



Didactic Digital Tools and Autonomous Learning in Information Technology Engineering Students at Uleam, Chone Extension



Nubia Aracely Mera-Santander ^a
Fabricio Rivadeneira-Zambrano ^b

Article history:

Submitted: 09 February 2024

Revised: 18 March 2024

Accepted: 27 April 2024

Keywords:

autonomous learning;
digital tools;
scientific access;
technological;
technology engineering;

Abstract

The technological scenario has transformed the way people communicate, learn and carry out daily activities. Since the COVID-19 pandemic, it has been proven that technology has provided many advantages, but challenges related to access and security have also been generated, making it essential to guarantee that all people have the same opportunities related to scientific access. The objective was to evaluate the use of digital didactic tools in the autonomous learning of information technology engineering students of the ULEAM Chone extension, the study was descriptive with the quantitative approach, the inductive-deductive method was applied, the review of information and the statistical method. Among the instruments used in the work, a structured survey was used for the 16 teachers and information technology students with a total population of 193 students, applying the Larry and Murray formula with a sample of 89 schoolchildren. It is concluded that digital tools offer advantages in autonomous learning such as time optimization, in addition to allowing the analysis of various investigative approaches, even though there are factors that affect the educational field for the application of digital tools such as social, cultural, political and economic.

International research journal of engineering, IT & scientific research © 2024.

This is an open access article under the CC BY-NC-ND license

(<https://creativecommons.org/licenses/by-nc-nd/4.0/>).

Corresponding author:

Nubia Aracely Mera-Santander,

Student of the master's degree in education with a Major in Teaching and Research in Higher Education

Universidad Laica Eloy Alfaro de Manabí, Extensión Chone, Manabí, Ecuador.

Email address: nubito79@hotmail.com

^a Student of the master's degree in education with a Major in Teaching and Research in Higher Education Universidad Laica Eloy Alfaro de Manabí, Extensión Chone, Manabí, Ecuador.

^b Teacher at the Universidad Laica Eloy Alfaro de Manabí, Extensión Chone, Manabí, Ecuador

1 Introduction

Digital tools serve to develop the learning of the population and are defined as software programs that make active and autonomous teaching possible. It is also essential to specify that the tools constitute time management and are useful in any space that this free to start browsing and learning.

When analyzing digital tools, they are those that belong to the area of virtual teaching-learning environments, tutorials, simulators, repositories, search platforms and construction tools. And when listing information and communication technologies such as desktop and laptop computers, personal digital assistants, tablets, smartphones, video game consoles, and smart televisions.

Digital tools refer to the software used by the computer, this is classified as one of the information and communication technologies (ICT), which are computer programs that have educational purposes. Per se; Within this, you can find paid ones and those for free distribution and use, the student of new educational technologies must prioritize the use of free software digital tools (Bringas, 2021).

Autonomous learning is a concept that refers to the training of students as learners, with the ability to take control over their learning process, for the rest of their lives (Maldonado-Sánchez et al., 2019).

When hybrid education was proposed, the need to show the need and urgency of promoting skills that allow students to be autonomous and regulate the learning processes was decisive. Likewise, it is stated that university autonomous learning is that capacity that the student body achieves outside of the established conditions, managing to self-regulate learning. Virtual teaching has strengthened the autonomous learning of students in all modalities and levels (Suyo-Vega et al., 2021).

The use of digital tools facilitates teaching when students' prior knowledge, stages of development and context, the importance of knowledge and the choice of the appropriate tool depending on the training field in which it is applied, remembering at all times that it is a tool and not an end. The teacher must continue to constantly prepare for class so that students understand the use of resources and tools with greater usability and support by a repository.

The Eloy Alfaro Secular University of Manabí Chone extension, aware of the leading role that the entity has in the training of professionals, seeks to contribute to the development and progress of society, contemplating that research affects the growth of the academy and the improvement of quality of life of the population in the face of dizzying technological changes and the usefulness that they generate in that progress.

Detailing that the use of digital didactic tools affects the autonomous learning of information technology engineering students at the ULEAM Chone extension, defined as the object of study. Digital tools are the field of action to achieve autonomous learning, understanding that through the use of digital didactic tools the autonomous learning of students will be strengthened (Martín-Gutiérrez et al., 2015; Nguyen, 2012).

