The Role of information technology in education under COVID-19

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Abstract:

The study aims to find out the role of information technology in education during the lockdown caused by COVID-19. The researcher used a structured questionnaire for data collection, a sample population of 66 teachers in Ramallah, examining the readiness of schools and homes in terms of technology to resume the education process. The researcher used a structured questionnaire for data collection, SPSS is used for data analysis and doing the statistical tests in order to get study results. Then studying the effect of some characteristics like school type, age, sex.

The study found that IT has a major role in the education process through the COVID-19 pandemic especially under lockdown and students cannot reach their schools, but in Palestine, public schools suffer a lot from the non-existence of basic technological infrastructure to achieve this purpose, it also found that some demographic characteristics statistically affect the role of IT in education.

Keywords: Information Technology (IT); Education; Internet; e-learning.

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1. INTRODUCTION

The rapid development of new information technologies and their introduction in our country left an imprint on the development of the personality of modern young people. The computer or the commonly used abbreviation PC which stands for personal computer is being introduced into most modern schools, and computer learning is being part of the curriculum of our schools. Information technology penetrates deeper into human life, and increasingly determines the level of his education. It is very important to

keep in mind the importance of building the information culture starting from the elementary school, where the base of the education system, and by growing up step by step in this system, the student can independently, actively act, make decisions, flexibly adapt to changing living conditions.

Information is one of the main productive resources in our society, it forms the foundation for the development of both the economy and society. A new term is used to describe the society where the information is an important part of its components "the information society", when a high degree of education becomes a priority. In this society, the highly educated people are able to effectively use information as a powerful productive resource. They must constantly update their knowledge, they need the information technology to their lives, they need continuous training and the learning process itself changes significantly.

The importance of information technology in the education process increased under the COVID-19 pandemic, as most countries went for lockdown, at a time education process must keep going, so the need for using technology in education under this situation becomes a priority, and the term "Distance learning" is the skeleton of education process. Distance learning can be defined as a system of means, methods and forms of training for the replicated implementation of a given educational content. In other words, we can say that the technology of distance learning is a form of organization of the educational process, which provides interactive interaction between the learner and the teacher at a distance using open access channels. Teachers use electronic textbooks which are copies of printed publications and have several advantages over printed ones: compact storage of educational material. They also use sound and video materials, educational films, and classroom recordings.

Problem Statement

The previous literature reflects the importance of introducing information technology in education process, in the time of lockdown because of Corona virus and the health crisis. Hence, the main question arises in this study, which can be formulated as follows: what is the role of information technology in education under COVID-19 pandemic in Ramallah city in Palestine?

Hypothesis

H1: There is no statistically significant relationship at the level of 0.01 between information technology and education in schools under COVID-19.

H2: There is no statistically significant relationship at the level of 0.05 between information technology and overcoming education obstacles under COVID-19 crisis in schools

H3: There are no statistically significant differences at level of 0.05 between the demographic variables of respondents (school type, gender, age, teacher education, specialization (IT or not) and years of service) and the role of information technology in education.

Methodology and tools used

This study is based on the descriptive analytical methodology, using the case study approach. An organized questionnaire was designed after reviewing literature about the topic of the study, then the researcher used the statistical software SPSS to perform the statistical analysis for the field study

2. Information technology (IT)
2.1 Definition of information technology

ICTs refer to "the devices, applications, media, associated hardware and software that receive and distribute, process and store, retrieve and analyse, digital information, between people and machines or among people" (Rice & Leonardi, 2013). ICT is defined as any technology or device that has the capacity to acquire, store, process, or transmit information and can include personal computers, the Internet, mobile communication devices, and email (Steinmueller, 2000). We define ICT resources as any ICT factor or process at work involving some type of storing, transmitting, or processing technology (e.g., computer programs) or device (computer, cell phone) that assist employees with the completion of their work, reduce the burden of job demands, or that promote personal growth and development (Day, Scott, & Kelloway, 2010). ICT in the workplace can be described as a "double-edged" sword because it is not homogenous in either its uses or its impact on employees. Even though ICT can be used to make work more efficient and

employees' lives better, the demands associated with its use may create additional problems for employees (Day, Scott, & Kelloway, 2010)

2.2 Benefits of Information Technology in COVID-19 pandemic

The benefits of e-learning could transform education into a lifelong learning process. Having access to lectures anytime, as many times as needed, allows students to better recall the information that is required for traditional education. The flexibility of E-learning is a solution for people's commitments to their family or work, which may increase the number of people who enrol in this type of education. In fact, this goes beyond the learners; it gives flexibility also for the instructors. In addition, educational institutions are implementing E-learning technologies to improve the communication among learners and instructors for better knowledge exchange as well as to strengthen the learning community to accomplish personal objectives (Alqahtani & Rajkhan, 2020).

