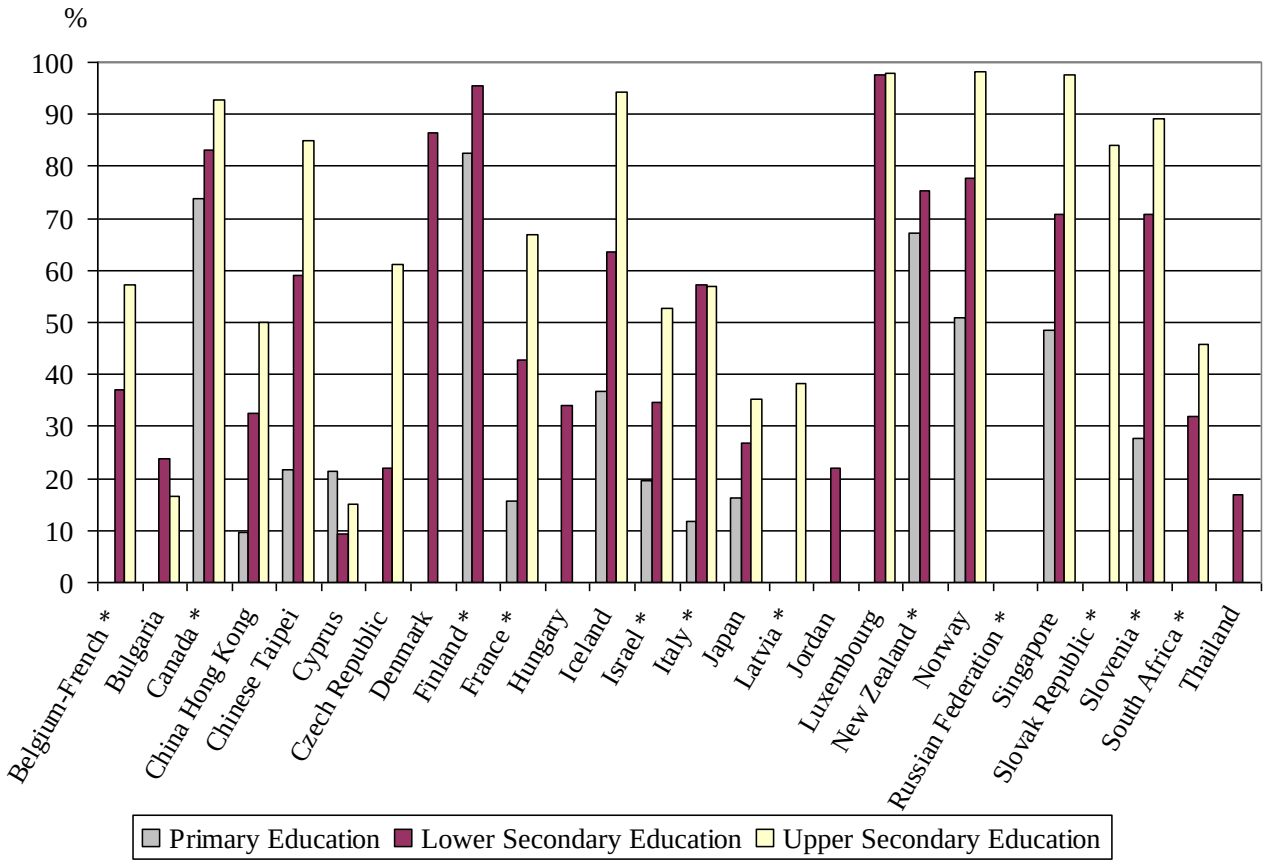


Figure 10 Percentages of schools (technical respondents) indicating that the e-mail/WWW was used, within the grade range, for instructional purposes .

Respondents who indicated that the school used email or WWW for instructional purposes answered a number of additional questions, namely:

i. What percentage of students (will) have used email and/or the WWW by the end of the target grade?
ii. What percentage of teachers (who teach in the grades range) use email and/or the WWW in their teaching in some way?
iii. Will a typical student have done any of the following at the school by the end of grade [X]:

1. Communicating via e-mail with teachers within and/or outside the school for learning purposes
2. Communicating via e-mail with peers from other schools within and/or outside the country
3. Using e-mail or bulletin boards for group projects/collaboration within the school and/or with other schools
4. Using external databases to retrieve and extract information from different sites across the Internet and/or WWW Designing and maintaining Web sites
6. Disseminating information via the Internet and/or WWW (e.g. publishing projects)
7. Discussing, debating issues and exploring ideas by video conferencing with others (e.g. schools or experts) outside the school
8. Other

Given the fact that in many countries the percentage of schools using the internet/WWW was far below 100%, further statistics relating to the answers to these additional questions were considered to be insufficiently representative for all country samples. Table 16 contains the percentage of students and teachers using Internet and the WWW, while in Table 17 the percentages of respondents are shown who indicated that typical students would have done Internet-related activities.

Table 16

Table F.3.2

Percentages of students whose schools (technical respondents) indicated which percentages of teachers (from the grade range) and students (at the end of the target grade) would have used e-mail (at schools that used e-mail and/or WWW for instructional purposes)-lower secondary education

Country	% Teachers using e-mail: none	% Teach. using e-mail: under 10%	% Teachers using e-mail: 11-25%	% Teachers using e-mail: 26-50%	% Teachers using e-mail: 51-75%	% Teachers using e-mail: 76-100%	% Students using e-mail: none	% Stud. using e-mail: under 10%	% Students using e-mail: 11-25%	% Students using e-mail: 26-50%	% Students using e-mail: 51-75%	% Students using e-mail: 76-100%
Belgium-French *	65	18	12	4	0	0	69	10	9	5	4	2
Bulgaria	78	17	4	1	0	0	79	11	7	1	1	1
Canada *	18	23	20	17	14	9	18	4	8	14	16	41
China Hong Kong	68	16	7	1	4	4	69	7	7	4	3	10
Chinese Taipei	44	25	7	5	4	14	46	13	5	11	3	22
Cyprus	91	9	0	0	0	0	91	6	2	0	0	1
Czech Republic	80	11	7	2	0	0	78	2	3	4	3	10
Denmark	15	21	22	21	13	7	16	12	12	9	16	35
Finland	5	12	30	27	20	7	5	1	2	10	21	63
France	59	29	9	2	0	0	62	12	9	7	3	6
Hungary	69	19	5	6	0	1	67	3	6	4	4	15
Iceland	41	11	12	11	10	16	38	5	4	2	7	43
Israel *	68	21	6	2	1	2	70	11	6	5	2	5
Italy *	44	29	16	6	3	1	54	25	8	6	3	3
Japan	75	19	5	1	0	0	75	8	3	2	1	12
Jordan	81	9	4	3	3	1	81	4	4	6	3	1
Luxembourg	3	58	26	13	0	0	3	17	31	3	0	45
New Zealand *	27	26	22	17	3	5	27	18	12	10	6	28
Norway	22	19	22	20	13	4	25	15	12	11	12	25
Russian Federation *	~	~	~	~	~	~	~	~	~	~	~	~
Singapore	30	23	12	17	11	7	29	15	10	15	6	25
Slovenia	32	32	25	8	2	1	31	22	33	8	2	5
South Africa *	69	15	6	4	4	1	68	10	3	2	1	16
Thailand	86	11	2	1	0	0	85	8	2	2	1	1

Notes: *: country did not satisfy all sampling criteria. ~: no data collected. See Appendix D for rules of thumb for estimating the standard errors for percentages.

Table 17

Table F.4.2

Percentages of students whose schools (technical respondents) indicated that typical students by the end of the target grade would have practiced particular Internet/WWW related activities (at schools that used e-mail and/or WWW for instructional purposes)-lower secondary education

Country	1. E-mail teach. inside/outside schl.	2. E-mail peers in-/outside country	3. Group projects in-/outside schl.	4. Info from external data bases	5. Design/maintenance Web sites	6. Disseminate/publish information	7. Discussion video conferencing	8. Other Internet related activities
Belgium-French *	16	15	3	28	8	5	4	1
Bulgaria	8	15	10	10	4	5	1	2
Canada *	28	37	19	66	19	26	3	10
China Hong Kong	11	10	4	27	11	6	1	0
Chinese Taipei	21	11	7	53	12	7	0	2
Cyprus	1	2	1	5	0	1	0	0
Czech Republic	7	16	7	13	8	3	4	3
Denmark	16	44	23	84	12	8	3	16
Finland	29	49	12	79	48	12	4	10
France	10	23	17	28	11	8	2	3
Hungary	12	22	4	27	1	2	0	6
Iceland	12	39	19	49	21	9	3	18
Israel *	9	16	9	22	3	2	5	5
Italy *	23	18	12	28	7	12	4	4
Japan	5	6	5	18	1	9	0	0
Jordan	9	9	7	9	4	5	5	3
Luxembourg	39	38	37	64	12	14	7	16
New Zealand *	25	36	14	53	12	18	6	7
Norway	8	23	14	66	6	6	3	12
Russian Federation *	~	~	~	~	~	~	~	~
Singapore	34	54	21	55	40	24	7	10
Slovenia	31	40	33	51	28	23	9	9
South Africa *	14	20	8	16	4	5	0	1
Thailand	5	7	2	10	2	4	0	1

Notes: *: country did not satisfy all sampling criteria. ~: no data collected. See Appendix D for rules of thumb for estimating the standard errors for percentages.

As Table 16 and Table 17 show, Jordanian secondary students and teachers who teach in the grade range had very low experience with email and/or Internet/WWW.

ICT-related learning opportunities

In order to answer research question 4 "Which ICT-related learning opportunities do schools offer to students?", respondents were requested to indicate whether a typical student would have used any of the following technology applications at school by the end of the target grade:

1. Simulations of natural or man made systems (e.g. work environments, human and animal populations, etc.)
2. Dynamic modeling and graphical modeling of mathematical functions.
3. Software for simple data manipulation and statistical analysis.
4. Word processing / desk top publishing .
5. Hard- and software for real time data collection (data logging) and data manipulation for science investigations .
6. Spreadsheets packages.
7. Software supporting creative works (music/ arts.
8. Computer aided design/ Computer aided manufacturing.
9. An interactive multimedia encyclopedia on CD ROM.
10. Software for learning programming skills .

Table 18 contains, for each ICT application per country , the percentage of students at schools where respondents indicated that a particular application would have been used by time a typical student would have reached the end of the target grade.

Table 18
Table 3.4.2
Percentage of students whose schools (technical respondents) indicated that a typical student would have used particular ICT applications at the end of the target grade- ***lower secondary education****.*
Last column: average values and standard errors (between brackets) for an indicator of application coverage.

Country	1. Simulations of natural systems	2. Modeling mathematic. functions	3. Software data manipul./statistics	4. Word processing/desktop publ.	5. Hard-/Softw. real time data coll.	6. Spreadsheets	7.Software creative works	8. Computer aided design/manufac.	9. Interactive encycl. CD-ROM	10. Software for programming	Application coverage
Belgium-French *	4	6	7	66	5	24	38	9	49	13	22 (1.5)
Bulgaria	8	13	19	64	5	22	19	1	16	24	19 (0.7)
Canada *	20	31	51	97	14	66	30	39	79	27	46 (0.6)
China Hong Kong	2	5	29	83	2	65	16	9	38	49	30 (0.6)
Chinese Taipei	1	2	2	97	0	40	31	11	20	6	21 (0.7)
Cyprus	20	0	0	57	6	0	22	52	16	20	19 (1.6)
Czech Republic	15	13	53	95	5	75	36	3	47	27	37 (1.2)
Denmark	22	44	57	99	10	96	54	1	85	8	48 (0.9)
Finland	6	25	38	99	5	89	45	3	63	47	42 (1.0)
France	12	33	39	99	18	91	23	54	84	10	46 (1.0)
Hungary	6	22	39	97	32	96	43	12	36	18	37 (6.4)
Iceland	9	31	26	89	12	47	30	2	34	3	28 (1.1)
Israel *	33	52	53	93	27	75	32	19	58	24	47 (1.8)
Italy *	10	32	48	81	21	73	16	22	53	40	40 (1.5)
Japan	10	44	27	72	12	33	30	7	14	31	28 (1.3)
Jordan	23	37	56	93	44	61	28	27	58	57	48 (1.8)
Luxembourg	6	13	36	97	14	72	8	15	43	37	34 (1.5)
New Zealand *	25	26	71	98	16	85	43	36	92	23	52 (1.0)
Norway	4	8	27	96	4	79	28	0	70	4	32 (0.3)
Russian Federation *	0	22	13	35	3	23	37	1	5	39	18 (2.1)
Singapore	17	38	45	100	20	60	37	24	84	28	45 (0.0)
Slovenia	53	39	58	84	31	70	50	62	73	46	57 (1.8)
South Africa *	17	11	28	70	5	47	18	10	48	22	28 (2.3)
Thailand	7	9	37	85	8	61	35	12	22	18	29 (0.8)

The results in Table 18 indicate that in almost all countries including Jordan, word-processing was one of the most popular ICT applications, spreadsheets were used in a good number of countries (usage was greatest in Denmark, Finland, France, and Hungary, and lowest in Belgium-French, Bulgaria, Cyprus, and the Russian Federation). For Jordan, the results from Table 18 indicated that popular ICT applications were:

1. Word processing / desk top publishing (93%).
2. Spreadsheets packages (61%).
3. An interactive multimedia encyclopedia on CD ROM (58%).
4. Software for learning programming skills (57%).

