

ICT adoption in university digital natives and immigrants in a pandemic context

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Abstract

Evaluating the factors that affect the teaching-learning process has several factors that intervene directly or indirectly in the results projected by any university education institution; however, when these factors are represented by the virtuality required in times of pandemic, it turns into chaos, since many of its members are not in conditions of adaptability to technology because they are from dissimilar generations. The purpose of the research is to evaluate the significant differences in the teaching-learning process affected by the use of ICT in immigrants and digital natives in university contexts immersed in the pandemic. The research is quantitative, applied, non-experimental design, transectional correlational comparative, applying the hypothetical deductive method. The population consisted of 192 teachers and 362 students. The results showed that through the U- Mann-Whitney statistic, there is a difference in medians in the teaching-learning process, which is significantly affected by the use of ICT in immigrants and digital natives, in a differentiated way; therefore, students respond differently than teachers to the use of ICT in the teaching-learning process at the university.

Keywords: Educational processes, ICTs, digital natives, digital immigrants.

1. Introduction

There is constant concern about how university education should respond quickly to the pandemic context, a phenomenon that has shown adaptive shortcomings in the handling of ICT by its teaching staff (Christian et al., 2020; Maridueña et al., 2020); evidencing unbridgeable gaps with students who do possess these competencies (Mohan et al., 2020, 2020); evidencing the need to strengthen the required competencies and to respond to the mission of the university (Lavy et al., 2020), which comprehensively trains the student to face the highly competitive labor market (Saad et al., 2020). Tofler (1973), a visionary of the future, dared to write a work that would revolutionize

man's thinking, conditioning his ability to adapt, as the way to survive the aggressive technification of society (Nissen et al., 2020). This author warns of unpredictable circumstances of change in the life of man, family, and society. He reports the lack of preparation for the future, disorienting them (Larionova et al., 2021). Human beings are in constant movement, perceiving new realities and with it, new affronts; a reality that today can be fully appreciated in every circumstance of existence (Stankovska et al., 2020). Life is a process of continuous learning, evolving as humans, and, through education, building capacities to face life (Mansilla & Wilson, 2020).

Although education has a determining role in the progress of any society, being the promoting factor of the evolutionary system, learning processes must be constantly adapted to the profiles of the new generations that are succeeding each other in time (Hernández et al., 2020). In idealizing scenarios, the crossing of educational and technological planes is visualized; a situation that today's university must face, adapting its teaching methodological strategies, according to the needs of the student, and the urgent need to be solved (Westwick & Morreale, 2021).

The reflection leads to generating conjectures about the role that the University is developing in the generation of competencies, which give competitive factors to the graduates and, in the short term, they must prove to be prepared to join the economically active population, so necessary in our precarious economy (Gamlath, 2022). Thus, the study proposed to know the perception, from different scenarios, of the differences that mark the behavior towards educational processes; the generation of digital immigrants (teachers), and digital natives (students) (Vergara et al., 2022). Both represent different aspects of the teaching-learning process, but that combine interests in university classrooms; the former in their task of teaching with transcendence and the latter, learning to transcend; that is why, the logic indicates that the former must adapt to the latter since it is bidirectional in nature (Evans & Robertson, 2020); therefore, they must be imbued in constant processes of adaptation to the new generational demands (Kesharwani, 2020). Although it is holistic research, given that it encompasses a series of transcendent dimensions for the University, it will be important to know what needs lie in the proposed generations to be studied and, thus, dispense with an inconsequential reading of the problem to be studied (Adedoyin & Soykan, 2020; De la Cruz et al., 2022)

1.1 Theoretical basis

Generalized positions affirm the need to rethink, in terms of continuous improvement, the way teachers should design and execute teaching and learning processes, oriented toward students of

the digital natives' generation, focused on generating professional competencies, capable of building the profile needed by the technological society (Dadhe & Patil, 2021). The role of technology will be decisive in the educational task in the short term, a response that university education institutions must act quickly, adapting their processes to a student who learns by navigating huge amounts of information, mastering the calculation and other disruptive aspects, if they intend to fully integrate into an increasingly technological society (Oliveira et al., 2021). Accordingly, active pedagogy is required to provoke experience as a learning scenario, doing, solving, and constructing. For all the above, this exercise requires the adequacy of strategies in which mental development is stimulated (König et al., 2020).

