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Original article

The influence of technology on the learning of third-year high school students

La influencia de la tecnología en el aprendizaje de los estudiantes de tercero de bachillerato

A influência da tecnologia na aprendizagem de alunos do terceiro ano do ensino médio

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ABSTRACT

This study aims to analyze the influence of technology use on the learning of third-year high school students, evaluating their perceptions of usefulness, ease of use, and adoption intent, according to the Technology Acceptance Model. The use of Information and Communication Technologies in education has transformed learning processes, although their implementation still faces challenges in institutions such as the Tiburcio Macías Educational Unit. A mixed-methodological approach with a cross-sectional and descriptive design was applied, using a questionnaire based on the Technology Acceptance Model, following the implementation of technological tools in the classroom. Data were processed with SPSS and Microsoft Excel, ensuring reliability through Cronbach's alpha coefficient. The results showed a predominantly positive perception, highlighting that technology facilitates academic comprehension and fosters interest in its continued use. However, some students

expressed neutrality, suggesting barriers such as lack of confidence and inequalities in access. It is concluded that Information and Communications Technologies are fundamental to education, but their adoption must be strengthened through strategies such as teacher training and infrastructure improvements to maximize their benefits for learning.

Keywords: learning; teaching; high school student; information technology; educational technology.

RESUMEN

El presente estudio tiene como objetivo analizar la influencia del uso de tecnologías en el aprendizaje de los estudiantes de tercero de bachillerato, evaluando su percepción sobre utilidad, facilidad de uso e intención de adopción, según el Modelo de Aceptación Tecnológica. El uso de las Tecnologías de la Información y las Comunicaciones en la educación ha transformado los procesos de aprendizaje, aunque su implementación aún enfrenta desafíos en instituciones como la Unidad Educativa Tiburcio Macías. Se aplicó un enfoque metodológico mixto con un diseño transversal y descriptivo, utilizando un cuestionario basado en el Modelo de Aceptación Tecnológica, tras la implementación de herramientas tecnológicas en el aula. Los datos fueron procesados con SPSS y Microsoft Excel, garantizando su confiabilidad mediante el coeficiente Alfa de Cronbach. Los resultados mostraron una percepción mayoritariamente positiva, resaltando que la tecnología facilita la comprensión académica y fomenta el interés por su uso continuo. No obstante, algunos estudiantes expresaron neutralidad, lo que sugiere barreras como: falta de confianza y desigualdades en el acceso. Se concluye que las Tecnologías de la Información y las Comunicaciones son fundamentales en la educación, pero su adopción debe fortalecerse mediante estrategias como la capacitación docente y la mejora de infraestructura para maximizar sus beneficios en el aprendizaje.

Palabras clave: aprendizaje; enseñanza; estudiante de secundaria; tecnología de la información; tecnología educacional.

RESUMO

Este estudo tem como objetivo analisar a influência do uso da tecnologia na aprendizagem de alunos do terceiro ano do Ensino Médio, avaliando suas percepções de utilidade, facilidade de uso e intenções

de adoção, segundo o Modelo de Aceitação de Tecnologia. O uso das Tecnologias da Informação e Comunicação na educação tem transformado os processos de aprendizagem, embora sua implementação ainda enfrente desafios em instituições como a Unidade Educacional Tiburcio Macías. Aplicou-se uma abordagem metodológica mista, com delineamento transversal e descritivo, utilizando um questionário baseado no Modelo de Aceitação de Tecnologia, acompanhando a implementação das ferramentas tecnológicas em sala de aula. Os dados foram processados com SPSS e Microsoft Excel, garantindo a confiabilidade por meio do coeficiente alfa de Cronbach. Os resultados mostraram uma percepção predominantemente positiva, destacando que a tecnologia facilita a compreensão acadêmica e fomenta o interesse em seu uso contínuo. No entanto, alguns alunos expressaram neutralidade, sugerindo barreiras como falta de confiança e desigualdades no acesso. Conclui-se que as Tecnologias da Informação e Comunicação são essenciais na educação, mas sua adoção deve ser fortalecida por meio de estratégias como capacitação de professores e melhorias na infraestrutura para maximizar seus benefícios para a aprendizagem.

Palavras-chave: aprendizagem; ensino; aluno do ensino médio; tecnologia da informação; tecnologia educacional.

