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Effect of the implementation of a technological resource on the teaching process in accredited high-quality programs

Efecto de la implementación de un recurso tecnológico en el proceso de enseñanza en programas acreditados de alta calidad

PRADA, Raúl [1]
GAMBOA, Audin A. [2]
HERNÁNDEZ, César A. [3]

Abstract
The importance of this article lies in the need to train teachers in the process of incorporating digital resources into the teaching strategies developed in their chairs. A quantitative approach is adopted, for which a sample of 300 informants enrolled in three academic programmes in different faculties and which is recognised as being of high quality was formed. The results show malfunctions that need to be corrected to ensure their effectiveness and massive use in the institution.
key words: ICT resources, teaching, didactics, high-quality accreditation, pedagogical practice

Resumen
La importancia de este artículo radica en la necesidad de capacitar a los docentes en el proceso de incorporación de los recursos digitales dentro de las estrategias de enseñanza desarrolladas en sus cátedras. Se adopta un enfoque cuantitativo, para lo cual se conformó una muestra de 300 informantes matriculados en tres programas académicos de diferentes facultades y que cuenta con reconocimiento de Alta Calidad. Los resultados evidencian fallas de funcionamiento que requieren ser subsanadas para asegurar su efectividad y uso masivo en la institución.
Palabras clave: recursos TIC, enseñanza, didáctica, acreditación de alta calidad, práctica pedagógica

1. Introduction

It has repeatedly been stated that education is the way for a society to move forward and for a country to access and lead to technological development. Then it is necessary to review whether the educational processes that are being advanced at each level of the Colombian education system are complying with the quality standards demanded by society.

As Ardila-Rodríguez (2011) emphasizes, the concept of quality in education is generally associated with the ability of educational institutions to ensure that their students achieve quality educational goals regardless of their origin social data; academic goals based on an initial condition of admission to the student to the academic program and should promote performances that are superior to those shown.

1 Teaching research. Faculty Education, Arts and Humanities. Francisco of Paula Santander University. raulprada@ufps.edu.co
2 Teaching research. Faculty Education, Arts and Humanities. Francisco of Paula Santander University. audingamboa@ufps.edu.co
3 Teaching research. Faculty Education, Arts and Humanities. Francisco of Paula Santander University. cesaraugusto@ufps.edu.co

To achieve these performances superior to the student entry condition, some aspects should be considered such as: what content should be included in the curriculum? How should they be evidenced? What characteristics should the teacher who orients them have? What should be the pedagogical process that develops in the classroom? Does the evaluation conform to the characteristics of the institutional pedagogical model? Is it convenient to incorporate Information and Communication Technologies (ICT) resources into the teaching process? How are teachers implementing ICT resources in their pedagogical practice?

In many cases in order to fulfill this purpose, there is talk of the renewal of universities by opening the possibility towards innovation. But innovation usually consists of the creation of new academic programs in which some new subjects are incorporated or simply played with combinations or permutations of existing subjects, i.e. innovation is often revolves around what is taught? Abandoning the how is it taught? (Coraggio, 1994).

To this contributes the widespread belief that a good teacher is one who masters academically or professionally his knowledge or subject, usually a professional specialist in some scientific or technical field, even if he is an improvised in his specific task of teaching in a university context, then will surely replicate the methodologies he experienced in his academic training process, that is, he would be replicating teaching processes surely with a traditionalist approach based on transmission possible memorization of knowledge and possible memorization (Salas Zapata, 2005).

This research is in the context of higher education and aims to reflect on the process of integration that is made of an ICT resource in the teaching processes in programs that have the recognition of quality by the Ministry of National Education at a public university.

1.1. Background of Educational Paradigms in Colombia

Historically reviewing how education was in Colombia shows that training processes have focused on the teaching process, boasting that it positively impacts learning. Ianfrancesco (2004) emphasizes that in European countries every 25 years on average, reforms are suggested that change the role of education which leads to the change of the roles of the student and the teacher.

