E

C

O

R

F

A

N

ECORFAN®

ECORFAN-Journal Colombia

Definition of Journal

Scientific Objectives

Support the international scientific community in its written production Science, Technology and Innovation in the Field of Humanities and Behavioral Sciences, in Subdisciplines of philosophy, history and human sciences.

ECORFAN-Mexico SC is a Scientific and Technological Company in contribution to the Human Resource training focused on the continuity in the critical analysis of International Research and is attached to CONAHCYT-RENIECYT number 1702902, its commitment is to disseminate research and contributions of the International Scientific Community, academic institutions, agencies and entities of the public and private sectors and contribute to the linking of researchers who carry out scientific activities, technological developments and training of specialized human resources with governments, companies and social organizations.

Encourage the interlocution of the International Scientific Community with other Study Centers in Mexico and abroad and promote a wide incorporation of academics, specialists and researchers to the publication in Science Structures of Autonomous Universities - State Public Universities - Federal IES - Polytechnic Universities - Technological Universities - Federal Technological Institutes - Normal Schools - Decentralized Technological Institutes - Intercultural Universities - S & T Councils - CONAHCYT Research Centers.

Scope, Coverage and Audience

ECORFAN-Journal Colombia is a Journal edited by ECORFAN-Mexico S.C in its Holding with repository in Colombia, is a scientific publication arbitrated and indexed with semester periods. It supports a wide range of contents that are evaluated by academic peers by the Double-Blind method, around subjects related to the theory and practice of Philosophy, history and human sciences with diverse approaches and perspectives , That contribute to the diffusion of the development of Science Technology and Innovation that allow the arguments related to the decision making and influence in the formulation of international policies in the Field of Humanities and Behavioral Sciences. The editorial horizon of ECORFAN-Mexico® extends beyond the academy and integrates other segments of research and analysis outside the scope, as long as they meet the requirements of rigorous argumentative and scientific, as well as addressing issues of general and current interest of the International Scientific Society.

Arbitration Committee

VILLALOBOS - ALONZO, María de los Ángeles. PhD
Universidad Popular Autónoma del Estado de Puebla

BAZÁN, Rodrigo. PhD
Universidad Autónoma del Estado de Morelos

CHAVEZ - GONZALEZ, Guadalupe. PhD
Universidad Autónoma de Nuevo León

LOZANO-RAZO, Georgina. PhD
Universidad Autónoma de Zacatecas

SALAS-HERNÁNDEZ, Juana Elizabeth. PhD
Universidad Autónoma de Zacatecas

GARCÍA-SÁNCHEZ, María Dolores. PhD
Universidad Autónoma de Zacatecas

MIRAMONTES-ZAPATA, Silvia del Carmen. PhD
Universidad Autónoma de Zacatecas

PÉREZ-SÁNCHEZ, Lucía. PhD
Universidad Autónoma de Nayarit

CASTILLO, Georgina. PhD
Universidad Autónoma de Nayarit

PADILLA - CASTRO, Laura. PhD
Universidad Autónoma del Estado de Morelos

Assignment of Rights

The sending of an Article to ECORFAN-Journal Colombia emanates the commitment of the author not to submit it simultaneously to the consideration of other series publications for it must complement the Originality Format for its Article.

The authors sign the Authorization Format for their Article to be disseminated by means that ECORFAN-Mexico, S.C. In its Holding Colombia considers pertinent for disclosure and diffusion of its Article its Rights of Work.

Declaration of Authorship

Indicate the Name of Author and Coauthors at most in the participation of the Article and indicate in extensive the Institutional Affiliation indicating the Department.

Identify the Name of Author and Coauthors at most with the CVU Scholarship Number-PNPC or SNI-CONAHCYT- Indicating the Researcher Level and their Google Scholar Profile to verify their Citation Level and H index.

Identify the Name of Author and Coauthors at most in the Science and Technology Profiles widely accepted by the International Scientific Community ORC ID - Researcher ID Thomson - arXiv Author ID - PubMed Author ID - Open ID respectively.

Indicate the contact for correspondence to the Author (Mail and Telephone) and indicate the Researcher who contributes as the first Author of the Article.

Plagiarism Detection

All Articles will be tested by plagiarism software PLAGSCAN if a plagiarism level is detected Positive will not be sent to arbitration and will be rescinded of the reception of the Article notifying the Authors responsible, claiming that academic plagiarism is criminalized in the Penal Code.

Arbitration Process

All Articles will be evaluated by academic peers by the Double Blind method, the Arbitration Approval is a requirement for the Editorial Board to make a final decision that will be final in all cases. MARVID® is a derivative brand of ECORFAN® specialized in providing the expert evaluators all of them with Doctorate degree and distinction of International Researchers in the respective Councils of Science and Technology the counterpart of CONAHCYT for the chapters of America-Europe-Asia- Africa and Oceania. The identification of the authorship should only appear on a first removable page, in order to ensure that the Arbitration process is anonymous and covers the following stages: Identification of the Journal with its author occupation rate - Identification of Authors and Coauthors - Detection of plagiarism PLAGSCAN - Review of Formats of Authorization and Originality-Allocation to the Editorial Board-Allocation of the pair of Expert Arbitrators-Notification of Arbitration -Declaration of observations to the Author-Verification of Article Modified for Editing-Publication.

Instructions for Scientific, Technological and Innovation Publication

Knowledge Area

The works must be unpublished and refer to topics of Philosophy, history and human sciences and other topics related to Humanities and Behavioral Sciences.

Presentation of the Content

In the first article we present, *Education at the middle and higher level: Information Technologies, pre-eminence in teaching and learning processes in period of pandemic* by MANUEL-MORALES, Amador & LINO-GAMIÑO, Juan Alfredo, as the next article we present, *Self-perception of digital competences in Higher Education Teachers* by PREZA-MEDINA, Sergio Roberto, with adscription in the Universidad Tecnológica de Cancún, as the next article we present, *Collaborative software project development with source code repository* by DURAN-BELMAN, Israel, MAGDALENO-ZAVALA, Juan Antonio and GALLARDO-ALVAREZ, Dennise Ivonne, with adscription in the Instituto Tecnológico Superior de Irapuato, as the last article we present, *Collaborative activities mediated by technology for integration into University life in the introductory Engineering course* by MACÍAS-BRAMBILA, Hassem Rubén, ZAMORA-RAMOS, Victor Manuel, OSORIO-ÁNGEL, Sonia and BECERRA-VELÁZQUEZ, Violeta, with adscription in the Universidad de Guadalajara.

Content

Article	Page

Education at the middle and higher level: Information Technologies, pre-eminence in teaching and learning processes in period of pandemic

Educación en el nivel medio y superior: Tecnologias de Información, preeminencia en los procesos enseñanza y aprendizaje en periodo de pandemia

MANUEL-MORALES, Amador†* & LINO-GAMIÑO, Juan Alfredo

ID 1st Author: *Amador, Manuel-Morales* / **ORC ID**: 0009-0003-0835-4555

ID 1st Co-author: *Juan Alfredo, Lino-Gamiño* / **ORC ID**: 0000-0002-7022-5438, **CVU CONHACYT ID**: 268945

Abstract

At present, the influence generated by globalization, the knowledge society and information technologies (IT) propose challenges to educational institutions, the above due to changes related to educational models, job skills, interaction styles and communication between the different social sectors, and even in unexpected phenomena, such as the pandemic generated by COVID-19, a situation that caused chaos in the teaching and learning processes, where teachers and students had overnight the need to resort to technological tools and distance learning platforms in order to conclude a complicated 2020-2021 school year. This document analyzes the increasing influence of IT, the way in which these have increasingly modified educational spaces, for such analysis relevant IT issues that impact the teaching and learning processes are reviewed, at the same time it is also examined how the IT facilitate new pedagogical schemes, thus generating a range of possibilities in training modalities both for the field of online education or for face-to- face education, or even for mixed education (b-learning). Regarding academic training with IT, these allow differentiating a more influential training in students, discovering in them skills to solve problems, professional skills and complete learning, turning them into increasingly competent individuals.

Resumen

En la actualidad la influencia generada por la globalización, la sociedad del conocimiento y las tecnologías de información (TI) proponen desafíos a las instituciones educativas, lo anterior debido a cambios relacionados con los modelos educativos, las competencias para el trabajo, los estilos de interacción y comunicación entre los diferentes sectores sociales, e incluso en fenómenos no esperados, tal como la pandemia generada por el COVID-19, situación que originó caos en los procesos de enseñanza y aprendizaje, en donde docentes y alumnos de la noche a la mañana tuvieron la necesidad de recurrir a herramientas tecnológicas y plataformas de educación a distancia con el propósito de concluir un complicado ciclo escolar 2020-2021. El presente documento analiza la ascendente influencia de las TI, la forma en que estas han modificado cada día más los espacios educativos, para tal análisis se revisan temas relevantes de TI que impactan los procesos enseñanza y aprendizaje, al mismo tiempo se examina también como las TI facilitan nuevos esquemas pedagógicos, generando con ello un abanico de posibilidades en modalidades formativas tanto para el ámbito de la educación en línea o para la educación presencial, o incluso para la educación mixta (b-learning). Respecto a la formación académica con TI, estas permiten diferenciar una formación más influyente en los alumnos, descubriendo en ellos pericias para resolver problemas, habilidades profesionales y aprendizajes completos, convirtiéndolos en individuos cada vez más competentes.

Knowledge Society, Information Technologies, Educational Models, COVID-19, Online Education, Teaching and Learning, B-Learning

Sociedad del Conocimiento, Tecnologías de Información, Modelos Educativos, COVID-19, Educación en Línea, Enseñanza y Aprendizaje, B-Learning

† Researcher contributing as first author.

Introduction

Today we must face the enormous task of improving science education to meet the demands and challenges of an increasingly globalized society. If the new IT are used in an appropriate way, perhaps they can offer the potential to reach the forefront of teaching; this environment is becoming more important every day because to be active in the new social space requires new knowledge and skills to be acquired in the educational processes and these are almost always supported or supported by IT.

With respect to the above, it can be said that IT together with formal or informal education are transforming society, particularly educational processes. IT has become part of everyday life, the decrease in their costs and their popularity have allowed them to be included in almost any daily activity, and for most students the use of these tools is essential, since they allow them to communicate, have fun and carry out their school and social activities. However, these tools should also be treated as one of the main axes to acquire valuable knowledge that will help them to be better people every day.

In the same sense, IT by itself opens up new actions for innovation and improvement of formal teaching and learning processes, however, it should be emphasized that the mere incorporation of technological tools into educational practices does not guarantee that meaningful learning will actually take place; there is evidence that what happens on certain occasions is exactly the opposite, that the introduction of IT in educational practices serves more to reinforce traditional conceptions or practices rooted in teachers; the inclusion of these technologies in inadequate training models not only does not improve learning, but complicates it.

Even with all the above, it is considered that the incorporation of IT in the teaching and learning process is an opportunity that the educational community should take advantage of to generate learning experiences that interest students, promoting in them processes of understanding and construction of knowledge, favoring their reflective development, turning them into increasingly independent, capable and competent subjects.

On the other hand, the main purpose of education should be to contribute to the formation of free, participative, responsible and informed citizens, capable of exercising and defending their rights; who actively participate in social, economic and political life; that is, people who have the motivation and capacity to achieve their personal, work and family development and are willing to improve their social environment, as well as to continue learning throughout their lives, in a complex world that undergoes increasingly dizzying changes. Taking into account the above mentioned, it can be said that:

a) The world has been transformed in a short period of time and will continue to do so, as a consequence of IT innovation.

b) The IT-supported environment can perhaps support current society and future generations in achieving their social, educational and professional development, although this may not be easy since there are other factors or variables in society that are also involved and that could affect learning, such as poverty, discrimination, family breakdown, as well as lack of opportunities.

c) IT and well-intentioned software in conjunction with the internet are tools and as such can be used to the benefit, but unfortunately also to the detriment of education and student development.

d) It is important for the education system to provide students with digital competencies, to teach them to navigate safely through a world that, like the digital environment, offers opportunities, but also presents many unpleasant events; therefore, digital literacy is considered a task that must be addressed alongside the development of IT.

