













ICT as a model for the creation of digital academic environments





Las TIC como modelo para la creación de entornos académicos digitales

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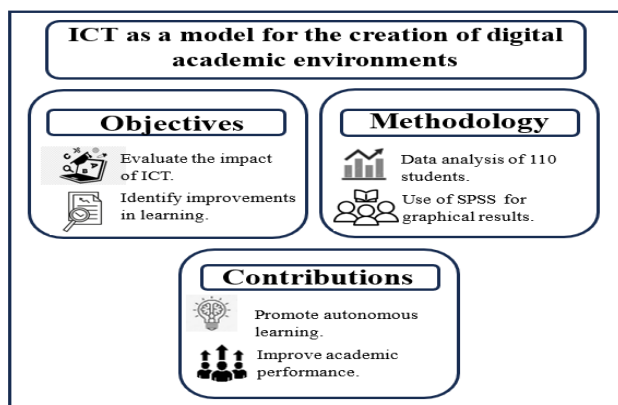
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Abstract

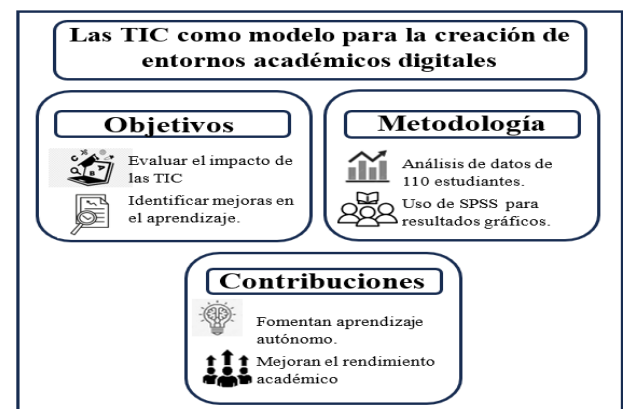
The primary objective of this study is to assess the effectiveness of Information and Communication Technologies [ICT] by analyzing the academic activities of students in the Bachelor of Management program. Based on this objective, the research question is: How do Information and Communication Technologies impact and enhance the academic activities of students in a school-based Bachelor of Management program, and what key factors demonstrate their usefulness in improving learning and training? Most participants agree that technological tools enhance school practices, yet some express varying degrees of disagreement, emphasizing the need to consider diverse perspectives in educational technology implementation. Additionally, the findings indicate that students generally possess good skills and knowledge in ICT, feeling comfortable and competent in their use. However, there are areas of disagreement, as a small group of students do not fully recognize some ICT benefits, highlighting the necessity of addressing different viewpoints in academic settings.

Resumen

Este estudio evalúa la efectividad de las Tecnologías de la Información y las Comunicaciones [TIC] en las actividades académicas de los estudiantes de la Licenciatura en Administración. La pregunta de investigación es: ¿Cómo impactan las TIC en las actividades académicas y qué factores clave demuestran su utilidad para mejorar el aprendizaje? La mayoría de los estudiantes considera que las herramientas tecnológicas mejoran las prácticas escolares, aunque algunos muestran desacuerdo, resaltando la importancia de considerar diversas perspectivas en su implementación. Los resultados indican que los estudiantes tienen buenas habilidades en TIC y se sienten competentes en su uso, pero un pequeño grupo no reconoce completamente los beneficios de estas tecnologías. Esto subraya la necesidad de abordar diferentes puntos de vista en los entornos académicos para optimizar su integración.



Teacher training, training needs, higher education



Capacitación docente, necesidades de formación, educación superior

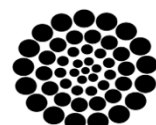
Area: Development of strategic leading-edge technologies and open innovation for social transformation

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## Introduction

The integration of technology has brought significant benefits to higher education, the implementation of computerized methods stands out as integral tools for students, facilitating effective strategies for teaching and promoting continuous learning in various areas of higher education. In recent years, these tools have experienced remarkable progress, bringing significant meaning and impact to those who interact with them. This progress has led to a solid convergence between education and technology, generating a synergy that strengthens the educational experience and optimizes teaching and learning processes.

Thus, we live in a digital world that affects practically all aspects of human life, including the educational sphere [Santistevan et al., 2023]. In addition, it is mentioned that technology is becoming a mechanism for educational reform by transforming teaching practices and technological training processes. In sum, digitization and technological advances are significantly influencing the way people learn and teach.

