




Contribution of learning and knowledge technologies in the digital competences of students of higher basic education

Aporte de las tecnologías del aprendizaje y conocimiento en las competencias digitales de los estudiantes de educación básica superior

Contribuição das tecnologias de aprendizagem e conhecimento nas competências digitais de alunos do ensino superior básico

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DOI (Generic) : <https://doi.org/10.35622/j.rie.2021.04.004>

DOI (Document in English) : <https://doi.org/10.35622/j.rie.2021.04.004.en>

DOI (Documento en español) : <https://doi.org/10.35622/j.rie.2021.04.004.es>

Received 24/06/2021/ Accepted 15/09/2021 Published: 01/09/2021

ORIGINAL ARTICLE

KEYWORDS

learning, skills, virtual education, learning technologies, knowledge technologies.

ABSTRACT. This research covers the results of the use of learning and knowledge technologies (LKT). Its objective was to recognize the effects of the application of ICTs in the digital competencies of students in higher basic education at the José María Santana Salazar educational unit in Ecuador from December 2020 to July 2021. The methodology used was a mixed qualitative-quantitative approach, the research was descriptive, the population consisted of teachers and students of the higher sub-level, the sample was selective. Surveys and an interview with an expert provided specific information. The results highlight those teachers believe that they have knowledge on this subject in 38% and consider that students do not have digital competencies in terms of information management and security in 75% and 85% respectively, at the same time they value its importance within learning as an innovative aspect for their task; although their activities are developed without the effective application of these. It is concluded that the effects of the application of ICTs are positive in motivating classes, facilitating the subjects, promoting the attention and commitment of the students; however, the application of these tools is deficient due to the digital gap and the lack of training of teachers.

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PALABRAS CLAVE

aprendizaje, competencias, educación virtual, habilidades, tecnologías de aprendizaje, tecnologías de conocimiento.

RESUMEN. Esta investigación abarca los resultados de la utilización de las tecnologías del aprendizaje y conocimiento -TAC. Su objetivo fue reconocer los efectos de la aplicación de las TAC en las competencias digitales de los estudiantes de la básica superior de la unidad educativa José María Santana Salazar de Ecuador de diciembre 2020 a julio 2021. Se empleó como metodología el enfoque mixto cualitativo – cuantitativo la investigación fue de tipo descriptivo, la población se conformó por docentes y estudiantes del subnivel superior, la muestra fue selectiva. Se aplicó encuestas y una entrevista a un experto que proporcionaron información específica. Los resultados destacan que los docentes creen que tienen conocimientos sobre esta temática en un 38% y consideran que los estudiantes no cuentan con las competencias digitales en cuanto a manejo de información y seguridad en un 75% y 85% respectivamente al mismo tiempo valoran su importancia dentro del aprendizaje como un aspecto innovador para su tarea; aunque sus actividades se desarrollen sin la aplicación efectiva de estas. Se concluye que los efectos de la aplicación de las TAC son positivos al motivar las clases, facilitando los temas, propiciando la atención y el compromiso de los estudiantes, sin embargo, la aplicación de estas herramientas es deficiente por la brecha digital y de formación en los docentes.

PALAVRAS-CHAVE

aprendizagem, habilidades, educação virtual, habilidades, tecnologías de aprendizagem, tecnologías do conhecimento.

RESUMO. Esta pesquisa abrange os resultados da utilização de tecnologias de aprendizagem e conhecimento -TAC. Seu objetivo era reconhecer os efeitos da aplicação do TAC nas competências digitais dos alunos do ensino fundamental superior da unidade educacional José María Santana Salazar do Equador de dezembro de 2020 a julho de 2021. A abordagem qualitativa-quantitativa mista foi utilizada como metodologia A pesquisa foi descritiva, a população foi composta por professores e alunos do subnível superior, a amostra foi seletiva. Foram aplicadas pesquisas e entrevista com especialista que forneceu informações específicas. Os resultados evidenciam que os professores acreditam que 38% possuem conhecimentos sobre o assunto e consideram que os alunos não possuem competências digitais em gestão da informação e segurança em 75% e 85% respectivamente, ao mesmo tempo que valorizam a sua importância na aprendizagem. como um aspecto inovador para sua tarefa; embora suas atividades sejam desenvolvidas sem a aplicação efetiva destes. Conclui-se que os efeitos da aplicação dos TACs são positivos na motivação das aulas, facilitando os temas, fomentando a atenção e o comprometimento dos alunos, porém, a aplicação dessas ferramentas é deficiente devido ao gap digital e formativo. professores.