Background

IT has expanded the communication options among human beings, specifically among young people, with a digital device and an internet connection, students or not, have access to an enormous amount of information and knowledge.

Currently, young people live in a world and in circumstances that are very different from those of past generations; currently, the opportunities to enter and advance in school have multiplied, so that the level of schooling is higher than that of previous generations.

For Castañeda (2011), it is a reality that since IT has been in our lives, more forms and modes of communication have appeared, mainly used by young people of school age. The voracious advance of IT in many occasions does not allow to become aware of the problems that revolve around them, even with this, the proper use of digital tools provides much more efficient processes to improve educational projects and therefore the quality of teaching.

Regarding the above, Sayavedra (2018) highlights that, a living being must develop nutrition functions that lead to a full life, but points out, that nutrition is not only what we eat, but also the information and knowledge we acquire through ears and eyes.

Cabero (2012) also explains that, for IT to become true icons of change in the learning process, the updating of teachers must be considered in order to obtain the greatest benefit from these tools.

The digital era, together with the development of IT, demands a new role for teachers and their training, from the transmission of content to the orientation and support of students, creating the conditions for them to actively and skillfully construct their own knowledge.

This leads to the reconfiguration of teacher training, contemplating in a more solid way the pedagogical use of digital environments for the society of the 21st century.

Sánchez *et al*. (2019) argue that in the development of the digital era, most of the attention has been given to students, leaving aside in many occasions the education and training of teachers, a situation that could cause gaps in the educational processes supported by IT and in the student-teacher relationship.

Today's educators should not pass without seeing the current reality, it is not worth transiting with the flag of naivety; they should recreate the problems of the moment, exploit the capacity, as well as the experience, generate a new way of seeing and acting in reality; it is important to generate a thinking more focused on collaboration and the use of new technologies, which provide support to an education with formative elements and whose purpose is the social and professional development of the student.

Menjívar (2019) points out that, on the other hand, educational institutions should support teaching staff with regard to training in the use of IT, but also states that these institutions should require their teachers to design new learning schemes supported by IT. In this regard, Peralta (2013) considers that in the same way that students learn in the new teaching models, this learning reinforces and complements learning reinforces and complements the knowledge of the participating teachers.

Finally, today it is more accurately recognized that IT are tools that facilitate social communication and the acquisition of information and knowledge; although specifically speaking of information, this is not necessarily beneficial or profitable.

Considering the above, we could say that information constitutes a key element from which society participates in processes of globalization, union, education and generation of new knowledge. The knowledge and use of IT by societies represent an ideal means to generalize the education of a society and consequently of a country are directly linked to the educational system, are faced with the enormous challenge of responding to a society that is increasingly globalized and influenced by the vertiginous advance of technology.

Technology advances with a constant profile and normally exceeds the possibility of teachers to be at the same level, however, they should not be held back by this process and have the challenge of being updated in the most modern educational technology, so it would be convenient to commit to programs that promote more innovative educational projects supported by IT and that these are used by institutions of secondary and higher education, and why not, also in basic education.

Problem statement

It is still possible to perceive in many public educational institutions the limitations of the educational approach, focused on the physical classroom and with an instructor in front.

When the student gets to know other environments and other people; how they live, what they think, what problems they face, what is similar or different from them and discovers how easy it is to achieve it, their interest is focused towards other points or references that do not necessarily have their origin in the school.

Education requires an important attitudinal change in people as well as a modification of policies in institutions, especially in educational institutions and with governments. It seems that in a forced way, governments are timidly increasing financial resources for the education sector. That is the problem, education is conceived as a sector that now requires more money than before; it is convenient to invest in education, instruction to be more precise, in today's students so that they learn what society will need from them tomorrow.

It is important to understand that the information that must be disseminated to students cannot continue to be shared mostly through the classroom teacher, a task for which teachers and any other professional, in many cases, are becoming less and less competent every day.

The educational center approach, where it was always maintained that it was possible to find or have access to all the resources for teaching and learning, necessary for the formation of the student, today in most cases is limited or in the worst case obsolete, since the current educational resources are found in everyday life and distributed throughout the world. Even the role of facilitator, advisor, guide or mediator that now seems to be rescued for the teacher may be insufficient or wrongly formulated, when education escapes schools, when students learn and are formed in everyday life, at home, in the street, at work and especially on the Internet.

Technology offers knowledge in a pleasant and practical way, society itself is reinventing itself with all the possibilities offered by IT, therefore schools also have to do so, since they are part of the society in which we live. For all this, it is increasingly necessary to design new scenarios and educational actions, to train people so that they can act skillfully in the various scenarios of this environment.

Therefore, in addition to applying technologies to education, new educational scenarios must be designed where all students can learn to move and intervene in the new technological space. Virtual educational networks are the new basic units of such a training system, which includes the design and construction of new pedagogical scenarios, the development of technological tools and the training of educators specialized in teaching in the new social space.

Relationships in real or natural environments are usually face-to-face, are based on neighborhood or proximity between the actors or interlocutors, and require the spatial and temporal coincidence of those involved in them. On the other hand, virtual space, whose best current exponent is the Internet, is not presential but representational; it is not proximal but distal; it is not based on spatial enclosures but depends on electronic networks whose nodes of interaction may be distributed in different places.

In this new century, digital social networks and online communication are the most developed expression of the virtual environment due to their multimedia character, very important for educational purposes and a very significant level of interactivity.

Justification

It is considered that IT supports educational designs related to what is called open learning or flexible learning, because the student, according to the administration of his time, can or could decide what to learn, how to learn, where to learn, when to learn, and whom to consult.

Considering what was mentioned in the previous paragraph and the current link between education and technology, this chapter aims to analyze and recognize the growing influence of IT in educational processes and the way in which every day they propose new challenges to educational institutions, as a recent example, we can mention the COVID-19 pandemic, which initially unleashed anguish among teachers who had kept away from technology, On the other hand, it represented a challenge for teachers who were already immersed in the use of technology, so that both situations combined and gradually opened the way through collaborative work in which new strategies emerged every day with the use of applications that were gaining ground in the educational environment, making distance education possible at the basic and higher education levels.

We must also recognize the strong linkage that exists between society, education and technology; therefore, it is valid to express that education does not depend only on the government, nor is it the total responsibility of teachers or parents; education must be a joint work of the government through educational institutions, teachers and society, which of course includes parents; it must be considered an act of conscience and responsibility, which we must all adopt to achieve development as a country and reach a better quality of life. Education is considered one of the most influential factors for the advancement and progress of people, societies and countries, which has acquired greater importance due to the scientific and technological changes of the present time.

Research questions

a)   What social contribution does the use of new IT generate in 21st century education?

b)   What would the teaching-learning process have been like during the COVID-19 pandemic period without the use of IT?

c)   How can we face the challenges posed by 21st century society in terms of IT?

d)   How can teaching activities be strengthened through the use of IT in the classroom or outside it?

e)   What is the role of students with the use of IT as a learning strategy or tool?

f)   What is the role of teachers with the use of IT as a teaching strategy or tool?

General objective of the research

To analyze the influence and social contribution of IT as a strategy in the educational evolution of teaching and learning processes.

Specific objectives of the research

a)   To generate a new experience of professional knowledge in educational environments.

b)   To recognize the importance of IT in educational processes.

c)   To promote the responsible use of IT among the educational community and society.

Information technologies in confinement by COVID-19

In our country, in March 2020, from one day to the next, classrooms were empty, the COVID-19 pandemic dictated this event; students and teachers were not supposed to be in them, it was intended to avoid transfers, as well as proximity and physical interaction and thus prevent possible contagion of the voracious virus. This situation placed the entire educational environment in an unexplored environment. A new challenge was presented to all those involved in the educational process.

How to teach or share knowledge if students are no longer in the classroom?

To overcome this unfortunate phenomenon, educational institutions found it necessary to rely on the constant use of IT to carry out classes, counseling, consultations, collaborative work, as well as many other educational actions that from that moment on had to be carried out online or virtually, it was necessary to diversify the way of working; although it is important to mention that these actions would be carried out initially in schools located in urban areas and in circumstances of preparing and directing the educational process through the use of technology.

Adapting to the new challenge or the new need was complicated for many teachers and students, the change was radical, frustration was present, for some the mere fact of being connected (online or offline) generated stress and they did not like the new way of interacting; the usual way of socializing, that physical presence of few or many classmates to which they were accustomed had disappeared, now a small space at home had become the classroom and in some students caused a feeling of loneliness. In traditional educational processes the classroom is considered fundamental, De Haro (2009) defines it as an exclusive and particular society, which is integrated by a teacher and his students, who work and collaborate to achieve common goals.

The confinement by COVID-19 affected the daily processes of teaching and learning; it was a scenario out of the ordinary, everything had changed!

However, for some others, the process of adapting to this new teaching and learning scheme was a challenge.

It could be said that as the process progressed, little by little it came to be considered enriching and motivating, since every day new ways of communicating and sharing knowledge appeared and were assimilated.

IT came to offer other alternatives for learning, for example: It was common to find scenarios where moms and dads learned to use IT at home together with their children, which translates as a bulwark for families that from that moment on and in the face of this health emergency had to adapt to the virtual environment, As the days went by, the online work scheme also brought benefits to the student, especially in the development of their skills to learn to manage their time, compare and evaluate content, be more self-taught, in addition to responsibly experience a learning with a more global approach, this by interacting through social networks with other people installed in other places, but with topics of common interest.

Currently, and after having lived so far the most adverse period of the health contingency, no one can deny that IT offers multiple options to bring knowledge closer to people; education with these is no longer limited only to certain minutes in the classroom, knowledge is all around us, now in the virtual environment, such as social networks, chats, forums, videoconferences, platforms, blogs and many other digital tools that shorten distances and facilitate interaction.

It is evident that in the period of pandemic IT stopped being a luxury and became a necessity, these gradually reaffirmed the term innovative education, even with all its blunders, but these not generated mainly by the technology itself, we are talking about failures in the infrastructure of internet connections associated with insufficient bandwidth, This caused weak and unstable links, in most schools there was no specialized technical staff to provide hardware and software support when technologies were used, lack of teacher training in the use of technology tools, scarce devices (PCs, laptops, tablets, cell phones), for example: when in a household two or more family members had to connect to their class, and even dad or mom had the need to attend to situations of their work remotely and in real time.

Situations such as the above caused anger and disenchantment with the new social interaction in both educational and work processes; it is notorious that the COVID-19 pandemic exposed the fact that not everyone has the same opportunities, in addition to this it was evident that there are students who do not make pedagogical use of technological devices,

It is enough to take a look at the contents or applications installed in their cell phones, although it was also evident that some teachers do not use technologies in their academic function.

At present, the aftermath of COVID-19 or post-COVID-19 is present everywhere and at all times; society, business environments and, undoubtedly, educational environments are no exception. This is a huge challenge for the different educational levels, in terms of considering the new learning scheme through IT and combining it with the face-to-face learning scheme, both designs are fruitful as long as there are teachers prepared to deal with both schemes.

In the COVID-19 pandemic, it has been confirmed that the technologies to meet this alternative or need exist and are currently available; previously, these technologies in educational environments were limited only to postgraduate levels.

We must consider that, if formal education really wants to face the challenge of combining the two formative schemes and achieve productive processes in current education, digital evolution is a necessity, the adoption of connectivity and management tools is required, the task is not simple, the investment is strong, it implies high costs of transformation and network infrastructure, i.e. better coverage with quality connections, technological devices within the economic reach of the majority, competent and efficient teachers and managers in the extensive use of technologies, as well as generating alternatives to develop digital competencies among teachers and students.

Definitely a cultural and innovative change that allows to support the teaching and learning processes according to the context of pandemic and post-pandemic in education.

