Impact on High School Students by the Application of Innovative Methods in Virtual Education

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Abstract

This work aims to encourage and provide a global vision of the teacher's task during this difficult stage, where this pandemic has become an opportunity to apply the constructivist paradigm in the educational system with greater coherence, using active methodologies and technological tools that enrich the educational work and provide the student with a range of benefits, such as intrinsic motivation, leadership training and social contact to provide solutions to complex problems in real life with a professional projection. The experiences and points of view on the application of innovative methods and the benefits of the same are detailed, as well as the execution of project-based and problem-based learning, from the bibliographic review carried out and the application of the inductive method, it can be concluded that there is great interest on the part of teachers to implement information and communication technologies pedagogically in their teaching practice and generate high levels of competitiveness and satisfaction in students.

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1 Introduction

The current situation in which not only Ecuador lives but the entire world has forced educational institutions of all levels to analyze and choose the best strategy to offer their students the opportunity to continue their studies through virtual platforms, which It involves teachers incorporating into their classes not only the application of technology but also that they are planned through innovative methods. For many years, institutions have been preparing to implement technological advances in their classrooms, but society had never imagined that schools would have so much technology in such a short time, marking a new beginning, and we not only observe it in the field of education but in the economy, politics, culture, in short, the way of understanding and valuing the world has changed (Goig, 2012).

Educational institutions must train their teachers to face this new way of doing education, and the challenges that the implementation of new teaching-learning models brings with it, this reality is contradictory, a range of teachers who must adapt to the different scenarios that current technology offers in front of a generation of young people that have been born in the digital age, a quite interesting challenge, where the application of constructivist methods through virtual education is a wise decision. Goig (2012), affirms that Information and Communication Technologies (ICT) have become a great help in the field of education, turning the teaching-learning process from traditional to interactive, allowing the redesign of processes and providing the teacher with professional development and a greater relationship between all members of the educational community (teachers, students, families).

It is essential that teachers include active methodologies in their virtual classes, enrich their plans with the application of interactive tools, the teacher must take advantage of the use of technologies within their classes since through it they can contribute to a great extent constructivist learning, currently a positive influence on the school performance of many boys, girls, and adolescents (Moya, 2017; Buttazzoni et al., 2018). An invisible virus has generated a global pandemic and has managed to transform the world, education is no exception, therefore, the question is: will the educational system be able to adapt to the speed of technological evolution and apply this technology through constructivist and innovative methods?

Since January, the WHO Emergency Committee revealed the emergence of Covid-19 as a "public health emergency of international interest", as the point of origin of the outbreak China imposed a series of restrictions on its population, many countries began a series of controls and social distancing measures to prevent the disease from continuing to spread, despite the little scientific information available on it, but where the political and economic interests of each country are manifested to a greater extent (García, 2020). Since then, efforts to contain the spread of the virus have increased, each of the countries has tried to contain the outbreak by taking strict preventive measures. Ecuador entered a state of exception in mid-March, evidently very late, the disease was already gaining strength and since then deaths began to increase without hope of obtaining positive results.

García (2020), affirms that the virus outbreak is expanding and is reflected in the daily increase in cases, the concern is clear, without being able, for the moment, to predict the extension and the impact that it will generate on the world population. To protect the lives of citizens, airports, provincial borders, shops, among others, were closed. As a result of the declaration of the state of exception, the health emergency, and the confinement measures, classes were suspended indefinitely in person in the private educational units, prosecutors, fiscal commissions, universities, among others and the students, teachers, and workers, in general, had then to stay home. The odyssey began with no idea how long the confinement was going to last, how many people would lose their jobs, their families, their lives, without taking into account that they had already lost their freedom. The impact that occurred on a global scale is incalculable, some companies and educational institutions were forced to continue their work through teleworking.

The situation generated by the pandemic has forced everyone to transform the way they approach, virtuality unites them from a distance and broadens the way of seeing the world without borders or beliefs, each one from their homes and virtually far from it, generating new social paradigms (Soler, 2016). The global calamity is a challenge for educational institutions of all levels, but especially for their teachers who must necessarily transform their routines, often traditionalists, and try to innovate in this new way of doing education, fighting against the current with the thinking of many parents who still do not understand the arduous and laudable work of the teacher in these moments of the technological revolution (Rovai, 2003; Rovai & Downey, 2010).

