TIC - TAC and Digital Competences in Military Higher Education

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Abstract
In the digital age, education with excellence must be supported by teachers with advanced levels in digital competencies, therefore, the research identifies the competency areas and their available levels by the different actors in military higher education, applying the scientific method and its progress is descriptive; through a survey to 124 people among Management staff, Administrative staff, Teachers and Military Instructors of the Escuela de Formación de Soldados del Ejército "Vencedores del Cenepa." According to the most relevant results, basic and medium levels in security competence are evidenced in 52,42% of respondents, considering that the career of Higher Technology in Military Sciences belongs to the department of Security and Defense of the University of the Armed Forces - ESPE, which is responsible for the training of soldiers in the field of security and defense, reason why it is essential to improve the digital skills on its personnel through specialized training processes. It is concluded that the effects of the application of TIC-TAC dynamize the classes, facilitate the teaching-learning process, contributing to have a training in didactics and methodological innovation of military and civilian teachers, improving skills and abilities.

Keywords: Digital Competences, Military Education, TAC, TIC

Introduction

Worldwide education has had to adapt to numerous changes caused by various aspects, among which is the introduction of Information and Communication Technologies (ICT in spanish TIC). Unfortunately, it has primarily focused on the use of technological tools without exploring the benefits they bring to learning. Technology provides a new approach to educational research, which doesn't imply that ICT improves education per se, but rather how teaching and learning are approached. This gives rise to Technologies for Learning and Knowledge (TLK in spanish TAC), which allow organizing students into collaborative work groups to plan and solve problems, tasks, or projects together.

In the military environment, there has been a need to include ICT in education, but without fully assessing their importance in teaching and learning. At the Escuela de Formación de Soldados del Ejército "Vencedores del Cenepa" (ESFORSE), the application of technology has been evident, including virtual classrooms, MI ESPE (the computer platform of the Escuela de Formación de Soldados del Ejército), digital bibliographic repositories, among others. However, in some cases, the teacher or military instructor uses ICT out of obligation rather than allowing technology to generate joint learning and knowledge between the teacher, students, and technology. Therefore, it is essential to explore the digital skills of the different stakeholders and the benefits in the educational field. To achieve this, it is necessary to introduce TLK in military education to evaluate the performance of ICT in teaching and learning.

This study aims to answer the research question: What are the levels of digital competencies among the academic staff at ESFORSE? The paper begins by providing a detailed literature review, followed by a description of the methodology employed. It then presents the analysis and discussion of the results obtained and concludes with the findings of the current research study.

Literature Review

Education at all levels is the main pillar of socio-economic development, and in order to promote continuous improvement in the teaching-learning process, various actions have been developed worldwide, such as the establishment of legal norms and reports.

Currently, communicative, ethical, or intellectual competencies, to name just a few, are no longer sufficient to ensure effective teaching performance, which faces several challenges similarly with the new educational environments (Rangel, 2015). Knowledge has become the main source of wealth, and Information and Communication Technologies (ICT) are the most effective tools for its production and dissemination (Cabero, Barroso, Rodriguez, & Palacios, 2020).

The Organic Law on Intercultural Education in Ecuador, in its Article 6, section j, regarding the obligations of the state, states that it should: "guarantee digital literacy and the use of information and communication technologies in the educational process and promote the connection between teaching and productive and social activities" (LOEI, 2012).

Digital Teaching Competencies

In 2008, UNESCO developed a curriculum report with standards on competencies to integrate ICT with new pedagogies and promote dynamic social classrooms, cooperative interaction, collaborative learning, and group work, stimulated in teachers. This plan is based on three main components: basic technology concepts, deepening knowledge, and knowledge creation, which establish objectives and competencies that teachers should achieve (UNESCO - a Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura, 2008).

