# RESILIENCE AND DIGITAL COMPETENCES IN HIGHER EDUCATION STUDENTS

LA RESILIENCIA Y LAS COMPETENCIAS DIGITALES EN ESTUDIANTES DE EDUCACIÓN SUPERIOR

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**ABSTRACT**

*Resilience and digital skills could be considered necessary competencies for the individual of the twenty-first century, which the current social reality suggests. For this reason we carried out a research in the institution of higher education -IES- Corporación Escuela Tecnológica del Oriente, of Bucaramanga-Colombia, which had a dual purpose: to describe resilience and digital competence in 356 of its students and establish a comparison between the values of these two aspects and those reported in other HEIs in Mexico, using a quantitative, non-experimental, cross-sectional design and descriptive scope approach, the SV-RES Resilience Scale instrument and a Questionnaire for the study of the Digital Competence of Higher Education Students.*

**RESUMEN**

*La resiliencia y las competencias digitales podrían considerarse competencias necesarias para el individuo del siglo XXI, que la realidad social actual sugiere. Por tal razón realizamos una investigación en la institución de educación superior –IES- Corporación Escuela Tecnológica del Oriente, de Bucaramanga-Colombia, la cual tuvo un doble propósito: describir la resiliencia y la competencia digital en 356 de sus estudiantes y establecer un comparativo entre los valores de estos dos aspectos y los reportados en otras IES de México, usando un enfoque cuantitativo, no experimental, de diseño transversal y alcance descriptivo, el instrumento Escala de Resiliencia SV-RES y un Cuestionario para el estudio de la Competencia Digital del Alumnado de Educación Superior.*

## 1. Introduction

The emergence of SARS-CoV-2 in Wuhan, China, in December 2019, reactivated the need to train and train the teacher in online work, expecting students to have a set of digital competences, of knowledge that allows you to reach the objective of learning under a technological, information and non-linear communication environment (Islas & Franco, 2018), changing the way we teach, research and seek to increase educational opportunities for students of all levels around the world (Montera, 2015). But is this really the case?, Have the young people who belong to these generations already acquired digital skills?

Studies carried out in Spain such as That of Prendes and Román (citado en González et al., 2018) showed that students are not always as skilled in the use of technological tools in their academic activity, as expected. This situation, known as digital illiteracy, could be considered as a risk factor for dropping out or school lag due to ignorance or the stress that it entails for the student not to reach the standards of competences imposed by the institutions of higher education. Thus, the concept of resilience is taken up, defined as "the ability to face everyday adversity, overcome it and even come out strengthened and transformed" (Vanistendael, en García-Vesga & Dominguez-de la Ossa, 2013, p. 66).

The terms, resilience and digital competence, concur in a framework of natural and complex asymmetries in the various educational scenarios of the higher level, in whose inference the interest of this research fell, which, from a descriptive study and a cross-sectional design of quantitative cut, sought to analyze both concepts and establish a comparison between students of the higher level of different states of the Mexican Republic, research to which we had access through the Latin American Studies Network of Education and Pedagogy -RELEP- with whom we share the information collected, both from Colombia and Mexico.

## 2. Objectives

The fundamental purpose that we outlined in this research was the description of resilience and and the digital competence of students at the higher level and to be able to establish a comparison between the values of these two aspects in the Corporación Escuela Tecnológica del Oriente, a private higher education institution in the municipality of Bucaramanga, capital of the department of Santander in Colombia, and the data reported in other Mexican higher education institutions within the framework of the research proposed by the Latin American Studies Network of Education and Pedagogy -RELEP- by 2022. More specifically, the objectives would be:

1. Identify the level of resilience of university students in the Schools of Economic and Accounting Administrative Sciences, the School of Education, Art and Human Sciences and, the School of Engineering of the Corporación Escuela Tecnológica del Oriente.
2. Identify the digital competence of the university students of the academic programs of the School of Economic and Accounting Administrative Sciences, the School of Education, Art and Human Sciences and the School of Engineering of the Corporación Escuela Tecnológica del Oriente.
3. Identify sociodemographic factors associated with the resilient process and digital competence.

Below are the different approaches to resilience and digital competence; it begins by clarifying both terms, as well as their relationship in this stage of emerging adulthood within a university space.

## 3. Methodology

Initially, it became necessary to define the theoretical perspective from which we would approach the research, that is, of the variables of competences, digital skills and resilience with a view to their study at the university level. The conceptualization developed by various authors who have subscribed to the subject is presented, mainly prior to the impulse received by the confinement by COVID-19.