In Colombia, only two structural reforms of the education system have been carried out. The first when education is first organized under the responsibility of the Ministry of Public Instruction, with Law 39 of 1903 on Public Instruction, which does not define what education is, let alone its objectives. The second major reform was carried out with Law 115 of 1994 which defines education as a process of permanent, personal, cultural and social formation. It follows that in Colombia the vision of education was transferred as a process of instruction to that of the formation of the subject in a social and cultural context.

Looking at the process followed by the role of the teacher since 1900 it can be mentioned that when the end was instruction his role was to "expose"; then evolves by assuming the function of "explaining" by seeking the student to "understand"; subsequently the teacher must "demonstrate" supported in the process of experimentation what leads to his role as "mediator" in the training process of the educator seeking to make him a transformative agent of society through problem solving evidence of the transition from concepts to facts and this demands a good deal of self-learning.

1.2. A brief reflection on the teaching-learning process

In analyzing the change in the quality of the educational process it is necessary to reflect on some aspects of the so-called teaching-learning process. For example: a) the teaching-learning process should not be limited solely to the classroom environment. When the teacher takes advantage of all the spaces offered by the institution, the city, the context in which the student lives and in general, all the resources offered by the world through the

use of technology; gets from the student an emotional recharge that is reflected in much more motivation and therefore, greater commitment in the subject (Ferreyra Díaz, 2017; Bonetto & Calderon, 2014; Cieza García, 2010); b) learning is based on the creation of an educational work community, then from the activities that the teacher schedules in his or her planning should consider those spaces where cooperative learning is applied as a teaching resource in the development of Chair(Johnson, Johnson & Holubec, 1999; Torrego & Negro, 2014; Cifuentes Férez & Meseguer Cutillas, 2015; López & Acuña, 2018).

1.3. Integrating ICT into Higher Education

Gutiérrez Martín, Palacios Picos, & Torrego Egido (2010) state that the importance that technological innovation and ICT development in particular, is having in the world of education is undeniable (Alcívar et al., 2019; Vaganova et al., 2019). However, on rare occasions those responsible for education policy take for granted the cause-and-effect relationship between the use of ICT and the improvement of educational quality.

Technological discourse exaggerating the educational and didactic potential of ICT generates unfounded expectations and hopes in the various sectors of the education system. This excessive confidence in ICT diverts attention from other educationally relevant aspects, such as planning for adequate ICT curriculum integration and teacher training. Then the commitment of educational institutions must go beyond the purchase of state-of-the-art technological resources or the provision of computer rooms or the development of applications; it must be understood that the pedagogical implementation of technology in the development of university professorships requires a process of training teachers, only in this way will the desired results be achieved (Padilla-Beltrán, Vega-Rojas & Rincón-Caballero, 2014; Vega, Rodríguez-Baena, Pérez-Agustin &Melo-Solarte, 2019).

1.4. Accredited High-Quality Programs and ICT

Decree 792 of 2001 for Engineering and Decree 0917 of 2001 for Health, established quality standards in professional undergraduate programs, which coincides with what was proposed in Decree 2566 of September 10, 2003, in relation to the provision of educational means, where the program had to guarantee conditions to advance research processes, teaching and social projection. With regard to ICTinformation and communication technology, it was stated that institutions should have up-to-date, specialized, sufficient and adequate information and communication technology (ICT) resources, with access and training to users of the program, for proper use (Mesa Jiménez & Forero Romero, 2016). Quality standards emphasize the existence and adequacy of resources in ICT and not their use in educational processes.

Resolution 2772 of 2003 (Health) and Resolution 2773 of 2003 (Engineering) define the quality characteristics, mentioning the educational means within which the provision of equipment and the use of specialized software is cited for which verification was required of their existence, usage statistics, training processes for program users and possible purchase investment plan, if they do not have them. In 2010, Decree 1295 regulates the Qualified Registry in which the importance of ICT in the educational process (uses of databases, computer equipment and applications, simulators, interconnectivity systems, among others) is increased according to nature students' needs and needs, in order to enhance students' research skills through the use of ICT.

Then, with this, it recognizes the importance that ICTs have in the processes of High-Quality Accreditation of academic programs, from the point of view that through them can be strengthened the development of research skills in future through their correct teaching use in the teaching and learning process.

