

Innovative educational practices through the use of ICT in the teaching-learning process: A diagnostic study

Las prácticas educativas innovadoras a través del uso de las TIC en el proceso de enseñanza aprendizaje: Un estudio diagnóstico

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ABSTRACT

The article presents the main results of the diagnosis carried out by students and teachers of the Digital Educational Competences program of the Instituto Superior Espíritu Santo, on the teaching-learning process in relation to innovative educational practices and the creative and efficient use of ICT. The research was based on the theoretical references related to educational innovation and technological resources, and on the data obtained from the research instruments applied to teachers, students and directors of Basic Education; which allowed the analysis and understanding of the problem and to establish as a study objective to determine the current state of the teaching-learning process in relation to the creative and efficient use of ICT and innovation in educational institutions in the city of Guayaquil. A qualitative methodology is used and an exploratory and hermeneutic type of research is developed based on the emergent paradigm, which allows the subjects of the study to actively participate in the research process; the theoretical methods used are analysis-synthesis and inductive-deductive; within the empirical methods,

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observation, interview and survey are used; and in the processing of the survey results, the percentage analysis is used. The main results are related to the lack of adequate technological resources and insufficient access to the Internet, which exacerbates the existing disparities in education; the low development of digital competencies of teachers and the resistance to change that hinders the adoption of new digital tools and innovative practices in the classroom.

Key words: technological resources, internet, digital competencies, educational innovation.

RESUMEN

El artículo presenta los principales resultados del diagnóstico realizado por estudiantes y docentes de la carrera Competencias Educativas Digitales del Instituto Superior Espíritu Santo, al proceso de enseñanza aprendizaje en relación con las prácticas educativas innovadoras y el uso creativo y eficiente de las TIC. La investigación se sustentó en los referentes teóricos relacionados con la innovación educativa y los recursos tecnológicos, y en los datos obtenidos de los instrumentos de investigación aplicado a docentes, estudiantes y directivos de la Educación Básica; lo que permitió el análisis y la comprensión de la problemática y establecer como objetivo de estudio determinar el estado actual del proceso de enseñanza aprendizaje en relación al uso creativo y eficiente de las TIC y la innovación en instituciones educativas de la ciudad de Guayaquil. Se trabaja una metodología cualitativa y se desarrolla una investigación de tipo exploratoria y hermenéutica sustentada en el paradigma emergente lo que posibilita que los sujetos de estudio participen activamente en el proceso investigativo; se utilizan como métodos teóricos el análisis-síntesis y el inductivo- deductivo; dentro de los empíricos se usan la observación, la entrevista y la encuesta; y en el procesamiento de los resultados de la encuesta se utiliza el análisis porcentual. Los principales resultados están relacionados con la falta de recursos tecnológicos adecuados y el insuficiente acceso al internet lo que exagera las disparidades existentes en la educación; el bajo desarrollo de competencias digitales de los docentes

y la resistencia al cambio que dificulta la adopción de nuevas herramientas digitales y prácticas innovadoras en el aula.

Palabras clave: recursos tecnológicos, internet, competencias digitales, innovación educativa

INTRODUCTION

Currently, the introduction of ICT in educational processes is an unavoidable fact. According to Marqués (2001) cited by (Rangel, 2015), the teacher is no longer limited only to teach knowledge that will have a limited validity and will always be accessible. Today, their main role is to help students to "learn to learn" autonomously in this culture of change and to promote their cognitive and personal development through critical and applicative activities that, taking advantage of the immense information available and the powerful ICT tools, take into account their characteristics (student-centered training) and require them to actively and interdisciplinary processing of information so that they build their own knowledge and do not limit themselves to performing a simple passive reception-memorization of information.

However, in pedagogical practice it is observed that many teachers have limited knowledge of online educational resources, collaborative tools and innovative teaching methods, which prevents the active participation of students in their own learning and limits the development of competencies that are essential to meet the challenges of the information and knowledge society.

Digital competencies are defined as a set of knowledge and skills that facilitate the responsible use of digital devices, technological applications for communication and networks to, in this way, access information and carry out an adequate management of these devices (Ecuador, Ministry of Education, 2021). On the other hand, UNESCO cited by (Profuturo, 2023), considers that digital teaching competencies are the skills and knowledge necessary to access, understand, exchange and create information through the prudent use of technologies for teaching and learning purposes.

However, in the country's educational institutions, access to the Internet is still limited, and the technological resources available are insufficient or inadequate; a situation that represents a significant obstacle for teachers to develop digital competencies. In addition, it creates a digital divide that negatively impacts the quality of education.