The index of 'application coverage' was highest in New Zealand and Slovenia, and lowest in Bulgaria, Cyprus, and the Russian Federation, Jordan was in the middle 'application coverage' equal [48 (1.8)]. It is interesting to note that the percentages for some applications in Table 18 (notably for spreadsheets) are higher than for comparable applications in Table 15. This situation seems to indicate that, in practice, certain learning activities occurred to a greater extent than might have been expected on the basis of educational targets of the schools.

Perceived ICT-Related Opportunities Regarding the Emerging Pedagogical Practices

In the previous section regarding the pedagogical paradigm of the schools, Table 8 was included to show the list of instructional activities that was presented to school principals, who were then asked to indicate to what extent these practices were present in their schools. This same list was used when principals were asked to rate the extent to which these activities had been realized through ICT (the answer options were 'not at all', 'to some extent', and 'a lot').

Table 19 contains the percentages of students at schools where principals claimed that, for each activity, it was realized 'a lot' via ICT.

Table 19

Table F.5.2

*Percentages of students whose school principals indicated per instructional activity that it had been realized **a lot** with the help of ICT-lower secondary education*

Country	1. Independent learning by students	2. Weaker students: addit. instruc.	3. Differences in entrance level	4. Students learn info-search	5. Emphasis on development skills	6. Same materials, same pace	7. Teach. tracks all stud. activities	8. Stud. responsible own learning	9. Students work on own pace	10. Cooperative projects students	11. Stud. determine self taking test	12. Students learn by doing	13. Parts school subjects combined	ICT-opportunities emerging	ICT-opportunities trad. important
Belgium-French *	7	7	5	24	7	4	3	12	16	9	2	9	6	37 (1.6)	25 (1.7)
Bulgaria	21	9	18	36	45	13	30	21	27	26	6	38	17	41 (1.2)	50 (1.3)
Canada *	28	19	11	68	24	8	48	12	20	24	4	34	16	56 (0.6)	57 (0.6)
Chinese Taipei	13	9	24	19	28	21	15	10	19	13	9	33	9	47 (1.2)	56 (1.3)
Cyprus	30	1	9	26	23	16	30	13	23	35	8	34	13	44 (3.5)	43 (3.9)
Czech Republic	40	12	32	48	44	14	40	24	46	14	8	43	36	51 (1.7)	55 (1.8)
Denmark	24	30	18	58	26	2	8	5	33	45	3	26	24	62 (0.9)	46 (1.0)
Finland	16	4	9	47	22	8	26	12	21	11	0	38	9	51 (1.0)	51 (1.3)
France	15	20	10	26	13	6	12	7	19	14	3	21	12	44 (1.3)	42 (1.4)
China Hong Kong	13	6	10	24	13	9	13	7	14	16	15	19	8	40 (0.9)	42 (0.9)
Hungary	39	9	30	72	31	11	24	20	40	24	2	38	30	56 (1.4)	47 (1.6)
Iceland	5	22	19	19	19	8	22	8	26	8	3	11	2	47 (1.4)	46 (1.9)
Israel *	34	33	24	39	29	15	33	21	37	36	4	30	19	58 (2.1)	52 (2.3)
Italy *	10	13	5	35	23	6	12	4	11	15	4	33	21	41 (1.7)	43 (1.7)
Japan	12	4	3	19	17	8	17	9	18	11	1	17	4	31 (1.5)	41 (1.6)
Jordan	29	12	22	31	41	8	24	12	13	25	14	39	17	50 (1.8)	53 (1.9)
Luxembourg	12	0	18	64	33	19	29	6	17	19	6	39	22	46 (3.1)	56 (3.7)
New Zealand *	12	11	7	53	14	4	32	6	13	10	2	20	9	53 (1.1)	53 (0.9)
Norway	16	45	9	55	7	2	2	5	11	21	1	20	15	53 (0.4)	32 (0.4)
Russian Federation *	13	5	21	28	40	11	29	9	35	14	6	28	10	40 (2.6)	50 (3.1)
Singapore	25	12	13	42	29	21	27	16	15	27	4	25	13	53 (0.5)	57 (0.3)
South Africa *	15	15	10	35	41	15	21	14	28	24	3	45	8	41 (2.6)	49 (3.0)
Thailand	16	6	18	10	24	22	25	14	18	16	2	29	7	47 (0.9)	57 (1.0)
Slovenia	45	8	28	46	21	15	35	40	44	26	10	34	31	56 (2.0)	50 (2.2)

Notes: *: country did not satisfy all sampling criteria. Last two columns: average values and standard errors (in brackets) for indicators of the emerging and traditionally important ICT-opportunities. Standard error (se): value ± 2*se provides 95% confidence interval for the population. See Appendix D for rules of thumb for estimating the standard errors for percentages.

A first observation from Table 19 is that extreme high percentages do not occur. However, given that, in some countries, a substantial number of school principals indicated that ICT is used for realizing pedagogical practices in the school. Overall, it seems that 'Students learning to search for information, process data, and present information' and 'Students learning by doing' were perceived as major contributions of ICT. Also, school principals in substantial number of countries mentioned 'a lot' of ICT contribution in relation to the item on independent learning. For Jordan, the main contributions of ICT were*: 1. the emphasis in learning is on the development of skills (41%); 2. Students learning by doing (39%); 3, Students learning to search for information process data, and present information (31%).*
These observations suggest that educational practitioners acknowledge the potential that ICT has to facilitate strategies related to active learning (items 2 and 3).

The box plot of the emerging ICT-related opportunities indicator as shown in Figure 11 contain information about the median value and dispersion of the values across schools in each country.

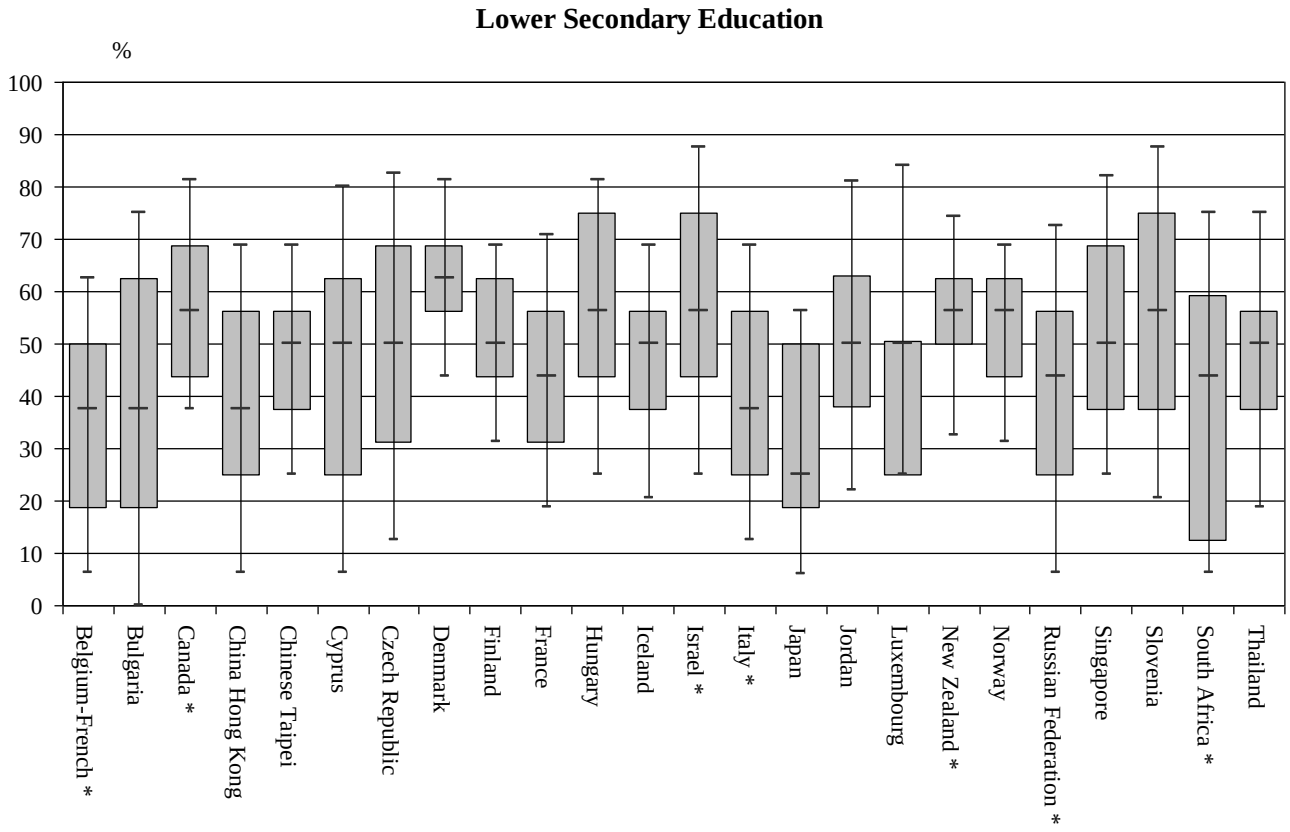


Figure 11 Box plots of indicators concerning emerging ICT-related opportunities .

Figure 11 shows that, relatively high values on the indicator were observed in Canada, Denmark, Hungary, Israel, New Zealand, Norway, and Slovenia. Also the results show that for Jordan, the indicators were on average when compared with other countries.

Perceived ICT-related opportunities regarding the traditionally important paradigm.
The instructional activities listed in Table 11 included activities that were seen as indicative of the traditionally important paradigm. These items are:

5- The emphasis in learning is on the development of skills
6. Students working on the same learning materials at the same pace and/or sequence,
7. Teachers keeping track of all student activities and progress

The results were shown in Figure 12.

The box plots in Figure 12 suggest that most percentages for the indicator of traditionally important ICT-related opportunities were slightly above or below 50%. For Jordan it was around 50%. However, as was the case in other countries, the variation between schools is very large.

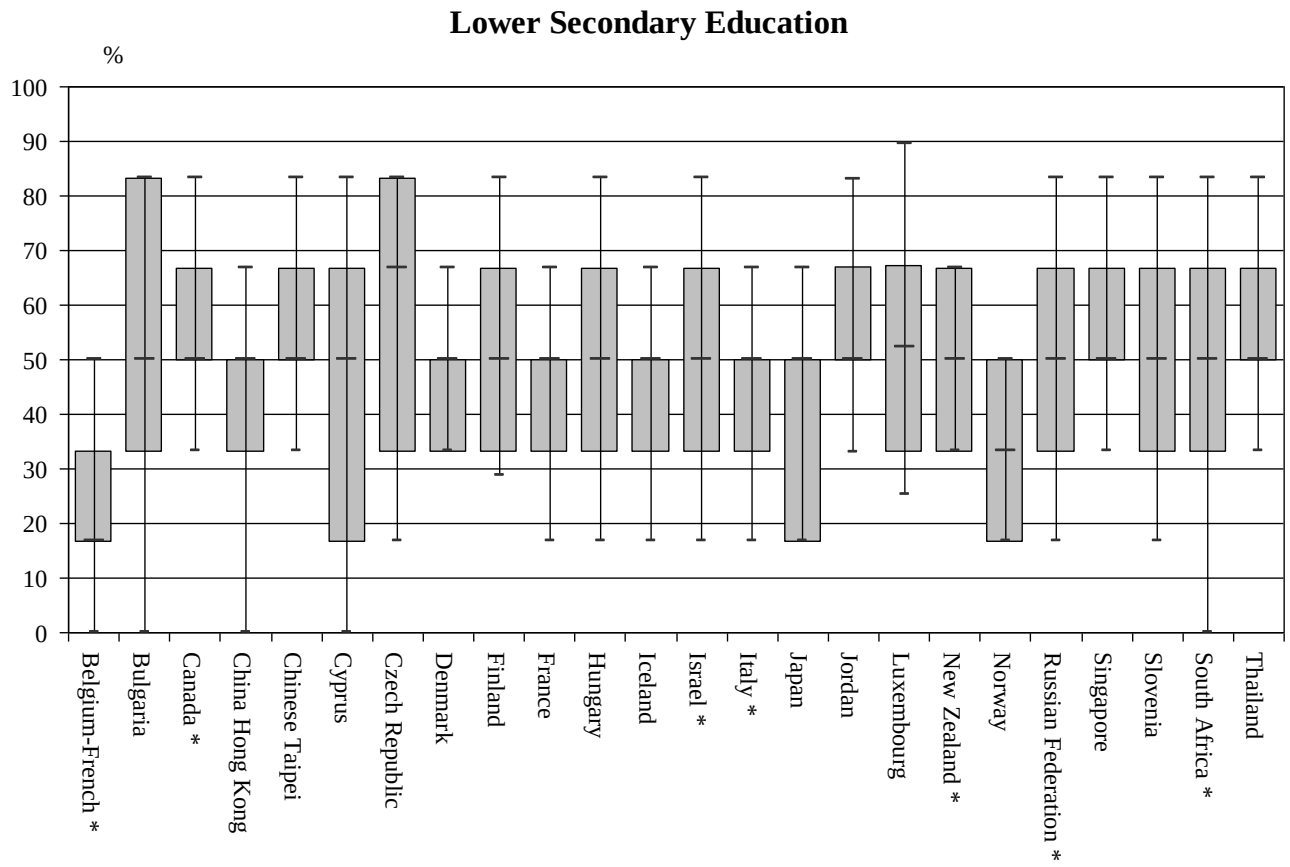


Figure 12 Box plots of indicators concerning the traditionally important ICT-related opportunities .

