



*ICT usages by primary school French language teachers in Tunisia: user profiles and associated factors*

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**Abstract ;**

Nowadays, we can notice that the integration of digital technology in the professional practices of teachers is becoming more and more widespread in the Tunisian education system. Nevertheless, there is a significant gap between the uses announced by decision makers and the uses observed among Tunisian teachers. Our study aims to closely analyze the professional uses of ICT by primary school teachers in Tunisia while trying to assess the various factors associated with this use to understand the causes of these differences. Initial theoretical work was necessary to define the concept of usage and present the various factors associated with it in the scientific literature. Then, we conducted a quantitative study with 350 French Language teachers in the primary cycle in Tunisia. The results revealed a weak ICT integration correlated to a set of personal and institutional factors. However, these correlations, by themselves, are not significant enough to explain these low uses. This allows us to explore new approaches in relation to the social dimension of the concept of usage, which considers the teacher as an active social actor who constructs his or her uses in interaction with other actors, hence the importance of considering collective dynamics in the construction of teachers' professional uses of ICT.

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## 1. Introduction

Since the first attempts to introduce computers into school systems in the early 1980s, educational policy makers have shown great concern and curiosity about the issue of ICT integration into education. This concern has been further emphasized by the wave of massive spread of education that most countries have witnessed, and in which traditional educational systems have been confronted with new demands and requirements (Cottier & Burban, 2016).

In fact, looking at the new means of communication, message presentation and the different levels of interactivity that ICT offers (Mayer, 2009), political actors have placed great hopes in order, not only to make education more effective, but also in order not to lose the technology race.

However, even if this is well-intentioned and the policies and structures for the generalization of ICT integration are carefully designed, very often the planners do not take into account the actors' reactions at the different levels of the educational system. Indeed, these new provisions will necessarily shake up an already established organizational order and they will necessarily modify the daily activity and change the nature of the professional relationships between the different actors of the education system, which will be "difficult to foresee and to control" (Legrand & France, 1983).

In this perspective, teachers are considered as the main actors at the heart of these

actions, but they are not involved in the different stages of their conception and implementation and are considered as simple executing agents. It often turns out that they are not sufficiently prepared for the new tasks that are expected of them or that they are not well informed of the difficulties they will encounter, whereas it would be more judicious to obtain their adhesion (Tondeur et al., 2008) (Ronau et al., 2012).

It would then be more judicious to closely analyze their ICT professional practices by proposing a typology of teachers according to their uses and to evaluate the various factors associated with these uses.

Our research aims to answer different questions concerning the use of ICT in the professional practices of primary school teachers and to explain these usages.

## 2. Theoretical background

### 2.1 The concept of "usage"

Pierre Chambat writes: "*usage is not a natural object but a social construct*" (Chambat, 1994, p. 253). Despite the complexity of the notion of usage, it always refers, according to the same author, to a *continuum* of definitions which ranges from simple use or adoption to *appropriation* and this is true whatever the theoretical framework mobilized. (Chambat, 1994, p. 249)

The notion of usage is polysemous, but we can note the existence of standard sociological definitions of this notion. "*The usage*" designates "*the particular uses that an individual or a group can make of a*

*product, an instrument, an object. (...) it is a question here of highlighting the social uses, their subtlety, the complex cultural meanings of these behaviors of the daily life.*" (Akoun & Ansart, 1999)

Two main meanings can be identified: (1) The first is that of *"the social practice that long-standing or frequency makes normal in a given culture"*: this meaning gives a general dimension of usage which is not always linked to a technical object and a dimension of *"trivialization"* by insisting on the qualifier *"natural"*; (2) the second meaning, which is used within the framework of the study of the usages of ICT, refers to the uses of technical objects in relation to the culture of individuals in their daily lives. (Breton & Proulx, 2016, p. 268-269)

In the educational context, usage is considered by Lacroix, Miege, Moeglin, Paji and Tremblay as *"long-term uses of stabilized educational and social practices"* (Lacroix et al., 1993, p. 101). Moeglin adds: *"The criterion of stability makes it possible, in fact, to distinguish usage and utilization. These are occasional or intermittent. The usage result from the transformations that, collectively more often than individually, they impose on the frameworks fixed by the offer and the policies"* (Moeglin, 2005, p. 160)

According to these authors, we can therefore, consider the use of educational technologies by teachers from a first temporal axis, which allows us to know whether the use is in daily life or not, and from a second, more functional and effective axis, which allows us to situate the use according to the different tasks of the

teacher outside or inside the classroom, as well as his or her different ways of negotiating the school prescriptions and constraints. These two dimensions must finally be crossed with the teacher's non-professional uses of ICT.

Proponents of the *technology appropriation approach* assumes that the different logics of users are constructed on two distinct levels: Personal and Social. Appropriation thus, calls for processes bringing into play both the personal identity of the user — the affirmation of his singularity, more individualization for the purposes of personal fulfillment — and his social identity — the affirmation of his belonging to a specific social group. Research has shown that the individual appropriation of a technical device is closely linked to its collective appropriation by a given social group. This social group seeks, through this appropriation, to increase its autonomy and its capacity to act in relation to other groups or social categories. This strong relationship is justified by the fact that the balance of power between producers and consumers can only resist the domination of the former if, by constructing a political representation, the collective acts to further develop the individual uses of its members (Bouchard, Doray, & Prud'homme, 2015, p. 26).