To address these challenges and ensure that teachers achieve a high level of mastery in the use of ICTs, it is crucial to implement effective professional development strategies, invest in adequate technological resources and foster a culture of innovation in schools. After these reflections, the objective of the research is to determine the current state of the teaching-learning process in relation to the creative and efficient use of ICT and innovation in educational institutions in the city of Guayaquil.

MATERIALS AND METHODS

The research follows a qualitative methodology, exploratory and hermeneutic, based on

the emergent paradigm because it arises from the dynamics and reality of teachers and students of Ecuadorian basic education and the challenges they face in the education of the twentieth century I, also facilitates the active participation of the subjects of study. The research is a diagnostic study and uses theoretical methods such as analysis-synthesis and inductive-deductive; within the empirical methods, observation, interview and survey are used; which allowed the authors to determine the current state of the teaching-learning process in relation to the creative and efficient use of ICT and innovation in educational institutions in the city of Guayaquil; the percentage analysis method is also used in the processing of the results of the surveys applied to teachers and students of Basic Education.

The research sample is made up of 62 teachers, 188 students of basic education and 14 directors of private and public educational institutions in the city of Guayaquil.

Interventions.

Once the research instruments are designed, they are submitted to evaluation to guarantee their validity and reliability. The evaluation implies a rigorous process that seeks to identify possible deficiencies in the instruments designed and to make the necessary adjustments to improve their effectiveness. Pilot testing is then conducted with a small sample of participants to test the functionality of the instruments under conditions similar to real research, to identify problems such as ambiguous questions or complicated procedures.

Once the questionnaire has been corrected, it is applied by students and teachers of the Digital Educational Competences program of the Instituto Superior Espíritu Santo, using the forms.app program, and Microsoft Excel is used for data processing and tabulation.

RESULTS

In an increasingly digitized world, digital skills are crucial, and computer labs provide an environment where students and teachers can acquire and hone these skills. However, 32% of teachers surveyed say they do not have labs in their schools (see Table I), highlighting both the educational benefits of labs and the current limitations faced by many institutions; computer labs are vital to ensure that all students have equitable access to technology.

Forty-seven percent of the teachers surveyed stated that they have never used laboratories to teach classes, which reveals that teachers do not optimize or take advantage of the existing technological infrastructure in educational institutions to support the teaching-learning process; On the other hand, the rest of the teachers respond that they always use it (27%) and 26% that they only sometimes use the laboratories for teaching classes and/or practices, which shows that there are teachers committed to the integral development of students and that they recognize the value of the laboratories as tools for meaningful learning and the formation of digital competencies in the new generations.

Another data obtained from the survey to teachers and that deserves a deep analysis is related to the technological resources available in the Educational Institution and

whether these are sufficient and adequate to develop digital competencies in students and teachers; 69% of teachers consider that these resources are neither sufficient nor adequate to use in the teaching-learning process (see table 1). This marks a significant concern in the educational environment, where technology plays an increasingly crucial role. The lack of suitable technological resources can limit teachers' ability to implement innovative teaching methods to foster meaningful learning and digital competence in students.

Only 52% of teachers admit that their institution has access to the Internet, 45% do not have access to the Internet, which represents a serious problem because it negatively affects the quality and equity of the educational process (see Table 1). Internet access is essential for teachers and students to be able to use online educational resources, access updated information and use digital tools that complement learning in the classroom.

Fifty-eight percent of the teachers have received training from the IE on the use of ICTs in the teaching and learning process, which is something positive that deserves to be highlighted. Training on the use of ICT allows teachers to acquire the digital competencies necessary to effectively integrate technology into their teaching practices. Not to mention that 25% of the teachers responded that they only sometimes receive this type of training and 17% stated that they have not received training from the IE on the use of ICT in the teaching-learning process. On the other hand, only 39% of teachers consider that these trainings respond to their real training needs (see Table 1).

When the trainings respond to the needs of teachers, they promote the formation of digital competencies necessary to effectively integrate technology into their pedagogical practices, allowing them to design more dynamic and interactive learning experiences adapted to the needs and learning styles of students.

Regarding teachers' mastery in the use of ICTs, 47% rate it as high, 39% as medium and 14% consider their mastery to be low (see Table 1); these data underscore a significant concern in the educational field, where technology plays an increasingly crucial role. Teachers' low or poor proficiency in the use of ICTs limits teachers' ability to implement innovative teaching methods and provide inclusive education with quality and equity.