Soler (2016), states that a large percentage of educational institutions the sudden change has not given them time to efficiently plan this transition, although it is true for several years there has been talking of technological innovation in the classroom and this has led to that the administrators of the institutions worry about acquiring the necessary equipment to be at the forefront of the digital age, unfortunately, both pedagogical and didactic preparation of the use of this equipment and of the programs and applications that allow the use of the machines, hand in hand

with an awareness of the proper use of computer media. Current innovation requires that teachers not only master the use of computer equipment, but also have a vast knowledge of programs, applications, and computer platforms that allow synchronous and asynchronous interaction with students. However, unfortunately, they were never prepared for that, and added to this they must apply the tools pedagogically with the students. This modality is not only being adopted by Ecuadorian teachers; but it is being a common factor in all countries whose citizens are in confinement, of course, that not all are at the same level of technological knowledge, but it is essential that everyone take up the challenge and despite the difficulties it entails, such as the bird phoenix rising from the ashes.

New regimes have been established worldwide to maintain the academic preparation of children, adolescents, and adults. Distance and online education, solution and reasons why teachers of all nationalities are obliged to modify the modality of education they teach from face-to-face to virtuality, those classes that were often tinged with traditionalists should be converted into live synchronous and asynchronous sessions, it must also be considered that the classrooms of educational institutions have been moved to the home, thus creating several challenges: Maintain the attention and concentration of the student when they can be watching the replay of your favorite sports game on cable television; while having breakfast, distractions, so it is necessary to have tools and skills to counteract this situation in the middle of teaching from home (García, 2020). It should be noted that society has a great challenge, that each individual must collaborate with the restructuring of education, create study habits, but above all call on the conscience of students and parents to take this new form of education seriously because a people without education is a people without democracy or freedom.

Soler (2016), states that the digital age allowed humanity to digitize words, images, colors, videos, with which communications have accelerated and with this information reaches the whole world instantly. The increasing digitization has broken the barriers of distance allowing two people, regardless of where they are, to establish communication, thus benefiting business, education, and interpersonal relationships. The digital age has taken hold worldwide and now is the time to put virtual access into practice to break the barriers of distance, information travels in seconds from one end of the world to the other, and there are such several information that would be impossible for a user to even observe everything that is stored in the cloud. Commerce is carried out through the Web, some companies do not have physical facilities but virtual ones, it is time to change paradigms, to move from one place to another without having to move from the computer front, an ambitious challenge for many educational institutions, but if they are not transformed, they perish.

Technological advances have been taking place since several years ago, many educational institutions "try" to stay at the forefront of these advances, although they had never been forced to "prove" if their theory served in practice, today the situation is very different and many of those educational institutions have put their feet on the ground and have had to recognize that they were not yet ready for change. The technological changes that they were adopting were simply an acquisition of hardware and software without knowing how to apply them in a hybrid way with pedagogy and didactics. There are several synchronous and asynchronous interaction tools that allow effective communication between students and teachers (Alcívar & Calle, 2020), among these you can find: Zoom, Microsoft Team, Google Meet, WhatsApp, Messenger, Facebook (Zambrano *et al.,* 2020), Hangouts among others.

The teacher must know to choose the one that offers the best didactic communication advantages. The Fiscal Educational Units use the Microsoft Team platform provided by the Ministry of Education, which is accessed through an institutional email and a password, allows more than 100 users to be connected synchronously, includes the possibility of incorporating different applications to do more friendly and useful platform. Several educational institutions have chosen to bet on asynchronous education, aware that the fact of observing the students allows them to be closer, and sharpen the senses to detect their emotions in their faces. Rubio (2011), asserts that synchronous systems within the teaching-learning process facilitate interaction and discussion in real-time, within virtual education, a clear advantage in the teacher-student relationship.

It is possible to differentiate the benefits of synchronous versus asynchronous communication, without diminishing the disadvantages that both entails. Synchronous communication allows better control during interaction with students, observing and listening to them in real-time, observing their faces is very important, discovering if they are sad, happy, intrigued, excited, angry are key points to use empathy and initiate A dialogic accompaniment also facilitates answering the questions that may arise at the time, allowing the adolescent to create study habits, collaborative work, which facilitate greater self-control. The important thing is that teachers grow in knowledge and abandon those ideas of traditionalist classes, purely conceptual and incorporate current technology into innovative, constructivist practices without neglecting humanism. It would be a mistake to place technology as the most important part of education, the student is the center of educational work, making the child and youth a human being who uses their knowledge and skills at the service of society, forming competent beings, with values, that they

develop as true leaders, that they are distinguished by their high degree of emotional intelligence and they manage to break down the walls of corruption, which today are so deeply rooted in this society.

