DEVELOPMENT OF RESEARCH COMPETENCE IN EDUCATION: SYSTEMATIC REVIEW OF LITERATURE

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Abstract – The modern world demands better prepared people; that is to say, that they handle diverse competitions; In this framework, the investigations are what make it possible to continue developing other skills; basic and higher education are the most appropriate stages to strengthen them. The objective of this research is to address the development of investigative skills in the educational process. The methodology of systematic literature reviews has been followed, which has allowed the subject to be broadly addressed and, at the same time, synthesized in this work. The results found show that the development of investigative competencies has been studied, mainly in higher education and, mainly, in universities; to a lesser extent at the basic education level. It is demonstrated, in this way, that investigative skills allow strengthening other skills that contribute to a better development in the workplace of future professionals, however, at an early age, it is not cemented.
Keywords: Investigative skills; basic education; higher education; systematic literature review.

INTRODUCTION

Research skills are fundamental in innovation processes, they lead to achieving the sustained development of countries (Skare & Porada, 2022). These competencies are essential, because they allow people to delve into complex situations, discover hidden truths, and analyze evidence to reach precise conclusions (Leshchenko et al., 2021); whether in the field of law enforcement, journalism or various professional settings, in the application of technologies in companies (Arevalo et al., 2023), the power of these cannot be underestimated. They encompass a variety of abilities, including critical thinking, problem solving, attention to detail, information gathering, analysis, and effective communication (Díaz & Cardoza, 2021).Research competencies are not limited to a specific domain; they can be applied in various fields where the discovery of facts, the resolution of puzzles and the understanding of complex systems are crucial (Fuster-Guillén et al., 2022). In investigations, whether to solve a crime, explore a scientific mystery, or expose corporate fraud, the ability to navigate through layers of information, ask pertinent questions, and connect disparate evidence is paramount (Hernández-Gil et al., 2023).

One of the fundamental aspects of research skills is critical thinking (Giacomazzi et al., 2022). It implies the ability to evaluate situations objectively, evaluate evidence skeptically, and analyze information from multiple angles (Guerrero et al., 2022). Critical thinkers possess a keen eye for detail, recognizing patterns, inconsistencies, and gaps that others might miss (Okolie et al., 2022). They ask probing questions and seek relevant information to build a comprehensive understanding of the topic and are crucial to problem solving. Researchers often encounter complex puzzles and challenges that require a systematic and strategic approach, requiring them to develop hypotheses, test theories, and adapt their strategies as new information emerges (Ooi & Husted, 2022). Problem-solving skills encompass creativity, adaptability, and the ability to think outside the box to overcome obstacles and find innovative solutions (Felin & Zenger, 2014).

The collection of information is a fundamental aspect of investigations. Researchers must be adept at finding, collecting, and organizing data from a variety of sources. This includes conducting interviews, reviewing documents, analyzing fingerprints, and using technological tools to extract valuable information. The ability to filter large amounts of data, identify relevant facts, and separate reliable from unreliable sources is vital to the success of investigations (Rivera, 2021). Analytical skills are also essential in investigations, researchers must analyze the information

collected, identify patterns, establish connections and interpret complex data to discover meaningful information, they must use logical reasoning, statistical analysis and deductive thinking to put the puzzle together and draw accurate conclusions; thus, effective analysis helps researchers make informed decisions, identify trends, and provide evidence-based recommendations (Ain et al., 2019).

Finally, effective communication skills and abilities are essential for researchers to communicate their findings, share information with colleagues, present evidence clearly and compellingly, and collaborate with others in multidisciplinary teams. Researchers must possess strong verbal and written communication skills to articulate complex concepts, translate technical jargon into accessible language, and engage with diverse audiences (Díaz Espinoza & Cardoza Sernaqué, 2021). The research aims to carry out an analysis of research skills in educational processes at different levels; Investigative competencies are important to study because they encompass a wide range of skills that are essential for uncovering truths, solving mysteries, and making informed decisions. Cultivating and honing these skills enables individuals to become expert investigators, equipped to navigate through complex situations, discover hidden truths and contribute to the advancement of knowledge in their respective fields.