The key role played by ICTs lies not only in their ability to improve efficiency and accessibility, but also in their capacity to adapt to the changing needs of the educational environment. In this context, it is necessary to explore how this integration can redefine the dynamics of education and provide fertile ground for innovation and continuous development of higher education.

Thus, the objective of the present research is to evaluate and understand the effectiveness of Information and Communication Technologies [ICT] through a detailed analysis of the academic activities performed by students in the Bachelor of Management program in a school-based environment, from which the research question derives How do Information and Communication Technologies [ICT] influence and benefit the academic activities of students within the Bachelor of Management program in a school-based system, and what are the key aspects that highlight their usefulness in enhancing learning and training in this educational context?

Likewise, the interaction of ICT has not only transformed traditional teaching methods, but has also opened new perspectives for the personalization of learning, global collaboration and the acquisition of skills necessary to face the challenges of the 21st century. Thus, it embarks on the task of exploring and understanding the complexity of this convergence, analyzing how ICTs influence and benefit academic activities within the Bachelor of Management program in a school-based environment, and highlighting the key aspects that delineate their usefulness in enhancing learning and training in this specific educational context. It is worth mentioning that, the introduction of ICT has transformed education by affecting how learning takes place, the role of teachers, study content and assessment practices [Gordón, 2020]. This impact encompasses different aspects of the educational process and contributes to the continuous evolution of the educational system. Therefore, the intervention of technology has contributed to fostering autonomy in student learning and has improved their digital skills and competencies, which is fundamental in an educational and work environment that values the ability to adapt to emerging technologies [Del Carpio et al., 2023].

## Technology in the educational context

In various countries, educational centers are equipped with technological gadgets and artifacts, assuming that the technology itself, the equipment, will be immediately integrated into the educational activities of the center, thus improving the quality of education [Aretio, 2019]. That is, educational centers have been equipped with technological devices and artifacts with the expectation that the mere presence of this technology will automatically lead to an effective integration into educational activities. The underlying premise is that the introduction of this equipment will immediately contribute to the improvement of the quality of education.

Therefore, the introduction and use of ICTs in education does not follow a fixed trajectory, but is subject to different variables that can be categorized in terms of their impact and type. This interpretation highlights the complexity and dynamics involved in the successful integration of ICTs in the school context [Sánchez, 2019].

Likewise, the interpretation highlights the versatility of ICTs in encompassing a wide range of tasks related to information management in virtual contexts [Mamani and Alvites-Huamani, 2021]. These tools not only facilitate efficient data management, but also enable the creation, distribution and manipulation of diverse information in the digital environment. In essence, ICTs are presented as fundamental digital tools to enhance education in cyberspace, offering opportunities for teaching, learning and collaboration in virtual environments.

In addition, the latest ICTs encompass the most current technological developments. As people become familiar with these emerging advances, their ability to generate, share and access knowledge is enhanced. Over the past few decades, innovative ICT tools have fundamentally transformed the way people interact and conduct business. These advances have generated significant changes in various sectors such as industry, agriculture, medicine, management, engineering and education.

However, curriculum development is moving towards new learning methods and the incorporation of competencies and other curricular elements, allowing educational technology to address aspects of interest to the educational and scientific communities, such as research on the digital competencies of teachers, students and institutions [Sánchez, 2023]. Furthermore, this involves analyzing how people and educational organizations use technology, how digital skills are integrated into the educational process, and how technology can effectively contribute to the achievement of educational and scientific goals. Technology plays a fundamental and indispensable role in educational systems. It suggests that the presence and integration of technology are essential components for the functioning and effectiveness of teaching and learning systems [Marín et al., 2020].

Therefore, technology provides the opportunity to carry out learning activities not only within conventional classrooms, but also in places specifically intended for knowledge, such as libraries. This extension implies that learning can occur in a more flexible and diversified way, using technological resources that transcend the physical limitations of a conventional educational space [Navarrete, 2021].

Therefore, educational technology is conceived as a tool that arises from the reflective application of educational theories to address specific problems and situations in the field of teaching and learning [Zapata-Gallegos et al., 2021], being supported by ICTs and hoping to improve the quality and effectiveness of education by applying grounded pedagogical approaches.