The importance of Technology in Education

We are living in times with an enormous amount of all kinds of information, the media, altered by technological changes, have been innovating constantly and voraciously. Information nowadays occupies a dominant place and is considered a primordial factor in society, as it has become a main component of society it requires new forms of access and in less and less time, action that is facilitated by technological innovation, it is also clear that this fact has reached the teaching and learning processes, so the training system in educational institutions has been changing with all these developments.

The use of technology as a support resource for education is enriching the teaching process, since in most cases it improves learning and also provides convenient conditions for the student and the teacher to interact in an environment of mutual participation.

Technology as a tool in the teaching-learning process stimulates the fundamental senses such as hearing and sight, which normally favors the learning of the revised knowledge. When reference is made to educational technology focused on the media, emphasis is made on the IT tools that are available and at the service of educational processes, we find powerful tools of great value in educational training, tools that in seconds allow the exchange of information of any type. Likewise, by using these tools correctly, knowledge is acquired, even if some people do not have any preparation or university training, in the same way they can learn about a subject or knowledge in which they are interested.

Technology offers to do the job in an efficient, fast, mobile and error-free way. We are facing a phenomenon characterized first by the growth in the flow of information, the disappearance of restrictions on communication in time and distance and sometimes a significant dependence on technology in almost all sectors of society; in turn these changes have generated consequences in the use of information, for this reason those involved in formal or informal education must be prepared to meet these changes with the study of techniques that allow them to prepare them to have the skills in the use of technology.

It is important for educational institutions to design guidelines that consider the knowledge that must be known about technology, that teachers work in order to meet the objectives established according to the needs of students, it is clear that these are times of social change and this undoubtedly yields results every day, although it is also true that in many cases the changes are slow and not always positive.

It is evident that incorporating technology in learning, generates a great contribution to the teacher when he/she manages in a correct way knowledge with his/her students, we can mention some of the perceptible and objective contributions regarding the use of technologies in educational projects; next, we present some of them:

a)   Generate a real link with society.
b)   Bringing the student closer to modernization or vanguard.
c)   It generates a more practical and effective environment, the theory is limited to basic concepts.
d)   Motivate with respect to learning.
e)   Increases imagination through images and videos.
f)   Encourages participation in teachers and students.
g)   Strengthens collaborative work and develops creativity.

Analyzing the previous paragraphs, it is understood that teaching is characterized as a scenario where reflection and collaboration in change take place. The current century attributes to the educational theme the need to continue with this approach and consider the new social demands.

Educational Innovation and digital literacy: Cornerstones of Technological Social development

Society in general is undergoing transcendental changes today and IT increases uncertainty in daily life, as contexts are transformed, but people do not always progress. In the current era, it is necessary to recompose and reconstruct the relationships between society, institutions and technology, deploying strategies in this new space and place to which man must adapt. The new IT is impacting the world

The new IT impact the world with innovations, sometimes becoming something absolute and definitive in its value, which gives rise to the culture of virtuality and are the pillar of global communication through various digital devices.

The word innovation is used to refer to the new, etymologically this word derives from novelty, which means something different from the usual, an idea that appears together with the notion of modernity, therefore, we can say that an innovation could be defined as the novelty and the attempt of assimilation and the way in which that novelty becomes the transformation of an environment, group, individual, institution, classroom or behavior. This is where the question arises:

Are technology tools an innovation in current educational processes, it is considered that yes, by using new technologies in educational environments; but it is also clear that such technologies demand a knowledge and adequate use of them by the educational actors, a task that corresponds directly to the processes of digital literacy.

Supporting the previous idea Casado Ortiz (2016) states that, digital literacy is a process in which the knowledge of IT tools must be acquired and used, in order to address current situations regarding the collection and review of information and knowledge found in various and varied digital environments.

Likewise, IT came to establish itself in our lives and this was confirmed with their performance in the recent pandemic COVID-19, they have absolutely changed our society and mainly the actions of our students. Those individuals who were born in the digital era, are considered with natural digital capabilities, but do not necessarily know how to make good use of new technologies, it is the responsibility of parents and teachers to facilitate a positive incorporation to technology and a good use of it.

Therefore, it is in our hands to favor the healthy and full growth of the new generations with respect to their technological social development.

In essence, it is clear that the learning environment is changing rapidly, the traditional face-to-face educational institutions are moving from being the center of regular training to the creation of remote connections in which students increase their learning through relationships that offer greater exchanges and in less time. With the above, it is clear that access to information in today's society is more intense and the limitations for sharing knowledge and handling large amounts of data have been overcome.

Teaching systems, therefore, have an important role to play in training for the necessary skills and competencies in the use of IT and according to strategies that allow students to be more active. These modalities lead to new conceptions of the teaching and learning process that emphasize attention to emotional and intellectual skills at different levels, preparing young people to assume responsibilities in a constantly changing world.

Thus, with all the unpleasant recent events, we refer to the confinement generated by the COVID-19 pandemic; the information society and the knowledge society are on an upswing that establishes an ever-present and constant positioning of IT, operating within economic systems, in culture, human interactions and evidently in the processes and circumstances of instruction (learning). It is for these reasons that digital literacy plays an important role in the knowledge, learning and responsible application of these new IT.

It is understood that digital literacy is the appropriate integration of technology to teaching and learning processes and not only in formal educational training, digital literacy has facilitated actions of globalization, innovation in different areas of specialization, virtual communication, in addition to crossing cultural boundaries and facilitating broad and continuous training. Consequently, digital literacy is very significant because it is considered the key to inclusion in the new society, we must remember that the digital divide is also social divide, it is for this reason that digital literacy is the key to progress in the information society and the knowledge society.

Challenges of digital literacy in the 21st century

Digital literacy aims to enable people to understand and use the new IT tools. In relation to the above, Barroso *et al*. (2017) state that education is facing one of its greatest challenges, which involves a digital literacy that aims to prepare citizens to perform in the information society and knowledge society.

Reflecting on this, we realize that it is not a simple situation, since it depends not only on individuals, whether they are students, teachers or people from civil society, but also directly involves governments, which are largely responsible for the digital development of a country. In addition to this, the Organization for Economic Cooperation and Development, OECD (2003) states that in order to enter the information society and the knowledge society, digital literacy is necessary and that in contrast to this there is the digital divide, which is considered an obstacle or impediment to the development of citizens and society with respect to the scope and use of technology.

From the above we can deduce that the concept of digital divide is constantly linked to the term digital literacy, and consequently also to IT-related environments.

Unfortunately, it is assumed or it is a reality that, in an information society, those subjects who are not able to incorporate IT in an expressive, communicative, leisure, labor, or social way to their world, in many cases will be rejected by the citizenship, will have less possibilities to develop and develop at all social levels.

From different approaches, digital literacy proposes the acquisition of skills that allow people to be more aware, critical and reflective with information and knowledge through the technologies available to them; likewise, it aims to provide them with skills and abilities that enable them to develop in a changing and complex environment.

In this regard, Scolari (2013) mentions that digital literacy can concentrate many people, who are technologically connected and integrate a large network. What is a fact is that cyberspace has enveloped the society in which we live, this space is accessible thanks to the Internet, it generates cultural transformations that in turn are altering the social and political order of the world, hence new schemes of relationship, approach, participation, marketing and mainly of acquiring and sharing information and knowledge are being generated.

Knowing and understanding all these transformations in the environment is one of the tasks proposed by digital literacy, education that with a critical and reflective approach seeks that individuals have a process of appropriation of the technologies that surround them. Few studies have been conducted on the competencies, capabilities and digital training needs of academic actors, referring specifically to teachers and students. It is assumed that it is normal that at present there is still a digital gap, which should be decreasing every day. Gordo *et al*. (2006) argue that at the beginning of the 1990s there was already a natural facility for young people to learn how to use technologies, to express spontaneously many of their concerns, including their rebelliousness.

Digital literacy proposes the challenge of generating strategies that allow the insertion of technology in learning processes, where the adoption of technology should not be the main purpose of learning, but only the facilitating instrument of educational processes in teaching and learning environments, i.e. the tool.

On this subject Ortega (2019) states that digital literacy should be the didactic tool that allows access to the diverse and enormous amount of information in the knowledge network, but makes it clear that it will not always be scientific knowledge.

|It is possible that one of the immediate challenges that we have as a society is to establish what is meant by digital literacy. Understanding that carrying out this process helps to produce technological advances that improve life and that is basic to involve people in technology as soon as possible. In the teaching performance, ignoring digital literacy would be delaying, even blocking, the opportunity for job growth, because it is unquestionable that this illiteracy also jeopardizes access to employment.

Conclusions

The information and approaches presented throughout this work invite reflection on education supported or supported by IT, it was clear in times of confinement by the COVID-19 pandemic that IT was recognized as a modality that came to install itself in the world of education as a modality that came to be installed in the teaching and learning processes and in some cases mitigated educational lags, in addition to this technology evidenced the divisions and social differences.

However, educational development considering IT still requires a strong investment in infrastructure, human resources and time; but it has already been demonstrated that it can bring benefits in online learning.

It is considered that current educational resources are within reach in the environments in which we live; therefore, it is important that educational institutions consider educational guidelines, where knowledge involving the use of technology is taken into account; that the government, through its educational institutions, together with teachers, work to achieve the objectives set according to the needs of their students.

Technology in education has allowed new teaching models and greater access to information and knowledge, and these are not only available for the development of student learning, but also provide greater knowledge and skills to teachers.

It is clear that we live in an era of technological transition, which was perhaps even more accelerated by the COVID-19 health phenomenon; for this transition to continue through an adequate process and generate positive results in aspects of teaching and learning, we must be willing to participate in the change. It is our responsibility and that of educational institutions to provide digital competencies to students and new generations.

The challenge for educational institutions should be based primarily on their teachers, they must be involved in the effective use of IT, so that they are updated and can support the training of their students, transmitting in a more innovative way the knowledge and skills that today's society demands.

References

Barroso, J., Llorente, M. (2017). La utilización de las herramientas sincrónicas y asincrónicas para la teleformación. *E-actividades Un referente básico para la formación en* Internet. https://dialnet.unirioja.es/servlet/artic ulo?codigo=2144246

Cabero, J. (2012). La aplicación de las TIC ¿esnobismo o necesidad educativa? *Red digital: revista de tecnologías de la información y comunicación educativa*, *1,* https://redined.educacion.gob.es/xmlui/handle/1 1162/36036

Casado Ortiz, R. (2016). Alfabetización Digital: ¿Qué es y cómo debemos entenderla? En R. Casado (Ed.). *Claves de la alfabetización digital* (pp. 51-55). Ariel Fundación Telefónica. https://dialnet.unirioja.es/servlet/libro?codigo=4 23876

Castañeda, M. (2011). *Tecnologías digitales y el proceso de enseñanza- aprendizaje en la educación secundaria.* [Tesis de doctorado, UNED] https://www.academia.edu/9778571/ tesis_doctoral_tecnolog%c3%8das_digitales_y _el_proceso_de_ense%c3%91anza_aprend izaje_en_la.

De Haro, J. (2009). Las redes sociales aplicadas a la práctica docente. *Revista DIM: Didáctica, Innovación y Multimedia*, *13*, https://www.raco.cat/index.php/DIM/ article/view/138928

Gordo, A., Megías, I. (2006). *Jóvenes y cultura Messenger*. INJUVE. http://www.injuve.es/observatorio/infotecnologi a/jovenes-y- cultura-messenger.

Menjívar, E. (2019). Diseño de ambientes de aprendizaje con TIC. Una experiencia de formación docente. En M. Del Valle y S. González. (Eds.). *Experiencias y tecnologías encaminadas a la investigación y educación. El camino hacia la formación con tecnología* (pp. 52-57). https://www.researchgate.net/publication/35464 1324_libro_experiencias_y_tecnologias_encam inadas_a_la_inve stigacion_y_educacion.

