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Investigating the Interplay between the Use of ICTS and Students' Academic Performance in Higher Education

Rachid El Yazidi*

* Correspondence:
elyazidi.rachid87@gmail.com
The Faculty of Juridical, Economic and Social Sciences, Moulay Ismail University, Morocco

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Abstract

The ICTs have invaded not only the fields of business, economics, and different sciences, but also the field of education and particularly language teaching and learning. This article addresses a crucial issue related to the use of ICTs at the university in Morocco and its impact on the academic performance of students. Many studies in the review of literature are presented and they mainly revolve around similar issues related to advantages and disadvantages of ICTs in general, however little attention has been devoted to the relationship between ICTs and academic performance. Thus, this article seeks to answer a set of research questions along with hypotheses which are tested and discussed following some statistical procedures. The researcher looks at the correlation between the use of ICTs in higher education and students' academic performance. A questionnaire was designed and submitted to a sample of students composed of 108 students from four major universities in Morocco. Cronbach's alpha was obtained to test the reliability of the instrument. The findings indicate that the implementation of ICTs in higher education is positively correlated with the academic performance of students. The implications of this study suggest that integrating ICTs into higher education can lead to improved academic performance of students. This has significant implications for educators and policymakers who can use this information to design and implement effective ICT-based teaching and learning strategies to enhance student learning outcomes. The study also highlights the importance of considering the relationship between ICT use and academic performance in educational research and policy-making. The results provide a foundation for further research on the use of ICTs in higher education and their impact on student success.

Keywords: academic performance, attitudes, higher education, ICTs

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1. Introduction

For many industries throughout the world, information and communication technologies ICTs have emerged as a significant source of innovation and efficiency improvement. University students now use ICT applications both inside and outside of the classroom as an essential element of their learning process. This is especially true in the education sector. Over the past two decades, the government and other education sector players, including university administration and scholars, have committed a substantial budget to implement ICTs in the educational system. The majority of colleges that have completely embraced ICTs have experienced enormous advancements in the use of ICTs to enhance learning strategies, teaching methods, research endeavors, and development. Still, it is unclear how ICT applications affect students' performance and attainment.

The phrase "technology" is a significant concern in many disciplines, including education, in the twenty-first century. This is because in most nations, technology has replaced traditional means of information sharing. The way people think, work, and live today has been completely altered by the innovations and transformation of our society brought about by technology integration (Toprak, 2021). This calls on educators and other educational bodies to take into account integrating ICT into their curricula in order to educate students for living in an intellectual society.

The use of computer-based communication that is integrated into the regular educational process in the classroom is referred to as Information Communication Technologies (ICTs). Teachers are viewed as the essential actors in using ICTs in their regular classroom settings and they are in charge of training students for the contemporary digital environment (Gebre et al., 2015). This is a result of ICTs capacity to provide an active and dynamic teaching-learning setting. The goal of ICTs integration is to enhance and raise the quality, accessibility, and cost-efficiency of how education is delivered to students, but it also refers to the advantages of networking learning communities to meet the problems of current globalization (Albirini, 2006). ICTs adoption is a continual process that includes continuing measures to completely support teaching, learning, and online resources (Young, 2003).

2. Literature Review

As a matter of fact, the incorporation of ICTs in education often refers to a technologically based method of teaching and learning that has a tight relationship to the use of educational tools in classrooms. The issue of ICTs integration in education, particularly in the teaching, is crucial since students are accustomed to technology and learn better in a technology-based environment. This is due to the fact that technology in education makes a significant contribution to the pedagogical elements, where the usage of ICTs will result in successful learning with the aid and support of ICTs components and aspects (Finger et al., 2013).

It is accurate to claim that platform tools and gadgets help students study nearly all subject areas, including mathematics, physics, languages, the arts, and other important topics. Additionally, ICTs offer assistance and supplementary assistance for both instructors and students when it comes to successful learning using computers as instructional aids (Jorge et al., 2010). Technology and computers are not seen as substitutes for good teachers; rather, they are seen as supplemental asset for improved teaching and learning. ICTs integration in education is essential because, with the aid of technology, the process of teaching and learning may take place not just in a classroom setting but also when teachers and students are physically apart. Yet, digital literacy is a continuous process that creates dynamic learning atmosphere. In fact, it is not a one-step instructional operation (Young, 2003).