The objective of the study is to evaluate the use of digital didactic tools in the autonomous learning of information technology engineering students at the ULEAM Chone extension, characterizing the usefulness of each of the digital tools used in the student's performance. with the development of a plan that follows the study topics using digital applications, carrying out model classes of simple processes through the contributions of different digital tools (Hillmayr et al., 2020; Ramallete et al., 2010).

Digital tools in the development of learning are those software programs that promote active and collaborative learning, simplify learning tasks and, together with the repositories, constitute the collection that prevents teachers from preparing material that already exists on the Internet, thus constituting the time management tool. Digital teaching tools have their potential in computer programming and are supported by ICT, favoring the development of learning that has an educational purpose (Aurioles, 2021).

Training and training are increasingly important in a competitive world where the most prepared individuals maximize their chances of success both in the academic and professional fields (Basantes et al., 2018).

Institutions must adopt the use of digital tools for virtual education as soon as possible since little-by-little remote learning is becoming the standard to follow. It is true that face-to-face classes, such as a university degree, will never be replaced, however, the objective of learning tools is to strengthen any educational project, without the need to replace it completely (Borja et al., 2021).

In addition, more and more students are looking for the convenience and practicality of being able to study from wherever they are, so digital tools for students offer advantages so that institutions can offer that versatility. There are different types of educational digital tools.

Traditional teaching methods are gradually becoming obsolete to meet the needs of modern society. A monotonous blackboard and chat are no longer enough, so technology has reinvented them with the purpose of

awakening student motivation with positive tools to improve the quality of sessions and encourage critical thinking (Castillo-Bustos & Yépez-Moreno, 2021).

On the teachers' side, although digital tools have represented a challenge, they are great allies in building bridges of personalized communication with students, taking into account their diversity and how each one learns.

The legal part that empowers and creates relevance to the problem to be resolved is necessary; since it involves the participants and the contributions that are generated for the benefit of higher education and the legal framework that provides sustainability and the basis for the study to be a scientific novelty.

Art. 12.- The Higher Education System is governed by the principles of responsible autonomy, co-government, equal opportunities, quality, relevance, comprehensiveness, and self-determination for the production of thought and knowledge, within the framework of the dialogue of knowledge, and universal thought. and global scientific and technological production. The Higher Education System, being part of the National System of Inclusion and Social Equity, is governed by the principles of universality, equality, equity, progressivity, interculturality, solidarity and non-discrimination; and will operate under the criteria of quality, efficiency, effectiveness, transparency, responsibility and participation (Organic Law of Higher Education, 2010).

These principles comprehensively govern the institutions, actors, processes, norms, resources and other components of the system, in the terms established by this Law.

Art. 32.- Computer programs. - Companies that distribute computer programs should grant preferential rates for the use of the mandatory licenses of the respective programs, in favor of higher education institutions, for academic purposes. Private higher education institutions will be exempt from the mandatory use of computer programs with free software. In the case of public higher education institutions, to access licensed software, they must justify and support the acquisition before the higher collegiate body of each IES, which will approve its use.

Art. 35.- Allocation of resources for culture, research, science and technology and innovation. The institutions of the Higher Education System may additionally and preferably access the competitive public resources of the pre-allocation for culture, research, science, technology and innovation established in the corresponding Law. For this purpose, administrative processes will be simplified so that obtaining resources for culture, research, science, technology and innovation are timely, and effective and allow the development of a permanent interest of researchers and teachers.

Digital didactic tools play a fundamental role in the autonomous learning of information technology engineering students at the ULEAM Chone extension, because they are technological resources that complement and enrich the teaching-learning process, encouraging the active participation of students. students and facilitating access to updated and relevant information (Pan et al., 2014; Yan et al., 1996).