Ojeda, M. (2001). Los retos de la educación en el siglo XXI. https://www.uv.mx/personal/mojeda/files/2012/ 04/LosRetosdelaEducacio n-2001.pdf

ORGANIZACIÓN PARA LA COOPERACIÓN Y EL DESARROLLO ECONÓMICO (2003). OCDE. *Los Desafíos de las Tecnologías de la Información y las Comunicaciones en la Educación.* Ministerio de Educación, Cultura y Deporte. https://doi.org/10.1787/9789264103429-es.

Ortega, I. (2019). La Alfabetización Tecnológica. *Revista Electrónica: Educación y Cultura en la Sociedad de la Información.* 10, http://www.usal.es/~teoriaeducacion/rev_numer o_10_02/ n10_02_ortega_sanchez.pdf

Peralta, T. (2013). La tecnología educativa como apoyo pedagógico. Utel-Blog Universidad.

Sánchez, A., Boix, J. y Jurado, P. (2019). La Sociedad del conocimiento y las TICS: Una inmejorable oportunidad para el cambio docente. *Pixel-Bit Revista de Medios y Educación, 34, (pp. 179-204).* https://www.redalyc.org/pdf/368/36812036013. pdf

Sayavedra, R. (2018). Ciencia e Innovación,¿Cómo incluir a la educación de este país en ellas? En E. Velasco, R. Guillen, y C. Galindo. (Eds.). *Situación y diagnóstico de la educación en México: perspectivas y posibilidades* (pp. 141-158). STUNAM. https://stunam.org.mx/sa/11carrera/2019/situaci on_diagnostico_educacion_mexico_jul19.pdf

Scolari, C. (2013). *Hipermediaciones: Elementos para una Teoría de la Comunicación Digital Interactiva.* Gedisa https://www.google.com.mx/books/edition/Hip ermediaciones/gDslB QAAQBAJ?hl=es-419&gbpv=1&printsec=frontcover

Self-perception of digital competences in Higher Education Teachers

Autopercepción de las competencias digitales en Profesores de Educación Superior

PREZA-MEDINA, Sergio Roberto*†

Universidad Tecnológica de Cancún. Carretera Cancún-Aeropuerto, Km. 11.5 S.M. 299, Mz. 5, Lt 1, 77565 Cancùn, Q.R.

ID 1ˢᵗ Author: *Sergio Roberto, Preza-Medina* / **ORC ID**: 0000-0001-5010-0585, **CVU CONAHCYT ID**: 505691

Abstract

The present study had two research objectives: (a) Analyze the self-perception that higher-level teachers have about the mastery of digital skills in relation to the areas of information, communication, content creation, security and problem solving; and (b) Identify the level of mastery of digital skills presented by higher level teachers in relation to the areas of information, communication, content creation, security and problem solving. The methodological design had a quantitative approach, which allowed the collection of information required to achieve the objectives set. With this study, we contribute to the frontier of knowledge regarding the gaps between the use and application of digital skills, by the teaching staff of public institutions of higher level.

Resumen

El presente estudio tuvo dos objetivos de investigación: (a) Analizar la autopercepción que tienen los docentes de nivel superior sobre el dominio de las competencias digitales en relación con las áreas de la información, comunicación, creación de contenido, seguridad y resolución de problemas; y (b) Identificar el nivel de dominio de competencias digitales que presentan los docentes de nivel superior en relación con las áreas de la información, comunicación, creación de contenido, seguridad y resolución de problemas. El diseño metodológico tuvo enfoque cuantitativo lo que permitió la recolección de información requerida para alcanzar los objetivos planteados. Con este estudio, se contribuye a la frontera del conocimiento respecto a las brechas existentes entre el uso y aplicación de las competencias digitales, por parte del cuerpo docente de las instituciones públicas de nivel superior.

Digital competences, Teacher self-perception, Higher education

Competencias digitales, Autopercepción docente, Educación de nivel superior

---

Citation: PREZA-MEDINA, Sergio Roberto. Self-perception of Digital Competences in Higher Education Teachers. ECORFAN Journal-Republic of Colombia. 2023. 9-16: 12-18

---

* Correspondence to Author (e-mail: spreza@utcancun.edu.mx)
† Researcher contributing as first author.

Introducction

The focus of this study is on the analysis of the self-perception of higher education teachers on the degree of mastery of digital skills in their teaching practice.

Currently, the degree of knowledge that educators possess in relation to digital skills is not known. This study will highlight the urgent need for training in this area. The circumstances derived from the pandemic have required teachers to strengthen these competencies. In relation to this issue, Pérez and Rodríguez (2016) have raised the importance of learning by teachers to meet the technological demands of students. Therefore, it is necessary to incorporate digital tools in teaching methods, in order to complement and develop teachers' digital skills (Cabero & Ruiz, 2014).

During the last decade, the technological society affirms that digital competencies have been transformed from a recommended training stage to a degree of unavoidable necessity (Pérez & Rodríguez, 2016). In this sense, the development of digital competencies in the educational process has become indispensable for the development and improvement of teaching practice.

According to Pozos and Tejada (2018), technology is indispensable from the professional field, both in the transformation of personnel, as well as the updating of teachers. In the case of teachers, existing competencies should be initiated with technological innovation and explore new professional competencies (Cabero, 2013).

Research trends aimed at a modality that has evolved that is distance education seek to develop skills in the use and management of technological tools in the teacher (Pérez and Rodríguez, 2016). These skills expose the teacher to develop and grow professionally on digital competencies in the pedagogical scenario. On the other hand, the need for teacher training must be determined specifically with the level of mastery of digital competencies in the pedagogical area (Pozos and Tejada 2018).

It is worth highlighting, that there is a diversity of teachers who are described as digital immigrants, where they indicate that they do not know the procedure for the integration of technological applications or tools in the classroom (Ruiz and Belén, 2010). In addition, the authors argued that some teachers do not have technical knowledge to handle technological devices and do not have content that demonstrates the advantages or benefits that these digital tools can offer in the educational process. According to the above, this situation deserves immediate attention, since technological tools should be used in support to complement the pedagogical skills in the classroom, in fact, it is recommended to integrate technology in both face-to-face and distance modalities (Cabero, 2013).

Problem statement

Generally in Higher Education Institutions (HEI) the existing gaps between professional profiles and psycho-pedagogical profiles in new teachers at this level are large, which represents in the educational praxis pedagogical biases and teaching practices lacking strategies, techniques and adequate use of digital tools available for such work And it is there, in this gap where the objectives of this research are framed:

– O1: To analyze the self-perception that higher level teachers have about the mastery of digital competencies in relation to the areas of information, communication, content creation, security and problem solving.

– O2: To identify the level of mastery of digital competencies presented by higher level teachers in relation to the areas of information, communication, content creation, security and problem solving.

The questions that direct the research study are the following:

– Q1: What is the self-perception of higher level teachers' mastery of digital competencies in relation to the areas of information, communication, content creation, security, and problem solving?

– Q2: What is the level of mastery of digital competencies presented by higher level teachers in relation to the areas of information, communication, content creation, security and problem solving?

Justification

There are several research studies that show that teachers should develop a basic level of digital competencies to improve the teaching and learning process. If the teacher intends to develop digital competencies in the area of education, a complete and correct integration is required when using technology in the classroom and technological training (Cabero, 2013).

Based on the above, for university institutions it is essential to analyze and evaluate the teacher's self-perception on the level of mastery of digital competencies in order to improve or reevaluate the procedures currently used by teachers towards the annexation of technology in the teaching and learning process (Cabero & Ruiz, 2014).

Theoretical framework

Competence

The term competence originated in the 1960s. In the work context, David McClelland in 1969 raised the motivation theory, focused on three needs. The first is the need for achievement, the second is the need for quality at work and the third is the need for power/influence. This theory emphasizes that through motivation people achieve their competencies in the areas of expertise favoring competitive power, leadership and knowledge.

On the other hand, Cameron and Quinn developed a competing values model to specify indicators of organizational effectiveness. This model is subdivided into four criteria, which are: clan (collaborative), adhocracy (creative), hierarchy (control) and market (competent), these values allow to identify and classify organizations by the type of dominant culture. Thus, Cameron and Quinn contributed to the competence approach.

The term competence from the didactic context is based on a series of elements such as; abilities, attitudes, knowledge, and capacities, skills possessed by the teacher to execute and concretize the learning process effectively (Rivadeneira, 2017). On the other hand, Perez (2015) expressed that an individual who presents pertinent knowledge in particular situations, who performs procedures that demonstrate know-how and who knows how to act demonstrating values and positive attitudes is classified as a competent person.

Competency-based learning

Higher Education has educational trends based on including technology and developing learning by competencies in teachers throughout their academic life (Fernández, 2017). This is why learning is related to the development of recent knowledge that the teacher can and should acquire. Therefore, learning by competence develops and evolves according to learning styles in the integration to knowledge to current conflicts. An example of these conflicts is the integration of attitudes, values and the incorporation of techniques, in the way of performing when facing educational situations (Villa and Poblete, 2011). On the other hand, learning by competencies is directed with significant changes in the structure of the contents of what is traditionally taught, however, it is also necessary to educate about the contents that demonstrate the best technological skills (Monereoad a,).

Zabala and Arnau (2007) expressed that when speaking of learning by competency, it implies a complexity analyzed in a triple dimension: (1) learning by competency is aimed at an intense change where the contents of traditional education are highlighted through a structure that also teaches skills and values, (2) at the end of the 20th century, the international community began to explore the requirements of establishing competencies that were essential to effectively reintegrate the 21st century society, (European Commission,), ( ) as a third dimension, it is suggested to approve, that competencies are essential for teachers to demonstrate the ability to educate in the digital era and that competencies are essential to apply to students for the 21st century, (Perez 2015. p 106).

On the other hand, the particular learning processes and the stimulation to know, favor learning by competencies. However, the source of connection between its elements related to conceptual support knowledge ("knowledge") is not obtained distant from use or "know-how". (Perez, 2016).

Zabala and Arnau (2007) analyzed 11 key ideas aimed at how to learn and educate about competencies. There are ways to understand competencies by transforming ideas that are periodically disseminated in teaching. Therefore, teachers must explore alternatives that help them improve how to teach and implement competencies. The 11 key ideas are presented below:

–   Key idea 1.- Competency should be taught in educational settings to dominate rote learning of knowledge.

–   Key idea 2.- Competencies should be identified according to the needs of the individual who experiences diverse situations in daily life in order to offer answers that integrate concepts, attitudes and procedures.

–   Key idea 3.- Competencies go hand in hand with knowledge, since they integrate elements such as skills, knowledge and attitudes.

–   Key idea 4.- Competencies should be taught taking into account the progress of the personality in the totality of current life scenarios.

–   Key idea 5.- When teaching school competencies, the management of professional, personal, interpersonal and social scenarios should be included.

–   Key idea 6.- The learning of a competence implies equality at a maximum level of functionality and significance.

–   Key Idea 7.- Teaching competencies should incorporate safe teaching strategies that provide solutions to conflicts and problems of daily life.

–   Key idea 8.- The basis of competencies is undoubtedly the disciplinary goal.

–   Key Idea 9.- To teach all the components in specific areas in correspondence with the disciplinary goal and then the systematic learning in the areas.

–   Key idea 10.- To teach competencies requires elements of globalization.

–   Key Idea 11.- To classify the level of student proficiency is hard work; assessment for each element of the competency must be considered.

Digital Competencies in the Teacher The teacher who promotes true learning is considered digitally competent when he/she provides a digitally competent digitally competent when he/she provides an enriched enriched environment using technological technological tools by demonstrating essential elements such as knowledge, skills, attitudes.

In order for the teacher to be competent, he/she must enrich their professional self-development and identity by demonstrating the ability to make use of digital educational technology. Demonstrating a transformation in the classroom where digital content is integrated giving the student the opportunity to perform technological activities (Hall *et al*., 2014).