The interest of this theoretical approach lies in the fact that beyond this notion of practice, appropriation is presented with other sociological dimensions, namely the meaning assigned to technical objects by users, their insertion into their daily life, new cultural attributions of technology articulated with those of users, hence the concept of domestication developed by

Roger Silverstone (Søraa et al., 2021). This concept offers a framework for analyzing the use of technologies by providing a typology of uses and a set of conditions for describing the appropriation of technical objects by users on a graduated scale and not in a dichotomous manner. (Bouchard et al., 2015, p. 24).

## **2.2 Factors associated with the teacher's ICT professional uses.**

Many studies have focused on the factors that facilitate or prevent the integration of digital technology in the classroom by teachers. These factors concern three levels, namely: (1) The macro system, (2) The meso system and (3) The microsystem (Association for the Development of Education in Africa (ADEA) & ICT Task Force, 2014)(Ramírez-Rueda et al., 2021)(Gil-Flores et al., 2017)In this study, we will focus on the teacher level, "micro system", and the school level, "meso system".

### **2.2.1. Factors related to the micro system.**

Looking at the demographic characteristics of teachers, research have shown that there is a relationship between these characteristics and the use of ICT: Age, gender, professional experience (Søraa et al., 2021)(Tondeur et al., 2008)and academic field of study(Akbulut, 2009). Use seems to be more significant for male and relatively young teachers (Scherer et al., 2015)and the higher the level taught ,the more frequent the use (Van Braak, 2001).

Nevertheless, the effect of these variables remains insignificant and just statistically significant for the case of age (Scherer et al., 2015)and in the case of gender (Van Braak, 2001). Other research go over the relationship between teacher motivation and competence (Ertmer et al., 2006)(Yeh et al., 2021)(Foulger et al., 2022), their attitudes towards ICT (Bas, 2016), their concerns about the consequences of ICT use on health education(Akbulut, 2009)and their self-efficacy in the use of ICT (Kreijns et al., 2013)(Rohatgi et al., 2016). In addition, other research have shown that usage can be influenced by the subjects taught (Cottier & Burban, 2016, p. 81-96)and innovative teaching practices (Hennessy et al., 2007). Finally, ICT literacy is considered by several studies to be the most important teacher-level factor that can further promote their use of educational technology in the classroom (Maddux, 2009).Therefore, professional development in ICT is an important factor for increasing their use (Paquay et al., 2001). Many researchers report that ICT policies based on in-service training of teachers on the technological and pedagogical use of ICT yield a high educational technology penetration in schools (OCDE, 2012, 2019).

### **2.2.2. Factors related to the mesosystem.**

The scientific literature concerning this factor reports a set of indicators in order to evaluate it, namely: (1) The quantity and quality of materials, (2) Internet



access, (3) Technical and administrative assistance, (4) The development of digital educational resources and their language, cultural and didactic adequacy, etc. (The European Commission, 2019)

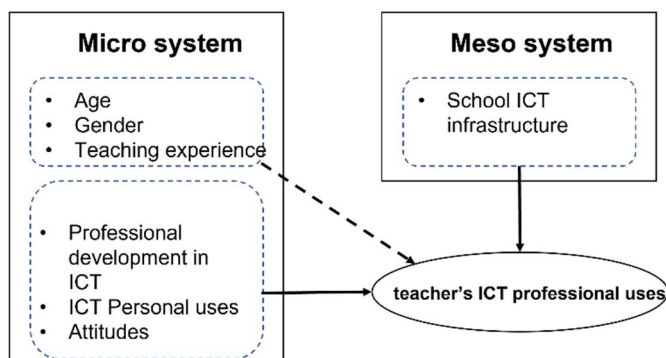
In this field, the results have shown that it is the developed countries that invest the most in the establishment of these infrastructures as well as in their maintenance and development. The other countries try with their resources to acquire these infrastructures but the maintenance and the supervision of this installation is practically inexistent (Pelgrum & Law, 2003).

### 2.3 Research Framework

As far as our study is concerned, we will adopt the framework of Javier Gil-Flores (Gil-Flores et al., 2017) which shows that the use of ICT in the classroom depends on the characteristics of teachers and school.

We have added the variable of personal technology uses as a potential factor that could influence the teacher's professional uses of ICT. The final model is shown in the following figure:

**Figure 1. Framework for analyzing the teacher's ICT professional uses.**

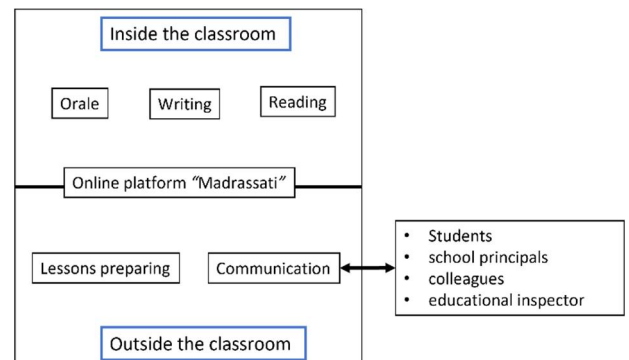


The broken line in this model indicates the control variables while the solid lines show the relationships studied in our study.

The usage definition that we have retained obliges us to differentiate the analysis of uses according to the categories of primary school teachers in Tunisia (French, Arabic, mathematics, scientific awareness, English). Indeed, each discipline has unique characteristics that we must consider in our analysis. We have chosen, for reasons of feasibility, to focus only on French language teachers.

The following diagram presents the different professional tasks of Tunisian primary French teachers.

