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THE INFLUENCE OF INFORMATION AND COMMUNICATION TECHNOLOGIES ON THE TEACHING-LEARNING PROCESS AMONG UNIVERSITY STUDENTS

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Abstract: Introduction The teaching-learning process is interrelated with various types of activities in which the teacher plays a leading role, guiding students, evaluating the process, and assessing the results achieved by each student; Likewise, education has various specific goals that respond to the individual being educated, as well as to the social and cultural model. In this sense, learning management is defined as the set of activities and strategies to facilitate the achievement of goals, objectives, and purposes, with the support of educational technology to systematically design, implement, and evaluate teaching-learning processes, utilizing various means to ensure that education achieves its purpose. For this reason, it seeks to identify how the use of ICT influences the teaching-learning process. **Methodology** A cross-sectional, descriptive study was conducted among first-year undergraduate students. For data collection, the Technological Resources and Learning Strategies (RTEA) questionnaire was used, consisting of 61 items across 7 dimensions. **Results and Discussion** The sample consisted of 125 first-year students in the nursing and community development for aging programs. The instrument showed a reliability coefficient of .943 (Cronbach's alpha), indicating good internal consistency for a unidimensional scale. Differences were found in the proportion of students by program regarding learning strategies ($\chi^2 = 7.008$, $df = 2$, $p < 0.05$); with regard to teaching strategies and ICTs, a statistically significant linear and inversely proportional association was found ($r_p = .295$, $p < 0.05$). Technological resources have high potential to drive innovation but do not necessarily lead to improved educational practices. **Conclusions** There is a significant relationship between teaching

and learning strategies and the use of technologies, demonstrating the benefits of using ICTs in learning processes.

Keywords Learning, teaching, information technology

Introduction

Guzmán (2023) argues that the implementation of ICT (Information and Communication Technologies) is positively received by society, changing both the way we teach and the way we learn. Each of these tools is evolving to become a key component that helps improve the quality of teaching, enabling students to efficiently access, manage, and obtain information of any kind. Maleki et al. (2012) state that the use of ICTs modifies structures, lifestyles, teaching and learning processes, communication processes, and even the way we teach, thereby fostering a society of knowledge and communication.

Gaf (2020) indicates that this type of technology is used to exchange information—such as through social media, digital platforms, email, various browsers, and others—thereby facilitating the dissemination of information across different fields of knowledge.

Revelo (2022) suggests that achieving learning requires the availability of time, effort, and determination; in any situation where the acquisition of knowledge is required, when organizing a self-directed course, three attitudes are necessary: focus (concentrating on a goal), responsibility (acquiring information to discover new paths), and commitment (analyzing, discerning, synthesizing, and acting).

Armas-Alba and Alonso-Rodríguez (2021) note that the implementation of ICTs implies a shift in the roles of teachers and students, who will use these tools on an ongoing basis to facilitate work both inside and outside the classroom, as students take on responsibility, participating actively and autonomously with flexible work schedules. The use of ICTs presents challenges, requiring teachers to be literate in the various devices, which are essential for student education.

According to (León and Cisneros, 2021), students must possess competencies in the use of technologies, keeping up to date with the latest developments in their areas of interest, in order to make ethical use of these tools.

Barbosa-Quintero et al. (2023) argue that the implementation of ICTs for academic education requires a multidimensional perspective in which each student has access to information digitally, adheres to digital ethics, and engages in effective teacher-student and student-teacher communication, within a solid framework for their successful application in educational institutions.

Arriaga, Bautista, and Camacho (2020) note that teachers must be educated on the theoretical foundations of these tools, with an emphasis on the pedagogical aspects and a clear understanding of how, when, and why they should be used; this is because many educators teach based on how they themselves were taught or on their limited or extensive experience with these tools.

To this end, (Caballero, Pachas, and Caballero, 2023) propose that teachers should adopt strategies to facilitate virtual

learning by planning lessons and activities within virtual platforms.

Proveída and Cifuentes (2020), cited by Velázquez-Humpire and Guerra de -González, (2024), that “the main driver is technology in education, which brings about changes in the various ways of teaching through a new model that maintains both asynchronous and synchronous communication or allows for diverse circumstances in which the subject’s curriculum content can be addressed.”

Lerma-Noriega et al. (2020) note that when technologies are used, they allow students to develop at their own chosen pace to acquire new skills, which will enable them to use these tools for their learning.

(Yong et al., 2017) emphasize that the use of ICT is a pedagogical tool highlighted for achieving learning, where the student is the primary educational agent and the teacher is merely a facilitator and guide of knowledge.