### Digital learning

Digital learning refers to the elements that have had an impact on the incorporation and overall status of education that is carried out through technologies [Palacios-Díaz, 2020]. In this context, it involves recognizing the various components and factors that influence the way in which technology has been integrated into the educational process, as well as assessing the overall state of education in the digital environment. More broadly, it refers to the set of circumstances, tools and conditions that affect education in the context of digital technology.

Technological advances have succeeded in establishing the essential means to connect individuals and groups, facilitating the exchange of messages, videos, files and everything related to the digitization of data. It is noted that the learning process is profoundly affected by the intensive use of technology, suggesting that this tool has a significant impact on the way people acquire knowledge [Garzozi-Pincay et al., 2020]. Likewise, connectivism seeks to explain the transformations in the knowledge era caused by ICTs. According to this approach, it is argued that learning is not generated solely by individuals in isolation, but is the result of interaction and connection between society and various groups [Carrillo, 2021]. In other words, connectivism suggests that knowledge is constructed through active participation in social networks and collaboration with different communities, emphasizing the influence of society and groups in the learning process in the digital era.

It is worth mentioning that, the Internet offers a wide range of possibilities for communication and interaction between people, thus facilitating learning, work and leisure environments by simply accessing some of the available applications [Herrera-Pérez and Ochoa-Londoño, 2022].

This statement suggests that the Internet provides diverse opportunities and options for communication. In other words, it highlights that the World Wide Web offers a wide variety of ways and tools through which people can communicate with each other.

These possibilities may include e-mail, social networks, videoconferencing, instant messaging and other online platforms that facilitate interaction and information exchange between individuals around the world. Similarly, these technological tools are available to both teachers and students, who can take advantage of them in a variety of ways. They constitute a novel approach to the development of the educational process and promote significant changes in classroom dynamics [Granados et al., 2020].

Their integration not only demands training in their management, but also the willingness to abandon pre-existing schemes and previous conceptions about educational methods. This implies a reconfiguration of the relationship between the individual and the object of learning, transcending the conventional interaction between people. It is fair to say that, ICTs are not simply technological tools, but represent a set of innovations that, when used, have the potential to redefine the functioning and dynamics of society at multiple levels [Doria et al., 2014].

This change can affect daily life, the economy, education and other aspects of social life. Therefore, technological innovations and ICTs are tools that have the power to reshape the way society functions.

This involves changes in the way people communicate, access information, work, learn and participate in everyday life, ICTs can influence social, economic and cultural structures.

### Main Objective

The main purpose of this research is to evaluate and understand the effectiveness of Information and Communication Technologies [ICT] through a detailed analysis of the academic activities performed by students in the Bachelor of Management program in a school-based environment.

### Research question

In accordance with the main objective, the following research questions are derived: How do Information and Communication Technologies [ICT] influence and benefit the academic activities of students in the Bachelor of Management program in a school-based system, and what are the key aspects that highlight their usefulness in improving learning and training in this educational context?

### Methodology

In the development of the research, a quantitative approach was adopted, involving statistical analysis of the data collected. The main purpose of this approach is to describe, explain, predict and objectively control the reasons related to the object of study. This approach seeks to confirm conclusions through a rigorous and systematic application of the methodology, thus contributing to a deeper and more grounded understanding of the phenomena involved [Sánchez, 2019].

The research was carried out with groups of the Bachelor's Degree in Administration belonging to the Academic Unit of Accounting and Administration of the Autonomous University of Nayarit, Mexico. To determine the sample, the non-probabilistic convenience sampling technique was used, selecting participants according to the ease of access [Pineda, 2018] and the availability of students to be part of the sample, the result was a sample composed of 110 students. Consequently, the processing and analysis of the information were performed using the SPSS statistical program. During this process, frequency tables were generated. Subsequently, the analysis and interpretation of the information was carried out by means of visual representation through graphs, which allowed a more effective understanding of the data collected.

### Results

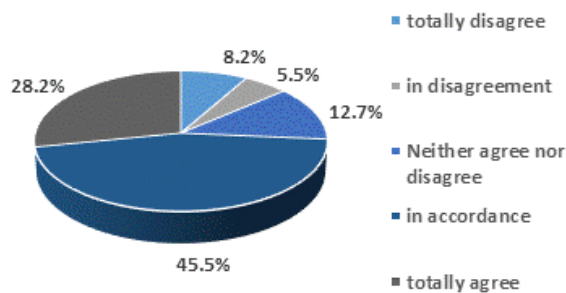
These findings not only contribute to the understanding of the interaction between students and ICTs in the educational environment of the Bachelor's Degree in Management, but also provide valuable information for the formulation of future strategies with the objective of perfecting the integration of ICTs in the educational process.



