

GENERATION OF PRODUCTIVE EXPERIENCES IN THE DIGITAL ERA 4.0

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ABSTRACT

The digital age 4.0 governs the progress of society and individuals require the acquisition of skills to face this reality. Education is the only way that will allow human beings to adapt to the new global challenges. Therefore, the achievement of productive experiences must be the priority of the current educational system to train competent professionals. This research aimed to diagnose the elements involved in the generation of productive experiences in the digital age 4.0. The methodology worked through a quantitative approach, of a descriptive nature, supported by a non-experimental and field design. The research sample was made up of 25 teachers from the "Nueva Era" Educational Institution, who participated in a survey consisting of a questionnaire of questions related to learning experiences and the digital age. The results of the study showed that an average of 3.82 interviewers, at a high level, pay special attention to the causal processes in the approach to such learning. Therefore, it was concluded that the main elements that intervene in the generation of productive experiences in the digital age 4.0, are the technical, contextual, and pedagogical processes, as well as the intervention of teaching strategies and technological tools, directly influencing in the development of digital skills for life.

KEYWORDS

Productive Experiences, Digital Age 4.0, Digital Skills, 21st Century Society

1. INTRODUCTION

As technological advances increase, the requirements of society become more demanding. The digital age no longer depends on mechanical individuals, but on subjects prepared to face current problems. For this reason, the training of professionals should be directed to the development of abilities and skills applicable to life, where they become executors of innovative processes. Consequently, the educational field plays a fundamental role in creating the exit profile of students, providing a wide range of theoretical, practical, and evaluative knowledge, focused on the use of TIC and globalization.

The generation of productive experiences is the possible response to the change that the world demands because it allows acquiring significant learning that facilitates the resolution of conflicts of daily life. However, the biggest obstacle is found in the so-called digital age 4.0, since the gaps between one context and another have made innovation almost impossible for certain sectors of society. Therefore, the insertion of technological tools in education is a complex task and requires proper resource management. In other words, not only is it enough to acquire virtual equipment and platforms, but also to plan their effective use.

The use of TICs in educational units has not shown major change when compared with the results obtained by the same institutions in previous years. The high school exit profile, despite having the management of technology and innovation as a strength, has not been sufficiently reflected in the labor field. So, it is not possible to speak of productive experiences, since there are individuals who have only acquired theoretical knowledge, but do not know how to use it properly for their personal and collective benefit.

In this way, the main objective of the research was to diagnose the elements that intervene in the generation of productive experiences in the digital age 4.0, applied by the teachers of the "New Era Educational Institution". In this way, the study emphasized the interrelation between technical, contextual, and pedagogical processes, which directly affect the achievement of learning for life supported using technological tools.

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Students, through the development of digital skills, can actively participate in solving current problems under a well-prepared professional profile.

The aspects that intervene in the generation of productive experiences in the context of the digital age 4.0 must consider the needs of the 21st century society. The technical, contextual, and pedagogical processes involved in the generation of learning experiences must be fully understood to improve current education. However, we must not forget the role that the educator plays in teaching and the development of skills that allow the learner to form a comprehensive profile. Based on these approaches, it is essential to analyze the global panorama of the study phenomenon and determine the influence of the elements that intervene in the educational and professional training field.

2. STATE OF THE ART

According to Casillas and Ramírez, 2019, The digital culture has modified the population, causing social interactions to change in all sectors. Technological transformation forces human beings to redesign their way of communicating and acting, however, adequate preparation is necessary to face the panorama of the 4.0 age. Therefore, educational institutions must be ready to train versatile students, capable of easily adapting to the new way of life, through processes that identify strengths and weaknesses that directly affect the achievement of learning, especially in the technological context.

Mogollón (2020) mentioned that educational innovation faces various obstacles such as the use of technological tools, the design of learning experiences in digital contexts and the formation of a culture of digital literacy, however, he considers that they do not represent a challenge. The correct planning of the use of ICT can provide fruitful results, however, if they are not used, unfortunately there will never be a significant change. Thus, the resources that schools have, regardless of their quantity, must be used to the maximum to achieve the desired skills.

Mobile devices and some technological devices such as computers and tablets have become essential tools for society. The increase in technologies that include the internet and mobile connection forms an imminent possibility to establish a wide set of processes that facilitate feedback and learning (Gelb, Mital and Mukjerjee, 2020). In other words, people who have digital resource should make the most of its benefits and use its full potential for the benefit of knowledge and its applicability to everyday life.