The development of digital competencies in teacher training has become an essential educational need, not just a trend. According to Morales (2013), this impact is reflected through the following aspects: expanding the coverage of education services, strengthening the educational system, promoting the use of ICT, and meeting the demand for services, see figure 1.
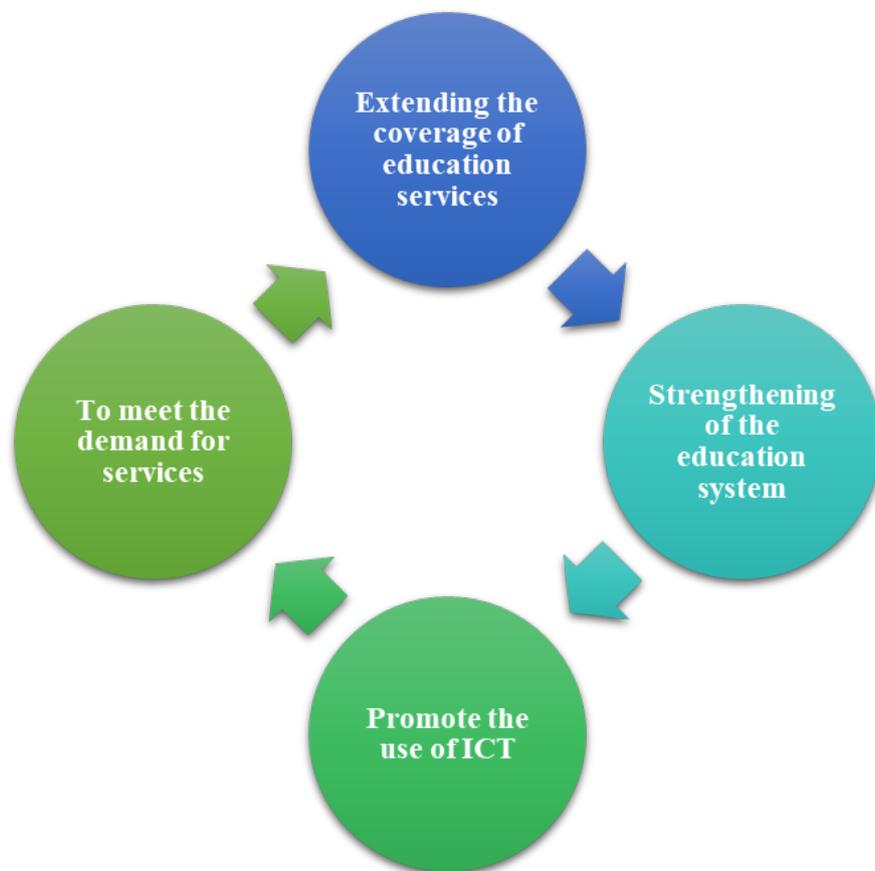

Figure 1: Aspects of digital competencies
Source. Morales (2013)

In recent studies conducted by Rangel (2015), the new role of the 21st-century teacher and their skills in using a set of resources are described:

Those that enable interaction with information, intellectually managing different systems and codes, reading and decoding not only in a linear manner but also in a hypertextual and hypermedia way, and evaluating information by discriminating valid and useful information for their educational, communicative, and action projects.

Similarly, we can say that teachers need to develop technical and pedagogical competencies to know, use, and integrate ICT in teaching practice, with the aim of making effective use in the teaching and learning process (Vera Noriega, Torres Moran, & Martínez García, 2014).

Considering the competencies that teachers of the 21st century need to develop for the improvement of their educational practice and continuous professional development, the Common Framework for Digital Teaching Competence establishes 5 competency areas and 21 competencies structured into 6 competency levels of proficiency. These five areas are: information and information literacy, communication and collaboration, digital content creation, safety, and problem-solving. Please refer to Figure 2 for more details. The six progressive levels of proficiency are: A1 Basic Level, A2 Basic Level, B1 Intermediate Level, B2 Intermediate Level, C1 Advanced Level, and C2 Advanced Level (INTEF, 2017).
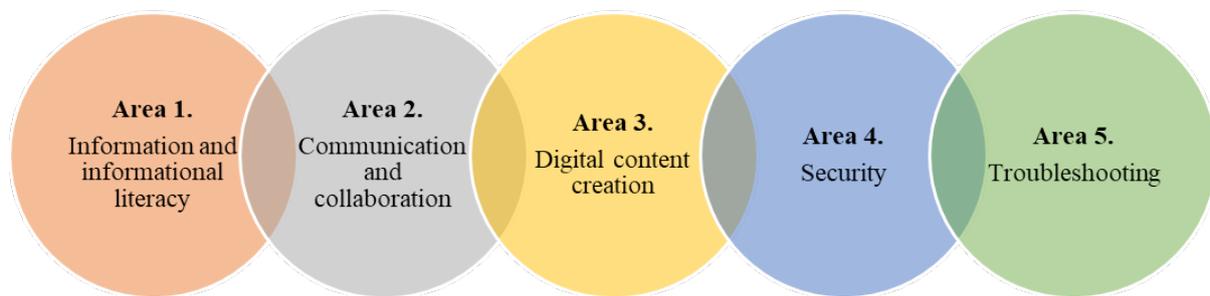