1.2 ICT in the teaching-learning process

Technology has been introduced in this relationship and has generated a bilateral training correspondence between teacher and student (Velandia et al., 2020). The existence of a wide range of technological resources allows the teacher to have a range of possibilities to carry out activities according to the characteristics of their educational modality (Rapanta et al., 2020). When talking about dominant technological competencies, the phenomenon of skills shortage occurs when teachers identify the new educational context and become aware of the need to develop pedagogical and technological skills to apply them to the new teaching contexts (Peimani & Kamalipour, 2021); however, there is tangible evidence, pointing out that technology provides powerful teaching tools, but the potential is not harnessed, using them as isolated means, disconnected from the teaching and student learning processes (Vassilakopoulou & Hustad, 2021).

For authentic learning, designers guide collaborative technology tools, fostering the development of communication, metacognition, and interpersonal skills (Rodriguez et al., 2021). When creating virtual learning environments, program designers and instructors must guard against arguments for change in virtual

pedagogy based on unsubstantiated variables such as age (digital natives and digital immigrants). Educational leaders should take into account that the digital learner brings technological skills, due to previous use of leisure and communication practices (Kesharwani, 2020; Pérez et al., 2020; Guerrero et al., 2022).

1.3 Teaching and learning process in digital immigrants

Digital immigrants are those who have adapted to technology and speak its language, but with a certain accent, who in many cases are engaged in teaching using obsolete language (Kesharwani, 2020). They work with classical, structured, and controlled teaching models, considering linear and coordinated teaching processes (Basit et al., 2021). In learning theory, they use behaviorism and cognitivism as a learning model; results that lead the teacher to seek information that impartially ensures the report of the student's development (Campbell et al., 2020). In communication, they apply unidirectional strategies; it is not possible to contradict or question conditions that emanate from their authority, transmitted to many people in large enclosures (Kitagawa, 2021). In pedagogy, they practice linear learning, promoting memorization, generating teaching centered on the teacher, and rigorously planned contents considered unilaterally important. In this context, the teacher (digital immigrant) is the only transmitter of knowledge to the student, programmed through the subject and organized in class sessions (Rahmadi, 2021); promoting competition among students and rewarding individualism rather than teamwork (Keshavarz, 2021); focused on individual learning, only some prepared teachers use technological means (Mpungose, 2020).

1.4 Teaching and learning process in digital natives

Digital natives are students born in times of analogical domain, in which technological tools are essential in their lives and they depend on them for all kinds of daily issues, such as studying, getting information, shopping, having fun, interacting; making quick decisions and in

complex environments (Kesharwani, 2020). Knowledge acquisition is a function of the type of adaptive and dynamic information accessed, generating abstraction processes (Bag et al., 2020). In learning theory, they use techniques developed through and with the network; presenting capacity for constant updating through exploration on the Internet, capturing information quickly and renewed (Wilson et al., 2020). In communication, they integrate competencies according to cultural and generational contexts, which condition the communicative processes (Gögele et al., 2020).

In pedagogy, it is stated that connectivism is the only current theoretical approach that can offer an adequate understanding of this type of learning; the rest of the theoretical paradigms have a limited scope to show the influence of the interconnected digital world on the learner (Tham et al., 2021). The teacher becomes a mediator in the transmission of knowledge, facilitating the ideal classroom conditions for learning, including real cases that reinforce and connect the surrounding reality; promotes participation and collaboration, rewarding teamwork (Tran et al., 2020); the management of information is supported by technologies that provide access to applications and different technological devices (Smith et al., 2020).

1.5 Attitudes towards the use of information and communication technologies.

The nature of human beings maintains the innate posture of learning new challenges and adapting to circumstances that demand survival. Based on this understanding, a series of models have been built to explain the circumstances in which human beings adapt as part of their evolution (Parra et al., 2021). At this crossroads of homo sapiens, digitization affects their capabilities and disrupts them, coercing their imminent adoption as part of their existence (Oke & Fernandes, 2020). Driven by codes, systems have spread to a significant percentage of the world's inhabitants, offering never-before-imagined opportunities and unprecedented threats (van der Keylen et al., 2020).