METHODOLOGY

The processes of systematic review of literature, identify the information that is most relevant and that is written and published about a certain topic; For this, a series of methodological procedures and approaches that have already been established must be implemented (Jahan et al., 2016). The procedures must be routed within the previously specified protocols, which include various tests that have been developed for this purpose. These processes must be algorithmic and exclusive, which must increase the value of the study (Tranfield et al., 2003). The research has followed the three-stage methodology proposed by Tranfield et al. (2003) which are: a) planning the review, b) carrying out the review, and c) preparing the report, presentation and dissemination; These stages are widely used and were applied by (Harrison et al., 2019; Sawyerr & Harrison, 2020). Next, each of the steps developed for the present investigation is disclosed.

1.1.   Step One: Plan the Review

Planning has become an important part of the work, it has allowed us to focus on the topic to be reviewed; In the first place, the study of investigative competencies was carried out through a panel of experts in research topics, receiving favorable comments from them. In the same way, a scope guide was applied contemplating the exhaustive review of the literature written on the subject.

Study questions:

A study was carried out with the purpose of delimiting the scope of the research, this helped to define the review questions, which will lead the process and allow the presentation of results, consolidating, in this way, five research questions:

• At what educational level is the development of investigative skills promoting the most?

• What are the investigative skills that are being promoted the most at the various educational levels?

• What methodologies are the most used in the study of investigative skills?

• Is the development of investigative skills being promoted in high school students?

• What are the variables associated with the development of investigative skills?

Review criteria

In order to guarantee the selection of the most pertinent and relevant information, which guarantees the adequate filter in the quality of the results to be obtained, various criteria have been considered to include and exclude literature (Denyer & Tranfield, 2009), these criteria were the following:

Inclusion criteria
- Documents written in English and Spanish as a product of peer review.
- Relevant documents that lead to answering the research questions.
- Documents that present within their title or in their summary investigative competences.
- Documents that are relevant to achieve the objective of the investigation.
- Documents that have been published from 2013 onwards.
- Documents published in high impact journals.

Exclusion criteria
- Documents that do not have references.
- Documents that do not contribute to the achievement of the research objective.
- Unpublished documents that did not pass blind peer review.
- Documents classified as gray literature.
- Documents with publication prior to the year 2013.

1.2. Step Two: Patch Implementation

Following the steps established for systematic literature reviews, both manual and electronic searches have been carried out in various databases. For this, generic words of what was wanted to be searched on the web have been used. It began with Google Scholar, which made it possible to identify the main sources of information, since it is the most used and generalized at a global level, in addition, that it is used by the main journals in the world, allowing it to be clearly identified which databases data contains the study of investigative skills, significantly narrowing the search.

The following have been selected as databases for the search for information: a) Emerald insight, b) Taylor & Francis online, c) Web of science, d) Scopus, e) SAGE journals, f) Elsevier, and g) Springer link. The aforementioned sources have been used in various literature review processes (Clark et al., 2019). The following information search strings were applied in all the databases:

a)   Investigative skills (in the title)
b)   Investigative skills (anywhere)
c)   Investigative competence (in the title)
d)   Investigative competence (anywhere)
e)   Investi** compe****** (in the title)
f)   Investi** compe****** (anywhere)

The search string returned a total of 945 research articles. These documents were submitted to the criteria established for their inclusion or exclusion, finding within the analysis 86 duplicate documents. Next step, a rigorous review of the documents found has been carried out according to the criteria proposed by Harrison et al. (2016). This process suggests that articles that are based on evidence and unequivocal arguments should be reviewed, in addition to documents that are referenced and meet suitability criteria, also incorporating the selection of their abstracts. This process led to the selection of 64 articles published in refereed journals; Subsequently, a manual comparison was made through the lists of references and citations that were handled. Afterwards, the articles were filtered again with the selection criteria previously proposed, which led to the elimination of 12 articles, leaving the final base with 52 documents, a process completed by May 15, 2023

1.3. Third step: Reporting and dissemination

As a step followed, we proceed to present the various findings of the systematic review process, in addition to answering the questions raised.

