



# Mediation of Virtual Environments as Strategy to Develop Investigative Skills

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## Abstract

The outbreak of the Covid-19 pandemic promoted the implementation of information technologies for academic processes, transforming paradigms and approaches at all formal levels of education. Therefore, the objective of this study was to analyze the development of research competencies in relation to the mediation of virtual learning environments. This was an exploratory-descriptive study, with a non-experimental design in the context of a case study; with an analysis from the interpretative paradigm and a mixed approach. A Likert-type virtual self-evaluation instrument was used; the study population consisted of 28 undergraduate students (84% female and 16% male), belonging to the Educational Research Workshop II course. One of the findings was the development of research competencies favored by the use of virtual learning environments. It was concluded that the development of research competencies is directly linked to the acquisition of technological competencies, which benefits the management of new didactic strategies for virtual learning environments.

**Key Words:** Investigative competence, virtual environments, digital competences

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## Introduction

At present, the mediation of virtual environments as a strategy to develop investigative skills constitutes a topic addressed in various academic investigations, in the national and international contest, since they have served to respond to the dynamics, and to the vertiginous advance in the production of knowledge. With the implementation of technologies, educational models over time have experienced development, evolution and transformation according to the needs and demands of the social, economic, political labor environment, among others of each country or region; such evolution is based on the adequacy and globalization of knowledge; around this from the second half of the twentieth century, these models have been based on a process of training by competencies, observing important advances in several countries in which they are

applied.

Likewise, the development of digital and technological skills in the educational field for the management and knowledge of virtual learning environments has become one of the key factors to be acquired by students and teachers of all educational levels; the current needs in the different areas of society, require the university that the training of its students and graduates go hand in hand with technological advances; pedagogical mediation has also been integrated into virtual learning environments (AVA) to respond and provide effective solutions to the different problems they will face at work and in the social environments where Aante and Gómez (2017) operate, for which specific knowledge and

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and the correct use of technology are essential (Pérez-Escoda and Rodríguez, 2016).

The use of ICT has become frequent in the teaching-learning process, especially at the university level. The university is in charge of managing the academic, research and extension processes, basically from a pedagogical action, which must promote the training of qualified professionals, with a comprehensive vision in science and technology; the human talent that carries out specific research activities, are called to promote changes in knowledge management and research processes, to ensure efficiency, quality and social relevance (Alvarado and Moreno, 2017). However, according to González, cited by Batista, Trujillo and Barbán, (2018, p: 9), it is still not possible to articulate the academic, investigative processes, which affects the fulfillment of educational objectives and the comprehensive training of the student. According to the above, it is difficult for educational technology to solve and overcome and generate knowledge by itself, so it is necessary to link pedagogical mediation with ICT, for the consequent purposes, teachers and students are required with effective performance.

However, the development of investigative skills during the learning process in higher education implies the transfer of investigative skills, at the same time it is important to use the appropriate strategies for the intervention process to be successful. In the case of undergraduate students, this action or skill is inherent to their professional training, therefore, investigative skills are generated by the challenge of finding answers to the different approaches and problems that arise during the teaching process. - learning.

The development of these skills occurs through successful teaching methods, which allow students and teachers to manage various tools to carry out investigative processes. As Oquendo (2019, p: 96) refers, citing Tamayo and Tamayo (2005) "it is convenient to clarify the meaning of a curriculum focused on research, that allows spaces for investigative processes, and that offers the opportunity to the professor of being a teacher-researcher and the student an active co-researcher".

In accordance with the above, regarding tutoring, it has been implemented virtually through virtual learning environments. According to Sebastiao et al. (2018) we must focus on interactive and technological teaching, tutoring, communication and feedback". This article presents a theoretical-

conceptual framework on the main aspects of investigative skills, and their requirement in the educational field; specifically, the need to be developed and used in virtual learning environments. In response to the demands that have had to be met in the last two years, due to the substitution of face-to-face classes for virtual ones, having to implement various academic, educational, informative and communicational strategies, to speed up the educational processes in all levels; and go hand in hand with global advances; in relation to the emergency raised from the Pandemic.

