

Research paper

Integration of information and communication technologies in the training of nurses and health technicians in the Marrakech-Safi region of Morocco

Hicham Mejdouli^{1,2*}, Abderrahmane Bouamri³, Fatima Ezzahra Madih², Nadia Ouzennou²

¹ *Pharmacology, Neurobiology, Anthropobiology, Environment and Behaviour Laboratory, Cadi Ayyad University, Semlalia Faculty of Science, Marrakech, Morocco*

² *Higher Institute of Nursing and Health Technology Professions, Marrakech, Morocco*

³ *National School of Agriculture, Meknes, Morocco*

PAPER INFO

Paper History

Received January 2024

Accepted July 2024

Keywords

Information and communication technologies

Educational integration

Training

Nurses

Morocco

ABSTRACT

Information and Communication Technologies (ICT) are invading Moroccan society, including the field of education. The benefits of integrating ICT into teaching are now indisputable. This study aims to explore the current state of integration of these technologies by teachers and students at the Higher Institute of Nursing and Technical Health Professions in Marrakech, as well as the factors influencing this integration. *The data was collected between March and July 2019 using two questionnaires, the first of which was sent via Google Forms to all permanent teachers at the Marrakech institute and its annexes in Safi and Essaouira, while the second was self-administered to a sample of 548 students representing the three institutes.* Taken together, the results of this research show that the pedagogical use of ICT in the training of nurses and health technicians in Morocco is limited. The lack of technological infrastructure, the lack of training for teachers and students in the pedagogical use of ICT and the absence of an institutional policy for integrating ICT are the main factors explaining this rudimentary use. Decision-makers are called upon to take account of the main constraints highlighted in this research in order to integrate the digital era into the training of nurses and healthcare technicians on a more solid footing.

Introduction

The national survey conducted in 2018 by Morocco's Agence National de Réglementation des Télécommunications (ANRT) to collect Information and Communication Technology (ICT) indicators from households and individuals revealed that the number of smartphones is estimated at more than 22 million; internet access in households increased by 181% between 2010 and 2017, and the number of internet users is almost 19.6 million, or more than half the Moroccan population [1]. This invasion of technology into the Moroccan population, particularly among young people, is influencing lifestyles, communication and knowledge. Schools find themselves obliged to exploit and integrate ICT to meet the demands of society and the needs of learners [2]. The positive effects of using ICT-based educational resources on the teaching/learning process have been highlighted for some thirty years now [3]. In particular, they allow flexibility, accessibility and increased exchanges, and relocate exchanges between teachers and learners in time and space, thus diversifying teaching/learning activities [4].

In Morocco, a number of initiatives have been taken to generalize the use of ICT in the education system, with the aim of improving the quality of training and bringing it up to international standards. The first such initiative dates back to 1998, when the MARWAN (Maroc Wide Area Network) was set up to provide Moroccan universities with high-speed Internet access via a network reserved specifically for academic traffic [2].

*Corresponding author. Email: hicham.mejdouli@ced.uca.ma

Currently, the 2030 strategic vision for school reform considers the integration of ICT into the Moroccan education system as a priority measure for educational reform [5].

The pace of development of nursing and health techniques is accelerating in Morocco. Those involved in training are convinced that renovation is an essential lever for improving the quality and skills of future healthcare professionals. Thus, integrating ICT into nursing training was a priority of the reform launched by the Ministry of Health already in 2013 [6].

Nevertheless, this ambitious vision has not been well realized in the field. A survey of teachers at the Higher Institute of Nursing and Health Technology (ISPITS) in Tétouan in 2015 showed that the pedagogical integration of ICT remains very limited. ICTs are used as enrichment tools through in-class videos or as a support for lecturing [7].

However, the pedagogical integration of ICT is a multi-stage process that begins with familiarization and culminates in appropriation or "exemplary use" of ICT for pedagogical purposes by both teachers and learners[8].

Karsenti and Gauthier (2006) suggest that the factors influencing the pedagogical integration of ICT can be grouped into external factors linked to the environment, such as lack of equipment, lack of technical support and lack of support from management, and inadequate techno-pedagogical preparation in both initial and in-service training; and internal factors linked to the teacher, notably lack of time, motivation and techno-pedagogical skills [9].

For Mastafi (2015), five categories of obstacles can influence the integration of ICT into the Moroccan education system, namely: obstacles relating to the technological infrastructure, those relating to support and professional development, those relating to the policy and strategy for implementing ICT in education, those relating to cultural and linguistic issues and finally those relating to general problems associated with the education system itself[10].

Data on the use of ICTs in the training of nurses in Morocco are scarce, if not absent. The aim of this study was to estimate the level and determinants of ICT use at the ISPITS in Marrakech, in order to contribute to their integration into the training of nurses and health technicians in Morocco.