### 3.1. Competences

Competencies are defined as the abilities that a subject has to interact contributing to the construction and transformation of their daily reality from an assembly of complex processes where it is sought to put into action-creation for the resolution of problems and the implementation of activities in the various contexts (Tobón, 2008). Likewise, competencies are defined by good performance in diverse and authentic contexts based on the integration and activation of knowledge, of norms, techniques, procedures, skills, abilities, attitudes and values (Villa y Poblete, 2009).

Medina-Salguero (2013) defines them as "a set of knowledge and socio-affective, psychological and motor skills which enable the person to properly carry out an activity, a role, a function, using the knowledge, attitudes and values he possesses" (p. 2).

## 3.2. Digital competence

For-Rozo (2016), digital skills are those skills that allow the use of adequate communication, as well as the ability to define, access and evaluate information that leads to equitable scenarios that guarantee equal opportunities to resolve various situations.

For-Gutiérrez (2014), digital skills are "values, beliefs, knowledge, skills and attitudes to properly use technologies that allow and enable the search, access, organization and use of information in order to build knowledge" (p. 53).

According to Área (cited in González et al., 2018), the current university student needs to be trained in digital skills, which must be able to access new information, to be trained in search skills, to develop the ability to build knowledge in interaction, to express themselves and communicate with languages and tolos and acquire skills for learning in spaces enriched and built with technologies.

Some other research has focused its proposals on digital competence. Such is the case of Roig and Pascual (2012), who analyze the use and frequency of computers and Information and Communication Technologies (ICTs), as well as the basic competences of use of these technologies among the teaching staff; others for their part, evaluate digital competences among Pedagogy students based on the five axes proposed in the European Framework of Digital Competence (González, et al., 2018).

## 3.3. Resilience

Resilience comes from the Latin resilentia, which means, resist, bounce, return to the original state. This term is initially applied in engineering and was later adopted by the social sciences to understand the fact of healthy development and socially successful in people with risk experiences. It is a global response in which the protection mechanisms are put into play, allowing the individual to emerge strengthened from adversity, in each situation and respecting personal characteristics (García-Vesga & Dominguez-de la Ossa, 2013).

For Grotberg in (Saavedra & Villalta, 2008), resilience is the interaction of factors coming from three different levels: social support, skills, and internal strength. González, et al., (2009) consider it a competence in that it can be seen as a knowledge and know-how in the context. For their part, Saavedra and Villalta (2008) point out that the resilient response is a goal-oriented action.

In the educational context there are different approaches to the work of resilience, among which the works of Romero and Abril (2015) stand out, who make practical recommendations for schools to foster resilient attitudes among adolescents. Likewise, Caldera, et al., (2016) developed a study to identify the level of resilience of students, finding high levels of resilience in the ways of attending and facing the context in which they are immersed, of their social reality in particular.

That is why it is necessary to have the classrooms as the place where it is built and facilitate resilience to prevent students from dropping out and thus prevent them from delaying or postponing their university studies and facilitate their academic development and personal growth, because at this stage the student usually moves in a variety of specific contexts and most develop support networks, which in the absence of these at present, it is pertinent to evaluate the resilience perceived by them.

Now then, it is important to highlight the design process and protocol followed for the collection of the necessary information to carry out the proposed objectives.

### 3.4. Information sampling design and protocol

The research described in this document, as we have already announced, was of a cross-sectional quantitative type of descriptive scope. To carry out the research began with training for the application of the instruments and the emptying of data to research participants from Mexico who are members of the Latin American Studies Network in Education and Pedagogy (RELEP), of which our team was part, which in turn was replicated to the teachers of the Corporación Escuela Tecnológica del Oriente, Bucaramanga-Colombia to apply in our country to students of eight (8) academic programs, five (5) undergraduate and three (3) graduate. A non-probabilistic sample of 356 first, fifth and seventh semester students from the Schools of Administrative Sciences, Economics and Accounting, from the School of Education, Arts and Humanities and the School of Engineering  was then selected. For this, the coordinators of the different areas were asked to allow the collaboration of their teachers to be able to apply the instruments to their students at one point in their class sessions; then proceeded to the elaboration of the database with the results obtained from the survey, capturing the surveys in a Google form. To

finish the process, a final review was carried out and then proceeded to the validation of the data collected in the database. This empirical process was carried out in a concentrated manner for a month.

## 3.5. Instrument

For the collection of data, the survey evaluation technique was used. The first part of the scale was reserved for the sociodemographic data of the participants: gender, age, career, average, semester, place of residence and type of housing. Two instruments were applied:

The SV-RES Scale (Saavedra &amp; Villalta, 2008), which consists of 60 items, divided into 12 specific resilience factors (Table 3). The validity study yielded a Cronbach's alpha of 0.975. From the overall results it was determined that a score of 4,017 or less, corresponding to 25% of the sample, would be considered a low score and those who had 4,700 points or more (25% higher) would be a high score, while intermediate values would be considered average score. These values will be taken as a reference to evaluate local results.