**Fig. 2. Professional tasks of Tunisia primary French teacher**



### 3. Research questions and hypotheses

#### 3.1. Research questions

In Tunisia, as in most countries, ICT is increasingly becoming part of the education system as a new vector of pedagogical and administrative efficiency. Political actions in this area are multiplied and diversified in order to

generalize its use, especially among teachers. On the other hand, a first diagnosis reveals that the integration of these technologies is not de facto. Indeed, most studies have shown that digital technology is slow to take hold in schools and that there is a significant gap between what decision-makers announce and what is really happening in classrooms and schools. This gap is certainly a general fact, but it is polymorphous(OECD, 2015)(Association for the Development of Education in Africa (ADEA) & ICT Task Force, 2014). In each context, the gap is different and specific. Analyzing and understanding this gap requires diversified methods and tools.

Indeed, to address the question of the use of digital technology by teachers, we were interested in the sociology of usages which offers a large corpus of studies on the use of technological objects. Originally, this field proposed two opposing deterministic visions: technical determinism and social determinism. But these two visions reduce the uses to predefined constructions as we mentioned above. To circumvent this double determinism, several studies have put forward what Josiane Jouet calls "*the double mediation of the technical and the social*" (Jouët, 1993). This approach emphasizes what individuals do with technical objects: the study of usages. Usage was considered as a creative and inventive practice that is part of the daily life of users rehabilitated with a role of active actors (Jauréguiberry, 2003a). It is

through this conception of usage that we will analyze the ICT professional practices among primary school teachers in Tunisia and attempt to draw up a typology of teacher profiles according to their digital usage.

In addition to the analysis of ICT teacher's uses, we want through this study to identify the factors associated with them. The literature identifies several factors at different levels (Pelgrum & Law, 2003). The most highlighted factors are those of professional development, school ICT infrastructure and perceptions and attitudes towards technology(Gil-Flores et al., 2017). We were able to observe that the variables of age, gender and teaching experience do not significantly explain the infusion of technology into the classroom. This can be explained by the fact that ICT, as a social fact, is increasingly used outside of school, regardless of the age and gender of the teachers. Therefore, and in line with the sociological approach adopted in this research, the personal teacher's ICT use is selected in addition to other factors. Specifically, our research questions are as follows:

- How do French primary school teachers in Tunisia use technology in their professional practices?
- What are the factors associated with the use of ICT in the classroom by French primary school teachers in Tunisia?

### 3.2 Hypotheses

Our research hypothesis is as follows:

H1: The professional ICT use by primary school French teachers in Tunisia is low and varies according to factors related to the teacher level (professional development in ICT, ICT Personal uses and attitudes toward technology) and factors related to the school level (school ICT infrastructure).

## 4. Methodology

We conducted a quantitative study using a questionnaire. It aims to provide a comprehensive description of the way in which teachers use technology, both professionally and personally, and of the different contextual factors associated with this use (socio-demographic, political and psychological data) according to the proposed analytical framework.

### 4.1 Population

Our population is all the French primary school teachers in public schools in Tunisia.

The number of primary school teachers in Tunisia is 62,700. French teachers represent almost 40% of this workforce, namely 25,080. The following table describes the population of teachers in relation to two demographic properties:

**Table 1. Number of primary school teachers in Tunisia**

	Total	of which women
Rural area	21666 (34.5%)	9949 (45.91%)
Urban area	41034 (65.5%)	28,111 (68.5%)
Urban area + Rural area	62700	38060 (60.70%)

### 4.2 Participants

For our population size of 25,080 teachers, a confidence level of 95% and a margin of error of 5%, our representative sample size will be 350 participants. For feasibility constraints, we adopted the quota-based sampling technique which is a non-probability method.

We defined, as quota criteria, the following variables: (1) gender of the respondents and (2) the geographical areas of the primary schools. Below is the quota table:

**Table 3. Quota-based sampling: gender and geographic location.**

	Total	of which women
Rural area	131(34%)	98 (75%)
Urban area	249(66%)	199(80%)
Urban area + Rural area	380 (100%)	297(78%)

### 4.3 Data collection instrument

We will use a questionnaire with 5 dimensions, 32 questions and 135 items. The following table presents the structure of the Survey:

**Table 2. Structure of the questionnaire**

Dimensions	Questions	Items
D1 - Personal ICT uses	2	11
D2 - Professional ICT uses	14	70
D3 – Professional development in ICT	4	17
D4 – Attitudes and overall satisfaction	3	28
D5 -General data	9	9

we used the SPSS software in its 25 version to analyse the participants' responses. After data entry was complete, we proceeded to handle missing and outlier values by performing flat sorting of all items and adopting the Linear Trend of Point method to handle missing values. Finally, we retained 350 responses.

Once the preliminary processing was completed, we proceeded to verify the statistical validity of the questionnaire globally and by dimension. We used for this the reliability analysis with the Alpha model (Cronbach)

**Table 4. Measure of statistical reliability of the questionnaire.**

Dimensions	Alpha Cronbach
Personal ICT uses	0.807
Professional ICT uses	0.874
Professional development in ICT	0.734
Attitudes and overall satisfaction	0.796
The four dimensions	0.786

$\alpha_{\text{overall}} = 0.780$ , we can confirm that the quantitative corpus has an excellent statistical reliability.