Methods

First, confirm that you have the correct template for your paper size. This template has been tailored for output on the A4 paper size. If you are using US letter-sized paper, please close this file and download the Microsoft Word, Letter file.

Nursing training in Morocco is provided by ISPITS. These are non-university higher education establishments under the supervision of the Ministry of Health, and are responsible for training nurses and health technicians. In ISPITS, the curriculum is divided into five streams, each with at least one option.

- The nursing stream ;
- The midwifery stream ;
- The health technology stream;
- The Rehabilitation pathway;
- The medical-social assistant stream.

At the same time, we carried out two questionnaire surveys among the two main players in the training of nurses and health technicians, i.e. teachers and students, at ISPITS Marrakech and its two annexes in Essaouira and Safi, the only training establishments for nurses and health technicians in the Marrakech-Safi region. Data will be collected between March and July 2019.

Teaching at ISPITS is carried out by permanent and part-time teachers. Only permanent teachers were included in this study. They number 67 in total (44 in Marrakech, 09 in Essaouira and 14 in Safi) and belong to two different cadres: research teachers (n=7) and permanent teachers. The latter fall into two categories: nurses (n=31) with a post-graduate diploma (diploma in paramedical education equivalent to a baccalaureate plus 5), and nurses

(n=29) with a diploma equivalent to a baccalaureate plus three, who are civil servants in the Ministry of Health and seconded to ISPITS to teach.) We proceeded with an exhaustive sampling of 60 permanent teachers, after excluding teachers in charge of administrative tasks at the time of the survey and teachers who had participated in the pre-test of the questionnaire.

Among the students, the study involved all students in the Versatile Nursing and Midwifery options, at Semester 2 (S2), S4 and S6 levels (semesters open at the time of the survey), with a total enrolment of 548 students spread across the three establishments (204 in Marrakech, 159 in Essaouira and 185 in Safi). The choice of these two options among the 12 others present at ISPITS Marrakech is justified by the fact that they represent 61% of the total student body at ISPITS Marrakech and its annexes, as well as by the exclusive representativeness of these two options at the three data collection sites, Marrakech, Safi and Essaouira. Students who had postponed modules and who were not enrolled in any module at the time of the survey, and students who had participated in the pre-test of the questionnaire, were excluded from the study.

We used questionnaires as data collection tools, via the online Google-forms tool for teachers and self-administered questionnaires for students, supplemented by structured interviews.

Both teacher and student questionnaires included questions on personal characteristics, ICT knowledge and use (level of training and technological equipment; technological skills, personal and pedagogical use of ICT) and factors influencing the pedagogical integration of ICT.

We collected 39 questionnaires completed by teachers, with a response rate of 65%, and 513 questionnaires completed by students, with a response rate of 93%.

The data collected was entered and processed using SPSS software, which enabled us to describe the two study populations statistically, and to carry out correlation and comparison tests.

All required ethical considerations were respected, including authorizations to collect data from teachers and students, anonymity, confidentiality of responses and the right to participate or not in the survey.

Results

Results of the teacher survey

Our sample of teachers who responded to our questionnaire (n=39) comprised 12 male teachers (37%) and 27 female teachers (69%), working at ISPITS Marrakech (54%), Essaouira (20%) and Safi (26%). The age of the teachers ranged from 31 to 58 years, with an average age of 40 years (standard deviation = 6.54).

61% (n=24) of the teachers were post-graduates, 18% (n=7) had an undergraduate degree and 21% (n=8) belonged to other categories (state school graduates or research teachers).

All the teachers said they had a laptop computer and Internet access at home. 95% of them had a smartphone, 67% a desktop computer and 54% a digital tablet.

Only a third of teachers (n=13) said they had received training in the pedagogical integration of ICT. The majority of these teachers (66%) had received this training in a personal context, and only 34% as part of their basic training.

In terms of digital skills, only 10% saw themselves as capable of leading distance learning courses, and 18% were able to create digital teaching resources.

The results from the teachers' responses reveal two types of ICT use: personal use and pedagogical use. The latter concerns out-of-class use and in-class use (during lessons).

Whatever the ICT tool, the majority of teachers, 59% (n=23), used ICT for personal reasons for an average of over 3 hours a day, with 20.5% exceeding 4 hours a day, with an average of 3.1 hours a day (standard deviation =1.28).

However, the majority (61.5%) reported using ICT for educational purposes for between one and two hours, with an average of 1.5 hours per day (standard deviation =1). Figure 1 compares the daily duration of ICT use for personal and educational purposes among the teaching population.

