The Research Competencies of University Professors: A Literature Review

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EN | Abstract:

One of the primary functions of universities is knowledge generation through research; however, the fulfillment of this function is influenced by various factors, among which the research skills of university professors stand out. In this context, this study aimed to understand the current state of research on the research competencies of university professors and the gaps in this field through the analysis of available scientific literature from 2008 to 2023 on the subject. To achieve this, a systematic literature review was conducted, which included planning, selection, extraction, and analysis of relevant scientific articles. The results indicate an interest in emerging countries in characterizing research competencies among university professors. Additionally, there is a predominance of quantitative methods for their study and an emphasis on identifying specific research competencies, rather than general ones, among university faculty. Therefore, future research could focus on identifying research competencies from a comprehensive perspective and through the application of mixed methods.

Keywords: *scientific activity, teacher competencies, research, scientific researcher, academic staff, SDG 4, SDG 10, SDG 16, SDG 17.*

ES | Abstract:

Una de las funciones principales de las universidades es la generación de conocimiento a través de la investigación; sin embargo, el cumplimiento de esta función se ve influenciado por distintos factores, entre los que destacan las habilidades investigativas de los docentes universitarios. En este contexto, el presente estudio tuvo como finalidad comprender el estado actual de las investigaciones acerca de las competencias investigativas de los profesores universitarios y los vacíos en este campo a través del análisis de la literatura científica disponible de 2008 a 2023 sobre el tema. Para ello, se realizó una revisión sistemática de literatura que incluyó la planificación, selección, extracción y análisis de artículos científicos relevantes. Los resultados indican que existe un interés en países emergentes en caracterizar las competencias investigativas, los docentes universitarios. Asimismo, se identifica una predominancia de métodos cuantitativos para su estudio y un énfasis en identificar las competencias investigativas específicas, en lugar de generales, del cuerpo docente universitario. Por tanto, futuras investigaciones podrían enfocarse en identificar las competencias investigativas desde un enfoque integral y a través de la aplicación de métodos mixtos.

Palabras Clave: *actividad científica, competencias del docente, investigación, investigador científico, personal académico docente, ODS 4, ODS 10, ODS 16, ODS 17.*

I.INTRODUCTION

Historically, universities were established to fulfill two functions. The first involves understanding reality and what occurs within it; the second is to prepare future workers to integrate into the labor market (Moscardini et al., 2020). This dual function has created tension between the vocational and academic roles that universities must fulfill. Consequently, many of them focus on academically training professionals for employment, paying attention to the fundamental role they should play in generating and disseminating knowledge through research (Coronado, 2018).

Research contributes to the development of communities and societies in general by providing solutions to problems and generating new knowledge (Coronado, 2018). Additionally, it enables a country's economic and social growth by fostering innovation and the development of technologies (Lukovics & Zuti, 2015), directly impacting regions' productive competitiveness (Lukovics & Zuti, 2015). This creates a close link between research and universities as knowledge production centers (Coronado, 2018).

Despite its importance, various studies have documented the challenges faced by university professors when conducting research, such as lack of time and resources (Pérez-Penup et al., 2023). However, one of the most prominent and alarming challenges is the lack of necessary research competencies to carry out quality research projects (Iqbal & Mahmood, 2011). This lack of research competencies results in negative consequences for scientific productivity and contributions of university professors, especially in developing countries where scientific production is low (Nazer et al., 2021). Similarly, it affects the quality of research projects, leading to less rigorous studies and unreliable results (Iqbal & Mahmood, 2011).

In response to this issue, various studies have addressed research competencies from different approaches and methodologies to characterize university professors and create training programs that strengthen the research capacities of teachers. In this context, this research aims to understand the current state of this line of investigation and the gaps in this field by analyzing available scientific literature from 2008 to 2023 regarding research competencies in university professors.

Research Competencies

Tobón (2007) defines competencies as dynamic and complex processes that integrate and apply knowledge, skills, and attitudes in specific contexts to achieve successful performance in a given task. This definition implies acting on reality through applying knowledge, skills, and attitudes in analyzing and resolving problems. Although generic, this conception of competencies provides a global framework from which the notion of research competencies, specifically applied to university professors, can be derived.