A comparison of Figures 11 and 12 suggested that, according to the perceptions of school principals, ICT plays a role in realizing both emergent and traditionally important ICT opportunities.

Summary and Reflections

This chapter has shown the presence of both emergent and traditionally important ICT orientation in Jordan. Jordan school principals show indications that in a substantial number of schools (roughly 1/3) innovative pedagogical practices are occurring, such as: students, learning to search for information, process data and present information. The median score for the emerging pedagogical practices for Jordan secondary schools is 52% which is comparable with other countries. Results from this chapter indicated that emerging ICT-related objectives had been adopted to a high degree in Israel and Singapore, for Jordan it was on average when comparing with other countries. Regarding the use of internet in schools for pedagogical purposes, the results showed that Jordanian secondary school students were least likely to be in schools using email and WWW for instructional purposes when compared with other countries.

A first breakdown of the pedagogical practice indicators by the number of years of ICT use did not lend strong support to the hypothesis that long-term experience with ICT would facilitate the emerging practices (and not the traditionally important practices). An example is illustrated in Figure 13, which shows the breakdown of the mean values on indicators of the emergent and traditionally important pedagogical practices by levels of student:computer ratios in Jordan secondary schools. Figure 13 also indicates that where as schools with high emerging practice conditions tended to have low student:computer ratios, this tend was not apparent for the traditionally important pedagogical practices. Given that low student:computer ratios point to favorable conditions regarding computer hardware in the schools, the hypothesis could be drawn that ICT might differentially affect emerging pedagogical practices.

Chapter 4: Staff development

As teachers play a key role in any innovation, their training is an essential condition for success. In this chapter, indicators on teacher training will be reviewed. The results presented here revealed that the Jordanian respondents saw a lack of ICT-related knowledge among teachers as a major obstacle to realizing the ICT-related objectives of the schools. In this context it was not surprising to observe that most schools had adopted a policy that all teachers should receive training for using ICT in their instructional practice. However, it appeared that in most schools this policy had not yet been satisfactorily realized. Nevertheless, even in the absence of ICT-training requirements a substantial number of teachers had attended basic ICT courses. It seems that for most of the schools there is a need for additional continuous staff development regarding ICT.

Introduction

Teachers play a key role in any educational innovation. If teachers are not able to apply new methods, an innovation will fail, therefore, the main goal for the Ministry of Education in Jordan is that of turning teachers into ICT users, through teacher education and in-service training.

The MOE has realized the importance of focusing on the human capital developmental factors on-line with the future knowledge-based world economies. In addition to large scale infrastructure initiatives that the MOE is involved with at the current time, there are some specifically targeted activities that are intended to build and support capacity in the utilization of ICT for teaching and Learning. These activities include Discovery Schools project, the Intel and World Links teacher training programs, and the schools-on-line project.

In this chapter the following research questions will be covered in the different sections that will follow.

1. To what extent are teachers adequately trained?
2. Do schools have adopted specific policies regarding staff development on ICT?
3. To what extent are staff development facilities available in schools?
4. How is ICT related knowledge transferred in the school?
5. Which ICT-related courses are available for teachers?
6. To what extent are technical resource persons in the school adequately prepared to support maintenance and pedagogical ICT related activities?

Are teachers adequately trained?

A considerable number of school principals (61%) indicated that they perceived a lack of teachers' knowledge or skills as a major obstacle in realizing the school's ICT related objectives (see Table 6, which was already shown in Chapter 2)). However, there is only a small group (although still substantial, namely 22%) of school principals who reported that it is a major obstacle that teachers feel uncomfortable because some students are more competent with ICT than they are. Although in, for instance, France and Luxembourg "Lack of training opportunities', was mentioned less frequently it was still mentioned by substantial groups of respondents in most countries

Policies with regard to staff development and its realization.

Staff development is an expensive activity, and it was therefore reasonable to expect that schools would set priorities with regard to training all staff members. In order to answer research question two 'Do schools have adopted specific policies regarding staff development on ICT?', school principals were asked if it was the policy of the school to train all staff or only some staff members and to what extent their school had realized this policy. The percentages of students whose principals indicated that there was a policy and the percentages reflecting that this was almost completely or fully realized are shown in Table 20. The percentages for realization were

not confined to the existence of a policy, as it was assumed that realization could also happen in the absence of explicit policies.

Table 20
Table 5.1
Percentage of students at schools that had adopted goals regarding the training of teachers and percentages of schools that had realized these goals *almost or fully* in primary, lower secondary and upper secondary education.

	Primary Education				Lower Secondary Education				Upper Secondary Education			
Country	Goal training all teachers to use ICT	Goal train few teach. ICT specialist	Real. Train. all teachers to use ICT	Real. train. few teach. ICT spec.	Goal training all teachers to use ICT	Goal train few teach. ICT specialist	Real. Train. all teachers to use ICT	Real. train. few teach. ICT spec.	Goal training all teachers to use ICT	Goal train few teach. ICT specialist	Real. Train. all teachers to use ICT	Real. train. few teach. ICT spec.
Belgium-French *	~	~	~	~	81	95	10	42	78	95	11	43
Bulgaria	~	~	~	~	71	83	2	16	72	88	1	15
Canada *	85	76	23	34	80	74	17	29	81	73	16	35
China Hong Kong	95	93	4	10	95	88	2	13	95	88	2	13
Chinese Taipei	91	88	23	40	97	90	15	34	97	87	31	41
Cyprus	85	62	3	10	38	49	0	8	92	89	4	12
Czech Republic	~	~	~	~	83	78	12	31	84	89	17	45
Denmark	~	~	~	~	85	88	19	60	~	~	~	~
Finland	97	87	32	35	98	94	31	38	~	~	~	~
France	73	57	3	5	82	87	5	20	85	88	4	30
Hungary	~	~	~	~	97	68	7	15	~	~	~	~
Iceland	80	78	10	21	78	77	8	25	79	69	7	25
Israel *	89	83	30	34	95	84	31	25	95	89	28	32
Italy *	86	72	23	32	90	75	14	22	91	80	17	33
Japan	74	41	16	7	67	47	12	11	45	48	7	10
Latvia *	~	~	~	~	~	~	~	~	91	83	18	20
Jordan	~	~	~	~	87	83	39	39	91	76	14	13
Luxembourg	~	~	~	~	71	100	5	51	71	98	5	49
New Zealand *	95	73	30	39	93	77	22	37	~	~	~	~
Norway	95	86	20	38	97	88	24	47	97	85	24	46
Russian Federation *					51	44	6	13	51	44	6	13
Singapore	99	85	80	36	99	87	74	36	100	93	58	46
Slovak Republic *	~	~	~	~	~	~	~	~	18	21	17	29
Slovenia	98	92	21	46	98	93	17	53	99	94	23	42
South Africa *	~	~	~	~	64	65	6	24	60	67	7	21
Thailand	~	~	~	~	90	91	48	48	~	~	~	~

The overall observation from Table 20 is that, training all teachers to use ICT was a policy goal of the majority of schools in most countries. However, in Cyprus and the Russian Federation this

was much less the case In Jordan, the training of all teachers was a policy goal at a majority (87%) of schools, and this goal had been almost or fully realized at 39% of the schools.
In addition to the data given in table 20, information was solicited from school principals regarding the extent to which training was obligatory for teachers at the targeted grade range and for which types of courses, moreover, the principals were requested to indicate if a substantial number of teachers from the targeted grade range actually had taken particular types of courses. The questionnaire item addressing these issues was worded as follows:

16. The following contains some questions about the ICT-related training for teachers of grades *-*.

– *Tick 'no' or 'yes' for each question.*

	No	Yes
A)		
Is it obligatory for:		
1. All grades *-* teachers to take at least some basic computer courses?	o	o
2. All grades *-* teachers to regularly take courses to update their ICT-knowledge and skills?	o	o
B)		
*Have a substantial number of teachers from grades *-*.*		
1. Attended at least some basic computer courses?	o	o
2. Regularly attended courses to update their ICT-knowledge and skills?	o	o

Figures 13 and 14 contain respectively the percentages of students whose principals answered questions A1/B1 and A2/B2 affirmatively. The percentages for the items in part B of the question were not dependent on part A, because it was assumed that part B could occur in the absence of obligatory prescriptions.

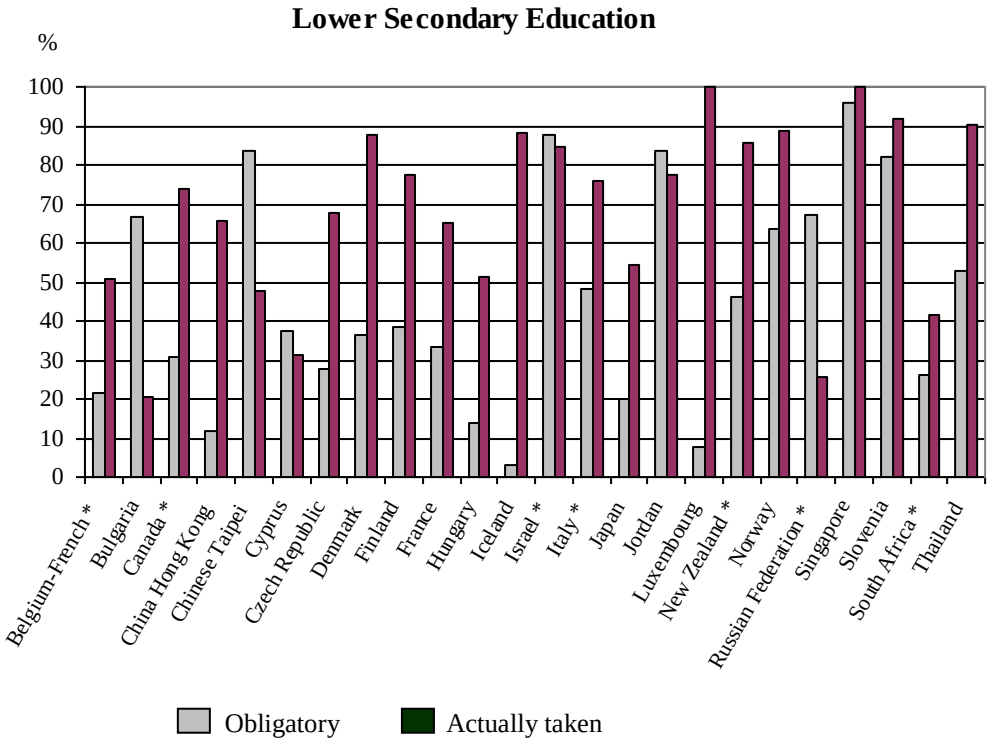


Figure 13

Figure 5.1 Percentages of students at schools where it was obligatory that all teachers from the targeted grade range had taken some basic ICT-course and percentages reflecting if a substantial number of teachers actually had taken such course in lower secondary education

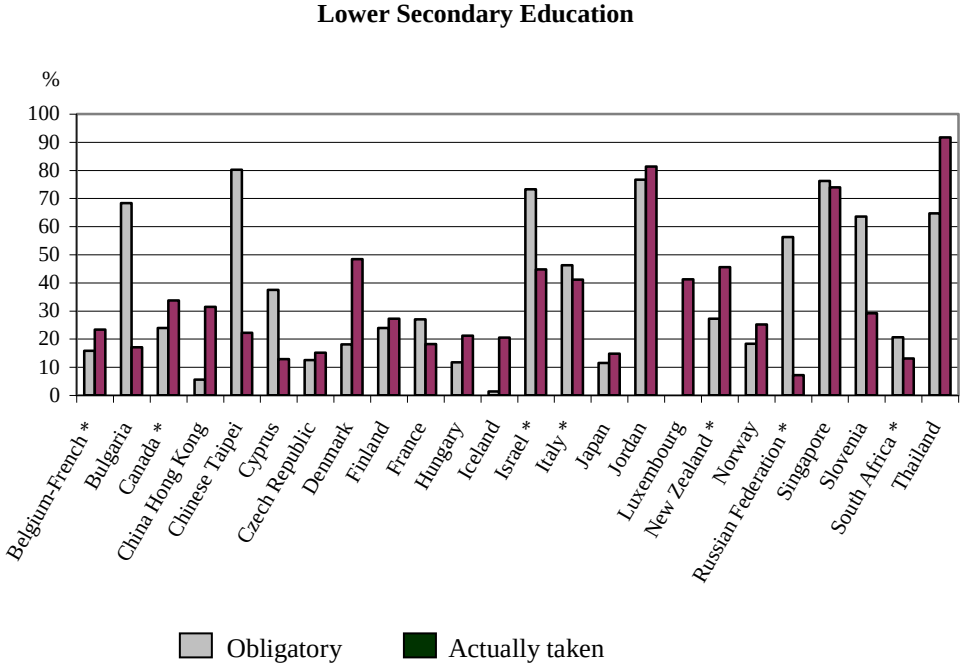


Figure 14

Percentages of students at schools where it was obligatory that all teachers from the targeted grade range take course to regularly update their ICT-knowledge and percentages reflecting if a substantial number of teachers actually had taken such courses in lower secondary education.