2.3 Importance information technology under COVID-19

The pandemic is an outbreak disease, spread through a wide area, like the current one of COVID-19 which accessed almost all countries across the globe, it triggers respiratory distress and signs including cough, nausea, and trouble breathing in more extreme situations. The COVID-19 is the biggest public health epidemic of the modern period and the largest threat confronting humanity after World War Two. It has the ability to generate catastrophic societal, political, and economic problems by stressing each of the countries it hits. So, the role of Information and Communication Technology (ICT) is significant in the time of this disease outbreak (Arshad, 2020). ICT is a methodology and management technique used by scientists, technologists, and engineers in the handling of information, its application, and interaction with social, economic, and cultural issues.

3. Education and e-learning
3.1 Definition of e-learning

The development of information technology and modern communications helped in the formation of educational institutions, introducing new methods of education, which made it possible for the emergence of a new type of education, e-learning. E-learning is the use of technology and technological means in education, and its use to motivate

students to self-learning and make him the focus of the lecture, starting from the techniques used for presentation in the classroom of multimedia and electronic devices, to leaving the physical components of education behind: such as smart school and virtual classes through which the members of the educational process interact over the Internet and interactive video technologies.

Many terms are being used nowadays to define the education process using technology under the COVID-19 pandemic, some of these are: online learning, e-learning, open learning, and web-based learning. So it can be defined by the ability to use a computer connected to a network that offers the possibility to learn from anywhere, anytime, in any rhythm with any means (Dhawan, 2020). It is a learning experience in an environment using technological devices like smartphones, laptops and tablets connected to the internet.

A new concept has emerged lately, which is "integrated e-learning". It is a combination of e-learning activities with conventional methods. With the global health crisis of coronavirus (COVID-19) going on, it includes a more extensive use of technology to grant students continuity in the face of adverse circumstances. A hybrid of face-to-face (in-person) learning and e-learning lessons is one of the many proposed models for the future. The question of how to incorporate and evaluate e-learning activities as part of a face-to-face learning course is a significant educational challenge in Higher Education (Martín-Lara & Rico, 2020).

E-learning is defined as "the wide set of applications and processes which use available electronic media and tools to deliver vocational education and training". Researchers stated that E-learning is "the use of various technological tools that are web-based, web distributed, or web capable for education" (Alqahtani & Rajkhan, 2020). E-learning has been growing year after year as there are many advantages, such as flexibility, internet accessibility, and cost-effectiveness

3.2 Types of e-learning

Two basic types of e-learning are commonly compared, synchronous and asynchronous e-learning. Many organizations and educational institutions are interested in using and developing both asynchronous and

synchronous e-learning, but have a limited understanding of the benefits and limitations of the two.

Asynchronous e-learning commonly facilitated by media such as e-mail and discussion boards, supports work relations among learners with teachers, even when students are not online at the same time. Asynchronous e-learning enables students to make different things together like taking online courses, work and family, it enables learners to log on to an e-learning environment at any time and download documents or send messages to their teachers (Hrastinski, 2008). Four different asynchronous e-learning activities have been used to identify the main asynchronous e-learning actions: (1) non interactive videos and audio recordings; (2) readings; (3) virtual tour of recommended websites of entities/associations/organizations; (4) PowerPoint slides and class notes. Synchronous e-learning commonly supported by media such as videoconferencing and chat. Learners and teachers experience synchronous e-learning as more social and avoid frustration by asking and answering questions in real time. It gives them the feeling as participants not isolates.

3.3 Obstacles for applying e-learning

The process of integrating e-learning into teaching and learning can be a complex procedure that may face several difficulties that are sometimes called barriers or obstacles to integrating e-learning.