Forty-nine percent of the teachers surveyed believe that they always promote the use of ICTs in the learning process of students, 39% of the teachers consider that they only sometimes do so, and 10% respond that they never do (see Table 1). These data highlight the fact that the effective use of Information and Communication Technologies (ICT) in the teaching-learning process has not yet been achieved. Although a significant percentage of teachers claim to always promote the adequate use of these tools, there is a considerable proportion that recognizes difficulties in achieving this objective, this may be due to the low development of computer skills of teachers, the limited spaces for the preparation of teachers in relation to the effective use of ICT in the classroom, and last but not least is the fact of technological or infrastructural barriers that hinder their integration.

According to the teachers surveyed 47% of the students use web pages in the learning process, this indicates that access to online resources is playing a fundamental role in

education; 29% state that they sometimes use it and 14% consider that students never use web pages for their learning (see table 1); the reasons behind this situation may be in the limited access to technology or due to personal preferences. In summary, these data corroborate the need for adaptive education that effectively integrates online resources to support the diverse ways in which students learn and access knowledge in the digital age.

In relation to the technological resources most used by teachers in the teaching-learning process according to the survey applied are PowerPoint presentations, videos, and social networks; the least used are Software, Zoom, E-book, Prezi, Discussion forums and Infographics; these data are organized from the most used to the least, as shown in The correct application and selection of technological resources can improve the efficiency of the teaching-learning process by offering educational resources accessible at any time and place. Digital platforms can also facilitate rapid and personalized feedback, thus enhancing individualized learning. The preference for a particular technological resource may be conditioned by several factors such as knowledge, accessibility to these, fear of failure and technical or technological barriers, among others.

These data underscore the need to make teachers and managers aware of the potential of resources such as software, Zoom, E-books, Prezi, discussion forums and infographics, which offer unique opportunities to enrich learning, encourage student participation and creativity, and promote a more interactive and personalized approach in the classroom. In relation to the development of innovative practices in the teaching-learning process, the results are as follows: 66% of the teachers respond that they always use innovative strategies in their pedagogical practice, 31% indicate that they sometimes manage to develop innovative practices in class, and only 3% accept that they have not been able to do so. This result shows that a culture of innovation has not yet been achieved among the main actors in the educational process (see Table 1). However, it should be noted that 66% of teachers state that they apply innovative practices, which shows a degree of openness to innovation, but also reveals that these practices are not an integral part of their educational approach.

Among the innovative strategies most used by teachers in the teaching-learning process are Project Based Learning (PBL), Educational Gamification and Technology Integration; among the least used strategies according to this result are Cooperative Learning, Flipped Classroom, Virtual and Augmented Reality, Adaptive Teaching and Universal Design for Learning (UDL); the data have been organized from the most used to the least, as shown.

The choice of the appropriate strategy depends on the specific needs and characteristics of each group of students and the educational context in general; this result shows that there are innovative strategies that are more accepted than others by teachers, so it is necessary to emphasize that all strategies have the potential to improve educational quality and promote meaningful learning in students. It must be recognized that these data are a reflection of the Ecuadorian pedagogical model centered on the student and

the use of digital tools to improve the educational experience and promote meaningful learning, and the curricular model that establishes PBL as a central mythology.

The development of a methodological guide that promotes innovative educational practices focused on the creative and efficient use of Information and Communication Technologies (ICT) in the teaching-learning process is accepted by more than 70% of the teachers surveyed; this indicates the need for teachers to have a well-designed methodological guide that allows them to explore new ways of teaching and learning taking advantage of the potential of technological resources; as long as its main objective is to promote the creative and efficient use of ICT in the educational process to contribute to the integral formation of students; which translates into preparing them to face the challenges and opportunities of an increasingly digitized world (see Table 1).

Table 1. Results of the survey to teachers.