It appears from Figure 13 that especially in Bulgaria, Chinese Taipei, Israel, Singapore, and Slovenia all teachers from the targeted grade range were obliged to attend a basic course in ICT. In these countries it was also claimed that it was obligatory for teachers to regularly update their ICT knowledge, although this was the case to a lesser extent in Slovenia. For Jordan, the results from this figure reveal that, all teachers from the targeted grade range were obliged to attend basic course in ICT in 80% of the schools, which is a high percentage as compared with other countries. It is quite interesting to compare these figures with the percentage of students whose principals indicated that a substantial number of teachers had attended basic courses or were regularly updating their ICT knowledge. The percentage of schools where a substantial number of teachers had attended basic ICT courses was especially high in Denmark, Iceland, Israel, Luxembourg, New Zealand, Norway, Singapore, Slovenia, and Thailand. This attendance happened to a much lesser extent in Bulgaria and the Russian Federation. With regard to the requirement of regular updating of knowledge, relatively high percentages were evident for lower secondary education in Thailand, Jordan and Singapore respectively.

Methods of transferring ICT-related knowledge

It is known from innovation theories that continuous staff development is an important prerequisite for sustained implementation of change. Therefore, it seemed relevant to investigate to what extent schools had set up mechanisms for facilitating the transfer of ICT-related knowledge among teachers in the schools in order to address the question ‘How is ICT related knowledge transferred in the school?’.. Transfer may, for example, occur via working groups, the computer coordinator, newsletters, a cascade approach (trained teachers who further disseminate information within the school) and courses within the school. Alternatively, it may be left to individual initiatives within the school’s informal communication network. Table 21 contains the percentages of school principals who indicated that each of these arrangements existed.

Table 21
Table 5.2.2
Percentage of students at schools in lower secondary education where certain arrangements were available regarding the transfer of ICT knowledge among teachers.

Country	1. Via informal contacts/communic.	2. Via school's ICT working group	3. Regular item on staff meetings	4. Via a regular newsletter	5. Teacher repeats external course	6. Courses by an external agency	7. Via in-school courses	8. Via computer coordinator	9. No organized structure	10. Transfer ICT knowledge, other
Belgium-French *	75	15	7	4	60	21	28	56	23	0
Bulgaria	71	5	4	5	10	28	16	19	38	5
Canada *	90	45	16	12	36	32	44	65	22	6
China Hong Kong	88	44	17	12	33	44	57	45	12	3
Chinese Taipei	79	14	5	2	46	38	59	58	6	1
Cyprus	74	14	0	0	0	0	1	1	49	2
Czech Republic	85	6	11	0	17	10	32	35	17	2
Denmark	92	23	5	14	33	50	63	78	50	6
Finland	67	7	3	2	19	33	45	72	14	9
France	86	7	7	1	12	11	18	43	44	2
Hungary	30	21	7	14	25	17	25	29	36	4
Iceland	85	3	6	2	9	33	30	79	45	13
Israel *	49	34	11	5	46	53	57	65	17	6
Italy *	74	32	13	5	29	45	72	44	18	4
Japan	72	18	8	3	14	41	38	41	18	1
Jordan	50	27	26	11	28	28	38	37	28	10
Luxembourg	89	6	0	0	24	52	43	74	52	0
New Zealand *	90	61	13	12	31	38	61	74	20	1
Norway	87	16	4	1	16	38	61	73	22	3
Russian Federation *	68	9	9	2	22	45	8	8	22	6
Singapore	96	79	59	15	57	87	92	87	8	14
Slovenia	91	6	14	45	16	57	37	83	1	6
South Africa *	74	12	7	2	14	14	26	41	38	2
Thailand	59	26	15	5	50	41	72	29	5	3

From this table it appears that, overall, the most prevalent arrangements involved informal contacts, computer coordinators, courses run by external agencies, and in-school courses. Moreover the respondents in Jordan indicated that transfer took place in the following ways:-

1) informal contacts/communication (50%).
2) in-school courses (38%).
3) computer coordinator (37%).

The percentages of students at schools whose technical respondents indicated that no organized structure for internal ICT-information exchange existed were below 50% in all countries except Denmark and Luxembourg.

Availability of ICT training courses

The availability of training courses is a crucial condition for raising the ICT qualifications of staff. Therefore, a question about this topic was included in the questionnaires in order to address research question four 'Which ICT-related courses are available for teachers?'.
The respondents answering the technical questionnaire were asked if each of the following courses was available in-house or via external agencies for teachers from the targeted grade range:

1. General introductory course (how to use a computer, principles of software and hardware, functions of mouse, printer)
2. General introductory course (history of ICT, relevance, consequences of computer use, etc.) .
3. Introductory course for applications/standard tools (basic word-processing, spreadsheet, databases, etc.) .
4. Introductory course for Internet use (retrieve information, send/receive e-mails, etc.) .
5. Introductory technical course for operating and maintaining computer systems.
6. Advanced course for applications/standard tools (e.g. advanced word-processing, complex relational databases) .
7. Advanced course for Internet use (e.g. creating websites/develop a home page, advanced use of Internet, video conferencing) .
8. Advanced technical course for operating and maintaining computer systems (e.g. networks, special equipment) .
9. General course about didactical/pedagogical principles of computer use.
10. Subject-specific training (with subject-specific learning software, e.g. tutorials or drill and practice software).
11. Programming course, where teachers can learn how to create their own software (also with authorware).
12. Special course with digital video- and audio-equipment.

The percentages of respondents who checked the in-house availability of each possible course are shown in Table 22. Table 23 contains the percentages for externally available courses.

Table 22
Table H.2.2
Percentages of students whose schools (technical respondents) indicated that in-house ICT-courses were available for teachers of the targeted grade range-lower secondary education

Country	1. General technical introduction	2. Introduction, history, relevance,..	3. Introduction in applications	4. Introduction use of the Internet	5. Introduction maintenance	6. Advanced application use	7. Advanced Internet use	8. Advanced maintenance	9. General didactical principles	10. Subject specific training	11. Programming own software	12. Digital video/audio equipment
Belgium-French *	~	~	~	~	~	~	~	~	~	~	~	~
Bulgaria	32	15	22	13	6	5	3	1	4	3	4	2
Canada *	65	20	58	69	9	15	15	3	10	25	2	10
China Hong Kong	53	23	63	48	11	17	6	5	6	4	3	8
Chinese Taipei	~	~	~	~	~	~	~	~	~	~	~	~
Cyprus	28	15	14	0	5	5	0	0	19	14	0	0
Czech Republic	58	16	45	18	4	13	3	1	6	25	1	2
Denmark	67	15	65	63	9	12	11	5	8	18	2	15
Finland	41	5	35	51	6	7	15	3	4	9	5	3
France	~	~	~	~	~	~	~	~	~	~	~	~
Hungary	46	14	41	22	15	10	2	2	2	4	3	0
Iceland	30	2	26	22	2	4	5	0	1	13	1	1
Israel *	51	11	47	26	6	18	8	1	11	21	6	3
Italy *	77	46	67	43	15	12	21	3	11	18	16	6
Japan	48	45	11	22	32	9	6	4	8	19	6	7
Jordan	56	35	49	41	11	28	11	9	35	19	15	12
Luxembourg	~	~	~	~	~	~	~	~	~	~	~	~
New Zealand *	74	20	68	71	17	27	19	6	9	27	7	17
Norway	~	~	~	~	~	~	~	~	~	~	~	~
Russian Federation *	12	0	5	1	4	0	0	0	2	4	1	2
Singapore	57	28	53	41	24	16	24	4	28	50	17	26
Slovenia	81	26	78	54	8	38	12	5	17	37	5	3
South Africa *	69	26	69	39	11	10	10	5	8	5	7	3
Thailand	78	51	73	14	24	21	4	3	27	14	7	7

Notes: *: country did not satisfy all sampling criteria. ~: no data collected. See Appendix D for rules of thumb for estimating the standard errors for percentages.

Table 23
Table H.3.2
Percentages of students whose schools (technical respondents) indicated that external ICT-courses were available for teachers of the targeted grade range-lower secondary education

Country	1. General technical introduction	2. Introduction, history, relevance,..	3. Introduction in applications	4. Introduction use of the Internet	5. Introduction maintenance	6. Advanced application use	7. Advanced Internet use	8. Advanced maintenance	9. General didactical principles	10. Subject specific training	11. Programming own software	12. Digital video-/audio equipment
Belgium-French *	~	~	~	~	~	~	~	~	~	~	~	~
Bulgaria	37	22	34	30	11	15	11	7	15	11	17	7
Canada *	44	27	49	46	30	36	42	26	21	34	20	23
China Hong Kong	37	31	47	46	31	37	39	28	25	32	35	25
Chinese Taipei	~	~	~	~	~	~	~	~	~	~	~	~
Cyprus	61	19	67	40	0	13	8	0	40	31	14	8
Czech Republic	28	10	31	20	8	14	10	8	5	7	7	2
Denmark	36	26	51	44	38	33	34	38	33	38	14	34
Finland	38	12	43	44	23	25	36	23	19	18	15	16
France	~	~	~	~	~	~	~	~	~	~	~	~
Hungary	47	21	53	45	26	37	27	24	22	25	18	13
Iceland	66	41	68	73	46	48	63	40	38	31	21	21
Israel *	29	17	38	39	6	19	11	7	18	16	6	3
Italy *	19	14	16	19	2	8	9	8	8	11	8	4
Japan	72	73	63	69	50	51	55	46	54	42	54	44
Jordan	45	38	52	46	24	27	23	20	27	21	23	15
Luxembourg	~	~	~	~	~	~	~	~	~	~	~	~
New Zealand *	13	12	22	21	13	17	17	18	13	17	11	12
Norway	~	~	~	~	~	~	~	~	~	~	~	~
Russian Federation *	42	24	43	24	27	5	4	5	24	25	34	4
Singapore	52	29	84	78	42	35	48	21	30	48	41	25
Slovenia	31	11	39	40	37	37	37	26	34	38	21	16
South Africa *	23	13	28	20	13	10	15	11	3	3	7	2
Thailand	24	16	28	17	18	16	11	11	18	17	13	8

Notes: *: country did not satisfy all sampling criteria. ~: no data collected. See Appendix D for rules of thumb for estimating the standard errors for percentages.

Not surprisingly, with regard to the in-house training facilities, the largest percentages were observed for courses relating to basic computer-handling skills and the use of basic applications (word-processing, spreadsheets, and databases). It should be noted, however, that in some countries only a small group of students were at school where this introductory training could be handled inside the school, for example, in Bulgaria, Cyprus, and the Russian Federation. In Jordan, most important courses regarding to in-house training facilities are the following:

1- General introductory course (how to use a computer, principles of software and hardware, functions of mouse, printer) (56%).

2- Introductory course for applications/standard tools (basic word-processing, spreadsheet, databases, etc.) (49%).
3- Introductory course for Internet use (retrieve information, send/receive e-mails, etc.) (41%).

In relation to the external courses, it seems reasonable to expect that training facilities would be available for most of the above-mentioned topics. However, as the data in Table 23 reveal, this was, according to the perceptions of the technical respondents, clearly not the case. Another finding of relevance was that relatively small groups of the questionnaire respondents indicated that external courses were available that dealt with the didactical/pedagogical principles of computer use and with subject-specific training. The availability of such courses may be hypothesized as an important factor affecting the use of ICT in daily classroom practices. In Jordan, the questionnaire respondents indicated that external courses were available that dealt with the following:

1. Introductory course for applications/standard tools (basic word-processing, spreadsheet, databases, etc.) (52%).
2. Introductory course for Internet use (retrieve information, send/receive e-mails, etc.) (46%).
3. General introductory course (how to use a computer, principles of software and hardware, functions of mouse, printer) (45%).

A more condensed impression of the extent of availability of in-house and external courses can be gained from Figure 15. In-house availability in this figure reflects the average percentage of courses that were checked. External availability was calculated in the same way. In general, and not surprisingly, more external than in-house courses were available to teachers. Relatively high availability of external courses existed, for instance, in China Hong Kong, Cyprus, Hungary, Iceland, Japan, Russian Federation, and Singapore, while it was relatively low in, for example, Italy, New Zealand, South Africa, and Thailand. For Jordan, it appears that the availability of external courses was little bit higher than the availability of in-house courses.