[Tapez ici]

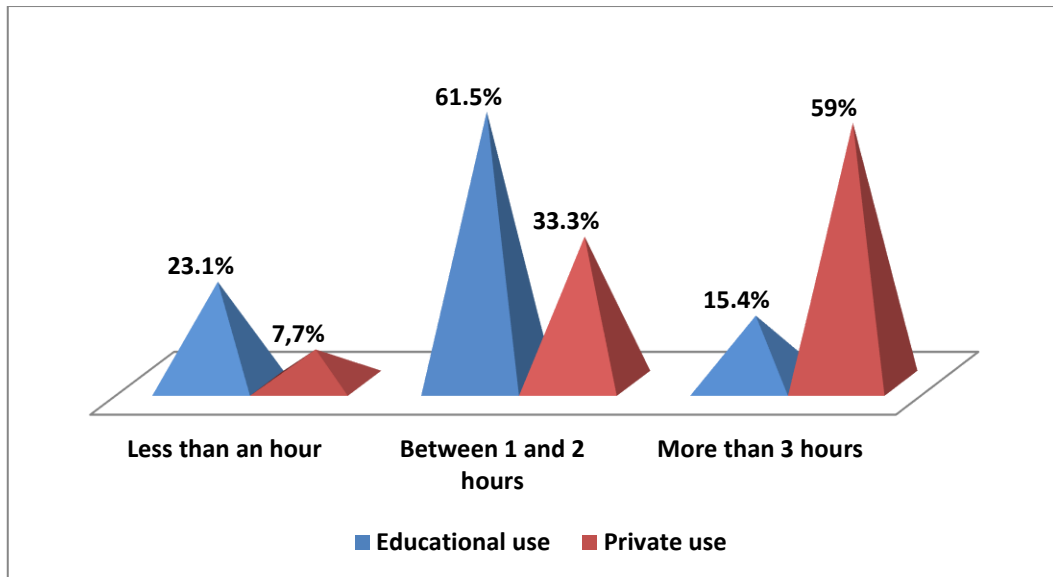


Fig.1: Average daily duration of ICT use by type of use among teachers

Personal use was dominated by sending e-mails (95%), participating in social networks and chat applications (90%) and buying products online (82%). Similarly, 26% of teachers said they had used ICT to download videos, and 18% for documentary research.

As for pedagogical use, in the classroom, 71.8% of teachers used ICT permanently in their teaching practices. 20.5% used them occasionally and 7.7% rarely. The main activity carried out in the classroom using ICT by 92% of teachers was lecturing. According to teachers, other activities that prompted ICT use were videos (21%) and guided visits to websites (15%).

Outside the classroom, teachers used ICT to prepare course presentations using office software such as Word and PowerPoint. By contrast, only 10% of teachers reported using special software for course scripting, and 64% were unaware of the principles involved in using an educational platform.

As for communication with learners, only 41% of teachers said they had used ICT to communicate with their students outside the classroom, compared with 59% who used it only occasionally or rarely for this purpose.

However, in order to apprehend and statistically verify the impact of these factors, in addition to others of a demographic, professional and institutional nature, on the pedagogical use of ICT, we proceeded to cross-tabulate the variables.

The results showed that the use of ICT in the classroom was significantly associated with lack of classroom equipment ($\chi^2=9.03$; $p<0.01$), lack of technical support ($\chi^2=6.36$; $p<0.01$), lack of institutional vision ($\chi^2=5.72$; $p<0.01$) and basic training ($\chi^2=8.35$; $p<0.05$). Indeed, teachers with a post-graduate diploma appear to use ICT more in the classroom (87.5%) than other categories (46.7%).

However, no statistically significant differences were observed according to gender, age or seniority in teaching.

Finally, it should be noted that all teachers had a positive perception of the use of ICT in nurse training. Thus, 95% felt that the use of ICT enabled them to broaden the range of teaching strategies, 82% stated that ICT enabled a diversification of learning activities, and 62% affirmed that the integration of ICT made students more autonomous in their learning.

Student survey results

Of the 513 students who completed the questionnaires, 86% (n=443) were female and 14% (n=70) male. 10 students were married at the time of the survey. The age of these students ranged from 18 to 24, with an average of 19.61 (19.57 for boys and 19.62 for girls, with no statistically significant difference). 78% of the students were from urban areas.

Smartphones and laptops were the personal technological equipment most used by students, with acquisition rates reaching 97.5% and 73.7% respectively.

With regard to students' digital skills, 88.1% said they were able to create and edit Powerpoint presentations, 82.7% were able to send an e-mail with an attached file, 95.1% felt they were able to use social networks and search for information on the Internet, and 93.8% were able to search for and download videos via the Internet.

On the other hand, only 46% of students claimed to be able to post a video on YouTube, and 19.5% have the skill to format a computer.

