

ICT and the Development of Techno-Pedagogical Skills among the Algerian University Teachers

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Abstract

The rapid development of the ICT compels us to train both teachers and students in new skills that allow adapting to the new learning situations; tending to become more and more complex. By carrying a survey among 240 Algerian university teachers, we tried to describe the importance given to ICT in education; while emphasizing their impact on the techno-pedagogical skills of the higher education teachers.

Keywords: ICT – Algerian University – Techno-pedagogical skills – Standards.

1. Introduction

1.1 Background

Since the adoption of the LMD system, Algeria has been striving to improve teaching quality by promoting the use of the ICT in education, seen as facilitating tool for learning.

The use of ICT in education has allowed to change the mode of teaching, from an educational environment focused on the teacher to a learning environment focused on the learner (Dwyer, 1995; Fisher, Dwyer and Yocam, 1996; Kulik, 1994; Laurillard 1993 in Bani 2013).

ICT provide innovative means not only for knowledge dissemination but also for the exploration of learning strategies that promote the skills building (Lebrun, 1999, CSE, 2000).

The use of new technologies in education involves new roles for teachers; new pedagogies, as well as new approaches to teachers training (Makrakis, 2005).

1.2 research question:

In the midst of this technological revolution, the question that arises is:

Do ICT really contribute in the acquisition, development and maintenance of skills?

1.3 Research objectives:

The objectives of the study are to:

- determine the importance of ICT in the learning process.
- understand the determinants of the use of ICT by university teachers.
- study the impact of ICT on the skills of the Algerian university teachers.

The paper typically consists of two parts: The first outlines the various concepts used in the study, and the second carries out the empirical validation; and discuss the results of the survey that aims to define the use of ICT and their impact on the teachers' acquired skills.

2. The Theoretical Framework

In this section, we define the two concepts that serve as a theoretical basis in the study: the ICT used in higher education and the development of the teachers' techno-pedagogical skills after their use.

2.1 *Integration of ICT in higher education:*

The use of ICT in education is more recent. Universities Computerization began in the early 1980s and the use of the Internet became widespread in the mid-1990s (Ben Youssef; Rallet , 2009).

We mean by Information and Communication Technologies the techniques and discourses about the techniques, they include the broadcasting worlds, television, radio and all the computer tools.

Basque (2005) defines ICT as a set of computer-based technologies, microelectronics, telecommunications (including networks), multimedia and broadcasting, which, when combined and interconnected, they allow to search, store, process and transmit information in the form of data of various types (text, audio, still images, video, etc.) as they permit interactivity between people, and between people and machines.

At the time of NICT (New Information and Communication Technologies), which became later ICT, it is important to note the occurrence of many acronyms:

- **ICT:** Information and Communication Technique(s) or Technology(s).
- **ICTE:** Information and Communication Technologies in Education or teaching, it refers to the pedagogical use in the context of ICT teaching and not to their technical mastery. ICT greatly enhanced the development of online training.
- **NET:** New Educational or teaching Technologies, the NET development allowed to bring together scholars and researchers in different disciplines around the world, and also to bring endless amount knowledge to the information market.

The integration of ICT requires from teachers, whether practicing or following a training, a change of relations knowledge and an enrichment of the educational content, such technologies stimulate the learner - learner and learners - teachers interactions. They can be an effective link in training to the extent that they promote independent learning; with the development of cognitive, syntheses, and critical evaluation skills. They allow to individualize training better and to reach populations excluded from university education until then.

ICT have many and interesting opportunities for teachers who want to experience activities where they seek to make students more active, and have them work together to build their knowledge (Poellhuber and Baker, 2001).

Baron and Bruillard (1996) identified four functions assigned to ICT by the stakeholders of the education system, namely, an initiation function to documentary research, remediation, development of autonomy and a scientific function (experimentation, simulation demonstration).

2.2 *ICT and development of professional skills: what relation?*

The concept of skill in education also appears in the 60s within the framework of educational reforms in the United States. The concern is to define, in the least unequivocal possible way, the expected skills at various times of the course, in order to ensure the objectivity and fairness of assessments, and measure the effectiveness of teaching (Rey 1996).