According to Finger and Trinidad (2002), Information and Communication Technologies (ICTs) can be used in a variety of ways to enhance teaching and learning across various subject areas. A technology-based approach to instruction provides students with engaging methods such as instructional videos, stimulating activities, data storage, database use, critical thinking, rewarding activities, brainstorming tasks, and Internet-based activities that can deepen the learning experience. However, to fully benefit from ICT integration, students must not be constrained by the curriculum or resources available to them. Hands-on activities in a computer course can help students increase their understanding of the topic. Additionally, incorporating ICTs into lesson plans can encourage students to actively participate in their learning, leading to improved engagement and accelerated learning (Finger & Trinidad, 2002; Finger et al., 2013; Jorge et al., 2010; Young, 2003).

The following three key stages namely integration, enhancement, and complementary have been recognized by Hermans et al. (2008) as necessary for instructors to highly appreciate and consider ICTs. The goal of the integration strategy is to increase students' accomplishment and attainment by integrating appropriate ICT use in a specific subject area that calls for complex concepts and abilities. Additionally, a review of the curriculum is required to ensure that only pertinent ICTs resources and suitable software are installed in order to accomplish the primary goals and objectives of the curriculum. The enhancement strategy involves heavily emphasizing the introduced issue utilizing

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ICTs. The Over Head Projector or Power Point, as a case in point, could be employed to discuss the subject in a highly unique and imaginative style that will encourage conversation and the exchange of ideas and views. Last but not least, a complementary method involves utilizing ICTs to facilitate and enhance students' academic progress. This method enables students to be more productive and planned by allowing them to take notes on a computer, send their work via electronic mail from home provided that the deadline is met, and search up materials from a variety of internet sources to carry out the assignment assigned to them (Hermans et al., 2008).

Technology-based instruction and learning have the potential to revolutionize education, but they need careful preparation and policy development. Policymakers and educators need to have common understanding of the future strategy. Shah (2022) points out that the national ICTs strategies may fulfill a number of essential purposes. They offer a justification, a set of objectives, and a picture of how educational institutions would function if ICTs are included into the operation of teaching and learning, and they are advantageous to learners, instructors, parents, and the general populace of a certain nation. Actually, recently and particularly after the pandemic Covid-19, three major strategies of ICTs in education have been developed by the Moroccan Ministry of Education. The first policy stipulates that every student should have access to ICTs. This seeks to decrease the digital divide between different educational institutions. The second policy focuses on the part that ICTs plays in education and how it serves that purpose. In addition, another policy emphasizes the implementation of ICTs as a means for productivity, evaluation, and access to information (Mishra, 2021).

Meanwhile, in order to provide ICTs to schools across the country, infrastructure and facilities are required. Having enough computer laboratories and devices is essential for effective ICTs impact. This will guarantee that instructors can have easy access to ICT resources (Ayele, 2022). One of the major issues that classrooms, particularly in rural regions, are currently confronting is a shortage of appropriate ICT hardware and internet connection. Several schools have experienced a rise in technological issues, which have frustrated learners and instructors and disrupted the teaching-learning process. Professors are unable to use the computer momentarily if there is an absence of technical support and no maintenance (Finger et al., 2013). As a result of receiving no help with the problem, instructors will be deterred from utilizing laptops out of concern about hardware failures. According to the research of Türel and Johnson (2012), technological issues provide a significant challenge for instructors. These issues involve poor connection, virus infection, broken printers, and lack of professional training for instructors who are well-versed in ICTs. Colleges in Europe for example have realized the value of IT assistance for helping teachers use ICTs in the classroom because they recognized the major role ICTs play in the teaching and learning of English language for example (Petrova & Kreer, 2022).

The usage of ICTs in education is also much influenced by the aptitude, preparedness, and proficiency of instructors with it. To integrate technology and apply it in the classroom, teachers need to be very confident in their ICT abilities. In addition, instructors need knowledge of the educational function of ICTs in order to effectively incorporate it into their teaching methods (Dionys, 2012). Wu et al. (2022) claim that instructors who have completed an ICT course are still more efficient utilizing computers and IT devices in the classroom than those who have not. However, technophobe instructors avoided utilizing ICTs, according to various researches. In this respect, similar studies occurred in some European countries, when several instructors acknowledged they were reluctant to employ ICTs simply because they lack the required basic notions of how to use ICTs and as a result they were afraid they would look uncertain in front of their students who are technophiles (Dionys, 2012).