1. INTRODUCTION

Today's society is going through accelerated changes in these times, due to the Covid 19 pandemic, where technologies are presented as significant didactic supports, it has gone from an analog to a digitized society (Nella, 2020). Incorporating CT is challenging, Ventura et al. (2017, p. 208) for teachers.

By López et al. (2021) few are predisposed to change, which is why TACs are not applied in the educational process and therefore students do not develop digital skills in their learning, these are considered one of the basic skills of the 21st century because they allow the use of new technologies for training and professional growth, discover new environments, function in the virtual world, create resources and materials, and solve academic problems (Ventura et al., 2017).

TACs go beyond learning exclusively to use Information and Communication Technologies (ICT) and are committed to exploring these technological tools at the service of learning and the acquisition of knowledge (Lozano, 2011).

Ecuador is no stranger to the trends of the knowledge society, it has sought to innovate equipment in educational entities, but it has become precarious due to resource limitations (Peñaherrera, 2012). The reality is that, despite



several years of incorporating computer science into education, most teachers do not know much about TAC, nor do they know how to use a computer or surf the internet with an acceptable degree of knowledge. For this reason, teachers must be digitally oriented, focusing on the use of TACs to create fully creative and productive learning environments (García & Pazmiño, 2018).

The problem arises as a deficient application of the TACs, which affect the digital competencies of the students of the upper elementary school in the José María Santana Salazar educational unit in the city of Manta, Ecuador. His approach considers that education should not be far from technology since the digital age presents transformations in the different educational fields, this implies that teachers should not be left behind in the management of TACs. On the contrary, it is imperative to promote digital skills throughout the teaching and learning process, as indicated by Cortés (2013) related to the application of TACs that all educational actors only apply them by obligation, without deepening their usefulness.

In the investigated scenario, it is characterized by teachers whose practices when teaching their classes underuse the TACs, due to ignorance, due to these limitations an attitude of reluctance is observed in the face of the effort that a constant and appropriate application of these implies.

This project is relevant since the application of the TAC in the educational process is generating an investigative attitude of the teacher, allowing him to explore new tools, so that the development of knowledge is favorable in the students and in this way consistent learning is achieved with what technology demands in the educational field. The Ministry of Education (2021) points out that ICT and TAC are transcendental for the development of education, for which it proposes innovative models that include them in educational processes, through the treatment of digital competencies, approaching the society of the knowledge turning it into a digital school.

Students have deficiencies in their digital skills in terms of communication, collaboration, and technology management since it is difficult for them to create new content, interact in computer media and solve problems autonomously. This is based on the fact that digital illiteracy in the country is 10.48%, while Internet penetration in rural areas is 16.6% and 46.1% in urban áreas (Molina, 2020); which denotes the difficulties to develop these skills successfully..

Then, the theoretical foundation of the TAC is presented, its characteristics and benefits for the development of digital skills.

Learning and knowledge technologies

Learning and Knowledge Technologies (TAC) are a challenge for education that facilitates learning through the use of technological tools, which requires greater training and commitment from educational actors (Vera & Sobenis, 2017). These tools promote student motivation (Velasco, 2017). Its importance according to Valencia et al. (2016) is that they can help improve academic results and increase digital skills. It is recommended that the teacher select the appropriate tools, according to the area, the students, and their resources; In addition, it must be permanently formed because it is a field of constant evolution (Pillacela & Ramón, 2017).

The benefits of TAC are indisputably relevant in the educational field, they refer to the inclusion of Information and Communication Technologies (ICT) in the educational context, which when implemented in processes facilitate the development of skills and competencies such as the digital ones necessary for professional life (Esteve, 2015).