2 Materials and Methods

The research was descriptive since it consists of characterizing a specific situation indicating more peculiar features. The quantitative approach was used because it deals with phenomena that can be measured and evaluated to obtain specific results; statistical techniques were used to analyze the data collected; In addition, the scientific, theoretical and empirical method was used. Among the theoretical methods, analysis-synthesis was used, search for information related to the topic addressed through bibliographic review where the theoretical foundations of digital tools and the learning of information technology students at ULEAM were investigated, Extension Chone. Among the empirical methods, a survey of teachers and students of the course was used, the statistical-mathematical method was used in the collection of information, the total population was 193 students, and the sample was determined by the Larry and Murray equation (Murray & Larry, 2009) shown in 1.

$$n = \frac{Z^2 \cdot N \cdot \sigma}{e^2 (N-1) + Z^2 \cdot \sigma} \quad (1)$$

n → Sample size

N → Population

σ → population standard deviation. When this data is unknown, a constant is used that is equivalent to 0.5

Z → value obtained through confidence levels. It is a constant number, which generally takes on two values depending on the level of confidence desired. 99% is the highest value (equivalent to 2.58) and 95% (equivalent to 1.96) is the minimum value accepted for the research to be considered reliable.

e → is the limit of admissible sampling error. It commonly ranges between 1% (0.01) and 9% (0.09). 5% (0.05) is the standard value used in research.

It is a priority to establish the purpose of obtaining results from the application of the survey to students because the research effort in this field can be assessed to make the best collective decisions. It was obtained that the sample is 89 students selected by non-probabilistic sampling.

3 Results and Discussions

The use of digital tools in the classroom is not limited to the mere use of the resource as such but must be used pedagogically, that is, with the clear purpose of facilitating learning, it is necessary to provide university professors with timely, clear and precise advice on how to use the available ICT, but with appropriate educational guidelines. The variety of existing and useful technological alternatives in the formal educational field can be seen that the list is extensive (López-Espinoza, 2020).

Digital educational tools are part of ICT and are the set of programs, platforms and applications aimed at generating entertaining, useful and beneficial content for students, in such a way that they facilitate their learning and access to information. The variety of digital teaching tools is extremely wide and depends on what needs to be achieved. For example, there are digital tools for teachers that aim to design interactive courses or presentations. Some online educational tools are more oriented towards the creation of graphics, maps and other visual resources to complement the courses (Castillo Bustos & Castillo Bustos, 2021).

There are digital tools for teaching that focus more on managing and tracking students to monitor their progress. In this way, both students and teachers have an extremely wide range at their disposal with which they can take their education to the next level. Regarding the existing Google Classroom platforms, it is one of the most used platforms for online classes. It is enough to have a Gmail account to access the functions and create virtual sessions. Another valuable digital medium is Google Drive for storing documents and files, as well as Google Academics for searching for truthful sources. Edmodo is another platform with wide use among teachers and students, as it resembles a social network, only here notices, tasks and multimedia resources seen in class are posted (Cedeño-Jama, 2022).

Another tool used is Dropbox as a means of storing information, in addition to Google Drive. Like the Google service, you can access documents whenever you need, as long as you have an Internet connection (Esteban-Albert & Zapata-Ríos, 2019). WeTransfer is an application for sending documents by email, it is usually difficult, especially when they cannot be compressed, therefore, it is a very useful educational digital tool, a site where it is possible to send or receive files up to 200 GB in size (García Prieto et al., 2022).

Prezi is a website for creating and sharing presentations. It is used by both teachers and students who want to give a special and interactive touch to the topics that will be presented in class. Zoom, is another application similar to Google Classroom, this app is mainly used for video conferences, webinars or group chats with a time restriction of 40 minutes if you do not have a premium account. Kahoot is a fun application based on a playful dynamic. This tool works through questions similar to a test, in which several people can compete and obtain places on a virtual podium, according to their knowledge of a specific topic.

iSpring learn, is a learning management system used to create, host and share cloud-based e-learning (LMS) that is easy to use but has advanced user and content management, powerful functionalities for course creation and a robust reporting engine. You can upload an unlimited amount of training materials, including SCORM courses, assign the content to your students, and track their results.

