Use and appropriation of ICT in the educational practices of teachers of the program of environmental engineering of the Universidad Francisco de Paula Santander

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Abstract. The academic evidence from developing countries shows the change that universities are making in the production of knowledge and the influence they exert on the development of their countries, given the integration of ICT in academic activities, which has made it possible to improve production processes and the exchange of knowledge through the network. The objective of the research was to characterize the use and appropriation of ICTs, which the teachers of the environmental engineering program of the UFPSO, do in their pedagogical practices, through a descriptive methodology with a quantitative and qualitative approach, which allowed to use instruments the collection as surveys, focus group and personal interview, to analyze the results through the statistical software SPSS and Atlas Ti. From the results of the work it is concluded that most teachers consider ICT as a resource to improve the teaching-learning process, where at the beginning they are used as a tool for the transmission of information, and that as they appropriate, they allow the construction of knowledge.

1. Introduction

ICTs permeates every field every day, including education, which modifies the ways to access information and ways to learn, to open up different possibilities for innovation in the teaching-learning process. However, the use and appropriation of these technologies by teachers in their pedagogical practices has not kept pace. There are many difficulties that have had to be overcome and even, many challenges that have not been known to face; perhaps, the most notorious, those related to updating and ongoing training by teachers to provide the necessary skills to their pedagogical practices, skills that allow the effective and rational use of ICT in the classroom.

To address then the problem of the use and appropriation of ICT by teachers in their pedagogical practices, in particular those of the environmental engineering program of the UFPSO, requires in the first place a precision of the concepts addressed in this topic.

In relation to the concept of Information and Communication Technologies (ICT), many definitions exist. Martínez suggests that: We can understand by the new technologies all those means of communication and information processing that arise from the union of the advances fostered by the development of electronic technology and conceptual tools, both known as those developed as a consequence of the use of these same technologies and the advancement of human knowledge [1].

Similarly, Haag, Cuming & McCuberry, state that Information technologies are composed of ”Any tool based on computers and that people use to work with information, support information and process information needs” [2].
From the previous perspectives, there are many definitions from different perspectives on ICT; however, in any of them reference is made to the technological tools used in multiple social fields, hence, that one of the primary urgencies in educational systems, driven by economic, social and political changes, is the incorporation of technologies of information, since these allow the construction, reconstruction, dissemination and generalization of knowledge; therefore, ICT, within academic activities obviously must be connected to the teaching-learning process.

In this regard, the inclusion of ICT in the educational field requires appropriation in the use of them, by the user, which according to Sunkel [3] is understood as: The significant use of computer and communication technologies, in which a degree of control and choice is exercised over technology and content, being useful, fruitful, valuable and important for the user to be considered.

Nowadays, academic institutions are not conceived without the incorporation of ICT to their pedagogical practices, for that reason the UFPSO, in the development plan to include the physical and technological strengthening of the academic programs, which bases the accomplishment of studies in the use and appropriation of ICT in the pedagogical practices of teachers, in this particular case of the environmental engineering program.

When developing the research, what was considered by the Ministry of National Education [4] was taken into account in terms of the need for the country to be at the forefront of the teaching-learning processes, mediated by ICT; and as indicated by UNESCO [5]:

The professional training of the teacher will be a fundamental component of this improvement of education. However, teacher professional development will only have an impact if it focuses on specific changes in the teacher's behaviour in the classroom and, in particular, if that development is permanent and harmonizes with other changes in the educational system. Therefore, the ECD-TIC project interprets the repercussions that each of the three approaches to educational improvement have on the changes of each one of the components of the educational system: educational policy; curriculum (curriculum) and evaluation; pedagogy; use of ICT; organization and administration of the educational institution, and professional development of the teacher.

The main objective of the research was to identify the use that teachers of UFPSO's environmental engineering program make of ICTs in their pedagogical practices, to describe the processes of appropriation and to relate the level of use they make.

2. Metodology

Due to the nature of the research and in order to answer the questions raised and meet the proposed objectives, it was proposed to apply a methodology where the quantitative and qualitative paradigms are linked, which allowed the use of a non-experimental design with a cross-sectional descriptive.

Based on the research problem raised and to achieve compliance with the first objective (corresponding to the first phase of research), the following variables emerge: Demographic data; Use of ICT; ICT integration; Teaching, Learning and ICT; and Teaching and ICT. In order to develop the second phase of the research and to fulfil the second and third objectives, two a priori category were established: Uses of ICT and Appropriation of ICT, to which some subcategories arose. For the use of ICT category, access subcategories, use scenarios, users and difficulties emerged, and for the ICT appropriation category, the subcategories of ICT notion, competencies and experience in disciplinary training emerged.

To measure the use of ICT, the quantitative approach was used and for the appropriation approach the qualitative approach was used.

The instruments used for the collection of the information where the Likert type survey (applied to a census sample), the focus group and personal interviews.

