



REVISTA

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## Teaching-learning methodologies in virtual education

### *Metodologías de la enseñanza-aprendizaje en la educación virtual*

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#### Abstract

Learning is a continuous and diverse process that requires knowledge and competencies to face life and the challenges of the 21st century, which became more acute due to the health emergency caused by Covid-19. In this sense, the implementation of active methodologies in virtual learning environments (VLE) are a response to overcome the challenges presented in terms of the development of meaningful learning in non-face-to-face modalities and the innovation of pedagogical practice mediated by CT. Among the most commonly used methodologies in VLE are the case method, problem-based learning, project-based learning and the inverted classroom. In addition, there are techniques that allow "activating" learning moments, encouraging participation, collaborative work and the generation of content by students, thus favoring application over transmission of content. On the other hand, to effectively introduce ICT in the teaching-learning process through active methodologies involves transforming the educational practice from the change of roles (teacher and students) and their relationship with the digital domain, through the development of digital competencies. Finally, there are a large number of digital resources that can be used as part of active methodologies, whose objective will be to overcome the passive role of students and teachers as consumers of information, allowing them to adopt a more active role in the generation of new knowledge from the exchange with other web users.

#### Keywords

Learning, teaching, active methodologies, LKT, virtual learning environment.



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## Resumen

El aprendizaje es un proceso continuo y diverso que requiere conocimientos y competencias para afrontar la vida y hacerles frente a los retos del siglo XXI, los cuales se agudizaron debido a la emergencia sanitaria derivada por la Covid-19. En ese sentido, la implementación de metodologías activas en entornos virtuales de aprendizaje (EVA), son una respuesta para superar los retos presentados en cuanto al desarrollo de aprendizajes significativos en modalidades no presenciales y a la innovación de la práctica pedagógica mediadas por las TAC. Entre las metodologías más utilizadas en los EVA se encuentran el método de casos, el aprendizaje basado en problemas, el aprendizaje basado en proyectos y el aula invertida. Adicionalmente, existen técnicas que permiten “activar” momentos de aprendizaje, fomentando la participación, el trabajo colaborativo y la generación de contenidos de los estudiantes, privilegiando así la aplicación por sobre la transmisión de contenidos. Por otro lado, para introducir de forma efectiva las TAC en el proceso de enseñanza-aprendizaje a través de las metodologías activas supone transformar la práctica educativa desde el cambio de roles (docente y estudiantes) y su relación con el dominio digital, a través del desarrollo de competencias digitales. Finalmente, existen una gran cantidad de recursos digitales que pueden ser utilizados como parte de las metodologías activas, cuyo objetivo será superar el rol pasivo de estudiantes y docentes como consumidores de información, permitiéndoles adoptar un rol más activo en la generación de nuevos conocimientos a partir del intercambio con otros usuarios de la web.

## Palabras clave

Aprendizaje, enseñanza, entornos virtuales de aprendizaje, metodologías activas, TAC.

## 1. Introduction

The global situation derived from the health crisis caused by the Covid-19 pandemic has been a trigger to rethink, and in many cases reaffirm, the need for a change for an efficient transformation in the educational field. According to the UNESCO-IESALC report (2020), around 166 countries decided to suspend face-to-face activities in their educational institutions at the basic, middle and higher levels, with the purpose of safeguarding the student population and the entire educational community. It is estimated that 87% of the worldwide student population was affected by these measures; this means that approximately 1,520 million students were affected.

As a consequence of the above, educational systems were forced to use non-face-to-face spaces and digital learning environments as alternatives to continue offering educational services and the implementation of teaching-learning processes. In the current context derived from this pandemic, certain shortcomings of educational institutions have become evident, especially in relation to infrastructure and teacher training in terms of knowledge and application of non-face-to-face modalities (Alcántara Santuario, 2020). However, it has also opened an area of opportunity to implement improvement strategies, particularly in relation to the interest in the use of resources and strategies to facilitate teaching through digital environments. Despite the aforementioned efforts, it must be recognized that the response was not always the most adequate from both teachers and students regarding the efficient use of digital tools and the development of digital competencies, but in record time (García-Peñalvo et al., 2020).