Descriptive analysis

In the descriptive analysis, the various results that characterize the research are considered. This section includes: the geographical distribution of the studies, approaches in which the research was developed, the various methods used for data collection, the tests used for data processing, the

years in which the documents were published, the number of citations for each article and the main journals used for the publication.

Geographic Location

The documents analyzed have been carried out in several countries, in the results Peru stands out with 11 cases, Australia and Russia with 4 studies each as the most outstanding. The results are shown in figure 1.

Figure 1. Countries where research skills studies were conducted
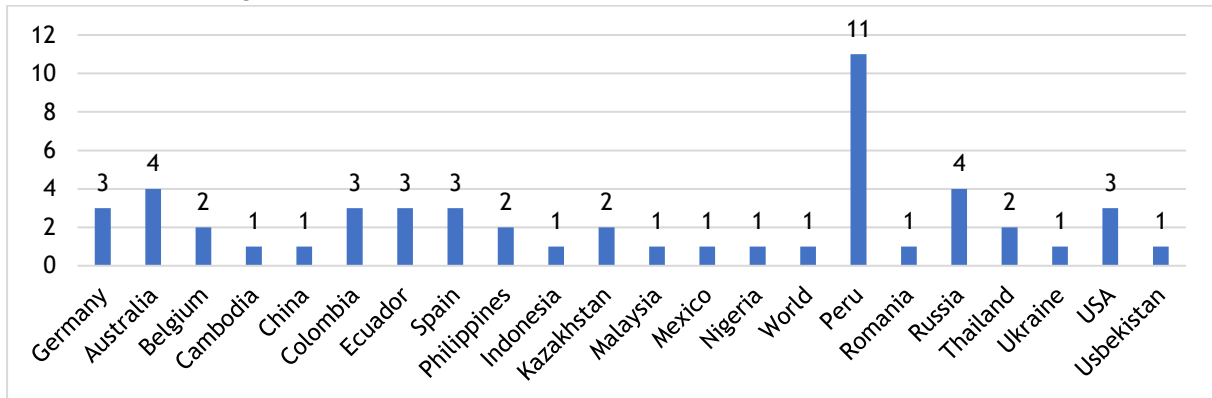
Approaches on which investigations focus

The universe of research documents on investigative competencies, prevail mostly with 42.31% the qualitative approach, 38.46% were carried out under the quantitative approach and 19.3% correspond to mixed methods. As evidenced in figure 2.

Figure 2. Methodological approaches of the reviewed studies
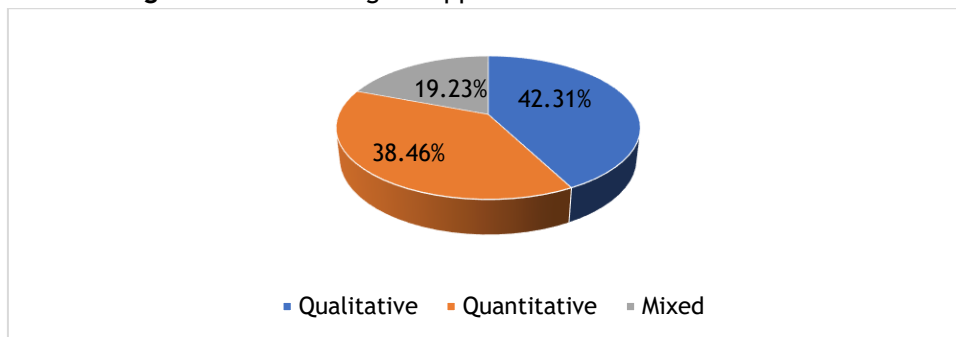
Methods Used To Obtain Data

Various methods have been used to collect data, among which the most prominent are questionnaires in 42% of cases, followed by observation or bibliographic sheets in 25% of cases, application of tests in 15%, guide to interview 4%, panel of experts 2% and other types of methods 12%. These results are presented in Figure 3.