According to Mercado, L., Mercado, T., Ziritt, G., and Consuegra, S. (2018), they argue that the vertiginous technological advance and the social transformations of the 21st century society have caused the response capacity of the school sector is not up to the level and requires urgent innovation alternatives. So, even though students have various electronic devices, education has not shown any progress by not properly taking advantage of the resources available to them. Therefore, it is necessary to plan activities that use the available tools to achieve the rhythm of the digital age 4.0.

The achievement of productive experiences must go hand in hand with the use of all available physical and human resources to ensure educational progress. In this sense, to generate true learning experiences in the digital age, school actors must seek the integration of capacities, both technological and academic, to consolidate interdisciplinary knowledge (Ureta and Rossetti, 2020). To do this, it is necessary to identify the goals to be achieved and design plans based on objectives, strategies, methods, activities, and evaluations that allow checking theoretical and practical learning.

In addition to proper planning, educational agents must consider the dizzying progress of TICs and how they affect the development of education for the 21st century. Apolo (2019) mentioned the importance of identifying trends in the field of technology for formal education and highlights the need to be applied in a study context, to distinguish weaknesses and strengths of use in school establishments. Various platforms and free digital resources are created every day and go unnoticed by society. Therefore, education must be attentive to changes and be ready to transform its traditional method of work.

Hernández R., 2017 mentioned that technology, therefore, has become the generator of opportunities for change and transformation of education, where the results cause a great impact that provides timely solutions to educational and social problems useful for the social progress. However, it should be noted that to achieve these results it is essential that there is a correct use of digital and technological resources, without ignoring the part that falls on the development of life skills. Therefore, prioritizing students to achieve productive experiences in the digital age 4.0 must become the global mission of education.

It is not enough to know the concept of technological devices or how to handle the main text editors, because digital competence encompasses more than that. Under this scheme, Álava, Illescas and Llor (2017), emphasize that students demand improvements in the exit profile, where the achievement of job skills aimed at the effective management of virtual platforms and the use of TIC is ensured. Therefore, education must analyze, from the social reality, the requirements of the new generations in terms of their training and professional development as functional subjects.

An alternative is to opt for the design of educational programs based on active methodologies that insert technology as an applicable means for academic training. Learning based on virtual platforms should be considered as an opportunity for educational actors to create their own digital resources, use e-learning strategies and apply interactive evaluations that work as support for current teaching (Clavijo, Loiza, Ramirez, and Pacheco, 2021). In other words, taking advantage of all the available tools will make it possible to meet the expectations of students in acquiring skills for the 21st century society.

Under this scheme, Garzón (2021) maintains that educational competencies are not static, much less unmodifiable, or rigid, since they must be adapted to the context and its particularities, considering the key factors that surround it. Therefore, education can no longer aspire to the formation of mechanical people, experts in replicating actions and following orders, since that is no longer required by society. Currently, the needs are focused on the search for solutions to the great problems of society, so the ability to solve and manage technologies are the most desired skills.

There are countless skills that have caught the attention of young people today, such as adaptability, capacity for interrelation and teamwork, as well as creativity, innovation and leadership, which will ensure the creation of a profile based on competencies (Tamayo, Tinitana, Apolo, Martínez, and Zambrano, 2021). The inclusion of such skills will allow the development of productive experiences in children and adolescents, who will be able to apply their knowledge in activities that stand out for innovation and the use of technological tools. Therefore, the use of digital resources is a key factor in the design of these study plans.

The main actor in educational change is the teacher, becoming the protagonist of the TIC inclusion process. The achievement of applicable skills for the digital age 4.0 continues to be perceived as a challenge, however, it should not be considered as an impossible challenge to meet. Hernández, Orrego and Quiñones (2018), assure that the teaching role is cataloged as a mediator of learning, which values the recent challenges of education in the so-called era of knowledge and innovation. So, although the educator is aware of the challenge of inserting technology in the school, he looks for ways to take advantage of it to improve the teaching and learning process.

According to Melo, 2018, the insertion of ICT in education leads to the development of sequential programs with all the stages of planning, application, and evaluation by the teacher. In addition, the teacher requires preparation and training processes that allow him to monitor compliance with educational plans and teaching strategies that include the use of technological tools. Consequently, the educator becomes an active subject, interested in learning new forms of teaching and the use of virtual resources that prepare students for life.

