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National Center for Human Resources Development
(NCHRD)

Supervision Committee for Evaluation Studies for Education Reform for Knowledge Economy Project (ERfKE I)

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Evaluation of ICT Resources Provision, Access and Utilization

A Study Report

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Table of Content

List of Tables

List of Figures

EXECUTIVE SUMMARY

Undoubtedly, the introduction of information and communication technologies (ICTs) has changed lives, organizations, strategies and discourse in communities around the world. In the education sphere, enthusiasm abounds over how computers and the Internet can bring improvement in numerous ways. As a result, various educational ICT programs have been initiated, strategies have been developed, hardware has been obtained and software has been designed. Therefore, most attention has been given to establishing good infrastructure and purchasing hardware and software. Less attention has been given to the goals of using ICT in education. In other words, how ICT is changing education and what needs to be done to achieve the goals behind using ICT are still incompletely revealed.

Based on King Abdullah's vision, several initiatives have been launched in different sectors of the society. One of these initiatives was the Education Reform for Knowledge Economy (ERfKE). Launched in the year 2003, the objective of ERfKE project was to help Jordan transform its education system at the early childhood, basic, and secondary levels to produce graduates with the skills needed for the knowledge economy.

The National Center for Human Resource Development (NCHRD) played the role of monitoring and evaluating for ERfKE project and conducted a study to evaluate the ICT resources provision, access and utilization.

In this study, both qualitative and quantitative research techniques were used to collect data.

The sample of this study consisted of 278 schools that were randomly selected from the actual population to represent all geographical regions in the country. Of these schools, 173 were urban, and 105 were rural. Among these schools, 59 were discovery. As for distributing these schools according to the supervising authority, 216 schools were selected from public schools, and 62 were selected from private schools.

The study is expected to provide insight for policymakers into the integration of ICT in the Jordanian school system. To help in this regard, the developmental (overtime) trend of ICT in Jordan was addressed by presenting several main ICT indicators over the years 1999, 2004, and 2008. Moreover, comparing the Jordanian experience of utilizing ICT in education with those of some other countries were also addressed by presenting several international benchmarks.

Highlights of the study results are organized into major topic areas as follows:

School Connectivity with ICTs (Intranet, Internet, Eduwave):

Around 86% of schools are connected to Intranet. Of these, 77% were connected between the years 2003 and 2006. As for Internet, around 72% of schools are connected to the Internet. Of these, 72% were connected between the years 2004 and 2007. Regarding Eduwave, 90% of schools are connected to Eduwave. Of these, 81% were connected between the years 2003 and 2006.

Availability of Computer Labs:

Results indicated that 79% of schools have one to two computer labs. Only 18% of schools reported that they have three to four computer labs. It is worth to mention that 1.4% of schools (4 out of 278 schools) reported that they do not have computer labs.

Student-Computer Ratio:

Results show that around 23% have a ratio of 5 to 10 students per PC. A close percentage (around 25%) of schools has a ratio of 25 to 30 students per PC. A small percentage (10%) of schools reported a ratio of 35 to 40 students per PC. However, around 42% reported a ratio of 15 to 20 students per PC. This last ratio seems to be the dominant among most schools.

Percentage of Classrooms Equipped with PC and ICT Equipment

When asked about the percentage of classrooms that are equipped with PCs, data shows, and/or projectors, a large percentage of respondents (around 88%) reported that classrooms at their schools are not equipped with any of such equipment. However, only around 4% of schools reported that 21 to 22 percent of their classrooms are equipped with such equipment.

Maintenance and Technical Support Arrangements:

Around 67% of respondents reported the availability of maintenance and technical support plans at the school level. A close percentage (61%) reported that at the MoE level, plans regarding hardware/software maintenance are available. It is interesting to notice that 14% of respondents were not sure whether such plans exist at the MoE level.

Occupancy Rate of Computer Labs:

When asked about the occupancy rate of computer labs at their schools, around 58% of respondents reported an occupancy rate of 4 classes and above a day. Around 25% reported an occupancy rate of 2 to 3 classes a day. Only around 7% of respondents reported an occupancy rate of one class a day.

Percentage of Classrooms that Use Computers and ICT Equipment:

When asked to respond to the question "What's the percentage of classrooms in your school that use computers and ICT equipment?" respondents provided a good number of percentages. Most of these percentages fell between 65% and 73%. The three percentages among these that received respondents' highest ratings were: 69%, 65%, and 72%, respectively.

How ICT Teachers Feel about Usability & Reliability of Connectivity & Equipment:

Around 272 ICT teachers were surveyed using the "ICT Teacher Survey". On a Likert-type scale with ranges 0 (Disagree) and 1 (Agree), ICT teachers were asked to rate their agreement with 4 items, which were worded positively. Results indicated that overall ICT teachers tended to disagree with all items. An average mean value of 0.37 indicates negative perceptions toward usability and reliability of connectivity and equipment.

The Degree to which Principals Feels about ICT Utilization in Schools:

On a Likert-type scale with ranges 1 (Hardly or Never), 2 (Partially), and 3 (Completely), principals were asked to rate their perceptions toward the degree of ICT utilization in schools for 4 items. All items on the survey were worded positively. Results indicated positive perceptions of principals toward the utilization of ICT in schools. The average mean value of items is 2.00, which indicates a partial utilization of ICT in schools.

Obstacles Facing the Use and Utilization of ICT:

To address this topic, ICT teachers and school principals were asked to rate some items on a 2-point Likert-type scale, with 0 (Not-Obstacle) and 1(Obstacle). Results show that the first two obstacles that received teachers' highest ranking were as follows: (1) Unfriendly and complicated educational software, and (2) Teachers' unawareness of the use of PCs in education. The Obstacle that received principals' highest ranking was the insufficient variety of educational software.

In light of the results of this study, several recommendations were set forth to help in steering the process of incorporating ICT into Jordanian educational system. These include: providing better technical support solutions for existing ICT infrastructure in schools, for example, by giving computer lab supervisors more responsibility in maintaining their labs; moving toward wireless schools in order to overcome deficiencies in the existing schools' fixed line infrastructure; emphasizing teachers' training to help them transform their classrooms into dynamic, student-centered learning environments;

investing on teachers and students motivation to act as a model of excellence in utilizing ICT in education; preparing backups for educational materials to overcome challenges that hinder the full utilization of computer educational resources; and replicating the successful experience of MIS online in other curricula.

1. CHAPTER ONE: INTRODUCTION

1.1 ICT Definition and Applications in Education

According to UNESCO (2002), information and communication technologies (ICT) consist of such tools as hardware (computers, scanners, digital cameras, etc.) and software (database and multimedia programs), which allow accessing, obtaining, recording, organizing, using and presenting information electronically and telecommunication tools like telephones, faxes, modems, and computers, which make accessing and using information possible.

Whelan (2008) stated that information and communication technologies radically affect school practices, distance education, government and public sector policies, and commercial and economic growth worldwide. ICT has impacted all aspects of society, and its potential to renovate education continues to be widely recognized. Countries all over the world have identified the momentous role of ICT in improving education (Kozma & Anderson, 2002; Hennessy, Ruthven, & Brindley, 2005; Goodison, 2003; Kangro &Kangro, 2004). Therefore, they have invested heavily in increasing the number of computers in schools and in the networking of classrooms (Pelgrum, 2001). In fact, schools have started to restructure their education programs and classroom facilities, in order to decrease the teaching and learning technology gap between today and the future. This process of restructuring demands efficient integration of ICT into existing context in order to supply learners with knowledge of specific subject areas, to encourage meaningful learning and to improve professional productivity (Tomei, 2005).

Gulbahar(2008) has brought up numerous applications of ICT in schools since1980s until recently:

- Computer applications for many school subjects have developed for educational use: programs for drill and practice, instructional programs, simulations, etc.
- A number of general purpose programs have been utilized in the classroom as learning or working tools: word processing programs, database and spreadsheets.
- Email and Internet access have become available to schools.
- Developing a new kind of learning in which teachers support students' learning instead of disseminating knowledge to them.

- Utilizing multimedia programs that enable students to get involved in solving real problems found in daily life.
- The Internet provides students with problems and assignments that are realistic and up to date. It also promotes communication with the world outside the school.
- ICT promotes individualization of instruction: tailoring both the content and the presentation of the subject matter to fit the individual background, experience, and needs of students.
- Students seem to like the use of ICT in the classroom and to be motivated by it.

Hew and Brush (2007) stated that, in primary schools, ICTs offer many opportunities for children to develop their knowledge and understanding of the world. These opportunities, which can enhance teaching in various ways, include:

- Presenting ideas dynamically (e.g. changing word endings, zooming along a number line).
- Providing feedback as children work.
- Offering ability to present information in easily changed forms (e.g. editing text).
- Using mathematical concepts (e.g. sorting, matching, shapes and patterns).
- CD-ROMs can offer "virtual" learning experiences (e.g. a trip to a zoo or another country that are beyond the child's immediate environment).
- Websites designed particularly for pre-school children, who generally can not read, are expected to be of value.
- The mix of drawing and art programs with word processing and possibly sound or music come out to offer opportunities for expressive and aesthetic development.
- In general, ICTs offer a way of motivating learners or engaging them in a curricular area that they might otherwise reject.

In short, ICT plays a valuable role in enhancing and improving education. Consequently, countries around the globe have launched serious initiatives in utilizing ICT in their educational systems.

1.2. Jordan ICT Initiative (ERfKE)

Jordan is a country attempting to develop using ICT in an increasingly globalized world. Although poor in natural resources, Jordan appears to be rich in its educated human resources. In 1999, king Abdullah II urged Jordan's private sector to prioritize the development of Jordan's ICT sector. The king's vision was to make Jordan a regional IT center in the Middle East, especially among Arab countries. Inspired by this vision, Jordan has engaged in a number of initiatives to develop vigorous, export-oriented ICT services that can enable Jordan to become a regional leader and internationally recognized exporter of ICT products and services (Nusseir, 2001).

One of these initiatives was the Education Reform for Knowledge Economy (ERfKE). Launched in the year 2003, the objective of ERfKE project was to help Jordan transform its education system at the early childhood, basic, and secondary levels to produce graduates with the skills needed for the knowledge economy. There are four main components in the ERfKE project (Al-Jaghoub & Westrup, 2003):

1. Reorientation of the education system policy objectives and strategy through governance and administrative reform.
2. Restructuring and realignment of education programs and practices to achieve relevant learning outcomes.
3. Achieving universal basic education through cost-effective measures.
4. Promoting readiness for learning through early childhood education.

In conclusion, the strategy of ERfKE is to build up a quality education system that makes Jordan the "hub" for ICT and an engine of economics progress and development in the region. This aligns with the Jordanian King's vision to see Jordan developing its human resources through education in order that the workforce of the future is equipped with the skills which will be needed.

1.3. Study Rationale

As mentioned earlier, Jordan has launched ground-breaking initiatives to prepare the citizenry for the global "knowledge economy." This has become an increasingly common element of the national education policy. One of the main strategies adopted by the government of Jordan to achieve these initiatives is the incorporation of ICT into the learning systems. The Education Reform for Knowledge Economy (ERfKE) is one of the best Jordanian initiatives that aimed at improving and enhancing the education system by employing and integrating ICT in the school settings.

According to Becker & Ravitz (2001), many researchers have expected that the significance of ICT in the classroom will continue to increase. However, the integration of ICT in the school curriculum continues to be a complex and challenging process (Cooper, 1998). In fact, it can be argued that in practice this integration process has focused more on the purchase and installation of computers and Internet connections in schools, than on improving curricula, pedagogy, teacher training or support. In other words, the extent to which existing ICT resources (computers, hardware, software, Intranet, Internet, extranet, etc.) in schools are being used and utilized for instructional purposes is still very much undetermined. Therefore, the issue of evaluating ICT resources in Jordanian schools is crucial and needs continuous monitoring and evaluation.

The National Center for Human Resource Development (NCHRD) played the role of monitoring and evaluating for ERfKE project and conducted a study to evaluate the ICT resources provision, access and utilization. The study is expected to provide insight for policymakers into the integration of ICT in the Jordanian school system.

It is our hope that this study report makes a valuable contribution towards a better understanding of how ICT is being used and utilized in the Jordanian school environment.

1.4. Objectives of the Study

The objectives of this study along with their corresponding topics are displayed in Table 1.1 –below. As shown, the first column displays four main objectives, while the second column displays the topics that correspond with each objective.

Table 1.1: **The Main Objectives that Derived the ICT Study**

Objective	Topics Addressed
1. Assessing School Connectivity and Availability of ICT Resources	**a.** The degree to which schools are connected with information communication technologies (percentage of school with intranet, percentage with Internet, percentage of schools with access to Eduwave, percentage of schools with access to e-content). **b.** Availability of computer labs (Number of computer labs per school, number of PCs per computer lab per school, Student computer ratio at school, percentage of classrooms at school with computer/data shows/projector/video/…) **c.** Maintenance and technical support arrangements at schools and centrally (hardware/software maintenance plans, responsibilities for maintenance, help, and troubleshooting). **d.** Conditions and quality of computer labs (educational aspects dimensions, environmental aspects (lighting, painting, dimensions per students. **e.** Security for equipment and information.
2. Assessing the Utilization of ICT Equipment and Facilities	**a.** Occupancy rate of computer labs. **b.** Percentage of administrative use of computers for each aspect of management (such as scheduling, staffing, communication, knowledge management, writing documents, maintaining budgets, reporting data such as grades, maintaining attendance and grades, tracking students). **c.** Percentage of classrooms that use computers and ICT equipments. **d.** How computers and ICT equipment are used in the classrooms.
3. Assessing Perception of School Principals, Teachers, Students, and Parents of ICT	**a.** How the school community feels about usability and reliability of connectivity and equipment. **b.** The degree to which each group feels about ICT utilization at schools. **c.** What people like about the different elements of ICT at schools. **d.** Obstacles facing the use and utilization of ICT. **e.** The degree to which people are satisfied with the support level. **f.** The degree to which people are satisfied with the Eduwave platform.

Objective	Topics Addressed
4. Investigating the Association between Effective Use of ICT at School and Student Achievement Utilizing the Results of Various M&E (Monitoring& Evaluation Unit at NCHRD) studies such as NAfKE	The various studies conducted/supervised by the Monitoring& Evaluation Unit (M&E) at NCHRD: NAfKE, etc.

2. CHAPTER TWO: METHODOLOGY

Qualitative and quantitative research techniques were used for this descriptive study (Bogdan & Biklen, 1998, Glesne, 1999). The rationale of employing mix methodology of data collection is using questionnaires only might result in too much concentration on the product rather than the process of learning with ICT. The most thorough types of evaluation methodology use data gathered in a variety of ways, including interviews, observations, and surveys (Babbie, 2005).

Some interactions between people and technology are best studied through observation. As this can be a resource-hungry process, the staff and learner questionnaires include questions designed to highlight these interactions. Comparisons of data collected via multiple data collection strategies can be very illuminating.

Perceptions of students, teachers and administrative staff were taken through questionnaires. Additionally, unstructured interviews and classroom observations were conducted in diverse schools to acquire deeper understanding of the way ICT is being utilized and the perceptions that students, teachers, and principals have about ICT.

In this descriptive study, *SITES* 2006 principal and ICT teacher modified questionnaires were used to collected data about ICT infrastructure, utilization, and participants' perceptions about the use of ICT in the process of teaching and learning. In addition to that, several unstructured interviews with principals, ICT teachers, teachers of different fields (Physics, English, Mathematics, and Arabic), students, and parents were conducted for the sake of capturing the whole picture of utilizing ICT in the process of teaching and learning (Janesick, 2000).

2.1. Population and Sampling

The population of the study included all Jordanian public and private schools that are distributed all over the country. The sample of this study consisted of 278 schools that were randomly selected from the actual population to represent all geographical regions in the country (Table 2.1).

Table 2.1: Areas of Schools

Area	Frequency	Percentage
Amman	142	51.4
Irbid	36	12.9
Zarqa	14	5.0
Madaba	8	2.9
Jarash	1	0.4
Ajloun	9	3.2
Al-Mafraq	23	8.3
Al-Salt	13	4.7
Karak	12	4.3
Tafeleh	4	1.4
Ma'an	6	2.2
Aqaba	9	3.2
Total	278	100

In choosing the sample for this study, researchers considered several criteria to ensure the representation of the sample to the whole study population. The first criterion was the school location. Among the 278 schools, 173 schools were urban schools, while 105 schools were rural schools (Table 2.2).

Table 2.2: Location of Schools

Location	Frequency	Percentage
Urban	173	62.2
Rural	105	37.8
Total	278	100

The second criterion was the school gender. The sample of the study consisted of 104 male schools, 90 female schools were schools, and 84 mix schools (Table 2.3).

Table 2.3: Gender of Schools

Gender	Frequency	Percentage
Male	104	37.4
Female	90	32.4
Mix	84	30.2
Total	278	100

The third criterion was the school classification (Discovery/ Non Discovery), in the final sample of the study, 59 schools were discovery schools and 219 were non discovery schools (Table 2.4).

Table 2.4: Classification of Schools

Classification	Frequency	Percentage
Discovery	59	21.2
Non-Discovery	219	78.8
Total	278	100

The fourth criterion was the type of school (Public/Private), 216 schools of the study sample were public schools and 62 were private schools (Table 2.5).

Table 2.5: Type of Schools

Type	Frequency	Percentage
Public	216	77.7
Private	62	22.3
Total	278	100

2.2. Data Collection

The data collection consisted of the administration of the two questionnaires that were created by Pelgrum & Anderson (1999) and adapted to the Jordan environment by Ajlouni & Pelgrum (2004): one questionnaire was administered to the ICT teacher and one for the principal of the schools. Therefore, results presented in this report correspond to the ICT Teacher's perceptions and/or those of each school's principal.

In addition to survey instruments, we conducted 45 unstructured interviews with schools principals, ICT teachers, physics teachers, Mathematics teachers, Arabic Teachers, English teachers, and computer lab supervisors. Each interview lasted from 20 minutes to One hour. All interviews were audio taped using digital voice recorders. Figure 2.1 shows the approach used to collect and analyze data in this study.

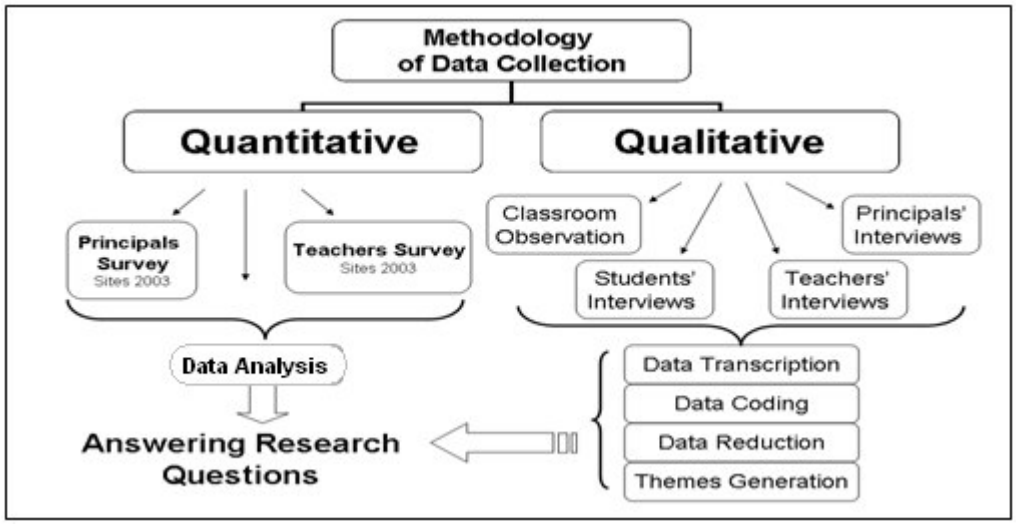

Figure 2.1. Methods of data collection and analysis.

2.3. Data Analysis

Within the quantitative approach of this study, we analyzed the data collected by the survey instrument by utilizing the SPSS 16.0 for the computation of descriptive statistical measures.

With regard to the qualitative data sources, all interviews were transcribed by a specialist transcriber and transformed into word format. The interviews transcripts and observations then undergo through extensive analysis by utilizing the recent qualitative data analysis strategies that consist of three stages: (1) *open coding*, (2) *selecting themes*, (3) *focused coding* (Emerson et al., 1995). In open coding, we read the data line-by-line to identify and formulate any and all ideas, themes, or issues the interviewees suggest, no matter how varied and disparate. In focused coding, we

subjected our field-notes to fine-grained, line-by-line analysis on the basis of topics that we identified as of particular interest from the earlier open coding process.

3. CHAPTER THREE: RESULTS

This chapter presents the results of the analyses of data gathered in the study. While the first four sections of the chapter display results pertaining each of the four main objectives of the study, the last section presents four case studies of schools from which data were collected qualitatively by the researchers (through unstructured interviews and observations).

3.1. Results Pertaining Study Objective #1:

The first objective was concerned with assessing school connectivity and availability of ICT resources. The results are organized according to the topics addressed under this objective:

School Connectivity with ICTs (Intranet, Internet, Eduwave)*:*

To address this topic, the 278 respondents were asked to provide whether their schools are connected or not connected to Intranet, Internet, and Eduwave. They were also asked to provide the year of connectivity to each of these ICT technologies if their schools are connected. It's necessary to re-mention that the 278 respondents represented 278 schools that formed the sample for this study.

Regarding Intranet, Figure 3.1 displays the percentages of schools connected to Intranet. In addition, Figure 3.2 presents percentages of years of connectivity to Intranet for schools having connections with Intranet.

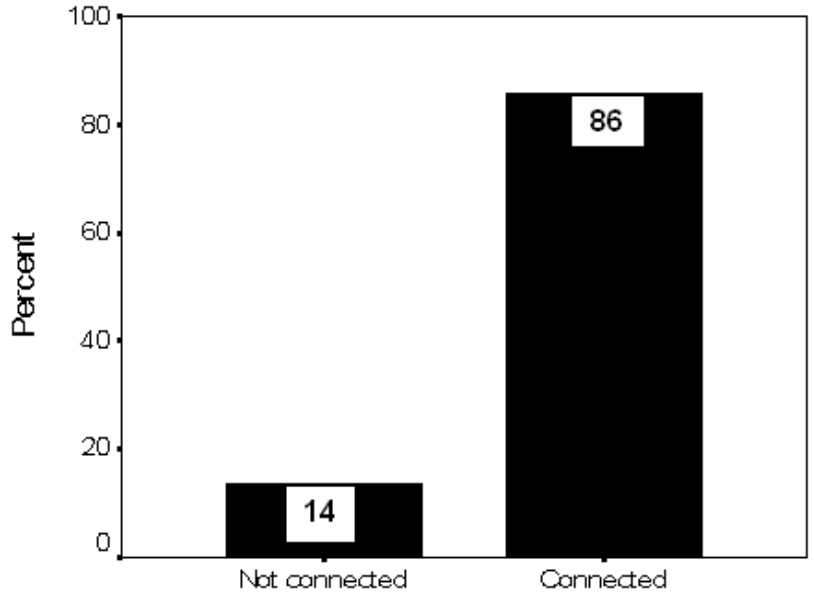

Figure 3.1**: Percentages of School Connectivity to Intranet**

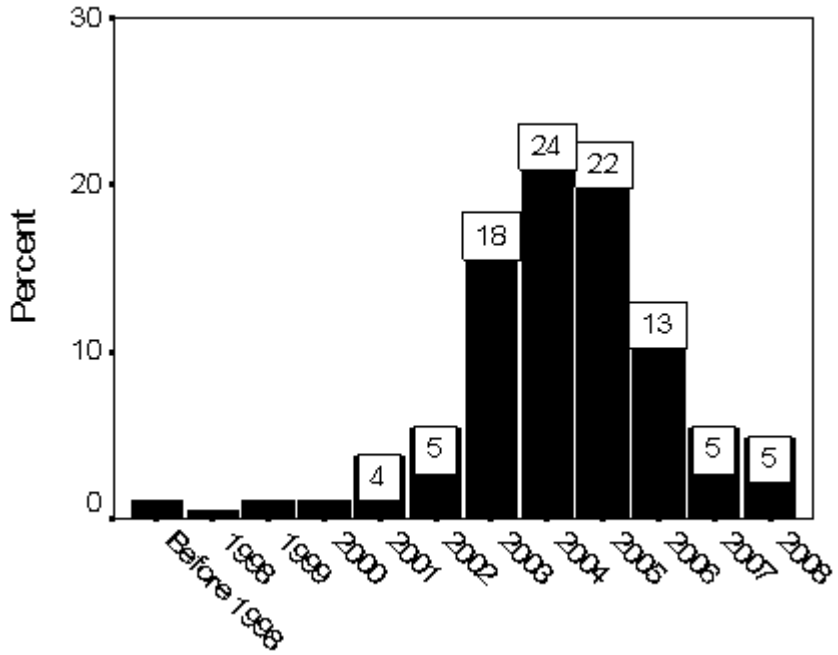

Figure 3.2**: Percentages of Years of Connectivity to Intranet**

According to the above two figures, 86% of schools are connected to Intranet. Of these schools, 77% were connected between the years 2003 and 2006. It is worth to mention that the year 2004 witnessed the highest percentage of connectivity to Intranet (24%).

As for Internet, Figure 3.3 displays the percentages of schools connected to Internet. In addition, Figure 3.4 presents percentages of years of connectivity to Internet for schools having connections with Internet.

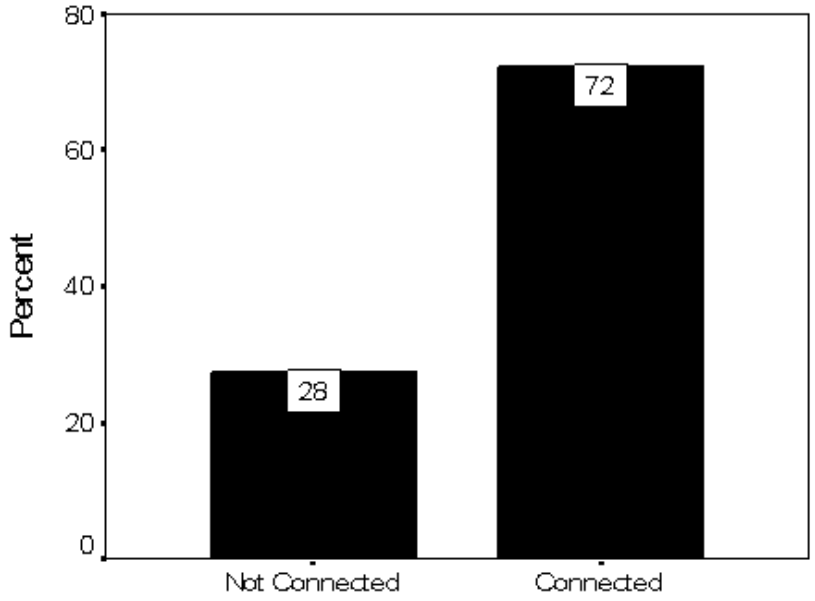

Figure 3.3**: Percentages of School Connectivity to Internet**

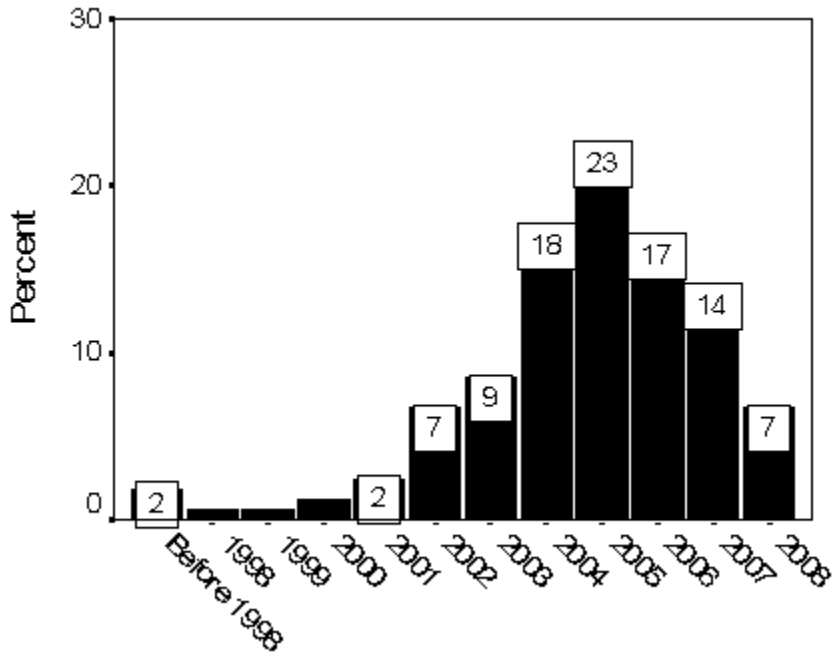

Figure 3.4**: Percentages of Years of Connectivity to Internet**

According to the above two figures, 72% of schools are connected to Internet. Of these schools, 72% were connected between the years 2004 and 2007. One can notice that the year 2005 witnessed the highest percentage of connectivity to Internet (23%).