The platform also allows you to create simple courses directly in a browser using a built-in tool and create engaging interactive courses, dialogue simulations, quizzes and video tutorials with the iSpring Suite authoring tool that includes the LMS for free, this is also a good option for b-learning or blended learning here you can organize virtual training sessions using the Zoom function and schedule both online events and classroom training on the calendar (Morales Diaz, 2016).

Digital education tools can eliminate the fear of change and benefit the educational process by being part of the educational revolution since this does not mean and has never meant the abolition of traditional education. New educational models, especially those based on electronic learning, must complement existing educational parameters

and increase their effectiveness (Borja et al., 2021). Technology plays a vital role in the introduction of new educational tools that benefit and bring great advances. These achievements not only occur in the educational process but also encourage education to respond to the needs of modern society, especially the process of technological adaptation (Herrera & Proaño, 2020).

Now virtual education can be beneficial in several aspects. However, adapting to change is not always easy and it is not always done correctly. Therefore, continuous training and analysis of the environment in which education takes place are essential steps to identify the digital tools necessary for education. These educational tools show that every day, the challenges of today's education are no longer limited to teaching. Rather, it corresponds to knowing how to go hand in hand with progress and innovation.

ICTs have become the tools that have allowed the continuity of the educational system worldwide within the context of the pandemic given their versatility, interactivity and simplification of barriers such as time and space, however, it must be considered that the reality of the schools in the world is not homogeneous and accessibility to these devices is often limited for some sectors (Salas Soto, 2016).

The use of ICT over time has allowed us to observe considerable benefits in some students who use it as a regular tool for the development of their classes. They are motivated and even get ahead of the topics by being self-taught, demonstrating improvements in their academic performance. The application of these technologies achieves an orientation towards a new pedagogical practice that shows more prominence in the students, making them more active and dynamic in the performance of their activities (Vázquez & Hernández, 2021; Vera-Muñoz & Santana-Sardi, 2021). These tools help by increasing interest and curiosity in learning by presenting characteristics that promote student learning; however, being part of an evolutionary process of education, it is necessary that teachers also present mastery over it.

Regarding the autonomous learning of students, it is what empowers knowledge and is enhanced by the student himself because he uses all the necessary mechanisms for the correct development of the process. It can be summarized as the ability to learn on one's own. The individual is managed without the intervention of an outside pedagogical authority.

Self-learning is intrinsic to every living human being and for this, it uses an effective way to incorporate into the process the internalization and memorization of new rules and skills, or an improvement of those already possessed (Sandoval & Aguilar, 2018). The autonomous learning processes and the use of digital tools to learn the fundamentals of the information that is processed and codified to become learning. The subject of self-learning is actively involved assumes a commitment and responsibility for his or her learning and acts firmly towards progress (Vaillant et al., 2020).

The use of digital tools for scientific inquiry is the main learning activity carried out by students (Roncal et al., 2022). They bring them closer to information, knowledge of the world, and the understanding of natural and social phenomena. But they will not learn alone, they require the professional guidance of teachers since they are knowledgeable about the subject and competent to design enriching learning activities that allow them to develop scientific curiosity, investigative skills and, consequently, scientific thinking is the most important challenge for teachers.

Technologies understood as a means for education and not as an end in itself, are established as a resource that allows us to respond, from the training field, to the demands that today's society requires. In this way, they favor not only an adaptation to new paradigms but the incorporation of countless tools that improve both the efficiency and the quality and results of academic processes (Pérez-Rodríguez, 2020). The flipped classroom methodology needs to be oriented with the participation of the teacher who facilitates the resources and tools for the student, who is the active protagonist in the teaching-learning process.

The flipped classroom methodology aims to address the problem of change in traditional education by using digital resources made by teachers and delivered to students before class. By using these available technological resources, the student cannot only be responsible for his learning but consider himself a person with values in which affection and emotions are unique characteristics (Hekkert et al., 2007; Miracle, 2005).

Students of higher institutions must know learning strategies for autonomous use so that they organize, systematize and integrate information, in the same way, the time used for each need or circumstance of learning and teaching is managed, and also recognize and reflect on their strategies. for better learning using the digital technical and pedagogical resources that we find in the environment in this reality of virtualization (Matta Huerta, 2021).