Figure 2: Areas of digital teaching competencies

Here is a description of each of the areas of digital teaching competencies:

Information and Information Literacy

This area focuses on the proper search for information on the internet and different digital platforms. It involves finding reliable, critical, easy-to-process information and being able to evaluate, organize, and analyze it effectively (INTEF, 2017).

Communication and Collaboration

 This area involves how to share information using different digital tools, and understanding how digital communication is managed and presented. It includes being able to share information and knowledge responsibly, actively interacting with different people online, and being capable of defending and protecting oneself and others from potential online dangers (INTEF, 2017).

Digital Content Creation

In this area, teachers learn to create, develop, modify, and edit both existing and new content in different digital platforms and formats. This includes multimedia content, texts, presentations, animations, spreadsheets, forms, and tests, among others. It also emphasizes respecting copyright and the different digital licenses associated with each application or software used (INTEF, 2017).

Safety

This area focuses on protecting information and digital content created and shared online. It involves safeguarding personal data and digital identity, respecting the privacy of all individuals who interact online, and protecting the workplace and the environment by minimizing technological pollution (INTEF, 2017).

Problem Solving

This area involves identifying the technological needs of both teachers and students based on their level and study conditions. It requires finding solutions to potential problems related to hardware and software. Furthermore, it emphasizes the need for continuous updating and improvement of knowledge to be considered a competent and adequately prepared teacher capable of sharing knowledge (INTEF, 2017).

Digital Competencies in Education

The situation experienced in recent years, particularly the COVID-19 pandemic, has radically changed the education landscape, from basic to higher education. It has highlighted the need to promote the development, research, and application of new online teaching methods. The difficulty of conducting face-to-face training has inevitably driven the use of ICT at all levels of education (Rodríguez, Martínez-Picazo, & Jara, 2022).

Currently, education is seen as a competency-based teaching-learning process. The aim is to have teachers in educational institutions who go beyond simply transmitting content, theories, formulas, and disconnected knowledge. Instead, they foster critical and reflective thinking in students, enabling them to have a transformative vision of their reality (Murcia, Barreto, & Triana, 2016).

Military Education

Education is essential at all levels and in all countries, especially in the military context. It has notably emerged and adapted to various educational and technological changes. In this article, we gather information on military education in some countries in all America and Europe.

Military Education in the United States.

Providing security in an unpredictable and rapidly changing world, and maintaining national security, still heavily relies on the military, their morale, motivation, and specialized skills, which are influenced by their academic training, professional education, and military training (Plifka, 2011).

In this context, the wars of the 21st century and future years will increasingly be fought against non-state actors, relying more on technology, information, and non-traditional methods (Plifka, 2011).

To meet the training, education, and development needs of its members, the U.S. military must strongly incorporate contemporary pedagogical methods. This includes blended learning, which is the reflective fusion of face-to-face and online learning experiences, or an

environment created when part of the instruction is conducted individually, while the other part is carried out through non-traditional methods or the use of technology (Plifka, 2011).

Globalization, increasing computing power, and the proliferation of low-cost advanced technologies have created an unprecedented level of global complexity. This growing complexity makes military operations extremely challenging. To succeed in a volatile, uncertain, complex, and ambiguous environment, military personnel must be able to respond quickly and comprehensively to enemy actions (Culkin, 2019).

The incorporation of ICT in education requires careful consideration of the goals and challenges of education. It is crucial to determine how and under what conditions the presence of ICT in education contributes to its improvement. The first and most important step is to determine the purpose of ICT in education and identify the pedagogical model that can directly contribute to improving the quality and equity of education (Díaz, Carneiro, & Toscano, 2021).