Therefore, active methodologies have gained strength in those interested in educational innovation by ensuring significant learning in students. The construction of knowledge from experiences supported by theoretical, practical, and technological knowledge will always be classified as a great educational success. In this sense, educational institutions must make the most of the benefits of such strategies.

The teacher oversees designing didactic activities, based on the use of technologies, where the search for adaptable teaching strategies and collective individual work, form in the student a profile attentive to the contents and practice (Rodríguez, R., Orozco, Rocha and Rodríguez, O., 2017). Therefore, the work of the innovative teacher will bear fruit if he develops an active plan that develops skills for daily living. Through human, digital, and physical resources, students will be able to acquire skills focused on the significant contribution they can make to society.

Internal factors such as motivation and aptitude, inherent to the teacher, need to be strengthened through strategies such as training in TIC skills, the use of digital tools and their incorporation into educational processes (Sosa, 2018). In this sense, the teaching profile, as well as the student profile, must be redesigned to meet the requirements of today's society. Teachers, being the subjects that directly influence student learning, need to innovate their methodology and expand the range of resources used during class hours.

According to Ramírez, Monroy and Vargas (2017), they assure that teachers must be constantly updated, causing them to appropriate the use of TIC and apply it in the classroom, achieving a drastic improvement in pedagogical performance. The benefits of inserting digital tools in the classroom continue to stand out by developing transversal skills that lead to critical thinking and the motivation to transform traditional education. Innovation in the educational field derives in the success of the subjects that are trained in the different

educational establishments. However, it depends on the efforts that all the actors involved in such a process are willing to make.

However, there are sectors that do not have basic resources such as devices or Internet access and, therefore, it is imperative that the authorities rethink government and institutional policies in order to keep pace with technological advances, making possible their insertion in education (Melo, 2018). Although there are establishments that have a wide range of digital resources, there is still a shortage of them in socially disadvantaged sectors. Therefore, state actions must be directed to the benefit of education, since it will mean, in the future, the development of the country.

The changes that 21st century society reflects day by day create new challenges in all sectors (Ramírez, et al., 2017). Education does not face its economic problems, but also of ideology and innovation. Not having sufficient technological resources for the development of a significant educational process is a serious obstacle, but there are institutions that have the necessary tools and do not know how to use them. Therefore, the preparation of future professionals should not remain stagnant and requires the search for alternatives that allow the formation of great skills in the future.

According to Callis and Basto 2020, technological culture is classified as a concrete process, in which thoughts and actions are combined for social benefit. An outdated education, focused on creating docile professionals who do not think and do, is no longer essential for global advancement. Therefore, the interest of creating true productive experiences in the digital age 4.0 must be perceived as the ideal objective for the society of the 21st century, since it is the salvation letter for the great problems of today.

3. METHODOLOGY

The study worked under a quantitative, descriptive approach, supported by a non-experimental and field design. Taking into consideration the theoretical construction and the obtaining of data on the fundamental circumstances that allow the generation of productive experiences in the digital age, the chosen methodology starts. A rational method of deductive hypothetical analysis was selected in relation to the type of knowledge generated by teachers in a technological context in favor of the education of the students of the "Nueva Era" Educational Institutional.

To approach this method, it was necessary to achieve the following order of steps: define the problem, formulate the hypothesis, contrast the empirical information with the scientific one, and deduce the results obtained.

The teachers of the educational institution were the protagonists of the study, who provided the field information required to comply with the methodological design of the research. The events raised are currently found for what is considered a contemporary temporality at work, emphasizing the pandemic caused by Covid-19, since the use of the necessary technological means in a virtual modality education was highlighted.

The events raised are currently found for what is considered a contemporary temporality at work, emphasizing the pandemic caused by Covid-19, since the use of the necessary technological means in a virtual modality education was highlighted. In the same way, the data collection approach was quantitative for its subsequent treatment and generation of statistical graphs that support the investigative work, the following scales being the ones selected to fulfill this task.

Table 1. Scale for the Interpretation of the average or arithmetic mean

Range	Interval	Category
5	4,21 – 5	Higher Level
4	3,41 – 4,20	High level
3	2,61 – 3,40	Moderate Level
2	1,81 – 2,60	Low level
1	1 – 1,80	Lower Level

Source: Armas, S (2022).

The scale that has been designed represents the levels that the results can reach taking into account the scores obtained on a measurement scale from zero to four represented in intervals and categories. Regarding the arithmetic mean and standard deviation, the tables indicate the degree of dispersion between the findings obtained, as well as their level of reliability.