Concerning Eduwave platform, Figure 3.5 displays the percentages of schools connected to Eduwave. In addition, Figure 3.6 presents percentages of years of connectivity to Eduwave for schools having connections with Eduwave.

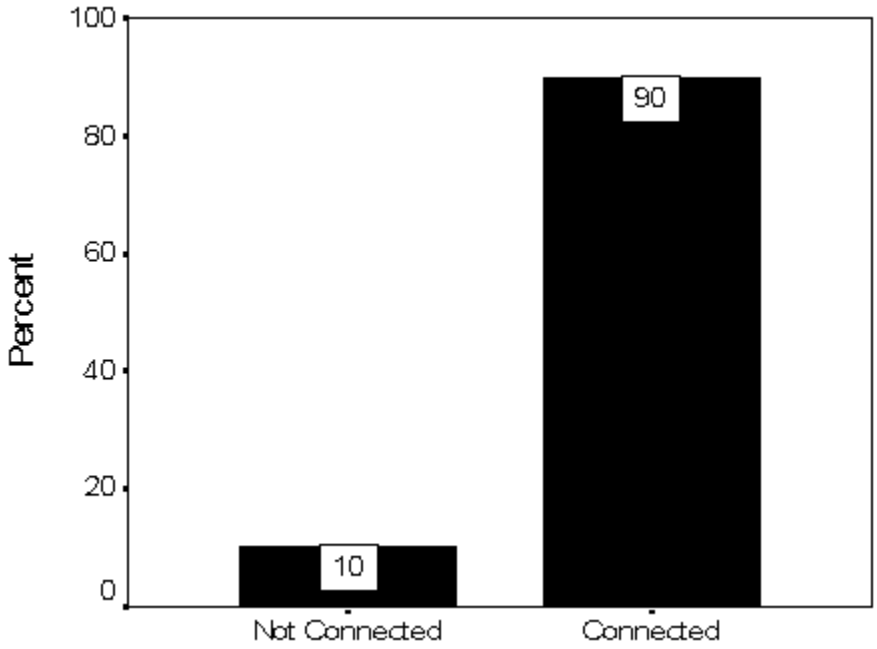

Figure 3.5**: Percentages of School Connectivity to Eduwave**

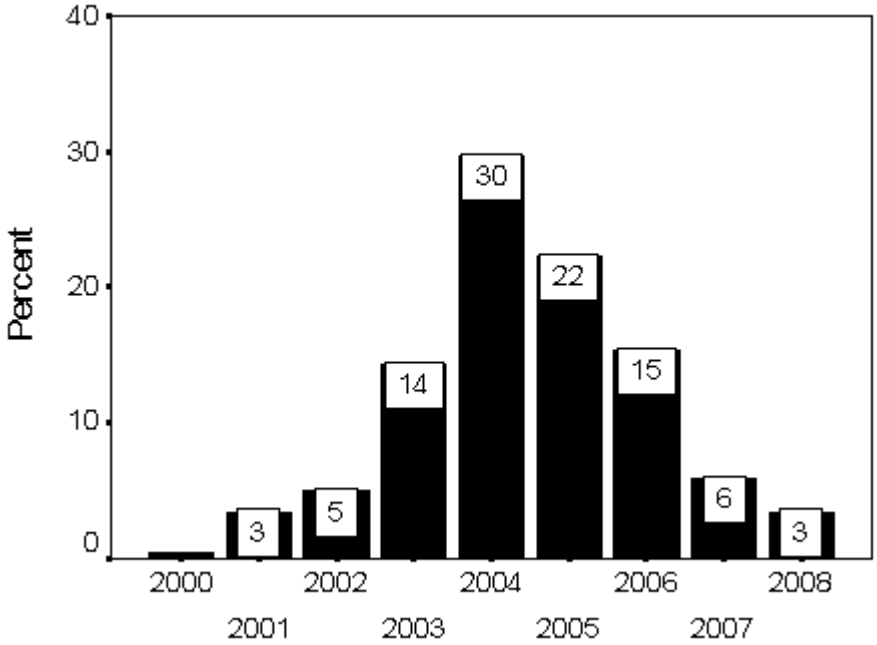

Figure 3.6**: Percentages of Years of Connectivity to Eduwave**

According to the above two figures, 90% of schools are connected to Eduwave. Of these schools, 81% were connected between the years 2003 and 2006. It is important to mention that the year 2004 witnessed the highest percentage of connectivity to Eduwave (30%).

It is worth noting here that Eduwave Platform is the official e-Learning and Educational Management System utilized by the Ministry of Education and its schools in Jordan. The platform includes Learning Management, Content Management, Instructional Management, and Student Information System. The platform is also used as a delivery mechanism for MoE's e-content material which is made available for access by users through Eduwave Portal. Eduwave is deployed centrally at MOE Data Center at Hashem and is accessed by all users remotely through the Internet or the MoE's intranet.

Availability of Computer Labs:

In addressing this topic, respondents were asked to provide information regarding the number of computer labs available at their schools. These labs are usually open for classes that require the use of computers by individual students. Labs are also open for students and teachers when not occupied by classes. Teachers usually reserve labs for certain classes throughout the semester. Reservations are usually made at the beginning of the semester.

Figure 3.7 displays the percentages of availability of computer labs per school. Based on the figure, one can say that 79% of schools have one to two computer labs. However, only 18% of schools reported that they have three to four computer labs. It is worth to mention that 1.4% of schools (4 out of 278 schools) reported that they do not have computer labs.

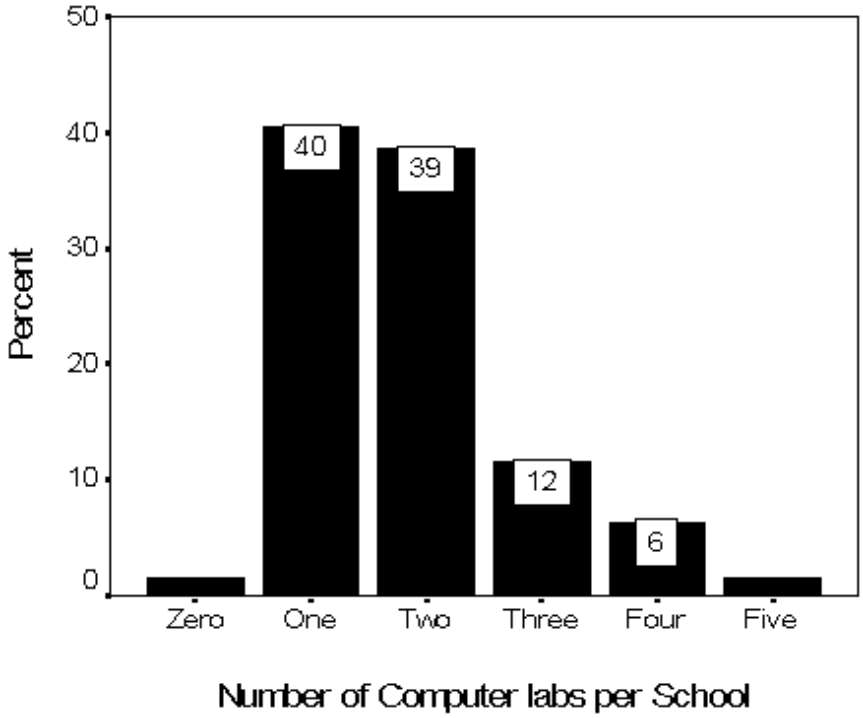

Figure 3.7**: Percentages of Availability of Computer Labs per School**

In the meantime, the information presented in Figure 3.7 may not be sufficient if the number of PCs per each lab is not provided. This additional piece of information is presented in Figure 3.8. As shown in the figure, 34% of respondents (schools) reported that on the average they have 18 PCs per computer lab. This is considered the highest average among all. While 27% of schools reported that they have 13 to 14 PCs per computer lab, only 9% reported that they have 23 PCs per lab.

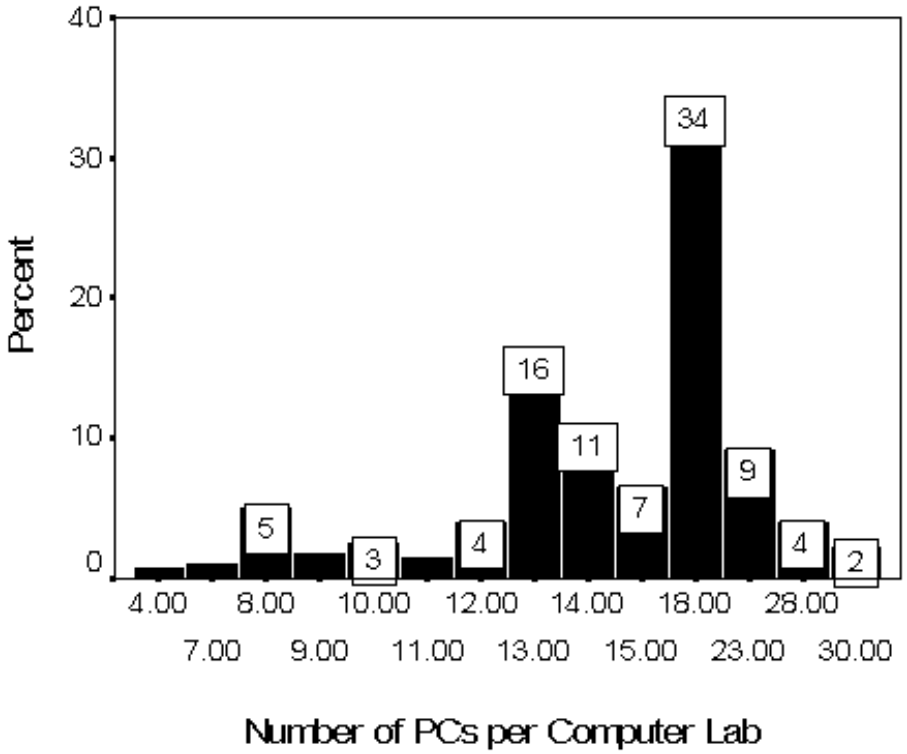

Figure 3.8**: Percentages of the Number of PCs per Computer Lab**

Concerning the student-computer ratio, Figure 3.9 displays the frequencies of different student-computer ratios across the sample of the study (i.e. 278 schools). According to this figure, 64 schools (around 23%) have a ratio of 5 to 10 students per PC. A close percentage (around 25%) of schools has a ratio of 25 to 30 students per PC. A small percentage (10%) of schools reported a ratio of 35 to 40 students per PC. However, 114 schools (around 41%) reported a ratio of 15 to 20 students per PC. This last ratio seems to be the dominant among most schools.

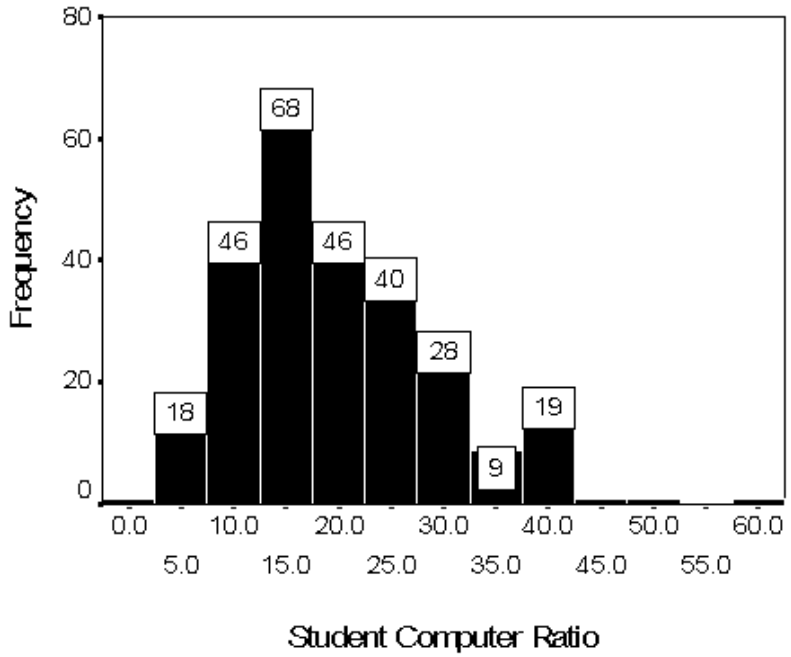

Figure 3.9**: Frequencies of Student-Computer Ratios**

When asked about the percentage of classrooms that are equipped with PCs, data shows, and/or projectors, a large percentage of respondents (around 88%) reported that classrooms at their schools are not equipped with any of such equipment, see Figure 3.10. However, only around 4% of schools reported that 21 to 22 percent of their classrooms are equipped with these equipment.

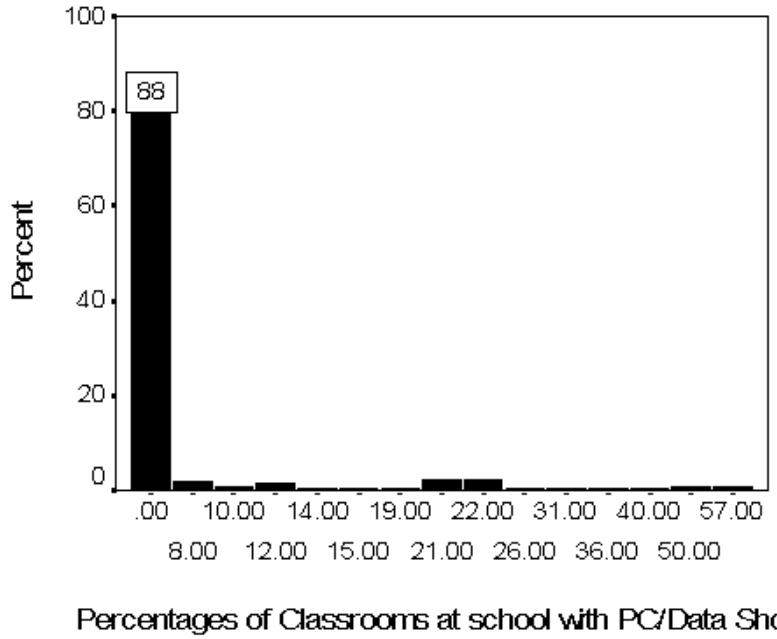

Figure 3.10**: Percentages of School Classrooms with PC/Data-show/Projector**

Maintenance and Technical Support Arrangements:

Respondents were asked about the availability of hardware/software maintenance plans at both school Level and Ministry of Education (MoE) level. Sixty-seven percent of respondents reported the availability of such plans at the school level (Figure 3.11). A close percentage (61%) reported that at the MoE level, plans regarding hardware/software maintenance are available (Figure 3.12). It is interesting to notice that, as shown in Figure 3.12, 14% of respondents were not sure whether such plans exist at the MoE level.

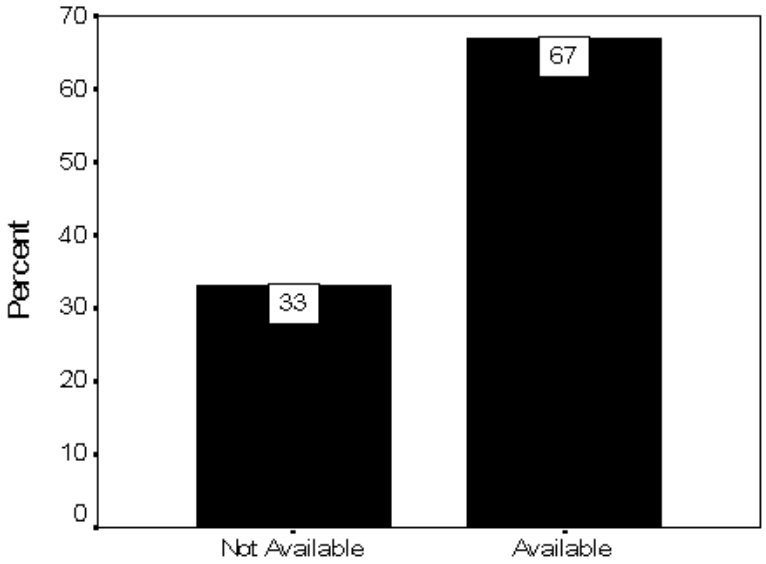

Figure 3.11**: Availability of Hardware/Software Maintenance Plans at School Level**

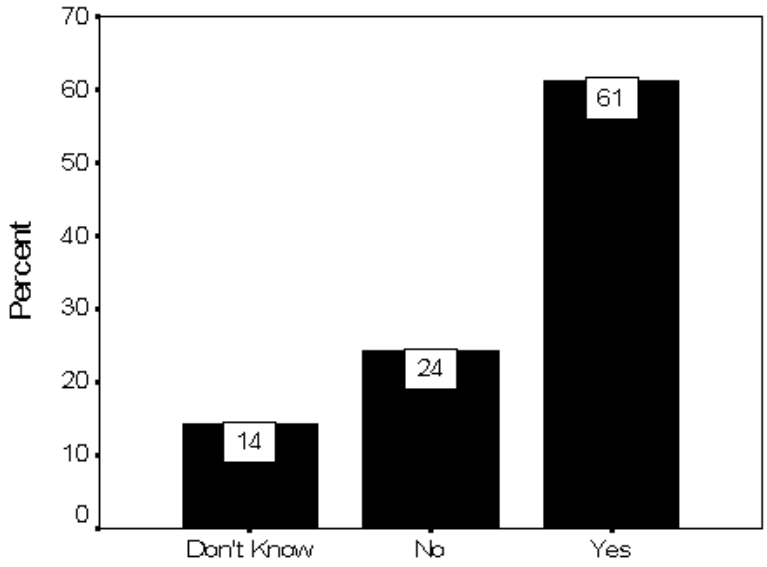

Figure 3.12**: Availability of Hardware/Software Maintenance Plans at MoE Level**

Conditions and Quality of Computer Labs:

Conditions and quality of computer labs refer to the educational and environmental aspects of computer labs at schools. Subjects addressed under this topic included: data show availability in PC labs, suitability of space to the number of PCs, lighting quality, paint and cleanness in PC labs, and space between PCs.

Figure 3.13 addresses the availability of data shows in PC labs. According to the figure, 79% of schools participated in the study have computer labs that are equipped with data shows.

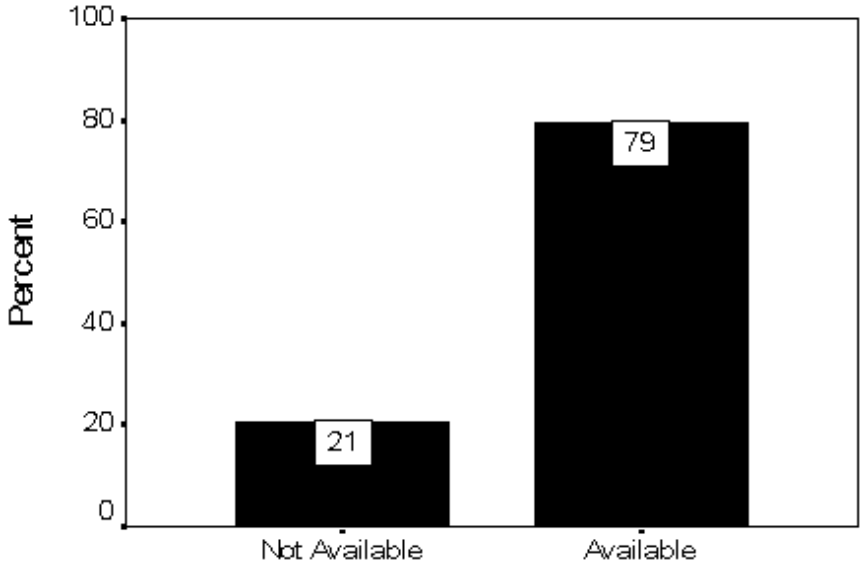

Figure 3.13**: Availability of Data-Shows in Computer Labs**

One of the other subjects that was investigated under conditions and quality of computer labs in schools is the suitability of space to the number of PCs. As shown in Figure 3.14, around 76% of the 278 respondents reported that the spaces of their computer labs are suitable to the number of PCs exist in these labs. Only around 24% of the schools have problems with the space of their computer labs compared to the number of PCs they have.

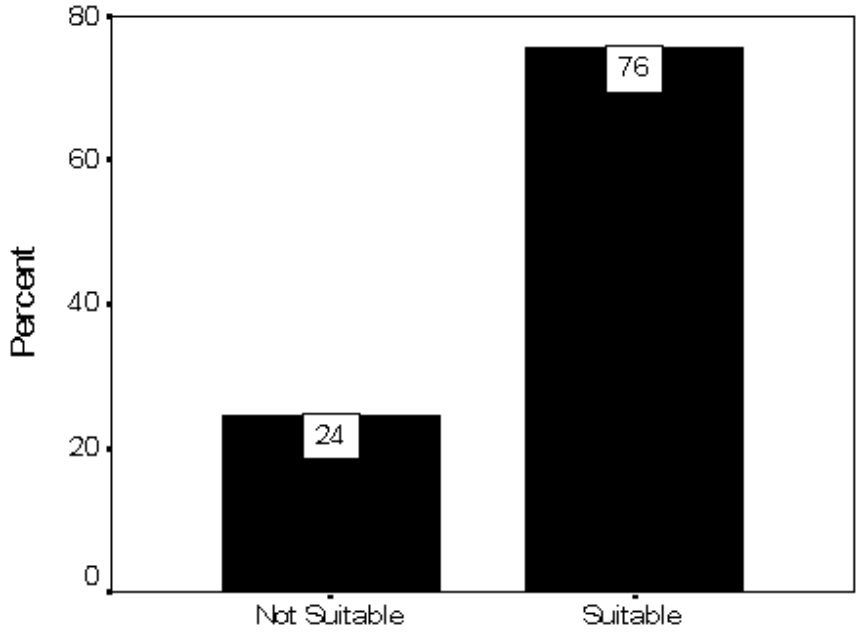

Figure 3.14**: Suitability of Space to the Number of PCs in Computer Labs**

When it came to the lighting quality in computer labs, the percentage of respondent who reported a good lighting quality was really high. Figure 3.15 shows that while 94% of schools have good lighting quality in their compute labs, only around 6% of schools suffer from bad quality of light.

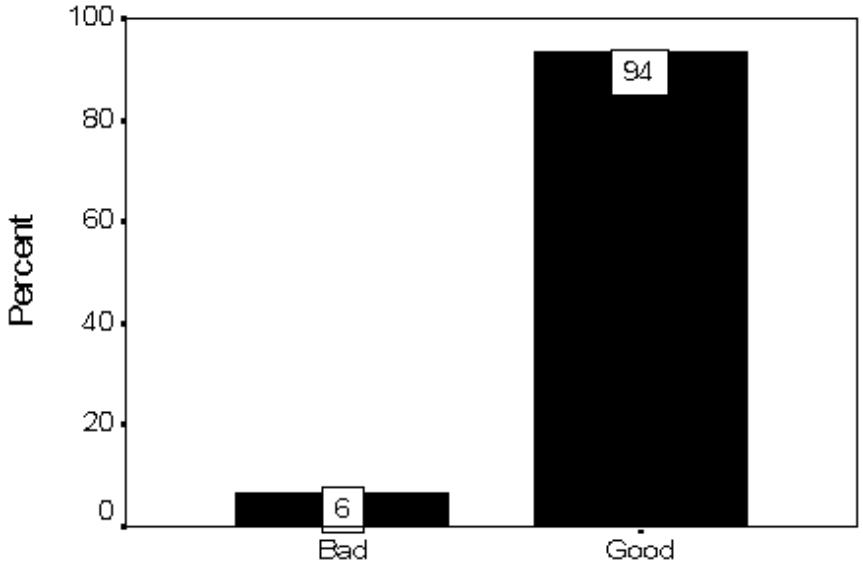

Figure 3.15**: Lighting Quality in Computer Labs**

The quality of painting and cleanness in computer labs was very similar to the quality of light according to respondents. Around 91% of respondents agreed on a good quality of painting and cleanness in their computer labs (Figure 3.16). Only around 9%

of schools participating in the study had bad quality of painting and cleanness in their computer labs.

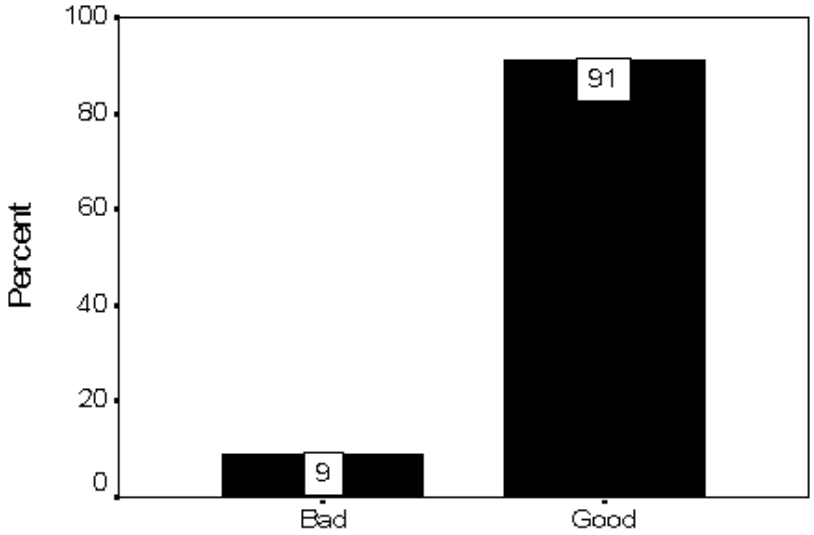

Figure 3.16**: Quality of Painting and Cleanness in Computer Labs**

Enough space between PCs in computer labs was the last subject investigated under the condition and quality of computer labs. According to Figure 3.17 –below, around 69% of respondents reported that the space available between PCs in their computer labs was enough. This is important for teachers and students to move around freely. Based on the same figure, 31% of the schools in the study sample do not have enough space between PCs in their computer labs.

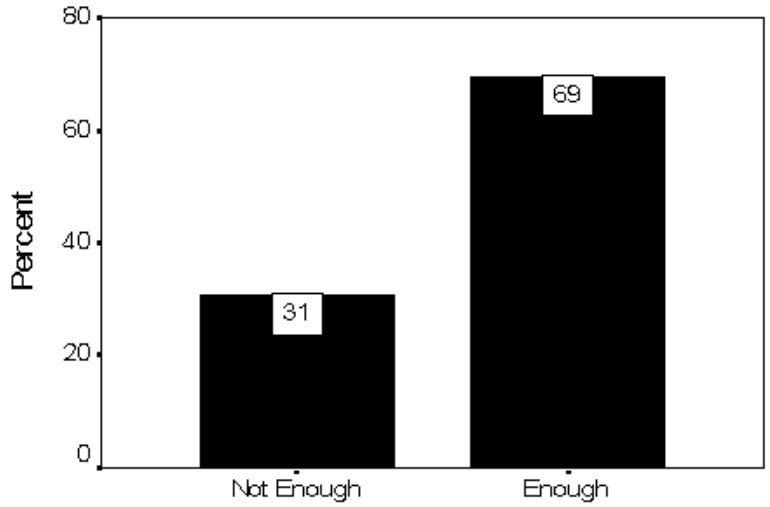

Figure 3.17**: Space between PCs in Computer Labs**

Security for Equipment and Information:

Under security for equipment and information, two main subjects were discussed: availability of antivirus software, and availability of antitheft alarm systems.