## 5. Results and discussions

### 5.1 Sample Description

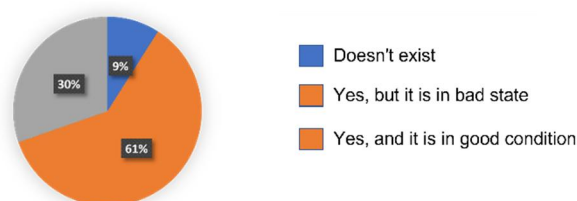
Our final sample includes 350 teachers, including 247 women (70.6%) and 103 men (29.4%), which shows the feminine nature of the profession of primary French teacher. 293 teachers (83.7%) are permanent, while 57 (16.3%) have substitute status. 55% of participants say they work in an urban area and 45% in a rural area.

In terms of the educational level of teachers, two main categories are dominant: (1) the first is that of teachers with a bachelor's or master's degree (46.6%) and (2) the second, that of graduates of teacher training institutes (24%). The remainder varies between those with a bachelor's degree (10%) and a doctorate (0.6%).

### Physical infrastructure of schools

9% of teachers say they do not have computer rooms in their schools. More than 61% admit that the state of the computer rooms is bad, while only 30% think they are in good condition.

**Figure 1 Status of computer classes in primary schools in Tunisia**



The chi-square test between the condition of the computer labs and the school zones (urban or rural) shows that there is a



statistically significant correlation of moderate magnitude between them. Indeed, schools located in rural zones have poorer coverage of computer class than those in urban zones.

**Table 5. Chi-square tests between the state of computer labs and school zone**

	Value	Asymptotic significance (two-sided)
<b>Pearson chi-square</b>	<b>21,193</b>	<b>0.000</b>
<b>Phi</b>	<b>0.237</b>	<b>0.000</b>
<b>V de Cramer</b>	<b>0.168</b>	<b>0.000</b>

In terms of equipment intended for use by pupils in the classrooms, accessibility is poor. More than 66% of teachers say that students in their schools do not have the possibility to use a tablet, 63.7% for Internet access. For access to computers, 43.7% of teachers admit that it is possible in their schools. Admittedly, this is a low percentage compared to the averages of OECD countries (OECD, 2015), but it is better than that of tablets and Internet connection.

Regarding the equipment available to the teacher, there is a great disparity. Video projectors, desktop computers and printers are the three most available equipment according to teachers. While digital cameras, IWBs and tablets are the least available with percentages exceeding 80.3% for the first and 75.1% for the last.

### 5.2 Digital skills and training

47.7% of teachers claim that they do not have a sufficient level in ICT. 34.6% say they have a sufficient level and 17.7% a very sufficient level.

As far as ICT professional development methods are concerned, more than 73% say they self-trained and more than 30% have initial training.

**Table 6. ICT professional development modality (in %)**

Training modality	Yes	Nope
<b>Self-training</b>	<b>73.7</b>	<b>26.3</b>
<b>Thanks to colleagues</b>	<b>24.6</b>	<b>75.4</b>
<b>Thanks to teaching assistants</b>	<b>13.1</b>	<b>86.9</b>
<b>Thanks to the pedagogical inspectors</b>	<b>21.4</b>	<b>78.6</b>
<b>Thanks to the ministry</b>	<b>15.4</b>	<b>84.6</b>
<b>As part of ministry projects (digital school, e-Twinning, etc.)</b>	<b>8.3</b>	<b>91.7</b>
<b>university course</b>	<b>30.3</b>	<b>69.7</b>

Furthermore, we note a great lack of training offered by the ministry (only 15.4% say they have received training from the ministry) or from inspectors and teaching assistants. In addition, the various ministerial projects (eTwinning+, digital schools, etc.) have not provided broad teacher training.

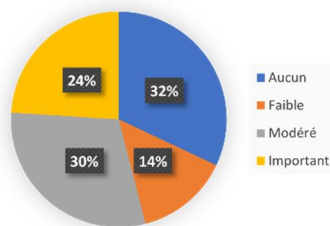
Among the teachers who have taken training in a professional setting, 34.7% say they have not taken any training during the last two years and only 10% say that training lasted more than 6 days.

**Table 7. Duration of professional training in ICT during the last two years**

	0 days	1 to 2 days	3 to 6 days	+ days
<b>Percentage of responses (in %)</b>	<b>34.7</b>	<b>28.7</b>	<b>26.7</b>	<b>10</b>

In addition, 32 % believe that these trainings had no impact on them, while 24% believe that the impact is significant.

**Figure 2. Impact of the institutional ICT training on the level of proficiency of teachers**



We can say that training has no significant effect on teachers' digital skills. This can be verified by comparison of averages using Student T-Test. The test shows a non-significant difference ( $t=-1.225$ ; ns) between teachers who did or did not take digital training. We also noted, by comparing the averages of digital proficiency according to the gender of the respondents, significant differences between men and women in terms of digital proficiency ( $t=3.706$ ;  $p<0.01$ ). On average men are better ICT users than women.

### 5.3 Perception and overall satisfaction

83.4% of teachers think that the use of digital technology in their schools is insufficient, while 7.4% find it sufficiently developed and 9.1% very developed.

**Figure 3. Teacher satisfaction with the use of digital technology in schools**



However, this attitude is not as negative when it comes to teachers' perceptions of digital in general.

For a range of 0 to 48, the average of the perception score variable is equal to 30.25 with a standard deviation of 7.67, which represents a good average, and which shows, despite the disparity of uses, a general trend to have a rather positive attitude towards digital technology. The table below shows the average responses by item.