Based on what was described above, other aspects that have concerned the educational community derived from the challenges presented in the implementation of non-face-to-face modalities are, on the one hand, those that are closely linked to the development of learning in the virtual modality, i.e., guaranteeing meaningful learning with the help of technology; and on the other hand, the possibility of innovating pedagogical practice,



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considering the adaptation of learning outcomes, objectives, processes and teaching-learning methods to the new situation, significantly modifying what has been done so far, without altering the educational project.

Given this scenario, perhaps one of the most favorable responses to overcome the challenges presented in terms of the development of learning in non-face-to-face modalities and the innovation of pedagogical practice is centered on the implementation of active learning methodologies mediated by CT, which are far from the virtualization of lectures (which in many cases has been the emergency solution to the health emergency, as shown by recent studies (Tejedor et al., 2020).

Following this order of ideas, the present work tries to give a perspective in relation to learning and active methodologies that, according to their purpose and design, can be applied in virtual learning spaces and environments and that allow, on the one hand, an adequate teaching-learning process, as well as a more efficient mediation of the teaching practice through the use of technology; and on the other hand, the generation of digital competencies of both teachers and students, which involve an adequate management of ICTs whose purpose is to make the most of the resources and tools available for interaction and creation of knowledge and assimilation of learning.

## 2. Learning in the context of active learning methodologies

To speak of learning in these times supposes recognizing it as a multidimensional process of the human condition where different ways of carrying it out converge, with singular styles, where a wide variety of contents interact and at different depths, as well as in differentiated contexts. In this sense, learning involves the actions of different actors who communicate according to the role of the moment, being able to modify or exchange among them; this supposes then that the interconnection between the actors, according to Herrera Pavo et. al (2021), "is given by activities developed jointly that allow students to assimilate, analyze and exercise what they have learned through concrete and meaningful experiences for their immediate context" (Herrera-Pavo et. al., 2021, p. 15). These authors also comment that these activities are developed through teacher mediation and the learning community in face-to-face and non-conventional modalities.

The aforementioned, according to the authors, implies then that the learning process through these activities "does not refer to the physical presence of the actors (teachers and students), but to the type of activity where these actors work collaboratively with each other, so that their actions are only understood and have meaning in the framework of achieving a common goal." (Herrera-Pavo et al., 2021, p. 15).

In order to implement the activities jointly and achieve the expected results, it is necessary to use those methodologies that refer to inquiry-based learning or commonly called active methodologies. Based on the idea of the previous paragraph, when talking about active methodologies, it makes sense to talk about active learning as a dynamic process where students can have authentic experiences and develop metacognitive processes in an autonomous and collaborative way. Applying these aspects, students, with adequate teacher mediation, will determine the pace and style of assimilation and generation of new knowledge based on their previous knowledge.

In this order of ideas and according to the report of the Association for the Study of American Higher Education (Bonwell and Eison, 1991), which points out that there are certain characteristics associated with the use of strategies that promote active learning, such as: a) students do more than just listen, they are involved in a higher order thinking process and are involved in collaborative activities; b) the transmission of information is



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less emphasized and space is given for the development of students' capabilities, as well as the exploration of students' attitudes and values is emphasized.

Therefore, and following the approach of these authors, it could be indicated that active learning is learning "that involves students in doing and reflecting on what they are doing" (Bonwell and Eison, 1991, p. 45), fundamental elements for the teaching-learning process mediated by ICTs, which will be discussed in more detail below.

As mentioned in previous paragraphs, active teaching-learning methodologies aim to maximize the probability that students learn in situations where the contexts and scenarios proposed by the teacher in an intentional manner make sense. Therefore, in order to achieve this purpose, it is necessary to take into account some principles that allow the design of activities based on these situations under active methodologies.

For this purpose, the research of Ambrose (2010) is a clear guide to the scope of these learning principles, which in turn recognize it as a developmental process that intersects with other developmental processes in the life of the student, who possess, in addition to skills, knowledge and abilities, also social and emotional experiences that influence what they value, their self-perception and that of others, and ways to get involved in the learning process. These principles are articulated with each other and in real learning situations, besides being indivisible, so an easy way to understand these principles and good teaching practices is the association proposed by Espejo and Sarmiento (2017) to guide the relevant implementation of certain active methodologies. That said, the principles and their good practices are listed below in Table 1.