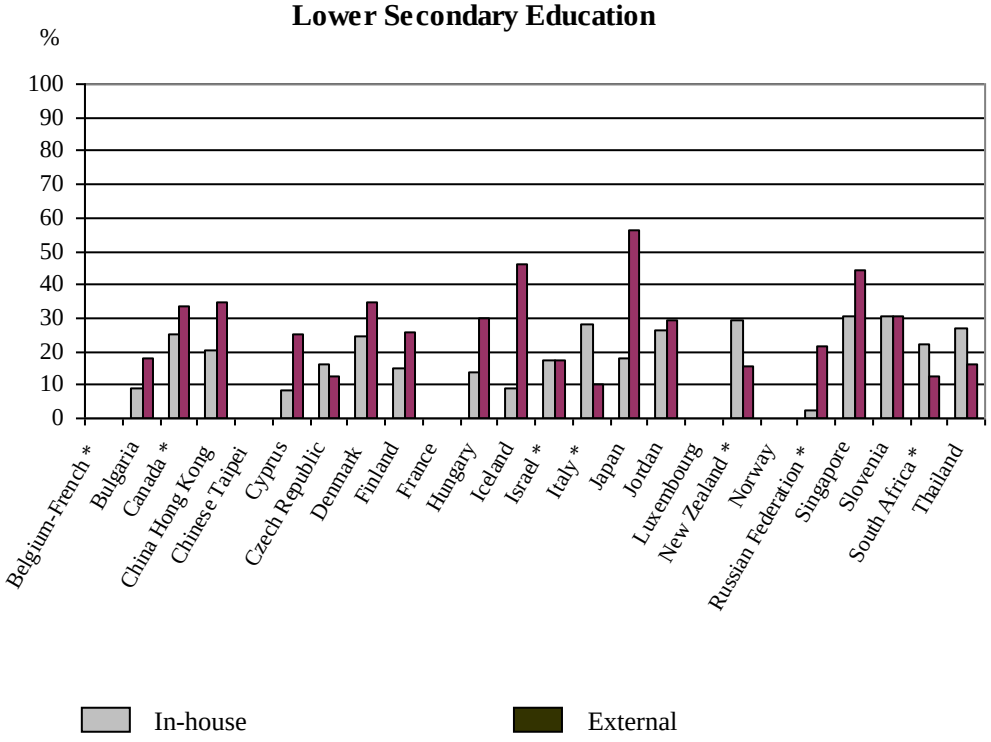


Figure 15 Average percentages across schools of available in-house and external courses from list of 12 lower secondary education.

On the whole, however, the availability of courses tends (at least in the perception of school principals) to be low. This is consistent with the finding that a substantial number of school principals reported that a lack of training facilities was a major obstacle in realizing the schools' ICT-related objectives (see Table 3), while also a meaningful number of respondents found the quality of available teacher training courses was insufficient (53%). Although this was also seen often as a major obstacle for most of the other countries, in Jordan it was mentioned most frequently.

Knowledge and skills of technology coordinators in the schools

If one assumes that the person who answered the technical questionnaire also plays an important role in transferring knowledge within the school, then it is interesting to know to what extent these persons were adequately prepared for their work in supporting ICT activities within the school. In order to acquire and estimate of such an indicator, the questionnaire respondents were asked to rate how well prepared they thought they were in each of the following areas:

General

1. MS-Windows
2. MacOs
3. MS-DOS
4. Word processing
5. Databases
6. Spreadsheets

Instructional processes

7. Subject specific applications
8. Application of student progress tracking software
9. Didactical and organizational integration of computers in subjects
10. The use of specific programs for subjects
11. Evaluation and selection of instructional software
12. Use of computers for individualized learning programs
13. The use of multimedia application
14. Adaptation of software to fit school purposes

E-mail, Internet, WWW

15. The use of e-mail for educational purposes
16. The use of the Internet/WWW for educational purposes

Presentation

17. The use of software for making presentations

If the area was not relevant, respondents were allowed to check a box titled not applicable. Table 24 contains the percentages of respondents who answered each item affirmatively. Some general observations can be made on the basis of the data in this table. Overall, it seems that the highest self-assessment of adequacy of preparation occurred for word-processing. It is not surprising to find that these self-assessments were low for the Mac operating system because the majority of schools did not use these operating systems, In some countries (for example, Canada, Singapore, and Slovenia) 85% or more of the respondents indicated that they felt adequately prepared for use of the Internet for instructional purposes. However, this was barely the case in other countries (for example, Bulgaria, Cyprus, Czech Republic, Japan, Russian Federation, and Thailand).

Table 24

Table H.1.2

Percentages of students whose schools (technical respondents) indicated that they were adequately prepared for supporting ICT-activities in particular areas in the school-lower secondary education

Country	1. MS-Windows	2. Mac Operating System	3. MS-DOS	4. Word processing	5. Data bases	6. Spreadsheets	7. Subject specific applications	8. Application student progress soft.	9. Didactical integration of ICT	10. Use specific progr. for subjects	11. Eval./select. instruc. softw.	12. Use for individualized learning	13. Use of multimedia applications	14. Adaptation of software	15. Use of e-mail for instruction	16. Use Internet for instruction	17. Use of softw. for presentations
Belgium-French *	88	6	75	94	62	74	23	18	20	24	26	22	43	28	59	57	39
Bulgaria	75	17	85	89	70	82	37	21	23	34	56	27	41	38	38	33	26
Canada *	82	29	64	94	78	84	61	44	41	55	59	34	70	54	79	88	75
China Hong Kong	95	9	89	97	85	89	54	10	32	41	50	57	64	25	71	72	83
Chinese Taipei	95	2	93	97	58	74	47	25	44	46	58	43	68	26	82	84	72
Cyprus	70	6	47	70	30	24	78	19	23	20	9	11	29	13	28	33	11
Czech Republic	89	8	79	93	50	78	58	29	33	43	57	49	53	33	36	35	28
Denmark	93	5	64	97	65	89	54	15	41	58	55	45	65	44	72	76	53
Finland	89	3	88	95	76	92	46	13	25	50	33	22	46	23	70	74	49
France	78	4	63	90	53	80	40	26	12	23	20	30	51	26	37	41	43
Hungary	96	4	95	98	74	92	64	69	53	40	59	67	66	41	53	57	51
Iceland	85	29	51	98	55	79	44	46	43	53	51	61	73	46	80	79	68
Israel *	77	8	55	91	79	60	48	37	56	53	53	50	62	64	50	52	77
Italy *	92	6	77	89	59	83	57	16	50	59	53	27	72	48	67	73	60
Japan	58	12	60	77	41	70	48	55	16	38	22	27	28	29	27	30	26
Jordan	96	20	84	100	97	97	83	56	53	75	65	68	82	70	66	72	86
Luxembourg	88	0	89	87	69	87	27	12	18	21	27	5	24	34	78	81	69
New Zealand *	82	35	60	97	81	88	48	39	67	44	53	30	60	42	80	77	67
Norway	72	2	51	88	32	65	26	13	13	21	27	22	36	11	54	58	38
Russian Federation *	70	7	76	88	73	87	54	35	36	50	67	66	29	48	26	20	28
Singapore	98	6	62	100	59	85	76	34	44	61	88	74	75	64	85	85	97
Slovenia	96	6	76	98	52	86	71	28	68	75	55	54	62	58	83	86	69
South Africa *	81	5	77	92	78	88	48	22	24	44	43	24	47	32	56	55	49
Thailand	63	4	53	68	37	50	18	4	4	4	9	19	10	10	10	11	23

Notes: *: country did not satisfy all sampling criteria. See Appendix D for rules of thumb for estimating the standard errors for percentages.

On the basis of the answers from Jordanian respondents, the rank order of items addressing adequacy of preparation appeared to be as follows:

1. Word processing (100%)
2. Databases (97%)
3. Spreadsheets (97%)
4. MS-Windows (96%)
5. The use of software for making presentations (86%)
6. MS-DOS (84%)
7. Subject specific applications (83%)
8. The use of multimedia application (82%)
9. The use of specific programs for subjects (75%)
10. The use of the Internet/WWW for educational purposes (72%)
11. Adaptation of software to fit school purposes (70%)
12. Use of computers for individualized learning programs (68%)
13. The use of e-mail for edu16.7cational purposes (66%)
14. Evaluation and selection of instructional software (65%)
15. Application of student progress tracking software (56%)
16. Didactical and organizational integration of computers in subjects (53%)
17. MacOs (20%)

From these items two scales were created, one reflecting the extent to which general ICT skillls were mastered and one which reflected the instructionally related topics.
Figure 16 contains the average percentages for each of these scales in each country.

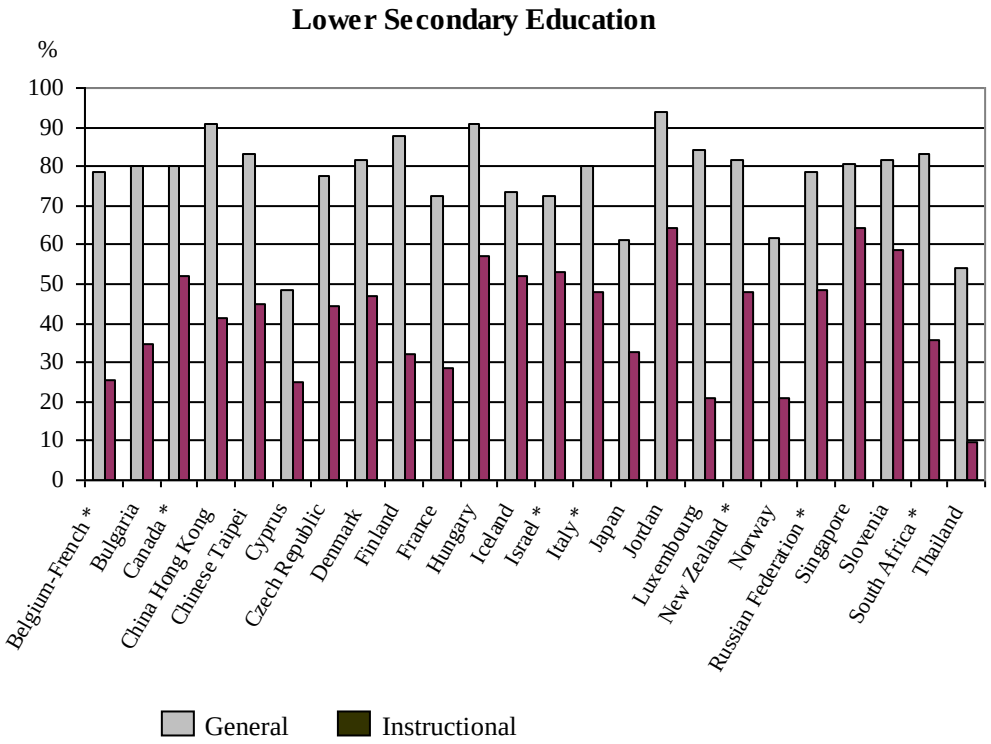


Figure 16 Average values of self-ratings from technical respondents regarding the adequacy of preparation for supporting general ICT-related activities and pedagogical ICT-related activities-lower secondary education.

A first observation from this figure is that the self-ratings for the general (or alternatively more technical) ICT-related activities were much higher than for the instructionally related activities. With regard to the latter activities, the ratings were relatively high in Jordan, Hungary and Singapore. However, the instructionally related ratings were comparatively low in Belgium-French, Cyprus, France, Luxembourg, Norway, and Thailand.

Summary

This chapter described a number of indicators relating to staff development. The results presented here revealed that the Jordanian respondents saw a lack of ICT-related knowledge among teachers as a major obstacle to realizing the ICT-related objectives of the schools. In this context it was not surprising to observe that most schools had adopted a policy that all teachers should receive training for using ICT in their instructional practice. However, it appeared that in most schools this policy had not yet been satisfactorily realized. Nevertheless, even in the absence of ICT-training requirements a substantial number of teachers had attended basic ICT courses. It seems that for most of the schools there is a need for additional continuous staff development regarding ICT.

Chapter 5: Management and Organization

This chapter reports on principals attitudes to ICT and the degree to which schools have developed and realized an ICT-related vision and policy. Findings relating to the extent to which ICT is used to monitor students for school administration are also presented, as are findings relating to the problems that schools face when implementing ICT.

Introduction

The relationship between school leadership and the use of ICT is twofold. First, school managers can use ICT as a tool to support the execution of their administrative and managerial tasks (Visscher, 1995; Visscher & Wild, 1997; Visscher, Fung, & Wild, 1999). Second, school managers, as leaders of their schools, often can take the important role of encouraging and facilitating the use of ICT within their schools for administrative and managerial work (Visscher, 1996) as well as for instructional activities (Akker, Keursten, & Plomp, 1992). The second consideration refers to the concept of educational leadership (Creamers, 1994; Levine & Lezotte, 1990), whereby school managers can influence and improve what happens in the teaching/learning process. The extent to which school principals promote the use of ICT in their schools probably depends on the degree to which they consider ICT useful. Their views on this matter can be manifested in a number of ways, such as how they incorporate ICT into their own school tasks and the school policy measures that they effect to promote the incorporation of ICT into their schools.

This chapter addresses the following questions: 1. To what extent do school leaders have positive attitudes regarding the added value of ICT? ; 2. Do schools have explicit written policies on ICT? ; 3.To what extent is there a common vision in schools on ICT-related goals? ; 4. What kind of measures did schools take to regulate the computer related activities in the school? 5.Are computers used for supporting the monitoring of student progress? ; 6. To what extent are infrastructural characteristics (electricity, telecommunication facilities, and available space in the school) experienced as serious obstacle for realizing the school's ICT related goals?.

Attitudes and beliefs of school principals toward ICT

School principals can be important agents of change. Principals attitudes toward computers can play an important role in the successful implementation of ICT in education (Pelgrum & Plomp, 1991). Table 25 present the outcomes for the scales used to measure the principals attitudes. The final column shows the results for the whole attitude scale (24 items, see question 15 of the Principal Questionnaire in Appendix C). The other columns contain the results of four sub-scales and two singletons (Single-item scales):

1. The impact of ICT on achievement (five items: questions 15-1,10,16,18,23);
2. The relevance of internet (six items: questions 15-5,6,7,9,19,24);
3. The impact of ICT on school management (five items: questions 15-2,3,4,15,21);
4. The contribution of ICT to life-long learning (six items: questions 15-8,11,12,13,14,20);
5. The importance of in-service training courses on computers (single item: question 17);
6. The importance of all teachers acquiring ICT certification (single item: question 22).