When asked about the availability of antivirus software in computer labs, around 69% of respondents reported that they have software to protect their computers from viruses. However, around 31% of schools lack this kind of protection and their computers are subject to virus attack. These percentages are shown in Figure 3.18.

Unlike antivirus software, the antitheft alarm systems do not seem to be generally available in the schools participated in the study. As depicted in Figure 3.19, around 95% of respondents reported that they do not have antitheft alarm systems. Only around 5% reported the existence of such systems in their computer labs.

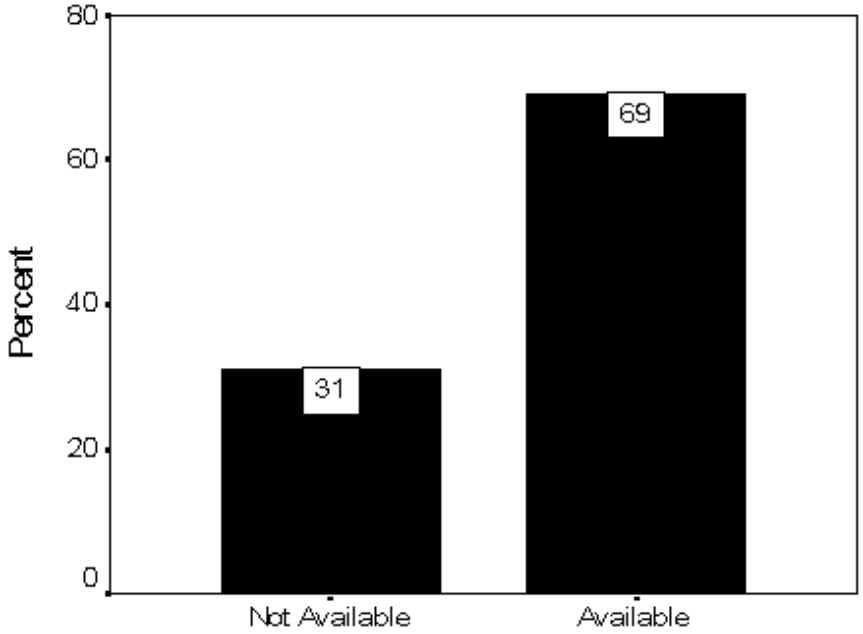

Figure 3.18**: Availability of Antivirus Software in Computer Labs**

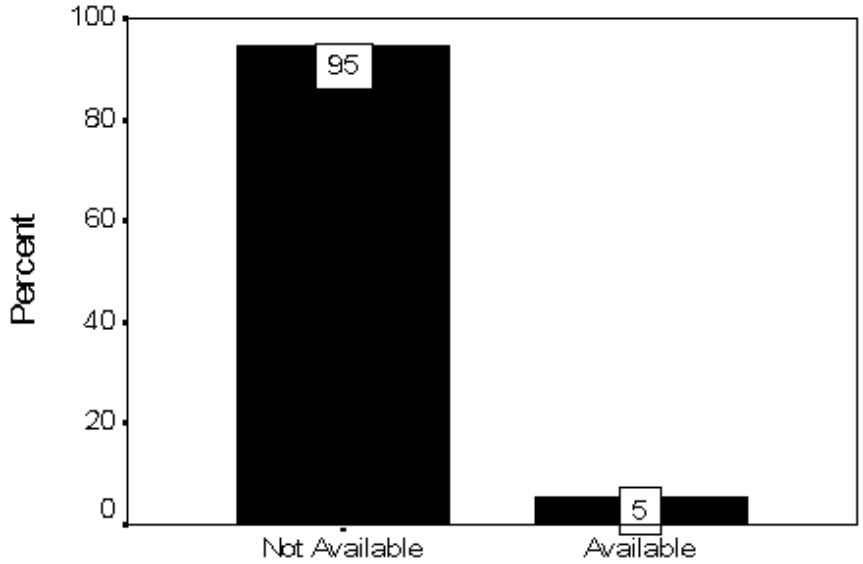

Figure 3.19**: Availability of Antitheft Alarm System in Computer Labs**

3.2. Results Pertaining Study Objective #2:

The concern of the second objective was in assessing the utilization of ICT equipment and facilities. Topics discussed under this objective include: occupancy rate of computer labs, percentage of administrative use of computers for each aspect of management, percentage of classrooms that use computers and ICT Equipment, and how computers and ICT equipment are used in the classroom.

Occupancy Rate of Computer Labs:

When asked about the occupancy rate of computer labs at their schools, around 58% of respondents reported an occupancy rate of 4 classes and above a day. Around 25% reported an occupancy rate of 2 to 3 classes a day. Only around 7% of respondents reported an occupancy rate of one class a day. It's interesting to mention that, as shown in Figure 3.20, around 10% of respondents reported that their computer labs never get occupied

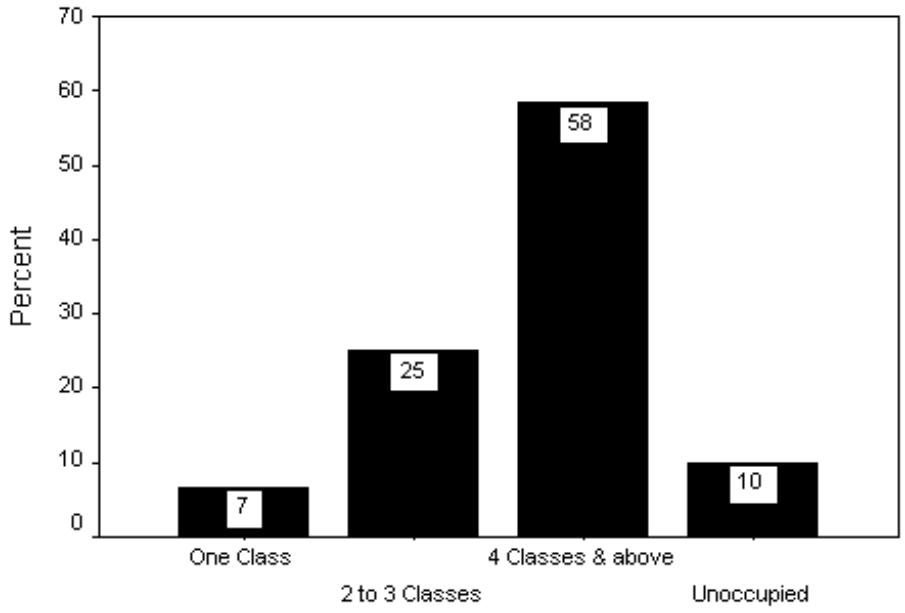

Figure 3.20**: Occupancy Rate of Computer Labs (Daily basis)**

Percentage of Administrative Use of Computers for Each Aspect of Management:

The aspects of management of the use of computers in school administration include: PC use for scheduling, PC use for staffing, PC use for communication, PC use for knowledge management, PC use for writing documents, PC use for maintaining budgets, PC use for reporting grades, and PC use for tracking attendance.

On a Likert-type scale with ranges "Weekly", "Monthly", "Sometimes", and "Never", administrators were asked to rate the administrative use of computers at their schools for each aspect. The results of the analysis are displayed next.

PC Use for Scheduling: Almost half of the respondents "administrators" (49%) reported that they sometimes use PCs for scheduling. However, on a monthly basis, around 23% reported the use of PCs for scheduling. In almost 6% of the schools participated in the study, PCs are used for scheduling on a weekly basis. It is worth to mention that in almost 21% of the schools, PCs have never been used for scheduling. Figure 3.21 shows the percentages of using PCs for scheduling.

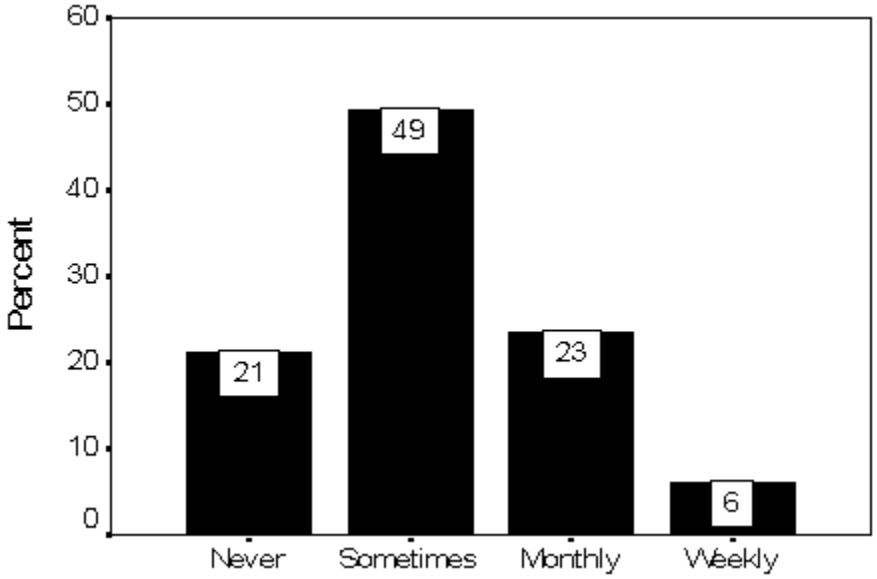

Figure 3.21**: Percentages of PC Use for Scheduling**

PC Use for Staffing: Almost 36% of respondents (around 100 out of 278 participants) reported that they use PCs for staffing on a monthly basis (Figure 3.22). A close percentage of respondents (around 33%) use it for this purpose on a weekly basis. Twenty two percent of respondents stated that they sometimes use PCs for staffing. Only around 9% of respondents reported that at their schools they have never used PCs for staffing.

PC Use for Communication: Unlike PC use for staffing, PC use for communication has a distribution that's almost the reverse. In almost 38% of schools participated in the study (around 106 of 278 schools), PCs have never been used for communication, according to Figure 3.23. Based on the same figure, around 28% of respondents reported that they sometimes use PCs for communication. On a monthly basis, around 23% of respondents stated that they use PCs for communication. Only around 11% of respondents reported that they use PCs for communication weekly.

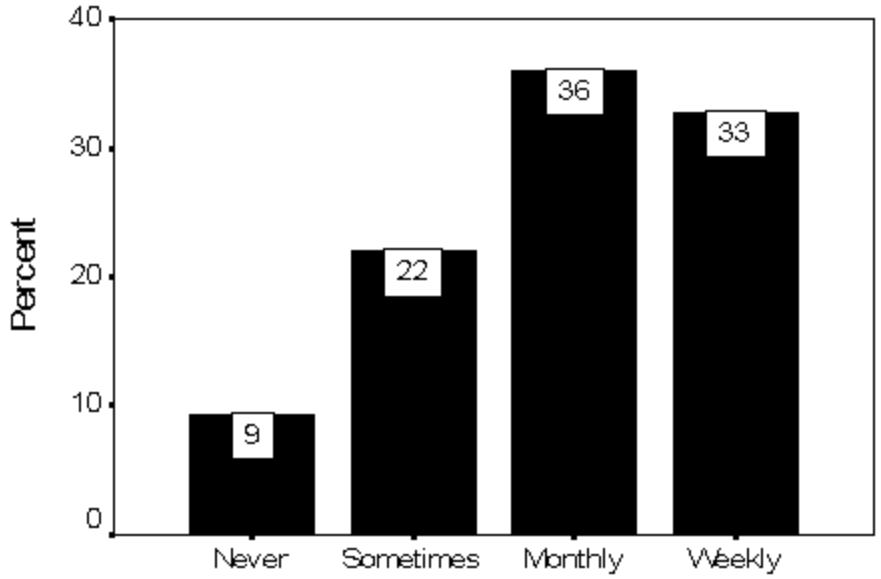

Figure 3.22**: Percentages of PC Use for Staffing**

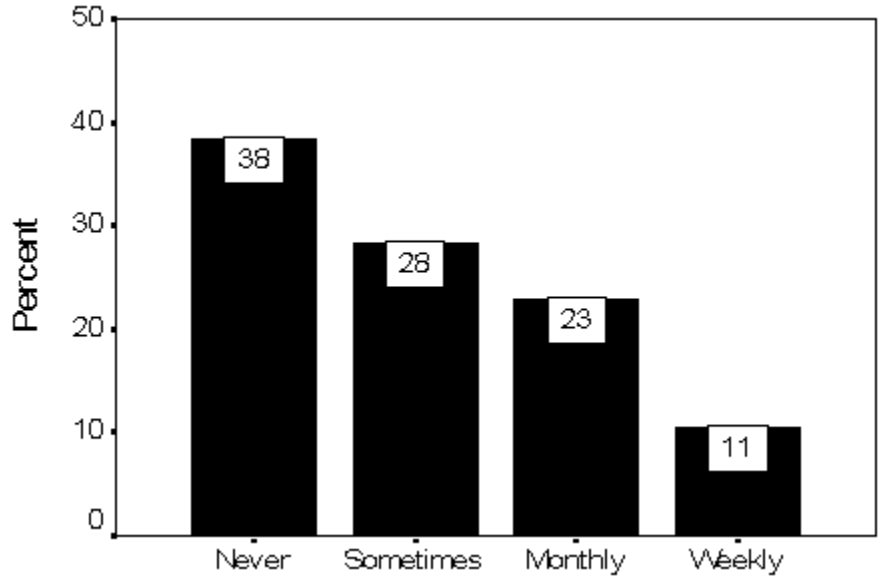

Figure 3.23**: Percentages of PC Use for Communication**

PC Use for Knowledge Management: The story of PC use for knowledge management is almost similar to that of PC use for communication. In almost 27% of schools participated in the study, PCs have never been used for knowledge management, as shown in Figure 3.24. According to the same figure, around 36% of respondents reported that they sometimes use PCs for knowledge management. On a monthly basis, around 28% of respondents stated that they use PCs for knowledge management. Only around 9% of respondents reported that they use PCs for knowledge management weekly.

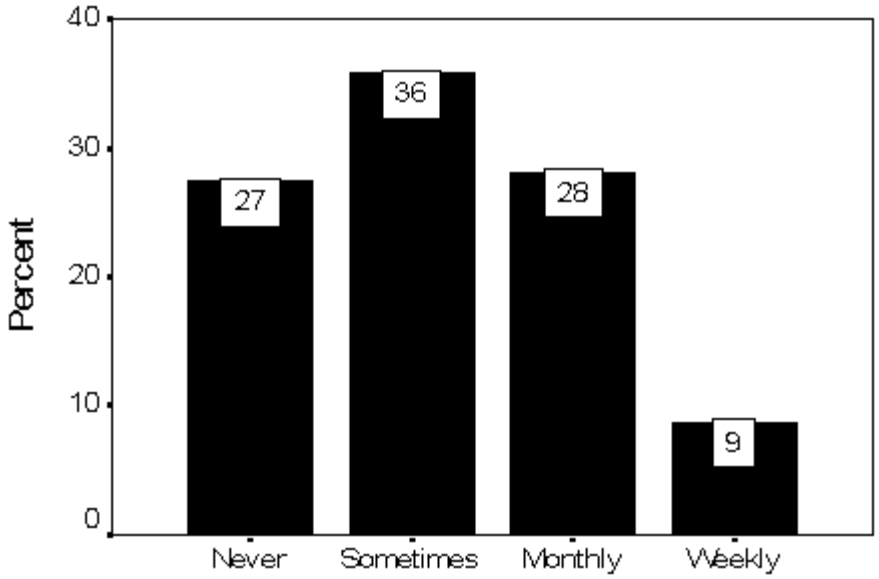

Figure 3.24**: Percentages of PC Use for Knowledge Management**

PC Use for Writing Documents: Almost unlike all previous administrative uses of PC, the use of PC for writing documents has a different frequency distribution. According to Figure 3.25, around 76% of schools participated in the study (211 out of 278 schools) reported that they weekly use PCs for writing documents. Based on the same figure, around 8% of schools use PCs for that purpose on a monthly basis. Around 11% of respondents stated that they sometimes use PCs for writing documents. Only around 5% of respondents reported that they have never used PCs for writing documents.

PC Use for Maintaining Budgets: Almost 37% of respondents (around 103 out of 278 participants) reported that they use PCs for maintaining budgets on a monthly basis (Figure 3.26). As shown in the figure, a percentage of 29 of respondents sometimes use PCs for the same purpose. Around 12% percent of respondents stated that they weekly use PCs for maintaining budgets. It's interesting to notice that around 21% of respondents (59 out of 278 respondents) reported that at their schools they have never used PCs for maintaining budgets.

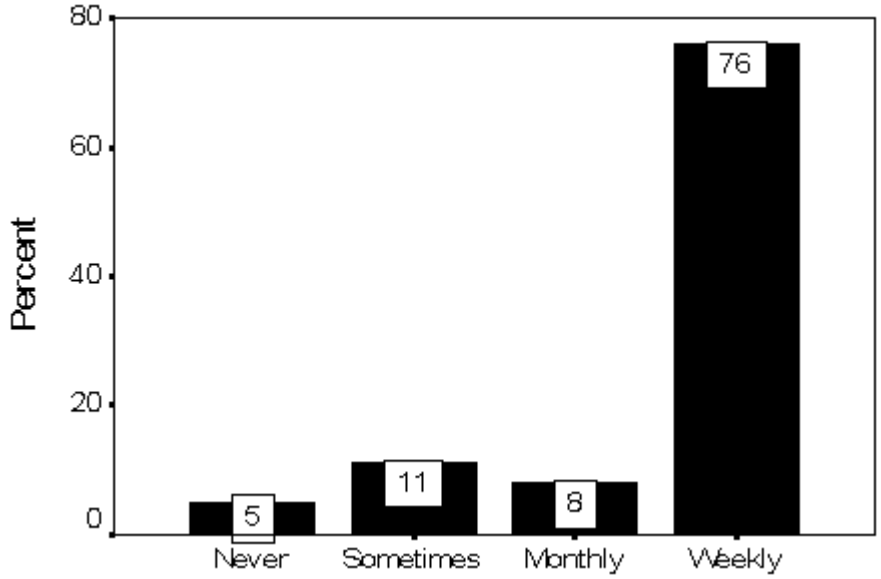

Figure 3.25**: Percentages of PC Use for Documents Writing**

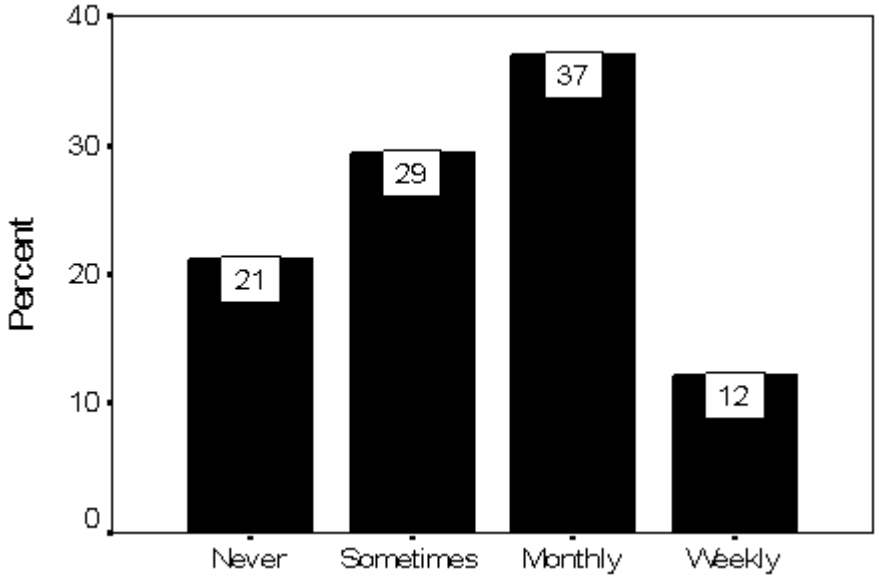

Figure 3.26**: Percentages of PC Use for Maintaining Budgets**

PC Use for Reporting Grades: According to Figure 3.27, around 79% of schools participated in the study (219 out of 278 schools) reported that they monthly use PCs for reporting grades. Based on the same figure, around 14% of schools use PCs for that purpose on a weekly basis. Around 4% of respondents stated that they sometimes use PCs for reporting grades. Only around 3% of respondents reported that they have never used PCs for reporting grades. It is worth to mention that reporting grades is usually done through Eduwave platform. Teachers are required to report students' grades after

the first month examination, the second month examination, and the final examination. This may explain why 79% of respondents monthly use PCs to report students' grades.

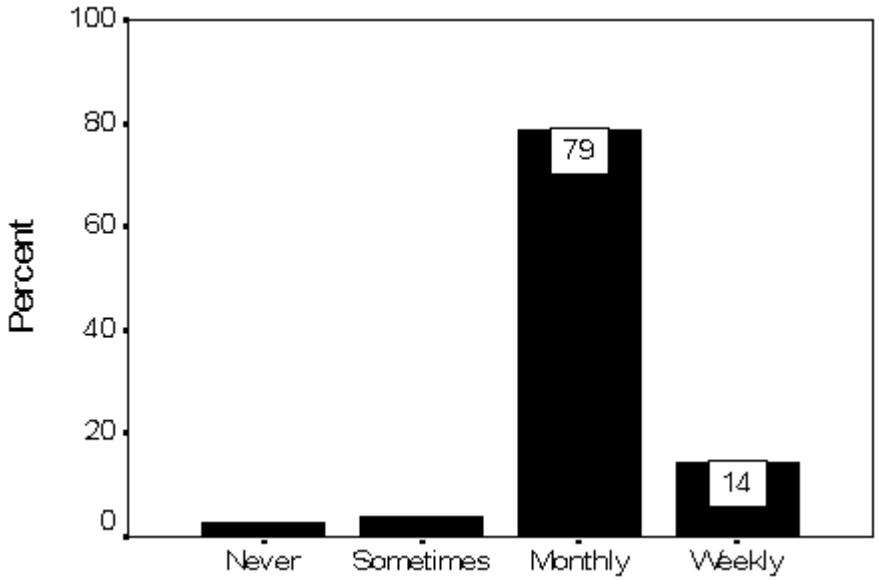

Figure 3.27**: Percentages of PC Use for Reporting Grades**

PC Use for Tracking Attendance: PC use for tracking attendance is in some regard similar to PC use for communication. In almost 66% of schools participated in the study (around 183 of 278 schools), PCs have never been used to track students' attendance, according to Figure 3.28. Based on the same figure, around 17% of respondents reported that they sometimes use PCs for tracking attendance. On a monthly basis, around 10% of respondents stated that they use PCs to track students' attendance. Only around 7% of respondents reported that they weekly use PCs to track students' attendance.

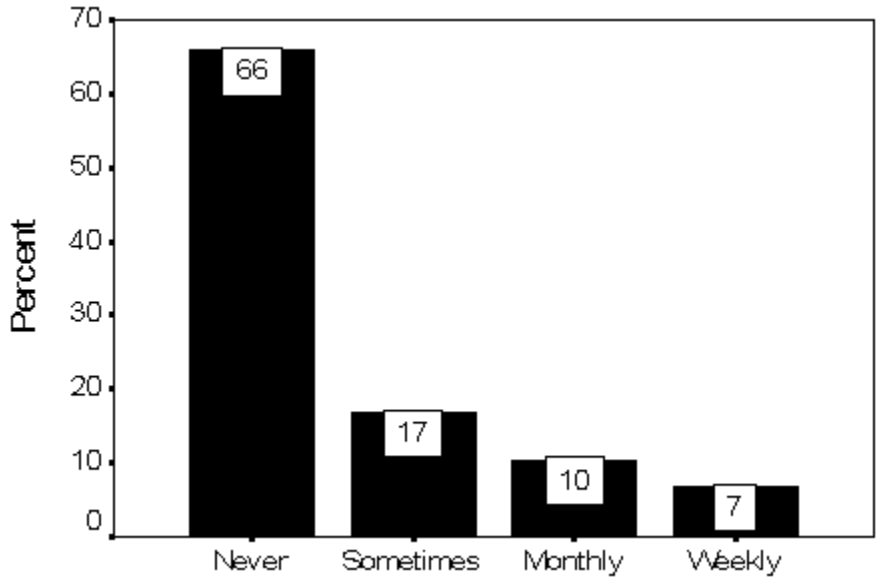

Figure 3.28**: Percentages of PC Use for Tracking Attendance**

Percentage of Classrooms that Use Computers and ICT Equipment:

When asked to respond to the question "What's the percentage of classrooms in your school that use computers and ICT equipment?" respondents provided a good number of percentages. Most of these percentages fell between 65% and 73%. The three percentages among these that received respondents' highest ratings were: 69%, 65%, and 72%, respectively. Around 24% of respondents (67 schools) reported that 69% of their classrooms use computers and ICT equipment. Roughly, 16% of schools reported that 65% of their classrooms use computers and ICT equipment. Finally, a closer percentage (15%) of schools reported that 72% of their classrooms use computers and ICT equipment.

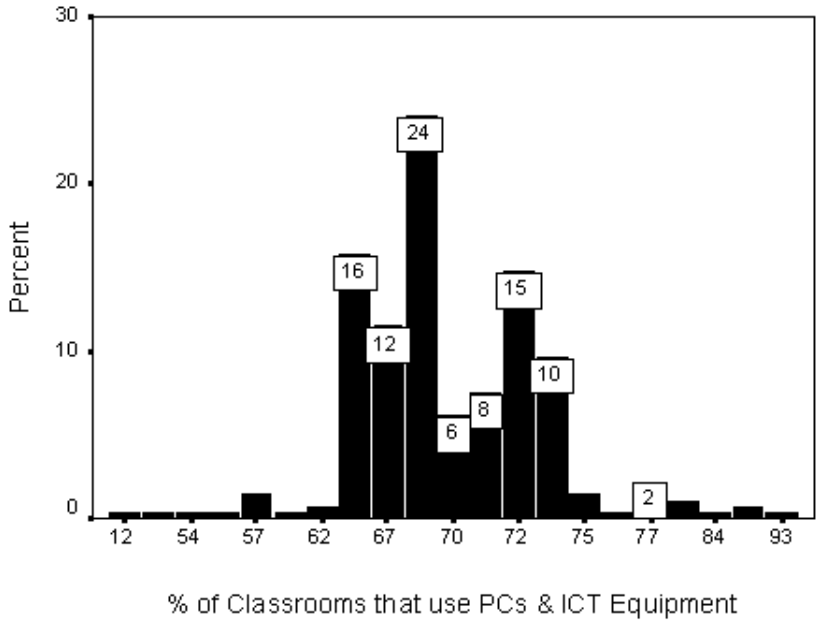

Figure 3.29**: Percentages of Classrooms that Use PCs and ICT Equipment**

How Computers and ICT Equipment are Used in the Classroom:

As mentioned earlier, computers and ICT equipment are mainly used in computer labs, not in classrooms. Moreover, ICT equipment used in computer labs mainly include PCs, data shows, CDs, Intranet, Internet, and Eduwave platform. Regardless to the type of ICT equipment used in these labs, the use of computers and ICT equipment included a number of applications: simulation, animation, word processing, creative work, multimedia, and programming skills.

On a Likert-type scale with ranges "Used" and "Not Used", ICT teachers were asked to rate the use of computers and ICT equipment for each of the above applications (i.e. simulation, animation, etc.). The results of the analysis of data collected are displayed next.

Simulation: Around two third of the respondents (75%) reported that PCs and ICT equipment are not used in simulation in their schools, according to Figure 3.30. Based on the same figure, only 25% stated that in their schools PCs and ICT equipment are used in simulation.