**Figure 3.** Methods used in data collection
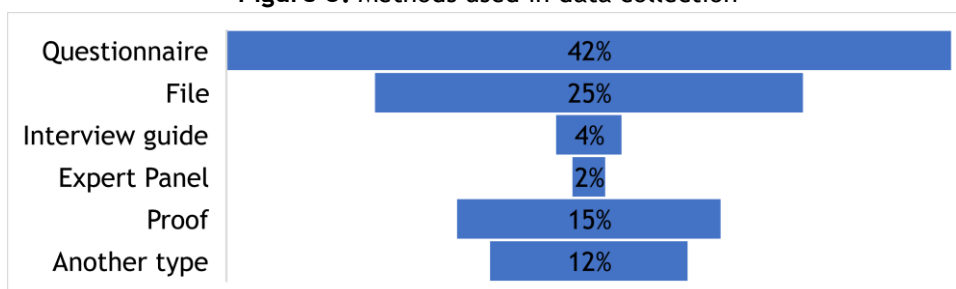
Obtained Data Analysis Methodologies

In the data analysis, the researchers have used various tests between statistics and non-statistics, for example, content analysis stands out with 35% of cases, regression 12% and Pearson correlation as regressions in 10% each. The results are shown in figure 4.

Figure 4. Most used data analysis methods
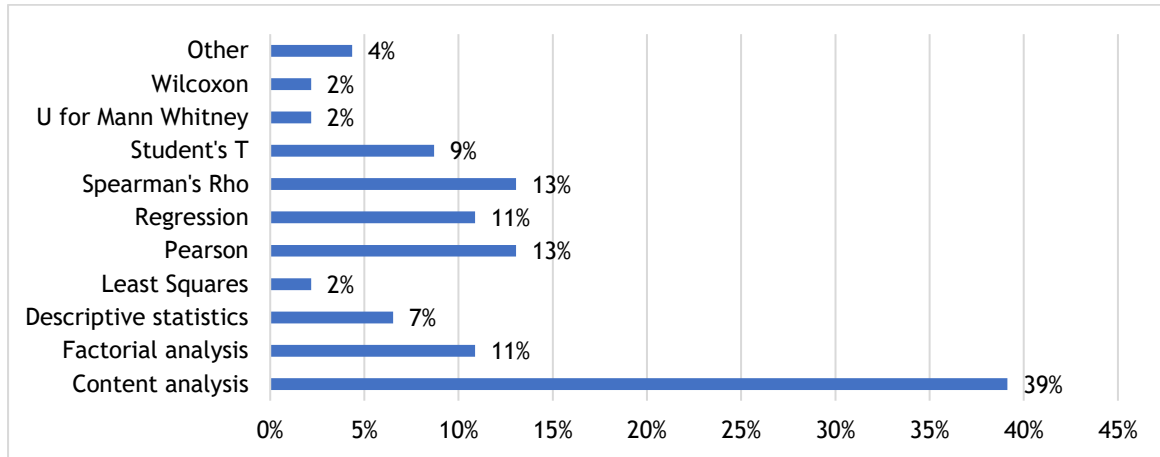
Publications Per Year

In relation to the number of articles that have been published each year, the year 2020 stands out with the greatest number, with 8 studies, the year 2014 with 7 documents published, the year 2023, despite the fact that the entire year has not been measured, there are 6 publications, which demonstrates interest in the subject; With fewer publications, there is the year 2013 with 1 publication and the year 2017 with 2 publications. The information is detailed in Figure 5.