The results of the survey were analysed using the statistical software SPSS (Statistical Package for the Social Sciences) Version 23. After applying the instruments (focus group and personal interview), to the key participants, a previous analysis of the information collected was carried out through qualitative software Atlas. Ti version 7.45.
For the application of the focus group and personal interviews, it was necessary to opt for key informants, who obeyed established selection criteria: voluntary subjects, but in the first place they were distinguished by the use and appropriation of ICT, as well as cases in those that the teacher recognized that he did not use ICT or did not have appropriation of them, also belonged to different disciplinary areas.

3. Results and discussion
To carry out the research, an initial characterization was made by the teachers of the environmental engineering program of the UFPSO, which can be seen in the Table 1.

| Table 1. Demographic data. | Parameters         | Frequency | Percentage | Total |
|----------------------------|--------------------|-----------|------------|-------|
| Gender                     | Male               | 34        | 66.66      | 100   |
|                            | Female             | 17        | 33.33      |       |
|                            | 20 a 35            | 10        | 19.60      |       |
|                            | 36 a 46            | 22        | 43.14      |       |
|                            | 47 a 57            | 14        | 27.45      |       |
|                            | > 58               | 5         | 9.81       |       |
| Age                        | Undergraduate      | 15        | 29.41      |       |
| Scholarship                | Specialization     | 23        | 45.10      | 100   |
|                            | Master’s degree    | 13        | 25.49      |       |
| Labor link                 | Full time          | 7         | 13.73      |       |
|                            | Chair              | 44        | 86.27      |       |
|                            | 1 a 10             | 35        | 68.63      |       |
| Work experience            | 11 a 20            | 10        | 19.61      | 100   |
|                            | 21 a 30            | 6         | 11.76      |       |

The results obtained in the research showed that teachers who provide their services to the academic program of environmental engineering, presents diversity in terms of gender, age, level of training, type of relationship and work experience in higher education, to also demonstrate the variability of responses obtained from the participants in the application of the survey; These results allowed us to diagnose that the teachers assigned to the program, although in a good percentage (19.60%) of them are young (under 35) cannot be classified as digital natives, since according to Prensky [6], digital natives are those who come from an environment with high access to these technologies, and what could be perceived during the development of the research is that the population is studying the process of initiation in the use of ICT with greater appropriation given the need for generational inclusion, for both can be classified as immigrants included, and immigrants excluded; the first category includes those young teachers who are constantly updated and who make efforts to keep abreast of technological advances, and in the second category, those teachers who, because of their age, resist change, which makes it possible to mention who have been doing things in the same way for a long time.

From the previous perspective, it can be affirmed that although most of the teachers involved in the research, present a positive attitude towards the use of ICT, there are some who resist the transformation of the digital divide, by contracting with the proposed by Prensky [7], who states:

A problem arises, a rupture, a gap, a digital and generational gap that cannot be ignored or accepted without a firm purpose of change to try to palliate or solve it: digital immigrants who dedicate themselves to teaching use an obsolete language.

In this regard, the vast majority (80.39%) of the teachers of the environmental engineering program are digital immigrants, which forces them to develop a certain level of acceptable competitiveness in the management of ICT if they intend to use them in the didactic activities within the classroom. Hence, UNESCO [5] indicates that: The teacher is the central agent on which it depends that ICT be used appropriately in the educational process, because it is he who decides if he uses them and how he
uses them, since he is responsible for designing both the learning opportunities and the enabling environment in the classroom that facilitates the use of ICT by students to learn and communicate as well as being prepared to provide their students with learning opportunities supported by the ICT.

The use of ICT is understood as the continuous and the daily practice of a technological tool and as appropriation, the meaningful, controlled and appropriate use of that tool; From this perspective, it can be stated that the teachers of the environmental engineering academic program, consider the relationship of the integration of ICT in teaching important, given the great educational potential they see in them, where it allows them to develop new skills, abilities and skills, adapting more easily to a world in constant change, also facilitates interaction with students and other teachers through the use of different learning platforms and social networks, which favors collaborative work, strengthening academic planning activities and work in the classroom, in terms of counselling, development of research, extracurricular and extension activities, to build academic networks, which contribute to the intellectual and scientific production of them, and to improve their professional and personal status.

Regarding the use of teachers assigned to the academic program of environmental engineering of ICT in their pedagogical practices, the results show that most of them are considered at a medium level (74.51%), which shows that everyone makes use of them; from a very basic level to present information, to a more advanced level as managers and content producers. Hence, Pontes [8] indicates that: The educational use of ICT encourages the development of attitudes favorable to the learning of science and technology, the use of interactive programs and the search for scientific information on the Internet helps to promote the activity of students during the educational process, to encourage the exchange of ideas, motivation and interest of students in science learning.