The lack of computers and software can seriously limit what teachers can do in the classroom with regards to the integration of information and communication technologies (ICT). Access to ICT is a necessary step in the integration process, with ICT competence, or skills, and ICT confidence in using the technologies (Peeraer & Petegem, 2011).

The obstacles to using e-learning are classified into three groups. The first is called "personal challenges." This group includes factors associated with internal personality traits, behaviour characteristics and habits. The second group is "attitudinal inhibitors". The internal variables that are most relevant to users 'attitudes and perspectives regarding e-learning features and the third group include a set of "contextual inhibitors" related to external variables that include a lack of ICT skills and organizational support in the use of learning techniques (Diab & & Elgahsh, 2020).

Education all over the world face a variety of challenges related to the successful implementation, maintenance and development of online programs. Challenges affecting online learning in the Middle East include low internet penetration, low public appreciation for online learning, and a lack of online educational repositories. Furthermore, challenges lead to failure of online education are institutional factors such as lack of understanding of online education, patterns of online learning, lack of management support for online education, number of students enrolled, and faculty qualifications.

4. Practical Study

4.1 Study approach, data collection and sample

The researcher employed the analytical descriptive method, using case study approach, because it is the most appropriate method for study topic. Depending on the type of information and data will be collected, the researcher found that the best suitable tool to conduct this study is the structured questionnaire. A structured questionnaire is prepared by reviewing the previous literature on the subject of the study. The questionnaire was distributed to 66 teachers who work in private and public schools in Ramallah city, and is divided into three main parts:

• Personal and demographic characteristics: seven questions about: the teacher works in private/public school, sex, age, education level, years of experience and is he an IT teacher or not, and teaches primary/secondary students.

• The independent variable: information technology (IT): questions covered the readiness of schools to provide distance learning through IT

• The dependent variable: education under COVID-19 pandemic, teachers were asked a set of questions about their opinion of using IT in education.

The study sample is a simple random sample, which gives the objectivity to the study tool; it consisted of 66 respondents, who are school teachers working at private and public schools in Ramallah city as follows:

Table 1. Study Sample

School Type	NO. of respondents	Percentage %
Private	51	77.3
Public	15	22.7
Total	66	100

Source: prepared by the researcher

4.2 Validity and reliability of the tool

Validity means that the questionnaire covers all elements that must be included in the analysis on the one hand, and the clarity of paragraphs and terms on the other, so that they are understood by everyone who uses them. Whereas reliability means the measure of the stability or consistency of test scores, and the ability for a test or research findings to be repeatable.

The Cronbach's alpha test is used to test study reliability, for the independent variable questions, each dimension of the independent variable, the dependent variable, and each dimension of the dependent variable. The results of Cronbach's alpha test are:

Table 2. Cronbach's alpha

Variable / Dimension	Cronbach's alpha
Information Technology (independent variable)	0.**879**
Education under COVID-19 / e-learning (dependent variable)	0.9**54**
Teachers opinion in e-learning under COVID-19	0.**974**
E-learning constraints	0.**927**

Source: prepared by the researcher

According to the Cronbach's alpha test results shown in table (2) above, all coefficient's values are high and statistically significant at significance level 0.05. The coefficient's value for the first dimension of the dependent variable (Teachers opinion in e-learning under COVID-19) is 0.974, second dimension of the dependent variable (E-learning constraints) is 0.927.We also calculated the Cronbach's alpha coefficient for the independent variable (Information technology) which recorded 0.879, and for the dependent variable (Education under COVID-19 / e-learning) 0.954. The overall Cronbach's alpha coefficient value for the questionnaire was 0.949, which is a very high value and statistically significant at the

significance level 0.05, this indicates the possibility of stable results to be obtained using the questionnaire

4.3 Analysis and Discussion

The statistical description of the study sample based on personal and demographic characteristics is as follows:

Table 3. Characteristics of the sample

Variable: School Type	Count	Percentages %
Public	51	77.3
Private	15	22.7
Variable: Educational Level	Count	Percentages %
BA	52	78.8
Higher Education	14	21.2
Variable: Level	Count	Percentages %
Elementary level	34	51.5
High school	32	48.5
Variable: Age	Count	Percentages %
Less than 25 years	1	1.5
From 25 to 40	27	40.9
More than 40	38	57.6
Variable: Sex	Count	Percentages %
Males	25	37.9
Females	41	62.1
Variable: Experience Years	Count	Percentages %
Less than 5 years	6	9.1
From 5 to 15	27	40.9
More than 15	33	50
Variable: Specialization	Count	Percentages %
IT teacher	16	24.2
Non IT teacher	50	75.8

Source: prepared by the researcher

Looking at table (4) below, we conclude the basic characteristics of the sample; the questionnaire were answered by teachers working in public and private schools in Ramallah city, 51 teachers in public schools (77.3%) and 15 in private (22.7%). The education of teachers ranged between BA holders and higher education (Master or higher), 78.8% of them having BA while 21.2% having a higher degree. The males were 25 (37.9% of sample size), females were 41 (62.1% of sample size). 34 teacher of the sample are teaching the elementary level (51.5%), and 32 of them are teaching high

school (48.5%).The distribution of sample members according to age categories: 1 member was less than 25 years old (1.5%), 27 members of the sample were in the age category from 25 to 40 years old (40.9%), 38 members of the sample were in the age category above 40 years old (57.6%). As for the years of experience, the members whose years of experience were more than 15 years was the highest with 50% of the sample size, then members with (5-15) years were 40.9% of sample size and lastly 9.1% of the sample had less than 5 years of experience.

The last variable was specialty of the teacher, whether he is an IT teacher or not, 16 teachers of the sample are IT teachers (24.2%), and the rest 50 were non-IT teachers (75.8%).

Table 4. Percentages of first section of the questionnaire

Questions that measure information technology	1* %	2* %	3* %	4* %	5* %	Mean	Standard deviation
The presence of virtual library of educational resources	6.1	42.4	13.6	22.7	15.2	2.98	1.234
Internet service is available at home	3	27.3	18.2	34.8	16.7	3.34	1.143
Electricity is always available	0	39.4	13.6	34.8	12.1	3.19	1.098
The school provides software and platforms to deliver lessons on time	6.1	36.4	19.7	22.7	15.2	3.05	1.208
Teacher has the technical information enable them to use educational programs easily	7.6	37.9	21.2	30	3	2.83	1.046
The school provides e-mail to teachers and students to communicate	0	15.2	9.1	53.0	22.7	3.83	0.954
Having a computer or tablet for each student to follow lessons	31.8	36.4	12.1	12.1	7.6	2.27	1.247

Source: prepared by the researcher

(* 1: Highly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Highly Agree)

Table (5) below shows the results of respondents' answers to the second section of the questionnaire which asked about the components of information technology provided either by the school or by students families to make e-learning possible in Palestine under COVID-19 provides teachers and students of virtual library of educational resources, almost 50% of answers disagreed the phrase and around 38% of them agreed that, this is because there were teacher in private school and the others in public schools, and the fact that private schools are better equipped with technological equipment than public schools. The second question asked the teachers about the availability of internet service which the basic tool to go on with e-learning, almost 50% were agree with this question, 30% disagree. The internet service in Palestine entered almost every single household, so the majority of the sample agreed on that. Two thirds of the sample agreed on the availability of electricity and around one third disagreed, the reason behind this situation, the interruptions in electricity because the occupation controls this service mainly. Question 4 gives a result similar to question 1 because the private schools are better equipped. Question 5 were about the technical experience and teachers' knowledge of dealing with new technology to be able to teach through internet and using online platforms with their students, their answers varied between agree, neutral and disagree. It is obvious that they need more training and orientation. According to teachers, the email service is available and almost every student can contact easily with average answer of 3.8. Lastly, two thirds of the sample disagreed the last question which is "Having a computer or tablet for each student to follow lessons" and only 20% agreed.

A detailed answers to Questions 1 and 4 that shows the difference between private and public schools.