Kaplún (2011) points out among the benefits of increasing these competencies having a critical attitude, ease in performing tasks, improving teaching practice, facilitating research, and developing collaborative projects, among others. They can be identified through communication, dialogue, participation (Arias et al., 2014; Levano et al., 2019). Among the ideal strategies to develop these competencies are play, simulation, representation, appropriation, multitasking, distributed thinking, collective intelligence, judgment, transmedia navigation, networking, and negotiation (Nolasco & Ramírez, 2011; Valverde, 2012).

Digital skills

According to Orozco et al. (2021) these competencies reflect the ability to handle information and communication technologies in a critical, creative and safe way to achieve goals related to work or learning; According to this criterion, they denote the student's abilities to manage information appropriately.

For Arias et al. (2014) "(...) digital competencies not only deal with the management of technologies, as it is something more complex, it includes knowing when for what and how to use them". Therefore, students are immersed in a globalized environment in which the management of technologies allows them to be competent in all fields of learning and life (Camacho et al., 2015). About these concepts are skills, knowledge, and attitudes of the student that allow him to use digital media for participation, work, and problem-solving.

About the theoretical review by Ariza (s. f.), Carrasco et al. (2015), Nguyen et al. (2015), Ruíz y Abella (2011) agree that the advantages and that these tools provide at the time of learning, emphasizing that it is necessary to promote the practical development of TACs, based on the mastery of digital skills according to the era of knowledge, being an innovative field for educational processes.

The main digital competencies proposed by the Common Framework of the National Institute of Educational Technologies and Teacher Training (2017) are presented below, which compiles five essential areas in which different competencies are included to detect the training needs of teachers.

Table 1.

Digital competences of the Common Framework for teaching digital competence

Areas	Competencies
Area 1. Information	This involves competencies related to browsing, searching, and filtering information; also, storage and retrieval of digital content
Area 2. Communication	It refers to interaction skills through digital technologies, information sharing, online participation, collaboration through digital channels, and digital identity management
Area 3. Content creation	It deals with the development and integration of content, copyright, and programming.
Area 4. Security	It encompasses the protection of devices, health, and the environment where data and content are exchanged.
Area 5. Troubleshooting	It refers to the skills of solving technical problems, innovation and use of creative technologies, and identification of gaps.

Source: National Institute of Educational Technologies and Teacher Training (2017)
Own elaboration.

2. METHOD

This research work used the mixed qualitative-quantitative approach, through quantifiable surveys and interviews that provided specific information, facilitating the obtaining of reliable results. It was descriptive because the analysis and deduction of the results obtained in the inquiry were detailed (Hernández et al., 2014).

The population of this work is part of the educational unit José María Santana Salazar of Manta Ecuador and there were 29 teachers and 180 students in the upper sublevel. There was a non-probabilistic and selective sample by the researcher according to the characteristics of this population, the research instruments were applied to the 29 teachers, 60 students, and an expert in educational technology.

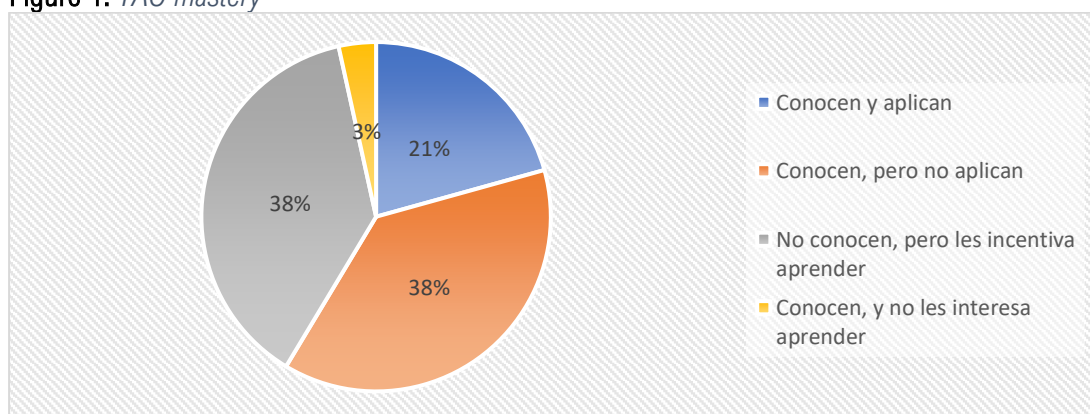
As a research technique, the questionnaire was used, through a survey of teachers and students that contained questions on a Likert scale. The interview was applied to an expert to obtain greater accuracy in the data and obtain recommendations in the face of the identified problem. For the validation of the research instruments, the method of the judgment of experts was taken as a reference, who exposed their opinions and experiences in the approval processes of the instruments, complying with the criteria of quality, validity, reliability that allowed obtaining relevant data of the subject of study.

