Correlational Analysis of Information and Communication Technologies' Integration in Direct and Distance Teaching

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Abstract—This study focuses on the correlations that exist between many items linked to the use and integration of Information and communication technologies (ICTs). This paper aims to contribute to the current debate in the literature concerning education in both forms, direct and distance teaching. The scientific novelty of the article also consists of a large-scale study that describes the theoretical and practical prerequisites of distance education through ICTs' integration. We have used of hybrid strategy of quantitative, analytical and descriptive type. The driving factor of choosing a questionnaire as the medium of data collection is that is provides a better sampling from different public high schools (N=102) in the region of Casablanca-Settat, Morocco, in a short time. A Spearman product-moment correlation coefficient was conducted to evaluate the null hypothesis that claims the absence of any relationship between the selected items. Preliminary analysis showed that there a correlation between age and ICTs mastery, and there was a significant evidence to conduct that there was a negative association between age and ICTs mastery $r(102) = -.57, p=.01$, there for there is a correlation between gender and Information and communication technologies mastery $r(101) = .56, p=.02$. A strong correlation between university degree and Information and communication technologies mastery $r(98) = .58, p=.01$. The results of this study could greatly help trainers to choose the right sample according to age, gender, application software, etc.

Keywords—correlation, education, ICT, distance teaching, COVID-19

1 Introduction and problem

This paper seeks to contribute to the current debate in the literature concerning education in both forms, direct and distance learning. The scientific novelty of the arti-

cle also consists of a large-scale study that describes the theoretical and practical prerequisites of the impact of information and communication technologies' (ICT) integration on direct and distance teaching.

The use of ICTE (Information and Communication Technologies for Education) disrupts the relationship between students and teachers by creating a new (virtual) exchange space. Without these tools, it would be quite impossible to reproduce such a dialogue framework. Therefore, ICTE has many advantages [1-8] on students in many ways including increasing student motivation, appreciating student work, enhancing students communication skills, knowing how to search for information and multiply resources, etc. teachers also benefit through saving time in class by allowing educational continuity between two sessions, pooling resources and increasing the comfort once the technical handling has been carried out [9].

United Nations agencies and other international entities are working to promote the use of ICTs. International academic institutions are also involved in the promotion of ICTs; along with ITU recognize the advantages of ICTs. The Plan of Action adopted during the first phase of the World Summit on the Information Society (WSIS) invites the international organizations and financial institutions concerned to develop their own strategies for the use of ICTs to promote sustainable development and achieve the goals set out in the United Nations Millennium Declaration.

Moroccan strategic vision of the 2015-2030 reform, "For a school of equity and equal opportunity", defines educational technologies as: "ICTs adapted to education. They are involved in learning, training and supervision, in planning, organization and management, and in evaluation. They include interactive programs and software, digital resources (videos, tutorials, simulations, picture, texts, and various electronic tools and equipment), … as well as networks of information systems and the services they offer such as distance education, videoconferencing, digital libraries, etc." [14].

Morocco, like many different countries, tries to mainstream ICTs in education by a program called "GENIE" (GENeralization of Information and communication technologies in Education), that is one of the structuring projects of the National Workshop Digital Morocco (since 2013). It is located at the heart of the emergency program, which is a new breath of educational reform in Morocco [13].

The "GENIE" program is the embodiment of the national strategy for the dissemination of information and communication technology in the educational field, during the period 2009-2013. In 10th Lever of the national charter for education and training the, this program aspires to contribute to improving the quality of learning, through the dissemination of the information tool in its various uses within the Moroccan school [13], and the key role they can play in science teaching.

In this study, we will ask some important questions, and try to get some answers during the correlational analysis of the data collected from the questionnaire. The main questions to be discussed are. First, are the age and gender directly linked to the integration of ICTs by teachers? Secondly, is the university level of teachers has a significant impact on the integration of ICTs? Thirdly, is the proficiency level of computer and IT training related to ICT use? Then, is there a correlation between the use of ICTs and text, tables, picture and audiovisual editing? Finally, what's the impact of ICTs' integration on both direct and distance teaching?