Accordingly, we present below the essential findings derived from this study.

The interpretation of these data suggests that most of the participants tend to show a favourable attitude towards the evaluated topic. Thus, the following results are presented: totally disagree 8.2%, disagree 5.5%, neither agree nor disagree 12.7%, agree 45.5%, totally agree 28.2% [figure 1].

### Box 1



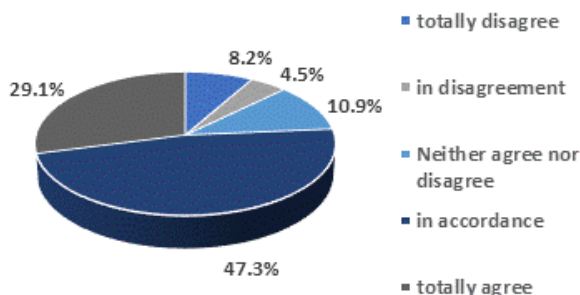
**Figure 1**

Used technological tools for developing learning strategies

Source: own elaboration

I combine technological tools to improve school practices, 8.2% totally disagree, disagree 4.5%, neither agree nor disagree 10.9%, agree 47.3%, totally agree 29.1% [figure 2].

### Box 2



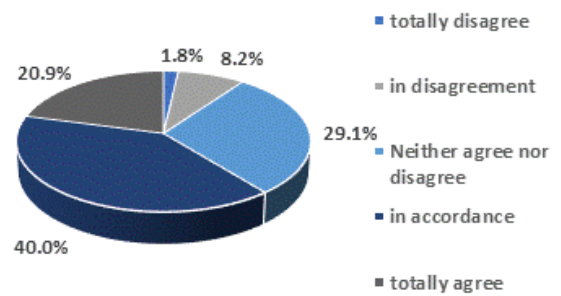
**Figure 2**

I combine technological tools to improve school practices.

Source: own elaboration

Through the use of technologies helps to develop critical thinking, 1.8% totally disagree, disagree 8.2%, neither agree nor disagree 29.1%, agree 40%, totally agree 20.9% [figure 3].

### Box 3



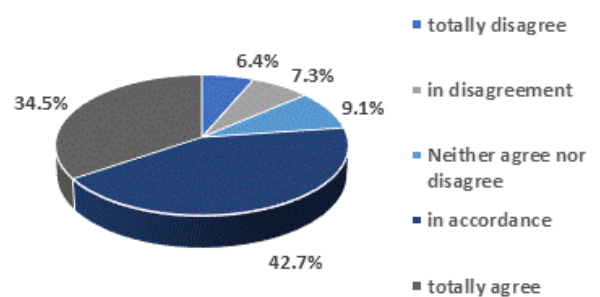
**Figure 3**

Using technologies helps to develop critical thinking.

Source: own elaboration

I have access to programs and ICTs for my educational training, 6.4% totally disagree, disagree 7.3%, neither agree nor disagree 9.1%, agree 42.7%, totally agree 34.5% [figure 4].

### Box 4



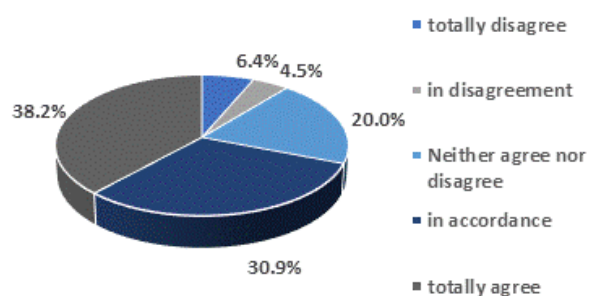
**Figure 4**

Access to programs and ICTs for my educational training.

Source: own elaboration

I solve practical problems through technologies, 6.4% totally disagree, disagree 4.5%, neither agree nor disagree 20%, agree 30.9%, totally agree 38.2% [figure 5].