2. Methodology

The various aspects characteristic of this research is described below following a logical sequence at the methodological level.

2.1. Focus and design

Quoting Gómez Zermeño (2009) "the researcher considers that one can know the reality, the value it gives to the data, its way of conceiving the processes, the method by which it approaches tentative explanations and how it tests them" (p. 119). On the basis of the above, the research is carried out through a quantitative approach, since it is intended to make measurements from the processing of the data collected through the implemented instrument.

A fieldwork designs adopted that the information is collected directly from the primary informant and conforms to the descriptive level for comparative purposes, since it was expected to contrast the results obtained in each of the academic programs and thus validate the possible existence of differences between them, according to the nature of each program.

2.2. Population and sample

The population is made up of all students enrolled during the first semester of 2019 in the academic programs belonging to the Faculties of Agricultural and Environmental Sciences, Engineering and Health Sciences at a public university in the North East of Colombia. The three selected academic programs are recognized by the Colombian Ministry of National Education. The socioeconomic conditions of the students correspond to those in strata 2 and 3, with residence in the city of San José de Cúcuta and its metropolitan area. In all three programs, the time spent on fulfilling their academic duties requires them to do the entirety of the day and at least six days a week, so students are financially dependent on their parents or a close family member.

For the selection of the sample, the application of non-probabilistic sampling under the technique of intentional sampling is used, since they had to meet certain selection criteria: a) be enrolled in the second half of 2019 in one of the three academic programs analyzed; b) be enrolled in one of the oriented subjects of teachers who expressed their desire to be part of the research; c) be users of the ICT resource under investigation. These criteria were able to form a sample of 300 informants distributed in equal numbers in each of the three faculties already mentioned.

2.3. Instrument for data collection

The survey is used as a technique for data collection. The research uses the instrument designed by Ortíz-Arismendi, Ramirez, & Diaz Vargas (2019), which is made adjustments in terms of the response scale, but keeps each of the variable's constant with their respective dimensions and indicators. The composition and distribution of the items in the instrument is shown in Table 1. The instrument used is attached at the end of the article.

Table 1
Operationalization of variables

Variable	Dimensions	Indicators	Items
Benefits	Information	Training	1-2
		Educational	3-4
		Performance	5-6
	Communication	Social media	7-8
		Connections	9-10

Variable	Dimensions	Indicators	Items
Teaching resource	Strategies	Research	11-12
		Tool	13-14
Learning strategy	Operation	Constructivism	15-16
		Pedagogical resources	17-18
		Organization of time	19-20
Applications	Organization	Ideas	21-22
		Teaching instrument	23-24
	Digital portfolio	Teaching strategy	25-26
		Group work	27-28
		Time optimization	29-30
		Reflection	31-32

Source. Ortíz-Arismendi, Ramirez, & Diaz Vargas (2019)

2.4. Instrument validation

The process of validation of the instrument after adjustments made of the original version presented by Ortíz-Arismendi, Ramirez, & Diaz Vargas (2019) can be verified in Prada Núñez, Hernández Suarez & Gamboa (2019) where it is highlighted that the instrument offers a Cronbach alpha of 0.961, admissible value as stated by Bojórquez Molina, López Aranda, Hernández Flores, & Jiménez López (2013).

2.5. Data processing and analysis

Once the data was created in the SPSS, the answers were reviewed in detail in search of possible typing errors that could affect the quality of the results in the future. The data carried out a descriptive report from which a number of considerations are derived.

3. Results

Table 2 describes the demographic characteristics of informants within each faculty. The predominance of the male gender in the faculties of Agricultural and Environmental Sciences and Engineering is highlighted, contrary to what happens in the Faculty of Health Sciences. The sample was made up of students from almost every semester, whose average age is adjusted with the age of the informant at the university.