Answering a question on the place occupied by ICT in their lives, 41.7% of students had considered ICT to be indispensable, 41.5% said ICT was fairly important, 13.7% considered it important and only 3.1% considered ICT to be useless.

However, the results did distinguish between the place of personal and pedagogical use among students. Thus, figure 2 shows that the majority of students (54.8%) set aside more than 3 hours a day to use ICT for personal purposes (average = 3.3 hours a day); whereas, only 22.6% set aside such a length of time per day for educational purposes (average = 1.5 hours a day).

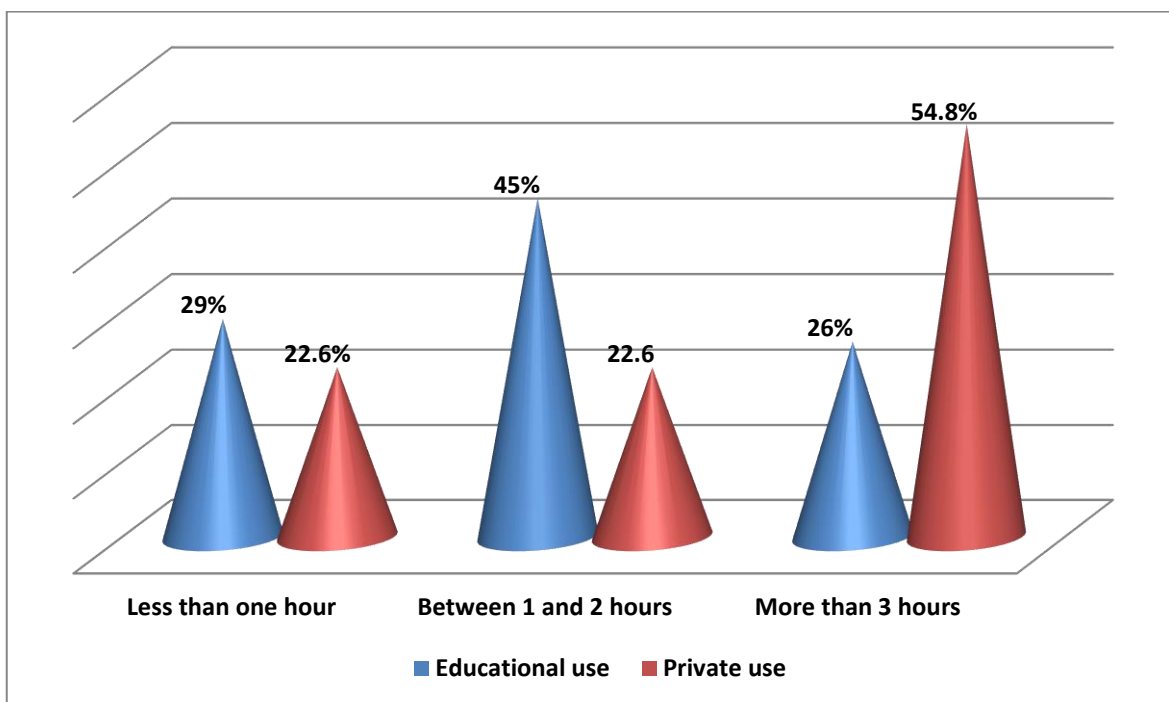


Fig.2: Average daily duration of ICT use by type of use among students

Personal use was dominated by participation in social networks (average = 43 minutes per day), chatting (average = 37 minutes per day), consulting the internet and watching videos (average = 26 minutes per day).

For educational purposes, student activities were limited to preparation of presentations, course revision and documentary research. On average, students set aside 26 minutes per day for preparing presentations, 25 minutes for reviewing lessons and 20 minutes for literature research.