According to (Alarcón and Alarcón, 2021), ICT can be used in a flipped classroom setting where information or materials—such as books, documents, videos, or films—can be made available for students to review outside of class. This allows in-person classes to be used to address questions or analyze problems students encounter while learning these topics, thereby achieving deeper, more meaningful learning centered on the students.

(Fernández Delgado, 2022) recommends that the teacher in charge of the subject should organize each of the elements to be presented using ICT, including reference materials, taking into account the characteristics of the students; furthermore, the teacher must guide, orient, and support the

student at all times to achieve meaningful learning.

Neli (2017) emphasizes that meaningful learning is clearly identifiable because it constructs knowledge in an orderly and clear manner, as it is formed by already defined concepts.

Pizano (2014) analyzes that the learning acquired by the student depends on their prior cognitive context, which they associate with new information, understanding this as the knowledge and ideas they possess about a specific field of knowledge, as well as how that knowledge is organized.

Methodology

Design

A cross-sectional, descriptive, observational, and prospective study was conducted using non-probabilistic convenience sampling with a quantitative research approach.

Monje (2011) notes that the quantitative approach describes the characteristics of different studies, in which the manipulation and control of variables are predicted with respect to the various facts or events that occur in the world around us.

Participants

The study included 125 students enrolled in the first year of the nursing and community development for aging programs.

Instrument

The instrument used was developed by (Yordan, 2021), who cites (Melo, 2018), and consisted of the Technological

Resources and Learning Strategies (RTEA) questionnaire, comprising 61 items across 7 dimensions. The first dimension assesses knowledge of ICT, the ability to adapt ICT for learning, Information Acquisition Strategies in Students, Information Encoding Strategies, Information Retrieval Strategies, and Information Processing Support Strategies, using a 5-point Likert scale where 1 corresponded to “Never” and 5 to “Always.”

Ethical considerations

In accordance with the Declaration of Helsinki, data confidentiality was ensured by protecting the identity of each participant.

Data analysis

The data were entered into the SPSS statistical software package, version 25, for Windows. The statistical analysis performed consisted of descriptive statistics and measures of central tendency based on the Kolmogorov-Smirnov normality test.

Procedure

The instruments were administered electronically via a Google form to each student, adhering to reliability criteria. Students were provided with instructions on how to complete the instrument, and any questions were addressed during the administration process, which took approximately 20 minutes without spending too much time on each individual question.

Results

The majority of the analyzed population consists of women, indicating that, regardless of the program, women continue to predominate in the fields of nursing and

Community Development for Aging. Table 1

Differences were identified in the proportion of students in the nursing and community development programs regarding information encoding strategies ($\chi^2 = 9.640$, $df = 2$, $p < 0.05$) as well as processing support strategies ($\chi^2 = 6.091$, $df = 2$, $p < 0.05$). Table 2

Regarding the use of technologies, respondents reported moderate use, as shown in Table 3.

Regarding learning strategies, it was found that only 19% use these strategies, which could improve teaching and learning strategies. Table 4.

To analyze the distribution of the data between the variables “Use of ICTs” and “Learning Strategies,” the Kolmogorov-Smirnov goodness-of-fit test was applied, confirming that the data follow a normal distribution for both variables with a p -value < 0.05 . Table 5

Differences were identified in the proportion of students regarding learning strategies between the nursing and community development programs ($\chi^2 = 7.008$, $df = 2$, $p < 0.05$). As shown in Table 7.

Differences were found in the proportion of students by grade level regarding the variable ICT use ($\chi^2 = 20.74$, $df = 2$, $P < 0.05$), as shown in Table 7.

Discussion

The implementation of ICT in higher education breaks down barriers of distance and physical space, helping to transform teaching processes into new forms of educa-

tion that foster greater student engagement (Delgado, J.F., Franco, E.N., & Macías, J.C., 2023). These technologies help make teaching in higher education, which is student-centered, more accessible and flexible in terms of schedules, adapting to students’ learning pace regardless of their location. However (Roberts et al., 2020) note that the widespread use of digital technologies, due to their advancements in learning and analysis, can lead to dependency issues among students facing social and academic pressures.

On the other hand, De la Hoz, Martínez, Combata, and Hernández (2019, p. 256) show that ICT is a defining feature of a society that has moved beyond traditional teaching toward a shift in the dissemination of knowledge, storing and distributing information from many sources. Meanwhile, Orlandes (2020) states that it is necessary to have an appropriate educational model that aligns with the use of technologies to make effective use of them for academic training.

It is important to add that (Cruz-Pérez et al., 2020) state that educational institutions are committed to making functional use of ICTs in each subject; therefore, teachers must change their teaching methods, adopting a new approach to the teaching-learning process to make education inclusive. Therefore, our results help us understand that the use of ICT is moderate, and this could be attributed to classroom teaching methodologies for the programs studied. Although (Rodríguez, 2021) explains that students spend a lot of time connecting to various networks—and these may involve academic software activities—such activities could be better focused if students are properly guided in using these tools for their learning.