Schools had employed a range of techniques to offer instructors additional professional development beyond the teaching of fundamental skills. In order for instructors to give a meaningful lesson using ICTs, Warwick and Kershner (2008) contend that ICTs grant a lot of benefits and alternatives for teachers however in order to learn about integrating ICTs in the teaching and learning process, instructors should be sent to training sessions. However, many educational institutions employed peer tutoring programs. A teacher with greater ICTs expertise would support and mentor a teacher with less ICTs expertise as they prepared for teaching and learning. As was previously stated, a variety of elements make it possible to employ ICTs for teaching and learning in educational environments. As a matter of fact, policy should come first, and then all the components of ICTs including the hardware constituents and the software properties should be taken into account, and finally the teacher's preparedness and ability to incorporate it into the teaching process (Zhang et al., 2022). Additionally, periodic technical assistance and ICT-related career development should be provided. To put it simply, cooperation amongst all parties is necessary for the country to grow technologically.

2.1 Positive and Negative Issues Related to ICTs in Education

Do information and communication technologies (ICTs) have a place in the classroom? We can look at this issue from two perspectives. Those who believe that information and communication technologies (ICTs) should play a part in

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education, particularly when it comes to the education of adults, present a variety of arguments in support of their position. The majority of these arguments focus on problems related to both the international and Moroccan contexts, for instance the shifting nature of the learner and the need for education to everyone, as well as the fact that the current educational system is unable to keep up with the need for education in addition to the concerns related to admission, fairness, and infrastructure (Moyo, 2017).

ICTs, like any innovation, have their advantages and disadvantages. Despite the cons, ICTs have a number of advantages that make them appealing for use in education. One advantage is the personalization of learning, which allows students to be taught as unique individuals rather than as part of a single cohesive cohort. ICTs make it possible for each person to have a personal connection to the medium and the material it provides. Another advantage is interactivity, which refers to the ability for learners to relate to information in a non-linear, personalized manner. ICTs also minimize the cost of education, bringing the cost per student down significantly, making education more accessible. ICTs also have no borders, allowing learners to access and learn from information and communication technologies regardless of their location or climate. In addition, ICTs seek to serve various specialties and different types of learners, such as those who require practice and drilling or those who need assistance diagnosing and solving problems. Furthermore, ICTs provide an immediate supply of information at a cheap cost, with a broad reach and high production speed, guaranteeing an immediate transmission of information. Finally, ICTs provide consistent quality everywhere. If information is generated properly and is of high quality, it is possible to provide the same level of quality to all areas, regardless of wealth, location, or urban/rural setting, at a low cost.

Despite their numerous advantages, ICTs also have several weaknesses and negative aspects that must be considered. One of the major drawbacks is the high cost of building and maintaining ICT systems. Another issue is the tendency to create universal content that may disregard individual distinctions, in favor of reaching a broader audience. Additionally, not everyone has equal access to ICTs, resulting in a digital divide between the wealthy and the poor. The evaluation of the impact of learning through ICT-delivered information is complex and requires a long-term approach. Instructors and trainers may also require special training to effectively utilize ICTs in teaching and learning. Moreover, the use of ICTs requires a shift in perspective on how teaching and learning is perceived, as it is a highly sophisticated medium with a different style of instruction than what learners are used to. Despite these challenges, ICTs remain an effective tool for enhancing language skills such as listening, speaking, reading, and writing.

2.2 ICTs and Students' Achievements

Schacter (1999) provides an overview of some studies on the influence of technology on learning. In his article, the author employed the case study technique. The report looks at students' attainment from 1994 to 1999. The paper discusses some cases related to national research conducted during that time. It also discussed some cases at a small scale research, such as Apple Classrooms of Tomorrow (ACOT) which gave insights into novel and successful applications of technology in education. The research revealed an increase in learners' performance in most categories, but not in all fields.

On the contrary, Cuban et al. (2001) believe that providing enough hardware and software related to ICTs in different schools and educational institutions will enhance exposure to learning via technology. Moreover both instructors and students will be fostered and ready to engage in the process of teaching and learning with the help of ICTs. The study conducted was a quantitative study that employed two data collection instruments namely, questionnaires and interviews with 21 instructors and students from two high-tech schools in Silicon Valley. It has been noted that in some public educational institutions, the ratio of each student to a computer increased from 92 users per computer in 1983-1984 to 27 users per computer in 1989 to 6 users per computer in 1999. The same trends were observed concerning cabling Internet connectivity in some schools, from 3% in 1994 to 90% in 1999. According to the study, the researchers discovered that three-quarters of the instructors in both schools did not use technology into their teaching. Students have reported low-level usage, including word processing and Internet searches. Cuban et al. (2001) sought to explain this paradox in two ways: the "slow revolution" or sluggish acceptance of technology, and the traditionally instructor-centered, resistant to change in the way teaching can be handled. In order to facilitate the spread of technology in schools, they recommended that major modifications in teaching approaches are necessary.