Table 25
Table 6-1-2
Principals' attitude towards ICT in ***lower secondary education****. Average values and standard errors (between brackets) for attitudes.*

Country	1.ICT impact on achievement	2.Relevance of Internet	3.ICT impact school management	4.ICT contribution lifelong learning	5.Make in-serv. ICT train. Compuls.	6.Teach. must acquire ICT certific.	Attitude towards ICT in the school
Belgium-French *	67 (1.2)	75 (0.9)	73 (1.1)	76 (0.9)	79 (1.7)	60 (2.1)	73 (0.8)
Bulgaria	85 (0.5)	84 (0.5)	86 (0.5)	82 (0.5)	79 (0.9)	79 (0.8)	84 (0.5)
Canada *	76 (0.5)	86 (0.4)	81 (0.5)	81 (0.5)	82 (0.7)	67 (0.9)	81 (0.4)
China Hong Kong	65 (0.5)	79 (0.5)	73 (0.5)	74 (0.5)	71 (0.8)	61 (0.8)	73 (0.4)
Chinese Taipei	78 (1.0)	86 (0.9)	81 (0.9)	82 (1.0)	84 (1.4)	80 (1.4)	82 (0.9)
Cyprus	83 (1.2)	84 (1.0)	86 (1.0)	83 (0.9)	92 (1.0)	93 (1.3)	86 (0.7)
Czech Republic	73 (0.9)	75 (0.9)	81 (0.7)	75 (0.8)	76 (1.7)	81 (1.2)	76 (0.6)
Denmark	64 (1.0)	81 (0.9)	70 (0.9)	69 (0.9)	89 (1.1)	87 (1.3)	73 (0.8)
Finland	57 (1.1)	82 (0.6)	70 (0.8)	69 (0.8)	66 (1.7)	47 (1.7)	69 (0.7)
France	67 (0.8)	72 (0.9)	71 (0.9)	74 (0.7)	78 (1.3)	73 (1.3)	71 (0.7)
Hungary	69 (1.0)	72 (0.8)	70 (0.8)	69 (0.8)	59 (1.6)	58 (1.6)	70 (0.7)
Iceland	73 (0.7)	88 (0.5)	80 (0.7)	80 (0.7)	84 (0.9)	69 (1.1)	81 (0.5)
Israel *	86 (1.2)	88 (1.1)	88 (1.1)	89 (1.0)	94 (1.3)	82 (3.0)	88 (0.9)
Italy *	84 (1.3)	86 (1.1)	88 (1.0)	82 (1.2)	88 (1.6)	79 (2.1)	85 (1.0)
Japan	68 (1.2)	68 (1.3)	62 (1.3)	68 (1.3)	72 (2.0)	46 (2.8)	66 (1.0)
Jordan	80 (1.3)	79 (1.4)	78 (1.2)	78 (1.2)	78 (2.0)	90 (1.5)	80 (1.2)
Luxembourg	63 (3.2)	84 (2.5)	76 (1.9)	73 (2.3)	74 (4.2)	67 (4.1)	74 (2.3)
New Zealand *	74 (0.9)	82 (0.7)	83 (0.7)	81 (0.8)	79 (1.4)	75 (1.3)	80 (0.7)
Norway	67 (0.3)	79 (0.3)	71 (0.3)	73 (0.3)	91 (0.3)	70 (0.6)	73 (0.2)
Russian Federation *	87 (1.3)	~	86 (1.4)	80 (1.4)	90 (1.7)	74 (2.5)	~
Singapore	89 (0.2)	94 (0.1)	89 (0.1)	92 (0.1)	92 (0.2)	85 (0.3)	91 (0.1)
Slovenia	70 (1.1)	79 (0.9)	77 (1.0)	73 (0.9)	66 (1.7)	72 (1.6)	75 (0.8)
South Africa *	78 (1.6)	77 (1.7)	84 (1.3)	81 (1.7)	86 (1.8)	70 (2.8)	80 (1.3)
Thailand	86 (0.6)	81 (0.7)	89 (0.6)	84 (0.7)	88 (0.8)	76 (1.0)	85 (0.6)

Table 25 indicates that, in each country the mean scorer for each sub-scale and the entire scale was higher than 60 (Jordan 80%), meaning that principals tended to have a positive attitude toward ICT usage in their respective schools. Nevertheless, countries differed in the extent to which principals were positive. In all countries the principals held positive attitudes toward ICT. Countries in which principals had a very positive attitude towards ICT in the school (in general, column 8) (a score higher than 80) were Bulgaria, Canada, Chinese Taipei, Cyprus, Iceland, Israel, Italy, Jordan, New Zealand, Singapore, South Africa, and Thailand. Less positive attitudes (scores between 65 and 70) were found for Finland, Hungary, and Japan. In relation to the different sub-scales, the scores on the sub-scale *relevance of Internet* were in some

countries higher (at least five points) than the scores on the other three sub-scales. The differences between the scores on these three sub-scales were small. This pattern was observed in Canada, China Hong Kong, Denmark, Finland, Iceland, Luxembourg, and Norway. For Jordan, the average values for the sub-scales were:

7. *The impact of ICT on achievement (80);*
8. *The relevance of internet (79);*
9. *The impact of ICT on school management (78);*
10. *The contribution of ICT to life-long learning (78);*
11. *The importance of in-service training courses on computers (78);*
12. *The importance of all teachers acquiring ICT certification (90).*

These results indicated that, Jordanian principals had a very positive attitude on all sub-scales scores > 75)

The existence of explicit school policies

Schools can express their interest in ICT through their school policies and, as such, develop a framework for action concerning the use of computers in their institutions (Pelgrum & Pomp, 1991). Table 26 shows the percentages of schools with a written ICT policy or statement for the targeted grade range (second column).

Table 26
Table 6-2-2
Percentage of students whose principals indicated that their school has a written policy or statement with regard to the use of computers for educational purposes by students in the grade range, and the issues included – ***lower secondary education****.*
Final column: Average values and standard errors (between brackets) for number of policy issues included.

Country	Written policy available	1.Use of comp.current school year	2.Use of comp.next school years	3.Plans hardware replacem./upgrad.	4.Plans staff developm.ICT training	5.Specif.comp.related tasks/pers.	6.Plans for software acquisition	7.Equity of access	8.Internet policy	Mean number of policies (max.8)
Belgium-French *	34	80	91	67	87	57	45	70	76	5.7 (0.3)
Bulgaria	50	79	79	57	58	53	35	45	69	4.8 (0.2)
Canada *	67	84	59	57	62	52	51	52	96	5.1 (0.1)
China Hong Kong	42	78	44	58	86	41	59	33	72	4.7 (0.1)
Chinese Taipei	~	~	~	~	~	~	~	~	~	~
Cyprus	24	100	19	13	28	41	13	26	19	2.6 (0.7)
Czech Republic	26	87	51	75	52	62	40	32	30	4.3 (0.3)
Denmark	49	90	82	78	90	54	68	54	64	5.8 (0.2)
Finland	48	86	42	56	46	80	28	29	67	4.3 (0.2)
France	56	85	62	78	87	32	78	57	89	5.7 (0.1)
Hungary	74	75	69	57	74	44	58	35	51	4.6 (0.2)
Iceland	53	97	89	59	57	51	32	74	57	5.1 (0.2)
Israel *	~	~	~	~	~	~	~	~	~	~
Italy *	41	81	49	44	65	35	48	6	57	3.8 (0.2)
Japan	54	63	34	23	62	61	38	9	29	3.2 (0.2)
Jordan	66	74	72	35	48	40	53	58	38	4.2 (0.2)
Luxembourg	~	~	~	~	~	~	~	~	~	~
New Zealand *	50	81	59	74	71	55	55	51	80	5.3 (0.2)
Norway	~	~	~	~	~	~	~	~	~	~
Russian Federation *	55	43	38	26	32	24	22	19	11	2.2 (0.3)
Singapore	78	92	87	82	95	91	91	66	73	6.8 (0.1)
Slovenia	54	90	36	84	77	63	82	69	54	5.6 (0.2)
South Africa *	22	80	85	85	60	50	65	35	55	5.2 (0.5)
Thailand	75	79	58	67	84	52	58	56	69	5.2 (0.1)

Less than 50% schools of Belgium French, China Hong Kong, Cyprus, the Czech Republic, Italy, and South Africa had a written ICT policy. Countries with high percentages of schools with a written policy document were Singapore (78%), Hungary (74%), Thailand (75%), Canada (67%), and Jordan (66%). Table 26 also shows (in relation to the total number of schools with a written policy) the percentages of schools in Jordan with policies regarding each of the following issues:

1. Use of computers in the current school year *(74%)*;
2. Use of computers in the forthcoming school years *(72%)*;
3. Plans for hardware replacement *(35%)*;
4. Plans for staff development with regard to ICT training *(48%)*;
5. Specification for computer-related tasks and persons in charge *(40%)*;
6. Plans for software acquisition *(53%)*;
7. Equity of access *(58%)*;
8. Internet policy *(38%)*.

The last column of Table 26 shows the mean number of topics (and its standard error) included in the written ICT policy. The mean was calculated on the basis of the maximum of eight topics listed above. In the majority of the countries, the mean number of issues included in the written policy varied between 3 and 5 *(Jordan: 4.2 more than 50% of the schools have a written ICT policy)*. In Cyprus, where only about one-third of the schools had a written ICT policy, the mean number of topics included was relatively low. The same was the case in Italy, Japan, and the Russian Federation, although in these countries more schools reported having a written policy.

The policy issue *use of computers in the current school year* was included in the written policy of about 75% or more of the schools in almost all countries *(Jordan: 74%)*.

Development of an ICT-related vision

The use of ICT in schools to a certain extent can be coordinated by developing a common vision regarding the use of computers within schools, and by paying attention to norms and values associated with the use of Internet and the WWW. Table 27 shows the data relating to these two matters.

Table 27
Table 6-3-2
*Percentage of students whose principals indicated that the development of a common vision on the use of computers respectively the attention to norms and values in using Internet/WWW is a policy goal, and the percentage of students whose principals indicated that these goals have not or only partially been realized – **lower secondary education**.*

	Development of a common vision			Paying attention to norms/values using Internet/WWW		
	goal	realized		goal	realized	
Country	yes	not	partially	yes	not	partially
Belgium-French *	79	46	49	82	26	36
Bulgaria	93	34	55	68	63	19
Canada *	84	17	57	93	5	32
China Hong Kong	94	22	72	86	38	52
Chinese Taipei	95	12	64	81	25	46
Cyprus	53	90	10	37	82	14
Czech Republic	84	29	59	48	65	17
Denmark	58	34	60	73	21	44
Finland	89	32	63	98	6	67
France	79	57	40	78	51	23
Hungary	94	41	54	91	40	30
Iceland	86	44	47	81	44	39
Israel *	75	36	50	74	49	20
Italy *	69	41	50	72	34	34
Japan	71	46	46	47	68	21
Jordan	90	9	55	67	33	23
Luxembourg	92	22	61	86	31	24
New Zealand *	89	11	62	88	9	45
Norway	69	58	35	74	51	40
Russian Federation *	34	39	48	~	~	~
Singapore	94	7	56	83	29	48
Slovenia	93	15	67	91	16	40
South Africa *	69	50	42	69	41	34
Thailand	91	5	45	66	24	41

Columns 2 and 5 of this table contain the percentages of principals who said that "developing a common vision" and "Paying attention to norms and values when using the Internet/WWW" was a policy goal of their school. In almost all countries, at least two-thirds of the schools had developed a common vision on ICT as a policy goal. The only exception for lower secondary level were Cyprus (53%), Denmark (58%) and the Russian Federation (34%). "Paying attention to norms and values when using the Internet/WWW" was a policy goal in at least 40% of the schools in all countries. In most of the countries

this percentage was higher than 60%. For Jordan, the results were: *"developing a common vision (90%)" and "Paying attention to norms and values when using the Internet/WWW (67%)"*
As far as the realization of these goals is concerned, the following picture emerges. The majority of principals answered that the two goals had not been realized or had been only partially realized (The percentage of schools in which the goals had been realized fully is not shown in the table, but can be inferred from subtracting the sum of the percentages that are shown from 100). "A common vision" was partially or fully realized by 50% or more of the schools in almost all countries, Jordan (55% and 36%). There were a few exceptions to this general trend. The exceptions were Cyprus (10% and 0%), France (40% and 3%), and Norway (35% and 7%).

Regulation of computer-related activities

Research Question Four 'What kind of measures did schools take to regulate the computer related activities in the school?' In order to investigate this question, Table 28 shows the outcomes for six particular measures that schools could take to regulate (to a certain degree) computer-related activities:

1. Preventing unauthorized system access or entry;
2. Honoring intellectual property rights (e.g. software copyrights);
3. Prohibiting access to adults only material;
4. Restricting game-playing on school computers;
5. Specifying compulsory student computer-related knowledge and skills;
6. Stimulating local community (parents and/or others) access to school computers or the Internet.