Therefore, it can be said that the teachers interviewed consider the integration of ICTs to teaching-learning processes important in their pedagogical practices, given the great educational potential they see in them, which facilitates interaction with students and other teachers, and thus build academic networks, which contribute to the intellectual and scientific production of them, to improve their professional and personal status, not without first having been trained in the use of these tools, to become tutors who share knowledge, from a virtual scenario, and thus shorten the digital divide that exists with the student, who has the task of searching, assimilating and appropriating the contents, and in this way improving the quality of the academic processes.

In this sense, it can be seen that all the teachers of the environmental engineering program use ICT in their pedagogical practices, but only a few (13.73%) make appropriation of them, which leads us to think that the vast majority of teachers are in a period of readiness of these technologies.

In contrast to the statement by Sánchez [9]: Know them and use them for different tasks, but without a clear curricular purpose. It implies that teachers and apprentices develop skills in digital literacy, use technologies to prepare classes, support administrative tasks, review educational software, etc. Technologies are used, but the purpose for which they are used is not clear, they do not penetrate the construction of learning, they have rather a peripheral role in learning and cognition. Technologies are not used to support an intentional need to learn. While it is true that they are used to support educational activities, at this level, it is often difficult for them to detach themselves from a view where technology is at the center. In other words, an important part of this level corresponds to a more technocentric approach to the use of technology to support learning.

From this perspective, it can be said that teachers present a positive attitude towards the use of ICTs, considering that social networks, the provision of equipment and infrastructure are a guarantee for adequate integration and that this will depend on the usefulness of have in the development of their academic work, the potential to facilitate the teaching-learning process and the impact they generate in the interaction between the teacher and his students, in this regard Samamé [10] states that the primary factors in the use of ICT by teachers are related to access to resources, equipment quality, software, physical and technological infrastructure, etc.

Similarly, the results indicate that teachers integrate ICT into their academic practices regardless of the ability to master them, which demonstrates that they do integrate these tools in their academic activities, but without any domain, because as gross says [11] “make use of ICT frequently to perform
simple tasks such as writing, searching for information, communicating on a daily basis, designing simple instruments, etc. does not mean that there is appropriation of them, only when there is technological innovation in the education system is there talk of appropriation”.

With the arrival of ICTs in educational scenarios, it made the role of the teacher change, and he is not the one with the knowledge, the information is available to all individuals, this makes the teacher have to develop other skills such as media and communication, which leads UNESCO to think [12]:

This shift goes from an education focused on what the teacher knows to a teaching that has to focus on how the student learns. Also, this implies evolving from the use of ICT for repetition of the use of ICT for communication, interaction, collaboration and expression.

To support the results presented in the present investigation, we took as reference the point raised by Hopper & Rieber [13], regarding a model of appropriation of ICTs in order to understand and interpret the uses that are given in the field education, based on five levels: familiarization, use, integration, reorientation and evolution.

From this perspective, it can be said that there are teachers (11.76%) who are at the familiarization level of ICT tools, where they make little or no use of them. The vast majority (74.51%) is in the levels of use and integration, where they have a good relationship with ICT and therefore use the basic tools. Few teachers (13.76%) are at the level of reorientation, where they use specialized learning environments through software and platforms; and at the level of evolution, there is no teacher, although there are teachers who try to create their own digital resources, they lack appropriation.

Therefore, it can be affirmed that integrating ICTs into pedagogical practices requires that teachers use them appropriately with each of the curricular aspects, so that they become part of the curriculum and not the universality of it, in this respect Sánchez [14] suggests that integrating ICTs is synonymous with making them part of the curriculum holistically, considering the educational, methodological and didactic parameters of the academic processes, which implies a systemic and dominant use in the curricular discipline.

In this sense, according to what was stated by Mumtaz [15], who states that: The use that teachers make of ICT in the classroom depends on several factors, among which are policies at the national or central level, availability and access to resources, support for schools, training in ICT or the own conceptions of each teacher on teaching and learning.

4. Conclusions
At the end of the investigation, it was concluded that:

The vast majority of teachers use ICT in their academic work, appropriating them for the continuous improvement of teaching-learning processes, some more actively than others; the uses they make of these ranges from a very basic level to obtain information, to an average level where they build and produce small contents; the tools they use the most are search engines for specialized information, videos, power point presentations and educational platform resources; This confirms that teachers recognize the use of ICT, the importance in the creation of new learning alternatives, which allows them to develop new skills, abilities and skills, to facilitate adaptation to a world in constant change.

The frequency with which teachers incorporate ICT into their pedagogical practices is due to the attitude they assume towards the use, domain, utility and benefit they achieve with the use of these tools, that is to say that the better they use them.

There is a digital and generational gap that prevents having good communication with their students, especially older teachers.

The use and appropriation of ICT, which they do in their pedagogical practice corresponds to their own initiative, given that they see an educational potential in them.

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