### **Research skills theoretical foundations**

The term competence has become very important in the last decade and is used both in educational legislation and in the educational field itself, especially at the level of university education.

The word Competence comes from the Latin *cum* and *petere*, which means ability, and includes the inherent characteristics of people in their natural and professional development, which is revealed in different situations; on this particular Lévy-Leboyer (1996), states that: Competencies are closely linked to professional activities and more specifically, to the actions that are part of a position, associated with the analysis of professional activities and the skills necessary to perfectly fulfill the demands that they imply.

With respect to Lévy-Leboyer (1996), they define competencies as "tasks or work situations, a set of behaviors organized within a mental structure, relatively stable and mobilizable when necessary" (p.45), linked to an activity, due to this the competent person mobilizes knowledge at the right time, without needing to consult basic rules, or wonder about the indications of such conduct.

In the same way, the term competence for Masten & Coatsworth (1995), arises from a complex relationship between the person's potentialities and their interaction with the environment; It has a double meaning: on the one hand, it indicates the good performance achieved and, on the other, the person's capacity to act successfully in the future. Regarding the definition, Le-Boterf (1995) states that they are like know-how, the result of a combination of resources from the integration and organization of knowledge, qualities, skills, experiences and their mobilization for the purpose of achieving performance in a context.

On the other hand, a definition disclosed in the



Latin American context, encompasses certain characteristics of the individual, where meaning is given to competencies, by the accumulation of skills, knowledge, information and prior abilities, which allow the individual the systematic and adequate performance of a task or job, successfully, effectively and efficiently; these aspects are acquired or learned during the training process (ECLAC, OEI, 2020).

Similarly, in the Commission of the European Communities CCE (2015) it is proposed that there are eight key competences to promote lifelong learning, which are: communication in the mother tongue, communication in foreign languages, mathematical competences and basic competences in science and technology; learning to learn, interpersonal, intercultural and social skills and civic competence, entrepreneurship, cultural expression and digital competence.

According to Chacín (2015), he states that the development of investigative skills in higher education has been the subject of debate and analysis at the national and international level; in this sense, the concept of investigative competence is constructed as a broad concept that integrates: knowledge, abilities, skills and practices in different learning scenarios. Also, as stipulated by the Organization for Economic Cooperation and Development-OECD (2019), it seeks to promote the strengthening of the general system of skills in order to develop those with the potential to translate into better jobs and living conditions, being necessary the training of individuals competent in: the production of knowledge, management of the economy, in relation to the level of technological development and the growth of a country.

Reflecting on the fact that both the term training and development have been interpreted in different ways and both are fundamental categories in the educational process; there is an interconnection between them, in that sense, the relationship between training and development, are principles that govern education in individuals, and therefore the links between learning and development (Rodríguez, Ponce, Pibaqué, Solórzano, Macías, Vélez and Cañarte 2019).

The training category is interpreted as the basis of development and also as a consequence of it; some refer to the affective sphere only, but in other cases they give it a greater scope including the cognitive sphere as well. Currently, after a significant evolution of the theories of development, and the

integration of the term training to designate other aspects of the learning process, the personal and professional growth of the individual, is related to development insofar as training tends to comprehensive development of people, of their essence; both categories contribute to the achievement of educational objectives (Latorre, 2016).

### **Epistemological foundations of investigative skills**

During the research process, it is necessary to adopt and base the study on an epistemological position, which guides the development of investigative skills that are above the reductionist conception of knowledge, so that in this way, when the student observes the social reality, visualize the different ways and alternatives to investigate or address a problematic and complex scenario, which sometimes appears as a dead end and also as a motivating element capable of awakening your creativity and wisdom.