The attitudes of digital immigrants are explained in the technology acceptance model, which

states that the individual's (teacher's) beliefs about usefulness and ease of use are the main determinants of the adoption and use of information systems in organizations (Sonia & Kumar, 2020).

Perceived usefulness refers to a teacher's belief that the use of information systems improves his or her job performance in the teaching-learning process (Chen et al., 2021). Perceived ease of use adoption is the degree to which an individual believes that the use of an information system

eliminates complications and mental effort (Kesharwani, 2020). Attitudes in digital natives are present in the framework elaborated specifically for education that includes information and communication technologies, defining dimensions on this variable, such as the aspirations that a student has towards synchronous learning, interest in technology as a measure of the feeling of wanting, knowing or learning, and the perceived difficulty of the technology (Ishmael, 2020).

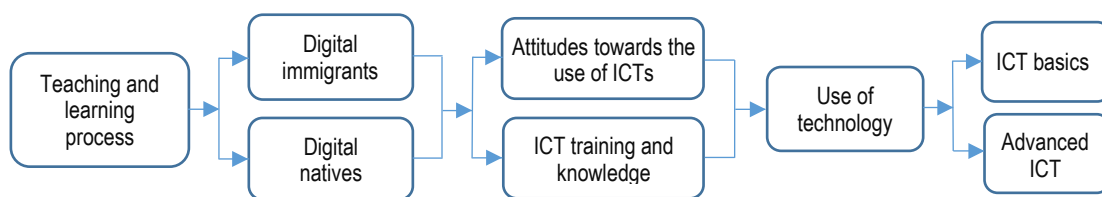


Figure 1. Concept mapping

Note: Own elaboration.

2. Materials and methods

The research developed a quantitative approach, applied, with a non-experimental, cross-sectional, comparative correlational design, following the hypothetical-deductive method. The population consisted of 6,300 students and 383 teachers, from which a probabilistic sample

of 362 students and 192 teachers was drawn. The data collection technique was the survey and the instrument was a 31-question questionnaire, 19 for the variable learning processes, and 12 for ICT use, applied to digital natives and immigrants.

3. Results

Table 1. Correlation matrix, power, and effect

Groups	Hypothesis	Factors	<i>n</i>	<i>α</i>	<i>Med</i>	<i>CC</i>	<i>p</i>	1- <i>β</i>	<i>f</i> ²
Digital natives			362	,932	3,00				
	VX→VY	Teaching and Learning → Use of ICT				,638**	,001	1	,798
	VX→DY ₁	Teaching Learning → Basic ICT				,511**	,001	1	,714
	VX→DY ₂	Teaching Learning → Advanced ICT				,610**	,001	1	,781
	DX ₁ →DX ₂	Attitude → Knowledge				,147**	,005	1	,383
	DX ₁ →VX	Attitude → Teaching Learning				,134*	,010	1	,366
	DX ₁ →DY ₁	Attitude → Basic ICT				,296**	,001	1	,544
	DX ₁ →DY ₂	Attitude → Advanced ICT				,070	,185	,99	,264
	DX ₁ →VY	Attitude → Use of ICT				,215**	,001	1	,463
	DX ₂ →VX	Knowledge → Teaching and Learning				,929**	,001	1	,963
	DX ₂ →DY ₁	Knowledge → Basic ICT				,513**	,001	1	,716
	DX ₂ →DY ₂	Knowledge → Advanced ICT				,615**	,001	1	,784
	DX ₂ →VY	Knowledge → Use of ICT				,638**	,001	1	,798
	DY ₁ →DY ₂	Basic ICT → Advanced ICT				,520**	,001	1	,721
	DY ₁ →VY	Basic ICT → Use of ICT				,714**	,001	1	,844
	DY ₂ →VY	Advanced ICT → Use of ICT				,800**	,001	1	,894
Digital immigrants			192	,916	3,00				
	VX→VY	Teaching and Learning → Use of ICT				,406**	,001	1	,637
	VX→DY ₁	Teaching Learning → Basic ICT				,495**	,001	1	,703