Table 2. Scale for the Interpretation of the standard deviation

Range	Interval	Category
5	3.21 – 4	Higher Level
4	2.41- 3.20	High level
3	1.61 – 2.40	Moderate Level
2	0.81 – 1.60	Low level
1	0 – 0.80	Lower Level

Source: Armas, S (2022).

4. RESULTS

As a result of the work carried out, with the help of the data collection instruments and the purpose of achieving the objectives determined in the investigation, the most relevant results for this document were taken. The following results were obtained:

Table 3. Causal processes in 21st century education

Dimension	Subdimensions	Average	Category	Standard deviation	Category
Causal Processes	Technical	4.08	High level	0.43	Lower dispersion
	Contextual	3.48	High level	0.19	Lower dispersion
	Pedagogical	3.89	High level	0.62	Lower dispersion
General average of the dimension		3.82	High level	0.42	Lower dispersion

Source: Armas, S (2022).

Taking into account the data obtained from the teacher survey applied in the “New Era Educational Institution”, there is an average of 4.08 respondents who reflected a high level in the technical subdimension, with a 0.43 standard deviation, resulting in a very low dispersion between the answers. Regarding the contextual subdimension, it was found that an average of 3.48 teachers have a high knowledge of their environment with a very low dispersion according to the interpretation scale of the resulting 0.19 standard deviation. Likewise, in the pedagogical subdimension, an average of 3.82 teachers was obtained, who show that they have a high recognition in pedagogy, reflecting in a very low dispersion between the results with a standard deviation of 0.62.

Table 4. Learning experiences in virtual environments

Variable	Dimensions	Average	Category	Standard deviation	Category
Learning experience	Teaching Strategies	4.24	Very High Level	0.16	Very low dispersion
	Types of technological tools	3.57	High level	0.33	Muy baja dispersión
	Causal Processes	3.82	High level	0.42	Muy baja dispersión
General average of the dimension		3.88	High level	0.30	Muy baja dispersión

Source: Armas, S (2022).

Regarding the findings collected from the teacher survey, it is reflected that there is an average of 4.24 respondents who claim to apply teaching strategies at a high level, showing a 0.16 standard deviation, demonstrating low dispersion. On the other hand, the participants have a high level of knowledge in relation to

the types of technological tools with an average of 3.57 and a 0.33 standard deviation, revealing a very low dispersion between the data. Finally, in the causal processes sub-dimension, the teachers ratified having a very high level of comprehension with an average of 3.82, confirming a very low dispersion according to the answers obtained with a standard deviation of 0.42.

5. DISCUSSION

The data reflected in table 3 show that, although the teacher is the owner of the subject and the concepts that he teaches within it, he must be aware that not only the theoretical part intervenes at the time of teaching, since the techniques that he uses, the environment in which it works and who are the beneficiaries of their work are fundamental elements. As Ramírez, Monroy and Vargas (2017) mentioned, who argue that a teacher must be constantly updated to strengthen their performance in the pedagogical field with the help of TIC tools in the classroom. Being corroborated by Sosa in 2018, who asserts that teaching skills are strengthened through self-training and training primarily when they focus on the use of TICs in educational processes.

Due to the fact that people are currently immersed in the digital age 4.0, it is necessary to recognize that the whole world is in constant change and that it is imperative to stay immersed in that change. In order to know how to accompany students in their learning process and the generation of productive experiences, the teacher is the key actor in the educational process. In this situation, it is necessary to take the words of Hernández R. (2017) and Mogollón (2020), who agreed that using technological tools conjectures a solution to the problems and challenges around the development of innovative learning and the generation of experiences, within a virtual educational modality. On the other hand, Hernández, Orrego and Quiñones (2018), supported that the teacher is the protagonist in the mediation of learning, if he knows how to respect and value the challenges that may arise in the new digital and knowledge era.

In addition, it is argued that to achieve a comprehensive education and form productive experiences in the student body, it is a requirement to combine the technical, contextual, and pedagogical field added to the technological advances that exist in contemporary times. According to Callis and Basto (2020), who considered that thought and action were favored within a technological culture that focuses on the social selection of individuals. Given the above, Gelb, Mital and Mukjerjee (2020), ratified that by using digital and mobile technologies added to the Internet, great opportunities can be created for the creation of a vast set of mechanisms and resources for the academic field.