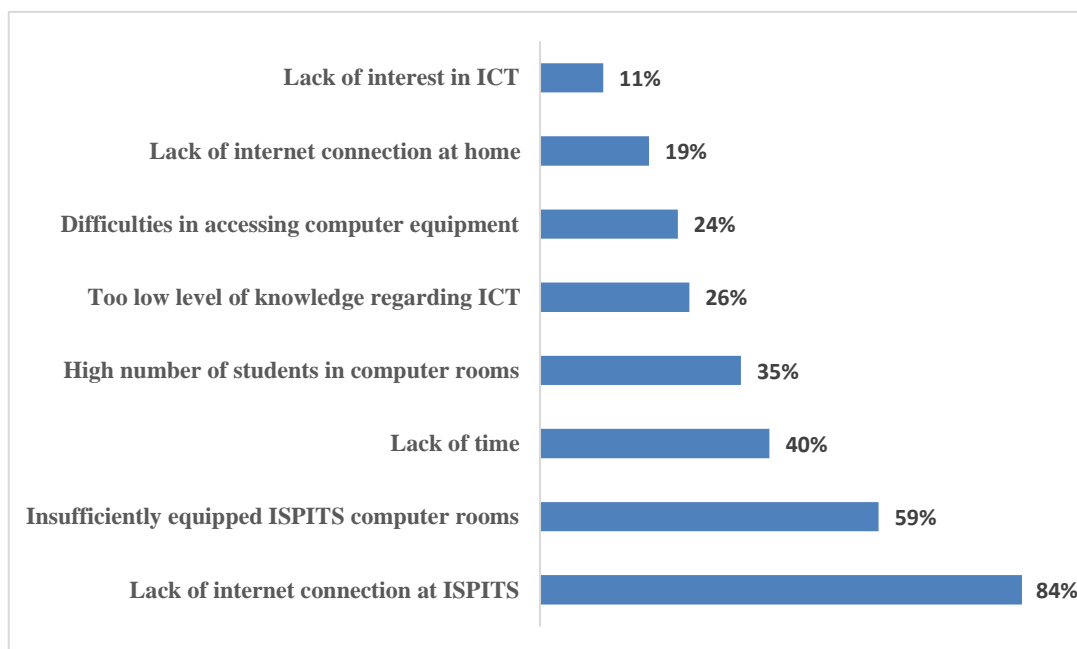
On the other hand, the use of ICT to communicate with teachers was only declared by 36% of students. On the other hand, 40% of students used ICT every day to communicate with their colleagues for training purposes. Table I presents a distribution of students according to the frequency of use of ICT to communicate with teachers and colleagues outside the classroom for training purposes.

Table I: Use of ICT by students outside the classroom for training purposes

Frequency of use of ICT	To communicate with peers		To communicate with teachers	
	Workforce	%	Workforce	%
Never	74	14	192	37
Every day	207	40	13	3
1 to 2 times a week	195	38	169	33
Rarely	37	8	139	27

∅ : Proportion

Figure 3 presents the factors hindering the use of ICT for training purposes as declared by the students. The majority of them considered the lack of internet connection and sufficiently equipped computer rooms at ISPITS as the main factors influencing the use of ICT in their training.

**Fig.3:** Students' perceptions of the factors influencing the integration of ICT into their education

In analyzing the association between the pedagogical use of ICT and students' perceptions of the factors hindering this use, we found an association ($\chi^2=9.52$; $p<0.05$) between the lack of home internet and the use of ICT for training purposes. There was also an association with ICT knowledge ($\chi^2=10.63$; $p<0.05$). However, no other associations with other factors were statistically significant.

Comparisons of the main variables in the two study populations

Comparing the main results obtained (Table 2), we found broad access to different types of technological equipment among the two populations studied. Similarly, the use of these tools did not differ between teachers and students: both groups made little use of them to communicate with each other, and reserved almost the same amount of time for personal and pedagogical use.

In terms of digital skills, the majority of teachers and students only mastered Power Point presentation software. In terms of social networking, students (95.1%) were more proficient than teachers (75%).

Finally, almost all teachers and students shared the same positive perception of the place of ICTs in the training of nurses and health technicians, despite the factors hindering their pedagogical integration at ISPITS (table II).

Table II: Comparison of the main variables in the two study populations

Variables		Teachers	Students
Technological equipment and Internet access	Home Internet access (%)	100	81
	Computer ownership (%)	100	73.7
	Smartphone ownership (%)	95	97.5
Training and use of ICT	Average duration of personal use of ICT(hour/day)	3.1	3.3
	Average duration of pedagogical use of ICT(hour/day)	1.5	1.5
	Training in pedagogical use of ICT (%)	33	0
	Regular use of ICT for pedagogical communication (%)	41	36
Digital skills	Ability to format a computer (%)	18	1.5
	Power point editing capabilities (%)	90	88.1
	Ability to use the main social networks (Facebook, Twitter, etc.) (%)	75	95.1
	You tube publishing capability (%)	41	46
Factors influencing the pedagogical use of ICT	Negative impact of the lack of Internet access at ISPITS on the pedagogical integration of ICT (%)	54	84
	Negative impact of the lack of computer equipment at ISPITS on the pedagogical integration of ICT (%)	35	59
	Negative impact of level of ICT training on the pedagogical integration of ICT (%)	28	26
	Positive perception of the place of ICT in the training of nurses and health technicians (%)	100	96.9

% : Proportion

Discussion

The aim of this study was to present a diagnosis of the reality of the pedagogical integration of ICTs in nursing training in Morocco, and also to identify the barriers and facilitators to the use of these tools by teachers and students.