VX→DY ₂ Teaching Learning → Advanced ICT	,331**	,001	1	,573
DX ₁ →DX ₂ Attitude → Knowledge	,182*	,012	1	,426
DX ₁ →VX Attitude → Teaching Learning	,216**	,003	1	,464
DX ₁ →DY ₁ Attitude → Basic ICT	,076	,293	,99	,275
DX ₁ →DY ₂ Attitude → Advanced ICT	-,418**	,001	1	,646
DX ₁ →VY Attitude → Use of ICT	-,056	,440	,99	,236
DX ₂ →VX Knowledge → Teaching and Learning	,911**	,001	1	,954
DX ₂ →DY ₁ Knowledge → Basic ICT	,495**	,001	1	,703
DX ₂ →DY ₂ Knowledge → Advanced ICT	,411**	,001	1	,641
DX ₂ →VY Knowledge → Use of ICT	,492**	,011	1	,701
DY ₁ →DY ₂ Basic ICT → Advanced ICT	,649**	,001	1	,805
DY ₁ →VY Basic ICT → Use of ICT	,837**	,001	1	,914
DY ₂ →VY Advanced ICT → Use of ICT	,774**	,001	1	,879

* Sig. < .05 / ** Sig. < .01 / f2= .10 low, .30 mean, .50 high.

Table 2. Difference between medians of the study groups

U Mann-Whitney	Digital natives	Digital immigrants	Z	U	p	1-β	d
	n=362	n=192					
	Average range	Average range					
Attitude	289,79	254,33	- 2,785	30302, 5	,005	,98	,44 2
Training knowledge	259,96	310,58	- 3,817	28401, 0	,001	,89	,39 7
Teaching learning	269,76	292,10	- 1,663	31949, 5	,096	,85	,21 6
Basic ICT	267,22	296,88	- 2,270	31031, 0	,023	,69	,22 9
Advanced ICT	241,96	344,52	- 7,712	21885, 0	,001	,99	,74 1
ICT use	243,70	341,23	- 7,447	22515, 0	,001	,99	,73 0

* Sig. < .05 / ** Sig. < .01 / f2= .10 low, .30 mean, .50 high.

The results obtained from the conjectures raised in the research, that of evaluating the factors affecting the teaching-learning process, coerced by the intervening variable represented by the pandemic, in the results of the use of ICT in the asynchronous context; conclude direct and indirect effects on the results projected by the university, visualized in Table 1. The correlation of the factors involved in the context of the study was analyzed, for the variables teaching-learning and ICT use, show higher positive effects in the population of digital native students, reaching correlation (CC)=.668, significance (p)=.001, power (1-β)=1, mean effect (d)=.798; while digital immigrants, reached correlation CC=.406, significance p=.001, power (1-β)=1, mean effect d=.637. About the hypotheses with dimensions, it is worth noting low relationships in the case of the attitude of both digital natives and immigrants to

the process of adaptation to the synchronous context in the class sessions scheduled by the university, showing resistance to change as a result of the new post-pandemic normality. In the case of digital natives, it shows a null hypothesis in the relationship between attitude and use of advanced ICT, probably as a result of the new adaptation and the lack of technological means for its practice. In the case of digital immigrants, it shows a null hypothesis in the relationship between attitude and use of basic ICT, reaching correlation (CC)=.076, significance (p)=.293, power (1-β)=.99, mean effect (d)=.275; the relationship between attitude and use of ICT is also a null hypothesis, reaching correlation (CC)= -.056, significance (p)=.440, power (1-β)=.99, mean effect (d)=.236. In general, the correlations existing in digital immigrants are low and average.