Therefore, the generation of productive learning experiences, useful for everyday life, can only be carried out if there is a conjugation between technical, contextual, and pedagogical processes. Educational actors must focus their efforts on designing recreational activities that allow students to develop digital skills that allow them to form a transversal and innovative profile. The TICs and the changes of the digital age are not an impediment and need to be involved in such a process, so that the skills achieved by students are used to provide solutions and create new opportunities.

Indeed, the main elements that intervene in the generation of productive experiences in the digital age 4.0 are the technical, contextual, and pedagogical processes. These phenomena directly influence the achievement of significant learning, which allows individuals to contribute greatly with innovative solutions that include the use of technological tools. The students, in other case, will achieve through the acquisition of digital skills, the ability to solve problems, innovation and leadership, which will allow them to actively participate in their environment, both individually and collectively. However, changes cannot be evidenced if education is not transformed.

In addition, there is a great variety of technical, contextual, and pedagogical processes that must be applied to develop productive experiences. Technological devices such as cell phones, computers and tablets are the main tools to acquire skills, however, there are other elements that are also essential. The context directly influences, social factors can benefit or affect the insertion of TICs, therefore, educational actors must make the most of all the resources available to them. Pedagogy is a discipline that could not be missing, since, without a good teaching method, unfortunately the educational process cannot be carried out.

On the other hand, the data showed in table 4, showed that there is a much higher level of response when talking about didactic strategies compared to the levels obtained in the types of technological tools and the existing causal processes within the classroom. For this reason, it is worth highlighting the words of Garzón (2021) who maintains that teaching competencies should never remain rigid, static, or immutable, on the

contrary, they must be variables that can understand the situations and the context in which the class develops today in day. According to Apolo (2019), he suggested that the most current trends in technology and virtual media intended for formal education should be identified, knowing how to combine them with the context in which students find themselves and differentiate the strengths and needs of the application of these tools in the educational system.

According to Ureta and Rossetti (2020), the learning experiences immersed in digital environments must show the integration between the academic and technological capacities of the students in favor of the construction of knowledge with the use of different strategies, methods, objectives, and activities. On the other hand, Tamayo (2021) and Melo (2018) agreed that educational agents must know how to adapt to the current era, focusing on the design and planning of sequential and continuous programs, taking into account the development, control and evaluation of strategies that include technological tools. Despite this, the reality is so different, since not all students and teachers can use technological means for education properly or conscientiously.

According to Loiza, Ramirez, and Pacheco (2021), maintained that learning can be supported on countless virtual platforms, this symbolizes a great opportunity for educational centers and teachers in order to generate digital materials, information bases, interactive assessments and thereby achieve encourage student learning. But for the before mentioned happen, it is necessary to include different didactic strategies in every academic process through the support of the technological tools within our reach and the recognition of the causal processes that encourage the student to generate productive experiences in a digital age.

In other words, to achieve a generation of productive experiences in the digital age 4.0, educational actors must direct their efforts to redesign the methodologies and resources used until now and transform them from an innovative perspective. Strategies, digital tools, and causal processes are, to a large extent, the main elements involved in achieving learning for life. Therefore, teachers must transform their role as an educator and become a leader, who motivates students to strengthen their skills and together they can achieve the skills that 21st century society so desperately needs.

Although all educational actors play an important role in generating productive experiences in the digital age, the teacher is primarily responsible for the teaching and learning process. Therefore, it is imperative that teachers design new ways of teaching, where the need for practice, criticism and assessment of what has been learned is taken into account, and not just the repetition of content. The insertion of technology can be seen as a great challenge, but after the analysis carried out, the educational rethinking is simpler than what is created thanks to the management of TICs and electronic devices.