Interpreting the integrative perspective of Edgar Morín, the human being, but mainly the educator, must be trained by integrating his investigative skills with the knowledge he acquires from his environment, since knowledge is progressively produced as events occur at a global level, which may be inserted in increasingly complex contexts; In this sense, training or educational processes cannot be conceived, with disconnected, divided and biased knowledge, since satisfactory answers to the phenomena under study would not be given. The development of humanity requires changing the fractional, disjunctive way of thinking and opening the way to an integrating modality, which must be notorious throughout society and culture, from which the university is not alien, nor the formative work that it has place in it (Varona, 2020, p: 95).

To illustrate the investigative competencies, it begins with the pedagogical foundation of two contemporary currents that support it, which are constructivism and connectivism, or inclusion of technologies in cognitive processes, Bernal (2019); which lead us to the achievement of significant learning in the virtual environment; with this base we have been able to plan, organize and design our virtual programs, which respond to an evaluation by competencies, based on international quality standards.

Analyzing Estrada (2014), the formation and development of investigative competence is



conceived, in higher education, both in the procedural-practical plane and in the structural-formal plane of the curriculum; it starts from foundations: sociological, psychological and pedagogical, where the sociological foundation starts from recognizing that the formation and development of investigative competences have a social character, which must be interpreted in relation to the other contextual spheres of the environment. Regarding the psychological foundation, it is based on a historical-cultural approach, considering a dynamic union between the cultural with the psychological and the biological, as elements that drive the psychic aspect.

In the same way, the pedagogical foundation corresponds to a historical-cultural approach, in the sense that education should be considered as the way for the development of the individual to occur, at the same time that the cognitive-affective processes are linked unfailingly with the teaching-learning process; and everything together forms a link with educational institutions and the surrounding society (Estrada, 2014).

In view of the above, student development is determined by a process of interactive construction between the personal components and those of the teaching-learning process (student-group-teacher), the latter acting as a mediator. Likewise, investigative competencies are addressed, such as the integration of cognitive dimensions (knowledge, skills), personal qualities (attitudes, skills) and metacognitive skills; that allow students, teachers or other professionals to perform efficiently in a research activity (Estrada, 2014).

From this point of view, investigative competencies refer to specific performance in the investigative field, not only in teaching, but also in the different fields that require the practice of these skills, generally in any professional area. Possessing investigative skills is directly related to the ability to generate, promote, disseminate knowledge and implement techniques that allow acting in a reflexive manner, in solving problems, through the creation of new models.

But from this point of view, the role of the teacher must be given primary importance, in the fact of the construction of their own investigative competences, since only in this way will the process of transmission of specific knowledge be possible and that the recipients of this (students) can grasp from the experiential model, the exact meaning of these skills in research practice.

The role of the teacher in the training and motivation of students in higher education institutions (HEIs) is an essential component when it comes to promoting academic development, since they will give the first instructions that guide and establish the necessary links so that the student assumes the social and moral commitment to work on research projects (Vallejo, 2020).

### **Students and Teachers in Virtual Environments**

Distance Education (EAD), is a non-face-to-face study methodology, implemented for a long time, characterized by the interaction deferred in time and/or separated in space between the actors of the educational process, as expressed in the Ministry of Education Peru, UNESCO (2017, p:12); today it is complemented by the use of information and communication technologies (ICT), applied to pedagogical practice. After two years in contingency due to the Covid-19 Pandemic, as we know, its use has reached great dimensions, and a vertiginous advance and growth in terms of updates and innovation of programs and equipment as well as the breadth in the use of the same. in all areas of society; but especially in the educational field they have had a great influence.

Doing a bit of history, distance education has coexisted over time with three generations of interactive technologies: 1) The one based on printed material: correspondence education, instructional modules, among others 2) The one based on the media ( radio, TV, cinema, telephony) guided by the "Open University" paradigm of the United Kingdom in Great Britain and 3) The contemporary of the digital age (digital networks and multimedia resources) supported by information and communication technologies (ICT) (Ministry of Education- Peru, UNESCO, 2017).