Table 28
Table 6-4-2
Percentage of students whose principals indicated that particular measures have been set up in their school – ***lower secondary education****.*
Final column: Average values and standard errors (between brackets) for number of measures indicated.

Country	1.Prevention unauthor. system acc.	2.Honoring intellect.property rights	3.Prohibition acc.adults-only mater.	4.Restrict.game play.school comp.	5.Spec.compuls.stud.comp.knowl.	6.Local community acc.to Internet	Mean number of measures (max.6)
Belgium-French *	63	48	53	70	25	24	2.8 (0.1)
Bulgaria	67	31	38	62	63	15	2.8 (0.1)
Canada *	90	79	87	89	42	26	4.1 (0.0)
China Hong Kong	73	80	59	62	50	6	3.3 (0.0)
Chinese Taipei	39	83	70	46	60	28	3.3 (0.1)
Cyprus	36	18	32	51	46	12	1.9 (0.2)
Czech Republic	63	64	53	21	40	12	2.6 (0.1)
Denmark	68	98	40	75	37	16	3.3 (0.1)
Finland	58	88	40	84	47	21	3.4 (0.1)
France	50	58	46	60	38	15	2.7 (0.1)
Hungary	55	43	46	46	72	29	2.9 (0.1)
Iceland	67	57	73	81	20	11	3.1 (0.1)
Israel *	64	55	46	62	42	22	2.9 (0.2)
Italy *	52	53	43	57	18	12	2.3 (0.1)
Japan	8	17	16	19	34	7	1.0 (0.1)
Jordan	45	55	64	61	59	15	3.0 (0.1)
Luxembourg	83	77	73	97	75	47	4.5 (0.2)
New Zealand *	91	73	76	88	42	41	4.1 (0.1)
Norway	59	44	36	59	23	15	2.4 (0.0)
Russian Federation *	33	16	39	26	57	7	1.8 (0.2)
Singapore	73	66	56	77	68	16	3.6 (0.0)
Slovenia	68	85	52	72	28	22	3.3 (0.1)
South Africa *	55	58	45	66	23	22	2.7 (0.2)
Thailand	27	32	32	42	29	19	1.8 (0.1)

Columns 2 through 7 in this table contain the percentages of principals who answered that these measures had been taken in their schools. The final column presents the mean number of measures (and its standard error) mentioned by principals in each country. A score of 3.6 (0.0) means here that, on average, a

principal checked 3.6 out of the six measures with a standard error of 0.0. Jordanian principals indicated the following measures to regulate computer-related activities had been set up in their schools:

1. Prohibiting access to adults only material (64%);
2. Restricting game-plying on school computers (61%);
3. Specifying compulsory student computer-related knowledge and skills (59%);
4. Honoring intellectual property rights (e.g. software copyrights) (55%);
5. Preventing unauthorized system access or entry (45%);
6. Stimulating local community (parents and/or others) access to school computers or the Internet (15%).

On average, in Jordan schools, three measures or more were taken. In many countries, more than 50% of the schools had taken the first five measures.

Use of ICT for monitoring student progress and for school administration

Principals were asked whether their school had been "using computers to keep track of student data" as a policy goal (see the second column of Table 29) and to what extent their school computers were being used for this purpose.

Table 29
Table 6-5-2
*Percentage of students whose school principals indicated to what extent computers are being used to keep track of students' learning process and for other student data – **lower secondary education**.*

	Policy goal: using computers for student data	Using computers for student data			Frequency computer use to keep track of student's learning progress			
Country	yes	not	partially	fully	never	a few times	monthly	weekly/daily
Belgium-French *	98	1	13	86	51	40	6	2
Bulgaria	83	52	34	14	72	24	2	1
Canada *	92	2	19	79	1	23	18	58
China Hong Kong	78	21	57	23	21	57	15	6
Chinese Taipei	97	2	35	64	11	20	31	38
Cyprus	87	0	4	96	9	57	31	3
Czech Republic	94	5	22	73	26	65	7	2
Denmark	97	1	10	89	8	73	12	6
Finland	100	1	4	95	10	49	23	18
France	97	2	20	78	18	50	25	7
Hungary	93	29	38	32	38	55	5	2
Iceland	98	17	44	39	15	42	26	17
Israel *	90	10	36	54	15	40	32	13
Italy *	97	3	19	78	45	39	10	5
Japan	76	8	50	42	~	~	~	~
Jordan	92	7	38	56	12	30	21	37
Luxembourg	100	0	21	79	43	57	0	0
New Zealand *	95	2	45	53	3	25	20	52
Norway	95	5	33	62	~	~	~	~
Russian Federation *	41	60	39	1	70	25	5	0
Singapore	97	3	44	53	1	72	20	8
Slovenia	97	4	42	54	34	53	9	3
South Africa *	91	7	22	71	19	37	21	22
Thailand	96	1	37	63	32	40	23	6

Table 29 shows that, in almost all countries, the percentage of schools that had been "using computers to keep track of students 'learning process' as a policy goal was about 90% or higher *(Jordan: 92)*. Only Bulgaria (83%), China Hong Kong (78%), Japan (76%), and the Russian Federation (41%) had lower scores. In Bulgaria, and the Russian Federation this goal had yet to be realized in 52%, and 60% respectively. In most countries the goal had been realized partially or fully in more than 50% of the schools (*Jordan 93%*).

A considerable number of schools in Belgium-French, Bulgaria, Hungary, Italy, Luxembourg, the Russian Federation, Slovenia, and Thailand had never used computers for keeping track of students learning progress. In the majority of countries, schools that used computers for this purpose, but did so only a few times each school year. The exceptions were Jordan, Canada, Chinese Taipei, Finland, Iceland, Israel, New Zealand, and South Africa. In these countries 40% or more used the computer for monitoring student progress on monthly or weekly basis *(Jordan 58%).*

Administrative Use

Computers can be used for various school administrative activities (Fung, Visscher, Barta, & Teather, 1997; Visscher, 1991; Visscher, 1996; Visscher & Wild, 1997). The questionnaire for school principals listed five ways that the school could benefit from using the computer in the school administrative area. These were:

1. Updating the library database;
2. Creating and updating the lesson schedule;
3. Staff administration;
4. Financial administration;
5. Communication with parents and others outside school.

Principals were asked to indicate the frequency per school year with which the school carried out each activity. Table 30 contains the frequencies and mean scores across all five activities. The percentages of principals who indicated that they never used the computer for a particular activity are not shown in the table. (These percentages are equal to the difference between 100% and the sum of the percentages that are shown.)

Table 30
Table 6-6-2
Percentage of students whose principals indicated that in their schools computers are used for particular administrative activities a few times or more during a school year – ***lower secondary education****.*
Final column: Average values and standard errors (between brackets) for number of activities.

Country	1. Updating library data	2.Creating/updating less.sched.	3.Staff administration	4.Financial administration	5.Communic.with parents a.o.	Mean no.of activities (max.5)
Belgium-French *	73	76	99	96	70	4.1 (0.1)
Bulgaria	20	42	54	50	26	1.9 (0.1)
Canada *	88	79	94	97	87	4.5 (0.0)
China Hong Kong	80	88	87	81	66	4.0 (0.0)
Chinese Taipei	75	94	97	99	66	4.3 (0.1)
Cyprus	20	54	52	17	33	1.8 (0.2)
Czech Republic	30	47	94	83	74	3.2 (0.1)
Denmark	89	88	99	98	90	4.6 (0.0)
Finland	29	90	93	86	79	3.8 (0.1)
France	93	81	100	99	77	4.5 (0.0)
Hungary	49	47	86	82	57	3.2 (0.1)
Iceland	79	95	88	77	90	4.2 (0.1)
Israel *	65	70	74	69	46	3.1 (0.2)
Italy *	69	64	96	95	81	4.1 (0.1)
Japan	~	~	~	~	~	~
Jordan	56	78	76	60	51	3.2 (0.1)
Luxembourg	93	93	100	100	88	4.7 (0.1)
New Zealand *	99	92	99	99	83	4.7 (0.0)
Norway	~	~	~	~	~	~
Russian Federation *	5	20	29	15	~	~
Singapore	100	89	100	100	81	4.7 (0.0)
Slovenia	94	59	99	98	73	4.2 (0.1)
South Africa *	52	49	84	90	74	3.5 (0.1)
Thailand	48	66	84	92	57	3.5 (0.1)

From the final column, it is evident that in the majority of countries the computer was used, on average, for at least three of the five school administrative activities. The mean number of activities was lower than 3 in two countries: Bulgaria (1.9), and Cyprus (1.8). The computer was used quite widely for all five school administrative activities in most countries (except in those that, on general, did not use the

computer much in this area), including Bulgaria, Cyprus. In Jordan, the computer was used quit widely for the five school administrative activities as the following:

1. Updating the library database (56%);
2. Creating and updating the lesson schedule (78%);
3. Staff administration (76%);
4. Financial administration (60%);
5. Communication with parents and others outside school (51%).

Problems realizing ICT goals

Research Question Six concerned 'To what extent are infrastructural characteristics (electricity, telecommunication facilities, and available space in the school) experienced as serious obstacle for realizing the school's ICT related goals?' In order to investigate this question, Table 6, (which was already shown in Chapter2) contains the percentages of principals indicating that they experienced specific obstacles in realizing their schools computer-related goals The numbers in the following list refer to the numbers in Table 6; (The missing numbers (items) were discussed in Chapter 2 and 4) the list of highest percentages of obstacles occurred given to Jordanian schools principals was as follows:

4- Insufficient time for teachers to prepare lessons in which computers are used (82%).
5- Difficult to integrate computers in classroom instruction practices (64%).
7- Problems in scheduling enough computer time for different classes (79%).
8- Difficult to use with low-achieving students (65%).
9- No time in the school schedule for using the Internet/WWW (64%).
10- No time in teachers' schedules to explore opportunities for using the Internet/WWW (66%).

From this outcome it may tentatively be inferred that obstacles 4, 5, 7, 8, 9, and 10 were experienced by many Jordanian schools principals as a major obstacle for realizing the school's ICT-related goals. These obstacles were also mentioned by a very large group of principals in some other countries (Belgium – French, China Hong Kong, China Taipei, Cyprus, and Russian Federation; in most case by 50% or more of them).

Summary and reflections

The general conclusion that can be drawn from the results presented in this chapter is that, schools in Jordan are doing much to develop their ICT-related policies, visions, and attitudes. Much is also being achieved in terms of computer usage for student monitoring and school administration. During the case studies more in depth observations will be performed on the nature of these monitoring systems. The attitudes of Jordanian schools principals toward the benefits of ICT in their schools in general tended to be very positive (80%), although the depth of that opinion varied considerably. In some countries, school leaders were very positive; in others they were only very slight positive.

As far as ICT policies are concerned, the results showed that in Jordan about 66% of the schools had developed school policy measures concerning the use ICT within their schools. Many schools had included about half of the policy issues listed in the questionnaire. A similar picture emerges from the research results concerning the development of an ICT vision and its realization. Although 90% of Jordan school principals indicated that the development of a common vision on the use of computers was a policy goal.

Many schools were benefiting from using the computer for school administration (in Jordan, the computer was used quit widely for the five school administrative activities >50% (see Table 30)). This chapter shows that the following obstacles were experienced by many Jordanian schools principals as a major obstacle for realizing the school's ICT-related goals:- insufficient time for teachers to prepare lessons in which computers are used; difficult to integrate computers in classroom instruction practices; problems in scheduling enough computer time for different classes; difficult to use with low-achieving students; no time in the school schedule for using the Internet/WWW; and no time in teachers' schedules to explore opportunities for using the Internet/WWW . These obstacles were also mentioned by a very large group of principals in some other countries.

Chapter 6: Summary, reflections and recommendations

In this chapter a summary will be provided of the main findings from this first round of the Jordan ICT-monitor. Also reflections on these findings will be presented against the background of a policy framework that was recently published by the ministry of education. Where appropriate, policy recommendations will be included.

Summary of main findings

The results of this first round of the Jordan ICT-assessment showed that in the past few years the access to ICTs in Jordan secondary schools has improved considerably. Almost all MOE-schools had in Spring 2004 access to computers. About 70% of the schools possessed already in 2003 fifteen computers or more, which in 1999 was the case for almost none of the schools. In a typical school there was, in Spring 2004, one computer available for every 30 students. Further, it was observed that there exists a substantial variation between schools in terms of the availability of computers: from 1 computer for 15 students to 1 computer for 60 students. Most schools possess general purpose software of the kind that is usually provided together with computers that operate under Windows (Word processor, spreadsheet, PowerPoint, and Internet browser). However, the availability of software that is suited for applying ICT in school subjects was still quite low. In theory, a compensation for this might be the Internet, where many valuable educational source materials can be found (although not always in the national language and tuned to the specific curricular context of the schools). However, in Spring 2004, the access to the Internet was still very low in Jordan schools. In the perception of educational practitioner the insufficient availability of hardware, software and connectivity are still major obstacles in realizing the school's ICT related goals. Whether this concern is justified needs to be further investigated when (around October 2004) a selection of schools will be visited in order to determine to what extent there exists an imbalance between infrastructure, school vision, pedagogical practices, readiness of teachers to implement ICT, curricular orientations, and the like.