The questionnaire applied was adapted from the study of the Digital Competence of Higher Education Students -CDAES- by Gutiérrez, et al., (2017), which consisted of a Likert scale with responses from Totally Agree (5 points) to Totally Disagree (1 point), whose Cronbach's alpha coefficient is 0.975. It consisted of 44 items divided into six factors: Technological literacy (12 items), information search and processing (6 items), critical thinking, problem solving and decision making (4 items), communication and collaboration (9 items), digital citizenship (6 items), creativity and innovation (6 items).

## 4. Results

Data analysis was carried out with R version 4.0.2. Initially, a descriptive analysis of the sociodemographic questions was carried out to know the characteristics of the participants and subsequently assessed resilience and technological competence in a comparative manner.

## 4.1. Descriptive statistics

The composition of the sample by sex was 295 women (81%) and 66 men (18.1%), with an average age of 26 years and an age range between 16 and 52 years (see Table 1).

Table 1. Distribution of the sample according to age, married students of the Corporación Escuela Tecnológica del Oriente.

| Age | Frequency | Percentage | Cumulative percentage |
|---|---|---|---|
| 17 | 12 | 3.4% | 3.4% |
| 18 | 13 | 3.7% | 7% |
| 19 | 22 | 6.2% | 13.2% |
| 20 | 31 | 8.7% | 21.9% |
| 21 | 32 | 9% | 30.9% |
| 22 | 28 | 7.9% | 38.8% |
| 23 | 20 | 5.6% | 44.4% |
| 24 | 21 | 5.9% | 50.3% |
| 25 o más | 177 | 49.7% | 100% |

Source: own elaboration (2022)

The Corporación Escuela Tecnológica del Oriente has eight (8) different academic programs. The distribution of surveys by areas can be seen in Table 2, in which we note that of the five (5) areas of knowledge that were part of the sample, the most representative was education with 46.2% of the total sample and the least representative was that of another with 8.7%.

Table 2. Distribution of the sample by areas of knowledge, case students of the Corporación Escuela Tecnológica del Oriente.

| Area of knowledge | Frequency | Percentage |
|---|---|---|
| Education | 165 | 46.2% |
| Business Administration | 37 | 10.4% |
| Engineering, manufacturing and others | 39 | 10.9% |
| Health área | 85 | 23.8% |
| Other | 31 | 8.7% |

Source: own elaboration (2022).

The last sociodemographic variable we considered was that of the people with whom the students lived while they were studying the academic program, as an aspect that could affect your well-being. In this section and

variable it was found that most of the students who participated in the research lived with their family of origin with 56.2%, and to a lesser extent with friends of the family of origin, by 0.6%, as can be seen in Figure 1.