Our results showed that personal use of ICT was regular and diversified among teachers. In terms of pedagogical use, teachers only used ICT in the classroom as a teaching enrichment tool or as a support for lectures, using videos and PowerPoint presentations developed by themselves or by students. Outside the classroom, ICTs are little used: teachers use them to prepare lessons and occasionally to communicate with students via non-institutional means such as social networks. The pedagogical integration of ICT at the ISPITS in Marrakech and its annexes is still in its infancy, and has not yet gone beyond the exploratory stage. The same observation was made by Regragui and colleagues [7] in a study carried out at ISPITS Tétouan in 2015. This situation at training establishments for nurses and health technicians is no different from that in the Moroccan education system, where several studies [11-13] have shown that the use of ICT is still very limited, or even absent from the practice of many teachers.

Students confirmed the finding that personal use predominates over use for training purposes. Digital practices were dominated by participation in social networks, chat, Internet consultation and video viewing. Pedagogical use was generally limited to documentary research to prepare presentations. These results corroborate those of Ed-dane [14], who found that the digital practices of Moroccan students are organized in the form of profane, playful and communicative digital practices for recreational purposes, such as music and communication via social networks. In the same vein, Maaroufi [15] concluded that the pedagogical exploitation of ICT among university students is limited to documentary research, while remote communication and interactivity remain limited between teacher and student.

On the other hand, and although their level of personal equipment in digital tools and home internet connection is good (100% among teachers and more than 71% among students), teachers as well as students did not have internet access at the ISPITS level and felt that the material available to them both in classrooms and in computer rooms was unsatisfactory. In this sense, Heer and his collaborators [16] concluded that if educational actors

(teachers and students) do not have easy access to adequate equipment, it is likely that they will be less likely to make the effort to use ICT for educational purposes. In addition, Regragui et al. [7] found that the existence of classrooms not equipped with digital equipment is one of the main reasons for limiting the pedagogical use of ICT in the training of health nurses and technicians. In the same vein, Bibeau [17] pointed out that providing training actors with the necessary infrastructure is a necessary condition for any successful implementation of ICT.

For digital skills, our results showed that the majority of teachers did not have the skills necessary for pedagogical integration of ICT as described in the UNESCO reference framework [18] on ICT skills for teachers. In fact, several studies around the world have concluded that a lack of technical knowledge and skills is a major obstacle to the use of these technologies in education [19-21].

It also appears from this study that students' digital skills focus on office software and the use of social networks. These results corroborate the findings of other studies conducted in higher education institutions which showed that more than 80% of university students only master software belonging to a Word office suite, Power Point and Adobe Reader [4,22]

Several studies have pointed out that effective integration of ICT for educational purposes cannot be achieved without training. The results of our survey showed that there was an increased lack of training in the pedagogical integration of ICT, both initial and continuing, among teachers [19,23,24]. These results go in the same direction as those highlighted by, Regragui and collaborators or the lack of training among teachers was classified as a factor hindering the pedagogical integration of ICT in the training of nurses and health technicians at ISPITS in Tétouan [7].

As for teachers' attitudes towards ICT, Karsenti and Gauthier [9] point out that teachers' attitudes towards the use of ICT are among the internal factors influencing the pedagogical use of ICT. Our study found that despite the lack of infrastructure and training, the majority of teachers used ICT permanently in their classroom practices. This use of ICT was justified, according to the teachers, by the added value of these tools on their work and on the learning teaching process. In this sense, 80% of teachers said that ICT is essential to the practice of their profession. This positive attitude of teachers towards ICT contradicts the results of Kaddouri and collaborators [25] where the majority of teachers interviewed in a university context, are in a situation of use of ICT as a principle and justify their attitude by the fact that the use of ICT would undermine the identity and status of the teacher, and the school as a place of production and transmission of knowledge. Similarly, Mastafi and Mabroul [26] concluded that the lack of conviction of Moroccan teachers regarding the contribution of ICT in the teaching process-learning, teachers' attachment to traditional teaching methods and resistance to the adoption of new ICT-based methods in teaching practice are important factors in the success of ICT integration in the classroom. On the other hand, our results are similar to those of Regragui et al. [7] who found a clear willingness of the teachers interviewed, at ISPITS in Tetouan, for an effective use of ICT in their teaching practices.

Similarly, our results revealed a positive attitude of students towards ICT. Almost all felt that these tools were essential or quite important to their lives. These results corroborate those of Maaroufi [27] who showed that the use of ICT is an integral part of the culture of students in higher education institutions in the Moroccan context. Similarly, Kaddouri and collaborator [25] found that the non-use of ICT among university students is not due to a negative attitude towards the use of ICT, but because of the inaccessibility of technological tools and the lack of adequate support to appropriate the signs specific to ICTs, and make these tools vectors of access to knowledge and knowledge construction.