The analytical method was used, since tests are obtained to verify or validate reasoning, through verifiable mechanisms such as statistics, the data were tabulated and graphical, for a better interpretation and analysis of the results compared to the reliable bibliographic sources studied.

3. RESULTS

To recognize the effects of the application of TAC in the digital competencies of the students of the Upper Basic, a survey was used of the teachers and students who constituted the study sample where it was sought to know the domain that they demonstrate about the topic, and is presented in *figure 1*.

Figure 1. TAC mastery

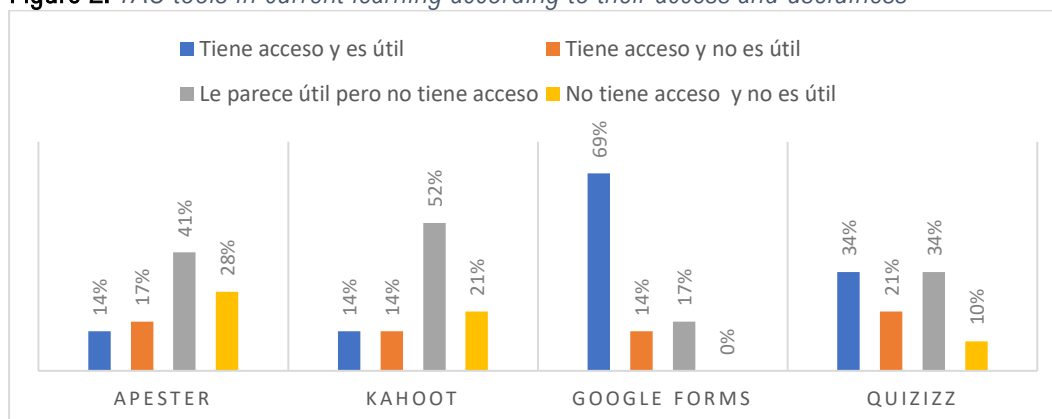


Source: Survey applied to teachers of the educational unit José María Santana Salazar. Own elaboration.

38% indicated that the majority of teachers know, but do not apply the TAC. About this, it is evident that the teachers consulted are completely or partially unaware of these innovative tools, and do not apply them because they do not know the appropriate methodologies to put them into practice, but they are open to learning, therefore it is necessary to promote training in this subject. According to Valdés et al. (2011) teachers must know and constantly update themselves in the use of ICT and TAC, since there are high training needs in these to improve learning in the current context, therefore it is their responsibility to update their knowledge and take initiative to apply TACs in your daily practices.

Also, in the same survey it was recognized that among the digital tools with the greatest access and utility, Google forms were cited with 69% and Quizizz with 34%. The students, for their part, found the concept maps and tutorial videos 40% very useful, since they facilitate learning in virtual environments, as shown in *figure 2*.

Figure 2. TAC tools in current learning according to their access and usefulness



Source: Survey applied to teachers of the educational unit José María Santana Salazar. Own elaboration.

According to Garcés et al. (2018) there are different current TAC tools that are resources for the development of digital skills such as information, communication, security, content creation and problem solving, highlighting innovative applications such as video cinema that strengthens the development of digital competence in the content creation area supported by playful-creative components, arouses interest and motivation; the Kahoot tool that allows interactive questionnaires for debate and also the digital Padlet board that allows information sharing and digital content management promoting digital communication and problem-solving skills.