Table 2
Description demographic of informants

Characteristic aspects	Faculty of		
	Agricultural and Environmental Sciences	**Engineering**	**Health Sciences**
Sex	Female: 42% Male: 58%	Female: 8% Male: 92%	Female: 95% Male: 5%
Average age (years)	18.9	19.1	18.5
Semester (medium)	IV	V	III
Number of semesters studying (average)	5	6	4

Source. Own elaboration

In order to assess the impact, benefits, difficulties and uses of the ICT resource implemented in the development of the subjects, in order to strengthen the evidence of independent work of the student while becoming a teaching resource to support the teaching and learning process. The valuation scale used offered three levels of

response (High, Medium, Low) then the following tables establish the comparison at the level of faculties with respect to the High and Low levels in each of the variables considered in the research.

Table 3
Comparative for faculties relative to High and Low levels

Benefits	Level High			Level Low		
	P1	**P2**	**P3**	**P1**	**P2**	**P3**
Information	48.8%	47.8%	60.6%	23.2%	29.0%	19.4%
Communication	33.6%	24.0%	33.8%	39.2%	47.8%	40.6%
Average	**41.2%**	**35.9%**	**47.2%**	**31.2%**	**38.4%**	**30.0%**

P1: Program Faculty of Engineering; **P2**: Faculty of Agricultural Sciences Program;
P3: Faculty of Health Program
Source. Own elaboration

Table 3 shows the average percentage assigned to the first variable analyzed corresponds to the *benefits* derived from the application of the ICT resource allowing to highlight that students of the Faculty of Health Sciences manifest the highest percentage of favorability favored by the Information dimension, highlighting as positive aspects that through the resource has constantly information associated with the development of the subject and that can be consulted at any time and place, providing independence teacher. In this sense Maldonado (2012) mentions that digital media is "a source of information and multidirectional communication channels among members of the educational community". (p. 111). Another positive element that students highlight is that as they perform the various activities the teacher has the space to make feedback and immediately assign a grade, then you can track in real time the progress academic in the subject.

In contrast to the stated so far, the size of the Communication has led to greater nonconformity in students of the Faculty of Agricultural Sciences and the Environment, because two weaknesses of the ICT resource in terms of its operation, being on the one hand the limited use of social networks as a communicative resource; and on the other hand, the application constantly experiences falls or system failures, preventing in many cases its access.

Finally, with regard to the students of the Faculty of Engineering it is mentioned that their opinions are divided at both ends of the valuation scale, but they align the self-contained trends: it offers permanent useful information for the student as activities and qualifications, but presents connectivity failures and does not link the use of social networks within its operation.

For all the above, it is suggested that the ICT course should initiate the process of rapprochement with social networks, because it is undeniable the value that they have in the lives of students and it would be valuable to incorporate them into the teaching process.

Table 4
Comparative for faculties relative to High and Low levels

Teaching Resource	Level High			Level Low		
	P1	**P2**	**P3**	**P1**	**P2**	**P3**
Strategies	40.6%	27.0%	43.8%	22.8%	39.2%	29.6%

P1: Program Faculty of Engineering; **P2**: Faculty of Agricultural Sciences Program;
P3: Faculty of Health Program
Source. Own elaboration

Table 4 shows the average percentages obtained in each faculty with respect to the second variable under investigation and corresponding to the *evaluation* of the ICT resource as a support tool in the teaching process. The students of the Faculty of Health Sciences were the ones who rated this variable best, highlighting as positive aspects that through the ICT resource promotes the development of activities oriented to formative research, that is, the development of research skills in students such as the use of databases and the writing of research reports. In this sense, the statement of Montes, Romero & Gamboa (2017) who states that digital resources facilitate the development of research through active teaching processes is resumed, then it is important to enhance this aspect at all times.

Following the same common thread, for its digital nature, it is expected to foster the commitment and development of research-related skills and skills. It is necessary to refer to what Alcántara (2007) who defines this tool as follows: "It is a strategy oriented to research in the Network, which allows students to use their time effectively, using and transforming information, rather than searching for it" (p. 4), accordingly, it is necessary to energize research, in order to achieve spaces that benefit student community. And it is in this sense that students of the Faculty of Agricultural and Environmental Sciences show that it is a weakness in their academic program. They argue that there are few proposed activities that motivate the development of research skills and, therefore, an opportunity to improve the student's teaching process is lost.