**Table 7. Descriptive statistics of teachers' feelings about the use of digital technology**

	Mean	Standard deviation	Variance
<b>Conduct a learning sequence</b>	<b>2.62</b>	<b>.806</b>	<b>.650</b>
<b>Intervene in front of the class</b>	<b>2.67</b>	<b>.822</b>	<b>.675</b>
<b>Accompany the student's personal work</b>	<b>2.26</b>	<b>.928</b>	<b>.862</b>
<b>Advance the</b>	<b>2.55</b>	<b>.802</b>	<b>.643</b>

student in their learning			
Make the student more autonomous and take more initiatives	2.57	.856	.733
Make the student more creative	2.60	.869	.756
Communicate with parents	1.88	1.061	1.126
Work and collaborate with colleagues	2.45	.844	.712
Diversify your teaching practices	2.58	.748	.560
Diversify your assessment practices	2.64	.788	.622
Make lessons more attractive	2.77	.754	.568
Min = 0 and Max=4			

#### 5.4 Description of the ICT use by primary school teachers in Tunisia

##### 5.4.1 The personal use of technology by teachers

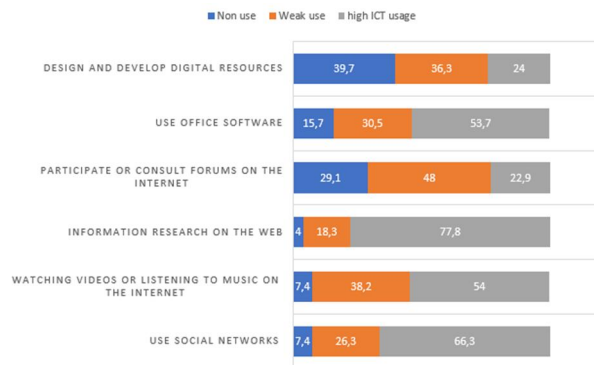
The first aspect is that of the degree of personal devices for teachers. The following table summarizes teachers' responses by percentage.

**Table 8. Teachers' Personal ICT equipment (in %)**

	Nope	Yes, but I don't use it	Yes, and I use it
A computer	58	14.9	26.9
A laptop	19.7	9.7	70.3
A tablet	62.7	12	24.9
Internet access from your home	28.9	2.9	68
A smartphone with internet connection	28.9	4.3	66.3

These findings indicate that the most used devices are laptops (70.3%), home Internet with a coverage of 68% and connected smartphones with a percentage of 66.3%. Tablets are not very widespread, only 24.9% of teachers say they use a tablet at home. Also, we can say that if a teacher has a piece of equipment, he uses it most of the time. The second aspect deals with questioning the mode of use as well as its frequency. The table below and the resulting graph show this usage. If we consider "usage" as a practice that is part of everyday life, we can organize the frequency of use scale according to three categories, namely: (1) *No use* for the answer "never", (2) *Undeveloped usage* for the responses "rarely" and "occasionally" and (3) *Developed usage* for the last two responses "often" and "always".

**Figure 4. Personal use of technology by teachers according to six modalities**



The results of Pearson's correlation analyze show that there is indeed a positive link between the personal ICT use ( $r=0.473$ ,  $p<0.01$ ) and the degree of equipment of teachers. To identify the devices most correlated with this use, we studied the correlations between personal use with each of these devices: The laptop computer and the access to the Internet at home are the most determining devices for seeing the use of technology in personal increase.

**Table 9. Correlations between personal ICT use and personal equipments**

		perso nal laptop	Inter net at home	Smartph one with Internet
Perso nal ICT use	Pearson correlat ion (r)	.355*	.422*	.250**

\*\* . The correlation is significant at the 0.01 level (two-sided).

#### 5.4.2 The teachers professional ICT uses

This variable is divided into six indicators.

##### Course preparation

The textbook and non-digital documents are the media most used by teachers in their preparation for home lessons. 87.2% declare a strong use of the textbook and 75.1% of

non- digital documents. In addition, 48% show extensive use of class files from the CNP<sup>1</sup> which are generally in paper format. We must specify that many teachers declare little effective skillful uses of digital resources, 38.3% for those without modification and 46% for those with modification. 20% say they never use technology to prepare their lessons, which is very significant compared to the actual number of teachers.

The results of the Pearson correlation analyze show the existence of a strong link between the use of digital resources and the personal use of technology and the degree of non-playful equipment (laptop and Internet connection at home), this link is more moderate with the degree of personal equipment in general (including smartphones and tablets). It seems to us from these data that laptops and Internet connection favor the ICT use to prepare lessons more than tablets and smartphones.

**Table 10. Correlational analyzes between the ICT use for lesson preparation and its use in personal (Pearson (r) correlation)**

	Digital resources without modification	Digital resources without modification
<b>Non-playful personal equipment (Laptop + Internet at home)</b>	.490**	.558**

<sup>1</sup> CNP (National Pedagogical Centre) : The center of the Tunisian Ministry of Education in charge of publishing and distributing textbooks, educational tools and digital educational content.



playful personal equipment (Smartphone + Tablet)	.184**	.255**
Personal ICT useS	.513**	.568**
Personal equipment	.348**	.396**

\*\* The correlation is significant at the 0.01 level (two-sided).

In addition, there was a moderate positive relationship between the use of digital educational resources without modifications and the level of the highest diploma ( $r=0.227$ ,  $p<0.01$ ) and a negative correlation with teachers' age ( $r= -0.196$ ,  $p<0.01$ ) and their experiences ( $r= -0.177$ ,  $p<0.01$ ). The correlation with gender or school zone was not significant.