1. Does the Educational Institution have computer laboratories?		
Yes	42	68%
No	20	32%
2. Do you use the laboratories for classes and/or practices?		
Always	17	27%
Sometimes	16	26%
Never	29	47%
2. Is the technological equipment available in the IE sufficient and adequate to develop digital competencies in students and teachers?		
Yes	12	19%
I don't know	8	13%
No	42	69%
3. Does the Institution have access to the Internet?		
Yes	32	52%
No I don't know	2	3%
No	28	45%
Have you received training from the IE about the use of ICT in the teaching and learning process?		
Yes	42	58%
Sometimes	18	25%
Never	12	17%
4. Do the trainings on the use of ICT that you have received respond to your real training needs?		
Very much	22	39%
Regular	23	40%

Not at all	12	21%
5. How proficient are you in the use of ICT?		
High Proficiency	29	47%
Medium Proficiency	24	39%
Low Proficiency	9	14%
6. Do you promote the appropriate use of ICT in the students' learning process?		
Always	32	51%
Sometimes	24	39%
Never	6	10%
7. Do students use web pages in the learning process?		
Always	29	47%
Sometimes	24	39%
Never	9	14%
Do you develop innovative practices in the teaching and learning process?		
Always	41	66%
Sometimes	19	31%
Never	2	3%
9. Does a methodological guide on innovative educational practices encourage the creative and efficient use of ICT in the teaching and learning process?		
Strongly agree.	21	34%
Agree.	28	45%
Neither agree nor disagree.	4	7%
Disagree.	7	11%
Strongly disagree	2	3%

Analysis and discussion of the main results of the survey of Basic Education students. Due to the importance of computer laboratories in the integral formation of students, they were asked if the institution where they study has this type of laboratory. 54% of the respondents affirmed the existence of computer laboratories in their schools, while 46% said that they do not have these laboratories in their institution (see Table 2); data that coincide with those given by teachers, which represents a serious problem for the education of new generations in an increasingly digitized world; computer labs are spaces for interaction where teachers and students share knowledge and experiences with the use of ICTs, it is also a learning environment conducive to the development of computer skills necessary in the formation of the student.

For the students surveyed, the technological equipment that exists in the IE is not sufficient or adequate for their learning (54%) as shown in Table 2; these statistics

highlight the importance of investing in technological infrastructure in educational institutions, it is imperative that schools have updated resources and reliable internet connections to ensure that all students have equal access to digital educational resources.

Since the COVID-19 pandemic in 2020 and the declaration of internal war conflict in January 2024 in the country, hybrid education has become an integral part of the education system. The lack of adequate technological equipment hinders the effective transition to these online learning modalities, thus limiting students' opportunities to actively participate in their education.

Regarding Internet access, the response of the students surveyed coincides with that of the teachers (see Table 2). Limited access to the Internet hinders the effective integration of technology in the classroom; without access to a reliable connection, students face obstacles to implement digital tools and platforms that promote interactive and developmental learning.

Only 18% of the students surveyed stated that teachers use the laboratories to teach classes, 47% stated that only sometimes they receive classes in the laboratory and 35% indicated that teachers never give classes in the laboratories (see Table 2). These results show that there is at least an intention on the part of teachers to incorporate these resources into their educational practice, but they also indicate a lack of consistency in their use, which may be due to time constraints, limited access to laboratories, insufficient and inadequate technological resources or the perception of teachers and administrators that traditional teaching is more efficient.

The effectiveness of ICTs depends largely on how they are integrated into the educational process. 14% of the students surveyed consider that teachers use technological resources in class very well, 20% rate it as good and 36% as regular; the rest of the students (30%) rate the use of technological resources as bad and very bad (see Table 2). This result demonstrates the need to make managers and teachers aware of the role of ICTs in contemporary education; technological resources enrich teaching by providing access to diverse educational resources, facilitating communication between teachers and students, and fostering collaboration and creativity.

The use of web pages in learning is still not significant, according to the data obtained in the students' survey (see Table 2); the fact that almost half of the students always or sometimes resort to web pages shows that these platforms are a valuable source of information. On the other hand, it is important to consider that 35% of the students state that they never use web pages for their learning. From the perspective of the authors of this study, this is due to the limitations of access to technology, which is one of the great barriers faced by education in the country, or to personal preferences. Web pages can offer a variety of educational resources, from articles and videos to complete online courses, which complement or expand the content taught in the classroom.

Another question asked to the students that coincides with the response of the teachers is related to the technological resources most used by them in the teaching-learning process; according to the students surveyed, the most used resources are videos,

PowerPoint presentation and social networks; and among the least used are: Software, Zoom, E-book, Prezi, Infographics and discussion forums; the technological resources are organized from the most used to the least used.

This shows that the potential of ICTs in the teaching-learning process is not fully exploited, and this may be largely due to the lack of knowledge on the part of teachers of the diversity of tools that can be used to improve student learning and for the development of digital competencies.

It also stresses the need to systematically train teachers on the use of ICTs in education. While videos, PowerPoint presentations and social networks are valuable tools, there are numerous other digital technologies and resources that can further enrich teaching and learning. These include online learning platforms, interactive applications, simulations, educational games, real-time collaboration tools, among others.