Currently, ICTs have become a substantial element in the daily activities of universities, as well as an essential tool for production and investigative work in groups of researchers and professionals in the knowledge society; for this reason, they have been introduced as didactic means and tools for the management of learning processes, with the purpose of promoting an integral formation with knowledge and technological skills that allows users and optimal development in a society increasingly computerized, and as Tuesta, (2021:441) thinks, "(...) the point is to have teachers trained to assume and raise the level of investigative skills related to Information and Communication Technologies (ICT) to deal with the



demands and opportunities of today's world. ICTs have allowed the systematization of processes in higher education institutions and universities, where streamlining processes of all kinds is the key to quality management, especially in investigative work, Alvarado and Moreno (2017) as already mentioned, but even more because it allows direct access to diverse material on personal and professional development, since there are innumerable sites, blogs, free web pages, which satisfy different needs for user training.

Based on the need for communication between educational institutions and confined students (Alvarado, Rosas, Sansores and Rafael, 2021), interactivity has been required in the teaching-learning processes, for which the education modality has been implemented globally. distance by expanding interaction through virtual learning environments or online learning, as an effective didactic and technological strategy, which has given a solution to the problems raised in the aspect of the continuity of educational activities, in time and space, although with some difficulties, also with great success.

Regarding the aforementioned aspect, the teaching process through virtual learning environments (VLE) have allowed the evolution of the traditional teaching-learning mode towards constructivist or socio-cognitive models, where the student is the center of the processes and the activities, basically is a process of self-training activity with an immediate and active participation of the students; Moreno, Ochoa, Mutter, and Vargas, (2021). In this context, knowledge arises interactively, since the student has in his hands the tool that allows him to analyze, transfer knowledge, share it and assimilate it immediately.

Virtual Learning Environments (VLE) are spaces that allow teaching and learning processes to be conceived from a technological perspective; they represent the update of the classic EAD modality. In this modality, the concepts of e-learning, online courses, flexible teaching, web education, online teaching, among others, arise (MINEDU-Peru-UNESCO, 2017).

The EAD-virtual modality makes it possible to improve teaching and learning processes through the design, implementation and evaluation of a "training plan" using digital networks, technological and multimedia resources, which facilitates students' access to services and resources. In these EVAs, exchange and remote interaction between the participants of the process

(student-teachers, student-students) and the development of the entire teaching-learning process (classes, communication and evaluation) are carried out (MINEDU-Peru-UNESCO, 2017).

Students, teachers, researchers and other interested persons can participate in a virtual environment, because it offers the opportunity to investigate, expand knowledge and communicate; the virtual environment constitutes an opportunity to develop an individual and at the same time collaborative learning process. This last aspect would be developed only if the participants consider that for their own training, an interrelation with the other participants must be given in order to increase the variety in the knowledge obtained and for this each member of the group must be able to value peers and colleagues, and support their own learning through feedback, otherwise it could promote situations of confrontation and conflict.

With regard to the development that a student could achieve when interacting in a virtual learning environment (EVA), several skills to be acquired can be considered. In the case of students, there are competencies such as for example, one enunciated by Lapyere, (2015), which encompasses aspects that could be considered as objectives, when observing participation in an EV. It says: it develops autonomously and effectively in virtual environments of different cultures and purposes; through this competition the student is able to: participate in virtual environments, articulated with hardware, software and networks; carry out these activities making the most of it personally and academically (teaching-learning process); for which you must know these environments in an analytical and critical way; interact, produce their own creations, using the resources provided.

Among other aspects, the aforementioned competence requires them to: function autonomously and effectively, actively participating, creatively, using their own skills in managing the web, obtaining expected results according to their purpose (Lapeyre, 2015).