ICT and TLK in Latin America

Technology has encouraged significant changes in teaching thinking and learning processes. Various studies in Latin America have shown the effectiveness of integrating technology resources in learning processes. A study evaluating the digital competencies of teachers in Mexico found that despite the not-so-sophisticated technical use of technology, most teachers demonstrated a high degree of appropriation of ICT in their teaching and learning processes. Their use of technology was timely and relevant in educational processes, suggesting that further training in ICT for these teachers would result in positive impacts on both teachers and students (Lamschtein, 2022).

The authors Coello, Menacho, Uribe, and Sánchez reflect their ideas in a program using the virtual classroom developed on the Canvas platform, under the blended learning modality in Peru. This program, AVCCSS, and the use of the virtual classroom had a positive and significant influence on students' academic performance, serving as a potential complement to face-to-face classes and applying constructivist theory (2019).

A long-term comparative study conducted between 2012 and 2017, focusing on 1,829 cases of university professors from public and private institutions in Argentina and Latin America, examined the teachers' preparation and attitude for using ICT and TLK in their classrooms. The study aimed to understand the state of the innovation process in an evolving educational scenario (Ehuletche, Lado, & Atlante, 2018).

TLK is fundamental in accessing education, as stated by Reynoso, Mejía, and Cruz, based on their study on TLK's role in mathematics education, equality in quality teaching and learning, and teacher training within the educational system. Latin America is not exempt from the trend of integrating TLK in education. The integration of digital technologies in schools in Latin America and the Caribbean has led to improvements in teaching methods across all areas, facilitating the revision and reformulation of prevailing practices (2020).

In the military context, pedagogical interactivity emphasizes communication and the reciprocal relationship between students and teachers based on the collective construction of knowledge. In the research on learning paradigms and experiences in military education in Colombia, officers and non-commissioned officers from the Combined Arms School of the

Army (ESACE) have strengthened the use of technological tools, particularly virtual platforms such as Cedoc 360 and Blackboard. These platforms are part of the military personnel's training in various promotion courses, providing parameters and guidelines for virtual learning exercises and yielding positive results (Contreras, 2021).

According to Hernández (2021), when using TLK-mediated didactic sequences for teaching English, teachers should take advantage of the available technological tools to allow students to develop digital competencies. This approach helps students construct knowledge through technology, enhancing creativity. The author analyzes the role of TLK in language teaching, highlighting its potential to reduce anxiety, motivate students to learn English, build self-confidence, and foster active learning in the classroom, leading to better language acquisition performance.

ICT and TLK in Ecuador

Lozano (2011) presents the following definition:

TLK aims to guide information and communication technologies (ICT) towards more formative uses, both for students and teachers, with the goal of learning more and better. In essence, it involves understanding and exploring the potential didactic uses that ICT have for learning and teaching. In other words, TLK goes beyond simply learning to use ICT and instead focuses on exploring these technological tools in service of learning and knowledge acquisition.

We believe that the use of ICT in the educational field has a greater impact when teachers also make use of the now not-so-unknown TLK. TLK serves as a complement that should be considered when delivering classes and facilitating the teaching-learning process (Polo, 2018).

Methodology

The scientific method with a descriptive scope was applied in this study. The survey technique was employed, using a questionnaire as the data collection instrument, administered to different stakeholders including managerial staff, administrative personnel, teachers, and military instructors at ESFORSE.

For obtaining secondary information related to the study variables, a bibliographic or documentary exploration was conducted, utilizing available resources such as books, journals, articles, etc., at a global level.

Population

The study considered a finite population consisting of individuals involved in the academic teaching and learning processes. The total population of 124 participants was comprised of 20 women and 104 men, ranging in age from 26 to 65 years.

Instrument

For data collection, a structured questionnaire was administered, consisting of seven sections:

- General information: Title, questionnaire introduction, and personal data of the respondents to identify the characteristics of the participants (five questions).
- Support of ICT: Four main questions to measure digital support in teaching and learning.
- Information and information literacy, corresponding to competence one.
- Communication and collaboration, corresponding to competence two.
- Digital content creation, corresponding to competence three.
- Security, corresponding to competence four.
- Problem-solving, corresponding to competence five.