2 Literature review

Regarding distant and direct instruction, numerous researches have been done from diverse angles. Several studies have looked into the practices and obstacles teachers encounter when using ICT. Their researches showed that teachers had undergone significant change in their regular teaching practices as well as their adoption of new teaching strategies [14–15]. The use of online learning and suggestions from various Information and Communications Technology (ICT) scenarios by teachers is therefore possible [14-19]. They discovered that teachers reported more work with ambiguous outcomes. Teachers and parents were concerned about pupils' unequal access to technology resources and the detrimental social and emotional effects of remote learning. However, recent studies found that there were numerous obstacles for teachers to overcome, including a lack of infrastructure, technical skills for teachers, and inadequate training for teachers of distance learning [14-19], as well as tool ownership, connectivity, training, etc.

At the European Commission in 2020, they mentioned that teachers and students in the twenty-first century must contend with new opportunities, expectations, and challenges as a result of the growth of information and communication technologies. Recent researches suggest that STEM activities should begin in preschool since they are crucial for children's cognitive development and are associated with later reading success [14-19].

Therefore ICT promotes the construction of knowledge by students. The emphasis is more on learning than on teaching. The teacher is no longer the teacher, the sole holder of knowledge, but rather a facilitator who helps students build their knowledge [14-20], he accompanies them to enable them to take ownership of the project.

Information and Communication Technologies (ICT) offer real potential to significantly increase the quality of higher education and to change our relationship to knowledge [14-21].

In a case study of five French institutions, previous researches demonstrate that the usage of ICT fits more into a pattern of replacing the channels through which knowledge is delivered than into a pattern of changing educational methods [15-19]. The old media seem to be replaced by the new learning media without having a significant impact on the type of learning that is being observed. They also demonstrates how poorly French higher education professors continue to portray the contributions of new technology [14-22]. It is insufficiently discussed how pedagogical transformation is required. ICT is used in a variety of ways and is regarded as basic equipment that can be used in conjunction with conventional teaching methods. According to them, the primary component causing effective utilization geared toward an improvement in the caliber of instruction is the teachers' motivation [3].

3 Theoretical framework

In this research we will highlight the impact of the integration of ICT through an empirical study and an in-depth review of the literature. First of all we will emphasize

the importance and objectives of ICTs' integration in the Moroccan educational system.

The COVID-19 pandemic that has affected the whole world has forced the University community to exploit new teaching methods, such as flipped classroom, online and hybrid teaching; this has been an issue of real-world, specifically after confinement and the cessation of direct lessons, the only way to ensure the continuity of lessons was to use ICT, it respects the health protocol and social distancing, it allow teachers and students to communicate with each other without taking any risk, learn/teach and there for ICT have now more value and importance in all countries educational systems.

For that, and according to the Moroccan strategic vision of the 2015-2030 reform, "For a school of equity and equal opportunity" [15], the integration of educational technologies aims to:

- Raise the quality of education and training by facilitating the acquisition of knowledge, further motivating the learner and enhancing the attractiveness of the School by integrating ICTs;
- Rationalize educational governance by relying on integrated information and communication systems;
- Involve and help educational actors in isolated areas, and in case of global pandemics (COVID-19 for example).
- Etc.

Given the objectives set by the "Digital Morocco Strategy"[15], which grants the School an essential role and functions in the dissemination of information and communication technologies, and in consideration of the effects induced by the integration of these technologies on the renewal and progress of the Moroccan School, the Council proposed to:

- Equip all the teaching rooms of these establishments with audio-visual means and ICTs; (Lever 6, strategic vision 2015-2030)
- Reinforce the integration of educational technologies to improve the quality of learning; (Level 12).
- The optimal exploitation, with a critical vision, of the role of ICTs in the functional use of culture and artistic expressions and the widening of the field of cultural interaction; (Lever 17).
- The promotion of programs for the dissemination of ICTs and their control through the improvement of services and the generalization of access to the Internet network, while constantly developing and enriching the educational content digital; (Lever 19).
- Integrate ICTs at all levels of management and facilitate access to data, their archiving and sharing, as well as interactivity and communication between the various parties involved in the management of the system; (Lever 20).
- Reinforce the integration of these technologies at school in order to promote the quality of learning; (Lever 20).