#### *Oral production in class:*

In class, during oral production activities, teachers show a very developed usages of rather traditional teaching aids. 89.7% use traditional didactic tools (illustrations, etc.) daily, 86.8% for comics and 76% for real objects and figurines. The use of digital resources is not developed as well; there are only 38.9% of teachers who claim they make frequent use of digital resources without modifications and 43.7% for digital resources without modification. The correlational analysis of the use of digital resources with modification in oral production shows that there is a positive link with the level of the highest diploma ( $r=0.240$ ,  $p<0.01$ ) and ICT proficiency ( $r=0.417$ ,  $p<0.01$ ). There is also a negative correlation with the age of the teacher ( $r= -0.204$ ,  $p<0.01$ ).

**Table 11. CORRELATIONAL ANALYSES of the use of personal digital resources in oral production (Pearson (r) correlation)**

	Digital assets without modification	Digital resources with modification
Age	-.013ns	-.204**
Professional status	-.147**	.012ns
highest diploma	.083ns	.240**
ICT proficiency	.292**	.417**
School ICT infrastructure	.181**	.161**

\*\* The correlation is significant at the 0.01 level (two-sided).

ns. Not significant

#### *Written production in class:*

During writing activities in class, 80.5% of teachers mainly use the textbook; comics are used by 77.4% of teachers very often. The use of digital resources is not frequent. Only 42.5% declare that they make extensive use of digital resources by modifying them and 32.3% declare use of resources without modification. Only 24.6% use the digital resources frequently offered by the ministry. As in the case of oral production, there is a good number of teachers who have never used digital technology in written production. 23.1% of teachers chose the answer "never" for the use of digital resources by modifying them, while 26% chose it in the case of digital resources without modification. The correlational analysis of the use of digital in oral production shows positive and moderate relationships with the digital

infrastructure of the school and the level of the highest diploma of the teachers. In addition, this analysis shows greater positive correlation between this dimension and the use of digital technology in oral production and reading or the use of digital technology in personal.

**Table 12. Correlational analyzes of the ICT use in written production in class (Pearson (r) correlation)**

	School ICT infrastructure	Level of the highest diploma	ICT proficiency	Personal ICT uses
ICT uses in writing	.264**	.143**	.388**	.525**

\*\* . The correlation is significant at the 0.01 level (two-sided).

The use of technology in written production is not correlated with the age or experience of teachers, nor with their professional status or the number of students per class.

#### *Reading in class:*

During reading activities in class, 93.7% of teachers mainly use the textbook. The use of authentic texts or tales is made by 51.4% of teachers very frequently. The use of digital resources is less developed. There are only 34.6% who say they frequently use digital resources by modifying them and only 24.3% of resources without modification. Only 20.8% frequently use the digital resources offered by the ministry. It should be noted that a large proportion of teachers report occasionally or rarely using ICT during reading activities.

If the use of technology displays a strong positive correlation with the uses of digital

in personal, this link remains positive but weaker with the level of the highest diploma and the infrastructure of the school.

#### *Communication outside the classroom:*

The aim here is to describe the results concerning the means deployed by the teachers to communicate with the pupils, the director of their school, their respective inspectors, and pedagogical assistants. We will present each part independently.

Primary teachers in Tunisia display a low level of communication with students outside the classroom. Moreover, there is a great disparity between the means of communication. ENT<sup>2</sup> Madrassati and e-mail are the least used means: 89.1% say they never use ENT to communicate with students and 84.9% never use e-mail. The two most used means of communication are the telephone (26.9% of teachers report occasional use and 15.2% extensive use of the telephone) and social networks (mainly Facebook, with occasional use by 20% of teachers and a very frequent use for 12.3%).

For communication with principals, the telephone (phone calls and text messages) is the most common mode. 83.4% of teachers state that they communicate with the principal using this technology. Then, 43.7% of teachers say they frequently contact the principal by social networks. The use of ENT Madrassati, as in the case of communication with students, is developed in only 10.2% of teachers. On the other hand, 22.5% of teachers say they frequently use e-mail to contact their

<sup>2</sup> ENT Madrassati: online platform developed by the ministry (digital working environment)

principals, while 32.6% say they never use it for this purpose.

Finally, to communicate with their pedagogical inspectors and assistants, 39.7% of teachers declare a high use of the telephone, 22.9% declare a high use of e-mail and 29.7% declare a frequent use of social networks. On the other hand, more than half of the teachers said they never use email and 45.1% never use social networks to communicate with their pedagogical inspectors and assistants.

#### 5.4.3 Factors that explain teachers' professional use of ICT

To verify the validity of our research framework and verify our hypotheses, we constructed a multiple linear regression model. The dependent variable of the model is the teacher's professional use of digital technology. The independent variables are (1) Professional development in ICT, (2) Attitudes towards ICT, (3) personal ICT use, (4) school ICT infrastructure, (5) age, (6) gender and (7) school zone. We have adopted a standard multiple regression method with a forced entry method after checking all the necessary premises.