INTRODUCTION

Information and Communication Technologies (ICTs) have progressively developed, evolving from different types of traditional technologies to a pivotal moment with the Internet and its diverse accesses (Verástegui Gutiérrez & Rodríguez Ahuanari, 2024). This evolution poses a challenge for educational institutions such as the Tiburcio Macías Educational Unit, where the implementation of ICTs is limited. In this context, this research analyzes the influence of these tools on student learning, considering factors such as perceived usefulness, ease of use, and adoption intent, according to the Technology Acceptance Model (TAM) (Davis, 1987).

The integration of technology with education has become a central theme in debates about educational innovation (Arteaga-Alcívar *et al.*, 2022). This refers not only to the use of devices and applications, but also to the transformation of pedagogical practices to fully leverage the potential of technology in the teaching-learning process (Arteaga-Alcívar *et al.*, 2022).

Due to the continuous advances in ICTs, various aspects of community life have changed, which includes the educational field (Verástegui Gutiérrez & Rodríguez Ahuanari, 2024). Therefore, ICTs are considered a tool or technique that influences the construction of learning; consequently, the education sector must contribute to the teaching-learning process by using new digital media as pedagogical tools (Mariaca Garron *et al.*, 2022).

Students now learn in a new way thanks to the use of ICT in the educational process, which allows them to be better prepared to face the challenges and characteristics of the 21st century (Verástegui Gutiérrez & Rodríguez Ahuanari, 2024). Autonomy, peer interaction, growth in mathematical reasoning, and emergent literacy are some of these capabilities (Domínguez-Ramírez & Fernández-Chávez, 2023).

It is important that the acquisition of this technology be applied in such a way that learning is beneficial for both stakeholders, since, through digital tools, the educational process becomes flexible and accessible, leading to high student performance (Verástegui Gutiérrez & Rodríguez Ahuanari, 2024). The Tiburcio Macías Educational Unit has not yet fully implemented advanced technologies in its classrooms; however, the potential impact of these tools on learning development is highly relevant in the current educational context. This situation highlights the need to investigate how the use of technology can influence the learning of students at this institution, promoting the acquisition of fundamental competencies and skills to face the challenges of a digitalized society.

This research used a mixed-methodological approach, combining qualitative and quantitative elements to obtain a comprehensive view of the impact of ICTs on student learning. Subjective experiences were collected through observation and interpretation of responses, and quantitative data were obtained using a questionnaire based on the Technology Acceptance Model (TAM). Data were processed using SPSS and Excel, and reliability was guaranteed with a Cronbach's alpha greater than 0.9 in all dimensions. This approach allowed for a more complete understanding of the situation, essential for proposing effective educational solutions.

Information and Communication Technologies (ICTs) have evolved significantly, transforming educational processes. Their integration into the classroom not only improves access to information but also optimizes pedagogical strategies. However, at the Tiburcio Macías Educational Unit, the implementation of these technologies is still limited, raising questions about their impact on learning. In this context, this research seeks to analyze the influence of technology on learning, evaluating

the perception of these tools among third-year high school students at the Tiburcio Macías Educational Unit.

Influence of technology on learning

Currently, schools are the only educational institutions that have the necessary resources regarding ICTs; these are integrated so that the student becomes familiar with them and learns how to use them (Verástegui Gutiérrez & Rodríguez Ahuanari, 2024). This reality is far from what is observed in rural areas, where the use of technology is quite precarious (García-Pinilla *et al.*, 2023). Therefore, it is necessary to integrate the resources of the information society in all school environments, so as to promote learning experiences in accordance with the sociocultural demands of students and that favor curricular enrichment, enabling a holistic education extended to all levels (Blanco Martínez & González Sanmamed, 2021).

Studies done by Arancibia Muñoz *et al.* (2019) and Díaz-García *et al.* (2020) highlight that the perception of usefulness and ease of use of ICTs directly influences the attitudes of teachers and students toward their adoption in the teaching-learning process.

There are several models for measuring technology acceptance; the Technology Acceptance Model (TAM), developed by Davis (1987) and Davis *et al.* (1989), stands out as a highly effective model that has proven to predict ICT use.

According to Davis *et al.* (1989), the purpose of the TAM is to explain the causes of user acceptance of technologies. The TAM proposes that an individual's perceptions of the perceived usefulness and ease of use of an information system are conclusive in determining their intention to use a system. The TAM consists of five variables, including: perceived ease of use, perceived usefulness, attitude toward use, behavioral intention to use, and actual use. The two most significant factors in the model are perceived ease of use, which refers to the belief that no effort will be required, and perceived usefulness, which describes the belief that the technology improves job performance (Cornejo Vasquez, 2023).