D'Souza and Wood (2003) underlined the need for more use of technology in education when they evaluated the views of Australian secondary school students concerning the incorporation of technology into mathematics. They argued that the survey of literature on computer use was diverse. They posit that technology should be incorporated into school since it had become such an integral element of society. For this investigation, the researchers surveyed 95 Australian students. Students in the study rejected new technology due to a lack of operating computers, malfunctioning computers, the difficulty of learning new software, and apprehension or lack of confidence when using

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computers. The researchers found that proper computer resources and training for students and teachers are necessary for a successful technology deployment while establishing a new curriculum.

2.3 The Conceptual Framework

For this present study, the Diffusion of Innovations theory (DIT) by Rogers and the Technology Acceptance Model (TAM) by Davis were chosen as the conceptual framework (Turner, 2007). According to Rogers' theory, the process of integrating ICTs to improve academic performance begins with the first phase of "knowledge and awareness" of the components of ICTs by users. The second phase is the users' "confirmation" of their acceptance of the technology and its appropriate integration. On the other hand, the TAM theory has several components that reflect the process of accepting ICT by users, including behavioral intent, perceived utility, and perceived usability. Efficacy relates to how much a person feels that using a technology would improve their ability to execute their work, while perceived usability refers to how easily a technology can be employed by users. The TAM theory was primarily developed to evaluate the efficiency of a technology in assisting users to comprehend the worth and usefulness of a certain system, and it is now regarded as one of the most important concepts in current studies on data systems. However, over time, the idea has evolved to include more precise factors that demonstrate how users may embrace a technology.

Actually, this study's primary goal is to evaluate how well ICTs adoption is correlated with students' academic performance. This paper precisely seeks to determine the following issues:

- The efficacy of ICT integration from a teaching and learning viewpoint,
- The successful components of ICTs integration in teaching in Morocco, and
- The correlation between ICTs integration and student's academic performance.

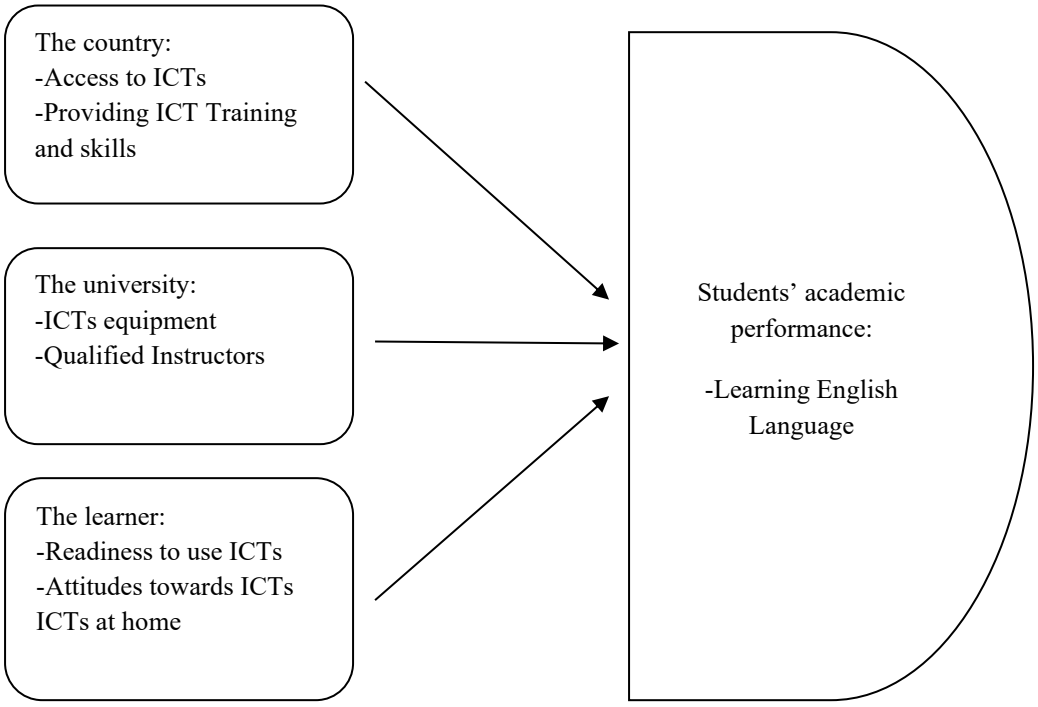

Figure 1. Researcher's conceptual framework

3. Methodology

3.1 The Aim of the Study

This article addresses a set of questions that the methodology section will strive to illuminate in an empirical and scientific approach. The main objectives of this study are to (1) figure out the role of ICTs and its components in education, (2) to highlight the efficacy of ICT integration from a teaching and learning viewpoint, and (3) clarify the correlation between the adoption of ICTs and its impact on students' academic performance.