Baron and Bruillard (2000) believe that "the notion of skill includes both a set of contextualized schemes of action that allow treating a set of tasks and a social process of characteristics assignment to an individual". They distinguish several types of skills among teachers and trainers:

- **Technical skills:** related to a particular instrument or a class of instruments.
- **Teaching skills:** they are related to the design of teaching and learning situations in academic skills.
- **pedagogical Skills:** they concern the practical management, within a constrained time, of the student activities, the intervention modes and professional actions needed according to the context.

While the concept of vocational skill is based on a scientifically developed professional knowledge: theoretical concepts, analytical grids, data collection procedures, intervention techniques, etc. (Paquay, Altet, Charlier and Perrenoud, 2001), it involves the ability to perform in an independent and responsible way; non-routine intellectual actions in complex situations in order to achieve a goal.

To give teachers the guiding skills they need to acquire in their professional practice, a significant number of ICT

skills standards¹ have been established internationally. It is rather about two types of skills standards. One is focused on the acquisition of tools (Poellhuber & Baker, 2001) and the other on instructional design which includes the design, implementation and evaluation of learning (HEP Vaud, 2006; IBSTPI, Loisel, 2004; NETS).

In France, in the specifications of the university teachers training institutes for teachers training (IUFM), the profile of the teachers' professional skills includes a skill for the control of information and communication technologies. It gives importance to the critical mind with respect to ICT, reflection, teacher evaluation, communication, problem solving and learning activities.

This perspective prefers to improve the educational aspect of the use of ICT in education. The interest also appears in the information processing, communication, collaboration and media literacy.

In America, the NETS profile (National Educational Technology Standard for Teachers) allows to structure techno-pedagogical skills and group them into six areas: knowledge of concepts and operations specific to technology; planning and design of experiments and learning environments; teaching, learning and programs; learning and monitoring evaluation; productivity and professional practice, and the social, ethical, legal and human issues.

Thus, the International Board of Standards for Training, Performance and Instruction (IBSTPI) has the mission to publish skill profiles for teachers. The proposed skill profile is not only of a techno-pedagogical kind. It includes 18 competencies grouped in 5 fields: professional foundations; planning and preparation; methods and pedagogical strategies; monitoring and evaluation of learning and management (Boéchat-Heer, S, 2009).

Both of these skill profiles show first the importance given to learning evaluation and monitoring, we notice the concern to encourage the development of skills within the pedagogical design, and integrate the use of ICTs in rich and real learning activities, in order to participate significantly in achieving the training programs goals and skills.

In Quebec, the teachers professional skills standard (MEQ, 2001) includes a skill related to ICTs called "integrating information and communications technologies for the purpose of preparing and steering teaching-learning activities, teaching and professional development management", the standard is concerned with the design, steering and assessing the teaching-learning situations (N. Lebrun, JM Wood, 2009).

When we analyze these different standards, we can identify four main areas of techno-pedagogical skills:

- **Information treatment:** Bernhard (1998) defines it as a set of information skills that students and teachers must now develop in a knowledge society; such type of skills must be mastered by college students (Mittermyer and Quirion, 2003) as well as at the university (Loiselle, Basque and Chomienne, 2005). In many standards, this field of skills is identified even for teachers (Tardif, 1998, Desjardins, 2000, Swift et al, 2001. Poellhuber and Baker, 2001; Haeuw et al, 2004 Bérubé, B; Poellhuber, B. (2005). In a further view, Desjardins (2000) sees that teachers need to develop an epistemological skill. Beyond their ability to provide access to information and transformation of the relation to knowledge; ICT offer many and various ways to support all stages of information processing, research, communication, as well as development work and knowledge organization.
- **Communication and collaboration:** At the time of ICT, many electronic means of communication, which may be used for collaboration, are available to teachers and students. They are able to replace the specialized software in the collaborative work.
- **The pedagogical design:** The pedagogical design is according to (Reigeluth, 1983 in Psyche, 2007) "a professional activity and a discipline that relates to a particular aspect of the process of the teaching structure: prescribing optimal pedagogical strategies likely to promote learning among students, depending on the expected results and the specific conditions of each educational situation". It takes place in a series of steps such as the study of training requirements; the definition and analysis of the pedagogical purposes, the choice of strategies and media, the assessment of the courses or studies programs ". (Briggs L.J. and Gagne R.M. in Psyche, 2007).
- **Production of learning resources:**
« Produce » in the grouping of skills COMPETICE² consists in creating and producing tools and services. According to Poellhuber and Boulanger (2001), teachers must be able to build multimedia contents by using ICT.