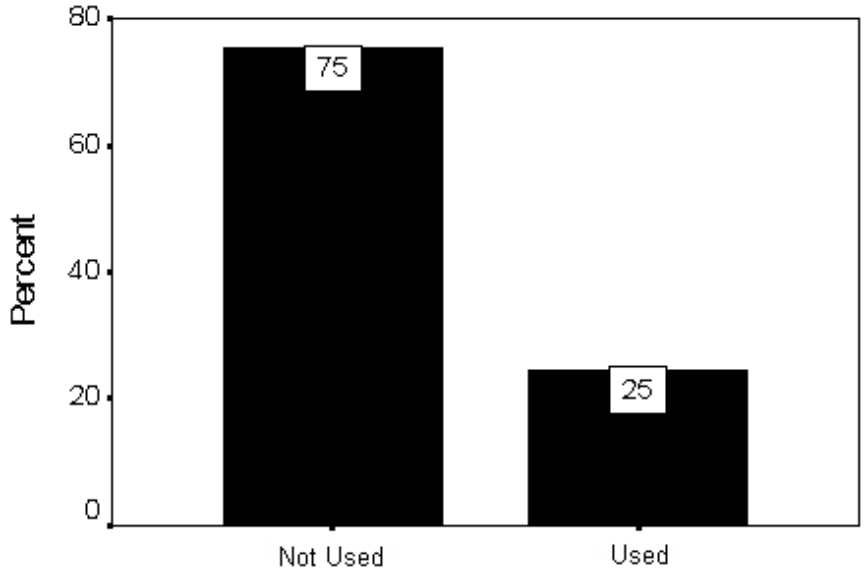

Figure 3.30**: Percentages of Using PCs & ICT Equipment in Simulation**

Animation: According to Figure 3.31, around 65% of respondents (178 of 278) reported that PCs and ICT equipment are used in animation in their schools. Based on the same figure, 35% stated that in their schools PCs and ICT equipment are not used in animation.

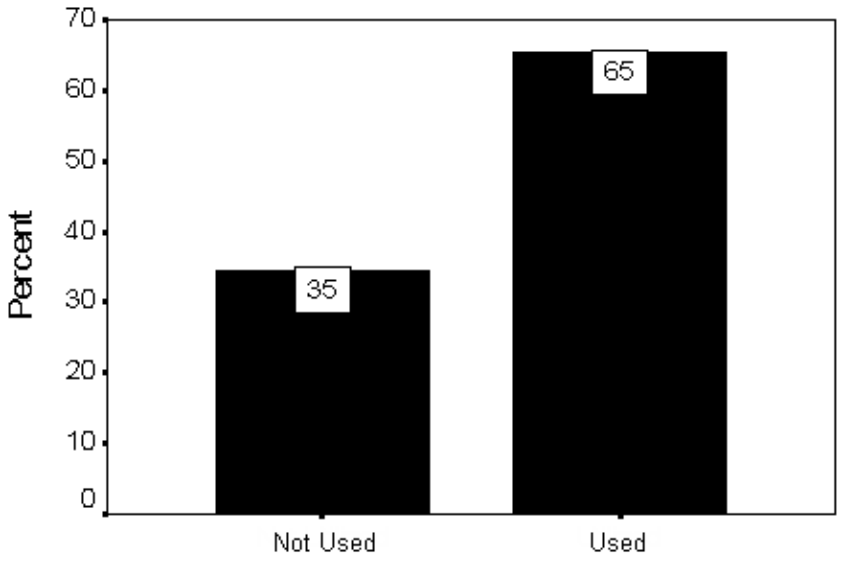

Figure 3.31**: Percentages of Using PCs & ICT Equipment in Animation**

Word Processing: A large percentage of respondents (around 89%) reported that PCs and ICT equipment are used in word processing in their schools, according to Figure

3.32. Based on the same figure, only around 11% (29 respondents) stated that in their schools PCs and ICT equipment have not been used in word processing.

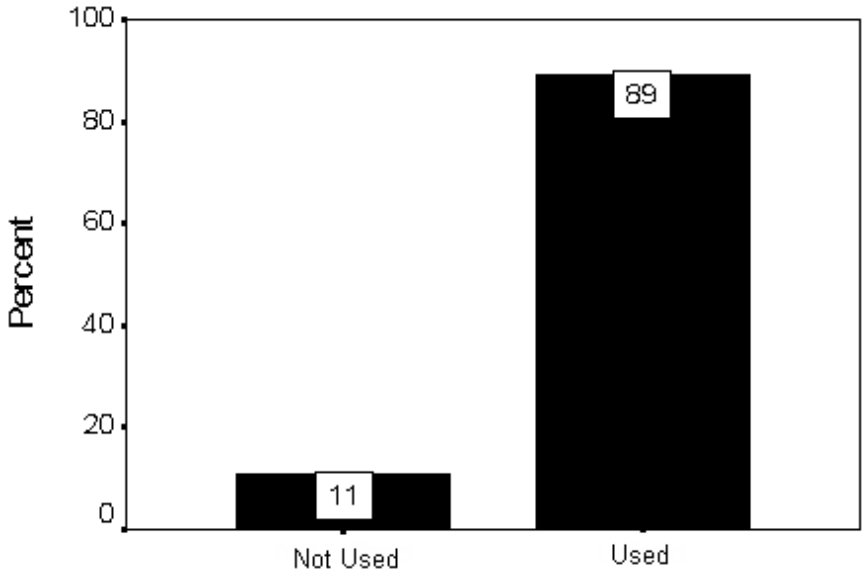

Figure 3.32**: Percentages of Using PCs & ICT Equipment in Word Processing**

Creative Work: Using PCs and ICT equipment in creative work is almost the same as using PCs and ICT equipment in simulation. Around two third of the respondents (74%) reported that PCs and ICT equipment are not used in creative work in their schools, according to Figure 3.33. Based on the same figure, only 26% stated that in their schools PCs and ICT equipment are used in creative work.

Multimedia: According to Figure 3.34, around 71% of respondents (192 of 278) reported that PCs and ICT equipment are used in multimedia in their schools. Based on the same figure, 29% stated that in their schools PCs and ICT equipment are not used in multimedia.

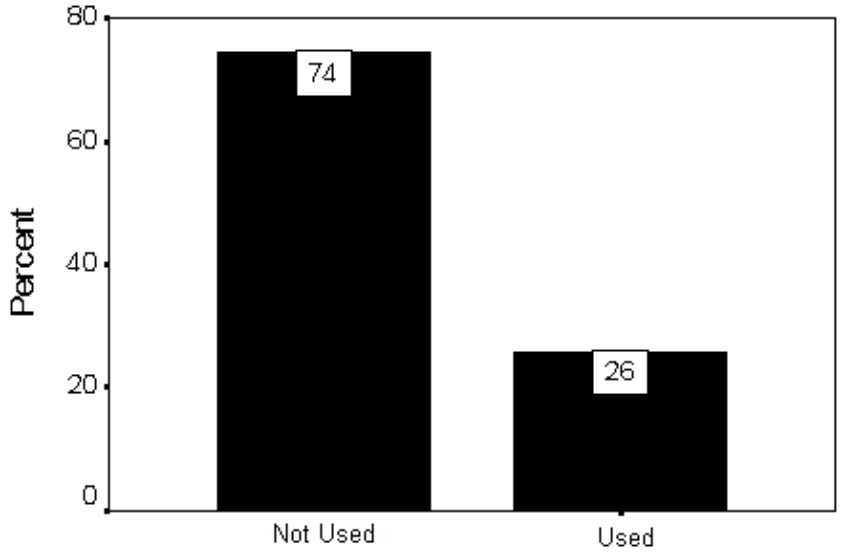

Figure 3.33**: Percentages of Using PCs & ICT Equipment in Creative Work**

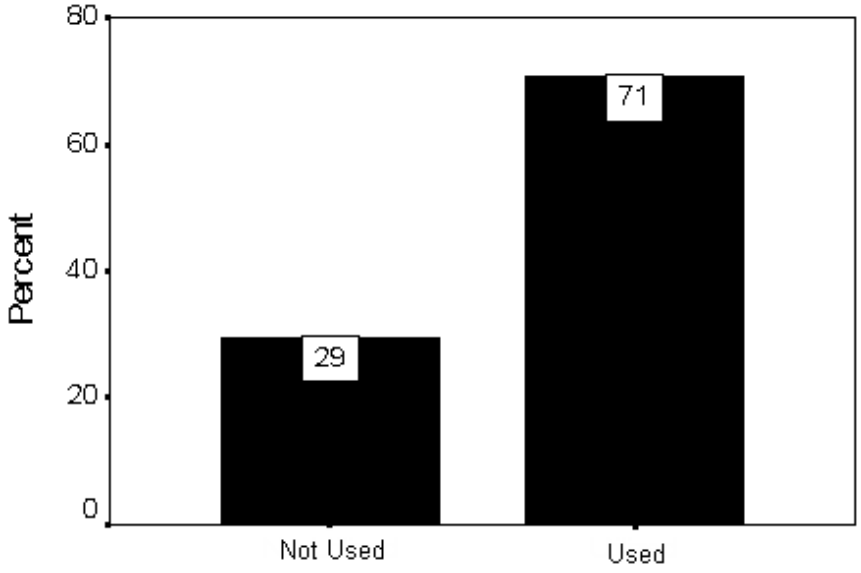

Figure 3.34**: Percentages of Using PCs & ICT Equipment in Multimedia**

Programming Skills: Around 56% of respondents (151 of 278) reported that PCs and ICT equipment are not used in programming skills in their schools, based on Figure 3.35. According to the same figure, around 44% stated that in their schools PCs and ICT equipment are used in programming skills.

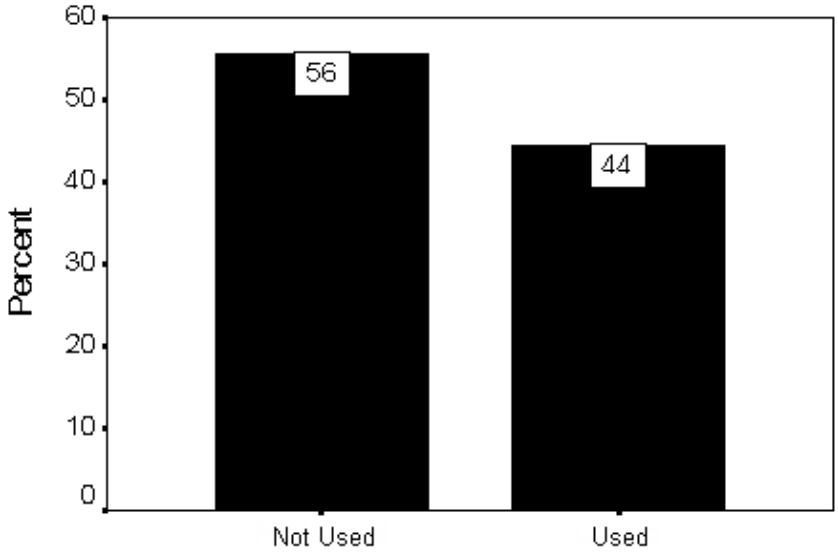

Figure 3.35**: Percentages of Using PCs & ICT Equipment in Programming Skills**

3.3. Results Pertaining Study Objective #3:

The third objective was concerned in assessing perceptions of school principals, teachers, students, and parents toward the use and utilization of ICT in schools. Topics discussed under this objective include: how the school community feels about usability and reliability of connectivity and equipment, the degree to which each group feels about ICT utilization in schools, what people like about the different elements of ICT in schools, obstacles facing the use and utilization of ICT, the degree to which people are satisfied with the support level, and the degree to which people are satisfied with the Eduwave platform.

In addressing these topics, different qualitative and quantitative methods and approaches were employed. However, the results of analyzing data collected for these topics are presented next.

How the School Community Feels about Usability & Reliability of Connectivity & Equipment:

Perceptions of ICT teachers, principals, students, and parents were sought in addressing this topic. While principals, students, and parents were approached qualitatively through unstructured interviews and observations, ICT teachers were approached quantitatively through the "ICT Teacher Survey".

Perceptions of ICT Teachers:

As just mentioned, ICT teachers were surveyed using the "ICT Teacher Survey". Although used to collect data for other objectives in this study, the ICT Teacher survey was utilized to measure ICT teachers' perceptions toward usability and reliability of connectivity and equipment.

On a Likert-type scale with ranges 0 (Disagree) and 1 (Agree), ICT teachers were asked to rate their agreement with 4 items, which were worded positively. The survey was sent to 278 ICT teachers distributed over the 278 schools that participated in the study. The total number of returned surveys was 272.

Table 3.1 displays the mean values and standard deviations for the four items of the perceptions scale. It can be noticed that all items had mean values less than 0.5, indicating that overall ICT teachers tended to disagree with all items. As shown in the table, the average mean value is 0.37, which indicates negative perceptions toward usability and reliability of connectivity and equipment.

To spotlight the perception items listed in Table 3.1, the distribution of each item was plotted. According to Figure 3.36, around 59% (161) of ICT teachers disagreed with the first item "At our school, we have sufficient number of PCs connected to Internet." Only 41% (111) of the teachers agreed that at their schools they have sufficient number of PC connected to Internet.

Table 3.1: Percentages and SDs for the ICT Teachers Perceptions Survey Items (N=272)

	Item	N	%	SD
1.	At our school, we have a sufficient number of PCs connected to Internet.	272	41	.49
2.	I think the network at our school is fast and reliable.	272	39	.48
3.	At our school, it is easy to connect to the network.	272	26	.43
4.	We have a good ICT infrastructure at our school.	272	44	.49
	Average		**37**	

Scale: 0=Disagree, 1=Agree

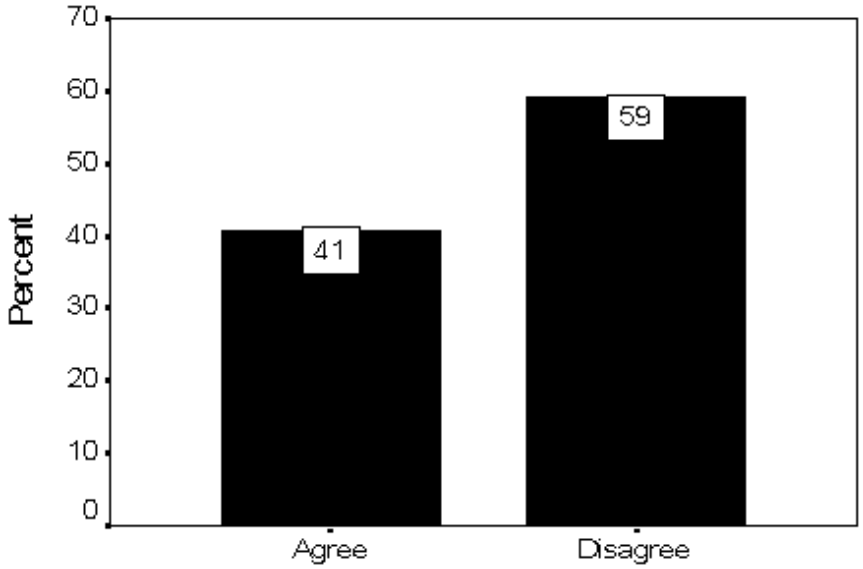

Figure 3.36**: Teachers' Perceptions toward Item #1 "Having sufficient number of PCs connected to Internet"**

In a similar manner, Figure 3.37 shows that around 61% (167) of ICT teachers disagreed with the second item "I think the network at our school is fast and reliable." Only 39% (105) of the teachers agreed that at their schools the network is fast and reliable.

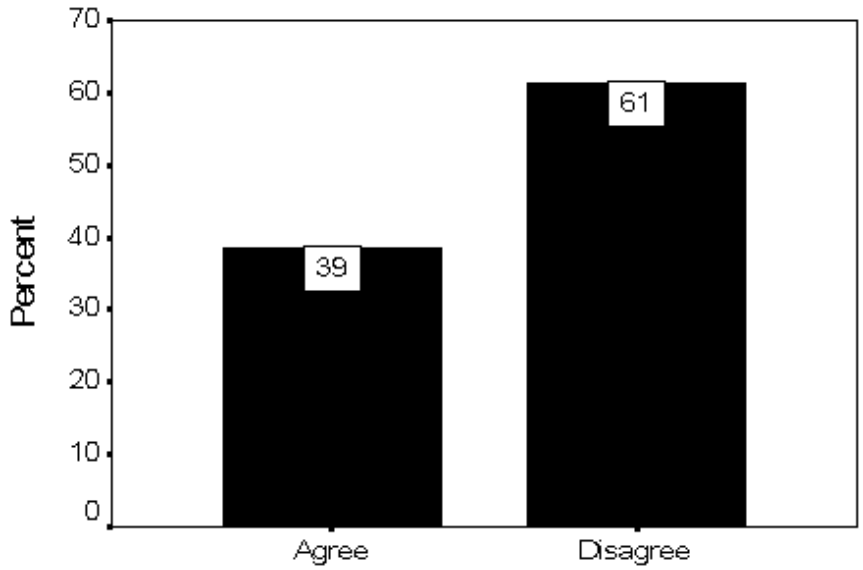

Figure 3.37**: Teachers' Perceptions toward Item #2 "Having fast and reliable network"**

When asked whether it is easy to connect to the network at their schools, 203 (75%) of ICT teachers disagreed. According to Figure 3.38, only 25% (69) of the teachers agreed that at their schools it is easy to connect to the network.

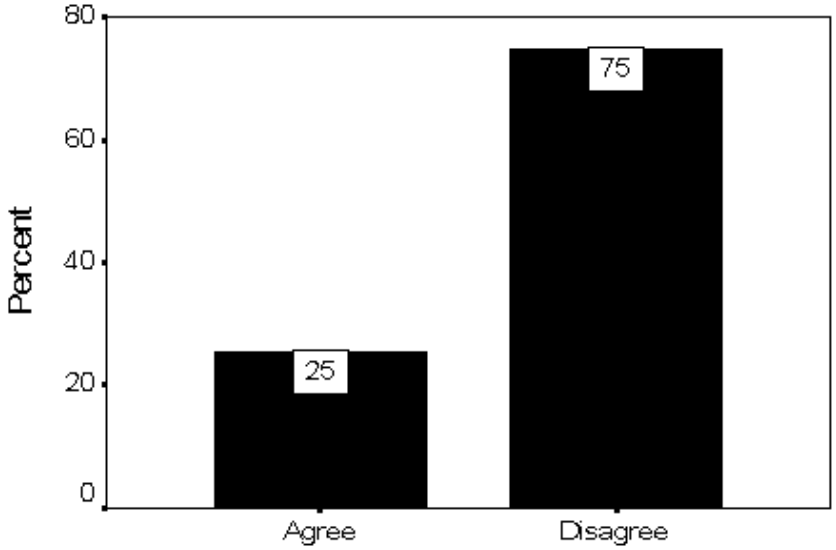

Figure 3.38**: Teachers' Perceptions toward Item #3 "Easy to connect to the network"**

Around 57% (154) of ICT teachers disagreed with the fourth item, "we have a good ICT infrastructure at our schools". Forty three percent (118) of the teachers agreed that at their schools they have a good ICT infrastructure, based on Figure 3.39.

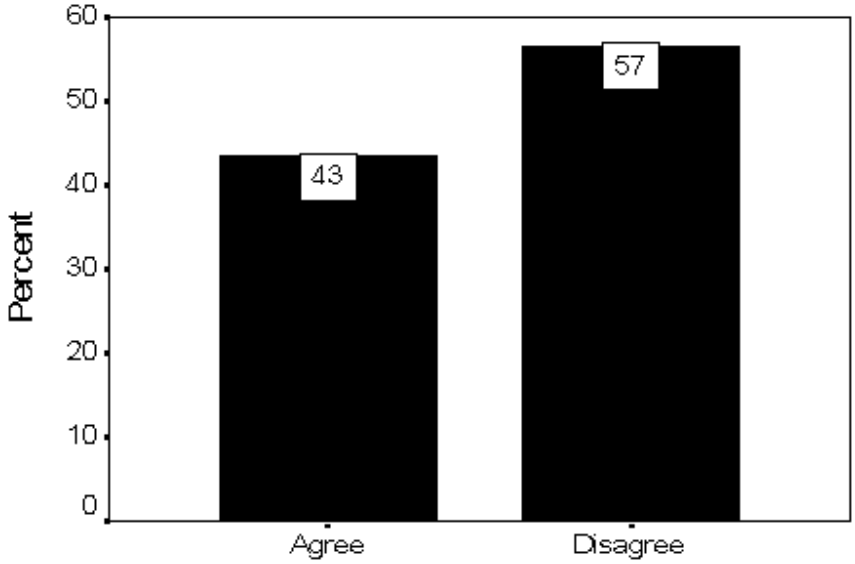

Figure 3.39**: Teachers' Perceptions toward Item #4 "Having good ICT infrastructure"**

Perceptions of Principals, Students, & Parents:

With regard to the principal, students, and parents perceptions about the usability and reliability of connectivity, our qualitative data shows that most of them demonstrated strongly positive attitudes toward employing internet in the process of teaching and learning. However, the majority of them complained about the unreliable and weak internet connectivity. That barrier, however, limits them from making a full use of internet educational resources in general and from accessing MoE's e-content available in Eduwave platform in particular. The following quotes represent their perceptions about the usability and reliability of internet connectivity.

> We don't make use of computers due to several complications starting from reserving the computer lab and ending to the slow and interrupted internet connections of our computers.
>
> I rarely use computers in teaching my courses because it is not easy to get connected to it and also not easy to maintain the connectivity while displaying the internet's educational content.

In parallel, our field observations indicate that only some schools have strong connectivity to the internet but the majority suffers from weak and unreliable internet connectivity.

The Degree to which Each Group Feels about ICT Utilization in Schools:

In tackling this topic, perceptions of ICT teachers, principals, students, and parents were sought. While ICT teachers, students, and parents were approached qualitatively through unstructured interviews and observations, principals were approached quantitatively through the "Principal Survey".

Perceptions of Principals:

As mentioned above, principals were surveyed using the "Principal Survey". Although used to collect data for other objectives in this study, the principal survey was utilized to measure principals' perceptions toward the degree of utilizing ICT in schools.

On a Likert-type scale with ranges 1 (Hardly or Never), 2 (Partially), and 3 (Completely), principals were asked to rate their perceptions toward the degree of ICT utilization in schools for 4 items. All items on the survey were worded positively. The survey was sent to 278 principals distributed over the 278 schools that participated in the study. Surprisingly, the total number of returned surveys was 278.

Table 3.2 displays the mean values and standard deviations for the four items of the perceptions scale. It can be noticed that all items, except the second one, had mean values greater than 2.00, indicating positive perceptions of principals toward the utilization of ICT in schools. As shown in the table, the average mean value is 2.00, which indicates a partial utilization of ICT in schools.

Table 3.2: Means and SDs for the Principals Perceptions Survey Items (N=278)

	Item	N	Mean	SD
1.	Teachers' ICT utilization in teaching	278	2.11	.73
2.	ICT utilization for special needs students	278	1.36	.62
3.	ICT utilization to promote students' self learning	278	2.22	.57
4.	Students' utilization of ICT as a learning aid	278	2.32	.59
	Average		**2.00**	

Scale: 1=Hardly or Never, 2=Partially, 3=Completely

To highlight the perception items listed in Table 3.2, the distribution of each item was graphed. According to Figure 3.40, around 45% (126) of the principals reported a partial utilization of ICT in schools. Roughly, 33% (91) of the principals reported a complete utilization of ICT in schools. Only 22% (61) of the principals stated that in their schools ICT has never or hardly been utilized in teaching.

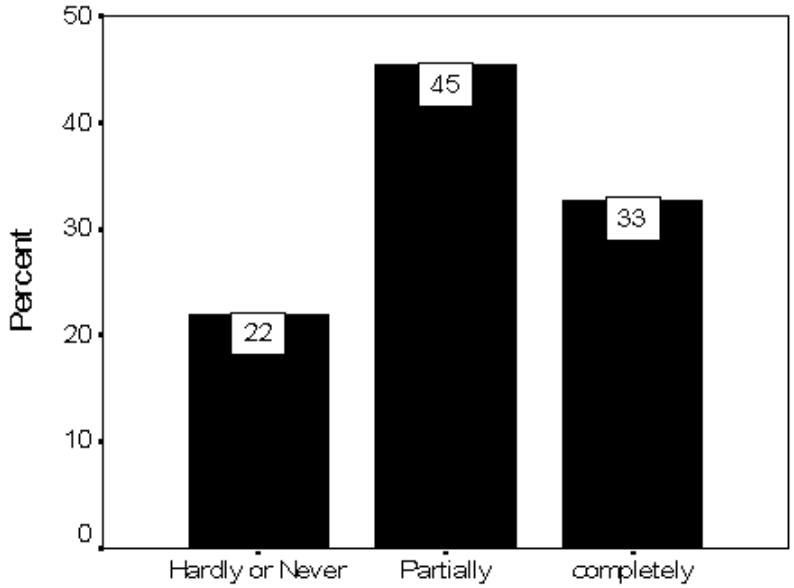

Figure 3.40**: Teachers' ICT Utilization in Teaching**

For the second item, around 21% (57) of the principals reported a partial utilization of ICT for special needs students (Figure 3.41). Approximately, 8% (21) of the principals reported a complete utilization of ICT for special needs students. It is interesting to notice that 72% (200) of the principals declared that in their schools ICT has never or hardly been utilized for special needs students.

For the third item, around 63% (176) of the principals reported a partial utilization of ICT to promote students' self learning, according to Figure 3.41. Based on the same figure, around 29% (81) of the principals reported a complete utilization of ICT to promote students' self learning. It is worth to mention that 8% (21) of the principals stated that in their schools ICT has never or hardly been utilized to promote students' self learning.

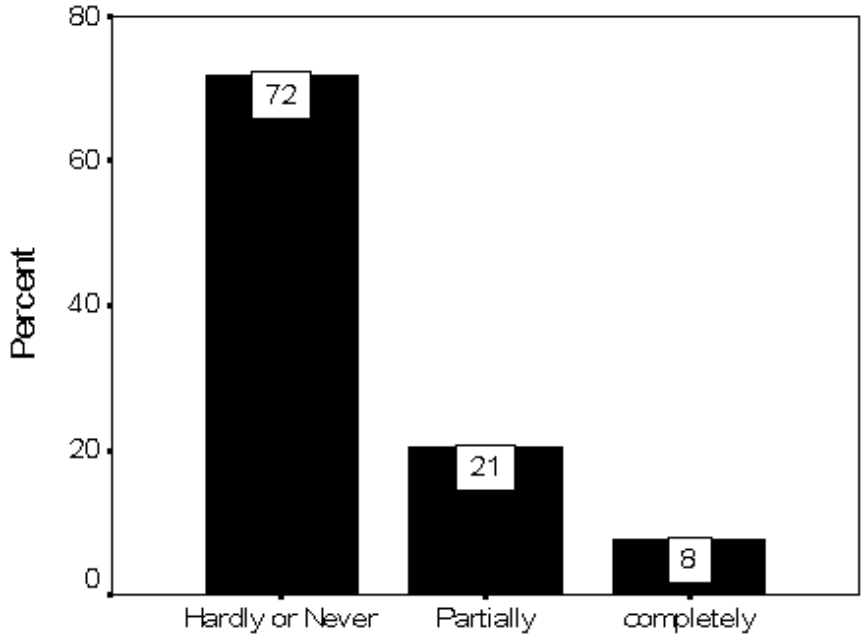

Figure 3.41**: ICT Utilization for Special Needs Students**

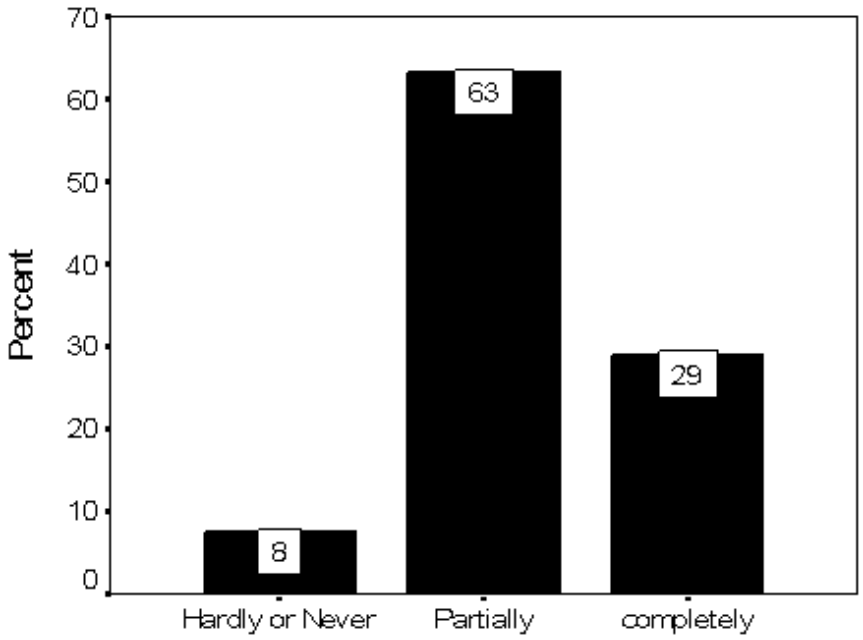

Figure 3.42**: ICT Utilization to Promote Students' Self Learning**

As for the forth item, Figure 3.43 shows that around 55% (154) of the principals reported a partial students' utilization of ICT as a learning aid. About 38% (106) of the principals reported a complete students' utilization of ICT as a learning aid. Only 6% (18) of the principals declared that in their schools ICT has never or hardly been utilized by students as a learning aid.