So, based on the research objectives, the following research questions can be formulated:

1. How does ICT integration impact teaching and learning from the perspective of teachers and students?

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2. What are the key components of successful ICT integration in teaching in Morocco?
3. To what extent is there a correlation between ICT integration and student academic performance in Morocco?

3.2 Participants and the Context

The sample of this study consists of 108 students from four main universities studying English language in different majors. The sample is composed of 56 males and 52 females. The age segment ranges between 19 years and 30 years. The sampling technique that is used is convenience sampling. The students are majored in different disciplines whereas all the majors comprise English language course as an essential element in the syllabus.

3.3 Design and Procedure

What classifies this research as a quantitative study is that it is based on "collecting numeric data from a large number of people using instruments with preset questions and responses" (Creswell, 2012, p. 13). Moreover, a quantitative research design hinges on "analyzing trends, comparing groups, or relating variables using statistical analysis, and interpreting results by comparing them with prior predictions and past research" (Creswell, 2012, p. 13)

Therefore, a quantitative approach was utilized to gather and evaluate data from all participants in this study. Before administering the questionnaire to respondents, it was devised and tested to meet the study goals concerning the efficiency of ICT integration at universities in Morocco. To determine the link between two interdependent entities, how one influences the other, and what eventual changes are noticed, a correlation study was conducted. This quantitative research approach requires the participation of at least two distinct variables to determine significant correlations. In this study, both the use of ICTs and students' achievements in learning languages will be regarded as two variables, with the former being independent and the latter being dependent.

3.4 Data Collection Tools and Procedures

The instrument used in this study is a questionnaire that includes both closed ended and open ended questions together with Yes/No questions. All the questions that are incorporated seek to answer a number of research questions that this article strives to encompass. The essential research question is about the correlation between the use of ICTs in teaching and student's academic performance. A questionnaire was devised and developed according to 4 points Likert scale, this technique was used to elicit responses from some university students. These universities are as follows, The University of Rabat, Kenitra, Ifrane, and Agadir. The first section is about the demographic and socioeconomic information of the respondents and it contains 7 questions. This section is crucial as it identifies the respondent in terms of gender, age, educational background, income, place of residence and computer ownership, use and availability of ICTs. The second section consisted of various statements on the use of ICTs by university students using a six point Likert scale starting from strongly agree to strongly disagree.

Using Statistical Package for the Social Sciences (SPSS), the collected data from the respondents were compiled and evaluated. Both descriptive and inferential statistics were conducted. The researcher opted for a descriptive study to determine the frequency values and percentages of the whole population's demographic details. In addition, the mean, median, standard deviation, frequency tables, and percentages were obtained in order to measure the efficacy of ICTs integration in learning and teaching in the Moroccan universities in addition to comparing both male and female groups. In this respect, the Pearson correlation coefficient was calculated to show the relationship between the use of ICTs and students' achievements. Besides, the Independent sample *t*-test was obtained; it is a statistical measure that is used when "the two sets of data could come from two completely separate groups of participants. For example, the study could involve a sample of men compared with a sample of women" (Gravetter & Wallnau, 2013, p.317). So, its objective was first to identify the mean difference in students' attitudes concerning the use of ICTs based on gender, second to identify the mean difference in students' attainment scores of the two genders.

4. Findings

The findings of this study will be presented as a set of outputs in a way that will serve to answer the research questions. So, the display of results will be gradually in accordance with the main sections in the questionnaire. However, before we start analyzing data, first the following table shows the reliability test applied on the questionnaire to test its reliability and efficiency in the process of measurement.

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Table 1. Cronbach's alpha based on standardized items

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,895	,551	58

So, the table above indicates that the questionnaire is internally consistent and it measures what it claims to measure. The value 0.895 denotes that the constructs employed in the questionnaire are reliable and meaningful.