The most relevant results for the research were taken from two questions of the survey applied to the students and two applied to the teachers to establish a comparison between the results, these represent the opportunity to better explain the close link between the variables that make up the study. Once the survey was applied to the population

chosen to carry out the research, the respective tabulation of the data was carried out in the Excel program to carry out the analysis of the most relevant results that helped in meeting the objectives. Presenting the statistical data of the survey applied to information technology engineering students at the ULEAM Chone extension. Table 1 shows the usefulness of the use of digital tools in autonomous learning.

Table 1
The usefulness of the use of digital tools in autonomous learning

Alternatives	Frequency	Percentage (%)
Very useful	65	73
Useful	24	27

Fountain: Information technology engineering students from ULEAM Chone extension.

Of the 89 students surveyed, 73%, corresponding to 65 students, answered that the use of digital tools in autonomous learning is very useful, and 27% of respondents, corresponding to 24 students, answered that the use of tools in learning is useful autonomous. Table 2 shows the types of digital tools used in autonomous learning.

Table 2
Digital tools used in autonomous learning

Alternatives	Frequency	Percentage (%)
word online	49	55
Excel online	20	22
PowerPoint Online	14	16
Canva	6	7

Fountain: Information technology engineering students from ULEAM Chone extension.

Of the 89 students surveyed, 55%, corresponding to 49 students, answered that they use Word online in autonomous learning, 22% of respondents, corresponding to 20 students, answered that they use Excel online in autonomous learning, 16% of Respondents, corresponding to 14 students, answered that they use PowerPoint online in autonomous learning and 7%, corresponding to 6 students, answered that they use Canva in autonomous learning. Table 3 shows the limitations of the use of digital tools in autonomous learning in the students surveyed.

Table 3
Limitations for the use of digital tools in autonomous learning

Alternatives	Frequency	Percentage (%)
The lack of interest of students in the use of digital tools	23	26
The Internet	45	51
Little knowledge of technological tools	17	19
The difficulty in acquiring technological tools	4	4

Fountain: Information technology engineering students from ULEAM Chone extension.

Of the 89 students surveyed, 51%, which corresponds to 45 students, answered that one of the limitations is the Internet, and 26% of respondents, which corresponds to 23 students, answered that one of the limitations is the students' lack of interest in using the Internet. digital tools, 19% of respondents corresponding to 17 students, answered that one of the limitations is the little knowledge of technological tools and 4%, corresponding to 4 students, answered that one of the limitations is the difficulty in acquiring technological tools. Likewise, the analysis and interpretation of the results of the survey applied to the teachers of the Information Technology Engineering career at Uleam Chone extension was carried out (Kitchenham et al., 2009; Gupta et al., 2007). In table 4 you can see the frequency of use of digital tools in the teaching-learning process used by teachers.

Table 4
Frequency of use of digital tools in the teaching-learning process used by a teacher

Alternatives	Frequency	Percentage (%)
Always	12	75
Sometimes	4	25

Fountain: Information technology engineering students from ULEAM Chone extension.

Of the 16 teachers surveyed, 75%, which corresponds to 12 teachers, answered that they always use digital tools in the teaching-learning process as a teacher, 25% of respondents, which corresponds to 4 teachers, answered that they sometimes use digital tools in the teaching-learning process as a teacher. Teachers were also consulted about the usefulness of the use of digital tools in students' autonomous learning; the results are shown in Table 5.

Table 5
Utility in the use of digital tools in students' autonomous learning

Alternatives	Frequency	Percentage (%)
Very useful	11	69
Useful	5	31

Fountain: Information technology engineering students from ULEAM Chone extension.

Of the 16 teachers surveyed, 69%, corresponding to 11 teachers, answered that the use of digital tools is very useful in the autonomous learning of students, 31% of respondents, corresponding to 5 teachers, answered that the use of tools is useful digital in the autonomous learning of students. Table 6 shows the benefits or advantages of the use of digital tools in the autonomous learning of students.

Table 6
Benefits or advantages of the use of digital tools in students' autonomous learning

Alternatives	Frequency	Percentage (%)
Time optimization	10	63
They are concrete and agile	4	25
They allow analyzing various approaches	2	13

Fountain: Information Technology Engineering students from ULEAM Chone extension.