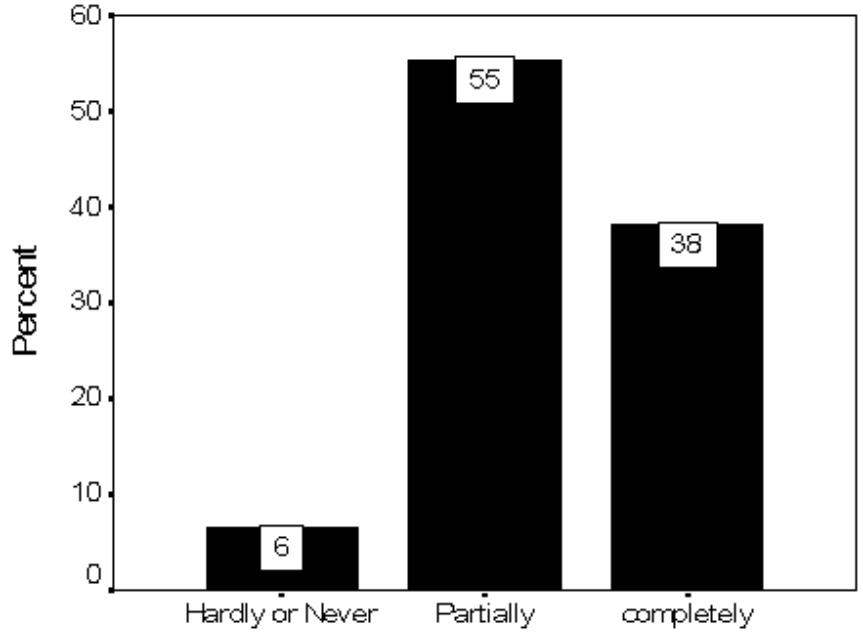

Figure 3.43**: Students' Utilization of ICT as a Learning Aid**

Perceptions of Teachers, Students, & Parents:

The partial utilization of schools' ICT was also documented in our qualitative data. Although some teachers and students make an excellent use of ICT resources, some others do not exhibit the same attitude. Both our interviews and observations show that MIS teachers and students are making a full utilization of the MIS online curriculum, which is made available through Eduwave. The following quotes represent this conclusion.

> I am very proud of the way the MIS online curriculum was designed.
>
> The MIS online curriculum experience was very successful and I wish that the other curricula are designed in a similar innovative way.

What People Like about the Different Elements of ICT at Schools:

The introduction of ICT to Jordanian schools has greatly enhanced the process of teaching and learning in schools. Most teachers and students, who participated in this study, indicated that they like to learn using computers as it motivates them to learn and encourages them to search for more information. Indeed, among all computers software, Microsoft office programs appear to be the most favored software that both teachers and students like to use. The following quotes support that conclusion:

> There are many advantage of using computer in teaching Mathematics; I never imagined getting my students to understand the meaning of random experiment in mathematics but by using computers it was so easy to do so (Math Teacher).
>
> The MIS online curriculum experience was very successful and I wish that the other curricula are designed in a similar innovative way (MIS teacher).
>
> Sometimes, we don't rely on the available Eduwave's content [MoE's e-content made available through Eduwave] because of the technical problems that we face but we do prepare our own content by using flash program, dream, and PowerPoint because our students love to learn by computers and especially to prepare PowerPoint presentations (Math and Science teachers).
>
> Undoubtedly, I think it is good to have a computer in each classroom, as I think that the future schools will be having students that have their own laptops (School Principal).
>
> I sent my girl to this school to get a good learning that centered around the use of computers (Parent).
>
> I like to learn by computers, I learned a lot from my computer teacher. I love navigating the web and writing up papers and do my home works (Student).

Obstacles Facing the Use and Utilization of ICT:

To address this topic, ICT teachers and school principals were surveyed. While the "ICT Teacher Survey" had 19 items of prospective obstacles, the "Principal Survey" had 3 items of such obstacles. The reason why the former survey had more items than the latter survey was because the focus was more on the ICT teachers since they are usually involved in using and utilizing PCs and ICT equipment more than principals or other people.

However, respondents (ICT teachers and principals) were asked to rate the items on a 2-point Likert-type scale, with 0 (Not-Obstacle) and 1(Obstacle). While 272 ICT teachers representing 272 different schools responded to the "ICT Teacher Survey", 278 principals responded to the "Principal Survey."

Table 3.3 displays a list of the obstacles rated by the ICT teachers in terms of frequencies and percentages of responses. Obstacles are listed in a descending order based on teachers' ranking; meaning that the first one in the table received teachers' highest ranking as an obstacle. Based on the table, the first three obstacles that received teachers' highest ranking were as follows:

1. Unfriendly and complicated educational software: This obstacle received ICT teachers' highest ranking (91.5%, 249 teachers).
2. Teachers' unawareness of the use of PCs in education: This obstacle received ICT teachers' second highest ranking (87.9%, 239 teachers).
3. Unfocussed educational software, and heavy teaching load: These two obstacles received ICT teachers' third highest ranking (80.9%, 220 teachers).

Table 3.3: Obstacles in Terms of Frequencies and Percentages of Teachers' Response

Obstacle	Obstacle		Not-Obstacle	
	f	%	f	%
1. Unfriendly and complicated educational software	249	91.5	23	8.5
2. Teachers' unawareness of the use of PCs in education	239	87.9	33	12.1
3. Unfocussed educational software	220	80.9	52	19.1
4. Heavy teaching load	220	80.9	52	19.1
5. Teachers' discomfort by their students' outperformance	218	80.1	54	19.9
6. Teachers' & students' difficulty in finding info on Internet	215	79.0	57	21.0
7. Difficulty to connect to Internet	203	74.6	69	25.4
8. Insufficient antitheft and student abuse of PCs	198	72.8	74	27.2
9. Absence of incentives for teachers	198	72.8	74	27.2
10. Insufficient technical support	174	64.0	98	36.0
11. Insufficient number of PCs	169	62.1	103	37.9
12. Unreliable and slow networks	166	61.0	106	39.0
13. Insufficient number of educational software	158	58.1	114	41.9
14. Insufficient number of PC Peripherals (printers, etc)	157	57.7	115	42.3
15. Insufficient teachers' training programs	123	45.2	149	54.8
16. Insufficient number of PCs connected to Internet	112	41.2	160	58.8
17. Unavailability of high speed internet at schools	68	25.0	204	75.0
18. Unavailability of PC lab supervisors	65	23.9	207	76.1
19. Insufficient encouragement from school administration	57	21.0	215	79.0

Number of respondents (N) = 272

Table 3.4 displays a list of the obstacles rated by the school principals in terms of frequencies and percentages of responses. Obstacles are listed in a descending order based on principals' ranking; meaning that the first one in the table received principals' highest ranking as an obstacle. Among the three obstacles, two of them received principals' highest ranking as obstacles:

1. Insufficient variety of educational software: This obstacle received principals' highest ranking (71.6%, 199 principals).
2. Difficulty in scheduling classes to use PC labs: This obstacle received principals' second highest ranking (69.4%, 193 principals).

Table 13.4: Obstacles in Terms of Frequencies and Percentages of Principals' Response

Obstacle	Obstacle		Not-Obstacle	
	f	%	f	%
1. Insufficient variety of educational software	199	71.6	79	28.4
2. Difficulty in scheduling classes to use PC labs	193	69.4	85	30.6
3. Teachers' weak tendency towards using PCs in teaching	93	33.5	185	66.5

Number of respondents (N) = 278

The Degree to Which People are Satisfied with the Support Level:

When we invited the teacher to talk about the other problems that she and other colleagues face in utilizing the school's computers, she mentioned that the computers needs to be maintained frequently because students abuse them most of the time. Additionally, she said that their computers are continuously exposed to computers' viruses:

> Our computers need to be maintained continuously as our students abuse some of them and break their peripherals. In addition, we suffer from computer viruses that enter to our systems when surfing the web as well as from the flash drives that our students use.

This limitation in the use of the platform available e-content was attributed, by most schools, to several reasons. The first reason is the shortage of computers, meaning the small number of computers comparing to the large number of students. The second reason has to deal with the problems with the computers themselves and their need for continuous maintenance, which is not available for all schools in the required short time.

The Degree to Which People are Satisfied with Eduwave Platform:

Figure 3.44 shows that 90% of schools participated in this study were connected with Eduwave platform, while only 10% of them were not connected.

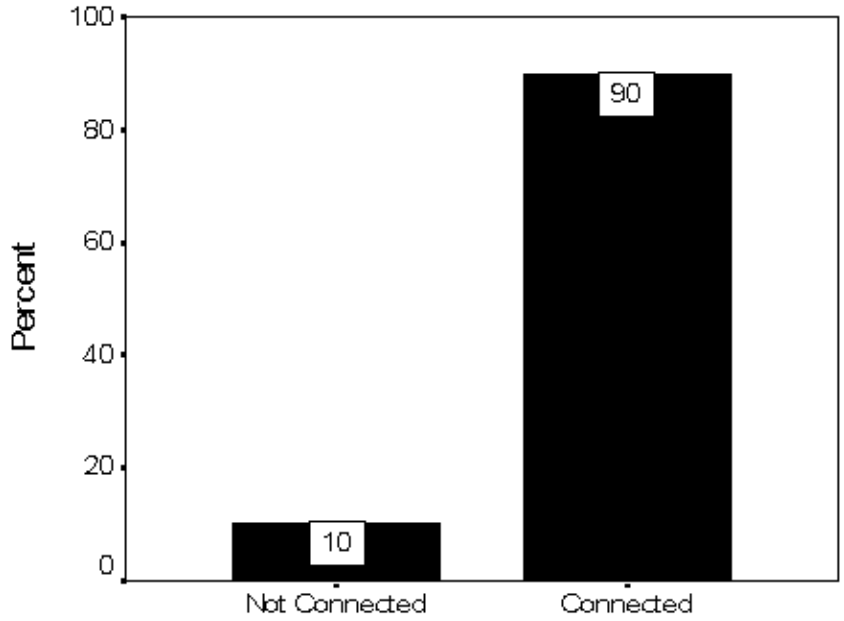

Figure 3.44**: Percentages of School Connectivity to Eduwave**

Despite the high percentage of schools connected with Eduwave, only minority of teachers of these schools were satisfied with its uses. It is important to note here that since Eduwave is MoE's main platform used by students, teachers, administrators, and parents, users seem to perceive the various issues they face whether related to infrastructure, connectivity, or e-content and describe them as Eduwave issues, which at certain points create a certain level of confusion when describing challenges or level of satisfaction even if not related to the Eduwave Platform. It is also worth mentioning that some of the references made by users to software or e-content are made with reference to some of the educational content made available by MOE at earlier stages but that are currently outdated.

Results of our qualitative data showed that only some teachers, especially MIS-online teachers, were satisfied with the use of Eduwave platform and the educational content. However, the majority of teachers expressed their dissatisfaction with the available Eduwave's educational material. When inquired about the reasons of that dissatisfaction, many teachers attributed that to the technical problems (i.e. slow and interrupted internet connectivity) that they face while using the platform. However, other

participants attributed their dissatisfaction to the old and poor educational content that the platform has.

> The Eduwave's software [meaning the e-contents not Eduwave] are not sufficient enough for our students, as they (the content) are similar to those in the books therefore, we prefer to produce our own content (Group of teachers).

> I rarely use Eduwave's software in teaching my secondary course as they (the content) are unsuccessful.

> The Eduwave software (e-contents) are pretty old and the enrichment activities that the platform has are similar to those in the books so we did not find a reason to use the computers (Group of teachers).

3.4. Results Pertaining Study Objective #4:

This objective was concerned in investigating the association between effective use of ICT at schools and student achievement utilizing the results of various studies conducted/supervised by the Monitoring and Evaluation unit (M&E) at NCHRD. To provide a more intelligible view, the objective has been approached qualitatively and quantitatively:

- Qualitative approach: Case studies summary from schools that participated in this study. These schools which are mentioned in the "Case Studies" section were the subject of the researchers' interviews and observations. Data collected from these schools that address this current objective were synthesized and presented.
- Quantitative approach: A quasi-experimental study conducted by USAID through Academy for Educational Development (AED) from May to July of the year 2008. The study was entitled "Evaluation of the youth technology and career: MIS-online approach".

A more detailed description of each approach is presented next.

Case Studies Summary:

When investigating the relationship between the use of ICT in learning and students' achievement, all interviewees expressed positive attitudes:

> Of course it does! I noticed that from their grades in English. Using the computer in reading, for example, can let my students find out about their spelling and grammatical mistakes as the computer itself underline their mistakes in a red line.

> I actually believe that my students achievement has improved by the use of computers and I notice that when I compare between their scores on paper test

> and computer tests. And I think that is because computer is different than using traditional ways of testing.
>
> Although I don't use computer that many in my teaching, but I think that it (the computer) can greatly affect our students' achievement.

According to those teachers, that strong relationship can be explained by the attractiveness of computers and their educational resources, which increases students' engagement and enthusiasm to learn:

> By computer, my students appear highly engaged and happy as the computer attracts them and gives them the joy that they want.
>
> Computer encourages students to become enthusiastic about learning, which results into increasing their achievement.

Although the previous quotes signify teachers' strong correlation between the use of ICT and students' achievement, some interviewees disagreed with that relation.

> I think that the use of computers contributed in my students' low achievement, as most of them use computers to play games and other entertainment computer stuff.

Similarly, schools' principals' demonstrated similar attitudes like those of teachers.

> I think that students' achievement did improve by the usage of computer but the issue is different for students who are above that level as they don't use computers.

Likewise, parents support the same positive perception about the relation between the use of ICT and their students' achievement. When asked to explain that relation, one parent explains that computers bring pleasure and joy to students thus they perform better and all that reflects on their academic achievement.

> I think that the achievement of my daughter has improved since she started using computers in her leaning. And I think that is because using computers is joyful to her.
>
> My son's Mathematical achievement has improved since his teacher uses of computer in teaching. I did notice that by myself.

Table 3.5 -below presents our interviewee's responses to the relation between the use of ICT in learning and students' achievement.

Table 3.5: Interviewees' Responses to the Relation between ICT Use and Achievement

Investigate the association between effective use of ICT at school and student achievement	▪ It is not a direct effect, but I feel that my students' achievement has improved by the use of computers and I notice that when I compare between their scores on paper test and computer tests (Teacher). ▪ I think that the achievement of my daughter has improved since she started using computers in her leaning. And I think that is because using computers is joyful to her (Parent). ▪ Of course it does! I noticed that from their grades in English. Using the computer in reading, for example, can let my students find out about their spelling and grammatical mistakes as the computer itself underline their mistakes in a red line (English teacher). ▪ It is really magnificent. I actually noticed the huge influence that the computer left on my students' achievement (Math teacher). ▪ Although I don't use computer that many in my teaching, but I think that it (the computer) can greatly affect our students' achievement. ▪ Computer encourages students to become enthusiastic about learning, which results into increasing their achievement. ▪ My son's Mathematical achievement has improved since his teacher uses of computer in teaching. I did notice that by myself (Parent). ▪ I think that students' achievement did improve by the usage of computer but the issue is different for students who are above that level as they don't use computers (Principal). ▪ I think that the use of computers contributed to my students' low achievement, as most of them use computers to play games and other entertainment computer stuff. ▪ I think we can boost our students' achievement by reducing the size of our classes and we hope to have a computer for each student.

USAID's Study "Evaluation of the Youth Technology and Career: MIS-Online Approach":

As mentioned earlier, this quasi-experimental study was conducted in the period May-July, 2008. The sample of the study consisted of 175 eleventh grade MIS students selected from three discovery schools in Jordan: Al-Balqa school in Alsalt, Ein-Jaloot school in Amman, and Bushra school in Irbid. The sample was divided into two groups: an experimental group (called the online group), which contained 88 students (46 females, and 42 males), and the control group (called the curriculum group), which

contained 87 students (46 females, and 41 males). While the curriculum group was taught using the conventional curriculum (textbook), the online group was taught using the MIS-online course. A pre/post test was administered to the two groups before and after completing the learning units. Questions utilized in the test had different formats, including: multiple choice, vocabulary, applications, etc. (Rich, 2008).

To some extent, the content in the two groups is similar; however, the way it is presented to students is different. Unlike the regular textbook, MIS-online is designed in a project-based approach. Moreover, the content in the MIS-online course has some supplementary materials (called "enrichments" or "resources"). These resources are designed to give students the chance to practice what they learn in theory. It's important to mention that MIS-online is accessed through Eduwave platform.

The online group was taught by two teachers who received a special training through a workshop on how to use and utilize the different stories and elements of the MIS-online course. The curriculum group was taught by teachers who usually taught the MIS course using the conventional way. These teachers didn't receive any kind of training prior to the outset of the study.

Table 3.6 –below presents the results of the pre/post test with significant differences for MIS status (curriculum and online) and gender (male and female).

Table 3.6: Results of the pre/post assessment

MIS Status	Gender		Difference on Total Test	Difference on Multiple Choice Items
Curriculum	**Male**	**Mean**	4.54%	5.60%
		N	41	41
	Female	**Mean**	9.68%	13.24%
		N	46	46
Online	**Male**	**Mean**	5.99%	8.26%
		N	42	42
	Female	**Mean**	14.71%	18.55%
		N	46	46

Based on the above table, one can notice that in all cases students in the online group improved (in achievement) more than their counterparts in the curriculum group. Another result of the study was the significant differences in achievement for students in the online group, regardless of gender. The study ended with a number of recommendations, including: training of teachers, accessing business people, using smaller business examples, and evaluating students' behavior in the market.

3.5. Case Studies:

In this section, we will include a thick description of all schools that participated in the qualitative part of this study. Each case study included a description of all interviewees' perceptions about the infrastructure, utilization, and perception about ICT. The narrative of these cases was constructed by drawing upon multiple sources of data (Interviews and Classroom observations). We will start by narrating the case then follow it with a table to summarize the participants' responses against each research question.

3.5.1. The Case of Public Discovery School

Ahmad Touqan's School is a public male's secondary school located in the middle of the city of Amman. Touqan's school is a discovery school that was set by the MoE to experiment the MoE's innovative educational programs and workshops (i.e. MIS, EMIS). The school is a place for more than one thousand students who can specialize in either pure academic stream or management information systems (MIS) stream. In addition, the school is used by many international agencies like (i.e. UNICEF) to apply new programs like MASAR and INJAZ.

ICT Availability and Connectivity

Touqan's school has more than 80 desktop computers distributed in four computer labs and more than 25 laptop computers available to use by all teachers. All these computers are connected to the internet through a high speed internet line by wireless routers that are mounted in the large rooms and hallways. The 47 teachers of the school hold both the international computer driving license (ICDL) and Intel certificates. The schools' computers are continuously maintained and protected from computers' viruses by the MoE's computer maintenance team. In addition to these

features, the schools' has several data show systems, display screens, printers, and scanners.

ICT Utilization

As it appears from the interviews, most school's teachers utilize computers in their teaching. However, among all teachers, Mathematics, Arabic, English, and MIS teachers appeared to be the most frequent users of the school's computers. When asked about the utilization of Eduwave software in teaching, both the teachers and the school's principal identified the sort of its uses. They mentioned:

> We use Eduwave for various purposes; in addition to use it in teaching, we use it to enter school's information, statistics, and students' grades.

However, when probing to elaborate about the utilization of Eduwave in teaching, the teachers mentioned that they mostly use the enrichment exercises that accompany the available e-curricula on the Eduwave platform like Mathematics, English and MIS curricula.

> We make use of the additional exercises that come with the available e-content on Eduwave platform.

Moreover, to know more about how different teachers make use of the Eduwave's e-curricula, the Mathematics teacher responded that he relies on both the books and their available e-activities on Eduwave. When asked to further elaborate on the way he teaches a lesson in Mathematics, he described that he begins his lesson by explaining its content and then he takes his students to the computer lab, whenever it is available, to let them answer the interactive activities that supplement the lesson. These activities, as he mentioned, help students to better understand the lesson and its applications in the real world.

Our classroom observation of the teacher showed that the teacher begins his classroom by asking his students to open an excel file and enter any five numbers of their choice in order to teach them how to calculate different statistical measures. The teacher then asks his students to choose the suitable options to calculate the average, summation, and the standard deviation of the entered numbers.

Furthermore, in his elaboration on the advantages of using e-learning, the mathematics teacher explained that learning on computers helps students understand

some abstract mathematical concepts (i.e. Randomization) in a much easier way than explaining it using the traditional chalk and talk way. He said:

> There are many advantage of using computer in teaching Mathematics; I never imagined getting my students to understand the meaning of random experiment in mathematics. In the supplementary exercises that are available in Eduwave, my students learned the concept very well through helping the girl to chose the clothes that she could wear from inside the closet. Similarly, was the case of teaching the geometry for little students.

The English teacher, on the other hand, explained three different ways that can be used to teach a lesson. The first one is to prepare either a PowerPoint presentation or a word program for the lesson and present it to the students using a laptop and data show inside the classroom. The second way is to make a hybrid between the book and its related enrichment activities that are available in Eduwave and present it to students in the computer lab, whenever it is available. The third way is to let the students themselves write a text on word program and then ask them to correct the spellings and the grammatical mistakes that they do.

Similarly, the MIS teacher expressed a great interest of the Eduwave MIS-online curriculum, the curriculum that was prepared by ESP (ERfKE support program). His appreciation stems from the way the MIS curriculum was designed. Students learn through practical stories, where they are required to learn the concept in an interactive approach then apply what they learn in designing a plan for a project of their choice. He mentioned:

> I am very proud of the way the MIS online curriculum was designed. My students learn MIS inside the computer lab, they learn how to design a plan for their projects and prepare a plan to establish their business as well as a plan to market their products. The MIS online curriculum experience was very successful and I wish that the other curricula are designed in a similar innovative way.

Although these teachers make a good use of the e-content available in Eduwave, they suffer from an array of problems; while one of these problems is related to computer infrastructure (i.e. old computers), other problems related to the ratio of computers to users, and the shortage of software as well. One of the teachers mentioned:

> We have problems in our school's infrastructure; some of our computers are old and need to be renewed. The other problem has to deal with the space of our computer labs, our computer labs should be larger and have better lights and paint. Our third problem is related to the ratio of computers to students, the

> present ratio is 10 students to one computer. This ration is too high and needs to be reduced.

Similarly, the Arabic teacher raised different limitations that should be eliminated to maximize the utilization of Eduwave platform. He pointed out:

> Although the Eduwave has many rich activities that accompany the e-contents, but I think that some of these activities are similar to those of the book itself. I believe that these activities should be different than those of the book in order to expose our students to different exercises.

Another problem that an Arabic teacher raised is related to the connectivity with the Eduwave system. The teacher complained that this problem holds him back from using the platform in his teaching. He said:

> I would like to use the different supportive activities on Eduwave but I find problems to connect with the platform. The connection is so slow and I lose more than 25 minutes of my class time to open the desired page.

These problems were also indicated in our classroom observations of these teachers. We noticed that teachers spent long time trying to establish Internet/intranet connection. These connectivity problems stood as barriers from making use of the educational resources available on Eduwave.

Perception about ICT

The principal, teachers, and students of this school hold positive attitudes toward the use of ICT in teaching. From his interview, the school principal admitted that introducing computers to schools has helped in transforming the way learning is happening in his school. He mentioned:

> I personally, was ignorant about computers and there uses, however, when I took my ICDL certificate, my belief and attitudes toward computers and their uses became different. I believe that teaching students by computers can positively influence their understanding.

Likewise, a teacher in the school expressed that computers unlock students learning capabilities. He argued:

> I think that learning by computers can foster our students learning to the degree that I can confidently challenge that their learning skills are way better than those of other students, who do not learn by computers.

In general, both the principal and the teachers hold positive attitudes toward computerization; however, the MIS teachers did not only express a maximum level of

appreciation to the way the MIS curriculum is prepared in Eduwave but also wonder why the other curricula were not prepared in the same striking way.

ICT and Students Achievement

The positive influence of ICT on students' achievement was also a point that all interviewees of this school made. The English teacher, for example, talked about the excellent way that computer helped his students excel in writing. In his response to the question whether using computer in teaching does influence his students' achievement or not:

> Of course it does! I noticed that from their grades in English. Using the computer in reading, for example, can let my students find out about their spelling and grammatical mistakes as the computer itself underline their mistakes in a red line.

In the same vein, the Mathematics teacher conveyed that using computers in teaching did strongly affect his students' achievement. He replied:

> It is really magnificent. I actually noticed the huge influence that the computer left on my students' achievement.

However, the same teacher reasoned that influence by; the full engagement that students demonstrate as well as the joy that they show when using computers. He mentioned:

> By computer, my students appear highly engaged and happy as the computer attracts them and gives them the joy that they want.

Summary

Table 3.7 -below summarizes the responses of participants of this case study to the different research objectives.

Table 3.7: A Summary of Responses by Research Objective (Touqan's School)

Research Objective	Selected Participants' Responses
Assess school connectivity and availability of ICT resources	▪ We have 80 desktop computers distributed in four computer labs and more than 25 laptop computers available to use by all teachers. ▪ All of our computers are connected to the internet through a high speed internet line by wireless routers that are mounted in the large rooms and hallways. ▪ The schools' computers are continuously maintained by the MoE's computer maintenance team.
Assess the utilization of ICT equipment and facilities	▪ We use Eduwave for various purposes; in addition to use it in teaching, we use it to enter school's information, statistics, and students' grades. ▪ We make use of the additional exercises that come with the available e-content on Eduwave platform.
Assess perception of school principals, teachers, students, and parents of ICT	▪ There are many advantage of using computer in teaching Mathematics; I never imagined getting my students to understand the meaning of random experiment in mathematics but by using computers it was so easy to do so (Math Teacher). ▪ I am very proud of the way the MIS online curriculum was designed (MIS teacher). ▪ The MIS online curriculum experience was very successful and I wish that the other curricula are designed in a similar innovative way (MIS teacher). ▪ I believe that teaching students by computers can positively influence their understanding (Principal).
Investigate the association between effective use of ICT at school and student achievement	▪ Of course it does! I noticed that from their grades in English. Using the computer in reading, for example, can let my students find out about their spelling and grammatical mistakes as the computer itself underline their mistakes in a red line (English teacher). ▪ It is really magnificent. I actually noticed the huge influence that the computer left on my students' achievement (Math teacher).

3.5.2. The Case of Public Non-Discovery School:

Zarqa Secondary school is a public males' secondary school located in the middle of Zarqa city. The school was established 50 years ago and has more than 800 students. Its buildings appear old but have been maintained recently. The school has more than 40 teachers who teach various branches of knowledge, where most of them have ICDL certificate.