In this variable, students of the Faculty of Engineering at the general level have a positive perception because they value the importance of ICT resources today in the process of accessing information, but emphasize that it is important to locate reliable sources that offer real knowledge and not just speculations or subjective postures.

Table 5
Comparative for faculties relative to High and Low levels

Learning Strategy	Level High			Level Low		
	P1	**P2**	**P3**	**P1**	**P2**	**P3**
Operation	46.8%	43.6%	51.0%	11.8%	19.0%	19.6%

P1: Program Faculty of Engineering; **P2**: Faculty of Agricultural Sciences Program;
P3: Faculty of Health Program
Source. Own elaboration

As for the *Learning Strategy* variable shown in table 5, the ICT resource is analyzed from three dimensions: pedagogical approach, pedagogical resources and time organization. Approximately half of the students of the Faculty of Health Sciences have expressed their favorability in this variable in that they emphasize that the activities proposed by teachers promote the self-employment of the student, offering spaces of interaction between the different knowledge with the capacities of the students recognizing different rhythms of learning, which ends up triggering in the optimal management of time and enhancing values such as responsibility and discipline.

On the same faculty, a representative group of students has an opposing opinion, since they recognize that there is diversity of activities proposed by the teacher that, in some cases, turn out to be excessive; but performing these activities is not guaranteeing the understanding of knowledge since in some cases responsibilities must be distributed without generating feedback spaces.

In this sense, Acevedo (cited by Piña, García, & Govea, 2009), argues that "... the wiki, in addition to encouraging cooperative learning among students, helps develop their creativity to design and produce activities in accordance with the content addressed". (p. 34), then it is required that teachers carry out an adequate programming of activities, that promote interaction between groups in order to produce content that really becomes evidence of learning.

Analyzing the opinions of the students of the Faculties of Engineering and Agricultural and Environmental Sciences, the promotion of autonomous learning must be recognized in the ICT resource, but they identify as weaknesses the excessive load of activities proposed by teachers with very short delivery times short, as well as the limitation regarding the size of the files that can be attached and the lack of activities that promote cooperative learning.

Table 6
Comparative for faculties relative to High and Low levels

Applications	Level High			Level Low		
	P1	**P2**	**P3**	**P1**	**P2**	**P3**
Organization	55.8%	51.2%	54.8%	16.8%	20.8%	17.8%
Digital portfolio	46.6%	38.8%	47.2%	24.3%	19.5%	23.3%
Average	**51.2%**	**45.0%**	**51.0%**	**20.6%**	**20.2%**	**20.6%**

P1: Program Faculty of Engineering; **P2**: Faculty of Agricultural Sciences Program;
P3: Faculty of Health Program
Source. Own elaboration

Finally, the table 6 show as for the *Applications* that members of the academic community have given to the ICT resource, two dimensions were analyzed: as a resource that facilitates the organization of independent work activities or as a digital portfolio.

In this aspect it is emphasized that in the Faculties of Health Sciences and Engineering the ICT resource has been used as a digital portfolio in which evidence is made the independent work of the student, a key aspect in the accreditation processes of programs academics. In this sense García & García (2012) refer that the school portfolio and the e-portfolio provide the educational process and evaluation, the accompaniment and individual follow-up of students in their learning processes, contextualization of thematic contents at the general and specific level, underlining the group work and optimizing class time; in the meantime students improve their study habits, self-regulate their learning, reflect on their own progress and at the same time are evaluated according to their progress; that is, it recognizes the individuality of the human being that, together with the different rhythms of learning, allows to have some academic flexibility that is not given in a traditional classroom scenario or without technology.

Although there is a representative group in the Faculty of Agricultural and Environmental Sciences that has a positive perception in this variable, it is noted that a subgroup of them identified as weaknesses of the ICT resource the following: a) it does not take into account the suggestions made by students in order to improve the work environment; b) while acknowledging its importance in the teaching process, they claim that it is more a means of controlling student self-employment where teacher feedback processes are not met in a personalized way, but ends up generating a series of messages depending on the quality level of the work delivered; c) are few not to mention null, the group activities that are developed and registered in the ICT resource, since each student must enter their activities individually so they would have developed in a group way.