- The promotion of theoretical and practical research in the fields of education and training, in relation to ICTs; (Lever 20).

The findings suggest that the adoption of information and communication technology may result in teacher professional development initiatives that should enhance teachers' digital literacy [10-17]. The implementation of science, technology, engineering, and math content in the classroom, however, depends on instructors having a solid pedagogical grasp of STEM education and its subject matter [16].

4   Methodology

4.1   Sample

This study focuses on the correlations that exist between many items linked to the use and integration of Information and communication technologies (ICTs), through a survey based on the collection of data from questionnaires distributed to qualified secondary school teachers (N = 102) in the Casablanca-Settat region, Morocco. We did a Probability sampling that involves random selection, allowing you to make strong statistical inferences about the whole group.

4.2   Method

We used a method that is quantitative, analytical and descriptive of a hybrid type, and for that we opted for the questionnaire as a method of data collection, with the aim of analyzing the data collected in order to know the impact of ICTs' integration on direct and distance teaching.

4.3   Data analysis

This data collection was processed with statistical software which is SPSS. We opt for a correlational analytical descriptive methodology where we describe the relationships between our items. Our research focuses on the discovery of relationships between the factors or the variables. According to the statistics (P < .05), we can say that the results are very significant.

The validation of our survey is made by an alpha Cronbach coefficient (α = .817, N = 102) for each item scale, after excluding 4 items.

Our study is based on a survey mad of 24 direct questions, targeting qualified secondary school teachers in the region of Casablanca-settat, aiming for clear answers for research questions using investigation approach and to move forward in our investigation, thought the following axes:

- Age and gender;
- University degree
- Possession, proficiency level of computer and IT training

- Use of ICTs
- Text, tables, picture and audiovisual editing

5 Results

A Spearman product-moment correlation coefficient was conducted to evaluate the null hypothesis that says that there is no relationship between teacher's age, gender, and ICT mastery (N = 102). Preliminary analysis showed that there a correlation between age and ICT mastery. There was a significant evidence to conduct that there was a negative association between age and ICT mastery r(102) = -.57,p=.01, but maybe not what you would expect, the younger the teachers are, the more they participate in ICT field, young age associated with mastery of ICT. The results also showed that males master ICT well, therefore, there is a correlation between gender and ICT mastery r(101) = .56,p=.02.

Preliminary analysis showed that there is a strong correlation between university degree and possession of laptop r(98) = .57,p=.01 and a strong correlation between university degree and IT training r(98) = .56,p=.01, and IT mastery r(98) = .58 ,p=.01, therefor higher degrees are associated with having laptop and IT training, perhaps because they used it in research or PFE. There is also a strong correlation between laptop possession and IT training r(98) = .54,p=.01, because eventually you need a laptop for ICT training, and finally mastery of IT is associated with IT training r(98) =.71 ,p=.01. "See Table 1".

Table 1. Inter-item correlation matrix of computer use and university dergee

	University degree	Possession of a computer	Computer training	Computer proficiency level
University degree	1.000	0.57	.56	.58
Possession of a computer	.57	1.000	.59	.54
Computer training	.56	.59	1.000	.71
Computer proficiency level	.58	.54	.71	1.000

The study showed that there is a correlation between ICT use and mastery Microsoft Word (M = 2.49,SD = 1.247), r(98) =.467,p=.01; Excel (M = 5.40,SD = 1.195), r(98) = .389,p=.01; PowerPoint (M = 4.79,SD = 1.365), r(98) = .447,p=.01; Picture editing (M = 5.73,SD = 1.216), r(98) = 0.468,p=.01; Audio editing (M = 5.81,SD = 1.189), r(98) = 0.425,p=.01; Video editing (M = 5.80,SD = 1.217), r(98) = 0.497,p=.01; Also a strong correlation exists between picture, audio, video editing (see Table 2 and 3), given the news that requires a certain level of mastery of the field of audiovisual data processing, to create for example a channel on Youtube or a page on Facebook, etc.