For 21% of the students surveyed their teachers always use innovative didactic resources in classes, 32% consider that only sometimes teachers implement innovative practices in the classroom and 46% think that teachers never use innovative didactic resources in the teaching-learning process; a result that suggests a more exhaustive study because innovative educational practices are fundamental to improve the quality of education and adapt it to the changing needs of students and society. It is important to keep in mind that developing innovative educational practices requires significant investments in time, money and trained human resources.

Innovative practices focus on promoting skills such as problem solving and the development of creativity and critical thinking. However, according to student feedback the innovative strategies most used in the classroom by teachers are: Project Based Learning (PBL), Educational Gamification and Technology Integration; the least used, according to students are Cooperative Learning, Flipped Classroom, Virtual and Augmented Reality, Adaptive Teaching and Universal Design for Learning (UDL). The data have been organized according to the opinion of the students from the most used resources to the least used.

These data coincide with those obtained by teachers, which shows one of the major problems facing Ecuadorian education is the limited knowledge of teachers of the various innovative strategies and their effective implementation in the teaching process. Innovative practices must take learning beyond the memorization of data; they must promote meaningful learning that prepares students to face the problems they face in different areas of life, which translates into offering education with quality and equity.

The managers interviewed all agree that, in order to achieve innovative educational practices through the effective use of ICTs, adequate levels of accessibility to digital services and tools and teachers with digital competencies that allow them to perform efficiently in the teaching-learning process are required.

However, managers recognize that their educational institutions do not have the appropriate technological infrastructure to facilitate the use of innovative educational resources and access to relevant information, which is detrimental to educational quality. Regarding the digital competencies of teachers, managers agree that they have not yet

achieved high levels of mastery in the use of ICT; this result is understandable and reflects the challenges faced by education in the digital era. According to the managers, the causes of this problem include the following:

- The speed at which ICT changes; they state that what is relevant for them today is obsolete tomorrow, and this represents a problem for teachers who cannot keep up with innovations and adapt them effectively to their teaching methods.
- Teachers who feel intimidated by technology or have some resistance to change, which hinders their willingness to explore and adopt new digital tools and develop innovative classroom practices.
- Limited resources: the lack of access to adequate technological resources and continuous training programs is an obstacle for teachers to improve their digital competencies. Investment in infrastructure and continuous training is essential to close this gap.

The results of the diagnosis lead to a reflection about ICTs and their effective use in the educational process; coinciding with Álvarez, Núñez & Rodríguez, 2017; Mezarina, Páez, Terán & Toscano, 2015, cited by (Lévano, et al., 2019), those who state that society as a whole is witnessing the revolution in the ways and forms of the use of the so-called digital resources and the virtualization of information, whose impacts in the current context seeks to rethink what was hitherto conceived about the possibilities of new technologies and their possible consequences.

On the other hand, (Galindo, Ruiz, & Ruiz, 2017) expose in their study their concern regarding the digital competencies of students and teachers in the Knowledge Society, these authors consider that despite all the information technology that has been placed in the hands of teachers, they are not able to take advantage of all its potentialities; concluding that this is due to the feeling of certain complacency in the use of limited digital tools and strategies, so that a certain obsolescence of digital competitiveness is perceived among them.

DISCUSSION

The results of the diagnosis showed that the low development of innovative practices mediated by the responsible use of technological resources in the classroom is conditioned by several factors, such as the lack of training programs for teachers; the limited availability of adequate technological resources, such as computers, mobile devices or reliable Internet access; and the resistance to change of both teachers and administrators.

Despite the importance of computer labs, not all schools have them, due to financial reasons, inadequate infrastructure, or different educational priorities, which creates a digital divide among students and increases educational and economic inequalities.

The technological resources available in educational institutions are neither adequate nor sufficient to be used effectively in the teaching-learning process, which may limit the ability of teachers to implement innovative teaching methods and motivate meaningful learning among students.

Not all educational institutions have access to the Internet; this disparity in Internet access creates significant inequalities between institutions and among students, increasing educational gaps and limiting opportunities for academic and professional development.

There is evident concern about the level of digital competencies of teachers, reflecting the challenges facing Ecuadorian education in the digital age. A methodological guide on innovative educational practices can serve as a professional development tool for teachers, providing practical guidance and concrete examples on how to effectively integrate ICT into their classes, thus fostering more meaningful and motivating learning for students.

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