Image 1. People with whom the students of the Corporación Escuela Tecnológica del Oriente lived
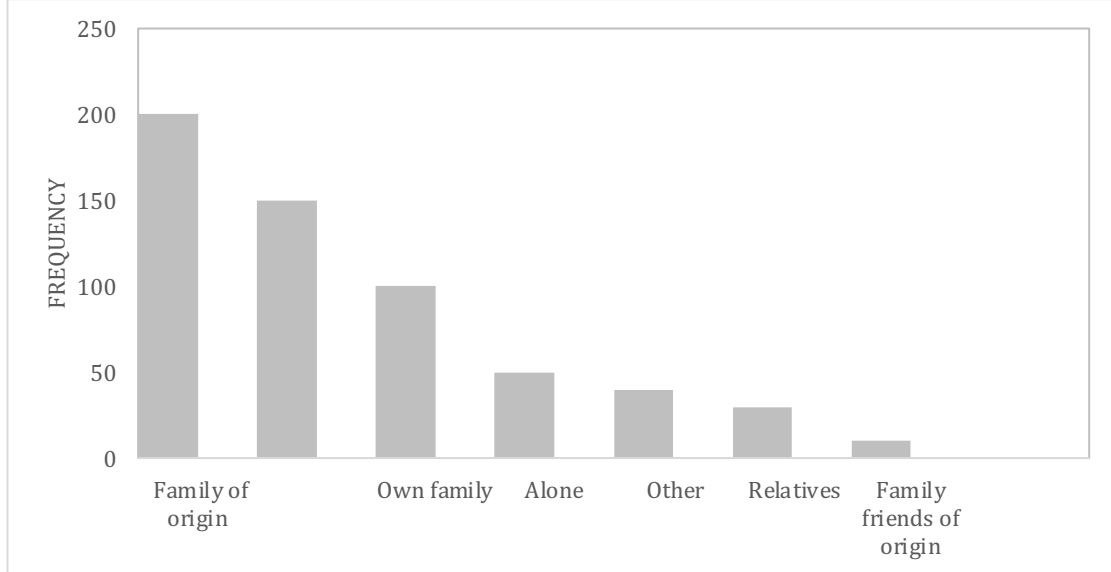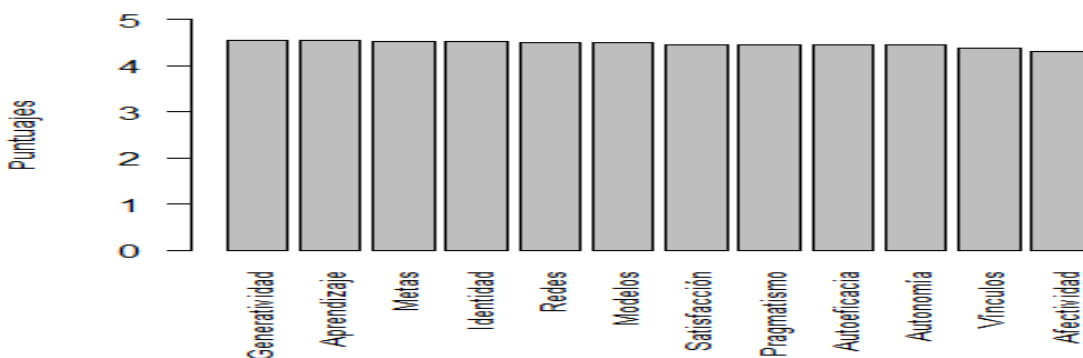


Source: own elaboration (2022).

## 4.2. Resilience of the students of the Corporación Escuela Tecnológica del Oriente

The first specific objective of this research concerned identifying the levels of resilience of university students. This is how 14.58% of the individuals in the sample were located at a low level, the other 47.62% at an average level and the remaining 37.8% stood at a high level of resilience.

We then proceeded to obtain the average scores of the resilience factors that make up the SV:RES scale, to then place them in the corresponding percentile and be able to obtain the low, medium and high levels of each of the interviewed students (Figure 2). The analysis of the results of the Resilience Questionnaire indicates that the generativity dimensions (possibility to ask for help from others to solve problematic situations) and learning (assessing a problematic situation as a learning possibility), they are the highest; while the scores go down in the dimensions of affectivity (possibilities about oneself and the link with the environment and links (value of primary socialization and social networks rooted in personal history).

Image 2. Factors of resilience of the students of the Corporación Escuela Tecnológica del Oriente



Source: own elaboration (2022).

## 4.3 Averages of the Corporación Escuela Tecnológica del Oriente and conceptual descriptions of the 12 resilience factors.

It is important to know what were the averages found in the students of the Corporación Escuela Tecnológica del Oriente regarding the 12 resilience factors consulted in the instrument applied and in particular the description of them as can be seen in Table 3.

Table 3. Averages of the Corporación Escuela Tecnológica del Oriente and conceptual descriptions of the 12 resilience factors.

| Factor | Mean | Conceptual description |
|---|---|---|
| Identity | 4.516 | (cultural values that define the subject in a relatively stable way) |
| Autonomy | 4.446 | (link that the subject establishes with himself to define his particular contribution to his sociocultural environment) |
| Satisfaction | 4.458 | (particular way in which the subject interprets a problematic situation) |
| Pragmatism | 4.458 | (how to interpret the actions you perform) |
| Links | 4.387 | (value of primary socialization and social networks with roots in personal history) |
| Networks | 4.503 | (affective bond that the person establishes with his close social environment) |
| Models | 4.498 | (conviction of the role of nearby social networks to support the overcoming of new problematic situations) |
| Goals | 4.520 | (contextual value of goals and social networks over the problematic situation) |
| Affectivity | 4.295 | (possibilities about oneself and the link with the environment) |
| Efficacy | 4.458 | (chances of success that the person recognizes in himself in a problematic situation) |
| Learning | 4.536 | (assess a problematic situation as a learning possibility) |
| Generativity | 4.542 | (possibility to ask for help from others to solve problematic situations) |

Source: own elaboration (2022).