ICT Availability and Connectivity

Zarqa Secondary school has more than 40 desktop computers distributed in two big computer labs. All these computers are connected to the internet through a high speed internet line. The school's computers are used for the school's teaching activities as well as to train other teachers who participate in the area's educational directorate computer training courses. The school's computers are maintained and protected from computers' viruses by the specialized maintenance staff of the area's educational directorate. In addition to this infrastructure, the school is equipped with two data shows, two display screens, one printer, and one scanner.

ICT Utilization

As indicated by the school's principal, the school's computer infrastructure is mainly utilized for the directorate's computer training courses. However, the infrastructure is also used by the computer teacher to teach his curricula but it is not utilized yet to teach other curricula.

> We have computers for more than 10 years but we mainly use them for the directorate's training courses. They also used by the computer teacher to teach his curricula but the other teachers at the school do not use them in their teaching.

The computer teacher, on the other hand, who taught in both private and public schools in Jordan and Saudi Arabia, mentioned that some teachers make use of the e-content made available through Eduwave but this usage is limited due to several factors (i.e. outdated content, old computers), he complained:

> I personally tried to use our computers in teaching but we found that in addition to the old computer that we have in this school, the e-contents available in

> Eduwave are pretty old and the enrichment activities that the platform has are similar to those in the books so we did not find a reason to use the computers.

However, these hurdles force teachers to use their students' personal laptops to prepare the needed activities, the computer teacher indicated:

> We ask out students to bring their own laptops to the school or to prepare something and present it in the class.

In addition to these obstacles, there are several other technical problems that limit the teachers' usage of the school's computers. One teacher added:

> The huge number of students in each class prevents us from taking them to the computer lab. In addition, the problem from having reliable internet connection to connect with the Eduwave is another big problem that we face.

However, the school's teachers believe that these obstacles can be overcome by taking several steps like equipping the school with new computers, update the e-content available in Eduwave and make them appealing to both teachers and students, training teachers on how to use the content, and after all that reduce teachers' teaching load and responsibilities.

On the other hand, the mathematics teacher in the school takes his students, occasionally, to the computer lab to show them how to use excel program to draw some mathematical curves and functions.

Perception about ICT

Although all school's principal, parents, and teachers staff hold positive attitudes toward the use of ICT in teaching, some of them attributed the little use of ICT in teaching by the fear of change that both teachers and students have about learning by computer. The mathematics' teacher, for example, argued:

> I believe that my colleagues and I have a fear to switch to use computer in our teaching. We actually feel that the students are not ready to learn by computer.

Similarly, another teacher attributed the little use of computer in teaching to the fear that teachers have from using computers. He mentioned:

> There are some teachers in the school who fear to use computers.

However, when requested to reason that fear, one teacher attributed it to the little knowledge and training that teachers have about how to employ computers' software in teaching.

> Actually, some teachers don't have enough knowledge and skills to use the available e-content in Eduwave.

In addition to that, another teacher added that some teachers don't like to use computer because they feel that their students are more skillful in using computers and solve the technical problems that they might face.

> Another reason why teachers fear to use computers is they think that their students know more about computers than the teachers themselves. Therefore, the teachers prefer not to be in that situation and stay away from employing computers in their teaching.

Furthermore, another teacher, who has a son in the school, added that secondary grade teachers use traditional teaching methods rather than computers in order to make sure that their students acquire enough knowledge to be able to excel better in "Tawjehi" exam.

> We don't use computers in teaching secondary level grades as the interest is to get a high average in Tawjehi but not to learn better.

ICT and Students Achievement

Although most of the interviewees in this school believe that the use of ICT has a positive influence on students' achievement, some of them hold an opposite one. One of the teachers, for example, justified his negative believe by the way students think about computers. He mentioned:

> I think that the use of computers contributed in my students' low achievement, as most of them use computers to play games and other entertainment computer stuff.

On the other hand, some teachers emphasized the strong relationship between the use of computes and students' achievement. One of these teachers explained:

> I think we can boost our students' achievement by reducing the size of our classes and we hope to have a computer for each student.

Summary

Table 3.8 summarizes the responses of participants of this case study to the different research objectives.

Table 3.8: A Summary of Responses by Research Objective (Zarqa Secondary School)

Research Objective	Selected Participants' Responses
Assess school connectivity and availability of ICT resources	▪ We have more than 40 desktop computers distributed in two big computer labs. ▪ The school is equipped with two data show systems, two display screens, one printer, and one scanner. ▪ All of our computers are connected to the internet through a high speed internet line. ▪ The school's computers are maintained by the specialized maintenance staff of our educational directorate.
Assess the utilization of ICT equipment and facilities	▪ We use our computers to teach the computer curricula but the other teachers at the school do not use them in their teaching. ▪ The e-contents available in Eduwave are pretty old and the enrichment activities that the platform has are similar to those in the books so we did not find a reason to use the computers.
Assess perception of school principals, teachers, students, and parents of ICT	▪ I believe that my colleagues and I have a fear to switch to use computer in our teaching. We actually feel that the students are not ready to learn by computer (Math teacher). ▪ Actually, some teachers don't have enough knowledge and skills to use the available content in Eduwave. ▪ We don't use computers in teaching secondary level grades as the interest is to get a high average in Tawjehi but not to learn better.
Investigate the association between effective use of ICT at school and student achievement	▪ I think that the use of computers contributed to my students' low achievement, as most of them use computers to play games and other entertainment computer stuff. ▪ I think we can boost our students' achievement by reducing the size of our classes and we hope to have a computer for each student.

3.5.3. The Case of Distinguished Schools

King Abdullah II distinguished schools are those schools that Jordan MoE has established to attract distinguished students from all over the country and offer them a careful education. Currently, there are three distinguished schools in Jordan located in Irbid, Zarqa, and salt. In these schools, students who seek admission to these schools are required to take a special admission test and score more than 94% in it.

The distinguished school that this case study revolves around is located in the city of Zarqa. The school was established in 2001 and it has two major divisions; one for males and the other for females. The principal of the school is a female teacher who has a B.A degree in engineering and two M.A degrees in education.

ICT Availability and Connectivity

The school is equipped with five computer labs. One of them labs is designated as a language lab and used to teach Arabic, English, French, and Religion. The school has 100 Pentium 4 computers, where half of them are connected to the internet via a high speed internet ADSL line. In addition to these computers, the school owns a number of data show systems, printers, interactive electronic board, web cameras, and scanners. This infrastructure is continuously maintained by the school's computer engineer and the special ICT maintenance team of the educational governorate.

The school administration relies heavily on electronic communication with its staff and some of the students' parents. In addition the school gives a special account for each student to access the Eduwave platform and to receive communications for the school administration.

The school has a special data base to preserve the school's weekly and monthly exams, students' grades on each exam, and students' information as well.

ICT Utilization

All teachers in this school are skillful in using computers and computers' software. However, most of them prepare their own educational content rather than relying on the e-contents available in Eduwave. When inquired about that, science and mathematics teachers responded:

> We make a good use of computers in the school, we don't rely on the available Eduwave's content but we do prepare our own content by using flash program, dream, and PowerPoint.

When asked to reason that ignorance of Eduwave's software, one of the teachers argued:

> Actually the e-contents available in Eduwave are not sufficient enough for our students, as they (the e-content) are similar to those in the books therefore, we prefer to produce our own software.

Another teacher added:

> I rarely use Eduwave's software in teaching my secondary course as they (the e-content) are unsuccessful.

Additionally, both the principal and the teachers argued that the actual utilization of computers and computers' software occurs only in some grades but not all of them. When asked to clarify that, they mentioned that teachers begin to prepare their students from the tenth grade for the exam of Tawjehi because they need to get high averages on it. They said:

> We do make use of computers in teaching the grades before the tenth grade because, the curricula are interconnected and we need to prepare our students to grasp more knowledge in order to make good in their Tawjehi because it is critical!

Another teacher added that there are several problems that prevent them from using Eduwave's software such as, connectivity problems, technical problems, and the big number of students in each class, they mentioned:

> Some of the teachers don't use Eduwave due to problems in connectivity, as not all of our computers are connected to the internet. In addition, we face problems in the big number of our students and the limited number of computers.

However, the teachers do use the Eduwave platform to enter students' scores and information, which are the only usage of Eduwave from their perspectives.

Perception about ICT

Although most teachers have the required skills to use computers, some of them prefer to use the traditional talk and chalk method. This preference was attributed to the culture that these teachers raised in. the school principal stated:

> Some of our teachers, as I know, prefer to rely on the traditional way of teaching rather than using computers and I can attribute that to the "traditional teaching culture" that each of them hold

However, the school's teachers had another justification of their behavior. One of them mentioned:

> We don't make use of computers due to several complications starting from reserving the computer lab and ending to the slow and interrupted internet connections of our computers.

ICT and Students Achievement

Although some teachers prefer to use the traditional teaching methods due to the aforementioned obstacles, most of them correlate between the use of computers and computers' software in their students' achievement.

> Although I don't use computer that many in my teaching, but I think that it (the computer) can greatly affect our students' achievement.

When asked to elaborate on that perception, the teacher attributed that to the encouragement and enthusiasm that computer gives to students. She said:

> Computer encourages students to become enthusiastic about learning, which results into increasing their achievement.

In the same vein, one parent concurred mentioning:

> My son's Mathematical achievement has improved since his teacher uses of computer in teaching. I did notice that by myself.

Similarly, the school's principal, agreed that the utilization of computer in teaching has a positive effect on the achievement of students who are in ninth grade or below. She mentioned:

> I think that students' achievement did improve by the usage of computer but the issue is different for students who are above that level as they don't use computers.

Summary

Table 3.9 summarizes the responses of participants of this case study to the different research objectives.

Table 3.9: A Summary of Responses by Research Objective (King Abdullah II)

Research Question	Selected Participants' Responses
Assess school <u>connectivity and availability</u> of ICT resources	▪ The school has 100 Pentium 4 computers, where half of them are connected to the internet via a high speed internet ADSL line. ▪ The school has a number of data show systems, printers, interactive electronic board, web cameras, and scanners. ▪ The school's ICT infrastructure is maintained by the school's computer engineer and the special ICT maintenance team of the educational governorate.
Assess the <u>utilization</u> of ICT equipment and facilities	▪ We don't rely on the e-content available in Eduwave but we do prepare our own e-content by using flash program, dream, and PowerPoint (Math and Science teachers). ▪ Eduwave's e-contents is not sufficient enough for our students, as it (the e-content) is similar to that in the books therefore, we prefer to produce our own e-content. ▪ I rarely use the e-content available in Eduwave in teaching my secondary course as it (the e-content) is unsuccessful.
Assess <u>perception</u> of school principals, teachers, students, and parents of ICT	▪ Some of our teachers, as I know, prefer to rely on the traditional way of teaching rather than using computers and I can attribute that to the "traditional teaching culture" that each of them hold (Principal). ▪ We don't make use of computers due to several complications starting from reserving the computer lab and ending to the slow and interrupted internet connections of our computers (Group of teachers).
Investigate the association between effective use of ICT at school and student achievement	▪ Although I don't use computer that many in my teaching, but I think that it (the computer) can greatly affect our students' achievement. ▪ Computer encourages students to become enthusiastic about learning, which results into increasing their achievement. ▪ My son's Mathematical achievement has improved since his teacher uses of computer in teaching. I did notice that by myself (Parent). ▪ I think that students' achievement did improve by the usage of computer but the issue is different for students who are above that level as they don't use computers (Principal).

3.5.4. The Case of Private Schools:

Jordanian international school (JIS) is a private school located in the western side of the city of Amman. JIS was established in 1992 and stated a vision for itself to prepare students who are able to learn continuously and capable to adapt in a continuously changing world. The school vision states:

> At JIS we aim to prepare every student for their future by providing a broad and balanced education that offers challenge in a safe stimulating environment by fostering high standards of achievement and enhancing all students to work hard and strive for excellence.

In addition, JIS hosts a special international educational program (GCE and IGCSE) that aims to prepare its graduates to pursue their education in the UK and abroad.

ICT Availability and Connectivity

Jordanian international school has more than one thousand female students (KG-12) with a ratio of around 20 students in each classroom. The school is equipped with three modern computer labs with a 30 computers in each lab. All of them are connected with a high speed internet line to the World Wide Web and to the MoE server as well. The schools' computers are continuously maintained and protected from computers' viruses by the school engineer and a nearby maintenance company. Additionally, each lab contains a data show, a display screen, and some other computer peripherals (i.e. scanners, sound plasters).

ICT Utilization

When asked about the utilization of ICT resources in the school, the school's principal mentioned that the school utilizes computers to teach students from their early stages till the secondary level, where little students have their special classroom computers while the younger students utilize the three computer labs available in the school. She says:

> We use computers to teach our students from KG-12. We have special computers available in the little students' classrooms and we use a special computer software that called (Techno kit) to teach our little kids, however, we let the younger students to use our available computer labs in their learning.

In addition to that, computers are used in the school administration to do several jobs, the school principal says:

> I actually don't use computer by myself, but we use computers in the school administration to do several jobs like, defining students' emails, preparing timetables, maintaining school statistics, entering students' info, and to prepare our budget and employees' salaries.

Furthermore, the school maintains a hot-line with each parent to keep them posted via email with every thing about their kids and the school as well.

However, when asked the computer teacher about the way she utilizes school ICT resources in her teaching she mentioned that she and her colleagues allow their students to apply what they learn practically in the computer lab:

> We, computer teachers at the school, use computer labs to let our students apply what they learned from their computer curricula.

But when requested to elaborate about the utilization of the MoE Eduwave platform, she mentioned that the teachers do not rely on the platform in teaching their curricula. She says:

> We don't use Eduwave in teaching; we use it only to enter our students' grades and other statistical information about the students and the school.

The teacher justified the non-use of Eduwave in teaching other curricula by the unavailability of computer labs to other teachers as well as the fear of some teachers to use the Eduwave available software.

> I think teachers of other curricula do not use Eduwave in their teaching due to several reasons; the first reason is the computer labs are always busy to teach computer curricula. The second reason is some teachers, as I know, afraid from using the available software in the Eduwave because these software are new and people fear from using new stuff.

When we invited the teacher to talk about the other problems that she and other colleagues face in utilizing the school's computers, she mentioned that the computers needs to be maintained frequently because students abuse them most of the time. Additionally, she said that their computers are continuously exposed to computers' viruses:

> Our computers need to be maintained continuously as our students abuse some of them and break their peripherals. In addition, we suffer from computer viruses

> that enter to our systems when surfing the web as well as from the flash drives that our students use.

Perception about ICT

Exploring the perception of the school's principal, computer teacher, parents, and students about the use of ICT in teaching and learning was also an important goal in this study. When asked to respond to the question of whether it is better to put a computer in each classroom or not, the computer teacher appeared not in favor of doing so. However, when asked to reason her answer, she argued that having one computer in the classroom will not give every student an opportunity to practice what she learned and test her computer skills:

> … I think that the idea of installing a computer in each classroom will have a negative effect on the students, as they will not be able to practice their learning and test their computer skills.

In contrast, the school principal was not only in favor of that idea, but also oversees that the future schools will be having students that have their own laptops. She argued:

> Undoubtedly, I think it is good to have a computer in each classroom, as I think that the future schools will be having students that have their own laptops.

Furthermore, the school's principal appears optimistic that her school will get red of the mass papering that she handles as all communication in the school will be carried on over computers.

Similarly, the perception of a parent of a student in the school was strongly in favor. As she mentioned that she sent her daughter to this school to let her acquire diverse skills and especially those related to computer as she believes that computer is the language of this century. One parent mentioned:

> I sent my girl to this school to get a good learning that centered around the use of computers. Because I think that knowing about computers is essential especially in this century.

Students also shared the same perception of the help that computers offer to their learning. One student mentioned that she likes to prepare PowerPoint presentation and surf the web to find out about some information, that is in addition to the amusement that computer gives to them.

> I like to learn by computers, I learned a lot from my computer teacher. I love navigating the web and writing up papers and do my home works.

ICT and students Achievement

When inquiring about the relationship between the use of ICT in learning and students' achievement. All interviewees expressed a positive attitude. However, when asked to reason that, they explained that computers bring about a change to students and encourage them to enjoy learning and searching for new knowledge. For example, one teacher says:

> It is not a direct effect, but I feel that my students achievement has improved by the use of computers and I notice that when I compare between their scores on paper test and computer tests. And I think that is because computer is different than using traditional ways of testing.

Likewise, parents support the same positive perception about the relation between the use of ICT and their students' achievement. When asked to explain that relation, one parent explains that computers bring pleasure and joy to students thus they perform better and all that reflects on their academic achievement.

> I think that the achievement of my daughter has improved since she started using computers in her leaning. And I think that is because using computers is joyful to her.

Summary

Table 3.10 summarizes the responses of participants of this case study to the different research objectives.

Table 3.10: A Summary of Responses by Research Objective (JIS)

Research Question	Selected Participants' Responses
Assess school connectivity and availability of ICT resources	▪ The school is equipped with three modern computer labs with a 30 computers in each lab. ▪ Our computers are connected to the internet via a high speed internet connection. ▪ Our computer labs contain a data show, a display screen, and some other computer peripherals (i.e. scanners, sound plasters). ▪ Our ICT equipment are maintained by the school engineer and a nearby maintenance company.
Assess the utilization of ICT equipment and facilities	▪ We use computers to teach our students from KG-12. ▪ I use computers in the school administration to do several jobs like, defining students' emails, preparing timetables, maintaining school statistics, entering students' info, and to prepare our budget and employees' salaries (Principal). ▪ use computer labs to let our students apply what they learned (ICT Teacher) ▪ We use Eduwave only to enter our students' grades and other statistical information about the students and the school.
Assess perception of school principals, teachers, students, and parents of ICT	▪ I think that the idea of installing a computer in each classroom will have a negative effect on the students, as they will not be able to practice their learning and test their computer skills (ICT Teacher). ▪ Undoubtedly, I think it is good to have a computer in each classroom, as I think that the future schools will be having students that have their own laptops (School Principal). ▪ I sent my girl to this school to get a good learning that centered around the use of computers (Parent). ▪ I like to learn by computers, I learned a lot from my computer teacher. I love navigating the web and writing up papers and do my home works (Student).
Investigate the association between effective use of ICT at school and student achievement	▪ It is not a direct effect, but I feel that my students' achievement has improved by the use of computers and I notice that when I compare between their scores on paper test and computer tests (Teacher). ▪ I think that the achievement of my daughter has improved since she started using computers in her leaning. And I think that is because using computers is joyful to her (Parent).

4. CHAPTER FOUR: CROSS CASE COMPARISON AND DISCUSSION

The individual case studies offered in the previous section served as the basis for a cross-case analysis in an effort to find aspects of the availability, connectivity, teachers' perception about ICT, and the relationship between the use of ICT and students' academic achievement.

As it appears from these case studies, most schools have a number of computers that ranges from 40 to 100 computers or more per school. Additionally, most schools possess other related ICT peripherals like data show systems, scanners, and printers. Although some schools portrayed in the previous case studies have their computers connected to the internet via a high speed internet line, some other schools do not show the same feature.

The popular use of ICT infrastructure in almost all these schools is in running schools' administrations and activities, communicating with teachers, and students and their parents. However, only few numbers of these schools utilize their ICT infrastructure in the process of teaching and learning. That utilization, however, was varied among the aforementioned schools. Although some schools utilize their ICT components to teach their students the basic skills on how to use the computer and its software (i.e. excel, PowerPoint), other schools put their ICT infrastructure in the hands of their students to boost their learning by searching for relevant educational software via internet.

However, with respect to the utilization of Eduwave platform, almost all schools use the platform to enter their students' grades and information, which is required by the MoE from each school. Only some schools, who have fast internet connection, utilize e-content made available through Eduwave. One successful example of that utilization is the experience of teaching MIS-Online (Management Information Systems Online). Most schools demonstrated a strong enthusiasm in teaching MIS curriculum by computers. That enthusiasm, however, stems from the way the MIS curriculum is produced as well as the nature of the MIS curriculum itself.

However, the utilization of the available e-content in teaching other curricula is concentrated on answering the enrichment activities that accompany each curriculum.

This limitation in the use of the available e-content was attributed, by most schools, to several reasons. The first reason is the shortage of computers, meaning the small number of computers comparing to the large number of students. The second

reason has to deal with the problems with the computers themselves and their need for continuous maintenance, which is not available for all schools in the required short time.

The third reason is related to the shortage of educational content, as not all educational curricula have available supplementary e-content available in the platform. Lastly, the fourth reason concerns with the internet connectivity problems, as most teachers do not like wasting the time of their classes trying to establish a connection.

In addition to the availability and connectivity of ICT in schools, the previously mentioned case studies demonstrated principals, teachers, students, and parents perception about the use of ICT in the process of teaching and learning. Although the majority of those people have positive attitudes toward using ICT in teaching and learning, some of them hold opposite ones. That negativity arose from both the fear of teachers and the fear of students from using technology. While the students' fear revolved around their need to take the comprehensive exam (Tawjehi) at the end of their education, the teachers' fear revolved around their discomfort of switching from teaching through traditional talk and chalk strategies to e-learning ones as well as their fear from relying on the unreliable computers and their software in their teaching.

The last dimension that the previous case studies demonstrated was the relationship between the use of ICT in teaching and students' academic achievement. All schools correlated between their students' high academic achievement and their use of ICT. However, that strong relation was attributed to several factors such as; the joy that computers give to students, the engagement that students demonstrate while using computers, and the help that computers offer to students in finding their linguistic and grammatical mistakes.

4.1. Emergent Themes of the Study:

The aforementioned cross cases comparison allowed for a description of the commonalities and differences between them. However, further analysis of across these cases resulted in more fundamental themes, ones that may prove to be transferable to other similar situations. The following section is devoted to discuss these emergent themes.

Theme One: Computers as Instructional Aids

Throughout the study, the observation that kept coming over and over was the issue of considering computers as instructional aids besides other traditional aids that

most schools have. The issue of equating computers to instructional aids, by teachers, reduces the benefits that both teachers and students could achieve from using it. However, we argue that the perception of computers as additional instructional aids has several roots; perhaps, the absence of internet connectivity could be the most important root for this problem. The absence of connectivity does largely reduce the utilization of online educational sources such as Eduwave. Rather than using office programs (i.e. excel, PowerPoint, word), computers do not have many educational values without internet.

Another root of equating computers to instructional aids problem could be the quality of the available platform-content. Throughout the study, many teachers complained from the low quality of e-content. Except MIS curricula, all other curricula are supplemented with some enrichment activities. These activities, however, are not worthy from the perspective of most teachers to go in the hassle of taking students to the computer lab and let them take these activities on computer. This teachers' behavior becomes justified when the available enrichment activities do not add to the ones available in students' textbooks.

A plausible solution for these problems seems to be enhancing the ICT infrastructure in all schools then preparing better interactive and attractive e-content for each curriculum. Once we reached to this end, teachers can then be asked to switch their teaching to online one.

Theme Two: Issues of Connectivity

Despite the enormous amount of work that has been done and the serious effort that has been made to rapidly advance the availability and usefulness of the Internet throughout the country, numerous problems and challenges still remain. One of these is the schools' connectivity to the internet. As appeared in the results of this study many schools suffered from the absence of internet connection. However, in some cases even if the connection is available, it would be in a bad quality that does not encourage teachers to rely on it. The bad connectivity with the internet does greatly affect teachers' use of Eduwave online features.

> Our teachers don't use Eduwave due to problems in connectivity.
>
> I would like to use the different supportive activities on Eduwave but I find problems to connect with the platform. The connection is so slow and I lose more than 25 minutes of my class time to open the desired page.

The solution to this problem is for MOE to solve the connectivity issues at schools. Parallel with this suggestion, the MoE needs to enhance and update the available e-content in the platform. A model example that the ministry could consider in preparing new e-content is the design of MIS curricula. According to the results of this study, MIS-online has several interactive features that were welcome by all users in the field. Therefore, preparing similar e-content will definitely encourage teachers to switch to use online teaching strategies instead of traditional ones.

Theme Three: Conception of Computerization

At several points during this study, we asked our participants to identify and review their philosophical beliefs about using computer in learning and pedagogy. Most of them demonstrated similar pedagogical beliefs about the meaning of computerization and the logic behind using it in teaching and learning. Some of them conceived the meaning of computerization as taking students to computer labs and let them take the enrichment activities that supplement each curriculum.

> I think the meaning of computerization as taking the Eduwave's enrichment activities of each curriculum.

Another conception of the meaning of computerization is the strategy that enacts students' autonomous learning. That meaning derived from a Mathematics teacher:

> I believe that computerization means letting our students learn by themselves using the computer's educational software.

An additional meaning of computerization was presenting the content of curricula on computer's screen:

> Computerization means to me displaying our textbooks on the computer's screen

These diverse conceptions of computerization underpin a problem in the way these teachers perceive the whole process of teaching and learning by computer as well as the way they perceive their teaching roles. This perception will consequently affect their students' learning. Pajares (1992) and many researchers (Haney, Czerniak, & Lumpe, 1996) argue that teachers' thinking do greatly affect students' learning. They argue that teachers' thinking affect their implicit perceptions, plans, and actions in

classroom. However, looking at the roots of these diverse conceptions of computerization informs that teachers derived their alternative conceptions from many sources such as; educational supervisors, representatives, or surrounding environment. Gess-Newsome et al., (2003) and Hargreaves (1994) indicate that teaching culture and environment influence teachers' thinking and conceptions.

Perhaps, one of the sources of these teachers' alternative conceptions of computerization derived from the definition of the former minster of education. Touqan (2004) defines computerization as transferring written curricula to electronic formats and displaying them by computers. This definition and similar ones act as a source for the alternative conceptions that these teachers had. However we agree with Powell's (2004) definition of computerization as it is an innovative way of teaching and learning that occurs via various computers' multimedia. This meaning is similar to the way MIS-Online curricula is presented in Jordan schools, as MIS teachers accompany their students to the computer lab and let them interact with the electronic MIS curricula by designing their individual projects and finding ways to apply it with the help of their teachers.

We argue that this successful experience may serve as a model to design other educational curricula in order to maximize both the utilization of schools' ICT infrastructure and students' learning in the future.

Theme Four: Fear of Technology

One of the most important themes that derived from analyzing the previous case studies is teachers' fear of using computers and computers' related technologies. Teachers do not prefer to use computers and their software.

> Teachers don't like to use computers and their software because they are afraid from using the new stuff from overtaking their teaching role.

We believe that this fear has multiple sources and roots. One of these sources is the teachers' confidence about using computers and their educational software. In other words, teachers perceive themselves to be technically incompetent.

Another source of that fear could be teachers' perceptions that their students may outperform them in using technology and its related equipment, which cause

teachers to avoid dealing with computers in their teaching in order not to get embarrassed in front of their students.

We argue that teachers need more specific training in ways to use computers and software as well as in ways to integrate these pieces of software in their teaching. ICDL and other general computer training courses do not provide teachers with the sufficient knowledge to work with computers and their software. Teachers need access to a considerable range of computer knowledge and skills in order to be able to keep up with the times and provide students with the best education possible.

Computers specialized courses can greatly assist teachers in delivering knowledge to students. Furthermore, as many educators see that computers are necessary in schools to help students develop skills on which they can build upon later (Leskov, 2001), they are unwilling to use the computers within classrooms unless they received specialized training. We believe that when teachers can not grasp all the facets of the software, they will be unwilling to use it in their courses.

Thus the training of teachers remains a major issue in computerizing Jordanian education. It is essential to help teachers learn how to use the equipment adeptly before they can begin to introduce a more technologically-based curriculum to students.

5. CHAPTER FIVE: MONITORING THE NATIONAL AND INTERNATIONAL PROGRESS OF ICT IN EDUCATION

5.1 Developmental (overtime) Trend of ICT in Jordan:

In this section, the developmental (overtime) trend of ICT in Jordan is addressed by presenting the following main ICT indicators over the years 1999, 2004, and 2008:

- Percentages of schools (MoE, private) with access to computers for instruction,
- Percentages of schools (MoE, private) having access to the Internet.
- Student-computer ratio in MoE schools.
- Percentages of teachers who use email or web.
- Percentages of schools with and without homepages.
- Percentages of students who bring their own laptops.
- Percentages of the frequency of using PC in financial administration.
- Percentages of the frequency of using PC to communicate with parents.