Table 2. Demographics and tables of frequencies

Statistics

		Gender	Age	Education
N	Valid	108	108	108
	Missing	0	0	0
Mean			23,45	1,5093
Std. Error of Mean			,270	,04833
Median			23,50	2,0000
Mode			24	2,00
Std. Deviation			2,806	,50224
Variance			7,876	,252
Range			9	1,00
Minimum			19	1,00
Maximum			28	2,00
Sum			2533	163,00

The table above highlights some statistical information about the participants in terms of gender, age, and their level of education. The following table explains the frequency of using ICTs by students in their learning process based on three variables namely gender, age, and Education.

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Table 3. The frequency of using ICTs by students in learning

ICTs Frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	always	81	75,0	75,0	75,0
	sometimes	23	21,3	21,3	96,3
	rarely	4	3,7	3,7	100,0
	Total	108	100,0	100,0	

As it is shown in the tables above, it is crystal clear that the majority of students tend to use ICTs mainly in their learning regardless of their gender, age, or education. 81 students namely 75,0 % always use ICTs in the process of learning. Subsequently 23 students that is 21,3 % still use ICTs sometimes. However, only 4 students (3,7%) showed their lack of interest in using ICTs. The following table below reveals the efficiency of ICTs in learning. To measure this efficiency, the following three major questions incorporated in the questionnaire dealt with the notion of efficiency:

To what extent do ICTs facilitate the process of learning?

Do ICTs encourage students to participate in the learning process?

Do ICTs help students improve their level in English language?

Table 4. The efficiency of ICTs in the process of learning

Statistics

		Gender	Age	Education	ICTs Facilitate Learning English	ICTs Encourage Sts Participate	English Level improved With ICTs
N	Valid	108	108	108	108	108	108
	Missing	0	0	0	0	0	0
Mean			23,45	1,5093	1,3889	1,1574	1,1574
Std. Error of Mean			,270	,04833	,06556	,03521	,03521
Median			23,50	2,0000	1,0000	1,0000	1,0000
Mode			24	2,00	1,00	1,00	1,00
Std. Deviation			2,806	,50224	,68130	,36588	,36588
Variance			7,876	,252	,464	,134	,134
Range			9	1,00	3,00	1,00	1,00
Minimum			19	1,00	1,00	1,00	1,00
Maximum			28	2,00	4,00	2,00	2,00
Sum			2533	163,00	150,00	125,00	125,00

As the values above suggest, ICTs really do have an effective role in the learning process and particularly via improving students' achievements in learning the English language. The results indicate that ICTs facilitate the process of learning English language (M = 1, 38), besides ICTs do encourage students to participate in the learning process

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(M = 1, 15). The table shows as well that ICTs do improve the level of students in learning the English language (M = 1, 15). The following tables are about the Independent t-test used to compare the means of the two groups namely males and females regarding how ICTs facilitate the process of learning the English languages.

Table 5. The mean, std. deviation and gender

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
ICTs Facilitate Learning English	Male	56	1,3214	,66352	,08867
	Female	52	1,4615	,69906	,09694

Table 6. Independent samples test and gender

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ICTsFacilitateLearning English	Equal variances assumed	1,091	,299	-1,069	106	,288	-,14011	,13112	-,40007	,11985
	Equal variances not assumed			-1,066	104,322	,289	-,14011	,13138	-,40062	,12040

Table 6 elucidates the results of the independent samples t-test that seeks to identify mean discrepancy in opinions of students whether ICTs do facilitates the process of learning the English language based on gender. The values denote that the mean difference in the responses of Males (M = -, 14011) and Females (M = -14011) was not at all statistically significant t(106) = -1.069, p = .299. Thus, the results show that there is no significant difference regarding both male and female students' responses about ICTs' effective role in facilitating the learning of the English language. The subsequent test answers the primary research question of this study namely the correlation between the use of ICTs and students' achievements when it comes to learning the English language.

Table 7. Pearson correlation coefficient r

Correlations

		English Level improved With ICTs	ICTs Frequency
English Level improved With ICTs	Pearson Correlation	1	,187
	Sig. (2-tailed)		,005
	N	108	108
ICTs Frequency	Pearson Correlation	,187	1
	Sig. (2-tailed)	,005	
	N	108	108

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Taking into account the results above, it is clear that the p-value is 0.005 ≤ 0.5 and thus, the test implies that there is a positive significant relationship between the frequency of using ICTs by students and their English level after being exposed to ICTs.