## 4.4. Average scores of the students of the Corporación Escuela Tecnológica del Oriente in the 12 dimensions of resilience, SV-RES Scale

Table 4 presents the levels of resilience factors obtained by the Corporación Escuela Tecnológica del Oriente and the levels of the study sample in Mexico, which allowed us to establish a comparative analysis of our educational context According to the data obtained, significantly higher differences were found in the factors of identity, autonomy, satisfaction, pragmatism, links, networks, goals, affectivity, self-efficacy, learning and generativity; in addition, it does not show significantly lower differences in any of the factors.

Table 4. Comparison of standard means and deviations of resilience factors of the Corporación Escuela Tecnológica del Oriente with that of the study in Mexico.

| Factor | Local | | Mexico | | P. |
|---|---|---|---|---|---|
| | Mean | Standard Deviation | Mean | Standard Deviation | |
| Identity | 4.516 | 0.488 | 4.290 | 0.580 | <0.001 |
| Autonomy | 4.446 | 0.539 | 4.290 | 0.583 | <0.001 |
| Satisfaction | 4.458 | 0.498 | 4.233 | 0.579 | <0.001 |
| Pragmatism | 4.458 | 0.488 | 4.317 | 0.541 | <0.001 |
| Links | 4.387 | 0.544 | 4.211 | 0.608 | <0.001 |
| Networks | 4.503 | 0.530 | 4.382 | 0.546 | <0.001 |
| Models | 4.498 | 0.540 | 4.470 | 0.544 | 0.328 |
| Goals | 4.520 | 0.471 | 4.346 | 0.561 | <0.001 |
| Affectivity | 4.295 | 0.575 | 4.100 | 0.665 | <0.001 |
| Efficacy | 4.458 | 0.508 | 4.354 | 0.532 | <0.001 |
| Learning | 4.536 | 0.477 | 4.362 | 0.529 | <0.001 |
| Generativity | 4.542 | 0.480 | 4.409 | 0.538 | <0.001 |

Source: own elaboration (2022)

## 4.4. Digital competence of the students of the Corporación Escuela Tecnológica del Oriente

The second specific objective of this research concerned to identify the digital competence of students in their daily academic practices, regarding the use of technological tools in teaching-learning processes, whose data can be seen in Table 5 that refers to the results of the total sample by dimension, as analyzed in a comparative analysis of means and standard deviations of the data collected in the applied instruments, both to the students of the Corporación Escuela Tecnológica del Oriente and of the institutions of higher education taken into account by Mexico in which it is observed that the students of the Technological School of the East Corporation do not show a significantly higher or lower value in any of the dimensions, when making a comparison between the results of the samples in the cases of both countries.

Table 5. Comparison of means and standard deviations of the digital competences of the students of the Corporación Escuela Tecnológica del Oriente with the study in Mexico

| Dimension | Local | | Mexico | | P. |
| | Mean | Standard Deviation | Mean | Standard Deviation | |
|---|---|---|---|---|---|
| Technology literacy | 7.808 | 1.866 | 7.883 | 1.670 | 0.44 |
| Search and processing of information | 8.123 | 1.852 | 8.413 | 1.598 | 0.003 |
| Critical thinking, problem solving and decision making | 7.789 | 2.015 | 7.890 | 1.821 | 0.341 |
| Communication and collaboration | 7.638 | 2.056 | 7.713 | 1.796 | 0.49 |
| Digital citizenship | 7.943 | 1.898 | 7.974 | 1.849 | 0.758 |
| Creativity and innovation | 7.875 | 1.936 | 7.938 | 1.848 | 0.539 |

Source: own elaboration (2022)

## 5. Discussion

So, it is important to emphasize first of all, that there are no marked differences between students in higher education programs of the cases studied in the institution of higher education of technological character of Bucaramanga-Colombia, the Corporación Escuela Tecnológica del Oriente and the students of the cases in the process of professional training in Mexico in relation to the levels of resilience and digital competences consulted.

However, in the case of students from the eight (8) higher education programmes, including those at the postgraduate level consulted. now, in the case of the students of these are, the Professional Technical Program in Hygiene and Safety at Work, the Professional Programs in Business Administration, in Bachelor's Degree in Child Pedagogy, in Safety and Health at Work and Production Engineering, and Specializations in Pedagogy and Specific Didactics, in Project Management and Integral Risk Management, Safety and Health at Work, in which it was possible to show that there is a fairly significant average of students who have a good treatment of resilience at its different levels, that is, 37.8% of the university population with a high level, 47.62% of them at an average level and 14.58% of the individuals in the sample were at a low level, it is then necessary to generate strategies to work around the latter, since the other students show that the Institutional Educational Project and the Strategic Model proposed in the Educational Development Plan "Learning in Contexts", is on the right track in teaching resilience management in its learners.

## 6. Acknowledgments

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