Figure 5. Number of publications by year of study.
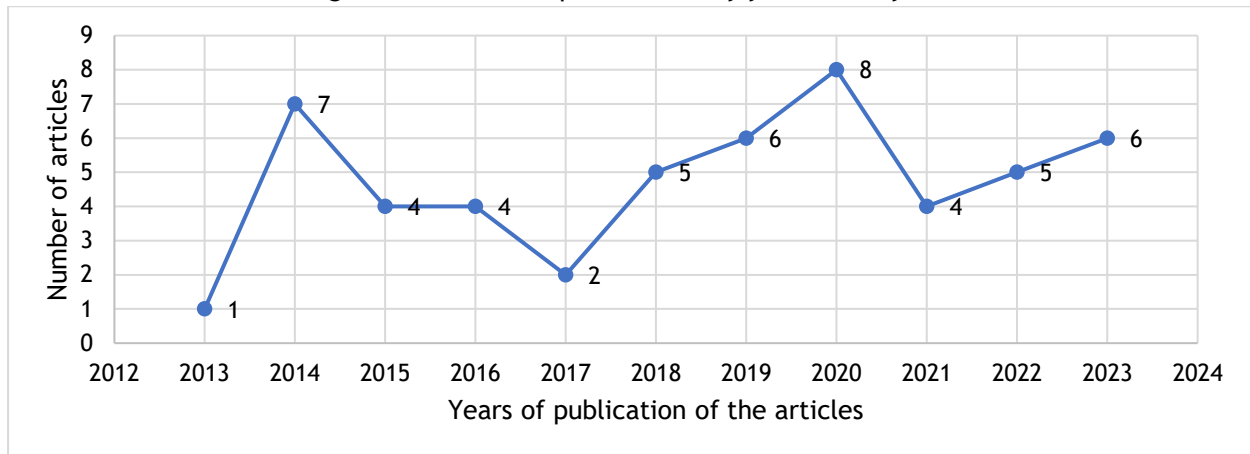
Quotes

The selected articles have been cited in various studies, among which we have (Wester & Borders, 2014) with 157 citations, followed by (Albareda-Tiana et al., 2018) with 136 citations and (Buendía et al., 2018) with 130 citations, as the most important; There are also studies that have not yet been cited.

Magazines In Which It Was Published

There are various journals that are selected by the researchers, in this case the publications have been made in 45 journals, of which we can highlight: Procedia - Social and Behavioral Sciences with

2 articles, Conrado Magazine with 2 publications, Espacios Magazine with 4 publications, Studies in Higher Education with 3 published investigations, the rest with one publication each.

Development Of Research Questions
At what educational level is the development of investigative skills promoting the most?
The research is mainly focused on the study of investigative competencies at the university higher education level (Alvarado et al., 2016), highlighting the research with undergraduate and graduate students. For example, you have Ding et al. (2016) who state that the main purpose in higher education is adequate preparation with suitable skills and knowledge; For this, scientific reasoning must be cultivated that allows them to infer causes and effects from what they observe in their environment, it was found in Chinese students that, regardless of the career they are formed, the scientific reasoning of university students, does not shows greater variation in the process of its formation, that is, no significant variation was found between university education and scientific reasoning.

There is also Marrero & Pérez (2014) who consider that scientific-investigative activity is a fundamental requirement in the training of university students, demanding that professionals graduate from universities culturally and axiologically trained according to their environment in which They will develop, giving solutions to problems that arise in their daily actions. For their part, Nwangwa et al. (2014) who developed their research in Nigeria, focused their attention on how social networks influence research skills in university students, that is, how they impact the ability to obtain information, generate ideas to investigate and whether it allows the achievement of scientific writing skills, demonstrating that university students in the aforementioned country use low-quality information sources such as Wikipedia, Facebook, Blogger or WordPress, concluding that research skills have decreased as a result of the use of this type of tools.

On the other hand, Lambrechts & Van Petegem (2016) relate sustainability competencies with investigative ones, finding that a more holistic vision is lacking that allows both theories to be integrated for joint study and development. Núñez (2019) for his part, considers that the investigative competence is of a medium level in university students, adding that the strategies of teachers are essential for the development of research in students. Guaman et al. (2020), considering that, in modern times, it is vitally important to develop investigative skills in university students, in which a series of behaviors, skills, knowledge, aptitudes and training must be strengthened that allow them to transform the information they obtain into knowledge, behaviors and values that must be applied in the future professional field.