The TAM was adapted by Lorenzo *et al.* (2011) in Spain, who modified it by adding the constructs of trust and perceived risk because they consider them important in online environments where uncertainty is present. According to this background, models based on the TAM, such as that of Lorenzo *et al.* (2011), which includes intention to use, perceived usefulness, ease of use and, in

addition, trust and perceived risk, can be considered the most complete to investigate the attitude towards social networks, given that they mention that attitude is presented as a fundamental antecedent of the intention to use, taking into account elements that can influence it such as trust and perceived risk.

The Tiburcio Macías Educational Unit has not yet fully implemented advanced technologies in its classrooms; however, the potential impact of these tools on learning development is a highly relevant issue in the current educational context. This situation highlights the need to investigate how the use of technology can influence the learning of students at this institution, promoting the acquisition of fundamental competencies and skills to face the challenges of a digitalized society. Therefore, this study aims to analyze the influence of the use of technologies on the learning of third-year high school students, evaluating their perceptions of usefulness, ease of use, and adoption intention, according to the Technology Acceptance Model (TAM).

MATERIALS AND METHODS

A mixed-methodological approach was used to analyze student perceptions of the usefulness, ease of use, and intention to adopt technological tools. A questionnaire was designed based on the Technology Acceptance Model (TAM). Data collection took place at the end of the implementation of the technologies in the classroom. The results were processed using SPSS version 25 and Microsoft Excel, ensuring reliability through Cronbach's alpha coefficient. A cross-sectional and descriptive design was chosen. The cross-sectional design involved data collection at a single point in time, allowing for the analysis of students' perceptions regarding the use of technology in a specific context, without considering changes over time. This approach was useful for identifying patterns and trends in the perception of the use of technologies in the classroom. The questionnaire allowed for the assessment of perceptions of usefulness, ease of use, and intention to use technologies in the educational context. To ensure the reliability of the scales, Cronbach's alpha was calculated, obtaining values greater than 0.9, which ensured the internal consistency of the instruments used.

The population consisted of 65 third-year high school students from the Tiburcio Macías Educational Unit. From this group, a sample of 59 students was selected using simple random sampling, which ensured representativeness and allowed for inferences about the impact of educational technology in the studied context. SPSS version 25 and Microsoft Excel software were used for data analysis. SPSS allowed for the application of appropriate statistical methods, while Excel was used to organize

and visualize the data in a more accessible and flexible manner. To ensure the validity of the instrument, validation was conducted through expert judgment, involving three teachers with experience in digital education. The questionnaire was administered in a face-to-face setting during school hours, ensuring consistent conditions for all participants. Before data collection, authorization was obtained from the educational institution in compliance with the ethical principles of educational research. The study respected the principles of confidentiality and privacy of the participants. The anonymity of the students was guaranteed, ensuring that the data obtained would be used solely for research purposes.

RESULTS

Reliability analysis using Cronbach's alpha coefficient was used to assess the internal consistency of the questionnaire dimensions. The results obtained reflect high reliability across all scales evaluated, as detailed below (Table 1):

Table 1. Cronbach's analysis

1	**Perceived Utility (PU)**	0.970
2	**Ease of Use (EOU)**	0.976
3	**Intention of Use (IU)**	0.974

Note: The values obtained indicate excellent internal consistency of the items that make up each dimension, considering that a Cronbach's alpha greater than 0.9 is indicative of high reliability
Source: own elaboration

Perceived Usefulness (PU): 0.970; this value indicates that the questions related to Perceived Usefulness are highly consistent and effectively measure this construct, suggesting that students have very coherent answers in this group of questions. Ease of Use (PEU): 0.976; the highest value among the three, confirming that the questions on Ease of Use are extremely consistent and well designed to capture this dimension of the TAM. Intention to Use (IU): 0.974; this alpha is also excellent and suggests that the questions on Intention to Use are very consistent with each other, providing reliable data for this dimension. The analysis of the results obtained through the application of the TAM questionnaire (Technology Acceptance Model) allowed us to identify students' perceptions

and attitudes toward the use of technology in their learning process. The distribution of responses by question is presented below (Table 2).