5. Discussion

The study aimed to investigate the impact of integrating ICTs on teaching and learning in Moroccan universities. Three research questions were formulated to achieve the research objectives. First, the study aimed to investigate how ICTs integration affects teaching and learning from the perspective of teachers and students. Second, it sought to identify the key components of successful ICTs integration in teaching in Morocco. Finally, it aimed to determine the extent of the correlation between ICTs integration and student academic performance in Morocco.

To answer these research questions, a quantitative research approach was employed, and a questionnaire was used as the data collection tool. The sample consisted of 108 students from four main universities in Morocco, majoring in different disciplines but all of which included English language courses as an essential element in the syllabus. The sample was composed of 56 males and 52 females, with ages ranging between 19 and 30 years. Convenience sampling was used as the sampling technique.

The study used descriptive and inferential statistics to analyze the data. Descriptive statistics were used to determine the frequency values and percentages of the whole population's demographic details. The mean, median, standard deviation, frequency tables, and percentages were obtained to measure the efficacy of ICTs integration in learning and teaching in Moroccan universities, as well as to compare both male and female groups. The Pearson correlation coefficient was calculated to show the relationship between the use of ICTs and students' achievements. In addition, the Independent sample t-test was used to identify the mean difference in students' attitudes and attainment scores based on gender.

The study found that the questionnaire was internally consistent and reliable, indicating that it measures what it claims to measure. The value 0.895 denotes that the constructs employed in the questionnaire are reliable and meaningful. The demographic and frequency tables showed that the sample was representative of the population, with no missing data. The results showed that the integration of ICTs had a positive impact on teaching and learning, with both teachers and students reporting increased engagement and motivation. The study identified several key components of successful ICTs integration, including teacher training, access to technology, and infrastructure. The study also found a significant positive correlation between ICTs integration and student academic performance, indicating that students who use ICTs in their learning achieve better results.

Furthermore, the study found that male and female students have similar attitudes towards the use of ICTs in learning, but male students achieve better academic results. This finding suggests that gender differences may play a role in academic performance and that further research is needed to explore this issue. In essence, the study contributes to the body of knowledge on the impact of ICTs on teaching and learning in Moroccan universities. The study highlights the importance of successful ICTs integration, which can lead to improved academic performance. The study also suggests that further research is needed to explore the role of gender in academic performance. The findings of this study can inform policymakers and educators in Morocco and other countries about the importance of ICTs integration in education.

The findings of this study align well with the conceptual framework provided in the literature review. The study's focus on the impact of integrating ICTs on teaching and learning in Moroccan universities is consistent with the Diffusion of Innovations theory by Rogers (2003), which emphasizes the importance of knowledge and awareness of ICTs components by users as the first phase of integrating ICTs. The study's identification of several key components of successful ICTs integration, including teacher training, access to technology, and infrastructure, also aligns with Rogers' theory, which suggests that acceptance of technology is related to its perceived usefulness and ease of use.

Moreover, the study's findings regarding the Technology Acceptance Model (TAM) by Davis (1989) support the theory's core components, including behavioral intent, perceived utility, and perceived usability. The study found that the integration of ICTs had a positive impact on teaching and learning, with both teachers and students reporting increased engagement and motivation, indicating that ICT's perceived efficacy is essential in driving technology acceptance. The study's positive correlation between ICT integration and student academic performance also supports the TAM's idea that perceived utility is a crucial factor in technology acceptance, as students who use ICTs in their learning achieve better results.

The study's use of quantitative research methods, including descriptive and inferential statistics, also supports the TAM's emphasis on empirical evidence in determining the efficiency of a technology in assisting users to comprehend

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the worth and usefulness of a certain system. However, the study's finding that male students achieve better academic results, despite both male and female students having similar attitudes towards the use of ICTs in learning, suggests that further research is needed to explore the role of gender in academic performance. This finding highlights the need to consider additional factors beyond the conceptual framework provided in the literature review, such as cultural norms and expectations related to gender, in exploring the impact of integrating ICTs on teaching and learning in Moroccan universities.

Overall, the study's findings contribute to the body of knowledge on the impact of ICTs on teaching and learning in Moroccan universities and provide valuable insights for policymakers and educators on the importance of successful ICTs integration, which can lead to improved academic performance. The study's alignment with the conceptual framework provided in the literature review emphasizes the importance of theoretical frameworks in guiding research and understanding the complex relationships between technology, education, and user acceptance.