According to Perrenoud (1999), the production of educational materials is an important activity for teachers, for

¹ A professional skills standard is a prescriptive document that contains all the skills expected among target persons, namely, in such case, the teachers whose coordinator has the pedagogical responsibility.

² The standard COMPETICE proposed by Haeuw (2002) is a steering tool by the skills of ICT projects in higher education. It consists of a set of cards that allow reading projects involving the use of ICT in the training system.

which they must necessarily resort to production tools, and more particularly, but not exclusively, to word processing software.

3. The Empirical Framework

3.1 Methodology

The study used the descriptive survey research design, the population of the study consisted of all university teachers, Our survey was carried out among a random sample of 240 teachers out of 400 questionnaires distributed in different Algerian universities (Mascara, Chlef, Msila, Algiers, Saida).

The questionnaire is composed of three sections:

- General information on the participants.
- The technologies that are the most used by teachers.
- The skills developed in the use of ICT.

The questionnaire consists of 21 questions; some of them contain the Likert scale and others are essay questions to gather more details on the percentages obtained to the quantitative questions.

The survey was administered only by e-mails based on the electronic addresses of teachers in higher education.

3.2 Personal and professional information:

The sample consists of 48.1% male teachers and 51.9% female. Thus, 82.4% of the sample is composed of tenured teachers (Professors, Senior lecturers, Lecturers) and 17.7% of non-tenured teachers (temporary lecturers).

We took into account the difference in ages: 66.8% of the sample is composed of teachers less than 40 years, which favors the acceptance of new technologies.

Table 1. Sample characteristics

	Survey (240 cases)
Age	
Less than 30 years	30.9%
30 to 40 years	35.9%
41 to 50 years	16.5%
More than 50 years	16.7%
Gender	
Male	48.1%
Female	51.9%
Seniority	
Under 5 years	26.4%
6 to 15 years	23.4%
16 years to 30 years	24.3%
More than 30 years	25.9%
Rank	
Professor	13.8%
Senior lecturer "A "	12.5%
Senior lecturer "B"	4.6%
Lecturer "A"	16.7%
Lecturer 'B'	34.7%
Temporary lecturer	17.7%
Home university	
Mascara	31 %
Chlef	25 %
Msila	03 %
Alger	21 %
Saida	20

3.3 Use of ICT by teachers:

We are interested in the use of the computer equipment and the perception of its use in the teaching context, for this purpose, we raised questions about the platform used, the availability of a device at home, and the different applications used on a regular basis and the time devoted to the use of ICT.

Table 2. Computer equipments used

	Yes	No	University equipment	Personal property	Internet café
Photocopier	73%	07%	73%	02%	25%
Printer	86%	04%	11%	70%	19%
A desktop computer	65%	35%	33%	53%	00%
Internet access	59%	41%	12%	46%	04%
Broadband connection	20%	80%	02%	27%	07%
Normal connection	44%	56%	17%	32%	07%
Laptop	77%	23%	06%	71%	00%
Internet access	57%	43%	02%	45%	02%
Broadband connection	20%	80%	02%	20%	03%
Normal connection	44%	56%	05%	55%	00%
Scanner	26%	74%	16%	16%	10%
Tablet	10%	90%	04%	09%	00%

As shown in the table above, most teachers have their own computer equipments; such as printers with a percentage of 70%, laptops 71%, connected to the internet with a normal speed (55% of teachers) although only 44% of the teachers mentioned the use of the internet, which allows us to probably declare that teachers have more time outside of normal working hours to make their researches, and develop new activities that they actually have in university.