On the other hand, the Commission of the European Communities (2006) requested an approval on the requirements to establish indispensable digital competences to solve efficiently and effectively in a digital society. When talking about teachers' competencies, it means that they must be able to educate and have the responsibility to educate and use their competencies are required in the digital era of the 21st century.

It should be noted that the Common Framework for Digital Competence in Teaching (DIGCOMP) is used as a reference framework to determine and improve teachers' digital competencies. By using the DIGCOMP framework as a reference tool, it makes it easier to explore the areas and levels in more depth, taking into account the formative and summative plans. The DIGCOMP framework is structured in twenty-one digital competencies and subdivided into five dimensions that will be described in this study, presented in Table 1. The digital competency areas are summarized below:

Description	Digital Competence
Information	Determines digital data by searching, analyzing, organizing, storing for the necessary purpose.
Communication	Communicates with networks through technological scenarios, shares materials through digital strategies, connects and collaborates with others using technological tools.
Content creation	Creates and edits new information using photos, and video conferencing to incorporate prior knowledge.
Security	Demonstrates safety and security in digital personal identification
Problems troubleshooting	Identifies the requirements of digital digital material for decision making to select appropriate virtual strategies

Table 1 Description of digital competencies

These areas of digital competencies are the variables included in the instrument of this study. These competencies were created and presented in February 2014 by the National Institute of Educational Technologies and Teacher Training (INTEF) for a comprehensive research to the Common Framework of digital competence of the teacher.

These five digital competencies mentioned in Table 1 and are pillars for teachers and training should be considered at a personal and professional level when offering classes both in a face-to-face and virtual modality.

Following are the activities to be performed in each competency: (a) when we talk about information literacy and information literacy, activities such as being able to classify, locate, store and analyze digital documentation, taking into account the relevance and relevance of the data, (b) communication here is directed to the teacher must share information and interact with students through networking and digital tools, (c) the competence of digital content creation involves knowing how to create and edit new university information on the level of mastery of digital skills. The instrument that was applied in this research was a questionnaire, which answered the research questions (Hernández *et al.*, 2014).

The questionnaire that was used in this research was developed and designed by Perez (2015) was described in Table 2. It consisted of five blocks with different indicators that collected information and answered the research questions.

Blocks	Indicators	Questions
Block I	Indicator 1.	9
	Context Information	3
	Context	
	Indicator 2.	
	Teacher training	
Block II	Indicator 3.	21
	Teacher's self-perception	
	of digital competence	
Block III	Indicator 4. Degree of mastery of digital competence in the role of the teacher.	7
Block IV	Indicator 5. Evaluates the learning in digital competence of primary school students with the current curriculum.	8
Block V	Indicator 6. Perceived need for formal digital alphatization.	9

Table 2 Description of the blocks and indicators of the questionnaire

Teacher training and integrate with previous contents where multimedia tools are integrated by applying the intellectual property regulation, (d) security competence is key, here is included protecting digital identity and securely using personal data, (e) and last we have the problem solving competence is focused on identifying digital needs selecting appropriate digital tools, solving technical problems, making technological decisions and updating the competence itself.

Methodological design

The methodology with a quantitative approach allowed the collection of the required information. The research was descriptive since the data obtained from the variables of the study are detailed. The methodology used in this study allowed the collection of data.

Validation. The validity of the instrument was carried out through a process of review by experts and empirical validation. For content validity, a questionnaire-type instrument was submitted for validation by 15 experts in the area of educational technologies.

Table 3 shows the results obtained from the interpretation of the relevance and clarity indexes for each block.

Pertinence index (pi)		Clarity index (ci)	
pi ≥ 0.80	Stayed in its original form: Block I (1 and 2), Block III, Block V (1 and 3)	ci ≥ 0.80	Stayed in its original form: Block I (1 and 2), Bloque II (2 and 5), Block V
0.60≤ip<80	Redaction was modified Block II (1), Block IV and Block V (1) and (3)	0.60 ≤ic≤0.80	Redaction was modified Block II(1),Block III and Block IV
ci<0.60	No block was eliminated	ci<0.60	No block was eliminated

Table 3 Interpretation criteria for the indices of relevance (ip) and clarity (ic)

Reliability. The consistency of the instrument was analyzed and Cronbach's alpha coefficient was calculated for the total sample.

To understand the degree of reliability of Cronbach's alpha, the result obtained for the block entitled: Self-perception of teachers' digital competence, presented a value of 0.93, which indicated a high degree of internal consistency.

Data Collection Procedures

In data collection, the participants were offered instructions on the topic to be investigated virtually by means of the "Goog e orm" form. In this way, teachers had access to the questionnaire at any time and in any place.

Procedures for data analysis. This study used a questionnaire and assessed teachers' self-perception of their mastery of digital competencies.

For the purposes of this research, data were collected through the questionnaire and then analyzed, tabulated and submitted directly to the statistical program Statistical Package for the Social Sciences (SPSS) in order to answer the study questions.

The first descriptive research question evaluated the variable of interest, which was the teacher's self-perception, and was analyzed by measures of central tendency and dispersion such as mean and standard deviation.

Conclusions

The conclusions derived from the results and the literature review of this study are presented below:

The self-perception of the teachers participating in the study, presents considerable variability with respect to the mastery of competencies and the use in their teaching practice. Teachers with professional profiles in educational technologies feel more confident and competent than those with engineering profiles. However, the latter recognize the importance of mastering digital competencies for the correct use in their educational practice. Subsequently, the self-perception of digital competencies can influence the confidence and skills of teachers to implement new technologies, as well as pedagogical approaches. Therefore, it is essential that HEIs offer continuous training opportunities in digital competencies for teachers, ensuring an environment of continuous monitoring and job security.

Finally, it should be considered that the scenarios linked to the pandemic have shown the need to strengthen digital competencies in higher education teachers, particularly in the field of distance education and the use of learning management systems.

References

Cabero, J. (2013). *La formación en la era digital: ambientes enriquecidos por la tecnología.* Revista de Gestión de la Innovación en Educación Superior REGIES, 2, p.p.34-53. ISSN 0719-742X.; E-ISSN: 0719-7624

Cabero, J., y Ruiz, J. (2014). *Las Tecnologías de la Información y Comunicación para la inclusión: reformulando la brecha digital.* International Journal of Educational Research and Innovation. IJERI, (9), 16-30

Comision de las Comunidades Europeas. (   ). Comunicacion de la c omision arguamento Europea, a onse o, a omit Econ mico Socia Europeo a omit de las Regiones de 20 de diciembre. *Un planteamiento europeo de la alfabetización mediática en el entorno digital*: http://eur-   lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:52007DC0833&from=ES

Fernández Medina, C. R. (2017). *Desarrollo de Competencias Digitales de Docentes y Estudiantes en Procesos de Evaluación Formativa con TIC*. Revista Atlante: Cuadernos de Educación y Desarrollo (agosto 2017). En línea: http://www.eumed.net/rev/atlante/2017/08/c ompetencias-digitales-tic.html.

Hall, R. y Atkins, L. Freser, J. (2014). *Defining a self-evaluation digital literacy framework for secondary educators: the DigiLit Leicester project*. DOI: https://doi.org/10.3402/rlt.v22.21440

Monereo, C. y Bad a A. (   ). a competencia informacional desde una perspectiva psicoeducativa: enseñanza basada en la resolución de problemas y emergentes. *Revista española de documentación científica*. No monográfico. Recuperado de: http://redc.revistas.csic.es/index.php/redc/ar ticle/view/745

Pérez Escoda, A. y Rodríguez Conde, M. J. (2016). Evaluación de las competencias digitales auto percibidas de profesorado de educación primaria en Castilla y León. *Revista de Investigación Educativa, 34*(2), 399-415. DOI: http://dx.doi.org/10.6018/rie.34.2.215121

Pérez Escoda, A. (2015). Alfabetización y competencias digitales en el marco de la evaluación educativa: Estudios en docentes y alumnos de Educación primaria en Castilla y León. Tesis doctoral. Universidad de Salamanca. Recuperada: https://doi.org/10.6018/rie.34.2.215121.

Pozos, K., & Tejada, J. (2018). Competencias digitales en docentes de Educación Superior: Niveles de Dominio y Necesidades Formativas. *Revista Digital de Investigación en Docencia Universitaria*, *12*(2), 59-87. Recuperado de: htps://dx.doi.org/10.19083/ridu.2018.712t

Villa Sánchez, A. y Poblete Ruiz, M. (2011). Evaluación de competencias genéricas, oportunidades y limitaciones. En *Revista Bordón 63*, pp. 147-170. Recuperado de: http://www.innova.deusto.es/images/archivos/e valuaci%C3%B3n_competencias_aurelio _bordon.pdf

Zabala, A. y Arnau, L. (2007). *11 ideas clave: cómo aprender y enseñar por competencias*. o . Ideas a earce ona Gra .

Collaborative software project development with source code repository

Desarrollo colaborativo de proyectos de software con repositorio de código fuente

DURAN-BELMAN, Israel†, MAGDALENO-ZAVALA, Juan Antonio and GALLARDO-ALVAREZ, Dennise Ivonne

Tecnológico Nacional de México/Instituto Tecnológico Superior de Irapuato, Carretera Irapuato-Silao, km. 12.5, Col. El Copal, C. P. 36821, Irapuato, Gto.

ID 1st Author: *Israel, Duran-Belman* / **ORC ID**: 0000-0002-1394-0486, **Researcher ID Thomson**: V-7806-2019, **CVU CONAHCYT ID:** 691483

ID 1st Co-author: *Juan Antonio, Magdaleno-Zavala* / **ORC ID**: 0000-0001-9762-0086, **Researcher ID Thomson**: S-5543-2018, **CVU CONAHCYT ID:** 691690

ID 2nd Co-author: *Dennise Ivonne, Gallardo-Alvarez* / **ORC ID**: 0000-0002-9197-6425, **Researcher ID Thomson**: S-4921-2018, **CVU CONAHCYT ID**: 264516

Abstract

Working on projects in isolation presents significant limitations. The lack of interaction and collaboration among students hinders the learning of diverse approaches, limits the expansion of understanding on a subject, and can decrease students' commitment and interest. Additionally, the absence of interaction negatively affects the development of key skills for academic and professional success. In the field of software project development, having a centralized source code repository is essential. It facilitates collaboration among team members, allowing them to work on the same project, make changes, review code, and solve problems together. It provides tools and functionalities that improve coordination and version control, resulting in more efficient and higher quality development. In summary, this article highlights the importance of collaboration among students and the use of centralized source code repositories to facilitate interaction, knowledge sharing, and ensure the quality of work in both academic and professional settings. It promotes collaboration through group projects, team activities, and online platforms that facilitate the exchange of ideas

Collaboration, Repository, Source Code

Resumen

El trabajo de proyectos de manera aislada presenta limitaciones significativas. La falta de interacción y colaboración entre los estudiantes dificulta el aprendizaje de enfoques diversos, limita la ampliación de la comprensión sobre un tema y puede disminuir el compromiso e interés de los estudiantes. Además, la ausencia de interacción afecta negativamente el desarrollo de habilidades clave para el éxito académico y profesional. En el ámbito del desarrollo de proyectos de software, contar con un repositorio de código fuente centralizado es esencial en el desarrollo de proyectos de software. Facilita la colaboración entre los miembros del equipo, permitiendo trabajar en el mismo proyecto, realizar cambios, revisar el código y resolver problemas de manera conjunta. Proporciona herramientas y funcionalidades que mejoran la coordinación y el control de versiones, lo que resulta en un desarrollo más eficiente y de mayor calidad. En resumen, este articulo destaca la importancia de la colaboración entre estudiantes y el uso de repositorios de código fuente para facilitar la interacción, compartir conocimientos y asegurar la calidad del trabajo tanto en el ámbito académico como en el profesional, fomentando la colaboración a través de proyectos grupales, actividades en equipo y plataformas en línea que faciliten el intercambio de ideas.