Procedure

Given the military context of this research, authorization was first obtained from the head of the Academic Administration Department at ESFORSE. Subsequently, the digital survey was administered using the Google Forms application. The results were tabulated and analyzed using IBM SPSS software, following the following phases:

First Phase: Respondents were identified based on variables such as age, gender, position, and study topic (competencies). Calculation of scores was then performed to establish ranges for proficiency levels, assigning a textual variable to each category for frequency counts and percentage calculations.

Second Phase: The obtained data was systematically organized in tables and graphical representations to facilitate the analysis and explanation of the results.

Results

Digital competencies in higher education teachers are essential for an optimal teaching and learning process. The following are the obtained results.

Various stakeholders participate in the military education at ESFORSE, identified by their respective roles. The majority of respondents were teachers and instructors, accounting for 67.7% of the participants (see Table 1).

Position	Frequency	Percentage
Managerial/Administrative	22	17,7 %
Teacher/Military instructor	102	81,4 %
Warehouse supervisor	1	0,8 %
Total	124	100,0 %

Table 1: Respondents classified by their position within the educational institution

Regarding the age of the personnel involved in military education, the majority (32.3%) fall within the age range of 41 to 45 years, as shown in Table 2.

Age (years)	Frequency	Percentage	Accumulated percentage
26-30	25	20,2	20,2
31-35	21	16,9	37,1
36-40	19	15,3	52,4
41-45	40	32,3	84,7
46-50	13	10,5	95,2
51-55	5	4,0	99,2
61-65	1	,8	100,0
Total	124	100,0	

Table 2: Age range of the population

Regarding the gender of the personnel involved in military education at ESFORSE, males dominate with 83.9%, as shown in Table 3.

Gender	Frequency	Percentage
Female	20	16,10%
Male	104	83,90%
Total	124	100,0%

Table 3: Gender of the population

There is a 58.06% of respondents who express that ICT provides significant support in the teaching-learning process, positively impacting lesson preparation and development, fostering motivation, and improving student learning. This contributes to professional development, with a tendency towards increasing knowledge through ICT training, as shown in Table 4.

Level	Frequency	Percentage
None	0	0,00%
Low	0	0,00%
Some	6	4,84%
Considerable	46	37,10%
Significant	72	58,06%
Total	**124**	**100,00%**

Table 4: Support of ICT in the teaching-learning process at ESFORSE

Regarding digital competencies in teachers and instructors at ESFORSE, Table 5 and Figure 3 display the proficiency levels for each of the 5 digital competencies, identifying that the majority surpass the basic level A1 in all competencies:

Competencies	Level	Frequency	Percentage	Accumulated percentage
Competence 1.- Information and information literacy	A1 Basic level	0	0,00%	0,00%
	A2 Basic level	4	3,23%	3,23%
	B1 Intermediate level	16	12,90%	16,13%
	B2 Intermediate level	51	41,13%	57,26%
	C1 Advanced level	37	29,84%	87,10%
	C2 Advanced level	16	12,90%	100,00%
	Total	**124**	**100,00%**	
Competence 2.- Communication and collaboration	A1 Basic level	2	1,61%	1,61%
	A2 Basic level	2	1,61%	3,23%
	B1 Intermediate level	20	16,13%	19,35%
	B2 Intermediate level	50	40,32%	59,68%
	C1 Advanced level	34	27,42%	87,10%
	C2 Advanced level	16	12,90%	100,00%
	Total	**124**	**100,00%**	
Competence 3.- Creation of digital content	A1 Basic level	1	0,81%	0,81%
	A2 Basic level	7	5,65%	6,45%
	B1 Intermediate level	12	9,68%	16,13%
	B2 Intermediate level	36	29,03%	45,16%
	C1 Advanced level	52	41,94%	87,10%
	C2 Advanced level	16	12,90%	100,00%
	Total	**124**	**100,00%**	
Competence 4.- Security	A1 Basic level	0	0,00%	0,00%
	A2 Basic level	4	3,23%	3,23%
	B1 Intermediate level	11	8,87%	12,10%
	B2 Intermediate level	50	40,32%	52,42%
	C1 Advanced level	43	34,68%	87,10%
	C2 Advanced level	16	12,90%	100,00%
	Total	**124**	**100,00%**	
Competence 5.- Problem solving	A1 Basic level	0	0,00%	0,00%
	A2 Basic level	9	7,26%	7,26%
	B1 Intermediate level	23	18,55%	25,81%
	B2 Intermediate level	39	31,45%	57,26%
	C1 Advanced level	37	29,84%	87,10%
	C2 Advanced level	16	12,90%	100,00%
	Total	**124**	**100,00%**	