As for the necessary equipments for teaching activities in economy, 73% of the teachers use photocopiers that belong to the university, and only 33% of computers (fixed) are available to the teachers. This shows a low rate of the equipments devoted to teaching; and which are concentrated mainly in the offices and lecture halls.

The following table shows the staffing of lecture halls with the necessary equipments for teaching the academic discipline.

Table 3. Staffing lecture halls with computer equipments.

	Never	Sometimes	Always
A data show projector	50.9%	38.5%	10.7%
A desktop computer	70.1%	13.4%	16.5%
A desktop computer connected to the internet	80.4%	12.3%	6.7%
A laptop	64.2%	22.8%	13.0%
A laptop connected to the internet	86.5%	7.7%	5.8%
Desktop computers for students	59.2%	28.0%	12.7%
A desktop computer for students connected to the internet	66.5%	22.6%	11.0%
An interactive whiteboard	96.8%	1.3%	1.9%
A camcorder	85.3%	9.0%	5.7%

It appears from the table that most teachers suffer from a lack of computer equipments in the lecture halls. In fact, 80.4% of the teachers mention the absence of a desktop computer connected to the internet in the lecture halls, and only 12.7% of them mention the regular use of the computer by students, despite the importance of the equipment to train and develop the students' information skills.

Thus, 10.7% of respondents state the permanent presence of a data show projector, and 96.8% of them confirm the absence of an interactive whiteboard in the classroom.

The analysis of the use of software programs by teachers in higher education shows that; word processing (Word, Latex, etc.) and the use of spreadsheets (Excel, etc.) are part of the usual tools for teaching the academic discipline. In fact, 90% of teachers use a software program for word processing and Excel as well.

The observation is however different for the databases processing software. Only 02% of teachers state that they know how to use the database software (Access), and only 33% of teachers say they used computer software (SPSS, Eviews), despite the importance of these programs for the academic discipline taught.

We also note a heavy use of the internet and e-mail (about 80% and 53%). Such generalization of the internet tool reflects the presence of adequate equipments in all the respondents' places, as well as a significant value in use.

Concerning the use of multimedia presentations software; we find that 65% of teachers turn towards a use of PowerPoint. This percentage illustrates a change in the methods of presentation of teachings based traditionally on written courses.

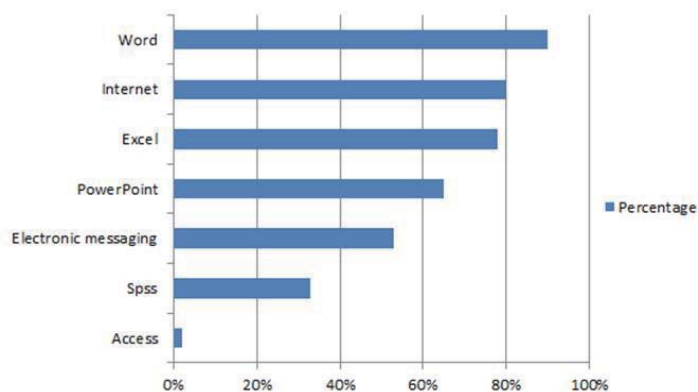


Figure 1. The most used software by teachers

The mastery of ICT is mostly acquired through self-study processes as the averages of responses indicate it in the table below. In fact, most teachers learned these techniques by learning on the job (3.9548), followed by an initial training (3.2260), the support of colleagues (3.2184), and finally, a continuing education (3 0000).

We also observe that the majority of teachers do not participate in virtual communities (2.4941) or a distance learning (1.8647). Such phenomenon is probably due to the lack of education and information related to the e-learning.