To meet the objective of finding out if there were significant differences in the response to the synchronous teaching and learning process by the digital natives and digital immigrants' groups, a non-parametric inferential analysis was carried out with the Mann-Whitney U statistic; the results can be seen in Table 2. It is concluded that there are significant differences between digital natives and immigrants, on attitude ($Z=-2.785$, $U=30302.5$, $p=.005$, $1-\beta=.98$, $d=.442$), training and knowledge ($Z=-3.817$, $U=28401.0$, $p=.001$, mean $(1-\beta)=.89$, $d=.397$), basic ICT use ($Z=-2.270$, $U=31031.0$, $p=.023$, $1-\beta=.69$, $d=.229$), advanced ICT use ($Z=-7.712$, $U=21885.0$, $p=.001$, medium $(1-\beta)=.99$, $d=.741$) and ICT use ($Z=-7.447$, $U=22515.0$, $p=.001$, medium $(1-\beta)=.99$, $d=.730$). However, the teaching-learning variable manifests that there is no difference between the groups of digital natives and immigrants, obtaining ($Z=-1.663$, $U=31949.5$, $p=.096$, high $(1-\beta)=.85$, $d=.216$). Based on the results, it is evident that the generations respond differently to the new reality presented in synchronous university classrooms, as a result of the pandemic.

4. Discussion

The purpose of the research was to demonstrate comparatively whether the groups chosen in the sample responded from the same perception to the changes in education resulting from the pandemic; that is, to verify the significant differences in the teaching-learning process, affected by the use of ICTs in immigrants and digital natives in university settings. It was verified through the Mann-Whitney U test that each of the study groups respond differently to the demands of educational change, a result shown in Table 2. The constant adaptation of the groups in the improvement of the educational processes of teaching and learning requires active pedagogy to provoke the experience as a learning scenario, with doing, solving, and building; this exercise requires adaptation of scenarios in which the mental development of all the active participants of the pedagogical processes is stimulated (Tham et al., 2021; Tran et al., 2020; Sonia & Kumar, 2020).

In this educational environment, the differences are referenced in the pedagogical process by teachers and students, rethinking the need to design and implement teaching and learning processes, and focused on generating professional competencies, capable of building the profile needed by the technological society (Ishmael, 2020). They require differentiated information literacy, immersed in the management of ICT, and mitigating gaps in the practical pedagogical reality (Dadhe & Patil, 2021; Oliveira et al., 2021). Countless studies point out that the nature of human beings maintains the innate posture of learning new challenges and adapting to the circumstances that require their survival, building models that explain the circumstances in which human beings adopt them as part of their evolution (Parra et al., 2021; Oke & Fernandes, 2020; van der Keylen et al., 2020).

Attitudes toward digital immigrants are explained in the technology acceptance model, which affirms the individual's (teacher's) beliefs about the usefulness and ease of use are the main determinants of the adoption and application of information systems in any organization (Sonia & Kumar, 2020); conceiving the perceived ease of use as the degree to which the teacher believes that, when using an information system, it eliminates complications and mental effort, favoring conditions and means in the results (Lavy, 2020). Attitudes in digital natives (students) are present with high potential for development, in the framework developed specifically for education that includes information and communication technologies (Ishmael, 2020), which include five dimensions for its development: (a) The aspirations of a job related to technology, (b) The interest in the technology of wanting to know or learn about its benefits, (c) The perceived difficulty of technology as a competitive measure (Chen et al., 2021; Kesharwani, 2020). All of the above leads to the following differentiated gaps.

5. Conclusions

Technology has changed every aspect of human life and education cannot be exempt from this

since human beings are constantly learning. The role of technology will be decisive in the educational task in the short term, as a response that should trigger means of adaptation in university education (including teachers and students), adapting their processes, if they intend to fully integrate into an increasingly technological society, considering that the learning process is an active sequence of acquisition of information and increase knowledge in the continuum of psychic activity. New digital generations are in the process of transition, with very different perspectives from the traditional ones, engaged in displaying a hint of individual competitiveness, transcending the group order, demanding transformation from the traditional to the technological, coexisting with the speed of response and questioning the traditional forms of education, and the ways of handling the transmission of information. Therefore, the university and teachers must adapt to this new virtual reality of teaching, accelerated by the pandemic, and face this challenge with the competencies required to achieve it. Nevertheless, care must be taken with the arguments in favor of changes in virtual pedagogy based on unsubstantiated variables such as the age of digital natives or digital immigrants.

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