<b>Principle</b>	<b>Example of good practice</b>
Prior knowledge	Conduct a diagnostic assessment using different activities or applying different procedures.
The way in which students organize knowledge	Use graphic organizers - e.g., a concept map - both at the beginning and throughout the course (e.g., to summarize each unit)
Students' motivation	Use a motivational test at the beginning, middle and end of a course. Monitor student enthusiasm in each class.
To develop mastery of a topic, students must develop cognitive, attitudinal and procedural resources.	Clearly identify the resources associated with the competencies of the graduation profile and associate them to the learning outcomes of the course.  Evaluate considering not only cognitive or procedural aspects, but also attitudinal and metacognitive aspects.  Use a variety of evaluation procedures, among others, scales of appreciation and rubrics.
Goal-oriented practice coupled with focused feedback enhances the quality of student learning.	Socialize the learning results of the course with the students and specify them in a learning guide or syllabus.  Generate a feedback system that provides information to students regarding their progress in the learning process.
Students' current level of development interacts with the social, emotional, and intellectual climate of the classroom.	Ask students how they feel about the course.  Use group work techniques that allow the development of social bonds among students



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To be autonomous learners, students must learn to monitor and adjust their approach to learning.	<p>Establish a system that allows students to check their progress in the course. to check their progress in the course.</p> <p>Socialize and discuss with students the autonomous workload associated with the course. workload associated with the course.</p> <p>Discuss with students the study techniques best suited to the course techniques best suited to the subject matter of the course. Exchange experiences among students.</p>
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Table 1. Application of Susan Ambrose's learning principles. Source: (Espejo and Sarmiento, 2017, p. 14)

## 2.1 Active Methodologies

As described in the previous section, active methodologies are necessary to be integrated into the teaching-learning process, which can transcend from a reproduction of knowledge to a participatory dynamic of the actors involved in the entire educational process. Taking into account authentic learning activities, monitoring and follow-up strategies, as well as clear and meaningful evidence regarding the quality of what is expected to be taught, as well as effective interactions to achieve the objectives and demonstrate learning outcomes.

The above as part of a quality education simulating what society demands today, i.e., individuals with skills such as: autonomy, development of work in small multidisciplinary teams, participatory attitude, communication and cooperation skills, problem solving, creativity, etc., aspects that have to be contemplated in the education of the 21st century.

Now, with the incorporation and continuous research of active methodologies, we would expect an adequate change in teaching practices, not only in terms of a different vision of the purpose of education, but also to offer methodological tools with which both teachers and other education professionals can implement much more creative and reflective processes, with a solid base of technical and technological knowledge, in order to be able to transfer all these components to students so that they can continue learning throughout their lives.

Under this scenario, it is important to indicate that active methodologies respond to the socio-constructivist paradigm, which places the learning process in the search for the emancipation of individuals, combining high doses of autonomy with balanced processes of accountability that allow students to be responsible for their learning. Taking Barkley and Cross (2007) and Espejo and Sarmiento (2017) as a reference, active methodologies can be classified into two large groups, the first requires the development of planning, prioritization, organization, communication and knowledge mobilization skills, as well as the metacognitive component of the individual learning process of students, the latter given the need to reflect on each stage of the work they perform, evaluating their personal results and those of their group. Therefore, these require continuous work over time. Among this classification are: a) the case method, b) problem-based learning, c) project-based learning and d) inverted classroom.

For a better understanding and to outline what each methodology consists of, Table 2 below presents an excerpt from the work of Espejo and Sarmiento (2017) where a brief synthesis of the most relevant aspects of each one is presented.



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Methodology	What does it consist of?	When to use it?	Time	Evaluation
Case method	Students should be able to identify the key aspects of the information presented as a case-problem, as well as determine a set of possible solutions, propose strategies for their solution, and make decisions regarding the associated problems.	It can be implemented with students of any year by adjusting the proposed cases and providing adequate feedback for individual and group work.	It is recommended to occupy it within a whole thematic unit.	This is done through the results of the proposed solutions to the case, both individually and as a group. An instrument based on criteria (rubric or checklist) is required.
Problem-based learning	It consists of directing the student towards learning through a problem; that is, before the students acquire a certain knowledge, they are offered a problem so that, through it, they discover what they need to know to solve it.	For its implementation, it is important to consider the level and characteristics of the students in order to choose problems that are understandable to them. For this reason this methodology tends to work best with students who already have a certain base in the discipline of study.	It is suggested that the teacher allocate a certain number of hours per week to the students' work, so that he/she is present and can accompany the process.	This is done through the delivery of preliminary reports at the end of each of the following stages: a) analysis of the problem and determination of the knowledge required to solve it, b) result of the research on the necessary knowledge, and c) final integration and solution proposal. At the end of the process, the teacher can encourage hetero, co and self-evaluation through rubrics