6. Conclusion

To conclude, the study indicates that the usage of ICTs in the classroom has a favorable effect on the academic performance of university students. This research backs up the claim that ICTs resources are advantageous to students' academic progress and contribute to teaching and learning approaches. A strong association between students' academic performance and their attitudes towards the usage of Information and Communication Technologies (ICTs) indicates that university students view ICTs resources as an asset to their academic performance. The same is reflected in their achievement results, which reveal a substantial association with their perceptions of the usefulness of ICTs resources for academic advancement. The outcome states that students believe that the use of ICTs contributes positively to their time spent learning per day using ICTs, which is consistent with other major findings of the study indicating that students' belief that learning via ICTs resources does help improve their level of English language, facilitates the process of learning, and encourage them to participate in learning.

The survey also found that male and female college students have comparable attitudes towards the impact of ICTs on their education. This indicates that they believe that the employment of ICTs has a beneficial impact on their learning, which is corroborated by another conclusion of the study demonstrating that male and female students get similar scores when using ICTs resources. There was also no difference between male and female male and female students for the number of hours per day spent using ICTs, indicating that male and female roughly spend the same amount of time per day using ICTs. The findings of this study stipulate a set of recommendations that the ministry of higher education should make allowance for. ICTs nowadays are crucial in developing the learning outcomes. After the era of the pandemic Covid-19, the ICTs remain indispensable in the field of teaching and learning if not in all sectors. This study contends that the following recommendations will bring change to the educational landscape.

- ICTs should be integrated in higher education through different forms and should attain all the areas of the country.
- Universities, faculties, and departments should be equipped with the necessary ICTs aids and devices.
- Both teachers and students should undergo a professional training about the effective use of ICTs for educational purposes.
- Supply students with the necessary ICTs tools that will help them stay in contact with their instructors like laptops, the Internet network, computers, and software applications.
- Intensify the infrastructure of some universities in terms of building IT laboratories.
- Conducting annual workshops at the national and international scale whereby instructors and students can exchange the latest developments in the field of ICTs in education. This will give the opportunity to some experts and professionals to share their expertise with our educational entities in the country.
- Regularly evaluate and assess the outcomes of the ICTs employment in the educational sector and the decision makers should keep the instructors posted about any recent updates concerning the use of ICTs.
- Appropriate work spaces should be created by universities for students while they are inside the campus.

When it comes to the implications of the present study, we can highlight three categories of implications namely policy implications, educational implications, and future research implications. Concerning the policy implications, the study's findings have several policy implications for policymakers and educators in Moroccan universities. Firstly, the study's emphasis on the importance of successful ICTs integration in teaching and learning highlights the need for policymakers to prioritize funding for ICTs infrastructure, teacher training, and access to technology. Secondly, the study's positive correlation between ICTs integration and academic performance suggests that policymakers should consider incorporating ICTs into the curriculum to improve student outcomes. Thirdly, the study's finding that male students achieve better academic results despite both male and female students having similar attitudes towards the

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use of ICTs in learning highlights the need to consider cultural norms and expectations related to gender in designing policies related to ICTs integration in education.

As for the educational implications, the study's findings have several educational implications for educators in Moroccan universities. Firstly, the study's identification of several key components of successful ICTs integration, including teacher training, access to technology, and infrastructure, highlights the need for educators to prioritize these factors in designing ICTs integration programs. Secondly, the study's positive correlation between ICTs integration and academic performance suggests that educators should consider incorporating ICTs into their teaching to improve student outcomes. Finally, the study's finding that male students achieve better academic results despite both male and female students having similar attitudes towards the use of ICTs in learning highlights the need for educators to consider gender-related factors when designing ICTs integration programs.

As regards future research implications, the study's finding that male students achieve better academic results despite both male and female students having similar attitudes towards the use of ICTs in learning suggests that further research is needed to explore the role of gender in academic performance. Future research could explore the impact of cultural norms and expectations related to gender on academic performance and the effectiveness of different strategies for ICTs integration in addressing gender-related disparities in academic outcomes. Additionally, future research could explore the long-term impact of ICTs integration on student outcomes beyond academic performance, such as employability and career success. In the grand scheme of things, the study's findings provide valuable insights into the interplay between the use of ICTs and students' academic performance in higher education. The study's implications highlight the need for policymakers and educators to prioritize successful ICTs integration in teaching and learning and consider gender-related factors in designing ICTs integration programs. The study also emphasizes the importance of theoretical frameworks in guiding research and understanding the complex relationships between technology, education, and user acceptance.

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