Of the 16 teachers surveyed, 63%, which corresponds to 10 teachers, answered that a benefit is the optimization of time, 25% of respondents, which corresponds to 4 teachers, answered that a benefit is that the information is concrete and agile, and 13% of Respondents, which corresponds to 2 teachers, answered that a benefit is that it allows various approaches to be analyzed.

When doing a more in-depth study of the theories chosen in the bibliographic review, it is detailed that there is cohesion and contradictions with reality. It is expressed that autonomous learning and the use of digital tools are important in education because advances are within everyone's reach as long as they have the resources to acquire the devices and direct them towards what learning is; Likewise, he believes that learning occurs actively and it is the university student who assumes the role of responsibility for his progress.

It is necessary to point out that many intelligent people have a great desire to learn, this leads them to invest time in cyber because they do not have the devices to handle them in their learning and they live in places where access to the internet and Wi-Fi is not possible to obtain, then teaching in the use of technology represents for this human being not having the conditions for adequate communication and losing a day of work trying to find the resource for communication.

The use of digital tools in the classroom is not limited to the mere use of the resource but must be used pedagogically with the clear purpose of facilitating learning. It is necessary to provide university professors with timely, clear and appropriate advice. precise what they are and how to use the available ICT, this is important

because the universities have the laboratories and the teachers are called to be trained in the use of digital tools, consequently reality shows that there are a good number of teachers who still They remain in traditional teaching and do not provide the opening for teaching following the hybrid education that was established with the pandemic (López-Espinoza, 2020).

Digital tools have benefits and disadvantages from the point of view of their implementation (López & Madrigal, 2020), the fact of the interaction between students, digital tools and teachers is considered outstanding by contributing to the process and methodology of the inquiry.

Virtual courses and scientific inquiry with digital tools thus become an interesting proposal for learning in the current perspective of education. This theory describes the moments of the classes given in the classrooms with the knowledge of applications or audiobooks for the specialties. Many when they do not understand some syllabus, review it on YouTube, asking and finding the procedures to acquire the knowledge that is needed in in the 21st century, without detracting from the great contribution that is made in the classrooms by university teachers with high professional quality processes.

There are limitations in the teachers' schedules for interaction with students because these are vertical, where everyone undergoes a plan already given and that must be fulfilled, which is why those who have not managed to attend will have a gap in content and of technological actions in practices that are lost and that must be achieved by the student and it is to remember that only certain hours are given for interaction in classes, in such a way that the topics cannot be debated as the students' expectations have been created. , without failing to point out that in the university environment, the student must develop an investigative spirit and contribute 50% of the knowledge; Initially, some do not fit into the system, which is why no class is homogeneous.

It can be recommended that classes be given with practices that validate the theory because the technological world is expanding rapidly, and it is possible to manage digital tools with great scope so that autonomous learning generates success and a great display of actions and creativity in the information technology career, establishing milestones in home automation, robotics, and software creation to provide future services to the entire university and community scenario. There are university students who only use technology from time to time, indicating that teachers also do not do it very often due to the demand of students, in addition to the limited time in classes, there are students who remain neutral in the satisfaction of using technology in college (Rokhmonov & Sarimsakov, 2022).

4 Conclusion

Digital tools offer advantages in autonomous learning such as time optimization, is possibility to analyze various research approaches to the topics, there is abundant information, even though there are factors that affect the educational field for the application of digital tools and these are: social, cultural, political and economic. The most widely used digital tools for autonomous learning are Word, Excel and PowerPoint, however, need to know and handle other platforms as well as the use of artificial intelligence. There is a lack of interest in the use of digital tools in some students, due to the difficulty of getting internet due to their low economic resources, and others have not had access to the knowledge of digital tools.

Conflict of interest statement

The authors declared that they have no competing interests.

Statement of authorship

The authors have a responsibility for the conception and design of the study. The authors have approved the final article.

Acknowledgements

We are grateful to two anonymous reviewers for their valuable comments on the earlier version of this paper.