As teachers, it is necessary to shed those traditionalist pedagogical practices, value the prior knowledge that every student possesses. By building meaningful learning based on the student's own experiences, their reality and complements it with what the teacher facilitates, step by step, they are building their knowledge, they are working with the constructivist method (Maldonado-Torres, Araujo, & Rondon). The constructivist pedagogical current offers the teacher tools that allow the student to build their knowledge, when applying the constructivist method the teacher is not a mere transmitter of concepts and definitions, this method implies a radical change to traditionalism, it is necessary that planning and organization of support methods, strategies and activities allow students to understand why they should build their knowledge, what it will serve or apply in their life, in this way the student will be motivated to learn by building their knowledge under their own generated cognitive structure for their motivation and commitment to learning.

The constructivist model asserts that in cognitive, social, and affective aspects the student generates his knowledge thanks to a progressive, internal, own construction, where he uses the knowledge he already possesses and reaches thanks to the relationship with his context and the new information, which allows acquiring a new competence. Piaget, Vigotsky, and Ausubel consider that the construction of knowledge is caused by interacting with the object of knowledge and with others, and when it is significant for the student. Today, several platforms on the market offer synchronous connectivity, some cheaper than others, (Astudillo *et al.,* 2018), and interaction with students can be done synchronously and asynchronously. By using synchronous communication, the interaction can be carried out from the front, contributing ideas, generating debates, in this way the active participation of all students in the class is promoted.

There are countless technological tools that when applied pedagogically give excellent results, likewise there are several methods, strategies, and techniques focused on learning. One of them is problem-based learning (PBL), where the focus is on the student, the teacher is a facilitator and its purpose is for students to be able to analyze different problem situations applied to life and guide them to some professional activity, where the student discovers the application and usefulness of solving these problems and transforming them into tools to face life in the not too distant future, where the student is motivated to be the protagonist of their learning. Another very important strategy is Project-Based Learning (López *et al.,* 2020), this strategy implies that teachers must develop guides where they propose challenges, questions, projects in a creative and interdisciplinary way, where students must analyze and go building through their experiences, experiences, knowledge, research, reflections and cooperatively. Together with this, we can integrate methods and techniques such as the inverted class (Mero *et al.,* 2019), cooperative learning, maker spaces (Mendoza *et al.,* 2020), learning communities, among others.

A current and interesting strategy is the so-called analysis or case study, where students become protagonists of their learning. According to Reibelo (1998), Bruner supports discovery learning as it motivates students to autonomously pose questions and answers, not to be content with being mere spectators or waiting for the teacher to dictate the concepts or content, arouses their curiosity and motivates them to be an active part of the teaching-learning process. It should be noted that it is very important for the teacher to efficiently plan each of the stages of the process, where it requires constant participation from all students, not just the group leader. Success depends largely on the competence of the teacher since they must cover a complex real-life situation, understand the exposed situation, and understand the context in which it unfolds. All the necessary data for decision-making must be had, with the objective that students can approach experiencing a situation as real as possible, where they develop their talents, their communication, leadership, effective and effective information processing, and contribute applicable solutions. Rodríguez (2014), affirms that cooperative work allows students to work together, divide the work, solve sub-tasks, and contribute significantly to each one with their knowledge, to obtain the desired result.

Generally, students have been accustomed to working traditionally, with teachers who organize students in groups, where one or two of the participants carried out the work, presented it and the grade was the same for all, an unfair way of earning a qualification. This unfair practice cannot continue, teachers must update themselves and plan their classes by applying constructivist methods, which means that the teacher must change their mentality and those paradigms. For this, working together from a distance is imperative, not only due to the situation of the pandemic but also because technology has evolved in an accelerated way and with it also how work is organized in companies worldwide, all this the situation is not momentary, it is here to stay and transform everyone's life.

In the hands of teachers is a great responsibility, to achieve the transformation of education in such a way that it improves educational quality. Modifying the role of the teacher implies understanding that they should take advantage of the generalization of the use of new technological tools, such as Jamboard, Puzzle, Gnially, Mindomo,

Edpuzzle, Freemind, Padlet, Quizizz, among others, and integrate them into constructivist methods to apply them to through innovative pedagogy. The use of technology must not only be carried out with a mere instrumental function within teaching practice, it is necessary to bear in mind the multiple intelligences that must be developed in students. Each child has a different learning pace, which implies enriching the educational settings with a wide range of strategies to motivate each of the students and generate the desire to learn in them.