Table 2. Results of the application of the TAM questionnaire

Questions	1	2	3	4	5
1. Does using technology in the classroom improve my learning?	5%	12%	44%	27%	12%
2. Do you think that technology makes it easier to understand academic subjects?	7%	12%	19%	34%	29%
3. Does the use of technology allow me to carry out learning activities more effectively?	8%	2%	22%	51%	17%
4. Do I think technology helps improve my academic performance?	7%	15%	37%	19%	22%
5. Is it easy to learn to use technology for academic activities?	8%	5%	17%	49%	20%
6. Is it easy to navigate educational technology tools?	7%	7%	32%	31%	24%
7. I find it comfortable to use technology to study	3%	12%	22%	31%	32%
8. I find the use of technology easy and hassle-free for academic tasks.	0%	10%	31%	39%	20%
9. I plan to continue using technology to support my learning.	5%	3%	19%	41%	32%
10. I would like technology to be more integrated into my studies.	3%	14%	24%	36%	24%
11. I think the use of technology is important for my learning	5%	14%	27%	36%	19%
12. I would use technology for schoolwork even outside of class.	7%	5%	12%	31%	46%

Note: The results show a predominantly positive perception of technology use, with a high percentage of students believing that technology improves their learning and facilitates academic activities

Source: own elaboration

Students' perceptions of technology in learning are largely positive. They recognize its usefulness in better understanding academic subjects and facilitating learning activities. Furthermore, most express comfort using technological tools and intend to continue using them to support their education.

However, although acceptance is high, there is a significant proportion of neutral responses on several aspects. This suggests that some students are still not fully convinced of its impact on academic performance or encounter certain difficulties in its use. This could be related to factors such as lack of training, access to devices, or previous experience with technology.

In terms of ease of use, most find navigating and learning new technological tools accessible, although some perceive a certain level of complexity. This indicates the need for strategies that reinforce training in the use of these tools to maximize their benefits.

Finally, the intention to continue using technology and further integrate it into studies is clear, highlighting its relevance in the academic environment. However, to improve its acceptance and effectiveness, it would be advisable to address the barriers that generate uncertainty and work on a more structured integration within the educational process.

Comparison between dimensions

Student t-test was conducted to compare students' perceptions of the perceived usefulness (PU) and ease of use (EOU) of technologies in learning. This analysis determined whether there were significant differences between these two key dimensions of the TAM model (Table 3).

Table 3. Comparison of dimensions of the Technology Acceptance Model

Dimensions Compared	Media (PU)	Media (PEU)	t	p-value	Significance
Perception of Usefulness vs. Ease of Use	0.970	0.976	-1.81	0.108	Not significant

Note: The t-test values indicate no significant difference between perceived usefulness (PU) and ease of use (PEU) among third-year high school students at the Tiburcio Macías Educational Unit. The p-value greater than 0.05 (0.108) suggests that both dimensions have a comparable relationship in terms of students' perceptions of technology in their learning process
Source: own elaboration

The test results showed that students similarly rated the perceived usefulness and ease of use of technologies, with neither being more important than the other. This balance reinforced the idea that both dimensions were essential to fostering their acceptance and use in the classroom. Although the majority had a favorable perception of ICTs, some students expressed neutral or skeptical views

about their impact on learning, suggesting the existence of barriers such as a lack of digital literacy and unequal access to devices.

It was also found that a positive perception of technology did not guarantee its effective use, as factors such as teacher orientation and available infrastructure influenced its use. Previous studies indicated that teacher training not only improved students' experience but also influenced their motivation and perception of the usefulness of ICTs.

Therefore, the results underscored the importance of continuing to research strategies for more equitable and effective technological integration, considering both access to resources and the training of students and teachers. Only through structured implementation could the full potential of ICTs in education be fully realized, reducing digital divides and promoting more inclusive learning.

DISCUSSION

The study's findings confirmed previous research on the positive impact of ICTs on education. Studies such as those by Arteaga-Alcívar *et al.* (2022) and Campos Olazabal (2020) indicated that the integration of technological tools improved educational quality and favored student learning. Similarly, Yan and Li (2023) highlighted that the use of technology in the classroom not only promoted cognitive learning but also contributed to the development of socio-emotional skills. However, as in previous research, barriers were identified related to inequality in access to electronic devices and a lack of training in the use of technological tools. These factors generated digital divides that limited the use of ICTs in certain sectors of the population, reinforcing the need to design inclusive strategies to guarantee equitable access to digital education. In this context, technology-based learning posed both benefits and challenges. Although it facilitated access to knowledge and fostered autonomous learning, it also presented associated risks, such as the misuse of information and problems with time management (Motoa, 2019). While the availability of digital resources allowed students to access a wide range of learning materials at any time and from anywhere, it also led to distractions and inefficient use of study time. Research such as that by Blanco Martínez and González Sanmamed (2021) pointed out that, in many cases, students lacked adequate strategies to self-regulate their learning when they relied heavily on digital tools. This aspect was especially relevant in the context of secondary education, where young people were still in the process of developing time management skills and critical discernment about the information they consumed online.