### **The University and Virtual Environments**

The University constitutes one of the main engines in the XXI Century Society and in the face of current scenarios, of sudden changes, uncertainty, and globalization, the incorporation of Information and Communication Technologies (ICT) in the different areas of life of the human being has been necessary, which has led to making adjustments to



educational models, and moving from paradigms based on teaching in face-to-face mode, to paradigms oriented towards self-learning characterized by flexibility and creativity in the construction of knowledge.

Taking into account the current requirements, on innovation and adaptation of the teaching-learning processes to technological trends, in correspondence with the global measures established to maintain the development of education, which were fast, innovative and revolutionary and promoted the insertion of the knowledge society into connectivity, as a different route but the most indicated, in the opinion of Tuesta, (2021:441). With the subsequent adaptation to new scenarios, in a post-pandemic era, which accelerated all kinds of activity towards reinvention; knowledge and information moved and supported by means of information and communication technologies, continue to be the fundamental pillars to achieve the goals established towards the achievement of the purposes and objectives in the educational field.

Regarding the aforementioned, Alvarado, et al. (2021) indicate that, the benefits of technologies have always been clear and defined economic investment and the incorporation of technological tools are necessary in all types of activities for the development of humanity, in all areas: educational, business, industrial, etc., in order to optimize and improve the quality of processes.

In this regard, it is conducive that educational systems be structured or restructured based on foundations and premises that ensure the transformation of economic, social, political and cultural processes, also requiring training processes that promote attitudes and skills in students to develop a permanent, constant learning and participating both individually and collaboratively, because in our opinion distance education was reinvented to stay.

It should be noted that this is not just a task for students and teachers - the university and higher education institutions must promote and manage quality educational processes and advance at the pace of the expectations that are raised, through technological innovation. In this aspect, "research activity as part of the professional education and training of university teachers and students is one of the aspects to consider to raise the quality of educational processes", according to Alvarado et al., (2021); at the same time that they go hand in hand with the skills or competencies for the effective and

efficient management of technology; investigative skills must be an important part of the curricular structure from the beginning, as competencies or skills required in university education.

Given that educational services are being implemented remotely, it is of priority interest to create, update and adapt pedagogical strategies that link the elements that structure the educational system in terms of human talent and resources that it possesses, together with the virtual, social environment surrounding; all playing a leading role, at the same time and form, through connectivity with a contextualized teaching-learning process, all focused on the success and achievement of educational objectives (Moreno, et al., 2021).

From this perspective, it is necessary to overturn educational paradigms based on preserving and strengthening the pillars of education, and research as a substantive function and basis of knowledge. Strengthening these pillars is of paramount importance; learning to develop understanding, learning to do to influence the environment, learning to live together to share activities and knowledge with others, learning to be to combine the previous three, as expressed by Salgado (2015), when at speaking of the nature of virtual education, infers that "every educational act, whether intentional or not, involves dialogue and exchange between people" being this type of personal interaction or interrelationship, on which everything should focus type of educational modality.

All of the above revolves around interactivity and connectivity, but it distracts us from the real purpose of establishing an effective and truthful communication with students since sometimes it is difficult to achieve it, given the physical distance that exists, Juca, (2016); what is a disadvantage that brings immersed the use of the EVA.

In short, it is about analyzing the basic aspects that support personal and professional training in virtual learning environments (EVA); starting from guaranteeing the individual learning of the students, through self-training, given the importance of learning as a social process. It is also of great importance to design a greater number of training experiences that offer even more possibilities for a more collaborative virtual educational process.

Taking into account that distance education is a type of non-face-to-face education, this disadvantage is observed and that it still maintains



a physical separation, a characteristic indicated by UNESCO, where the teacher trainer and the participant are acting in most of the training process in different spaces (...) Ministry of Education-Peru-UNESCO (2017); a situation that leaves many of the people who are still conservative when it comes to communicating in their comfort zone, or with underdeveloped abilities, At this about Cotán, García and Gallardo (2021), in reference to what Gallardo-López and López-Noguero expressed, (2020), point out that this modality is highly defended by these authors; those who believe in favor of the effectiveness of interactive methodologies, which are as valid, they say, as the traditional ones.