References

- Auriolles, M. E. W. (2021). Diez herramientas digitales para facilitar la evaluación formativa. *Revista Tecnología, Ciencia y Educación*, (18), 127-139.
- Basantes, A. V., Naranjo, M. E., & Ojeda, V. (2018). Metodología PACIE en la Educación Virtual: una experiencia en la Universidad Técnica del Norte. *Formación universitaria*, 11(2), 35-44.
- Borja, L. M. M., Tovar, G. L. C., & Sánchez, J. D. C. P. (2021). Herramientas digitales y su impacto en el desarrollo del pensamiento divergente. *Dilemas contemporáneos: Educación, Política y Valores*.
- Bringas, E. C. (2021). Herramientas digitales para el desarrollo de aprendizajes. *Revista vinculando*.
- Castillo-Bustos, M. R., & Yépez-Moreno, A. G. (2021). Bases esenciales para una formación profesional efectiva. *Editorial Universitaria. Ecuador*.
- Cedeño-Jama, K. E. (2022). Accesibilidad de los estudiantes universitarios a los entornos virtuales de aprendizaje implementados por la Universidad Laica Eloy Alfaro Extensión El Carmen. *Revista Científica Retos de la Ciencia*, 6(13), 145-155.
- Esteban-Albert, M., & Zapata-Ros, M. (2016). Estrategias de aprendizaje y eLearning. Un apunte para la fundamentación del diseño educativo en los entornos virtuales de aprendizaje. *Revista de Educación a Distancia (RED)*, (50).
- García Prieto, FJ, López-Aguilar, D., & Delgado-García, M. (2022). Digital competence of university students and academic performance in times of COVID-19. *Pixel-Bit: Journal of Media and Education*, 64, 165-199.
- Gupta, P., Tenhundfeld, G., Daigle, E. O., & Ryabkov, D. (2007). Electrolytic plasma technology: Science and engineering—An overview. *Surface and Coatings Technology*, 201(21), 8746-8760. <https://doi.org/10.1016/j.surfcoat.2006.11.023>
- Hekkert, M. P., Suurs, R. A., Negro, S. O., Kuhlmann, S., & Smits, R. E. (2007). Functions of innovation systems: A new approach for analysing technological change. *Technological forecasting and social change*, 74(4), 413-432. <https://doi.org/10.1016/j.techfore.2006.03.002>
- Herrera, R. M., & Proaño, F. P. (2020). Actitudes hacia la investigación y autorregulación del aprendizaje en los estudiantes universitarios. *CienciAmérica: Revista de divulgación científica de la Universidad Tecnológica Indoamérica*, 9(3), 11-26.
- Hillmayr, D., Zierenwald, L., Reinhold, F., Hofer, S. I., & Reiss, K. M. (2020). The potential of digital tools to enhance mathematics and science learning in secondary schools: A context-specific meta-analysis. *Computers & Education*, 153, 103897. <https://doi.org/10.1016/j.compedu.2020.103897>
- Kitchenham, B., Brereton, O. P., Budgen, D., Turner, M., Bailey, J., & Linkman, S. (2009). Systematic literature reviews in software engineering—a systematic literature review. *Information and software technology*, 51(1), 7-15. <https://doi.org/10.1016/j.infsof.2008.09.009>
- López-Espinoza, D. C.-A. (2020). Tendencias Pedagógicas y Herramientas Digitales en el Aula. *CIENCIAMATRIA*, 6(1), 16-39.
- Maldonado-Sánchez, M., Aguinaga-Villegas, D., Nieto-Gamboa, J., Fonseca-Arellano, F., Shardin-Flores, L., & Cadenillas-Albornoz, V. (2019). Learning Strategies for the Development of the Autonomy of Secondary School Students. *Journal of Educational Psychology-Propositos y Representaciones*, 7(2), 428-439.
- Martín-Gutiérrez, J., Fabiani, P., Benesova, W., Meneses, M. D., & Mora, C. E. (2015). Augmented reality to promote collaborative and autonomous learning in higher education. *Computers in human behavior*, 51, 752-761. <https://doi.org/10.1016/j.chb.2014.11.093>
- Matta Huerta, C. R. (2021). El aprendizaje autónomo y los recursos educativos digitales en estudiantes del I ciclo de una universidad privada de Lima, 2021.
- Miracle, D. B. (2005). Metal matrix composites—from science to technological significance. *Composites science and technology*, 65(15-16), 2526-2540. <https://doi.org/10.1016/j.compscitech.2005.05.027>
- Morales Díaz, C. S. (2016). La lúdica, combustible del pensamiento divergente.
- Murray, R. S., & Larry, J. S. (2009). Estadística 4ta edición.
- Nguyen, C. T. (2012). The roles of teachers in fostering autonomous learning at the university level. *Procedia-Social and Behavioral Sciences*, 47, 605-609. <https://doi.org/10.1016/j.sbspro.2012.06.703>
- Pan, F., Gao, S., Chen, C., Song, C., & Zeng, F. (2014). Recent progress in resistive random access memories: Materials, switching mechanisms, and performance. *Materials Science and Engineering: R: Reports*, 83, 1-59. <https://doi.org/10.1016/j.mser.2014.06.002>
- Pérez Rodríguez, N. (2020). Towards a participatory methodology in the teaching of social sciences, a classroom experience with digital tools. *Technology as the axis of methodological change*, 40.