				prepared for this purpose.
Project-based learning	<p>It is carried out by working in groups of students, who choose a topic according to their interests and elaborate a related project. The working group has the necessary autonomy to establish its objectives, planning and decision making, having the necessary time to reflect on their actions and guide their work.</p>	<p>It is generally used with students in higher years, but strictly speaking it can be adapted for students of any year by adjusting the proposed topics and the degree of autonomy required for the proper development of the project.</p>	<p>It is recommended to occupy hours over an academic period. It is possible to use shorter times, but it will require adjusting the planning so that it is feasible for the students.</p>	<p>This is done through the preliminary deliverables and the final deliverable that have been agreed upon. It is important to include also co- and self-evaluation in relation to the work in general and to the group dynamics in particular.</p>
Inverted classroom	<p>This considers the definition of a set of competences to be developed by the students, transferring, on the one hand, the responsibility for the apprehension of contents to the learner; and on the other hand, to the teacher, the organization and prioritization of contents in two types: those that will be acquired by direct teaching and those that are better placed in experimentation.</p>	<p>It can be applied in all curricular areas, as well as within the different levels of education: basic, higher basic, high school, higher education and even adult education.</p>	<p>It is recommended to use this methodology throughout the cycle, period or module a thematic unit.</p>	<p>This is done through the results of individual and group evaluations, as well as evaluations of the application activity.</p>

Methodologies to be used throughout a didactic unit. Source: (Espejo and Sarmiento, 2017, pp. 47-67)

On the other hand, the second classification, although they are not strictly speaking methodologies but specific techniques, allow "activating" a learning moment, encouraging



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participation, collaborative work and the application of student content. These, unlike the previous ones, only require a specific time for their implementation. For the purposes of this paper, it is important to mention that this group of techniques allows connection with the learning mediated by CT, which we will address in the following section.

In addition, it should be noted that their purpose is to make the most of direct contact time with students, thus favoring application activities over the transmission of content. These include techniques: a) to encourage class discussion, b) for reciprocal teaching, c) that use graphic organizers, and d) focused on writing.

### 3. TAC (CT) -mediated learning

The term ICT refers to the use of Information and Communication Technologies (ICT) from a more formative and pedagogical dimension. Thus, according to Lozano (2011) "ICTs go beyond merely learning to use ICTs and are committed to exploring these technological tools at the service of learning and knowledge acquisition" (Lozano, 2011, para. 7).

Therefore, to effectively introduce ICT in the teaching-learning process involves transforming educational practice by changing roles (teacher and students) and the relationship of these actors with the use and digital domain, through the development of digital competencies.

The above has as a consequence to visualize the teaching practice as an opportunity for change and improvement, since, on the one hand, the strategies implemented in conventional situations are no longer satisfactory for the new scenarios where the use of digital environments is privileged. This leads to the redefinition of the teaching role in relation to learning activities, tasks, knowledge, attitudes and the formation of competencies, which today are mediated by technology. Therefore, the teacher "must cease to be an instructor who dominates knowledge, to become an advisor, guide, facilitator and mediator of the teaching-learning process" (Segura et al., 2007, p. 6).

On the other hand, the role of students is also changed by the use of digital tools, since it implies a greater motivation in learning (Area Moreira, 2010; Pedró, 2011), as well as a different attitude towards the use of such technology, which enriches learning and contributes to gain self-confidence (Pedró, 2011).

However, as commented by Salinas (2004), these educational resources need to be mastered for the construction of knowledge; in that sense, students require new skills to face this reality. Therefore, the role of students is no longer limited to a simple reproducer of content, but "they must become intelligent and critical users of information, for which they need to learn to search for, obtain, process and communicate information and convert it into knowledge" (Segura et al., 2007, p. 6). In line with what has been described in the previous paragraphs, it is necessary to analyze the educational and technological context in which teaching practice is carried out. This means that the characteristics of the students, their capabilities, skills and competencies to be developed, the available resources, among others, must be considered. The above with the purpose of deciding between those methodologies, active techniques and TAC resources that allow students to acquire knowledge from the different learning styles they have developed. That is, allowing them to be the protagonists of their own learning mediated by technology and digital environments.