Table 2. Inter-item correlation matrix of office and ICT use

	ICT use	**Word**	**Excel**	**PowerPoint**	**Image**	**Audio**	**Video**
ICT use	1.000	.467	.389	.447	.468	.425	.497
Microsoft Word level	.467	1.000	.307	.456	.345	.243	.307
MS Excel level	.389	.307	1.000	.300	.234	.271	.221
MS Power-Point	.447	.456	,300	1.000	.381	.366	.351
Image level	.468	.345	.234	.381	1.000	.528	.580
Audio level	.425	.243	.271	.366	.528	1.000	.743
Video level	.497	.307	.221	.351	.580	.743	1.000

Table 3. Variance and Standard Deviation

Item1	**Mean**	**Variance**	**Standard Deviation**	**N**
Word	2.49	1.247	1.117	98
Excel	5.40	1.427	1.195	98
PowerPoint	4,79	1.865	1.365	98
Image	5.73	1.478	1.216	98
Audio	5.81	1.414	1.189	98
Video	5.80	1.480	1.217	98

We are part of a quantitative research; we are always interested in establishing links and studying the correlations between the existing variables to achieve concrete results. We used validated measuring instruments and we applied our experience to a large number of subjects and we processed the data statistically for greater stability and reliability.

An association between the age of teachers and the frequency of ICT integration in instruction is found in a recent study [16]. This supports what we already noticed: if age is a factor associated with integration, the oldest teachers will likely benefit the most. What is directly related to instructors' competence of ICT and covers both the demand for equipment maintenance and the intensity of this demand [20].

In a recent study [16], 79% of respondents agreed that ICT was useful, while 21% disagreed, and 67% cited their ability to motivate people and aid in the growth of autonomy. ICTs are valuable for their effectiveness in learning, according to 65% of users, although In light of ICT that make learning fun and less challenging, there is a significant and positive association between the incentive to act (r=0.629) and this factor [17-20]. Another recent study [18] revealed a connection between pedagogical continuity and TICE.

The more respondents claim to use ICT for pedagogical and technological purposes, the easier it seems to them to use the updated pedagogical methods with ICT, and the more at ease they are assisting teachers in the process of integrating ICT in the classroom, according to correlational analysis and studies [20–26]. ICTs appear to be more beneficial for Moroccan teachers' ongoing professional development. [28–34]

Our research targets the academicians and the practitioners, since it deals with a real-word issue "distance learning", "science" and "technologies", and since we are headed to a new era of online teaching/learning, especially after the global pandemic of COVID-19 that has changed our view to teaching process and has put more conditions to evaluate our approaches and methods.

Therefore, we answered the questions of our research, we conducted that ICTs have a significant impact on teachers, with so many parameters, such as gender, we found that young teachers have the ability to adapt to new situations (COVID-19) and more likely used to technologies, also, teachers with high university degrees integrate ICT in their classrooms, and use online teaching, via video clips, power point presentations, PDF courses, images, animations and simulations.

The findings' generalizability to other settings is uncertain due to the limits of study done in a single geographic area (the Casablanca-Settat region). In order to determine whether similar results are obtained elsewhere, more research in more geographic locations is also required. A professional teaching model for integrating information and communication technologies in the classroom would be developed as a result of this research.

6   Discussion

This study aimed to investigate secondary teachers' practices in direct and distance teaching, the impact of information and communication technologies on teachers' practices. We found that some items are linked to each other, concerning the ICT use in classroom or through online teaching, such as: teachers who master ICT use them often with their students, it is natural that teachers feel for confortable integrating ICT because it helps them gain time and effort by simply projecting text, playing videos or sending links or digital multimedia. We also found that teachers having laptop are more likely to integrate ICT, because they're already used to it, and they found no problem manipulating it in front of their students, or at home. However teachers having high university degree seem to know how to handle ICT more effectively. They are more trained and ready for any adaptation to any kind of situation such as COVID-19 pandemic and locked-in situation; it gave them opportunity to try new ways of teaching rather than using traditional methods. Previous studies found similar findings [1-5].

The impact of information and communication technologies on teachers is very significant; we found that the more teachers are young the more they participate in ICT field, lower age associated with mastery of ICT. The results also showed that males master ICT well, there for ICT will have a better future with the new generation, they are well trained, and use to it.