Colaboración, Repositorio, Código Fuente

---

† Researcher contributing as first author.

Introduction

A source code versioner, also known as a version control system, is a tool used in software development to manage and track changes made to a project's source code over time. The source code versioner allows developers to collaborate effectively on a project by allowing them to work in parallel on different branches or versions of the code, make changes without affecting the main version and merge those changes in an orderly and controlled manner.

It also makes it easy to track who made each change, when it was made and why it was made. By using a source code versioner, developers can access previous versions of the code, allowing them to revert changes if necessary, compare differences between versions, and resolve conflicts when two or more people have made changes to the same piece of code. There are several version control systems available, with Git being one of the most popular and widely used in the software development industry. Git allows both small and large projects to be managed efficiently, and has a wide range of features and tools to facilitate collaborative development and version management of source code.

Working on collaborative projects means that several people are involved in the development of a project, each contributing their knowledge and skills to achieve common goals. A version control system plays a key role in this type of work, as it allows for more effective and organized collaboration. Here are some features and benefits of using a version control system in collaborative projects:

1. Change management: the version control system records and stores every change made to the source code, making it easier to track changes and understand who made each change.

2. Parallel work: Developers can work on different branches or versions of the code simultaneously, without interfering with each other's work. Each person can make changes in his own branch and then merge them in a controlled and orderly manner.

3. Conflict resolution: When two or more people make changes to the same part of the code, there can be conflicts. The version control system helps to identify and resolve these conflicts efficiently, avoiding loss of work or code corruption.

4. Revert changes: In the event that a bug or unwanted change is introduced, the version control system allows for easy reverting to a previous version of the code. This is especially useful when problems are discovered later in the development process.

5. Remote collaboration: A version control system facilitates remote collaboration, as developers can access the source code from any location and make changes seamlessly. This is especially relevant in geographically distributed teams.

6. Feedback and communication: Version control systems often provide the ability to add comments to changes made, which helps maintain a clear record of decisions made and provides context to other team members.

Overall, a version control system improves efficiency, transparency and collaboration in projects by enabling developers to work together more effectively and achieve satisfactory results.

Materials and Methods

For the present project, a problem was detected in the development of team projects in the CMMI course of the Computer Systems Engineering course of the Instituto Tecnológico Superior de Irapuato, and the objective was to implement the development of projects through a tool that would allow team work, but building individual modules, which would facilitate the student's learning in the programming area.

The following phases were followed for the development of the project:

Search for Tools

It is essential for any development team that wants to efficiently manage the version control of its source code, to have a development environment, it is essential to have a tool that allows tracking, coding and managing changes made to the code over time, facilitating collaboration, conflict resolution and implementation of new features in an orderly manner. GitHub is a web platform that provides a collaborative environment for software development using the Git version control system.

Figure 1 GitHub repository

Repositories: A repository on GitHub is a space where a project's files and change history are stored. You can create repositories for your projects and collaborate with other developers on them. Repositories can be public (accessible to everyone) or private (accessible only to collaborators you invite).
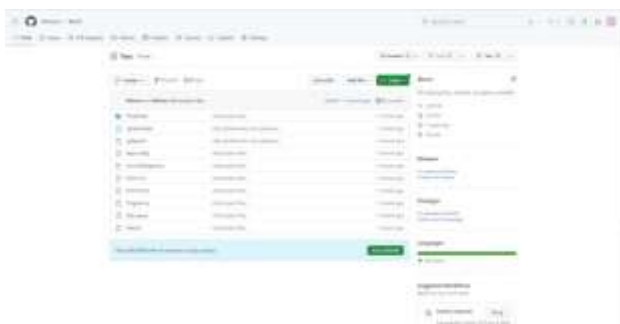
Figure 2 Visual Studio Project/Solution on GitHub

Tools configuration:

How to install and configure the code versioner in the development environment is taught. This may include software installation and initial user identity setup; it facilitates team collaboration. You can invite other developers to collaborate on your repository, assign tasks, review and comment on code, and keep a revision history to track changes and improvements.
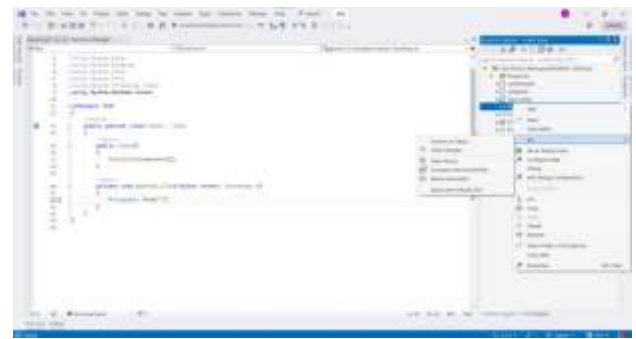
Figure 3 Visual Studio code with GitHub configurations GitHub

Project implementation:

The development of the project required the participation of eighth semester students, from the Integral Development Model subject, which has a total of 22 students and they were divided into three teams of four members and two teams of five. Each team was defined a specific role and a project which they had to carry out using GitHub and Visual Studio 2022. The project development time was contemplated for four months during which each team developed a different project.

The software project that the students should realize is based on the work of individual modules in which one member of the team serves as project leader and coordinates the progress according to the design postponed by the team.

It is worth mentioning that they must register to the github page and mount the project on the teacher's server, which monitors the progress in the time he wants.

This meant that the team members had to have constant communication and coordinate the progress of the project, respecting the times and forms that each one of them is using, forcing them to work as a team to avoid delays and unfinished forms.

Results

According to the projects and the time delivered, the following data were obtained:

–   60% of the teams (3 out of 5 teams) finished in time and form, verifying the information in the github platform with the progress of each project and its respective team.

DURAN-BELMAN, Israel, MAGDALENO-ZAVALA, Juan Antonio and GALLARDO-ALVAREZ, Dennise Ivonne. Collaborative software project development with source code repository. ECORFAN Journal-Republic of Colombia. 2023

−   100% of the teams stated that it is complex to agree on the different activities to be developed when there is only one platform to deliver the project, which requires constant communication with the members, otherwise it could affect the development of the project.

−   The two teams that did not deliver the project (40%), in addition to the lack of communication, expressed that they had problems with the computer equipment, which hindered the desired progress.

According to the results obtained by the work teams, it has been concluded that it is essential for students to become familiar with tools such as GitHub. These tools are of vital importance to facilitate the integration of work teams, since, in the field of software development, version control systems are used for each project carried out.

Conclusions

It is determined that continuous training is required to learn how to configure and adapt projects according to the needs of each team. Regarding teamwork, it has been observed that, when facing this type of projects, students leave their comfort zone and are forced to maintain constant communication in order to move forward according to the initial plans. This differs from the usual practice where each person develops a module separately and they merge at the end.

References

Straub, Ben, & Chacon Scott. (2021). Pro Git. Apress.

Muñoz Serafín, Miguel (2017). Introducción a C#. TI Capacitación.

Johnson, Bruce (2015). Visual Studio 2015. Wrox.

Collaborative activities mediated by technology for integration into University life in the introductory Engineering course

Actividades colaborativas mediadas por tecnología para la integración a la vida Universitaria en la asignatura de introducción a la Ingeniería

MACÍAS-BRAMBILA, Hassem Rubén[1]†, ZAMORA-RAMOS, Victor Manuel[2], OSORIO-ÁNGEL, Sonia[2] and BECERRA-VELÁZQUEZ, Violeta[2]

[1]*Universidad de Guadalajara – Sistema de Universidad Virtual, Av. La Paz No. 2453, Col. Arcos Sur, CP. 44130, Guadalajara, Jalisco. México*
[2]*Universidad de Guadalajara – Centro Universitario de Ciencias Exactas e Ingenierías, Blvd. Marcelino García Barragán No. 1421, Col. Olímpica, CP 44430*

ID 1st Author: *Hassem Rubén, Macías-Brambila* / **ORC ID**: 0000-0002-6540-7464, **CVU CONAHCYT ID**: 902812

ID 1st Co-author: *Victor Manuel, Zamora-Ramos* / **ORC ID**: 0000-0001-9537-6630, **CVU CONAHCYT ID**: 903643

ID 2nd Co-author: *Sonia, Osorio-Ángel* / **ORC ID**: 0000-0003-4540-4191, **CVU CONAHCYT ID**: 967323

ID 3rd Co-author: *Violeta del Rocío, Becerra-Velázquez* / **ORC ID**: 0000-0003-2866-977X, **CVU CONAHCYT ID**: 316236

Abstract

The article presents an educational intervention project implemented in the Introduction to Engineering subject of the Computer Engineering Educational Program of the Centro Universitario de Ciencias Exactas e Ingenierías of the Universidad de Guadalajara, developed by the Investigation Groups UDG-CA-991 Desarrollo de Competencias Profesionales en Ciencias Computacionales and the UDG-CA-863 Gestión y Desarrollo de Competencias en Entornos Virtuales during the periods 2022-B and 2023-A which developed strategies that integrated actions and resources for collaborative work mediated by technology for the integration of students into the university life, under a mixed model and a section group as a sample, achieving a pedagogical proposal assisted by technology focused on the development of significant learning, in which an impact evaluation was applied with interview and survey instruments, as well as satisfaction and evaluation , considering the institutional, teacher and student dimensions or categories. The project was focused with the principles of continuous improvement.

Collaborative work, IT in education, Meaningful learning

Resumen

El artículo presenta un proyecto de intervención educativa implementado en la asignatura de Introducción a la Ingeniería del Programa Educativo de Ingeniería en Informática del Centro Universitario de Ciencias Exactas e Ingenierías de la Universidad de Guadalajara, desarrollado por los Cuerpos Académicos UDG-CA-991 Desarrollo de Competencias Profesionales en Ciencias Computacionales y el UDG-CA-863 Gestión y Desarrollo de Competencias en Entornos Virtuales durante los periodos 2022-B y 2023-A el cual desarrolló estrategias que integraron acciones y recursos para el trabajo colaborativo mediado por tecnología para la integración de los estudiantes a la vida universitaria, bajo un modelo mixto y un grupo sección como muestra, logrando una propuesta pedagógica asistida por tecnología enfocada al desarrollo de aprendizajes significativos, en la cual se aplicó una evaluación de impacto con instrumentos de entrevistas y encuestas, así como de satisfacción y evaluación, considerando las dimensiones o categorías institucionales, docentes y de los estudiantes. El proyecto fue enfocado con los principios de mejora continua.

Trabajo colaborativo, las TIC en la educación, Aprendizaje significativo

---

---

† Researcher contributing as first author.

Introduction

The University of Guadalajara (UdeG) through the Educational Program (PE) Computer Engineering of the University Center of Exact Sciences and Engineering (CUCEI) establishes as an objective the training of professionals with skills and abilities to apply, configure and develop information systems for the implementation of solutions related to information processing.

In this sense and based on the needs of the productive sector and society, aligned to the Curricular Models of the National Association of Information Technology Education Institutions (ANIEI) and the recommendations of the National Council of Accreditation in Informatics and Computing (CONAIC) as Accrediting Body of the PE, through its framework of reference, constant updates of the plans and programs of study have been made, seeking the relevance and quality of the process; considering the integral formation of the student and his integration to the university life.

It is for this reason that within the curriculum of the PE is located in the first semester the subject of Introduction to Engineering that belongs to the area of common basic training and is designed for students to develop a detailed overview of their profession, acquire tools that promote their personal, academic and professional development, in addition to strengthening their sense of relevance to the Institution.

For the achievement of the above, it is necessary the development of some capacities, abilities and skills such as leadership, sense of entrepreneurship, social responsibility, ethics and integrity, which according to Alvarez et el. (2019) are individual qualities that are ingrained and can be transformed and developed.

However; the characteristics of the profile of students entering Engineering programs and who also have a training mediated by technology derived from the effects of the Covid-19 pandemic characterize as a challenge the approach of these topics in groups, which also exceed mostly 40 students per section.