REFERENCES

- Álava, I., Illescas, M., & Loor, E. (2017). *La plataforma virtual como fortalecimiento al proceso enseñanza-aprendizaje en las aulas de la educación ecuatoriana*. Revista científica Ciencia y Tecnología. <https://doi.org/10.47189/rcct.v17i16.135>
- Apolo, D. (2019). *Tecnología y educación: un largo camino por recorrer. Puntos de acuerdo, tensiones y disputas entre estudiantes, docentes y autoridades para los usos juveniles de internet con fines educativos. Caso: Colegio Nacional Eloy Alfaro, Quito-Ecuador*. Presentada en Universidad Nacional de La Plata. Facultad de Humanidades y Ciencias de la Educación para optar al grado de Doctor en Ciencias de la Educación. <https://www.memoria.fahce.unlp.edu.ar/tesis/te.1697/te.1697.pdf>
- Buzón De La Hoz, Y. (2021). *¿Cómo integrar el modelo pedagógico Constructivista y con las competencias educativas para despertar en los estudiantes un rol más activo dentro del aula de clase?*. Barranquilla: Corporación Universidad de la Costa. <https://hdl.handle.net/11323/8353>
- Callis, Y., & Basto, M. (2020). *La cultura tecnológica una alternativa en la formación protagónica del estudiante en la enseñanza universitaria*. Maestro y Sociedad, 189-203. <https://maestrosociedad.uo.edu.cu/index.php/MyS/article/view/5157>
- Casillas, M., & Ramírez, A. (2019). *Cultura digital y cambio institucional de las universidades*. RESU, 97-111.
- Clavijo, L., Loiza, C., Ramirez, S., & Pacheco, E. (2021). *Desarrollo de manual para el manejo de la plataforma lost (Goal Project) para docentes y estudiantes*. EIEI ACOFI, 1-13. <https://doi.org/10.26507/ponencia.1868>
- Garzón, C. (2021). *Las competencias docentes en el siglo XXI. De cara a la virtualidad de la educación con ocasión del COVID-19*. Boletín REDIFE, 10(5), 177-188. <https://dialnet.unirioja.es/servlet/articulo?codigo=8116437>

- Gelb, A., Mital, N., & Mukjerjee, A. (2020). *Hacia la gobernanza en tiempo real: el uso de la retroalimentación digital para mejorar servicios, voz y rendición de cuentas. Estado Abierto*. Revista Sobre el Estado, la administración y las políticas públicas, 165-179. <https://publicaciones.inap.gob.ar/index.php/EA/article/view/136>
- Hernández, R. (2017). *Impacto de las TIC en la educación: Retos y Perspectivas*. Propósitos y Representaciones, 5(1), 325-347. <https://dialnet.unirioja.es/servlet/articulo?codigo=5904762>
- Hernández, R., Orrego, R., & Quiñones, S. (2018). *Nuevas formas de aprender: La formación docente frente al uso de las TIC*. Propósitos y Representaciones, 671-701.
- Melo, M. E. (2018). *La integración de las TIC como vía para optimizar el proceso de enseñanza-aprendizaje en la educación superior en Colombia*. Alicante, España. <http://hdl.handle.net/10045/80508>
- Mercado, L. M., Mercado, T. M., Ziritt, G., & Consuegra, S. D. (2018). *Determinantes discursivos del uso de las Tics en el sector educativo oficial del departamento del Atlántico, Colombia*. Revista Espacios, 1 - 7. <http://hdl.handle.net/10584/9976>
- Mogollón, I. (2020). *Tendencias, desafíos y desarrollos de la educación a distancia y virtual en la universidad venezolana*. Universidades, 17-30. <https://doi.org/10.36888/udual.universidades.2020.83.73>
- Ramírez, E., Monroy, S., & Vargas, J. (2017). *Uso de la Tecnologías TIC por los Docentes de las Instituciones Educativas Públicas de la Ciudad de Riohacha*. (R. I. REDIPE, Ed.) Boletín Redipe, 6(6), 113-118. <https://revista.redipe.org/index.php/1/article/view/248>
- Rodríguez, R., Orozco, E., Rocha, C., & Rodríguez, O. (2017). *Transformación de la estructura cognitiva con el uso de herramientas tecnológicas en matemáticas*. 37. Universidad Sergio Arboleda: Colombia. <http://hdl.handle.net/11232/1040>
- Sosa, E. (2018). *Diseño de un modelo de incorporación de tecnologías emergentes en el aula (MITEA) para la generación de estrategias didácticas por parte de los docentes*. España: Universitat de les Illes Balears. <http://hdl.handle.net/11201/149058>
- Tamayo, L., Tinitana, A., Apolo, J., Martínez, E., & Zambrano, V. (2021). *Implicaciones del modelo constructivista en la visión educativa del siglo XXI*. Revista Sociedad & Tecnología, 4(S2), 364-376. <https://doi.org/10.51247/st.v4iS2.157>
- Ureta, L., & Rossetti, G. (2020). *Las TAC en la construcción de conocimiento disciplinar: una experiencia de aprendizaje con estudiantes universitarios*. Revista Iberoamericana de Tecnología en Educación y Educación en Tecnología, (26), e11. <https://doi.org/10.24215/18509959.26.e11>