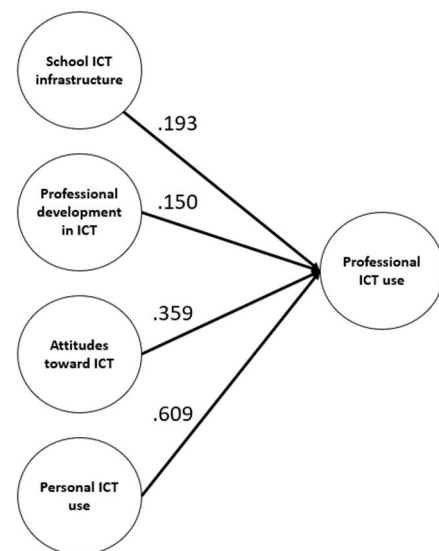
#### Correlations between model variables

The correlations analysis shows that there is a very strong correlation between professional and personal use of technology. This correlation is moderate for the variable attitudes toward ICT. For the variables school ICT infrastructure and Professional development in ICT, the correlations are weaker.

**Table 13. Correlations between the variables of the framework.**

	School ICT infrastructure	Professional development in ICT	Personal ICT use	Attitudes toward ICT
professional ICT use	.193	.150	.609	.359

**Figure 5. Linear Regression Model of research Framework**



#### Analysis of variance

Assessment of the fit of the regression model shows that the data fit our model satisfactorily. The  $R=.649$  value indicates that the model explains a significant proportion of the variance of the professional ICT use variable.

**Figure 6. Assessing the fit of the regression model to the data**

Recapitulatif des modeles<sup>b</sup>

Modèle	R	R-deux	R-deux ajusté	Erreur standard de l'estimation	Modifier les statistiques					Durbin Watson
					Variation de R-deux	Variation de F	ddl1	ddl2	Sig. Variation de F	
1	,649 <sup>a</sup>	,421	,409	14,20142	,421	35,481	7	342	,000	1

a. Prédicteurs : (Constante), Zone de l'école, Score\_formation, Score\_perception, Score équipement école final, Sexe, Score usage numérique, Age  
 b. Variable dépendante : Score usage numérique professionnel

The ANOVA table allows us to reject the null hypothesis  $H_0$ . Indeed, the value  $F=35.481$  is significant at  $p<0.001$  for the dependent variables of the model. Our hypothesis  $H1$  is therefore verified.

**Figure 7. Multiple Regression ANOVA Analysis**

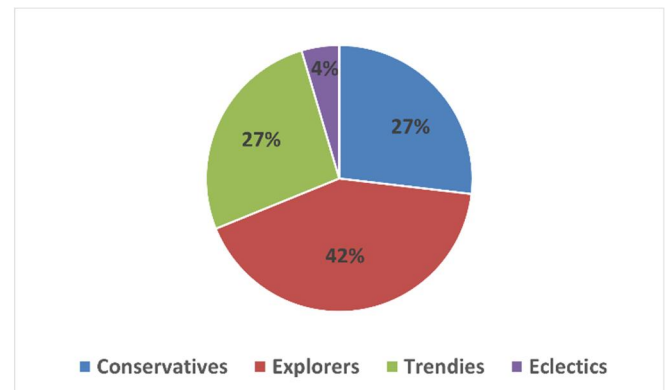
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50090,771	7	7155,824	35,481	,000 <sup>b</sup>
	Residual	68974,717	342	201,680		
	Total	119065,489	349			

a. Predictors : Age, Gender, School zone, ICT professional development, attitudes towards ICT, School ICT infrastructure, Personal ICT uses  
 b. Dependent Variable : ICT professional uses

*Typology of teachers according to their ICT usages*

The analysis of the quantitative results allowed us to show that the factors of our analytical framework predict the professional use of digital technology by teachers. Nevertheless, the only significant correlation is that of the personal use of digital technology. To better understand the uses of teachers, we have chosen to identify teacher profiles according to their personal and professional use of technology. A classification is then carried out in order to try to identify these profiles according to the articulation between personal and professional use of digital technology. We applied a K-Means Cluster method to identify four ICT user profiles.

**Figure 8. Teacher profiles according to their personal and professional use of technology**



**Table 14. The four teacher profiles according to K-Means Cluster method.**

	Number of teachers	Percentage (in %)
<b>Conservatives</b>	<b>94</b>	<b>26.9</b>
<b>Explorers</b>	<b>147</b>	<b>42</b>
<b>Trendies</b>	<b>93</b>	<b>26.6</b>
<b>Eclectics</b>	<b>16</b>	<b>4.6</b>

A first profile contrasts with the others and includes teachers who never or rarely use technology, whether in personal or in a professional context. These represent 27% of all respondents; we called this profile “*the conservatives*”. On average, they declare a lower level of highest diploma than the other profiles ( $M= 2.53$ ;  $E=1.577$ ;  $CV=2.488$ ), this is the only particular characteristic that we can retain.

“*Explorers*” show higher rates of personal and professional uses than eclectics but well below the other two categories. They begin to use technology but still resist despite a



positive perception of ICT. They represent the largest group (42%). The choice of the term explorer emanates from the fact that in our study, it is about teachers who are beginning to use educational technology in a moderate way and who are slow to fully adhere to the institutional prescriptions: they are people who show averages of personal ICT use well above that of the Conservatives (14.2 against 8.1) but the difference with the other categories does not exceed 3 points. Similarly, for classroom use, these teachers have averages that are not significantly below the other two categories. The most significant difference concerns the use of the ENT Madrassati, which can be, contrary to the other contexts, considered as a institutional prescription. They show scores that are too low (3.61 against 23.38 for the fourth category). This group does not have any specific socio-demographic properties.

The third category “trendies” brings together teachers who declare developed personal uses of technology and in the professional context, but their usages include disparities linked to contexts. They show higher standard deviations and variances than the last group. They have a developed use in general, but they vary their uses according to specific contexts. They show a great disparity in the use of the ENT Madrassati with a mean of 9.09, a standard deviation of 7.55 and a variance of 60.01. This average is very low compared to the last category (23.38). They represent 27% of the total sample.