### Box 5



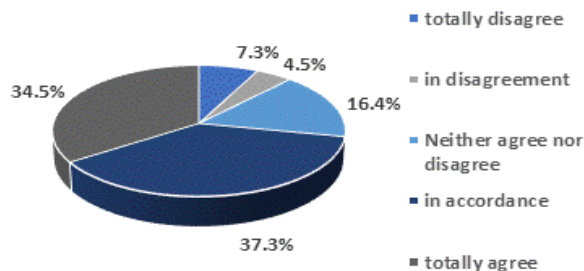
**Figure 5**

I solve practical problems using technology.

Source: own elaboration

Development of educational projects through ICT for knowledge generation, 7.3% totally disagree, disagree 4.5%, neither agree nor disagree 16.4%, agree 37.3%, totally agree 34.5% [figure 6].

### Box 6

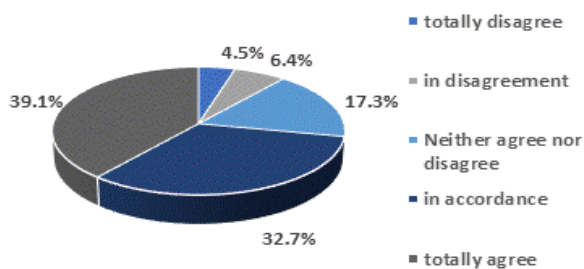


**Figure 6**

Development of educational projects using ICTs for knowledge generation.

The use of ICTs motivates autonomous learning, 4.5% totally disagree, disagree 6.4%, neither agree nor disagree 17.3%, agree 32.7%, totally agree 39.1% [figure 7].

### Box 7

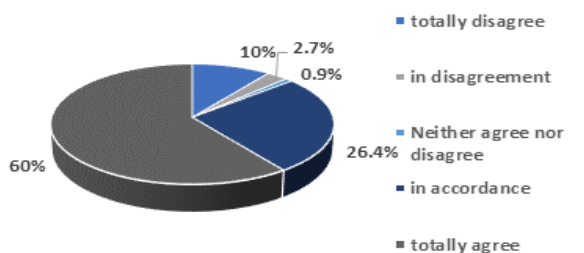


**Figure 7**

The use of ICTs motivates autonomous learning.

I search for information that is available on the internet, 10% totally disagree, disagree 2.7%, neither agree nor disagree 0.9%, agree 26.4%, totally agree 60% [figure 8].

### Box 8

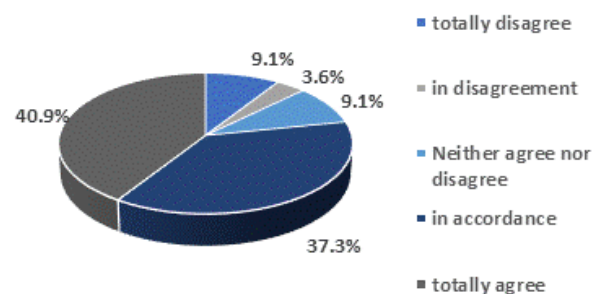


**Figure 8**

I search for information that is available on the internet

The integration of ICT helps my academic performance, 9.1% totally disagree, disagree 3.6%, neither agree nor disagree 9.1%, agree 37.3%, totally agree 40.9% [figure 9].

### Box 9

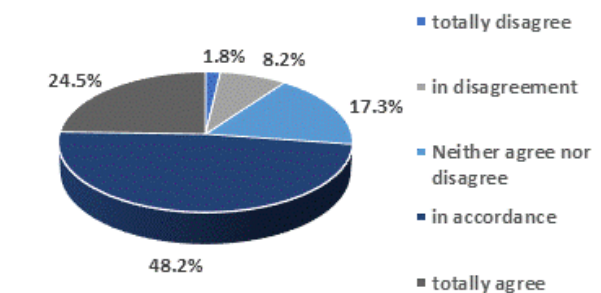


**Figure 9**

The integration of ICT helps my academic performance

Your knowledge and skill with ICT is favourable, 1.8% totally disagree, disagree 8.2%, neither agree nor disagree 17.3%, agree 48.2%, totally agree 24.5% [figure 10].

### Box 10



**Figure 10**

Your knowledge and skill with ICT are favourable.

## Discussion

In turn, the majority of participants support the idea of combining technological tools to improve school practices, although there is a segment that shows disagreement in various degrees, highlighting the importance of considering different perspectives in the implementation of technologies in the educational field. On the other hand, 9.2% show disagreement in various degrees. Specifically, 1.8% totally disagree, 8.2% disagree, and 29.1% fall into the category of neither agree nor disagree. These data indicate a diversity of opinions on the influence of technologies in promoting critical thinking.