Table 5. Answer to Question 1 according to the school type

		High Disagree	Disagree	Neutral	Agree	High Agree	Total
		The presence of virtual library of educational resources					
School Type:	Public	4	27	9	6	5	51
	Private	0	1	0	9	5	15
Total		4	28	9	15	10	66

Source: prepared by the researcher

Table 6. Answer to Question 4 according to the school type

		High Disagree	Disagree	Neutral	Agree	High Agree	Total
		The school provides software and platforms to deliver lessons on time					
School Type:	Public	4	23	13	8	3	51
	Private	0	1	0	7	7	15
	Total	4	24	13	15	10	66

Source: prepared by the researcher

Table 7. Answer to Question 7 according to the school type

		High Disagree	Disagree	Neutral	Agree	High Agree	Total
		Having a computer or tablet for each student to follow lessons					
School Type:	Public	19	23	7	2	0	51
	Private	2	1	1	6	5	15
Total		21	24	8	8	5	66

Source: prepared by the researcher

By looking at tables 5, 6 and 7 we can notice that private school teachers almost agree with the questions and public school teachers almost disagree to the same questions. The reason is we clarified above, private schools in Palestine are more equipped than public schools.

Table 8. Mean and standard deviation of respondent's answers to obstacles of applying e-learning

Question	Mean	Standard deviation
Lack of awareness of this type of education in society, and view it negatively limit its goals and advantages	4.166	0.904
Lack of sufficient conviction among teachers and students to achieve e-learning	4.151	0.898
The lack of physical resources and basic technology equipment in educational institutions	4.378	0.836
Lack of good management, lack of adequate training and technical support	4.060	0.892
Students have difficulties in English language	4.075	0.809
Students are busy with other sites away from e-learning sites during lessons	4.363	0.736
Lack of enough computers at home for brothers to follow e-learning lessons	4.530	0.684
Lack of an electronic system for managing courses	4.197	0.863
Lack of training for teachers in schools to work under COVID-19, to acquire teachers e-learning skills	4.181	0.909
Most teachers believe in traditional education system and don't think of using technology in education	4.060	0.926
Student's lack of responsibility towards e-learning	4.454	0.807
The high cost to fully implement e-learning	4.303	0.700

Source: prepared by the researcher

Table (8) shows above shows the results of respondents' answers to the third section of the questionnaire which asked them about the obstacles facing both teachers and students in Palestine in applying the learning process through information technology in the time of lockdown due to COVID-19 crisis. As show in the table the average of respondent answers is greater than 4 to all questions; that means the majority of teachers agree on the obstacles to achieve e-learning in Palestine. The most important challenge according to respondents facing e-learning in Palestine is "Lack of enough computers at home for brothers to follow e-learning lessons" with a percentage of 95% of agreement. The least important challenge are questions 4 and 10 in this section "Lack of good management, lack of adequate training and technical support", "Most teachers believe in traditional education system and don't think of using technology in education" with 75% of agreement.

4.4 Hypothesis testing

First hypothesis:

There is no statistically significant relationship at the level of $\alpha \leq 0.01$ between information technology and education in schools.

We employed a correlation test using the statistical package SPSS, to test the correlation between the independent variable (IT) and the dependent variable (education), the spearman correlation test is used in our case, as shown in table (9) below the sig (2-tailed) = 0.000 is less than the significance level of 0.01, so we reject the null hypothesis and accept the substitute hypothesis, which means a correlation is statistically significant between information technology and education in schools in Ramallah city.

Table 9. Spearman rho test of correlation

Spearman's rho	IT	E-learning
Information Technology (IT) Pearson Correlation	1.000	**0.417***
Sig. (2-tailed)	-	0.000
N	**66**	**66**
Education (Correlation Coefficient)	0.417*	1.000
Sig. (2-tailed)	0.000	-
N	39	39

Source: prepared by the researcher

*. Correlation is significant at the 0.01 level (2-tailed)

Second hypothesis: we tested the effect of using information technology in overcoming some of the obstacles and challenges in education process under the COVID-19 crisis.

There is no statistically significant relationship at the level of $\alpha \leq 0.05$ between information technology and overcoming education obstacles under COVID-19 crisis in schools.

We employed a correlation test using the statistical package SPSS, to test the correlation between the independent variable (IT) and the dependent variable (overcome education obstacles in COVID-19 time), the spearman correlation

test is used in our case, as shown in table (10) below the sig (2-tailed) = 0.024 is less than the significance level of 0.05, so we reject the null hypothesis and accept the substitute hypothesis, which means a correlation is statistically significant between information technology and overcome education obstacles in COVID-19 time in schools in Ramallah city.