Now, the incorporation of ICT in different educational scenarios and contexts has, in addition to the purposes already mentioned in previous lines, to overcome the passive role of both students and teachers as consumers of information, allowing them to adopt a more active role and allow them to position themselves as creators of content and generators of new knowledge from the generation and exchange with other web users.



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### 3.1 Types of Learning and Knowledge Technologies according to their purpose

According to Velasco-Rodríguez (2017) there are a large number of TAC resources with which students can create different contents and generate meaningful learning. These resources allow them to be the protagonists and responsible for their teaching-learning process, also from the mediation of the teacher, which consists of the presentation, collaboration, supervision and accompaniment in the use of the TACs, a greater potential can be exploited.

In this sense, this author presents a set of TAC that, according to their purpose can be used as part of the learning strategies in digital learning environments, commonly also called EVA. The purpose, resources and a brief description of the TAC are presented in Table 3 below.

Purpose	TAC Resource	Description
Video editing	Quik, Splice, Stupeflix y 123 apps	create and edit videos in a simple way
Interactive videos	Vizia y EDpuzzle	turn any video into an interactive lesson
Audio	SoundCloud, Audacity, Peggo y Vocaroo	create audio files and share them
Image infographics	- Genially, Typorama, Fotojet y Piktochart	create static or dynamic graphical content for various purposes
Classroom management	Moodle, Blackboard, Canvas, Edmodo, Classroom, Doceo y Additio	managing a teacher's daily life: lists, evaluation, rubrics, resource bank, group organization, etc.
Gamification	Cerebriti Edu, Quizizz, Trivinet, Jeopardy Rocks, Playbuzz, Triventy y Arcademic	Generate interactive activities using playful resources for curricular content.
Evaluation	Apester, Kahoot!, Google Forms y Quiz Revolution	check the learning acquired through resources and evaluation tools.
Communication	Homeroom, Otter y Blogger	establish fluid communication between all members of the educational community
Presentations	Emaze, Genially, Powtoon, Prezi, Sparkol y Haiku Deck,	to make presentations in a simple way and with attractive and professional results
Activity generators	Educaplay y Kubbu	create your own interactive activities in a personalized way
Collaborative work	Padlet, Team Maker, Teamweek, Meetingwords y Quip	create resources and didactic tools for shared work
Search engines and safe navigation	YouTube Kids y Kiddie	securely search for videos and information
Copyright	Pixabay, Iconicons, Skitterphoto, Sample Focus y pngimg	search for royalty-free images, audio files, icons, etc. to use in our projects
Mind maps	Coggle y WiseMapping	create digital mind maps
Languages	Lyrics training, Locallingual y Forvo	learn languages through real audio and interactive situations



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Productions	Pixton, Tiki toki y Storybird	create comics, timelines or stories
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Table 3. TACs according to their purpose. Source: (Velasco-Rodríguez, 2017, pp. 774-775)

Taking into account the above, it can be evidenced that the use of ICT allows, on the one hand, a paradigm shift in the school and towards quality teaching, where motivation and improvement of the expected results are achieved (Pedró, 2011). And on the other hand, the possibility that technologies transcend from a merely instrumental element to enhance a current and efficient educational model, which responds to the educational needs of citizens" (Castañeda-Quintero and Adell-Segura, 2013, p. 45).

#### 4. Conclusions

As conclusions, it could be stated that learning, being a continuous and diverse process, allows human beings to acquire the knowledge and competencies necessary to face life and be able to face the challenges of the 21st century. In accordance with this idea, it should be recognized that learning today is not only built in the classroom but also outside the institutions of any educational level; however, the role that educational institutions have acquired in recent years is to reinterpret knowledge and learning in an active and interconnected way based on the pedagogical dialogue between the student, knowledge, technology and the teacher (De Zubiría Samper, 2006, p. 2).

Under this scenario, it would be expected that teaching-learning transcends from a reproduction of knowledge to a participatory dynamic of the actors involved in the entire educational process; where both active methodologies are taken into account where learning activities can be established, strategies for monitoring and follow-up, as well as the development of digital competencies to make the most of the application of ICT to motivate students to enhance their creativity and increase their multitasking skills, as well as take advantage of synergies between teachers and students through virtual learning environments.



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