Table 4. Training processes

	Average	Standard deviation
Distance learning	1,8647	1,24008
Participation in virtual communities	2,4941	1,42197
Personal training with a training organization	2,8079	1,46448
Teamwork in the academic institution	2,8636	1,58335
Continuing training	3,0000	1,71226
Help of experienced colleagues	3,2184	1,40951
Initial training	3,2260	1,60426
Self-training	3,9548	1,55146

On the whole, all of the participants use ICT many times per day (65%) because of the availability of tools outside the professional workplaces. That allows us to conclude a lack of resource sharing between teachers and learners in the lecture halls through the intermediation of technology, while 27% of teachers use ICT once a day, 01% many times a week.

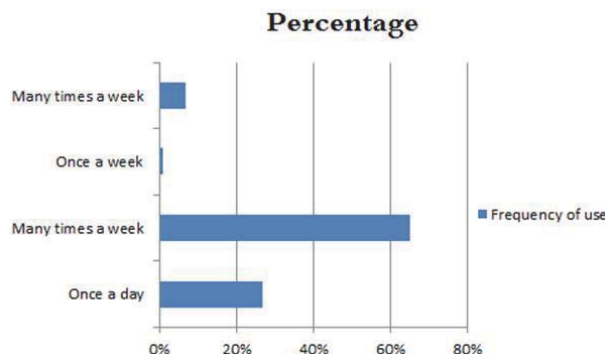


Figure 2. Frequency of use of ICT

3.4 Skills acquired by teachers when using ICT:

The following table shows all the averages and standard deviations of the different skills developed by teachers when using ICT. We observe that averages are on the whole close. The highest averages concern technical skills related to the frequent use of ICT (write, store, secure and archive data locally and on network (4.2905), and the achievement of the work presentations. Such skills are necessary to respond to issues that may arise in emergency with the computer equipment; followed by the development of behavioral skills linked to cross-functional relations created through communication (4.2793), and behavior teams at (4.0279).

Information skills (3.6910) that play an essential role in training students, and finally, the pedagogical skills that consist of designing, managing and developing learning situations adapted to the different needs of the students in items (07, 10).

Table 5. Skills developed by the teachers

	Average	Standard deviation
Write, save, secure and archive data to locally and on network.	4,2905	1,13398
Realize the works presentation.	4,2849	1,16230
Exchange and communicate remotely.	4,2793	1,18992
Improve teamwork.	4,0279	1,25613
Install educational software.	3,8483	1,19534
Share experiences and equipments.	3,8362	1,48142
Develop learning situations adapted to the different needs of the students.	3,8258	1,29667
Carry out projects in remote collaborative work.	3,7921	1,30039
Assist students in their learning ways for a better use of information.	3,6910	1,45751
Be able to design their own learning methods.	3,6536	1,32928
Know to work between situations that require ICTs and those that do not have recourse to them.	3,5866	1,28825

4. Results and Solutions

In order to optimize the use of ICT in class, we can identify some important results from the study:

- The lack of equipments constitutes a significant obstacle to the use of ICT.
- The complexity of the technical equipment prevents sometimes its use.
- The integration of ICT in education requires time to the detriment of learning time.
- The use of traditional teaching methods prevents the teacher from adapting to the use of new technologies.

From these results, we may raise some recommendations:

- The establishment of a bridge between technology and pedagogy, in order to sensitize teachers about the need to integrate ICT in different learning situations; becoming increasingly complex.

- The ongoing assessment of the acquired skills to enable teachers to develop new pedagogical practices, and acquire the necessary skills to succeed them.
- The use of technological tools, software programs, computer products specific to each taught field.
- Train teachers in information skills, because teachers usually try to transmit knowledge without paying attention to the professional goals that may be achieved through the acquisition of such skills.
- The establishment of a training that focuses on the technical side of ICT and the educational side as well, followed by training in managing the collaborative work of students.
- The need to establish a professional skills standard for teachers that allows guiding training programs.

5. Conclusion

In schools, ICT have often the role of facilitating the elements of a more mechanical part of the teachers' work, especially in terms of managing and preparing their courses.

The rapid development of ICT forces us to train both teachers and students in new skills that allow adapting to new learning situations. Yet, it appears that the adaptation to the use of ICT in class is too slow.

For that reason, universities should take responsibility to define the concerned skills in university courses; focused primarily on their fundamental values and goals.

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