Fuster-Guillen et al. (2022), identified various factors that condition the development of investigative skills in university students, highlighting the research methodological orientation that can be provided to the teacher, in addition to the initial training that the university student has, there is no evidence for the ethics factor in the investigation; students, in Administration it has been found that their research skills are low (Cardoso Espinosa, 2018), while in architecture students, the dissemination skills stand out (Ayala, 2020), the studies were carried out with professors, who must have skills investigations that allow them to better face and develop their work (Stan et al., 2023). Barbachan et al. (2020) found that teaching performance is essential for the achievement of research skills in Peruvian university students. (Rivera, 2021) proposes that investigative skills are irreducible assets of contemporary education, because they will be able to develop projects of daily life and will allow the liberation of the person from the individual and social perspective; Also, a study was carried out with higher education students in Mathematics in order to determine their investigative competencies (Yarullin et al., 2021)

Also Chamorro-Atalaya et al. (2022), carried out research on university students in Peru, finding that they have low research knowledge in both approaches, both qualitative and quantitative; In addition, they do not adequately handle the techniques and instruments for data collection; Also, 72% of the students participating in the study failed to prepare a scientific article, which is part of scientific writing. Fuster & Santa María (2020) in their study covered the use of investigative skills to solve social problems, finding a functional influence of research skills on the skills to solve social

problems. Similar are the results obtained by Vera et al. (2022), who determined that teachers should be guides for university students to improve their investigative skills for reflective thinking and problem solving that arise on a daily basis. It is also important to consider the contributions of Ain et al. (2019) who carried out research on students and how they applied investigative competencies in work performance, finding substantial differences in men and women in various investigative competencies. A study has also been carried out to analyze investigative competencies in secondary school students, finding that the student's grade and career have a significant influence on the formation of investigative competencies (Hernández-Gil et al., 2023).

What are the investigative skills that are being promoted the most at the various educational levels?

Different investigative competencies have been identified; Thus, for example, Huddleston & Bomd (2019) in their study determined the development of nine investigative competencies in university students: a) selecting the topic, b) strategies to search for information, c) finding the appropriate resources, d) knowing how to differentiate between types of information sources, e) knowing how to evaluate sources, f) synthesizing the appropriate information, g) making summaries, h) knowing how to cite, i) knowing how to read and understand quotes. Timmerman et al. (2013) consider that, at the level of university students, the investigative competences of adequately situating the work in the context correctly are being developed, for which primary literature is usually used, also, the hypothesis approach is handled, these two skills are born at the beginning of university careers; while the analysis of data and the elaboration of conclusions tend to be developed in more advanced years.

For their part, Wester & Borders (2014) considers 159 competencies related to research counseling grouped into: a) informed and critical thinking, b) steps to follow in the investigative process, c) ethical and professional competencies to develop research, d) aptitude for appreciation regarding the investigative processes, e) relational aspects with the investigation, and f) continuous training in investigation. Darus & Mohd Saat (2014) for their part, focuses on primary school students, studying an investigative competence: the formulation of hypotheses, which are divided into four categories: knowing the concept of hypothesis, identifying the effects of variables, know how to correlate them and be able to test the hypotheses; it was found that the mastery of this competence in this level of students is quite low.

Rubio et al. (2018) in their research on university students, determined that the most dominant competencies are writing, techniques for collecting data, qualitative analysis; however, the ones that handle the least are specialized bibliographic searches, proper citation and management of quantitative techniques (Gyuris, 2018). Böttcher & Thiel (2018) for their part, considers as research competencies those that allow reviewing the state of the subject, management of methodologies that make it possible to carry out the analysis of results, those that serve to communicate the results and the management of the subject investigated; also Salmento et al. (2021) consider that university students must possess competencies: critical thinking, reasoning, scientific research skills, basic concepts of science, research methodology, research process, origins of scientific knowledge, among others; The results showed that graduate students have deficiencies to clearly master each concept used in the research.