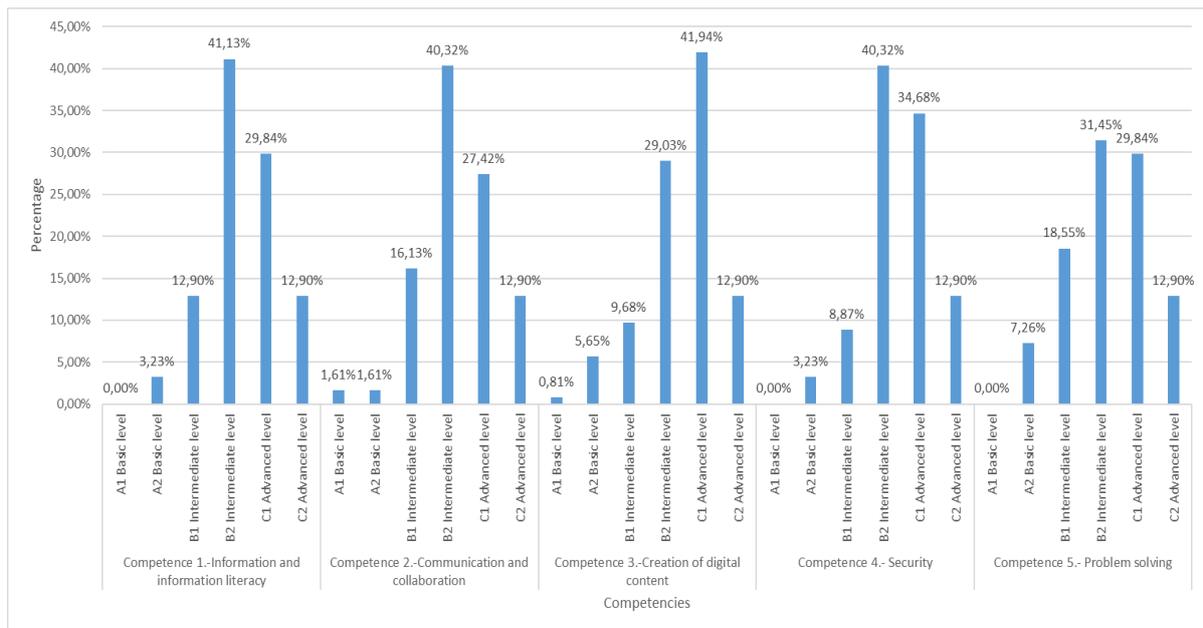Table 5: Digital competencies in teachers and instructors at ESFORSE
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Figure 3: Use of ICT and digital competencies in teachers and instructors at ESFORSE

Discussion

The following are the relevant findings for each digital competence:

Regarding Competence 1: Information and digital literacy, 41.13% of the respondents reported using digital information at an intermediate level (B2). This indicates that the majority of respondents are able to select and organize digital information using search engines and databases, and they possess the skills to analyze and store information using digital tools such as Google Drive. However, 3.23% of respondents are at a basic level (A1 and A2) and would benefit from further reinforcement in this competence area.

Talking about Competence 2: Communication and collaboration, 40.32% of the respondents are at an intermediate level (B2), indicating that they are able to effectively use various digital tools for communication and collaboration. They responsibly interact with users online, share knowledge, and actively participate in online platforms, social networks, and educational forums. Only 1.61% of the respondents are at a basic level (A1 and A2) in this competence.