- Ramalhete, P. S., Senos, A. M. R., & Aguiar, C. (2010). Digital tools for material selection in product design. *Materials & Design (1980-2015)*, 31(5), 2275-2287. <https://doi.org/10.1016/j.matdes.2009.12.013>
- Rokhmonov, D., & Sarimsakov, A. (2022). Theoretical study of the movement process of destroyed seeds and fiber in the new construction saw gin working camera. *International Research Journal of Engineering, IT & Scientific Research*, 8(4), 71–78. <https://doi.org/10.21744/irjeis.v8n4.2125>
- Roncal, L. E. P., Portal, M. D. P. G., Acuña, M. L. L., & Rojas, O. M. D. (2022). Herramientas digitales e indagación científica en estudiantes de educación secundaria: una revisión de la literatura. *Ciencia Latina Revista Científica Multidisciplinar*, 6(2), 989-1006.
- Salas Soto, M. (2016). Concepciones y percepciones de la calidad del e-learning en América Latina. Tesis doctoral. Universitat de Barcelona. Departament de Teoria i Història de l'Educació, Barcelona, España.
- Sandoval, G., & Aguilar, S. (2018). La motivación como estrategia didáctica para el estudio de los estudiantes de la Unidad Académica de Contaduría y Administración, Extensión Norte. Nayarit, XXI, 252-260. Obtenido de Proceedings T-XI
- Suyo-Vega, J. A., da Costa Polonia, A., & Miotto, A. I. (2021). Revisión sistemática sobre aprendizaje autónomo universitario a través de la virtualidad. *3C TIC*, 10(2), 17-47.
- Tantaleán Rodríguez, J. C. (2023). Estrategias didácticas innovadoras para la educación universitaria pospandemia. Lima: Universidad César Vallejo.
- Vaillant, D., Zidán, ER, & Biagas, GB (2020). Use of digital platforms and tools for teaching Mathematics. *Ensaio: Avaliação e Políticas Públicas em Educação*, 28, 718-740.
- Vázquez, L., & Hernández, M. (2021). Alumnos en pandemia: una mirada desde el aprendizaje autónomo. *Revista digital universitaria*, 22(2), 1-10.
- Vera-Muñoz, M. X., & Santana-Sardi, G. A. (2021). Fundamentación Teórica sobre el Empleo de Información Documental Digital para el Apoyo del proceso de Enseñanza y Aprendizaje de los Docentes del Bachillerato Técnico de la Unidad Educativa Mariscal de Ayacucho. *Polo del Conocimiento*, 6(12), 740-761.
- Yan, T. W., Jacobsen, M., Garcia-Molina, H., & Dayal, U. (1996). From user access patterns to dynamic hypertext linking. *Computer Networks and ISDN Systems*, 28(7-11), 1007-1014. [https://doi.org/10.1016/0169-7552\(96\)00051-7](https://doi.org/10.1016/0169-7552(96)00051-7)