- Percentages of teachers rating for the first five most serious obstacles to using ICT.

It is worth to mention that values of these indicators for the years 1999 and 2004 were obtained from NCHRD (2004). To illustrate the developmental trend of ICT in Jordan, a line graph was plotted for each indicator. A discussion of these indicators is presented next.

Percentages of Schools (MoE, private) with Access to Computers for Instruction:

Table 5.1 displays percentages of schools with access to computers for instruction over the three years: 1999, 2004, and 2008.

Table 5.1: Percentages of Schools with Access to Computers for Instruction over the Years 1999, 2004, and 2008

School Type	1999	2004	2008
MoE	60%	90%	96%
Private	75%	100%	100%

Based on Figure 5.1, one can notice that between the years 1999 and 2004, MoE has done a great job in increasing the percentage of its public schools that have access to computer for instruction. Moving from 60% in the year 1999 to 90% in the year 2004 is an obvious evidence of the serious efforts spent through outstanding initiatives (like ERfKE).

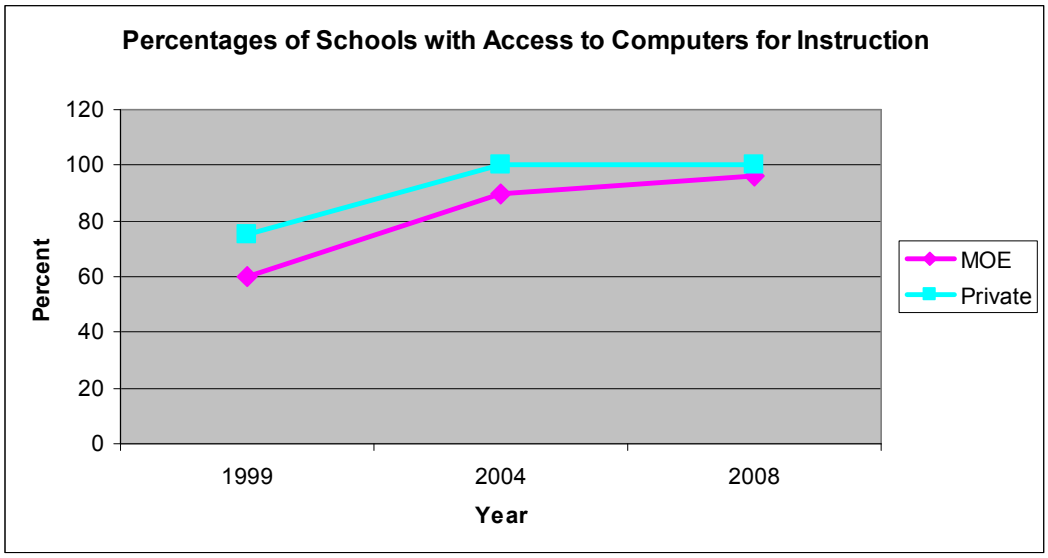

Figure 5.1**: Percentages of Schools with Access to Computers for Instruction**

From the year 2004 to the year 2008, MoE has continued its work to supply its public schools with more computers that can be beneficial to instruction. Although the difference in percentages between the two mentioned years is just 6% (from 90% in 2004 to 96% in 2008), the efforts behind such a difference is fabulous. A percentage of 96% of MoE schools with access to computers for instruction is outstanding when it's compared to the 100% of private schools with the same access to computers.

Although until recently the percentage of private schools in Jordan has been around 38% (MoE, 2007), the difference in the percentages of public schools to private schools with access to computers for instruction has shrunk from 15% (75% - 60%) in the year 1999 to 10% (100% - 90%) in the year 2004 to 4% (100% - 96%) in the year 2008.

The remaining 4% of MoE schools that still need to be supplied with computers for instruction requires great efforts. MoE's job won't be easy to accomplish since the nature of obstacles this time may be different. Some of MoE schools that are part of this 4% are rural. In fact, some of them still lack the indispensible infrastructure like electricity and phone lines. Therefore, what a cutting-edge PC can do in a school that has no electricity???...not too much!!

Percentages of Schools (MoE, private) Having Access to the Internet:

Table 5.2 displays percentages of schools with access to the Internet over the years 1999, 2004, and 2008.

Table 5.2: Percentages of Schools with Access to the Internet over the Years 1999, 2004, and 2008

School Type	1999	2004	2008
MoE	4%	18%	70%
Private	13%	62%	90%

The trend of this indicator seems to be different than that of the first one. Both MoE schools and private schools have not yet reached the saturation (i.e. the 100% level), where all computers have access to the Internet. As shown in Figure 5.2, it can be noticed that between the years 1999 and 2004, MoE has elevated the percentage of its public schools that have access to the Internet from 4% to 18%. On the other hand, the percentage of private schools that have access to the Internet has increased from 13% in the year 1999 to 62% in the year 2004. It's clear that in this period of years, private schools have done a better job than MoE.

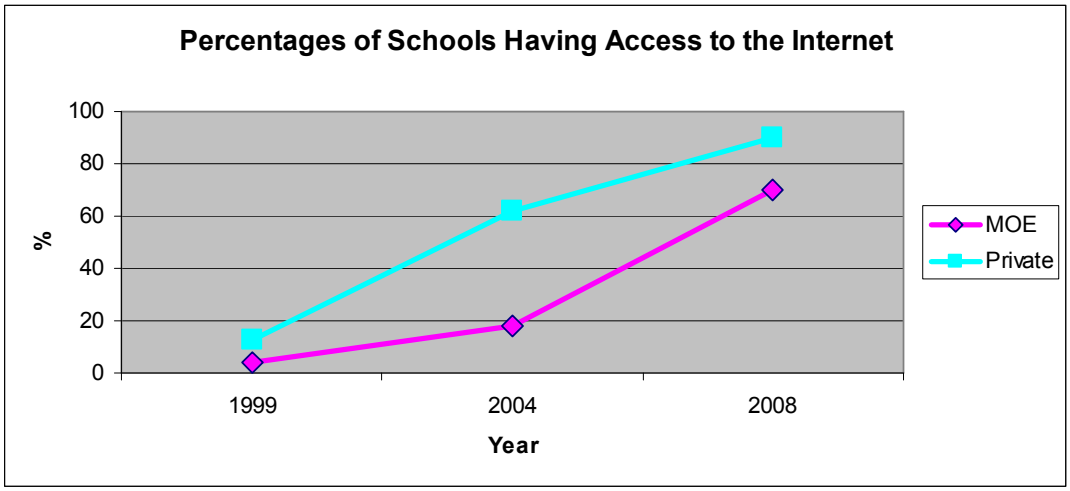

Figure 5.2: Percentages of Schools Having Access to the internet

However, the story has reversed between the year 2004 and 2008. MoE has been successful in increasing the percentage of schools with Internet access from 18% in the year 2004 to 70% in the year 2008, with around 52% increase. However, for the same period of time, the percentage of private schools with Internet access has increased from 62% to 90%, with around 28% increase only! This indicates that in the last 4 years MoE has doubled its efforts to increase the number of schools with Internet

access. This great achievement would not have happened without the great initiatives (like ERfKE) that make dreams true!

Student-Computer Ratio in MoE Schools:

Table 5.3 displays student-computer ratio in MoE schools over the years 2004 and 2008.

Table 5.3: Student-Computer Ratio in MoE Schools over the Years 2004 and 2008

School Type	2004	2008
MoE	28	20

As shown in Figure 5.3, student-computer ratio in MoE schools has dropped from 28 in the year 2004 to 20 in the year 2008. A drop of 8 in student-computer ratio in a period of four years in a developing country like Jordan is considered a great achievement when compared to other countries in the region. Therefore, it is necessary to compliment the continuous efforts of MoE in decreasing computer-student ratio in its public schools.

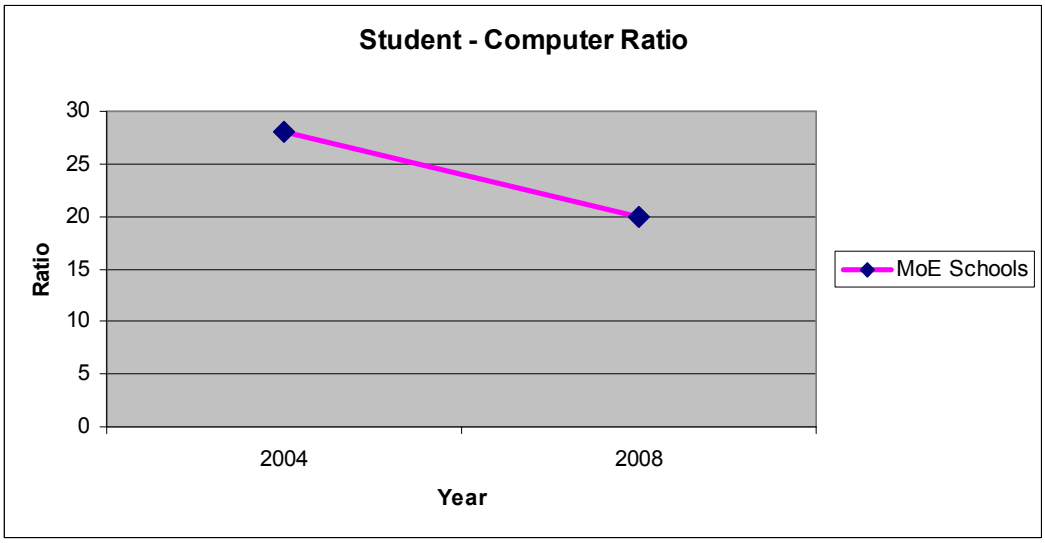

Figure 5.3: Student-Computer Ratio in MoE Schools

Percentages of Teachers Who Use Email or Web:

Table 5.4 displays percentages of teachers who use email or Web in teaching in MoE schools over the years 2004 and 2008. Teachers' use of email or Web has been classified into six categories: None, 1-10%, 11-25%, 26-50%, 51-75%, and 76-100%.

Table 5.4: Percentages of Teachers who Use Email/Web in MoE Schools over the Years 2004 and 2008

Category	2004	2008
None	15%	17%
1-10%	37%	14%
11-25%	18%	17%
26-50%	13%	15%
51-75%	15%	29%
76-100%	2%	8%

As shown in Figure 5.4, percentages of teachers who use email/Web in teaching in MoE schools have remained almost the same for the categories: None, 11-25%, and 26-50%. However, for the 1-10% category, the percentage has dropped from 37% in the year 2004 to 14% in the year 2008. This huge decrease in percentage (23%) for the category 1-10% has been faced by a big increase (14%) for the category 51-75%; a 15% in the year 2004 has been almost doubled (29%) in the year 2008. Based on these figures, we can conclude that over the last four years, almost half the teachers in the 1-10% category have migrated mainly to the 51-75% category, indicating more use of email/Web in teaching by teachers. For the 76-100% category, a small increase in percentage (6%) from the year 2004 to the year 2008 has been noticed.

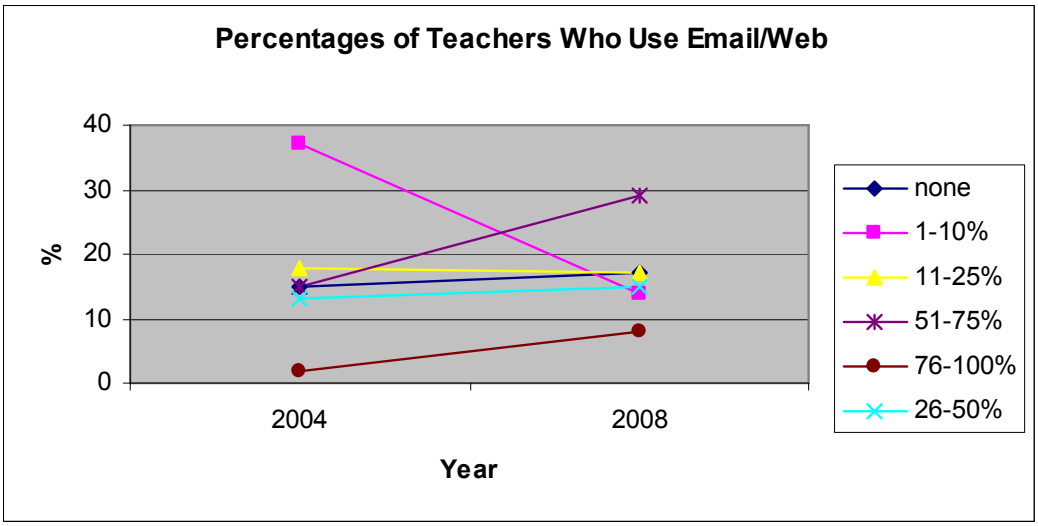

Figure 5.4: Percentages of Teachers who Use Email/Web in Teaching (MoE Schools)

Percentages of Schools with and without Homepages:

Table 5.5 displays percentages of MoE schools with homepages over the years 2004 and 2008.

Table 5.5: Percentages MoE Schools with Homepages over the Years 2004 and 2008

Category	2004	2008
With	14%	19%

As shown in Figure 5.5, a slight increase (5%) in the percentage of schools that have homepages can be clearly noticed as we move from the year 2004 to the year 2008. This indicates that the efforts of MoE in this regard have not fruited well over the last four years. MoE needs to investigate more in how to encourage schools to build their own pages and share knowledge and experience with each other.

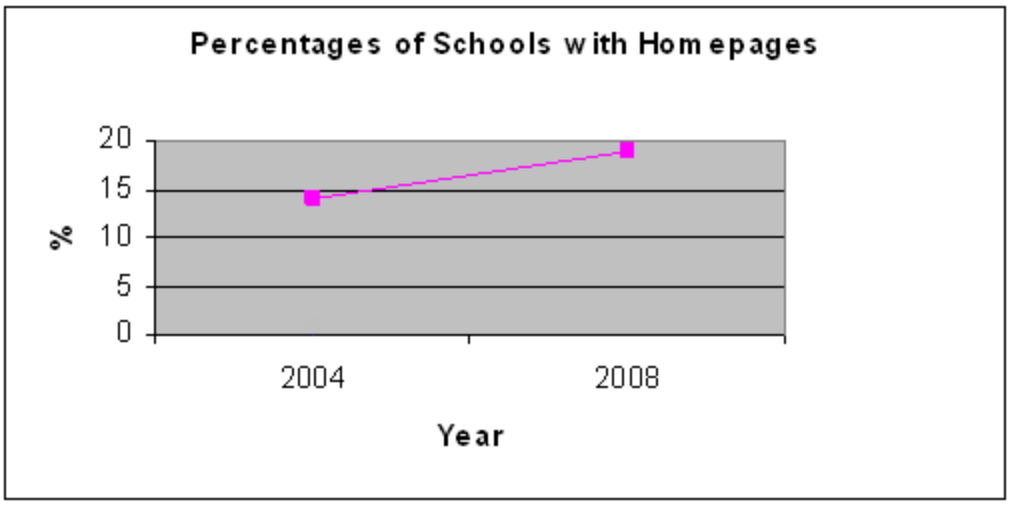

Figure 5.5**: Percentages of Schools with Homepages (MoE Schools)**

Percentages of Students who Bring their Own Laptops:

Table 5.6 displays percentages of MoE students who bring their own laptops to school over the years 2004 and 2008.

Table 5.6: Percentages of Students who Bring their Own Laptops over the Years 2004 and 2008

Category	2004	2008
1-10%	5%	10%

As shown in Figure 5.6, a slight increase (5%) in the 1-10% category of students who bring their own laptops to school can be noticed as we move from the year 2004 to the year 2008. However, to encourage students to have their own laptops, MoE may need to look for serious partners especially from the private sector who can help in this regard.

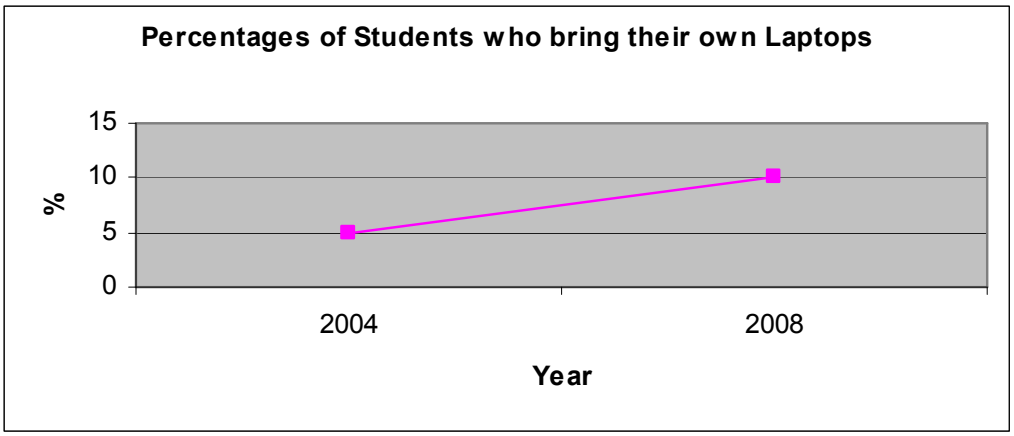

Figure 5.6**: Percentages of Students who Bring their Own Laptops (MoE Schools)**

Percentages of the Frequency of Using PC in Financial Administration:

Table 5.7 displays percentages of the frequency of using PC in financial administration in MoE schools over the years 2004 and 2008. The frequency of using PC in financial administration has been classified into four categories: Never, A Few Times, Monthly, and Weekly.

Table 5.7: Percentages of the Frequency of Using PC in Financial Administration over the Years 2004 and 2008

Category	2004	2008
Never	42%	31%
A Few Times	26%	23%
Monthly	20%	25%
Weekly	12%	21%

In general, as shown Figure 5.7, we can notice that the percentages of the monthly and weekly uses of PC in financial administration have increased over the last four years. In particular, the highest increase in percentage has occurred in the "weekly" category (9%). A decrease of 11% in the "Never" category can be noticed as we move from the year 2004 to the year 2008. This decrease indicates more use of PC in financial administration.

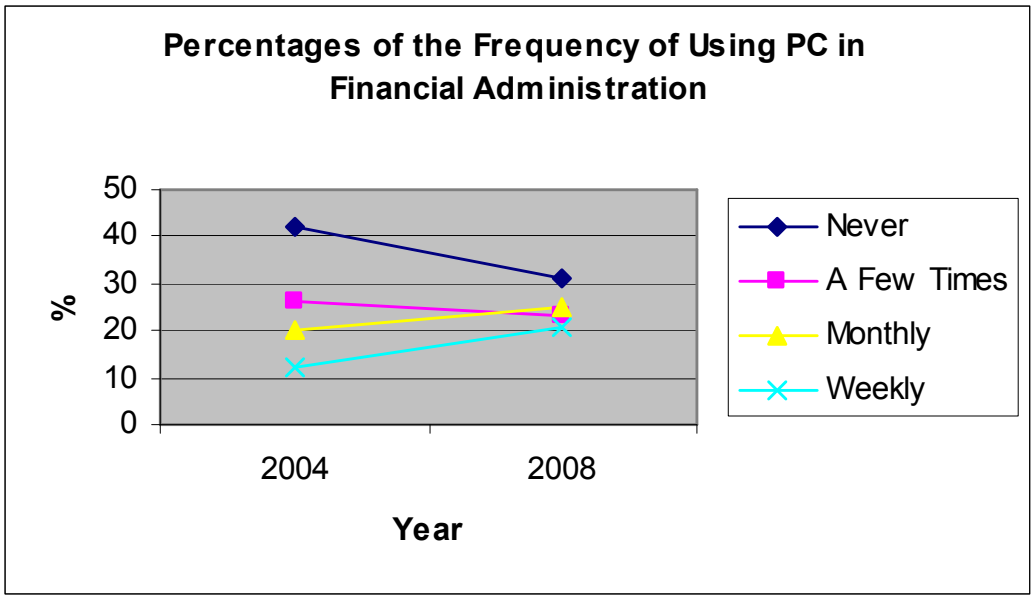

Figure 5.7: Percentages of the Frequency of Using PC in Financial Administration (MoE Schools)

Percentages of the Frequency of Using PC to Communicate with Parents:

Table 5.8 displays percentages of the frequency of using PC to communicate with parents in MoE schools over the years 2004 and 2008. The frequency of using PC to communicate with parents has been classified into four categories: Never, A Few Times, Monthly, and Weekly.

Table 5.8: Percentages of the Frequency of Using PC to Communicate with Parents over the Years 2004 and 2008

Category	2004	2008
Never	50%	38%
A Few Times	21%	28%
Monthly	18%	23%
Weekly	11%	11%

Generally speaking, as displayed in Figure 5.8, we can notice that the percentages of the "monthly" and "a few times" uses of PC to communicate with parents have increased over the last four years. Particular, the highest increase in percentage has occurred in the "a few times" category (7%). A decrease of 12% in the "Never"

category can be noticed as we move from the year 2004 to the year 2008. This decrease indicates more use of PC to communicate with parents. It is surprising to notice that the percentage of using PC to communicate with parents has remained the same for the "weekly" category as we move from the year 2004 to the year 2008. This may be justified by the insufficient collaboration of parents since communication is a two-sided process.

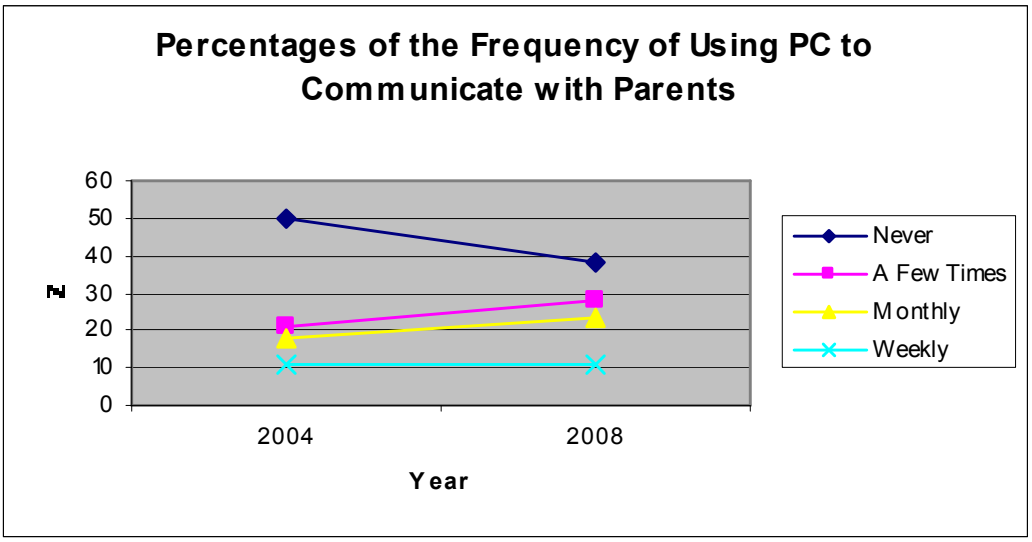

Figure 5.8: Percentages of the Frequency of Using PC to Communicate with Parents (MoE Schools)

Percentages of Teachers Rating for the First Five Most Serious Obstacles to Using ICT:

Table 5.9 displays percentages of teachers rating for the first five most serious obstacles to using ICT in MoE schools over the years 2004 and 2008. These obstacles were originally sited in the year 2004.

Table 5.9: Percentages of Teachers Rating for the First Five Most Serious Obstacles to Using ICT (Sited in 2004) over the Years 2004 and 2008

Obstacle	2004	2008
1. Insufficient number of available PC	86%	62%
2. Insufficient number of PCs connected to the Internet	71%	41%
3. Outdated school network	66%	54%
4. Slow and unreliable networks	57%	39%
5. Insufficient technical support	52%	36%

In general, as displayed in Figure 5.9, we can notice that the percentages of teachers rating for the first five most serious obstacles to using ICT as sited in 2004 have dropped significantly as we move from the year 2004 to the year 2008. The largest drop in percentage (30%) has occurred in teachers rating for the second most serious obstacle "Insufficient number of PCs connected to the Internet." This indicates that MoE has significantly increased the number of schools connected to the Internet over the last four years, which agrees with the results presented earlier. The second largest drop in percentage (24%) has taken place in teachers rating for the first most serious obstacle "Insufficient number of available PCs." As in the case for the second obstacle, MoE has significantly increased the number of PCs in schools over the last four years, which we discussed earlier in this section.

The smallest drop in percentage (12%) has appeared in teachers rating for the third most serious obstacle "Outdated school network." This may indicate that MoE has still something to do with school network. In fact, results presented earlier in this report pinpointed this obstacle.

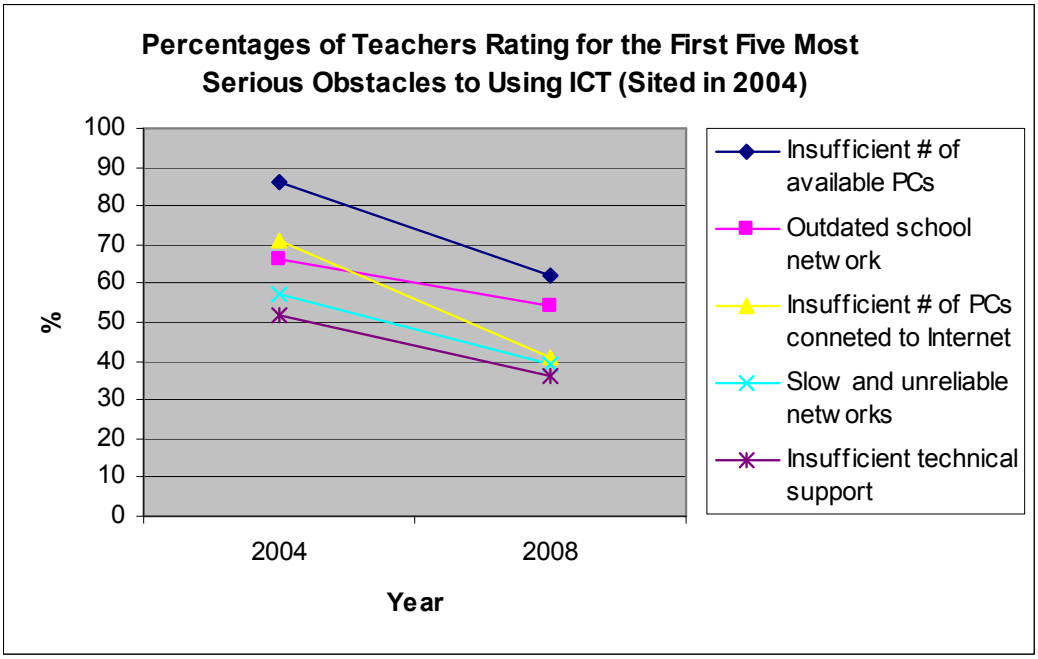

Figure 5.9: Percentages of Teachers Rating for the First Five Most Serious Obstacles to Using ICT (Sited in 2004)

In a nutshell, to keep the trends in some indicators mentioned above, MoE has to keep up the good work through its initiatives and spend more efforts in other indicators. As we know, the first phase of ERfKE (called ERfKE I) is almost over. What MoE needs

to do in the second phase of ERfKE (not sure if it's called ERfKE II) is to give ICT utilization and assessment much more attention.

5.2. Comparing Jordan to Other Nations with Respect to ICT Use and Utilization:

With respect to ICT use and utilization, comparing Jordan with some other countries is imperative. In fact, monitoring the national and international progress of utilizing ICT in education should be among the priorities of MoE. Usually, monitoring the progress of utilizing ICT in education can be achieved by looking at certain benchmarks. These benchmarks provide a way of measuring what has been achieved in the utilization of ICT in education and how much of it is still ahead. To compare the experience of MoE in utilizing ICT in education with that of other countries, the following four benchmarks were employed:

- Percentage of schools which use computers for educational purposes,
- Student-computer ration,
- Percentage of schools with Internet access**,**
- Percentage of schools that have their own Home Page.