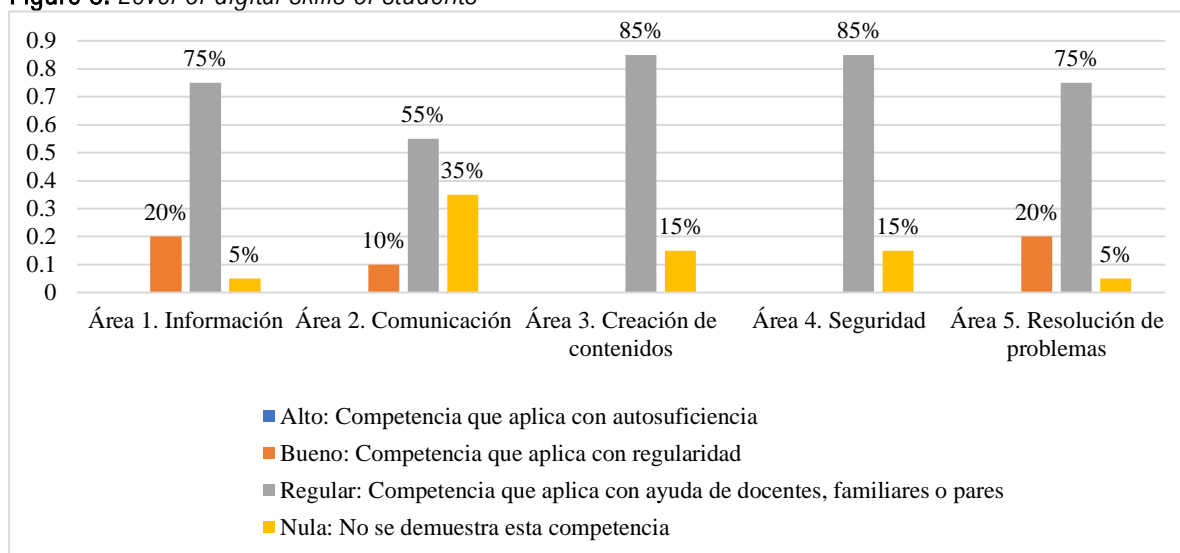
On the other hand, Velasco (2017) indicates among the most used TAC resources (pp. 774-775). The authors have identified for each of these alternatives, the digital competences that with the greatest emphasis to be developed:

- Video editing: Quik, Splice, Stupeflix: These allow the development of digital skills in the area of content creation; With these tools, students and teachers will be able to create and edit videos in a simple way.
- Interactive videos: Vizia and EDpuzzle: These resources make it possible to turn any video into an interactive lesson that will capture the attention and interest of students, thus allowing the development of digital skills in the area of information and communication.
- Audio: SoundCloud, Audacity, Peggo, and Vocaroo. - Facilitates the development of digital skills in the area of content creation through applications to create audio files and be able to share them with specific and diverse audiences.
- Image - infographics: Genially, Typorama, Fotojet and Piktochart. - Visual language is very important, these tools allow you to create infographics of any kind by developing digital skills in content creation and problem-solving.
- Communication: Homeroom, Otter and Blogger. - Resources to establish and develop digital communication and problem-solving skills, facilitating fluid interaction between all members of the educational community.
- Presentations: Emaze, Genially, Powtoon, Sparkol, and Haiku Deck. - Tools to make presentations in a simple way and with attractive results. Develop digital content creation skills.
- Collaborative work: Padlet, Team Maker, Teamweek, Meetingwords, and Quip. - Resources that facilitate collaborative work, thus promoting digital skills in the area of communication.

- h) Search engines and safe browsing: YouTube Kids and Kiddle. - Resources so that students can safely search for videos and information; facilitates the development of digital security competence.
- i) Mind Maps: Coggle and WiseMapping. - Applications to create digital mind maps facilitate the development of digital content creation competence.
- j) Productions: Pixton, Tiki Toki, and Storybird. - Tools to create comics, timelines, or stories, thus promoting the development of digital competence in content creation and communication.