However, in the aspect of the formation of investigative skills, Pozo, Bodero, & Cruz (2016), interpreting Schiavo and Ruiz (2012), describe ICTs as tools that greatly facilitate the work of research groups and/or collectives; but for this purpose universities have as an urgent task, the incorporation of research as an essential part of educational processes, undergraduate and postgraduate, Abykenova, Assainova, Burdina, Murphy and Abibulayeva (2016); consequently, undergraduate and postgraduate students need to acquire not only disciplinary content in an area of knowledge, or the methodological bases for research but also know how to effectively use technological tools that make it easier for them to search, select, organize and analyze information to structure knowledge in less time, which would optimize these processes (George and Salado, 2019)

Understanding that this is a time of continuous scientific and technological advances, we believe that the universities in our Latin American region have not cared enough to make research a compulsory course in undergraduate and postgraduate courses; very fashionable problem, which happens to continue being underdeveloped states, with priorities in other sectors, significantly more important to attend to.

However, this is a priority to achieve significant progress in all areas, and on the other hand, universities constitute the central nucleus that guarantees the scientific-technological development of a country, being the main generators of knowledge as a starting point for this to happen (Dáher, Panunzio and Hernández 2018). This deficiency is observed in postgraduate studies when masters or doctoral students find it very difficult to formulate their research projects and

even more so to complete their degree thesis, which affects the quality of the training they obtain. In this sense, it is necessary to permanently train the student to face the challenges that constantly appear in the world where scientific and technological discoveries are made daily. Universities as study centers are subject to advancing according to the dynamics of educational changes promoting the production of knowledge, so the training and preparation of their students in research on a par with technology is an urgent goal.

## Methodology

The analysis of the reviewed literature made it possible to specify that investigative competencies are treated from different perspectives and approaches by the level of the study subjects: undergraduate students. The challenge of formulating and being able to evaluate investigative competencies stems from the recognition of the role of the University in a globalized society in which it is necessary to reformulate the role of the professor as a researcher.

This was exploratory-descriptive research with a non-experimental design in the context of a case study with an analysis from the interpretive paradigm with a mixed approach. The object of study was to know the mediation of virtual environments as a strategy to develop investigative skills.

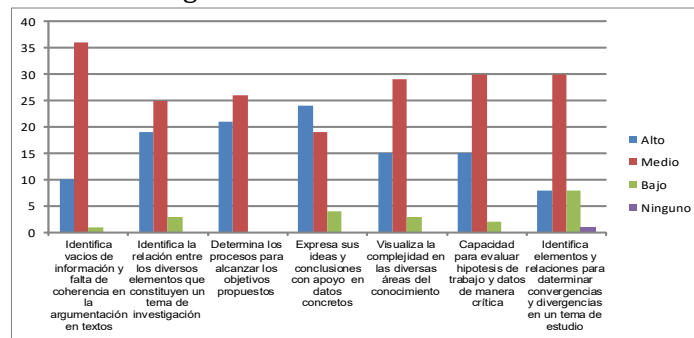
Having as a research question: How do students perceive the development of investigative skills in virtual learning environments? A virtual Likert-type self-assessment instrument was applied. The population under study was 28 students, of which 84% were women and 16% men belonging to the course.

## Analysis of the results

Graph No. 1 contains the criteria that represent the perceptions of the postgraduate students surveyed, referring to: Investigative Skills (Part I), these being the following: information gaps and lack of coherence in the argumentation in texts; relationship between the various elements that constitute a research topic; determination of the processes to achieve the proposed objectives; expression of their ideas and conclusions supported by concrete data; visualization of the complexity in the various areas of knowledge; ability to evaluate work hypotheses and data



critically, and the identification of elements and relationships to determine convergences and divergences in a subject of study.