Before getting to the benchmarks, it is imperative to mention that for the purpose of this report the comparison was done with the following (20) countries: Belgium (BE), Czech Republic (CZ), Germany (DE), Estonia (EE), Spain (ES), France (FR), Italy (IT), Cyprus (CY), Latvia (LV), Lithuania (LT), Hungary (HU), Austria (AT), Poland (PL), Portugal (PT), Slovenia (SI), Slovakia (SK), England (UK), Iceland (IS), Norway (NO), and United States of America (USA).

It's also necessary to mention that data used in the comparison were obtained mainly from a final report from Head Teacher and Classroom Teacher survey in 27 European countries, published in 2008, and available online at: http://ec.europa.eu/information_society/eeurope/i2010/docs/studies/final_report_3.pdf

With some benchmark comparisons, USA was included.

Percentage of schools which use computers for educational purposes:

Figure 5.10 –below displays the percentage of schools which use PCs for educational purpose in 21 countries, including Jordan. In countries like: Norway, Italy, France and Germany, almost all (99%) of schools use computers for educational

purposes. Countries like Spain and Poland reported that 95% of their schools use computers for educational purpose. USA reported almost a similar percentage (94%).

Except for Jordan, the rest of countries in the figure have percentages ranging from 95 to 98. It's interesting to say that Jordan with a percentage of 77 is not too far from these countries. An additional 17% or 18% will be sufficient to move Jordan to the level of USA, Spain, or Poland.

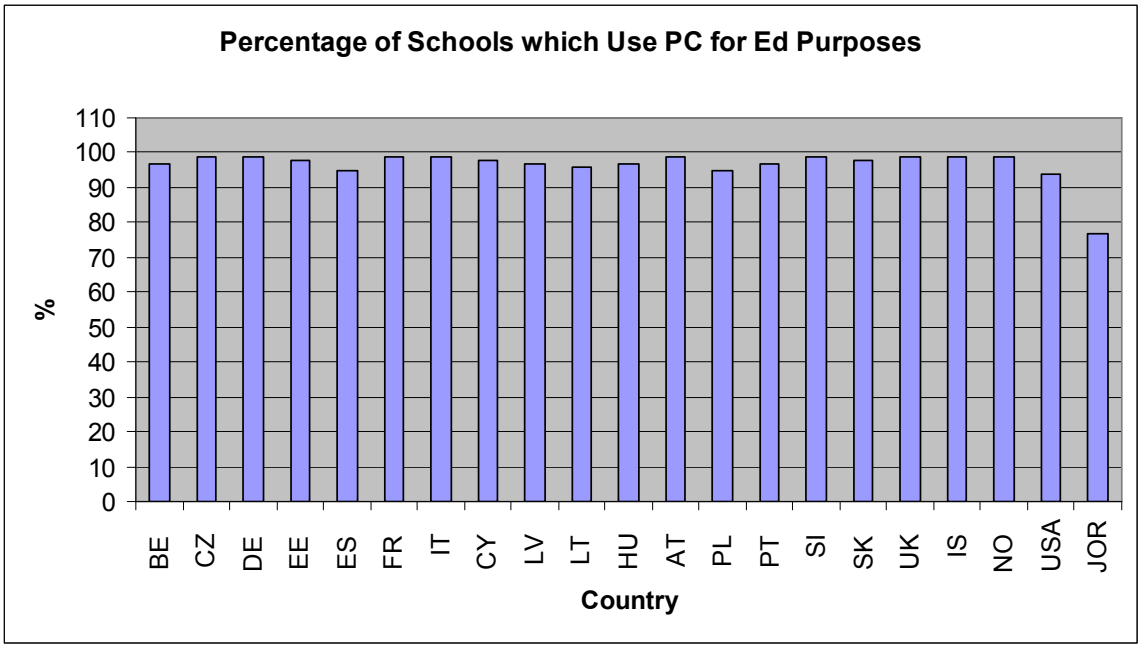

Figure 5.10**: Percentage of Schools which Use PCs for Educational Purposes**

Student-computer ratio:

For this benchmark, Figure 5.11 displays the student-computer ratio for the same countries presented in the first benchmark (expect for USA). Even a quick look at the figure can tell that Jordan is doing great compared to the rest of the countries in the regard of student-computer ratio. Surprisingly, Jordan has almost the same ratio (17) that Latvia, Lithuania, Poland, and Portugal have. Countries like: Norway, England, and Austria have the lowest ratios (4, 5, & 6, respectively) compared to other countries in the figure. Other countries in the figure have ratios ranging from 7 to 16.

Even with a ratio of 17, Jordan is considered to be doing well as a small country with limited resources.

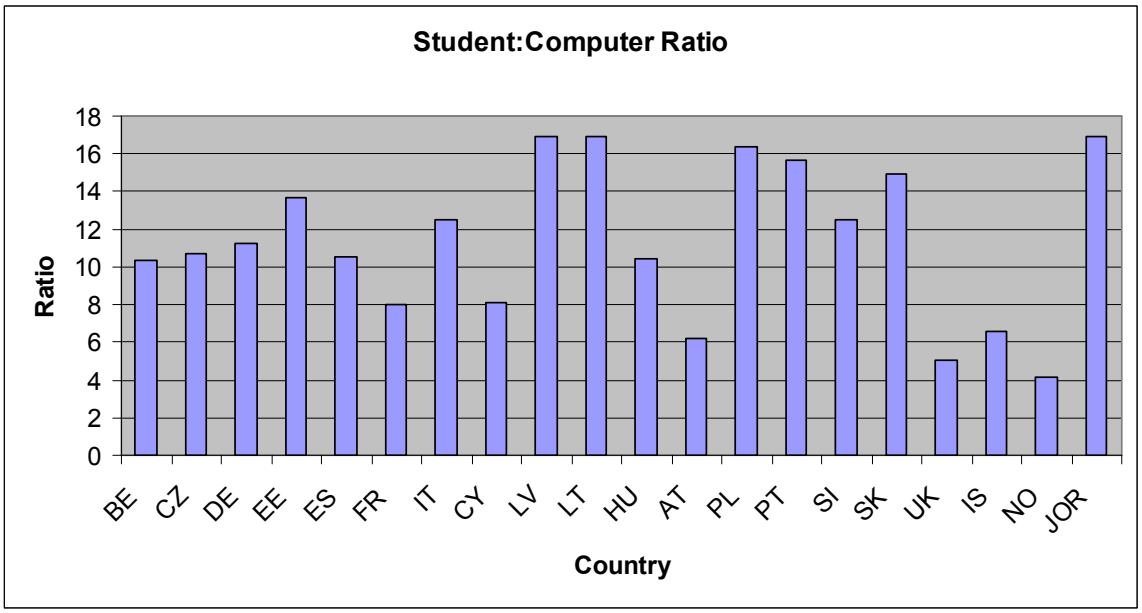

Figure 5.11**: Student-Computer Ratio**

Percentage of schools with Internet access:

Figure 5.12 displays the percentage of schools with Internet access in the 21 countries presented in the first benchmark. It is interesting to notice that in countries like Norway, England, Slovenia, and USA, all (100%) of schools have Internet access. However, some other countries have smaller percentages. For example, in France 90% of schools have Internet access. Closer to France, Portugal and Poland have percentages of 92 and 93, respectively.

Based on the same figure, in Jordan 72% of schools have Internet access. It's interesting to say that with additional 17% or 18%, Jordan can move to the level of France or Portugal. This requires Jordan to spend more efforts in connecting more schools to the Internet.

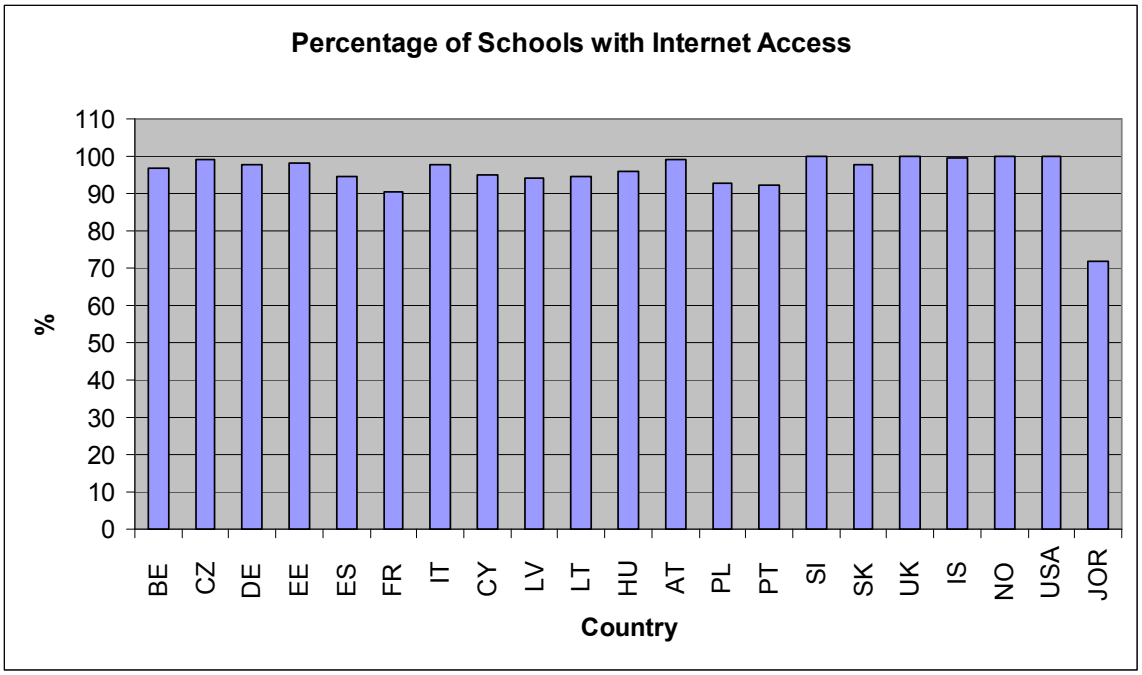

Figure 5.12**: Percentage of Schools with Internet Access**

Percentage of schools that have their own Home Pages:

In this benchmark, countries presented in Figure 5.13 have a noticeable variation in the percentages of schools that have their own home page. Except for Slovenia, not too many countries in the figure are doing well in this regard. Around 94% of schools in Slovenia have their own home pages. Countries like: Cyprus, Latvia, and France have lower percentages of 51, 41, and 29 respectively.

Surprisingly, Jordan has the lowest percentage among all countries in the list. Only 15% of schools in Jordan have their own home pages. This needs a great attention from MoE. With its own home page, a school can present its work, activities, achievements, and other things to the whole world. Schools can learn from each other. In short, having a home page has lots of virtues to the school itself and to other schools in the region.

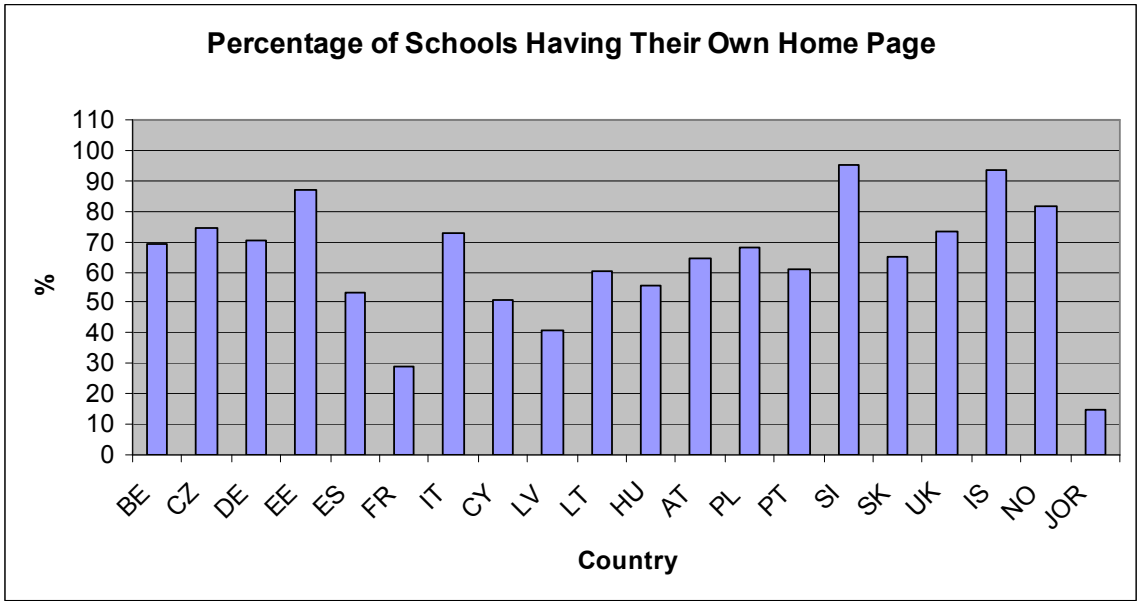

Figure 5.13**: Percentage of Schools having their Own Home Page**

In a nutshell, we can bluntly say that with a diligent and consistent work, Jordan can move up to a higher level in all the benchmarks presented in this section within the next few years. Increasing the percentage of schools that have their own home pages is a crucial issue that needs to be considered by MoE.

6. CHAPTER SIX: LESSONS LEARNED & RECOMMENDATIONS

The ground-breaking ICT education reform initiative in Jordan toward knowledge economy is fruitful and moving in the right direction with the help and support of all involved stakeholders. The incorporation of ICT into the learning system has led in changing the way teaching and learning is happening at schools. However, there are some important lessons that we learned throughout conducting this huge research. We believe that considering these lessons would result in complementing the success of incorporating ICT in Jordan educational system.

Lesson One: Providing Better Technical Support Solutions

Installing computers into schools is relatively easy; however, keeping them working is a greater challenge. A myriad of problems ranges from software problems

(i.e. computers' viruses) to hardware problems. Many teachers in schools participated in this study addressed these issues. They suffer from the absence of licensed copies of antivirus to keep their computers running. In addition, the long time that takes to get their down computers fixed was also a major obstacle for most schools. These problems are found everywhere in the world, literature indicates that most ministries of education all over the world are ill equipped to effectively service a large number of schools. Most schools are therefore left with very little technical support when inevitable technical glitches arise. However, a few innovative solutions have emerged in countries around the world. One solution is to give computer lab supervisors more responsibility for maintaining the labs. Many computer teachers are as or more adept with the technology than the "professional" technicians who are often hired. Providing those teachers with some basic training and a whole lot of trust can save a school and a school system time and money. Other solutions, however, must also be evaluated, such as outsourcing this technical support to private organizations.

Lesson Two: Moving toward Wireless Schools

MoE has done a wonderful job in equipping schools with ICT infrastructure; however, the issue of slow and unreliable connectivity was a critical problem that faces the full utilization of ICT in the process of teaching and learning. Related literature in ICT indicates that this problem is not a local problem; many schools in developing countries suffer from this sort of problems. In order to overcome the deficiencies of the existing fixed line infrastructure, some developing countries' schools are now bypassing their local fixed line infrastructure and establishing wireless Internet access. In Uganda, for example, there is a telling case of the schools' evolution to broader band Internet connectivity using wireless solutions.

Lesson Three: Emphasizing Teachers' Training

The professional development of teachers sits at the heart of any successful technology and education program. As indicated in the results section of this study, many teachers lack a good training on how to utilize the good educational software available in Eduwave platform. It is important to note that, teachers need not only formal training, but also sustained and ongoing support to help them learn how best to integrate educational software into their teaching. Training must go well beyond basic cutting-and-

pasting. Teachers need to be able to transform their classrooms from places where a static one-way flow of information from teacher to student occurs, into dynamic, student-centered learning environments in which learners interact with peers in teams, both in their own classroom as well as with virtual classes around the world through the Internet.

As it appeared for teachers' interviews, some teachers appeared to be intimidated by technology and are comfortable with their own teaching styles. Therefore, to help these teachers transform, suitable training that help teachers see past the technology to the pedagogical and educational gains that use of the technology will bring to the classroom. Furthermore, establishing channels of communications between teachers is crucial to help teachers transform and learn from others' experiences. Some countries have established online networks or communities-of-practice, in which teachers share resources that enhance their curriculum, get peer reviews of lesson plans they have created, and exchange ideas and good practices with other teachers of their subject. A practical step to accomplish such a goal is to start with teachers in distinguished schools as those teachers are creative in producing their educational materials.

Lesson Four: Investing on Teachers and Students Motivation

Throughout our interviews and classroom observations, we noticed that most students are so eager and motivated to use computers and surf the web searching for information to write papers and design projects. The case of MIS online students was a representative example of that. The MIS curriculum design is so appealing and encouraging to students. Therefore, we recommend replicating that successful experience in other curricula in order to maximize the utilization of the country's excellent ICT infrastructure.

Lesson Five: Preparing Backups for Educational Materials

Despite the enormous amount of work that has been done and the serious effort that has been made to rapidly advance the availability and usefulness of the Internet throughout the country, the issue of interrupted internet connectivity is still an ongoing challenge that faces the full utilization of computer educational resources. Therefore, the MoE should maximize its efforts to resolve the connectivity issues. However, for Internet disruption, the offline viewing alternatives can be considered, and can be made available through Eduwave.

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ABSTRACT IN ARABIC

الملخص باللغة العربية

تقييم مصادر واستخدام تقنيات المعلومات والاتصالات

مما لا شك فيه أن ظهور تقنيات المعلومات والاتصالات قد غيرت في مظاهر الحياة، وفي المنظمات والاستراتيجيات والتواصل في المجتمعات في جميع أرجاء العالم. أما في مجال التعليم، فقد كان الاهتمام منصباً حول ما يمكن للحاسوب والإنترنت أن تحدثاه من تطور بالطرق المختلفة. ونتيجة لذلك، فقد تم إطلاق العديد من برامج تقنيات المعلومات والاتصالات، وتطوير العديد من الاستراتيجيات، والحصول على معدات الحاسوب وأجهزته، بالإضافة إلى تصميم العديد من البرمجيات. وبالتالي، فقد حظي تأسيس البنية التحتية الجيدة وشراء المعدات والبرمجيات بمعظم الاهتمام، مما ترك القليل من الاهتمام للأهداف التي من أجلها استخدمت تقنيات المعلومات والاتصالات في التعليم. وبكلمات أخرى فإنه لم يتم بشكل كامل معرفة كيف تغير تقنيات المعلومات والاتصالات التعليم وما يجب القيام به لتحقيق الأهداف المتوخاة من استخدام هذه التقنيات.

إنطلاقاً من رؤية جلالة الملك عبد الله الثاني، تم إطلاق العديد من المبادرات في مختلف قطاعات المجتمع الأردني. كانت مبادرة التطوير التربوي من أجل اقتصاد المعرفة واحدة من هذه المبادرات التي تم إطلاقها في عام 2003، حيث هدفت هذه المبادرة إلى المساعدة في تطوير النظام التربوي الأردني في مرحلة الطفولة المبكرة، والتعليم الأساسي والثانوي من أجل توفير خريجين يمتلكون المهارات اللازمة لاقتصاد المعرفة.

قام المركز الوطني لتنمية الموارد البشرية بدور مراقبة وتطوير مشروع التطوير التربوي من أجل اقتصاد المعرفة بتطبيقه دراسة هدفت إلى تقييم مصادر واستخدام تقنيات المعلومات والاتصالات التي تم إدخالها في النظام التربوي الأردني.

في هذه الدراسة، تم استخدام كل من منهجيات البحث الكمي والبحث النوعي لجمع المعلومات وتحليلها..

تألفت عينة الدراسة من (278) مدرسة تم اختيارها بشكل عشوائي من مجتمع الدراسة لتمثل جميع المناطق الجغرافية في المملكة. كان من بين هذه المدارس (173) مدرسة حضرية و (105) ريفية. منها (59) مدرسة استكشافية. أما من حيث توزيع المدارس حسب السلطة المشرفة فقد تم اختيار (216) مدرسة حكومية و(62) خاصة.

يتوقع من هذه الدراسة أن تساعد متخذي القرار لاتخاذ قرارات مناسبة في مجال إدخال تقنيات المعلومات والاتصالات في النظام المدرسي الأردني. للمساعدة في هذا المجال، فقد تم توثيق التطور في استخدام تقنيات المعلومات والاتصالات في التعليم وذلك منذ عام 1999 وحتى عام 2008. بالاضافة الى ذلك فقد قدمت الدراسة مقارنة وضع استخدام تقنيات المعلومات والاتصالات في الأردن مع الدول الأخرى بالاعتماد على بعض المؤشرات العالمية الخاصة في استخدام تقنيات المعلومات والاتصالات.

تتركز نتائج الدراسة حول النقاط التالية:

مدى توصيل المدارس بتقنيات المعلومات والاتصالات المختلفة (إنترانت، وإنترنت، ومنظومة إديوويف):

حوالي 86% من المدارس موصولة بالانترانت. من هذه المدارس، 77% تم وصلها بين عامي 2003 و 2006. أما بالنسبة للإنترنت، فإن حوالي 72% من المدارس موصولة بالإنترنت. من هذه المدارس، 72% تم وصلها بين عامي 2004 و 2007. وفيما يخص منظومة التعليم الإلكتروني إديوويف، فإن 99% من المدارس موصولة بهذه المنظومة. والجدير بالذكر، أن 81% من هذه المدارس تم وصلها بالمنظومة بين عامي 2003 و2006.

توفر مختبرات الحاسوب:

أشارت نتائج الدراسة أن 79% من المدارس لديها مختبر حاسوب واحد أو إثنين، وأن 18% من المدارس أشارت إلى توفر ثلاثة أو أربعة مختبرات حاسوب فيها. والجدير بالذكر أن 1.4% من المدارس (4 من 278 مدرسة) أشارت إلى عدم امتلاكها لأي مختبر حاسوب.

نسبة الحواسيب للطلبة:

أشارت نتائج الدراسة أن 23% من المدارس تتمتع بنسبة 5 إلى 10 طلاب للحاسوب الواحد، وأن نسبة مئوية مقاربة من المدارس (25%) تتمتع بنسبة 25 إلى 30 طالب للحاسوب الواحد. وأشارت أيضاً إلى أن نسبة مئوية صغيرة من المدارس (10%) تتمتع بنسبة 35 إلى 40 طالب للحاسوب الواحد. أما الغالبية العظمى من المدارس (42%) فإنها تتمتع بنسبة 15 إلى 20 طالب للحاسوب الواحد.

نسبة الصفوف المجهزة بالحاسوب ومعدات تقنيات المعلومات والاتصالات:

وعند السؤال عن نسبة الصفوف المجهزة بالحواسيب وأجهزة العرض (Data Show) وأجهزة العرض الفيديوي، أشارت نسبة كبيرة من المشاركين (88%) إلى أن الصفوف في مدارسهم غير مجهزة بأي من هذه الأجهزة. وأشارت نسبة ضئيلة (4%) من المدارس إلى أن 21 إلى 22 بالمئة من صفوفهم مجهزة بمثل هذه الأجهزة والمعدات.

الترتيبات المتعلقة بتوفير الصيانة والدعم الفني:

أشار حوالي 67% من المشاركين في الدراسة إلى امتلاك خطط متعلقة بالصيانة والدعم الفني على المستوى المدرسي. وأشارت نسبة مقاربة (61%) من المدارس إلى امتلاك خطط متعلقة بالصيانة الفنية والمعداتية على مستوى وزارة التربية والتعليم. ومن الجدير بالملاحظة أن 14% من المشاركين كانوا غير متأكدين فيما إذا كانت مدارسهم تمتلك مثل هذه الخطط على المستوى الوزاري.

نسبة إشغال مختبرات الحاسوب في المدارس:

وعند السؤال عن نسبة إشغال مختبرات الحاسوب في المدارس، أشار 58% من المشاركين إلى أن نسبة إشغال مختبرات الحاسوب في مدارسهم تصل إلى 4 صفوف فأكثر في اليوم الواحد، واشار 25% من المشاركين إلى نسبة إشغال 2 إلى 3 صفوف في اليوم الواحد. وأشارت نسبة ضئيلة (7%) من المشاركين إلى نسبة إشغال تصل إلى صف و احد فقط في اليوم.

نسبة الصفوف التي تستخدم الحاسوب ومعدات تقنيات المعلومات والاتصالات:

وعند سؤالهم للإجابة عن السؤال "ما هي النسبة المئوية للصفوف في مدرستكم والتي تستخدم الحواسيب ومعدات تقنيات المعلومات والاتصالات؟" قدم المشاركون في الدراسة عدداً جيداً من النسب المئوية، والتي يقع معظمها بين النسبتين 65% و73%. والجدير بالذكر أن أعلى ثلاث نسب مئوية في الفترة السابقة كانت كالتالي: 69%، و 65%، و72% بالترتيب.

كيف يشعر معلمو الحاسوب بشأن استخدامات تقنيات المعلومات والاتصالات وثبات الاتصال بالانترنت:

تم التعرف على آراء المعلمين بالاعتماد على اجاباتهم عن أربع فقرات معدة على طريقة مقياس ليكرت (موافق – غير موافق). وقد أظهرت النتائج أن استجابات معظم المعلمين كانت سلبية على جميع الفقرات حيث كان متوسط استجاباتهم 0.37 والتي تشير إلى شعورهم السلبي بشأن استخدامات تقنيات المعلومات والاتصالات وثبات الاتصال بالانترنت.

ما هو شعور مدراء المدارس بشأن استخدامات تقنيات المعلومات والاتصالات في المدارس :

تم التعرف على شعور مدراء المدارس بالاعتماد على اجاباتهم على أربع فقرات معدة على طريقة مقياس ليكرت (بصعوبة – جزئيا - كليا). وقد اظهرت النتائج أن استجابات معظم المدراء كانت ايجابية على جميع الفقرات حيث كان متوسط استجاباتهم 2.00 والتي تشير الى الاستخدام الجزئي لتقنيات المعلومات والاتصالات في المدارس.

المعيقات التي تواجه استخدام تقنيات المعلومات والاتصالات في المدارس:

تم التعرف على طبيعة المعيقات التي تواجه المعلمين والمدراء لاستخدام تقنيات المعلومات والاتصالات في المدارس باستخدام مجموعة من الفقرات المعدة على طريقة ليكرت (معيق - لا معيق). حيث أشارت النتائج أن صعوبة استخدام البرمجيات التربوية وعدم وعي بعض المعلمين بكيفية توظيف الحاسوب في التعليم كانا أهم معيقين يواجههما المعلمون، أما عدم التنوع في البرمجيات التربوية فكانت على رأس المعيقات التي يواجهها مدراء المدارس.

في ضوء نتائج هذه الدراسة برزعدد من التوصيات التي من شأنها أن تساعد في تضمين تقنيات المعلومات والاتصالات في النظام التربوي الأردني، منها: (1) تزويد المدارس بالدعم اللوجستي اللازم من أجل الحفاظ على

استمرارية عمل ما لديهم من تقنيات الاتصالات والمعلومات مثل إعطاء مشرفي مختبرات الحاسوب مسؤولية أكبر لتصليح الأعطال البسيطة؛ و(2) ضرورة تزويد المدارس بخدمات الانترنت اللاسلكي من أجل التغلب على مشاكل الاتصال؛ و(3) التأكيد على تدريب المعلمين من أجل مساعدتهم على استخدام تقنيات المعلومات والاتصالات في صفوفهم؛ و(4) استثمار حماس المعلمين والطلاب من أجل استخدام أفضل لتقنيات المعلومات والاتصالات في العملية التربوية؛ و(5) إعداد برمجيات احتياطية للبرمجيات التربوية المتوفرة من أجل تجاوز المعيقات التي تقف في طريق الاستخدام الأمثل لتقنيات المعلومات والاتصالات مثل إعداد أقراص مضغوطة؛ و(6) نقل الخبرة المحوسبة الناجحة في منهاج نظم المعلومات الإدارية إلى المناهج التربوية الأخرى.