With regard to institutional support, 46% of the teachers interviewed confirmed that the support of officials in institutes for the use of ICT for teaching and learning purposes was poor and, only 47% considered the vision in the institute for the use of ICT to be good. In this sense, Tardif [28] cite certain necessary conditions for ICTs to contribute to the enrichment and diversification of teaching practices, including the organisational approaches and regular support that school leaders must provide to teachers who include ICTs in their classroom. Indeed, Kaddouri et al. [25] reported in their study that most teachers who find themselves in a situation of use of ICT in the classroom justified their attitude by institutional reasons such as the problem of bureaucracy and governance problems that characterize higher education institutions in Morocco, and also the lack of a clear political will to make ICTs a lever for reform and democratic access to knowledge.

Conclusion

ICTs occupy an increasingly important place in Moroccan society in general and in the education system in particular. At the end of this study, which aimed to study the integration of these tools in the training of health nurses and technicians, we can say that a diagnosis of the use of ICT among ISPITS teachers and students in the Marrakech Safi region has been made and the main factors hindering or facilitating this use have been identified.

In the perspective of an exemplary pedagogical integration of ICT at the ISPITS level, we consider that the leaders at the ISPITS level are called to adopt a clear vision and shared with all actors of training in the use of ICT. In this sense, it would be essential to draw up, at the level of each institute, an action plan which describes the actions to be undertaken to achieve an exemplary pedagogical integration of ICT in the training of health nurses and technicians, and also set up a system for monitoring and evaluating the various actions undertaken. Teachers should be fully involved at all stages of the ICT integration process. Also, incentives, motivation and encouragement for teachers who decide to integrate ICT into their teaching practices should be provided.

We also believe that the development of technological infrastructures at the institute level is necessary. Classrooms and computer rooms should be equipped with technological devices, certainly, but also by an internet connection to ensure access to networks and learning resources especially for students with difficulties in accessing equipment and internet connection at home such as students of rural origin and who are remote of their homes.

Similarly, the creation of educational platforms is seen as a necessity to facilitate exchange and interactivity outside the classroom between students and teachers on the one hand and between students themselves on the other. These platforms would undoubtedly make it possible to substitute the use of the non-institutional means of communication currently used by the various training actors, but they would constitute, also a step towards the initiation of distance education at the level of institutes.

Conflicts Of Interest

The authors declare no conflicts of interest.

References

- [1] Agence Nationale de Réglementation des Télécommunications. Usages des TIC par les ménages et par les individus année 2017 synthèse des résultats 2018. [En ligne]: <https://www.anrt.ma/sites/default/files/publications/enquete-tic-2017.pdf> consulté le 25 Février 2019.
- [2] Nafidi Y, Alami A, Zaki M, El Batri B, Hassani ME, Afkar H. L'intégration Des TIC Dans L'enseignement Des Sciences De La Vie Et De La Terre Au Maroc: Etat Des Lieux Et Défis A Relever. *European Scientific Journal*. 2018;14(1):97-121.
- [3] Collaud, G., Gurtner, J.-L. & Coen, P.-F. Design and use of hypermedia at the university level. *Journal of Computer Assisted Learning*. 2000;16 : 136-147.
- [4] Peraya D, Viens J, Karsenti T. Introduction : Formation des enseignants à l'intégration pédagogique des TIC: Esquisse historique des fondements, des recherches et des pratiques. *Revue des sciences de l'éducation*. 2002;28(2):243-64.
- [5] Ministère de l'éducation nationale Maroc. la vision stratégique pour la réforme de l'école (2015-2030) [Internet]. [cité 15 mars 2019]. [En ligne]: <http://www.men.gov.ma/> consulté le 11 Février 2019.
- [6] Ministère de la santé Maroc. Règlement Intérieur des Instituts Supérieurs des Professions Infirmières et des Techniques de Santé (ISPITS) 2015. [En ligne] <http://ispits.sante.gov.ma/Texts%20Reglementaires/Projet%20final%20> consulté le 11 mars 2019.
- [7] Reguragui S, Raghay K, Janati-Idrissi R. Intégration des TIC dans les pratiques professionnelles et pédagogiques des enseignants : Cas de l'Institut Supérieur des Professions Infirmières et Techniques de Santé de Tétouan. *International Journal of Innovation and Applied Studies*. 2017;21(2):344-351.
- [8] Raby C. Analyse du cheminement qui a mené des enseignants du primaire à développer une utilisation exemplaire des technologies de l'information et de la communication en classe. (Thèse de doctorat) Université du Québec à Montréal. 2004,459p. 9.
- [9] Karsenti T, Gauthier C. Les TIC bouleversent-elles le travail des enseignants? *Formation et Profession*. 2006;12(3):2-4.
- [10] Mastafi M. Intégrer les TIC dans l'enseignement : Quelles compétences pour les enseignants ? *Revue scientifique internationale en éducation, Centre de recherche interuniversitaire sur la formation et la profession enseignante*. 2015 ; 23(2):29-47.
- [11] Riyami B. Analyse des effets des TIC sur l'enseignement supérieur au Maroc dans un contexte de formation en collaboration avec une université française. Université de Bretagne Sud; 2018.
- [12] Mastaphi M. Intégration et usages des TIC dans le système éducatif marocain : attitudes des enseignants de l'enseignement primaire et secondaire. *Adjectifs Analyses Recherches sur les Tice*. 2013;11(1):175-204.