Finally, the "eclectic" group includes teachers who declare highly developed ICT uses in all personal and professional

contexts, for entertainment, educational or administrative purposes. They use all that ICT can offer, both in their personal and professional activities. They are autonomous and do not object to institutional prescriptions regarding digital technology. The average use of the ENT Madrassati is 23.38 with a standard deviation of 7.55. They are relatively more experienced than the other groups and they have a tenured position. They represent only 4% of all teachers.

**Table 15. Use of digital technology according to identified profiles.**

Profiles	Properties	Personal ICT use	ICT Professional use
Eclectics	Mean	19.81	81.68
	Standard deviation	4.07	11.27
	Variance	16.56	127,163
	Minimum	8.00	69
	Maximum	24.00	107
Trendies	Mean	17.38	53.91
	Standard deviation	4.45	7.20
	Variance	19.80	51,949
	Minimum	0.00	43
	Maximum	24.00	68
Explorers	Mean	14.29	33.01
	Standard deviation	4.22	5.32
	Variance	17.82	28,315
	Minimum	2.00	24
	Maximum	24.00	43
Conservatives	Mean	8.17	15.41
	Standard deviation	4.41	6.44
	Variance	19.45	41.51
	Minimum	0.00	3
	Maximum	20.00	25

The Chi-square correlation test shows that digital competence differs significantly and gradually according to the teacher's profile.

**Table 16. Chi-square test ICT competences\*teacher profiles**

	Value	df	Asymptotic (two-sided) significance or p
<b>Pearson chi-square</b>	<b>100,232</b>	<b>9</b>	<b>0.000**</b>
<b>likelihood ratio</b>	<b>94,751</b>	<b>9</b>	<b>0.000**</b>

\*\*p<0.01

In addition, the table below shows that eclectics are the teachers who participate the most in innovative projects in which they follow training in the digital field, unlike explorers and curators.

## 6. Discussions

The studies above point to an urgent need for new reflections which could offer us some relevant answers for our questions. Although we were able to confirm our research hypothesis in line with the scientific literature (Ertmer et al., 2006; Gil-Flores et al., 2017). The weak correlations indicate that other factors must be considered.

As far as our research context is concerned, the concept of usage and appropriation show some limits. Although it attributes to the user the figure of an autonomous actor, it minimizes the role of the school institution in the process of appropriation of uses. This institution imposes injunctions and prescriptions that limit teachers' capacities for "resistance", "tinkering" or "detour" (Jauréguiberry & Proulx, 2011, p. 56). Indeed, this approach allows us to

understand the question of usages only at the micro sociological level. If it allows us to explain the gaps between the prescribed and the realized, not only by "reactions and ways of being", but also by "creations and ways of doing", it struggles, as Jauréguiberry points out, to take into account the macro sociological level (Jauréguiberry, 2003a, p. 183). This limitation is threefold: (1) innovation is a social object, whereas technology cannot be considered as an object, initially, exogenous to society, as this approach assumes. As a consequence, the power relations that structure the social group will impact the way in which people negotiate their relationship with innovation (technology, politics, and their imperatives, etc.), (2) this exogenous nature of technology creates a kind of permanent face-to-face between the technique and the user which often leads to apprehending the question with two opposing logics. A technical logic that neglects the social aspect and a user logic that tends to psychologize his behavior to the "risk of losing sight of the social determination of users" (Jauréguiberry, 2003b, p. 183) and (3) the consideration of the actor's autonomy must not overshadow the weight of political prescriptions. The main part of the research on the usages have focused too much on the "I" at the "risk of forgetting the social upstream and downstream of the usages". (Jauréguiberry, 2003b, p. 184).

If the sociology of uses makes it possible to answer the question of what humans do with technology at several levels, it doesn't explain why individuals and social groups resist and negotiate differently the

injunctions to usages. This brings us back to the role of the networks of actors of the educational system in teachers' adherence to the generalization of ICT integration (Depover & Strebelle, 1997). Research that adopts systemic approaches places the dynamics of actor networks at the core of their studies (Fullan, 2007; Hall & Hord, 2015; Laflotte & Loisy, 2015). They assume that the integration of educational technologies by teachers is a dynamic process resulting from a strong interaction with different actors on several levels. We believe that these approaches may provide new theoretical elements to complement our micro sociological analysis.

### 7. Conclusion

In this research, we have tried to investigate the professional uses of ICT by primary school teachers in Tunisia, to propose a typology of teachers and to identify the most relevant factors associated with these uses. The results of our questionnaire survey revealed a weak penetration rate of ICT in the teaching practices. We have been able to propose a typology of teachers according to their professional uses of ICT, which includes four profiles: conservatives, explores, trendy and eclectics. In addition, we have demonstrated, as expected from the proposed framework, that the correlations between institutional factors (school digital infrastructure and digital training) and teachers' professional use are weak and moderate. However, the correlations between personal factors (perceptions and personal use) are stronger and more significant. If the sociology of usages has allowed us to examine the teachers on a micro sociological level, it seems more

judicious to extend this perspective with a macro sociological analysis which focuses more on the the network dynamics of the educational system actors in the generalization of the ICT integration in the school. We can thus investigate the impact of these networks on the construction of ICT usage and the different modes of interaction that lead to a more significant adoption of ICT by Tunisian teachers.

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