There are indications that Jordan schools tend to emphasize, in this stage of the introduction of ICT, learning *about* computers. This typically occurs in the first stage of introducing computers through which many countries have gone and which is followed by a stage of intensified integration in school subjects.
The results show that, in Jordan schools, emerging pedagogical practices are beginning to be realized. In this regard the ambitions of Jordan schools are quite high, which points to a sound innovation spirit. It was also observed that in this respect great differences existed between schools: some schools seem to be much more innovation oriented than other schools. This observation is of interest for the second stage of the Jordan ICT-assessment, when the exact nature of innovation in schools can be investigated in-depth in order to determine what are the possible causes of these differences and what can be learned from this. In Spring 2004 the use of e-mail was still rather low, because, as mentioned above, many schools were not yet connected to the Internet. An important observation in connection with the integration of ICTs in the curriculum is that more than 80% of the school principals mentioned that a major obstacle is that teacher do not have enough time to prepare lessons in which computers are used.

A very crucial condition for changing pedagogical practices and integrating ICTs is that teachers and support staff need to be adequately trained in order to feel comfortable to apply ICTs in their daily instructional activities. A substantial number of school principals think that many teachers don't have yet the required knowledge and skills, despite the fact that almost all teachers have received some form of training. Also the technical resource persons in the schools, indicated that, although their technical knowledge was quite acceptable, only half of them indicated that they were well prepared regarding the didactical and organizational

integration of computers. This is not a phenomenon that only existed in Jordan, it was observed in a substantial number of other countries.

After many years of exploring the possibilities for integrating ICT in education it seems that in countries which already started in the mid 1980s, the awareness has grown that, next to infrastructure, curricular flexibility and staff development, managerial and organizational factors play a crucial role in this process. School leaders, for instance, have a very important gate-keeping function in stimulating and steering global change processes in the school. This is only possible when they have a positive attitude towards ICTs and acknowledge the potential benefits of applying these new technologies. This may lead to stimulating the adoption of common vision in the school and establishing written policies in which objectives and trajectories towards further integration of ICTs in the learning processes are documented. From the data it appears that Jordan school principals have very high expectation regarding the benefits of ICTs: they expect increased achievements of students, they underscore the relevance of using the Internet and see ICTs as important for life long learning. Roughly 70% of the schools have written policies in which mainly issues like equity of access, computer related tasks and staff development have been specified. Most schools are aware that a common vision on ICTs in the school needs to be developed, but in a majority of cases (64%) it was indicated that this objective was only partially or not yet at all realized.

From the results of the first round of this ICT-assessment, as summarized above, it appears that there is reason to recommend further stimulation of developments in several areas. These recommendations will be reviewed in the next section.

Reflections and recommendations

Recently, the Ministry of Education drafted a policy framework that contains the guiding objectives for the ERfKE I project. The basis of this framework is the vision of His Majesty King Abdullah II's vision of Jordan as the IT 'hub' of the Middle East:

> **"***The Hashemite Kingdom of Jordan has the quality competitive human resource development systems that provide all people with lifelong learning experiences relevant to their current and future needs in order to respond to and stimulate sustained economic development through an educated population and a skilled workforce."*

In this policy framework a distinction is made between several main areas for which policy goals have been set: infrastructure, curriculum, staff development and regulations. In the sections below the policy goals in each of these areas will be reviewed in the light of the findings from the first round of this ICT-assessment and, where appropriate, policy recommendations will be made. Only those policy goals will be reviewed that explicitly refer to what is expected to happen in schools.

The results from the monitor may inform the Jordan policy-making and –planning processes on implementing ICTs in education. Policy goals are –ideally- an integral part of a monitor *process* as illustrated in the Figure below:

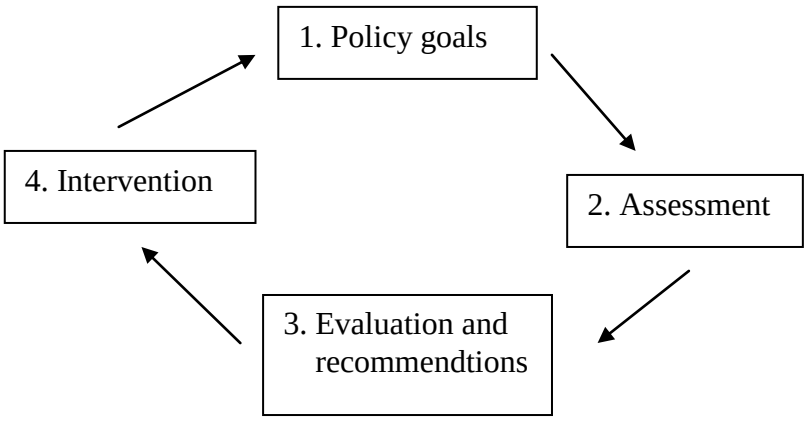


Figure 17 Main phases in a monitoring cycle.

This Figure illustrates that four main steps constitute the basis of a monitoring cycle. Assessments are conducted to determine to what extent policy goals are realized. Value judgments about the discrepancy between goals and realization take place in a next step which may lead to identifying weaknesses, which can constitute the basis for undertaking interventions (via policy measures) in order to realize improvements, after which a next monitoring cycle can start. Part of this process may be that the policy goals are changed, for instance maybe to make them a bit more realistic.
The current section is addressing the third phase of the cycle that is shown above.

Infrastructure

Deployment

All the public schools in the country will be provided with computers and Science laboratories equipped with PCs, other multimedia accessories, and appropriate software. One desktop computer will be provided for each of the following: teacher's lounge, school library, and the administration office and a number of classrooms determined by the size of the school. Printers will be provided for the laboratories, teachers' lounge, school library, the Principal's office, and at least one classroom.

In the assessment questions were asked about the location of computers in the school, although not exactly according to the categories (principals, library, etc.) as specified in the MOE-objectives. From the results it appeared that nearly 100% of the schools possessed computers that were in use for administrative purposes only. Usually (in ¾ of the schools) this was only one PC. From this finding it seems unlikely that many schools already had a computer available in the principal's office. Quite a number of schools (roughly 80%) reported that one or more computers were available for teachers'-use-only. It is not known where these computers were located. The location of computers in at least one classroom is an objective that still needs to be realized, because 99% of the schools reported that none of the computers were located in classrooms. With regard to the number of printers in the schools, the policy objective implies that ultimately 5 printers need to be made available. The monitor shows that this was currently only the case in 2% of the schools. A typical school (around 50%) possessed two printers.

Student Access

All schools will be provided with enough PCs, multimedia projectors, and other accessories to achieve the target of one PC for six students (1:6) ratio or better.

The typical secondary school in Jordan currently has a student:computer ratio of 30, it varies from 15 to 60. This shows that in some schools the infrastructure is much better than in other schools. This variation may be, from an equity perspective, of concern to policy makers and therefore it is recommended to pay attention to this phenomenon and to monitor in the forthcoming years to what extent the differences between schools are diminishing. Furthermore, it appeared that in Spring 2004 third (1/3) of the schools possessed a video-projector. Hence, this is also a matter for policy measures and monitoring in the forthcoming years.

Maintenance and Support

Continuous maintenance of the ICT infrastructure, including connections, hardware, and software will be provided on a regional (directorate) basis with a national helpdesk function available. Directorate level teams will provide the necessary technical support to computer equipment in each school. Designated teachers or students within the school will be expected to provide simple basic support for users within the school.

From the assessment it appears that roughly 60% of the respondents indicated that maintenance is a high priority issue. In combination with the observation that 65% of the technology coordinators in the schools indicated that a lack of technical support was a major obstacle for realizing the school's ICT related objectives, it seems fair to state that the realization of the above MOE-objective needs further political attention in the forthcoming years.

Connectivity

(Intranet/Internet): All schools, libraries, Directorate offices and LRC's will be connected to the MOE Intranet via a fiber-optics-based national network. Other forms of connection such as ADSL and leased lines using existing telephone cables will be employed until the broadband network is fully installed.

The assessment shows that this objective still needs to be realized. According to the current governmental initiatives it may be expected that in the forthcoming years great progress can be expected in this area.

Local Area Network (LAN)

Within schools a LAN will allow users to access resources both inside and outside of the school. The LAN will be installed in all of the computer labs, the library, the Principal's office, the teachers' lounge, and all classrooms. The LAN may be a combination of wireless and wired connections.

This objective seems to be realized, in so far as it concerns the connection of computers to a LAN **inside** the school in for all school computers in 40% of the schools, while in 65% of the schools half o the available computers are connected to a LAN. Around 20% of the schools reported that none or virtually none of the computers were connected to a LAN.

Operating System

There will be one operating system used across the country for educational purposes to ensure effective connectivity and efficiency.

From the assessment results it clearly appears that this objective has been realized in roughly 80% of the schools. This means that a substantial number of schools still use other operating systems and therefore it is recommended to try to locate these schools and investigate what are the reasons for not using a Windows operating system.

Software

A GUI and package of office productivity tools (word processing, spreadsheet, presentation) will be the universal MOE standards for all workstations, e-learning portals (Eduwave) and e-content.

The assessment shows that most schools (roughly 90%) have access to office productivity tools. However, it was also shown that software that is suited to be used in school subjects is still lacking and therefore in the forthcoming years measures for improvement of this situation need to be effectuated.

Curriculum

The first round of the ICT- assessment consisted of questionnaires administered at school level. When monitoring the implemented curriculum (instructional processes, students' opportunities to learn, etc.) and/or the attained curriculum (students' achieved competencies), data collection on teacher- and student-level would be required. However, this not being the case, a few indicators on curriculum issues based on perceptions of school principals and technology coordinators can shed some light on ICTs in the curriculum.

Roughly ¼ of the school principals gave indications that autonomous learning (a pedagogical principle that is seen as important for the school of the future) was present a lot in their schools. This was particularly also reflected in the policy goals of most schools. ICTs can help facilitate this way of learning, because students can search for information and access information sources so that they can construct their own knowledge. This, of course, presupposes that such sources are available and can be accessed, which currently is only the case in a minority of schools.

A substantial number (40 %) of the school principals indicated that learning by doing had been realized a lot in their school with the help of ICTs.

In almost all schools is it expected that students should have acquired in their schools skills in operating computers, word processing and making illustrations with graphic programs and these applications are also used in most schools. This points to the existence of a common vision. On other aspects there exists more diversity. Sixty percent of the school principals indicated that students should be able to write simple programs and roughly 1/3 of the principals responded that working with spreadsheets, communication via e-mail and the use of electronic information would be required. From these observations one may infer that the building of a common vision on necessary ICT competencies is an important issue for policy planning in the forthcoming years. In this process one may consider to make a distinction between core objectives (consisting of attainment targets for the whole populations of students) and optional objectives (that can be selected by students who specialize in particular directions).

Staff development

Almost all schools (and indeed school principals have very pronounced attitudes about this) intent to train *all* teachers to use ICTs and a *few* teachers to become ICT-specialists. These goals are, according to the perception of school principals, realized in 40% of the schools. This is a fairly high percentage when compared with other countries. On the other hand the lack of skills of teachers to use ICT is mentioned by 60% of the schools as a major obstacle in realizing the school's ICT-related objectives. From these observations in combination with the *perceived* lack of availability of courses, it seems fair to state that attention should be given to improving the facilities for staff development. As the training of teachers usually is a very costly activity, it may be worthwhile to explore the possibilities for learning on distance (for instance, via an educational portal) in combination with a cascade approach, whereby one or a few well trained teachers in the school guide their colleagues in acquiring the necessary skills and in making adaptations in their didactical approaches. In particular attention should be paid to training the technical support persons of whom roughly 50% indicated that they were not prepared enough to support the didactical integration of ICTs in the school.

Management and organization

As argued before, the integration of ICTs in education requires the creation of a balance between several conditions of which managerial and organizational conditions are one. These conditions concern aspects such as development of a common vision, leadership, creation of facilities for teachers to develop new ways of working, and the change of structural conditions in the school

buildings. A promising indication of the readiness of school principals to adopt and implement ICTs are the positive attitudes that they had towards the expected impact of ICTs on student achievement and life long learning as well as the management in the school.
In order to get all actors in the school on one line, it is crucial that there exists a shared vision in the school which is laid down in a written policy. A written policy exists in roughly 70% of the Jordan schools, which comparatively speaking is a rather high percentage. Most principals (90%) indicated that the development of a common vision was a policy goal of the school. However, in 2/3 of the schools this goal was not or only partially realized. This could mean that schools need support in this area. The kind of support that is needed could be further articulated on the basis of an investigation, during the case studies, of the questions which factors are inhibiting the realization of a common vision.
From the point of view of managing and guiding learning processes, ICTs can offer much support in storing, processing, retrieving and communicating information about students' learning progress. From the monitor it appeared that 40% of the schools are using ICTs for this purpose on a weekly or daily basis, which comparatively is a high percentage. As the monitor did not contain measures on the satisfaction of educational actors with the systems that are in use, a potential action for the near future might be to search for best practices that already exists in Jordan schools and which can be further disseminated to other schools.

Overall reflections
From the first round of the ICT- assessment it appeared that the large scale introduction of ICTs in Jordan secondary schools had a flying start. Future cycles of the monitor will show whether a high rate of change can be maintained. This report is intended to offer some first indications regarding the areas in which further measures to support change processes might be needed.

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Appendices

Principal And Technical Questionnaires