What methodologies are the most used in the study of investigative skills?

Gess et al. (2019) have validated and put at the service of the scientific community a scale that allows measuring investigative competencies in the social field, which can be used in training courses for investigative competencies in university students; in the same way, Alvarado et al. (2016), when validating an instrument to measure investigative competencies. Campos-Ugaz et al. (2022) propose formative research as a strategy for the development of investigative skills in university students; considers five stages in its development: a) sensitize, b) adopt, c) interact, d) evaluate, and e) confront, demonstrating that this strategy is quite effective in the formation of investigative knowledge.

Fuster & Santa María (2020) tested a structural equation model, through least squares to demonstrate that investigative skills significantly influence the solution of social problems in university students. Wannapiroon (2014), for his part, proposes a model to develop investigative competencies, stating that a favorable virtual learning environment should be included, a system installed in the cloud that allows them to manage it, implementation of various learning courses, having a adequate support, communication strategies, evaluating the learning process and carrying out the activity; To this end, it proposes that procedures such as an introduction to the program, various storyboards, magisterial conferences, technological and communication resources, teacher consultancies, blogs, evaluations, work presentations and exams that allow measuring the effect should be included.

Another model is the one proposed by Syzdykbayeva et al. (2015) which includes objectives, information, processes and various pedagogical conditions for its implementation, with the aim of developing investigative skills; for its processing, it uses the model of structural equations that help it to test the proposed model. Davidson & Palermo (2015) proposed the use of research projects and systematic literature reviews, a methodology that improves research skills in university students to a small degree (Qin et al., 2022). Yarullin et al. (2021) propose a model for the development of research skills in higher level students of Mathematics, it integrates the context, where information and communication is obtained, personal activities of researchers and systems that integrate knowledge of mathematics, computer science and pedagogy.

Khan et al. (2016) propose a model that integrates the diagnosis and training of competencies in students who are being trained for teaching; In the case of the diagnosis, various components have been used, such as the axiological, emotional, motivational, cognitive, behavioral and the control of the evaluations carried out; It was achieved that, through the implementation of a model using a training program, the research skills of future primary school teachers are improved. On the other hand, Böttcher & Thiel (2018) propose a methodology to be able to evaluate the investigative competences in different disciplines of knowledge at the university level, they consider five dimensions in their model, among them: the competences to review the state of the subject to be investigated, competences methodological, skills to analyze the results, skills to communicate the results and extensive knowledge of the content investigated.

There is also Gorshkova (2017) and Gorshkova (2018) who, in their work carried out on technical higher education students, consider that the functional model is a very important model for the development of investigative competencies; action research methodologies have been implemented in future teachers (Toquero, 2021); formative research methodologies Sabariego Puig et al. (2020). Among the most used methodologies for data analysis, those for content analysis stand out. (Buendía et al., 2018; Hernández-Gil et al., 2023; Lander et al., 2019; Skurikhina et al., 2018). While Dios-Castillo et al. (2022) propose using idea organizers in order to improve research skills in postgraduate student counseling processes.

Is the development of investigative skills in basic education students being promoted?
There are few studies that address competencies at the basic education level, specifically in secondary education, however, we have a study conducted by Darus & Mohd Saat (2014) in primary school students, considers an investigative competency such as the hypothesis approach, evidencing that the participants have low and very low levels in this competition. Udompong et al. (2014) proposes to carry out a literacy in investigative competences, mainly at the secondary level, since it will promote a better mastery of them and obtain better results in their learning processes.

Skurikhina et al. (2018) on the other hand, propose that the development of investigative skills can be improved by using robotics as a motivation tool for schoolchildren and associating them with the research process; likewise, technologies can be used in various subjects. On the other hand, Maddens et al. (2021) associates investigative competencies with the age of the schoolchildren, gender, trajectory in their education, autonomous and controlled motivations, as important variables that affect the development of their investigative competencies. Finally, Hernández-Gil et al. (2023) carried out a study to determine the importance of the implementation of

investigative competencies based on the directors of educational centers, they considered three important aspects to take into account in this task: interacting adequately with the members of the educational community, obtaining the adequate resources and articulate in an ideal way with those of a pedagogical type that the institution has and efficiently manage the human powers that are within the institutions.