The results showed that most students perceived technology as a useful tool for improving their understanding of academic subjects and facilitating school activities. However, some participants expressed uncertainty regarding its effectiveness, which could be related to a lack of guidance from teachers or previous negative experiences with technology. Studies such as that by García-Pinilla *et al.* (2023) indicated that teacher training played a fundamental role in the acceptance and use of ICTs in the classroom, as trained teachers were better able to guide students in integrating them into their learning. According to Lorenzo *et al.* (2011), trust and perceived risk were also determining factors in the adoption of technologies in educational settings. In this sense, adequate guidance from teachers not only improved the perception of the usefulness and ease of use of ICTs but also reduced the fear of possible difficulties or failures in their application.

Another fundamental aspect of the discussion was the role of teachers in an increasingly digitalized educational environment. The findings of this study contributed to redefining the role of educators and students in the teaching-learning process, fostering not only the efficient use of ICTs but also a critical approach that enabled students to become producers of technology rather than passive consumers (Hwang & Fu, 2020). Digital literacy was not limited solely to learning how to use technological tools but focused on developing advanced skills, such as computational thinking, problem-solving, and digital content creation. This approach contributed to strengthening students' preparation for the challenges of an increasingly interconnected and technology-dependent society.

In terms of ease of use, students positively valued the accessibility of technological tools, although a significant percentage encountered certain challenges in navigating and using them. This coincided with research such as that by Haleem. *et al.* (2022), who suggested that adequate training in the use of educational technologies optimized their use. However, not only training in the technical use of the tools was relevant, but also training in critical digital skills, such as information management, online security, and identifying reliable sources. In this sense, digital education was approached from a comprehensive perspective, in which not only tools were provided, but also their responsible and ethical use was encouraged.

Additionally, the results of this study highlighted the importance of technological infrastructure in the effectiveness of ICTs in the classroom. The availability of devices, internet connectivity, and the adequacy of physical spaces for the use of technology played a crucial role in students' experience with digital learning. According to Arancibia Muñoz *et al.* (2019), the perception of the usefulness of technology in education was directly related to the quality of the available infrastructure. In contexts

where technological resources were limited or where internet access was poor, the implementation of ICTs in the classroom became a challenge, generating frustration among students and teachers. Therefore, to achieve an effective integration of technology in education, it was essential that institutions had the necessary conditions to allow for its optimal use. Finally, although the results of this study showed a largely positive perception of the use of ICTs in learning, it was important to consider individual differences in acceptance and adaptation to technology. Not all students had the same level of familiarity with digital tools or the same willingness to use them in their learning process. Research such as that by Díaz-García *et al.* (2020) indicated that attitudes toward technology in the classroom were influenced by factors such as prior experience with digital tools, confidence in using technology, and perceptions of its relevance for academic and professional futures. Therefore, the integration of ICTs in education should be approached from a flexible and personalized perspective, taking into account the needs and abilities of each student to maximize its impact on learning.

In conclusion, the results of this research supported the importance of ICTs as key tools in secondary education, highlighting their benefits in improving student learning and motivation. However, they also highlighted the existence of challenges that needed to be addressed to ensure their effective implementation, such as teacher training, equitable access to technology, the development of advanced digital skills, and the improvement of technological infrastructure. This indicated that, while the potential of technology in education was significant, it was essential to address existing gaps through adequate technological infrastructure and training programs for both students and teachers. By overcoming these limitations, technology was able to consolidate itself as an essential resource for learning, promoting a more inclusive, effective education that is prepared for the challenges of the digital world. This fulfilled the objective of analyzing the influence of technology on the learning of third-year high school students at the Tiburcio Macías Educational Unit.