Despite the initial challenges teachers encountered, they underwent various modifications and transformations in how they approached concepts, piqued students' interests, and involved them in the learning process. It is important to note that the introduction of old or new digital learning communities helped teachers who deliver

instruction remotely; although teachers reported using digital tools for multidisciplinary activities during remote learning [10].

Our findings might serve as a foundation for direct and online instruction for all parties involved. Information and communication technology should be used by teachers in both in-person and online activities. In this regard, more digital tools should be developed and/or recreated to provide enriched environments with useful instructional resources.

Also, ways to involve parents and their best practices in the learning process should be suggested.

This study targets a sample of small size of teachers in Casablanca. We are also aware of the situation, which we have focused only on secondary qualifying teachers, and ignored primary and higher education teachers that are meant to be considered in this investigation. There for researchers are invited to extend this type of research in other areas, in order to compare and generalize in a larger scale.

7   Conclusion

The Covid-19 pandemic was not just a health crisis but also a global education crisis. In all countries, the functioning of schools has been disrupted, teaching methods and pedagogical practices destabilized.

This evaluative study is an analysis of this unprecedented experience of distance education imposed by the Covid-19 pandemic. Its main objective is to identify the practices, the relationships between the different items and the impact of the integration of ICT on teachers and the Moroccan education system. For a better understanding of an education system under pressure, this study also collected and examined the degree of use of ICT by teachers, that could be used and compared to other studies and help academicians and practitioners, since it deals with a real-word issue (Distance learning) and (technologies), and since we are headed to a new era of online teaching/learning.

The study showed that there is an existing correlation between different items, regarding the integration of ICTs, (ICT use and mastery Microsoft Word (M = 2.49,SD = 1.247), r(98) =.467,p=.01; Excel (M = 5.40,SD = 1.195), r(98) = .389,p=.01; PowerPoint (M = 4.79,SD = 1.365), r(98) = .447,p=.01; Picture editing (M = 5.73,SD = 1.216), r(98) = 0.468,p=.01; Audio editing (M = 5.81,SD = 1.189), r(98) = 0.425,p=.01; Video editing (M = 5.80,SD = 1.217), r(98) = 0.497,p=.01), some correlations are strong and significant (gender and ICT mastery r(101) = .56,p=.02), (university degree and possession of laptop r(98) = .57,p=.01 and university degree and IT training r(98) = .56,p=.01, and IT mastery r(98) = .58 ,p=.01, and laptop possession and IT training r(98) = .54,p=.01, and mastery of IT associated with IT training r(98) =.71 ,p=.01), some correlations are negative (age and ICT mastery r(102) = -.57,p=.01).

The impact of information and communication technologies on teachers is very significant; we found that the younger the teachers are, the more they participate in ICT field, younger age associated with mastery of ICT. The results also showed that

males master ICT well, therefore, ICT will have a better future with the new generation, they are well trained, and use to it.

Therefor we could understand that some items are directly linked to the integration of ICTs, and pay them more attention, given the necessity of the new situation, after the outbreak of the global pandemic (Covid-19), distance learning and the confinement, teachers better have different skills about computer and ICTs, to allow education to continue and to overcome obstacles. Based on the present study results and our educational experience, several recommendations can be made to improve ICTs' integration further.

With that been said, to overcome those obstacles, we mention some levers, to facilitate the integration of ICT, such as:

- Microsoft Office training (MS Word, Excel, PowerPoint);
- Computer training (image, audio and video processing);
- Possession of digital tools (Tablet, laptop, data show, IWB - Interactive Whiteboard, simulations, tutorials, etc.);
- Support and following from trainers or pedagogical inspectors;
- Motivation;

These are just some levers, the main change is coming from the teacher himself, without motivation, willingness and passion any attempt will be lost in advance, therefor the involvement of parents, learners and the various educational actors is necessary.

Educational institutions must hold conferences, seminars, and workshops for instructors to become familiar with ICT concepts. ICT experts are highly invited to take part in the campaign of fighting ICT illiteracy. These steps can assist educators in realizing the potential learning opportunities offered by educational technology and helping them go beyond the "conventional" classroom (Seow et al., 2017) [18]. Trainers in RCEPT must ensure that teachers understand the objectives, goals, and outcomes of using educational technology.

8   References

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