For this reason, the Academic Groups (CAs) UDG-CA-991 Development of Professional Competences in Computer Sciences and UDG-CA-863 Management and Development of Competences in Virtual Environments designed an educational intervention project, defined by De León (2021) as the means to determine strategies that integrate actions and resources with the objective of solving them during the 2022B cycle, project that was applied and evaluated during cycle 2023A, under a mixed approach and with a section as a sample group, in which through collaborative work based on constructivism and defined by Maldonado (2007) as a potentiator of learning and also implemented learning processes mediated by technology, described by Lizcano *et al.* (2018) as environments that streamline communication, collaboration and generate learning environments that promote the integral development of students.

This project counted on the design of learning scenarios and activities that allowed students to live the experience in their immersion in university life and the development of the competencies declared in the subject in a dynamic, interactive and completely opposite way to the initial appreciation declared by students at the beginning of the course.

This intervention process was designed, implemented and evaluated through data collection instruments, analysis and classification, evaluation instruments and satisfaction surveys, which allowed for this case study its assessment and consideration of success, which will allow presenting the results to the university authorities and thus propose the implementation of strategies that favor the transit of students in the rest of the PE that in their curricula offer this subject.

Methodology

The project began with its design and delimitation during the period 2022B, from August to December, for its implementation and evaluation in the calendar 2023A, from January to May 2023, applied to first semester students of the PE of Computer Engineering of the Centro Universitario de Ciencias Exactas e Ingenierías, under a mixed research model and with an impact on a population of 40 students.

Design

The determination of the educational intervention project began with the naming of the project in its identification within the institutional framework of the University of Guadalajara and the Centro Universitario de Ciencias Exactas e Ingenierías, integrating the process of problematization where it was determined that "the excessive use of traditional teaching methods such as expository, limits the generation of meaningful learning", with this it was possible to determine the research question, where according to Hidalgo (1997) formulates the purpose of the research, being for this project: In what way is it possible to transform traditional teaching methods for the generation of meaningful learning? .

The foundation of the project is based on collaborative learning, which has several currents that characterize it as a means of generating meaningful learning, which according to the constructivist vision of learning based on the theories of Piaget and Vygostky, since both consider the social context as a basic element for cognitive development and knowledge construction, which according to Martínez (2003) requires a confrontation of visions and is translated as a socio-cognitive conflict.

The operational determination of the activities contains the strategies conformed by actions to be carried out in the project, which according to Barkley (2005) are intentional and structured with a logical sequence, as shown in the following table with an extract of the project activities:

Activity	
No.	**Title**
1	Infographic "Collaborative work".
2	Timeline "de la UdeG".
3	Presentation of "Governing Bodies
4	Analysis of "University Regulations
5	Triptych "Computer Engineering".
6	Video "Computer Engineering".
7	Social impact project from the professional profile

Table 1 Extract of project activities
Own Elaboration

For each of the activities, the implementation strategy was designed, which considered the title, the thematic unit in the curriculum, the number of participants who would collaborate in the teams, the technological tool to be used for the development and presentation, considering at all times the use of free and multiplatform software to avoid incompatibility between the various electronic equipment available to the students, the duration of the activity, the place, the resources, its objective and content, in which the conceptual, procedural and attitudinal elements expected to be fulfilled were described, as well as the activities to be developed by the teacher and the students in the three moments of the sessions: beginning, development and closing; as well as the evaluation of the process and product, integrating the performance criteria, considering its indicators. Below is an excerpt of the design of the video activity:

Evaluation **Performance criteria** **Student indicators** **Attitudinal**
Will carry out the proposed activities with creativity and performance. Participate actively in the team. Will show interest in the subject

Table 2. Extract from the description of the project activities
Own Elaboration

The planning of the project activities were distributed during the whole period 2023A according to the time load of the subject, determining a session for the presentation and execution of the activity and another one for the presentation of the results by team as they were conformed.

In the case of the more complex activities such as the video and the social impact project, 3 and 4 sessions were determined, respectively, due to their characteristics and complexity.

We also determined the primary and secondary resources and materials for each of the activities, considering computer equipment, internet connection, smart phones, projector, speakers and microphone, as well as Classroom as a Virtual Learning Environment (VLE), which even though the University has other VLEs, the institutional accounts that are provided immediately are from the Google environment.

MACÍAS-BRAMBILA, Hassem Rubén, ZAMORA-RAMOS, Victor Manuel, OSORIO-ÁNGEL, Sonia and BECERRA-VELÁZQUEZ, Violeta. Collaborative activities mediated by technology for integration into university life in the introductory engineering course. ECORFAN Journal-Republic of Colombia

Which facilitated the implementation of activities, the repository, communication and consultation and feedback under this environment. Regarding the online technological tools that were used, a prior determination was made of those that were free access or that according to the collaboration agreements of the University there was access to institutional accounts at no cost, being the following the ones used:

−   Google Classroom, Meet and Forms.
−   Canvas
−   Powtoon
−   Filmora
−   Office Suite

The   site https://capacitateparaelempelo.org was also used to accompany the training process in microcourses such as time management, digital health, programming logic, your internet business, presentation skills, mobile business, tester, the virtue of serving and leadership, resources that were vital for students outside the classroom to work individually on these personal skills to strengthen their profile in parallel to the classroom activities.

The evaluation indicators were defined through the design of evaluation instruments congruent with the educational model, so checklists and rubrics were developed with a focus on self-evaluation, co-evaluation and observation guides, all under the premise established by Fritzen (1982) allowing to observe the content and the process, considering the dynamics of the work teams, identifying the behavior, interaction of the members and their relationships.

Evaluation

According to Fierro (1999) this is the last stage of a systematic intervention project of an educational situation, for which records were made of the sessions and the application of the instruments developed as a means of recovery, organization and analysis of the data; which allowed the determination of the units of analysis and their frequencies.   Some of the products developed in the project activities are presented below:
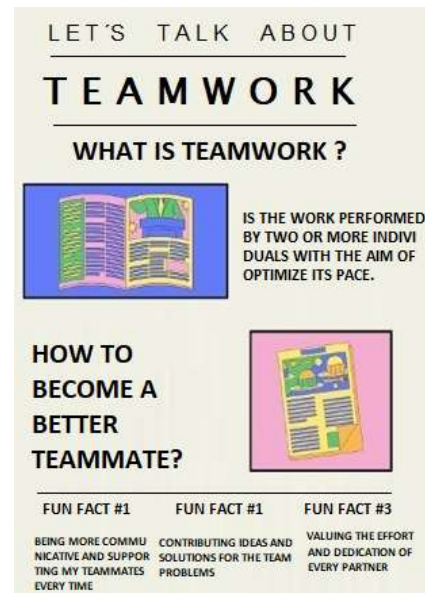
Figure 1 Sample teamwork infographic
Own Elaboration

The previous image corresponds to one of the products developed in the course, in which students identified the characteristics, modalities, elements and situations that arise in collaborative work. The following is one of the proposals for a triptych of Computer Engineering:

Figure 2 Sample triptych of Computer Engineering
Own Elaboration

The previous image shows an example of the triptychs developed by the work teams, which had the objective of identifying aspects such as the activities performed by a graduate, work trends and the salary received according to some statistics, thus contributing to the knowledge of important aspects of the PE. Below is a sample of a triptych related to the attitudes and values described in the profile of the PE, as well as the contributions of professionals in this field to society:

Figure 3 Sample triptych of values and attitudes of a Computer Engineer
Own Elaboration

Each of the activities implemented in the project were evaluated with the described instruments and allowed to characterize and obtain the appreciation of each of the members of the group, as well as the evaluation of the performance by each of the formed teams, as closure of this process, an impact evaluation mechanism was established, which from the International Labor Organization since Abdala (2004) allows to establish an assessment that is applied to a system to obtain information of the results of a project or program, in its follow-up of the process and measurement of its impact on the target population.

Results

The impact evaluation was generated through the contribution among students in the course process, considering social interaction as a tool that allows the improvement of the educational practice and thus achieve to perceive and live a learning process differently and was divided into three axes: institutional, in the teaching practice and in the students.

The institutional category yielded the following elements:

−   Implementation of collaborative strategies mediated by technology in the development of significant learning in the students of the introductory engineering course.

−   Implementation of new evaluation instruments congruent with the educational model in the introductory engineering course.

−   Modification in the semester planning of the introductory engineering course. Elaboration of the proposal for the implementation of data collection instruments.

The category in the teaching practice allowed us to have the following findings:

−   Elaboration of a resource planning for the mediation of technology-assisted learning in the subject of introduction to engineering.

−   Implementation of evaluation instruments that allow evidencing the achievement of the objectives of the curriculum through the assessment of the products and processes experienced by the students of the subject of introduction to engineering.

The category of students evidenced:

−   Verbal manifestation of progress in the development of teamwork skills.

−   Verbal manifestation of improvement in the development of interpersonal relationships among group mates through technology-assisted collaborative work strategies.

−   Improvement in the student-teacher relationship through personal expressions that allow the teacher to identify factors of motivation and progress of some of the students.

−   Increase in the presence and punctuality of students in the sessions through the implementation of strategies that are not related to the processes they experience individually in other subjects.

−   Development of interest in students from other groups to know and experience the processes developed by the intervention project strategies.

Conclusions

The design of the intervention project was carried out according to a planning of strategies directed to the development of significant learning in an academic process assisted by technology in the students of the subject of introduction to engineering through collaborative work strategies with the objective of evaluating the academic process and its impact on the students through indicators such as logical, affective and psychological significance.

In this process, evaluation instruments were designed considering aspects such as the organization of work teams, trust and student participation through adequate learning environments for their incentive, as well as the evaluation of knowledge construction. These factors were evaluated from the students' perspective towards learning actions and strategies.

This implementation allowed the development of a technology-assisted pedagogical proposal focused on continuous improvement in a constantly changing environment that will allow, with the results obtained, to propose its implementation in the rest of the sections or groups in which this subject is offered.

References

Abdala, Ernesto (2004) "Manual para la evaluación de impacto en programas de formación para jóvenes" CINTEFOR: Uruguay

Barkley, F. Elizabeth; Cross K. Patricia & Howell Major, Claire (2005) "Técnicas de aprendizaje colaborativo". España: Morata.

De León Cerda, D. D. (2021, agosto). El proyecto de intervención. La importancia del diagnóstico. Guadalajara, Jalisco, México: Sistema de Universidad Virtual

Fierro, Cecilia; Fortuol, Bertha & Rosas, Lesvia. (1999). "Transformando la práctica docente" España: Paidós.

Fritzen, Silvino José (1982) "La ventana de Johari: ejercicios de dinámica de grupos, de relaciones humanas y de sensibilización". Brasil: Editora Vozes.

Hidalgo Guzmán, Juan Luis (1997) "Investigación Educativa: Una estrategia constructivista". México: Castellanos Editores.

Lizcano-Dallos, A. R.; Barbosa-Chacón, J. W. & Villamizar-Escobar, J. D. (2019). Aprendizaje colaborativo con apoyo en TIC: concepto, metodología y recursos. magis, Revista Internacional de Investigación en Educación, 12 (24), 5-24. doi: 10.11144/Javeriana.m12-25.acat

Maldonado Pérez, M. (2007) "El trabajo colaborativo en el aula universitaria". Laurus, Vol. 13, N.23, pp 263-278.

Martínez Sánchez, Francisco (2003) "Redes de la comunicación en la enseñanza: las nuevas perspectivas del trabajo corporativo".España: Paidós Ibérica.

.