Another reality is that, in the world of networks, young people make up the largest number of users who connect daily, they are from generation Z. They were born in the digital age and are not afraid of virtual reality, more, without however, teachers belong to that generation known as millennials and generation X, which constitutes a challenge, a non-digital generation training digital individuals swimming in a sea of technology. This generation gap is a challenge for teachers. A challenge that should be seen as an advantage since teachers have the experience, knowledge, creativity, originality, initiative, but above all the particularity of transforming the lives of their students with their patience, selfless dedication, tenacity, and empathy. Values that make the teacher unique, unmatched, and of great value for the present and future of society**.**

2   Materials and Methods

The methodology used in this study is the deductive one, which was based on bibliographic reviews, documentary information, which consists of four phases: definition of the problem; search; organization, and analysis of information. Research papers were reviewed where topics on constructivism, problem-based learning, project-based learning, case studies, collaborative and cooperative learning are addressed through current technological tools, synchronous, and asynchronous virtual communication. The reviewed information has been downloaded from the bibliographic portal called Dialnet, to analyze several articles published in the last 10 years, giving priority to specialized ones, therefore, the applied approach is qualitative.

3   Results and Discussions

Constructivist perspective

The prior knowledge that all students have is the starting point to generate meaningful learning that requires the new information provided by the teacher, thus generating cognitive conflicts, an essential scenario for there is a conceptual change, this process is the one that is worked from a constructivist perspective (Durán, 2009; Kala *et al.,* 2010; Girvan & Savage, 2010). Contrary to traditionalist theories where it was stated that the student is a mere receiver of knowledge because their brains were empty, today constructivism affirms that the teacher must create the optimal conditions, necessary to generate knowledge progressively. Through questions and a dynamic class, the teacher becomes a facilitator or mediator of knowledge, providing the necessary tools to generate meaningful learning.

The use of computer networks

Today educational practices have been transformed thanks to the use of computer networks that allow interactive communication with all members of the educational community, which become learning communities, leaving aside the traditionalist practice (Astudillo *et al.,* 2018). Executed traditional teaching should be put aside and according to the data collected, we can analyze the teachers' responses regarding the application of constructivist didactic strategies. In other words, applying the collaborative approach and the use of ICT are very positive because some good practices are recognized, such as the orientation to promote meaningful, active, and autonomous learning. However, it is appreciated that a large part of the teachers acknowledge that they do not apply ICT in the classroom, so they do not use collaborative activities.

Collaborative and cooperative

Learning a learning system based on teamwork where each one is responsible for a part of the designated work and performs it autonomously and interacting with the other members of the group generates collaborative and

cooperative learning, applying digital tools that complement the work (Aristizábal & Dieste, 2012; Wisenthige & Guoping, 2016). Thanks to the technological tools of synchronous and asynchronous communication, collaborative work can become a reality, given the competitiveness and the current way of working of companies, young people must learn to work collaboratively, where they contribute to proposing solutions to problems as a team, to prepare communication strategies, multidisciplinary projects, etc. It is essential that they can discover the great advantage of collaborative teamwork, but above all, they can put aside selfishness, self-centeredness, and learn to share and complement their ideas and work.
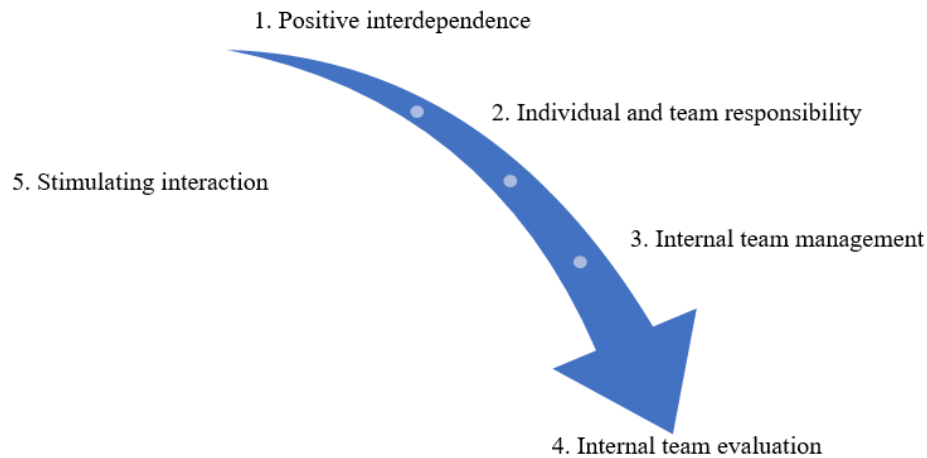