Variable	Freq	% n=125
Age	20.2	1.9
Age Group		
18–21 years	90	(70)
22–25 years	35	(28)
Gender		
Men	28	(22)
Women	97	(78)
Grade level		
First year	77	(61)
Fourth year	48	(38)
Degree		
Nursing	63	(50)
Community Development	62	(50)

Mean ± SD

Table 1 Sociodemographic Variables

Variable	Nursing	Community Development
	N=50	N=50
Information coding strategies	14 (54%)*	12 (46%)
Information retrieval strategies	16 (57%)	12 (43%)
Processing support strategies	21 (68%)*	10 (32%)

Chi-square test *p<0.005

Table 2 Learning Strategies

Variable	Freq	%
Low	31	(25)
Moderate	60	(48)
High	34	(27)

Table 3: Use of ICTs

Variable	Fo	%
Low	29	(23)
Moderate	72	(58)
High	24	(19)

Table 4 Learning Strategies

		Use of ICT	Learning Strategies
N		125	125
Parameters		65.90	44.97
Average			
Means Standard deviation		11.98	8.76
Most extreme differences	Absolute	0.96	0.59
	Positive	0.96	0.59
	Negative	-0.060	-0.59
Kolmogorov-Smirnov Z		1.069	.659
Asymptotic significance (two-tailed)		.204	.777

* Kolmogorov-Smirnov test

Table 5 Data Distribution

Variable	Nursing (n=)	Community Development (n=)
Learning strategies (low)	19(30%)	10 (16%)
Learning strategies (moderate)	37 (59%)*	35 (56%)*
Learning strategies (high)	7 (11%)	17 (27%)

*Chi-square test

Table 6 Percentage of students according to learning strategies

Variable	1st year	2nd year
ICT use (low)	24 (31%)	7 (15%)
Use of ICT (moderate)	43 (56%)*	17 (35%)*
Use of ICT (high)	10 (13%)	24 (50%)

*Chi-square test

Table 7 Percentage of students who use ICTs

On the other hand, (Meroño et al., 2021) states that each student's choice to use ICTs can be beneficial, as they will appreciate how these tools support them in improving the teaching-learning process to their advantage; however, technological advancements could limit their acquisition of information if they overuse them.

In this regard, Pazmay-Pazmay (2023) explains that the use of learning platforms enables students to form learning communities, supported by various tools to achieve the expected learning outcomes. This helps us understand that the use of ICT may be limited by the subjects students are taking, compounded by the fact that the teacher does not implement them for the subject they teach, which could reflect a lack of use of technological tools for learning that subject.

(Magallanes, et al. 2021) note that when simulations are used, this encourages students to interact more openly with models in scenarios that could be real-life situations. For students in the health field, this facilitates understanding and learning in simulated scenarios, thereby strengthening their confidence and assurance in handling such situations.

(Meza and Gallegos 2021) note that the use of technologies helps each student develop new skills in every subject they take to improve teaching and learning processes. However, our results indicate that teachers do not use ICT as frequently or apply it to improve their teaching processes.

Furthermore, (Meneses, 2020) state that to make use of technology, teachers must show students how to learn and use it in accordance with the subject's curriculum,

which could explain why students use ICTs only moderately for their subjects.

Likewise, (Moreno Garay, Ochoa Tajate, Mutter Cuellar, and Vargas Delgado, 2021) suggest that teaching modalities need to shift from in-person to virtual, with a single goal: for students to continue their learning in an active and participatory manner outside the classroom. As our study reflects, usage is moderate, which could be interpreted to mean that working asynchronously might be challenging for some students.

(Mariaca, 2022) explain that to make appropriate use of ICTs, each educational model must be personalized based on educational content adapted to students' needs, as teachers must design them to enhance students' skill development.

Conclusions

ICTs are digital tools that facilitate access to various sources of information, such as books, databases, and electronic journals, providing the most up-to-date information instantly. This benefits students by enhancing the teaching-learning process beyond expectations when these digital tools are used correctly.

The use of ICTs in teaching requires continuous professional development for both faculty and students to achieve educational innovation.

ICTs must be designed, implemented, and evaluated based on the educational context in order to improve the teaching-learning process, since the resources to use them inside and outside the classroom are not always available.

Teachers face significant challenges when teaching via a screen or asynchronou-

sly, but they must develop skills to synthesize, comprehend, write, recognize, and convey information from curricula and study programs, fostering a new way of learning to remain actively engaged in the learning processes.

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