**Graph 1: Investigative competences (part I)**

Identifies gaps in information and lack of coherence in the argumentation of texts.

Identifies the relationship between the various elements that constitute a research topic.

Determines the processes to achieve the proposed objectives.

Express ideas and conclusions supported by concrete data.

Visualize the complexity in the various areas of knowledge.

Ability to evaluate work hypotheses and data critically.

Identifies elements and relationships to determine convergences and divergences in a subject of study.

High level. Low level. Medium level. None

Source: Own elaboration (2021).

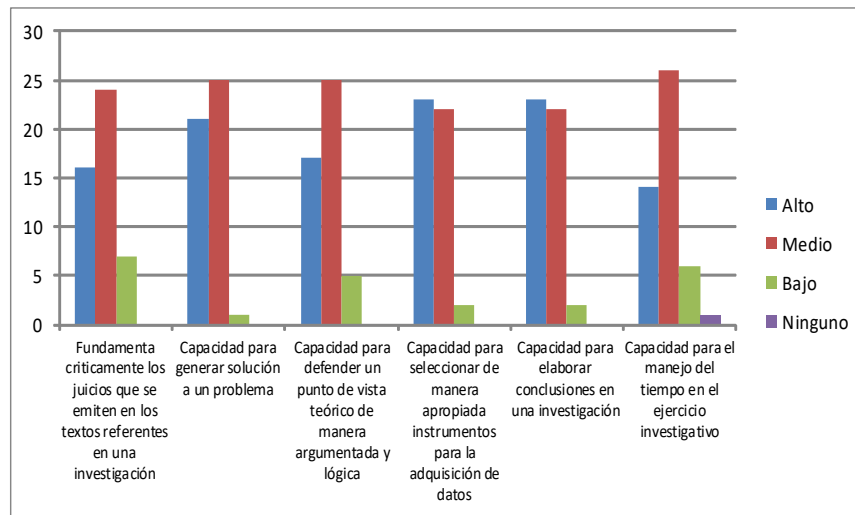
In the results presented in the previous graph: Graph 1, it is visualized the level of development of the skills necessary to develop the investigative competencies, which the students of the course Educational Research Workshop II, who responded to the survey provided virtually, that most of them are at a medium level, according to the skills they have developed or possess as part of their investigative capacity; another part of the respondents answered to be at a high level, in relation to the investigative skills they possess or have developed; in a smaller amount is the group of students who responded to possess a low level of development of these skills. As described above, the results of the survey show that in the context of some skills necessary to develop research competence, students perceive by means of the criteria exposed in the previous graph, that they have not been able to develop all the potential they have to carry out the research task in their respective academic functions. However, this purpose will be achieved to the

extent that they actively participate in training and activities related to the research task, parallel to the work they develop in virtual learning environments (EVA); this last activity (research) provides the space and the necessary tools for the optimal development of both aspects; George and Ramirez, (2019) state in this particular, that the success of students, depends largely on their ability to self-manage the learning process (... ) in the same way they must possess skills to make efficient use of technological tools (George and Ramírez, 2019, pp. 66 ). In the work done through the EVA, students (of any educational level) must face the difficulties, and master both the thematic contents and the basic research activities at the graduate level; as well as have mastery of the technological tool they are using, for the search and dissemination of information, learning management, knowledge publication, and maintain interaction with their peers and students (George and Ramirez, 2019). As for the previous approach, if the teacher has



these competencies (skills and abilities) then they will know how to create spaces for collaboration, stimulate and mediate interactions, and thus manage to favor the construction of learning (Ruíz, Martínez and Galindo, 2015, p.: 32)  
 Then in next Graph No. 2 it is presented a second group of criteria that describe skills to acquire during their training process, to be applied to investigative work, and the resolution of problems raised; these being the following: critical

foundation of the judgments that are issued in the reference texts in an investigation; ability to generate a solution to a problem and to defend a theoretical point of view in an argumentative and logical manner; ability to appropriately select instruments for data acquisition; ability to draw conclusions in an investigation and to manage time in the investigative exercise.