Figure 1. Cooperative Learning through Teamwork
Source: (Galindo *et al.,* 2015)

Information and Communication Technologies (ICT)

Information and Communication Technologies (ICT) play a fundamental role within education, reinforcing and transforming educational practices, empowering each of the digital tools, appropriating learning networks to allow that students generate meaningful knowledge, through discussions, gatherings, debates, research, where they are the ones who produce new knowledge (Astudillo *et al.,* 2018). The teacher must guide the construction of knowledge in the students, generating active participation always within the limits of respect, empathy, and tolerance, which benefits interpersonal relationships between the groups of students, motivating them to be an active part of the class, not mere spectators. The correct use of ICT motivates students to enter the world of technology, innovation, and knowledge, being a tool that must be used pedagogically in the classroom.

Independent learning

Students must be aware that their training is strengthened based on autonomous learning, where they acquire the necessary skills to learn on their own, facing the different situations that it entails, essential to face the world of work that they will find in a near future. Teachers must motivate and generate spaces for self-training including current technological changes (Martin *et al.,* 2017). Currently, students must empower themselves in their training. Technological advances have made information available to everyone, an important advantage for them, each one must become the protagonist of their education. For their part, teachers must apply innovative methods in the classroom, promote participatory learning, and encourage students to be able to self-regulate their learning, leisure times, and spaces.
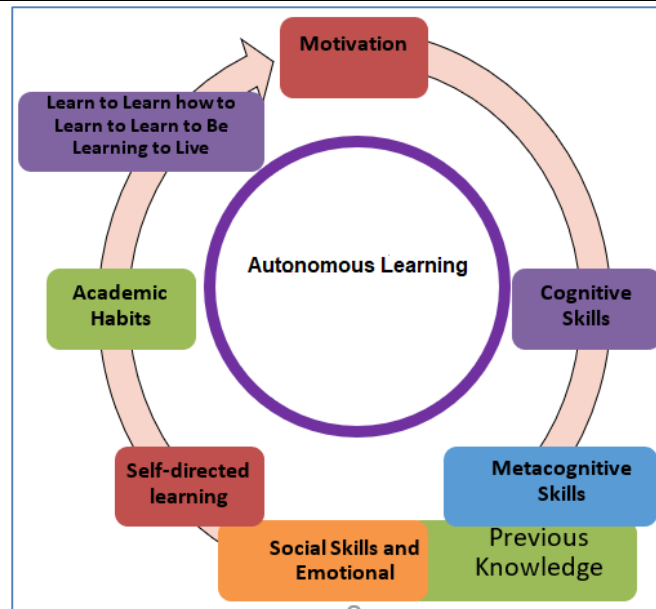
Figure 2. Elements of autonomous learning
Source: (Méndez & Sanjuan, 2011)

The crisis generated by the pandemic has traveled all over the world, without geographical, racial, economic, religious, or political limits having been able to stop it, causing worldwide economic, sports, religious, and educational activities to almost stop in a 100%. However, it has allowed humanity to create new alternative solutions so that confinement does not end the lives of those who have not yet been infected, and within these new alternatives, technology has become the number one ally, allowing synchronous and asynchronous communication offers a range of possibilities to continue with work and study collaboratively and at a distance.

4 Conclusion

In both fiscal and private educational institutions, it has been chosen to choose the platform that provides effective synchronous and asynchronous tools for teaching-learning. This favors and increases collaboration between members of the educational community, beyond the physical limits of the institution. Several tangible benefits are visible such as innovation, creativity, originality, digitization, among others, but it will be effective when teachers free themselves from traditionalist practices and insert constructivist methods in their virtual encounters. It was concluded that the application of the constructivist paradigm, of active and collaborative methodological strategies with a pedagogical and didactic approach, generate a predisposition in the student to enter the wonderful world of knowledge, due to the pre-existing motivation of being individuals who were born in the era of technology and digitization, aspects that teachers must take advantage of to be more successful in their educational practices.

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