Subsequently, it was identified that the level of digital competencies in students according to the evaluation of the teachers and about the information area present a regular level in 75%, in the communication area 55% a regular level, in the content creation area a regular 85%, in the security area a regular level of 85% and in the problem-solving area a 75% regular level; these results are presented in figure 3:

Figure 3. Level of digital skills of students

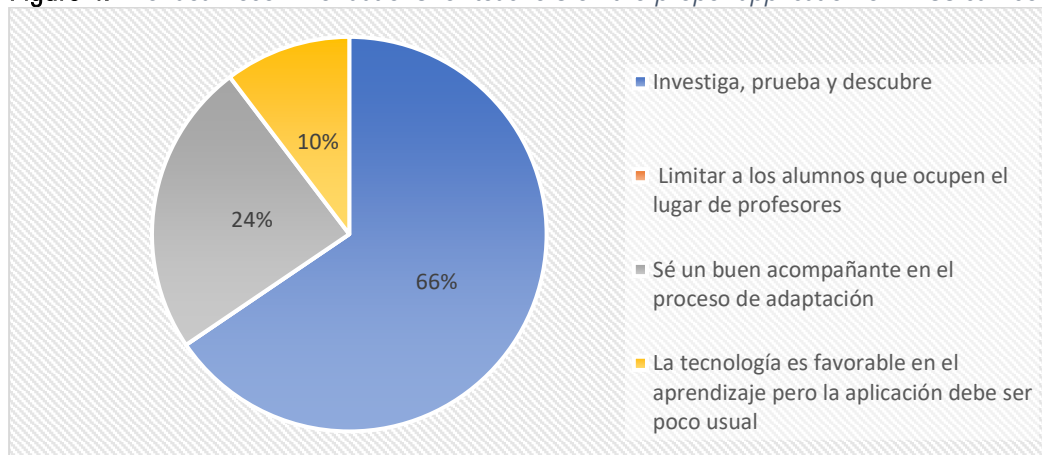


Source: Survey applied to teachers of the educational unit José María Santana Salazar. Own elaboration.

These results show that students in the different areas of digital competencies present a regular level, that is, they do not handle the TAC correctly for what they require the help of the teacher, family, or peers, this shows that it is necessary to strengthen them in the correct way to use these competencies for the benefit of your learning, taking advantage of them and directing them effectively. According to Chávez et al. (2021) current students know technology and its management but have not developed sufficient digital skills to guide their knowledge for the benefit of their learning, which is why they require more guidance and training from teachers or others who strengthen these skills for the benefit of your educational background.

An interview was also applied to an expert on the subject (Rosado, 2021) who indicated that it is necessary to encourage students to develop these competencies, through the search and implementation of didactic and innovative strategies that facilitate and make them fall in love. of these tools. In relation to this, Rodríguez (2017) states that it is essential to develop digital skills in students, using persuasive formulas to encourage and maintain attention to knowledge.

In relation to the recommendations for the application of TACs for the development of digital skills, 66% of teachers indicated that research is the most viable strategy; however, continuous training and support are essential. These results are summarized in figure 4.

Figure 4. *The ideal recommendations for teachers on the proper application of TACs can be?*

Source: Survey applied to teachers of the educational unit José María Santana Salazar. Own elaboration.

Another important piece of information among the results was that 66% of teachers indicate that they recognize the strategies, but they need to develop digital skills in students. About these results, there is a majority of teachers who know the strategies, but do not pay due attention to them or use them in their classes, so it is not possible to develop digital skills in students, this limits their ability to access new information, develop search skills and other learning skills. According to Prendes and Román (2017), it is necessary for teachers to know the strategies to develop these digital skills in students, because in this way they develop their ability to build knowledge in interaction, to know how to express themselves and communicate with new languages and tools, finally, acquire skills for learning in enriched spaces built with technologies.

4. DISCUSSION

Based on the data obtained, only 38% of teachers claim to know but do not apply the TAC and with the same percentage, they are concerned about learning. There is therefore a gap of ignorance and scarce application of the TAC, which requires teacher training and also increases their digital skills by taking advantage of the opportunities offered by virtual education. Regarding this, Valdés et al. (2011) argue that teachers must know and constantly update themselves in the use of ICT and TAC, since there are high training needs to improve learning in the current context; For the most part, it is your responsibility to take initiative to apply TACs in your practices.