Critically support the judgments that are issued in the reference texts of an investigation.  
 Ability to generate a solution to a problem.  
 Ability to defend a theoretical point of view in an argumentative and logical manner.  
 Ability to appropriately select instruments for data acquisition.  
 Ability to draw conclusions in an investigation.  
 Ability to manage time in the investigative exercise.  
 High level. Low level. Medium level. None

**Graph 2. Investigative competences (part II)**  
 Source: Own elaboration (2021).

In this case, the results on the perceptions of the respondents, represented in Graph No. 2 show a trend similar to that obtained in graph No. 1, that is, a medium to high level is maintained, and a smaller group of those surveyed at a low level of development of these skills. In this regard, the development of investigative skills, confirming the approaches of Pérez et al, (2016) that pose it as the ability to mobilize knowledge and the appropriate way to apply techniques to reflect on action, and build models that facilitate actions to the resolution of problems raised by means of an investigation. This aspect corresponds to the one raised by George and Ramírez (2019), in reference to Mas, (2014) where it is mentioned that investigative competencies are practices in the educational field related to the generation of knowledge, where the

researcher (teacher, student) is able to apply own skills developed from these actions. On the other hand, they work together with the skills of the field of virtuality and information technologies, since the latter allow research processes to be carried out effectively, as expressed by George and Ramírez (2019, p:67), about Berkeley (2004): "investigative competencies must consider among their elements, computational knowledge, necessary to manipulate and transform the information that is generated in the investigative processes"

**Conclusions**

- ✓ In addition to inquiring about the ideas of the students in relation to the use of virtual environments and their research training, it



was important to know the approach they have with information and communication technologies in virtual learning environments, which is a key process. There are no excuses when measuring the level of skills and that there are obvious weaknesses in its use, therefore the ideal is to know what is failing to solve it.

- ✓ It is necessary for universities to update their virtual platforms, making them more user-friendly in order to optimally manage the development of research skills of teachers, which is a weakness that must be resolved. It is necessary to promote the strengthening of research training in university institutions, increasing the acquisition of skills of knowledge and thought important for the development of research skills; understanding that they are interrelated with technological skills, they must go hand in hand in professional training. They must be strategically addressed and included in the teaching methods, creating an adaptable profile that is consistent with the new realities, those that are no longer eligible or not, because they are an important part of any field, labor, educational, social, among others.
- ✓ Research skills are directly related to research training during university studies, as well as training or courses through which knowledge, skills and abilities are acquired.
- ✓ Students in training and even graduated professionals must have the ability to use technology.
- ✓ Currently, and especially in higher education institutions, the consequences of not prioritizing the training in technological skills of students within the curricular structure of all professions are observed. There are also deficiencies and shortcomings in the professional training of teachers, especially those who, at the time of joining the EVA, as a didactic methodology to alleviate the situation of the absence of face-to-face educational activities (in the context of the pandemic) have encountered difficulties in adequately managing the technological and virtual tools implemented.
- ✓ The relationship between investigative skills and technological or digital skills is undeniable; in fact, they are related and this relationship is observed in all actions and environments at a professional level. Virtuality and systematization in educational processes is a

scenario where all kinds of professionals as well as students participate directly and indirectly, inside and outside the university and work campuses.

- ✓ Universities must develop educational models that respond to the needs and demands of today's society, in which they are inserted; it is essential to highlight the commitment they have to promote the generation of relay researchers.
- ✓ A review of the investigative skills of the undergraduate university student is necessary, where technological and remote communication tools become increasingly essential to carry out academic processes, especially evidenced during the last two years, given the declared confinement as a result of Covid-19; this has caused higher education institutions to assume virtuality in learning systems, thus generating important contributions for the academic research performance of universities and the development of cognitive skills in their students.

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