4. Conclusions

Based on the results obtained in this research, it can be shown that in an educational institution of Higher Education with an academic offer of more than 25 programs at the undergraduate level grouped in six different faculties, in which a same pedagogical model has been defined for the development of teaching activities that added to the fact that having selected informants enrolled in three academic programs that have the recognition

of High-Quality by the Ministry of Education - Colombia, there are teaching trends that make differences between one program or another. These discrepancies could be attributed to the nature of the disciplinary knowledge of each faculty, but that is where the unification of criteria for the use of the various ICT resources offered by the institution to the academic community is recommended, since it could be thought that depending on the faculty an optimal use of them is carried out.

It is highlighted in common in all informants who as students recognize the ICT resource as a modality of digital portfolio, emphasize that it is a valuable resource in the teaching of knowledge as it is evidence of the training process that develops throughout the academic semester, energizing and innovating the concept of a space for pedagogical interaction between the student, the teacher and the disciplinary know-how.

Of the positive aspects of the technological resource developed and implemented in this institution of higher education, its use in the development of research skills in students is highlighted, the organization of activities ensuring the fulfillment of academic duties, the development of self-discipline and self-control in the management of independent time (important concept in the definition of academic credit).

One aspect to be improved in the opinion of informants regardless of the academic faculty or program they carry out, is that it is necessary to incorporate some connection between the accompanying ICT resource with one of the existing social networks, since link it would facilitate the notification of new activities uploaded by the teacher, while the delivery times of the activities already proposed would be taken into account. Also, at the institutional level it is necessary to improve the technological infrastructure that supports the digital resource since by constantly experiencing drops in the system or by limiting the size of the attachments hinders the achievement of the objectives proposed.

Finally, considering that the use of the ICT resource in the teaching process was investigated in three programs that have high-quality accreditation, identifying a number of weaknesses in its pedagogical implementation is recommended at the institutional level schedule courses that guide the proper use of the tool and thus ensure its optimal use regardless of its knowledge area or quality condition.

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Annexes

Items
1. Does PLAD generate information on the educational level of the students?
2. PLAD offers a support in student training?
3. From your experience, have you seen educational benefits in the use of PLAD?
4. Does PLAD provide educational information?
5. Does PLAD contribute to the improvement of student academic performance?
6. Does PLAD allow you to give your students information about their academic performance?
7. Is the use of social networks evident in PLADs?
8. Does PLAD promote the use of social networks as communication aspects?
9. Is there a suitable connection for the application of PLAD?
10. Does the connection used in PLAD benefit communication in educational practice?
11. Does PLAD promote the development of research work as a teaching strategy?
12. Is research carried out with the help of PLAD in the development of education?
13. Is PLAD a tool that makes teaching more dynamic?
14. Does PLAD as a teaching tool contribute to the improvement of the teaching process?
15. Does PLAD facilitate the student's learning?
16. Does PLAD promote autonomy in student learning?

17. Does PLAD offer the pedagogical space for the interaction between disciplinary knowledge and the student?
18. Does the university offer the right resources for you to work with PLAD?
19. Has PLAD made it easier for you to organize your academic work in and out of the classroom?
20. Does PLAD optimize the time dedicated to the student's independent work activities?
21. Does PLAD allow for the organization of ideas?
22. Are the student's ideas used in PLAD?
23. Is PLAD a teaching support tool?
24. Does the use of PLAD encourage the development of the process of teaching and monitoring independent work?
25. Is PLAD a teaching strategy?
26. Do you think that the use of the PLAD tool favors the teaching process?
27. Does PLAD promote group work?
28. Is group work valued with the application of PLAD?
29. Does PLAD optimize the review time of academic activities assigned to students?
30. Does PLAD promote time management in the planning of academic activities?
31. Does PLAD develop reflexive processes?
32. Does PLAD allow you to obtain more information to generate reflections?

PLAD: Platform for Supporting Teaching