Table 10. Spearman rho test of correlation

Spearman's rho	IT	E-learning
Information Technology (IT) Pearson Correlation	1.000	-0.278*
Sig. (2-tailed)	-	0.000
N	**66**	**66**
Obstacles of e-learning (Correlation Coefficient)	-0.278*	1.000
Sig. (2-tailed)	0.024	-
N	66	66

Source: prepared by the researcher

*. Correlation is significant at the 0.01 level (2-tailed)

Third hypotheses: there are no statistically significant differences at level of $\alpha \leq 0.05$ between the demographic variables of respondents (school type, gender, age, teacher education, specialization (IT or not) and years of service) and their acceptance to use ICT to improve their work performance.

The one-way ANOVA test is used in this case, to investigate the effect of demographic variables on the importance of information technology in achieving e-learning, results are shown in table (11); the first test was done: the effect of school type (private or public). We found that the sig. = 0.000 > 0.05 meaning that there is a statistical significance of whether the school is private or public in the role of IT in education under COVID-19 crisis. As for the private school are more equipped by IT resources than the public schools, the infrastructure for achieving e-learning is stronger in private schools than the public ones.

Second test was done: the effect of teachers sex on the role of IT in education under COVID-19 crisis, we found that the sig. = 0.0.008 < 0.05 meaning that

there is a statistical significance of whether the teacher is male or female in the role of IT in education under COVID-19 crisis.

Third test was done: the effect of Age on the role of IT in education under COVID-19 crisis, we found that the sig. = 0.365 > 0.05 meaning that there is no effect of whatever the age of respondents on the role of IT in education under COVID-19 crisis.

Fourth test was done: the effect of the Level of education on the role of IT in education under COVID-19 crisis, we found that the sig. = 0.000 < 0.05 meaning that there is a statistically significant effect of the level of education of respondents on accepting the use of ICT on improving work performance, as the respondents are highly educated as they more willing to accept using IT in education under COVID-19 crisis.

Fifth test was done: the effect of Years of experience on the role of IT in education under COVID-19 crisis, we found that the sig. = 0.097 > 0.05 meaning that there is no effect of number of years of experience of respondents on the role of IT in education under COVID-19 crisis.

Sixth test was done: the effect of the specialty of the teacher (IT or not), we found that the sig. = 0.378 > 0.05 meaning that there is no effect of whatever the specialty of respondent on the role of IT in education under COVID-19 crisis.

Table 11.ANOVA test for thirds hypothesis

Variable	F-value	Sig.
School type	36.59	0.000
Teachers sex	7.445	0.008
Teachers Age	1.024	0.365
Level of education	14.445	0.000
Years of experience	2.420	0.097
Specialty	0.789	0.378

Source: prepared by the researcher

5. CONCLUSION

Results:

- The study presented the role of using information technology in the education process in Palestine under the COVID-19 crisis which affected the whole world, and all aspects of life causing lockdown in all countries. Education at schools and universities was one of the first

sectors affected by the crisis, students didn't attend their schools and universities for a long time starting from March 2020 until now, to keep them from infection of the corona virus. One of the solutions was using the technology to keep the education process going on, the study concerned of the education in schools and the questionnaire were directed to the teachers, to address their opinion of the subject.

- The teachers who answered the questionnaire agreed on the importance of using information technology in education, because it is the only way available to resume the education process in corona time and under lockdown.

- The study showed a difference between private and public schools readiness in IT infrastructure to resume the education process under COVID-19 crisis.

- The study showed a statistically significant relationship between information technology and the demographic variables: school type, teacher sex and teacher's level of education.

- The results of the study showed that there is no statistical difference of the age, years of experience and specialty variables on the role of information technology in education under COVID-19 crisis.

Recommendations:

- The necessity to follow up advancements in the technology sector, making efforts to have a computer or tablet for every student in the public schools to achieve full e-learning in hard times like the corona virus pandemic.

- The investment in training and providing teacher the needed orientation and knowledge to use software and electronic platforms to achieve e-learning.

- The necessity to reduce costs for internet connection and electricity as the costs in Palestine for these services are considered a little bit high.

  The need to raising awareness of the importance of e-learning.

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