Within this context, there is a positive attitude towards access to Information and Communication Technologies [ICT] for their educational training. In total, 77.2% are in the categories of agree or totally agree, suggesting significant support for the use of programs and ICT for educational purposes. On the other hand, 13.7% express some degree of disagreement. Specifically, 6.4% totally disagree, 7.3% disagree, and 9.1% fall into the category of neither agree nor disagree. These data reveal a diversity of opinions, although the general trend indicates a positive inclination towards access to programs and ICT for educational training. Thus, although the majority perceive those technologies are useful for solving practical problems, there is a segment that does not fully share this perspective, highlighting the importance of considering various opinions and experiences in the integration of technologies to address practical challenges. On the other hand, participants showed positive attitudes towards the use of ICT to develop educational programs and generate knowledge. This highlights the favourable perception of ICT as a tool to facilitate the creation of educational programs in this context. Therefore, the respondents [71.8%] also believe that the use of ICT can promote autonomous learning. This suggests that ICT is seen as a driver of autonomy in the learning process and as a motivational tool. 86.4% of respondents expressed a positive attitude towards searching for information on the Internet, demonstrating the high dependence and use of ICT as a source of information in the academic field.

In turn, 78.2% recognize that the integration of ICT contributes positively to their academic performance. This finding suggests that ICT is perceived as beneficial tools for performance in the academic field. Similarly, 72.7% claim to have favourable knowledge and skills in the use of ICT. This indicates that a significant proportion of respondents feel competent in handling these technologies.

### **SECIHTI Axis: Development of Cutting-Edge Strategic Technologies and Open Innovation for Social Transformation**

The integration of Information and Communication Technologies [ICT] in educational environments, as demonstrated in this study, significantly contributes to improving academic performance and fosters autonomous learning among students.

By promoting open innovation and the development of advanced technologies, these benefits extend to a broader context, generating an impact that transcends the educational sphere. This transformation not only modernizes teaching methods but also positively influences the social and economic structure, promoting more inclusive and sustainable development.

### **Conclusions**

In conclusion, the results obtained through the evaluation of the students' perception of the use of Information and Communication Technologies [ICT] in the Bachelor's Degree in Administration reveal a generally positive trend. The participants show a favorable predisposition towards the integration of ICT in various academic dimensions. It should be noted that students recognize the usefulness of ICTs for the development of educational projects, motivation for autonomous learning, searching for information on the Internet and improving academic performance. These findings suggest that ICTs are not only perceived as useful tools in the educational process, but also play a key role in creating a dynamic and enriching academic environment.

Technology adoption is seen as an inherent solution to improve educational standards without necessarily considering implementation processes, teacher training, or specific strategies to effectively integrate technology into educational settings. This approach can pose challenges because the effectiveness of technology in education often depends on how intentionally it is integrated into the instructional environment. Technology can range from electronic devices, such as computers and tablets, to educational software, online platforms, digital resources and other technological tools. The underlying idea is that technology not only complements, but also transforms the way education is delivered, information is accessed and learning activities are carried out. This statement recognizes the importance of incorporating technology effectively to improve the quality and efficiency of educational processes.

Finally, the study showed that students' skills and knowledge in the use of ICTs were mostly good, indicating that participants felt comfortable and competent in the use of these technologies in academic settings.

However, it is worth noting that there are areas of disagreement, such as a small proportion of students disagreeing with some of the benefits of ICTs. This highlights the importance of understanding different perspectives and personal experiences in the use of ICT.

## Declarations

## Conflict of interest

The authors declare that they have no conflict of interest. They have no financial interests or relationships that may have influenced the article reported in this article.

## Author contribution

*Mejía-Salazar, Gilberto and Gómez-Campos, Sinahí Gabriela:* They contributed with the main idea and the realization of the project, as well as the first draft. carried out theoretical framework and methodology of investigation.

*Granados-Magaña, Javier Alejandro and Félix-Pérez, Sirigui Garibeth:* Carried out the analysis of data, as well as graph review and correction comments. All authors contribute to the preparation of the summary, Results and contributions of the document.

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The research did not receive any funding.

## Abbreviations

CONAIC	National Council for Accreditation in Informatics and Computing
ICT	Information and Communication Technologies
RIED	Ibero-American Journal of Distance Education
SPSS	Statistical Package for the Social Sciences

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