In Competence 3: Digital content creation, 41.94% of the respondents are at an advanced level (C1). They are capable of creating, modifying, and editing digital content using different platforms and file formats. The creation of digital content plays a crucial role in the current teaching and learning process. The use of ICT enables the creation and editing of various types of content, including text, images, videos, and sound, with the support of digital tools. This competence requires teachers to have a good understanding of computer literacy and the ability to navigate operating systems, applications, and configurations, as well as perform data backups. Developing this competence contributes to professional growth.

In Competence 4: Security, 40.32% of the respondents are at an intermediate level (B2). They protect their devices with antivirus software, have knowledge of digital security systems, and are conscious of protecting personal data and digital identity to minimize technological risks associated with internet use. They also demonstrate awareness of the environmental impact of

ICT. However, there is room for improvement in this competence, especially for those at the basic level (A1 and A2).

Regarding Competence 5: Problem solving, 31.45% of the respondents are able to solve technical problems related to hardware and software. They demonstrate innovative actions in the field, leveraging technology advancements and continuously updating their digital skills. Problem-solving competence requires a proactive approach and continuous learning to adapt to technological changes. The results highlight the need for ongoing professional development in digital competences.

Overall, the research findings provide an overview of the digital competences of teachers and instructors in the ESFORSE. The majority of respondents demonstrate an intermediate level of digital competence, which aligns with previous studies (Cabero, Barroso, Rodriguez, & Palacios, 2020).). It is important to note that ICT has become a valuable tool for teaching and learning, and its integration positively impacts the development of digital competences, as evidenced by contributions from Martinez et al. (2018) and Gonzalez et al. (2016).

The main objective of this study was to identify the level of digital competence among teachers in the ESFORSE and how ICT supports their development. The results indicate that teachers with knowledge in ICT have higher levels of digital competence. This finding is consistent with previous studies emphasizing the importance of ICT as tools for teaching and learning.

Moreover, the use of ICT has been shown to be an instructional pattern in the educational context. For example, a study conducted by Rosales (2019) at the Escuela Superior Militar "Eloy Alfaro" in Ecuador implemented ICT using the Deming Cycle of plan, do, check, and act. This model facilitated teaching and learning by integrating platforms, websites, electronic whiteboards, and educational mobile applications. The results showed improved student engagement, motivation, and performance.

This aligns with the findings of competences 1 and 3 in the present study. The military education context presents unique challenges, and the effective use of technology can help address them. The Ecuadorian Army aims to lead complex military operations by providing education based on a constructivist model. Technology is a transformative tool that can reshape communication, education, and work methods for teachers (Querembás, 2021).

The ESFORSE has recognized the need to implement ICT tools to cover various subject areas in the training of aspiring soldiers. This includes hiring teachers who possess digital competences. The success of educational programs depends on the commitment of the human resources involved. The institution and teachers should strive for high-quality strategies, appropriate educational tools, and a teaching staff that is both capable and willing to adapt to changing study requirements and technological challenges.

Conclusions

This section begins by addressing the research question, "What are the levels of digital competencies among the academic staff of ESFORSE?" and describes the main conclusions of the study:

According to the most relevant results, basic and intermediate levels are evident in the competence of security among 52.42% of the respondents. Considering that the Superior Technology Career in Military Sciences belongs to the Security and Defense Department of the Armed Forces University - ESPE, which is responsible for training professionals in the field of security and defense, it is essential to improve the digital competencies of the teaching staff and military instructors through specialized training processes.

ICT and TLK are related to the digital competencies of teachers, where ICT serves as support tools for teaching and TLK represents the application of ICT and how new knowledge is assimilated through technology. Therefore, higher education institutions, including ESFORSE, have had to deliver education in a virtual format, which has become indispensable during times of pandemic and social events in the country.

Digital competencies play a crucial role in current military education. In a nutshell, in this study, a significant percentage of teachers rely on technology and various digital tools available online to support their teaching and educational activities.

Recommendations

ESFORSE's military education must stay at the forefront of new technologies. Therefore, military instructors and teachers should receive continuous training to enhance their digital competencies and provide mission-oriented teaching and learning aligned with the vision of the Ecuadorian Army and the demands of society.

To ensure that students achieve the required learning outcomes and strengthen their digital competencies, it is recommended to include the subject of Office Tools in the curriculum with at least 2 credits, equivalent to a minimum of 96 hours.

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