About this, it was found that 34% of teachers do not value the importance of TAC within learning, which differs from the opinion of Rodríguez (2017) that indicates that the teacher must recognize the importance of TAC since The need to educate with 21st-century tools, social networks, learning communities, and other technological means that facilitate teaching processes is undeniable. According to the results, it is evident that there is an important margin of conceptual limitations regarding the fact that they do not know the importance of TACs, which requires changes in attitudes and skills.

It was possible to evidence a low application of digital platforms, highlighting that many of the teachers do not have the pedagogical training necessary to use them and generate an innovative methodology with them, which limits the educational resources for teaching, making the processes monotonous and tedious for the students. students; Unlike what Papanastasiou and Angeli (2008) indicate, who recommend the application of various

digital tools in their classes such as email, internet and Word, and the use of most used applications such as Google forms, interactive concept maps on platforms such as create and text 2 mindmaps that facilitate the organization and simplification of information, software that encourages the participation of students such as Nearpod and Plicker that allow the interaction in augmented reality of questions and answers; It also highlights the interactive games that are free and facilitate the learning of different subjects at all levels.

From the survey applied to students, it was obtained that 40% find concept maps and tutorial videos very useful since they facilitate learning in virtual environments. Regarding this, Flores et al. (2016) point out that students consider that the strategies and tools used by the teacher have been good, but it is still necessary to promote education with flexibility and understanding in this situation of the virtual modality, understanding that not all have the same resources, for which is necessary to renew teacher training plans about ICT / TAC, at the curricular, methodological or evaluative level.

According to the results of the interview with the field professional, I indicate that TAC and ICT are important and must be combined with pedagogy and appropriate methodologies, this coincides with Gallegos et al. (2018) which indicates that it is relevant for institutions to incorporate the use of TACs in the classroom, highlighting that many of the teachers do not have the pedagogical training necessary to use them and generate an innovative methodology with them.

About the level of digital skills that students develop, teachers also indicated that 35% identify these in students when they show an open and critical attitude to learning. This agrees with González et al. (2018) and Fernández and Pozos (2018) who point out that digital skills should be promoted by teachers since they allow the critical, creative and safe use of TACs, they are identified with teamwork, use of interactive tools, autonomy, information management, communication, and ethics. About this, teachers identify digital skills in their students, however, it is not enough to identify them, they must constantly promote them to strengthen their skills and knowledge.

The level of digital competencies developed in the students, according to the evaluation carried out by the teachers regarding the five areas of digital competencies such as communication, information, content creation, security, and problem-solving in all of them, is appreciated a regular and null level; This must be taken into account since it is necessary to apply strategies and actions that allow them to increase these competencies for the benefit of their learning, taking advantage of them and directing them effectively. Chávez et al. (2021) pointing out that it is necessary to guide them effectively to take advantage of their skills since they are used mostly for leisure activities, rather than for training activities.

66% of teachers indicate they recognize the strategies, but they need to develop digital skills in students. A majority do not pay due attention to TACs or use them, for which it is not possible to develop digital skills in students, this limits their ability to access new information, develop search skills, and other learning skills. Prendes and Román (2017) indicate that to develop digital skills in students, it is necessary to establish innovative and creative strategies, in conducive and motivating spaces.

Among the teachers' recommendations, 66% indicate the research, sustains those teachers for the application of the TACs must be trained and master the knowledge so that they can use these tools for the benefit of the teaching-learning process. To which Segura et al. (2007) advises the training of teachers and the application of strategies such as redefining tasks, attitudes, skills.

To this, the interviewee also emphasizes that it is necessary to encourage students to develop their digital skills, through the example and search for new strategies to interest students and make them fall in love with these technologies based on their educational growth. This coincides with the argumentation of Rodríguez (2017) who states that it is essential to develop digital skills in students, using persuasive formulas to encourage and maintain attention to knowledge.

About this, it is necessary for the teacher as a research agent to explore and encourage the student to use different technological resources and platforms, analyzing their advantages and disadvantages to recognize and enhance the benefits of TAC in their learning process.