What are the variables associated with the development of investigative skills?

Nwangwa et al. (2014) who developed his research in Nigeria, focusing his attention on how social networks influence research skills in university students, that is, how they impact the ability to obtain information, generate ideas to investigate and whether it allows achievement. of scientific writing skills, showed that university students in the country studied use low-quality information sources such as Wikipedia, Facebook, Blogger or WordPress, they concluded that research skills have decreased as a result of the use of this type of tools. As well as digital skills for the development of investigative skills (Leshchenko et al., 2021). On the other hand, Lambrechts & Van Petegem (2016), related sustainability competencies with investigative ones, finding that a more holistic vision is lacking that allows both theories to be integrated for a joint study and development. Fuster-Guillen et al. (2022), also identified various factors that condition the development of research skills in university students, standing out the methodological research orientation that the teacher can provide; In addition, the scarce training that the university student has, not finding evidence for the ethics factor in research.

Barbachan et al. (2020) in their study related teaching performance to the development of research skills, demonstrating a positive and significant relationship between these variables. Scogin et al. (2023), carried out a study where they test motivation as an important variable for the achievement of research skills in university students, they showed that the motivation of future university professionals had a significant reduction in the process of developing research skills, negatively highlighting autonomy in this process; recommend the application of new strategies that allow students to improve the choice of topics, increase competition, inspire greater discovery and generate new opportunities for iteration in the processes of research generation. Feruza & Fozilovna (2023) also consider that the English language is a very important variable in the development processes of investigative competencies, since the greatest amount of information is written in this language, they recommend further strengthening in this field. (Sánchez & Rodríguez (2023) propose an action research strategy in order to develop investigative skills, thus improving basic level skills such as information search, analysis of data obtained and improving attitudes towards research topics (Díaz Espinoza & Cardoza Sernaqué, 2021).

Other studies such as the one developed by Timmerman et al. (2013) consider that the development of investigative competencies is associated with the threshold theory, stating that the research processes are developed in leaps of transformation and not only as a process of gradual progression. Likewise, Wester & Borders (2014) have incorporated counseling processes into their study as an element to achieve better results in the achievement of investigative competencies. Udompong et al. (2014) relates in their study scientific literacy as a means to achieve investigative skills in students, in addition, considers in their theoretical model and empirically proves that access to the Internet, computer skills and the teaching methods used, favor in to a large extent the scientific literacy of teachers and students (Groß et al., 2015). Davidson & Palermo (2015) explore in their work, including attitudes towards research on the part of students. Research skills have also been associated with sustainability, Albareda et al. (2018) propose a holistic research approach, using a project-oriented learning methodology, they managed to implement a model that allows research and sustainability skills linked to sustainable development goals to work together. It has also been related to academic performance in master's degree students, demonstrating that investigative skills allow them to obtain better results in their training process as specialists (Hendriarto et al., 2021).

CONCLUSIONS

It is evident in the research that the development of investigative skills has been concentrated, mostly, in the professional training processes, at the higher university level, both in undergraduate and postgraduate courses, because it is associated with the development of other skills that it helps them to solve labor problems, that is, when students practice their profession; Wide development has been found at postgraduate levels, both in teachers and students, which are implemented to provide solutions to real everyday problems. The research reflects that a greater number of qualitative studies have been carried out, leaving gaps in conclusive research, such as the quantitative approach and, to a lesser extent, research with mixed approaches. Thus, the great gap in applying research at lower levels of education can also be manifested; For this reason, it is suggested to start at an early age, in the formation of investigative competences, work must be done on the literacy of these competences, which will contribute so that, at higher levels, their application in the solution of concrete problems of investigation is better mastered. the society.

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