[Tapez ici]

- [13] El Ouidadi O, Lakdim A, Khadija E. Principaux facteurs influençant les usages des TIC chez des enseignants marocains. *frantice.net*. 2013;(6):37-52.
- [14] Ed-dane Y. L'intégration des TIC en contexte scolaire marocain : facteurs qui ont des répercussions sur l'accès au savoir et l'appropriation des TIC par les élèves de la ville de Zagora- Maroc Cas de deux lycées à Zagora. In: Colloque TICE Ouarzazate 2016. Ouarzazate; 2016. p. 267-84.
- [15] Maaroufi F. Usages des TIC dans l'apprentissage dans un établissement d'enseignement supérieur marocain. 2018,100p. ligne]: <http://www.c2i.education.fr/spip.php?article87> consulté le 22 mars 2019.
- [16] Heer S, Akkari A. Intégration des TIC par les enseignants : premiers résultats d'une enquête suisse. *Revue internationale des technologies en pédagogie universitaire*. 2006;3(3):38-49.
- [17] Bibeau R. Les TIC à l'école : proposition de taxonomie et analyse des obstacles à leur intégration. *EpiNet : la revue électronique de l'EPI* 2005; [En ligne]: <http://www.epi.asso.fr/revue/articles/a0511a.htm> consulté le 12 avril 2019.
- [18] UNESCO. TIC : un référentiel de compétences pour les enseignants. 2011; [En ligne]: <http://unesdoc.unesco.org/images/0021/002169/216910f.pdf> consulté le 10 mars 2019.
- [19] Leggett WP, Persichitte KA. Blood, sweat, and TEARS : 50 years of technology implementation obstacles. *TechTrends*. 1998;43(3):33-36.
- [20] Maaroufi F. Usages des TIC dans l'apprentissage dans un établissement d'enseignement supérieur marocain. 2018,100p.
- [21] Bibeau R. Les TIC à l'école : proposition de taxonomie et analyse des obstacles à leur intégration. *EpiNet : la revue électronique de l'EPI* 2005; [En ligne]: <http://www.epi.asso.fr/revue/articles/a0511a.htm> consulté le 12 avril 2019.
- [22] Ed-dane Y. L'intégration des TIC en contexte scolaire marocain : facteurs qui ont des répercussions sur l'accès au savoir et l'appropriation des TIC par les élèves de la ville de Zagora- Maroc Cas de deux lycées à Zagora. In: Colloque TICE Ouarzazate 2016. Ouarzazate; 2016. p. 267-84.
- [23] Pelgrum W-J, Law N. Les TIC et l'éducation dans le monde, tendances, enjeux et perspectives. Paris UNESCO; 2004. (International Institute for Educational Planning).
- [24] BECTA - British Educational Communications and Technology Agency. review of the research literature on barriers to the uptake of ICT by teachers . BECTA, ICT Research 2004. [En ligne]: http://dera.ioe.ac.uk/1603/1/becta_2004_barrierstouptake_litrev.pdf consulté le 1 avr 2019.
- [25] Kaddouri M, Bouamri A, Azzimani T. Le non-usage des TIC en contexte universitaire : Entre signes, sujets et sens. *Recherches Éducatives*. 2012;(6):71-88. [En ligne]: <http://journals.openedition.org/rechercheseducations/1041> consulté le 5 mars 2019.
- [26] Mastafi M, Mabrou A. Les TIC pour l'enseignement/apprentissage: perception des enseignants de l'enseignement primaire et secondaire;2019. [En ligne]: <https://hal-amu.archives-ouvertes.fr/hal-02048892> consulté le 3 mai 2019.
- [27] Maaroufi F. Usages des TIC dans l'apprentissage dans un établissement d'enseignement supérieur marocain. 2018,100p.
- [28] Tardif J. Une condition incontournable aux promesses des NTIC en apprentissage : une pédagogie rigoureuse : Actes de la Conférence d'ouverture au colloque de l'AQUOPS, Printemps de l'Éducation 1996.