In the case of Ecuador, the guidelines established in the Digital Education Agenda 2017-2021 (Ministerio de Educación de Ecuador, 2017) constitute a current challenge to meet the needs of those involved for the effective development of digital skills. Since "For the teacher to appropriate ICT for their transformation into a TAC teacher, it requires integration into the curriculum and daily teaching practice; its approach and scope requires a gradual process." (p. 32). That is progressive and mandatory stages of strengthening digital skills that are incorporated into initial training until teaching, aspirations that in educational practice still require empowerment of the professionals themselves and political decisions of greater compliance. For this reason, the researchers suggest this official document is an operational technical reference for a transformation that involves the entire educational community in the face of the digital age.

5. CONCLUSIONS

It was possible to recognize the effects of the application of TAC in digital competencies, which are transformative in the teaching process, motivating the classes, facilitating the topics, promoting the attention and self-management of the students. On the contrary, the students of the upper basic in the educational unit José María Santana Salazar of the city of Manta, are oblivious to the educational possibilities because the application of the TAC is deficient in the use and quality of the technologies and the training of the teachers.

Regarding the domain that teachers demonstrate in the application of TACs, it was determined that most have a limited domain regarding them, therefore they do not apply them in their classes and the students do not have the level of educational qualifications required to the context of virtual education, due to the lack of training and updating. It was also found that there are very few digital tools that they master and use in their classes, limiting the benefits that could be obtained from them, since it is necessary to diversify digital tools taking into account the EVA virtual learning environments, depending on the subject and characteristics of the student body.

A regular level was identified in terms of digital skills developed in students, according to the areas evaluated by teachers; This requires intervention through strategies and actions that allow them to increase these competencies for the benefit of the teaching-learning processes.

It was determined that it is necessary to create and apply the TACs, existing a wide catalog of these tools that are adapted to the needs of the subjects and contents, among which stood out to favor the development of digital skills are those of interactive videos, those of presentations such as Genially, those of collaborative work like a pallet, the safe seekers like Kiddle; those of mental maps such as wise mapping, among others, which should be used based on the teaching knowledge and what is sought to be obtained. Strategies were also proposed, among which are student motivation, participation, co-responsibility, collaborative learning, use of applications

and tools such as games, discussion forums, slides, oral presentations, among others that facilitate and guarantee meaningful learning in virtual education.

About the results found in terms of digital skills and TAC, it is necessary to carry out future lines of research-action that can clarify the limitations both in access to technological resources and in their use and didactic advantage presented by educational institutions for improving current methodological processes, so these research experiences will allow us to contribute to the goals of the digital educational Agenda established by the Ministry of Education of Ecuador. Therefore, it is recommended to prioritize as a strategy for improvement, to provide continuous techno-pedagogical support aimed at students and teachers in the consolidation of TAC in the teaching-learning process.

It is important to highlight the conceptual and methodological contribution of the Common Framework of Teaching Digital Competences prepared by the National Institute of Educational Technology and Training of the Ministry of Education of the government of Spain, which can be considered as a reference framework to develop future diagnostic research and the approach to improvement actions in the educational system. The authors perceive the need that to advance in the acquisition of these competencies in teaching practice, it is imperative to analyze this aspect as part of the evaluation system for practicing teachers, in continuing education plans, and as a fundamental part of curricular projects. of bachelor's and master's degrees offered by higher education institutions.

Agradecimientos / Acknowledgments:

Expresamos el agradecimiento a los docentes de la Maestría en Educación y Creatividad, de la Unidad de posgrado de la Universidad San Gregorio de Portoviejo, Ecuador.

Conflicto de intereses / Competing interests:

Los autores declaran que no incurrir en conflictos de intereses.

Rol de los autores / Authors Roles:

Aracely Yoza: conceptualización, curación de datos, análisis formal, adquisición de fondos, investigación, metodología, administración del proyecto, recursos, software, supervisión, validación, visualización, escritura - preparación del borrador original, escritura - revisar & edición.

Carlina Vélez: conceptualización, investigación, metodología, administración del proyecto, recursos, software, supervisión, validación, visualización, escritura - preparación del borrador original, escritura - revisar & edición.

Fuentes de financiamiento / Funding:

Los autores declaran que no recibieron un fondo específico para esta investigación.

Aspectos éticos / legales; Ethics / legals:

Los autores declaran no haber incurrido en aspectos antiéticos, ni haber omitido aspectos legales en la realización de la investigación.

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