REFERENCES

Arancibia Muñoz, M. L., Cabero Almenara, J., Valdivia Zamorano, I. (2019). Estudio comparativo entre docentes y estudiantes sobre aceptación y uso de tecnologías con fines educativos en el contexto chileno. *Apertura (Guadalajara, Jal.)*, 11(1), 104-119. https://doi.org/10.32870/AP.V11N1.1440

Arteaga-Alcívar, Y., Guaña-Moya, J., Begnini-Domínguez, L., Cabrera-Córdova, M. F., Sánchez-Cali, F., & Moya-Carrera, Y. (2022). Integración de la tecnología con la educación. *Revista Ibérica de Sistemas e Tecnologias de Informação*, (E54), 182-193.

Blanco Martínez, A., & González Sanmamed, M. (2021). Aprender desde la perspectiva de las ecologías: una experiencia en Secundaria a través del teatro y de Tiktok. *Educatio Siglo XXI*, 39(2), 169-190. https://doi.org/10.6018/EDUCATIO.465551

Campos Olazabal, P. J. (2020). La importancia de la investigación formativa como estrategia de aprendizaje. *EDUCARE ET COMUNICARE Revista de investigación de la Facultad de Humanidades*, 8(1), 88-94. https://revistas.usat.edu.pe/index.php/educare/article/view/397

Cornejo Vasquez, D. A. (2023). *Factores del Modelo de Aceptación de Tecnología (TAM) que influyen en la intención de uso de las plataformas online de viaje: efecto mediador de la utilidad percibida y facilidad de uso percibida*. Universidad ESAN. https://hdl.handle.net/20.500.12640/3661

Davis, F. D. (1987). *User acceptance of information systems: the technology acceptance model (TAM)*. http://deepblue.lib.umich.edu/handle/2027.42/35547

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35(8), 982-1003. https://www.jstor.org/stable/2632151

Díaz-García, I., Almerich, G., Suárez-Rodríguez, J., & Orellana, N. (2020). La relación entre las competencias TIC, el uso de las TIC y los enfoques de aprendizaje en alumnado universitario de educación. *Revista de Investigación Educativa*, 38(2), 549-566. https://doi.org/10.6018/RIE.409371

Domínguez-Ramírez, P. T., & Fernández-Chávez, C. del C. (2023). Perception of families with nursery school children facing mediated learning through information and communication technologies (ICTs) in times of COVID-19. *Información Tecnológica*, 34(2), 125-136. https://doi.org/10.4067/S0718-07642023000200125

García-Pinilla, J. I., Rodríguez-Jiménez, O. R., & Olarte-Dussan, F. A. (2023). Apropiación docente compleja de las TIC en instituciones educativas dotadas con herramientas tecnológicas: Un análisis cualitativo desde el Modelo de Apropiación de la Tecnología (MAT). *Perfiles Educativos*, 45(179), 37-54. https://doi.org/10.22201/IISUE.24486167E.2023.179.59798

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275-285. https://doi.org/10.1016/J.SUSOC.2022.05.004

Hwang, G. J., & Fu, Q. K. (2020). Advancement and research trends of smart learning environments in the mobile era. *International Journal of Mobile Learning and Organisation*, 14(1), 114-129. https://doi.org/10.1504/IJMLO.2020.103911

Lorenzo, C., Alarcón, M., & Gómez, M. (2011). Adopción de redes sociales virtuales: ampliación del modelo de aceptación tecnológica integrando confianza y riesgo percibido. *Cuadernos de Economía y Dirección de la Empresa*, 14(3), 194-205. https://doi.org/10.1016/j.cede.2010.12.003

Mariaca Garron, M. C., Zagalaz Sánchez, M. L., Campoy Aranda, T. J., González González de Mesa, C. (2022). Revisión bibliográfica sobre el uso de las TIC en la educación. *Revista Internacional de Investigación En Ciencias Sociales*, 18(1), 23-40. https://doi.org/10.18004/RIICS.2022.JUNIO.23

Motoa, S. P. (2019). Pensamiento computacional. *Revista Educación y Pensamiento*, 26(26), 107-111. https://educacionypensamiento.colegiohispano.edu.co/index.php/revistaeyp/article/view/104

Verástegui Gutiérrez, L., & Rodríguez Ahuanari, R. (2024). Influencia de la integración de las TIC al aprendizaje de estudiantes de Secundaria. *Cuadernos de Investigación Educativa*, 15(1). https://doi.org/10.18861/CIED.2024.15.1.3633

Yan, D., & Li, G. (2023). A Heterogeneity Study on the Effect of Digital Education Technology on the Sustainability of Cognitive Ability for Middle School Students. *Sustainability*, 15(3), 2784. https://doi.org/10.3390/SU15032784

Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.