Instructions for Scientific, Technological and Innovation Publication

[Title in Times New Roman and Bold No. 14 in English and Spanish]

Surname (IN UPPERCASE), Name 1st Author†*, Surname (IN UPPERCASE), Name 1st Coauthor, Surname (IN UPPERCASE), Name 2nd Coauthor and Surname (IN UPPERCASE), Name 3rd Coauthor

Institutional Affiliation of Author including Dependency (No.10 Times New Roman and Italic)

International Identification of Science - Technology and Innovation

ID 1st author: (ORC ID - Researcher ID Thomson, arXiv Author ID - PubMed Author ID - Open ID) and CVU 1st author: (Scholar-PNPC or SNI-CONAHCYT) (No.10 Times New Roman)

ID 1st coauthor: (ORC ID - Researcher ID Thomson, arXiv Author ID - PubMed Author ID - Open ID) and CVU 1st coauthor: (Scholar or SNI) (No.10 Times New Roman)

ID 2nd coauthor: (ORC ID - Researcher ID Thomson, arXiv Author ID - PubMed Author ID - Open ID) and CVU 2nd coauthor: (Scholar or SNI) (No.10 Times New Roman)

ID 3rd coauthor: (ORC ID - Researcher ID Thomson, arXiv Author ID - PubMed Author ID - Open ID) and CVU 3rd coauthor: (Scholar or SNI) (No.10 Times New Roman)

Abstract (In English, 150-200 words)

Objectives
Methodology
Contribution

Keywords (In English)

Indicate 3 keywords in Times New Roman and Bold No. 10

Abstract (In Spanish, 150-200 words)

Objectives
Methodology
Contribution

Keywords (In Spanish)

Indicate 3 keywords in Times New Roman and Bold No. 10

* Correspondence to Author (example@example.org)
† Researcher contributing as first author.

Instructions for Scientific, Technological and Innovation Publication

Introduction

Text in Times New Roman No.12, single space.

General explanation of the subject and explain why it is important.

What is your added value with respect to other techniques?

Clearly focus each of its features

Clearly explain the problem to be solved and the central hypothesis.

Explanation of sections Article.

## Development of headings and subheadings of the article with subsequent numbers

[Title No.12 in Times New Roman, single spaced and bold]

Products in development No.12 Times New Roman, single spaced.

Including graphs, figures and tables-Editable

In the article content any graphic, table and figure should be editable formats that can change size, type and number of letter, for the purposes of edition, these must be high quality, not pixelated and should be noticeable even reducing image scale.

[Indicating the title at the bottom with No.10 and Times New Roman Bold]
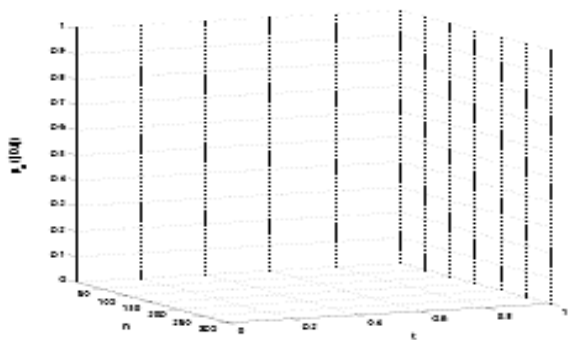
Graphic 1 Title and *Source (in italics)*

Should not be images-everything must be editable.
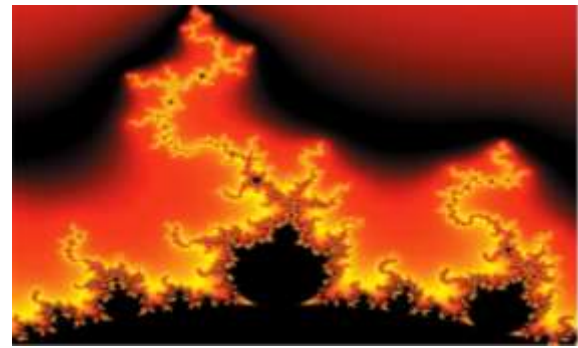
Figure 1 Title and *Source (in italics)*

Should not be images-everything must be editable.

Table 1 Title and *Source (in italics)*

Should not be images-everything must be editable.

Each article shall present separately in **3 folders**: a) Figures, b) Charts and c) Tables in .JPG format, indicating the number and sequential Bold Title.

For the use of equations, noted as follows:

$$Y_{ij} = \alpha + \sum_{h=1}^{r} \beta_h X_{hij} + u_j + e_{ij} \qquad (1)$$

Must be editable and number aligned on the right side.

Methodology

Develop give the meaning of the variables in linear writing and important is the comparison of the used criteria.

Results

The results shall be by section of the article.

Annexes

Tables and adequate sources

Thanks

Indicate if they were financed by any institution, University or company.

Conclusions

Explain clearly the results and possibilities of improvement.

References

Use APA system. Should not be numbered, nor with bullets, however if necessary numbering will be because reference or mention is made somewhere in the Article.

Use Roman Alphabet, all references you have used must be in the Roman Alphabet, even if you have quoted an Article, book in any of the official languages of the United Nations (English, French, German, Chinese, Russian, Portuguese, Italian, Spanish, Arabic), you must write the reference in Roman script and not in any of the official languages.

Technical Specifications

Each article must submit your dates into a Word document (.docx):

Journal Name
Article title
Abstract
Keywords
Article sections, for example:

1. Introduction
2. Description of the method
3. Analysis from the regression demand curve
4. Results
5. Thanks
6. Conclusions
7. References

Author Name (s)
Email Correspondence to Author
References

Intellectual Property Requirements for editing:

-Authentic Signature in Color of <u>Originality Format</u> Author and Coauthors

-Authentic Signature in Color of the <u>Acceptance Format</u> of Author and Coauthors

-Authentic Signature in Color of the <u>Conflict of Interest Format</u> of Author and Co-authors.

Reservation to Editorial Policy

ECORFAN-Journal Colombia reserves the right to make editorial changes required to adapt the Articles to the Editorial Policy of the Journal. Once the Article is accepted in its final version, the Journal will send the author the proofs for review. ECORFAN® will only accept the correction of errata and errors or omissions arising from the editing process of the Journal, reserving in full the copyrights and content dissemination. No deletions, substitutions or additions that alter the formation of the Article will be accepted.

Code of Ethics - Good Practices and Declaration of Solution to Editorial Conflicts

Declaration of Originality and unpublished character of the Article, of Authors, on the obtaining of data and interpretation of results, Acknowledgments, Conflict of interests, Assignment of rights and Distribution

The ECORFAN-Mexico, S.C Management claims to Authors of Articles that its content must be original, unpublished and of Scientific, Technological and Innovation content to be submitted for evaluation.

The Authors signing the Article must be the same that have contributed to its conception, realization and development, as well as obtaining the data, interpreting the results, drafting and reviewing it. The Corresponding Author of the proposed Article will request the form that follows.

Article title:

- The sending of an Article to ECORFAN-Journal Colombia emanates the commitment of the author not to submit it simultaneously to the consideration of other series publications for it must complement the Format of Originality for its Article, unless it is rejected by the Arbitration Committee, it may be withdrawn.

- None of the data presented in this article has been plagiarized or invented. The original data are clearly distinguished from those already published. And it is known of the test in PLAGSCAN if a level of plagiarism is detected Positive will not proceed to arbitrate.

- References are cited on which the information contained in the Article is based, as well as theories and data from other previously published Articles.

- The authors sign the Format of Authorization for their Article to be disseminated by means that ECORFAN-Mexico, S.C. In its Holding Colombia considers pertinent for disclosure and diffusion of its Article its Rights of Work.

- Consent has been obtained from those who have contributed unpublished data obtained through verbal or written communication, and such communication and Authorship are adequately identified.

- The Author and Co-Authors who sign this work have participated in its planning, design and execution, as well as in the interpretation of the results. They also critically reviewed the paper, approved its final version and agreed with its publication.

- No signature responsible for the work has been omitted and the criteria of Scientific Authorization are satisfied.

- The results of this Article have been interpreted objectively. Any results contrary to the point of view of those who sign are exposed and discussed in the Article.

Copyright and Access

Article Title:

Name and Surnames of the Contact Author and the Coauthors	Signature
1.	
2.	
3.	
4.	

Principles of Ethics and Declaration of Solution to Editorial Conflicts

Editor Responsibilities

The Publisher undertakes to guarantee the confidentiality of the evaluation process, it may not disclose to the Arbitrators the identity of the Authors, nor may it reveal the identity of the Arbitrators at any time.

The Editor assumes the responsibility to properly inform the Author of the stage of the editorial process in which the text is sent, as well as the resolutions of Double-Blind Review.

The Editor should evaluate manuscripts and their intellectual content without distinction of race, gender, sexual orientation, religious beliefs, ethnicity, nationality, or the political philosophy of the Authors.

The Editor and his editing team of ECORFAN® Holdings will not disclose any information about Articles submitted to anyone other than the corresponding Author.

The Editor should make fair and impartial decisions and ensure a fair Double-Blind Review.

Responsibilities of the Editorial Board

The description of the peer review processes is made known by the Editorial Board in order that the Authors know what the evaluation criteria are and will always be willing to justify any controversy in the evaluation process. In case of Plagiarism Detection to the Article the Committee notifies the Authors for Violation to the Right of Scientific, Technological and Innovation Authorization.

Responsibilities of the Arbitration Committee

The Arbitrators undertake to notify about any unethical conduct by the Authors and to indicate all the information that may be reason to reject the publication of the Articles. In addition, they must undertake to keep confidential information related to the Articles they evaluate.

Any manuscript received for your arbitration must be treated as confidential, should not be displayed or discussed with other experts, except with the permission of the Editor.

The Arbitrators must be conducted objectively, any personal criticism of the Author is inappropriate.

The Arbitrators must express their points of view with clarity and with valid arguments that contribute to the Scientific, Technological and Innovation of the Author.

The Arbitrators should not evaluate manuscripts in which they have conflicts of interest and have been notified to the Editor before submitting the Article for Double-Blind Review.

Responsibilities of the Authors

Authors must guarantee that their articles are the product of their original work and that the data has been obtained ethically.

Authors must ensure that they have not been previously published or that they are not considered in another serial publication.

Authors must strictly follow the rules for the publication of Defined Articles by the Editorial Board.

The authors have requested that the text in all its forms be an unethical editorial behavior and is unacceptable, consequently, any manuscript that incurs in plagiarism is eliminated and not considered for publication.

Authors should cite publications that have been influential in the nature of the Article submitted to arbitration.

Information services

Indexation - Bases and Repositories

RESEARCH GATE (Germany)
GOOGLE SCHOLAR (Citation indices-Google)
REDIB (Ibero-American Network of Innovation and Scientific Knowledge- CSIC)
MENDELEY (Bibliographic References Manager)

Publishing Services

Citation and Index Identification H
Management of Originality Format and Authorization
Testing Article with PLAGSCAN
Article Evaluation
Certificate of Double-Blind Review
Article Edition
Web layout
Indexing and Repository
ArticleTranslation
Article Publication
Certificate of Article
Service Billing

Editorial Policy and Management

43 Street # 30 -90 B. El Triunfo CP.50001. Bogota Colombia. Phones: +52 1 55 6159 2296, +52 1 55 1260 0355, +52 1 55 6034 9181; Email: contact@ecorfan.org www.ecorfan.org

ECORFAN Journal-Republic of Colombia

"Education at the middle and higher level: Information Technologies, pre-eminence in teaching and learning processes in period of pandemic"
MANUEL-MORALES, Amador & LINO-GAMIÑO, Juan Alfredo

"Self-perception of digital competences in Higher Education Teachers"
PREZA-MEDINA, Sergio Roberto
Universidad Tecnológica de Cancún

"Collaborative software project development with source code repository"
DURAN-BELMAN, Israel, MAGDALENO-ZAVALA, Juan Antonio and GALLARDO-ALVAREZ, Dennise Ivonne
Instituto Tecnológico Superior de Irapuato

Collaborative activities mediated by technology for integration into University life in the introductory Engineering course"
MACÍAS-BRAMBILA, Hassem Rubén, ZAMORA-RAMOS, Victor Manuel, OSORIO-ÁNGEL, Sonia and BECERRA-VELÁZQUEZ, Violeta
Universidad de Guadalajara