In this sense, Dipp (2013) proposes a specific definition of research competencies, directing them toward carrying out research activities effectively and functionally, such as formulating problems, analyzing and interpreting data, and applying the results for decision-making. Similarly, Guajardo et al. (2011) indicate that research competencies refer to an individual's ability to conduct research effectively, using appropriate methods and critically analyzing data. Additionally, they emphasize the ability to communicate findings clearly and coherently. This aligns with the definition proposed by Di Virgilio et al. (2007), who conceive competencies as skills that researchers employ at both theoretical and practical levels in developing their research, highlighting the selection of effective research strategies and coherent communication of results.

On the other hand, Buendia-Arias et al. (2018) point out that research competencies can be understood as knowledge that enables critical, reflective, and quality research. In their definition, unlike Dipp (2013) and Guajardo et al. (2011), they highlight technological and observational aspects, such as using digital tools for research and analyzing the context to identify research problems.

Classification of Research Competencies

Competencies are classified in various ways; however, two categories consistent in the literature can be distinguished. The first is competencies specific to a particular field (Tobón, 2007). These competencies refer to specific skills and knowledge related to an area of study or a particular discipline. In this category, the necessary skills for conducting research are configured, such as problem formulation, literature search, data collection, and result analysis. Along these lines, Dipp (2013) classifies these specific competencies into four subcategories:

1. Methodological referring to the selection and application of research methods and techniques
2. Cognitive, related to analysis, evaluation, synthesis, and interpretation of information
3. Communicative, which entails the ability to communicate results clearly and efficiently
4. Social, which pertains to the ability to work with other researchers in conducting research

On the other hand, Di Virgilio et al. (2007) conceive specific competencies as skills applicable only to a particular discipline, such as understanding theories and identifying literature relevant to that field. Di Virgilio et al.'s (2007) proposal acknowledges that the skills necessary for conducting research vary by discipline; however, it overlooks that these differences stem from the inherent knowledge of each discipline rather than the skill required to attain that knowledge (Tobón, 2007). Therefore, differences between disciplines vary due to the nature of their knowledge rather than the skills required to attain it. Consequently, it can be inferred that specific research competencies apply to every research process.

The second classification of competencies comprises generic or transferable competencies (Tobón, 2007). These competencies refer to skills and knowledge applicable to different

contexts and situations. In this regard, these competencies transcend a specific field, such as research, and can be applied professionally and personally. Some skills constituting this classification include leadership, critical thinking, teamwork, decision-making, and adaptability to change (Tobón, 2007).

It is important to emphasize that specific and generic competencies are not mutually exclusive; they complement each other to ensure high-quality research. Therefore, this comprehensive view of competencies should be considered in studies related to the research competencies of university professors (Dipp, 2013).

Challenges in the Study of Research Competencies

The literature describes several challenges in the study of research competencies. One is related to the design of appropriate assessment instruments to determine and measure the research competencies of teachers (Dipp, 2013). In this regard, methods and techniques are required to identify competencies objectively and to apply techniques that reduce the interference of possible researcher biases, such as combining methods and piloting data collection tools, so that the results are valid and reliable (Creswell, 2002).

On the other hand, another challenge in this field of study is the identification of research competencies relevant to university contexts (Guajardo et al., 2011). This involves determining those skills considered necessary for conducting research. Although there are different models of research competencies (Dipp, 2013; Di Virgilio et al., 2007; Tobón, 2007), the selection of the most suitable model is required considering the particularities of the context, as well as adapting it to the needs based on the institution's expectations in terms of quantity and quality of research, available resources, and teachers' workload.

Another challenge to consider is the changes in research practices (Di Virgilio et al., 2007). These changes may be driven by technological advances and the emergence of disciplines and research lines, which demand the design and use of techniques requiring acquiring new skills. This highlights the need to constantly reflect on and update university professors' research competencies to respond to research demands.

In summary, conducting studies on research competencies in university professors is a complex task, which requires correctly identifying the methods and techniques to be used to assess these competencies, considering appropriate criteria for the selection of competencies to be studied, and taking into account the advances and evolution of research practices. In this sense, it is advisable to systematically review the literature to understand the current state of this line of research and the gaps in this field.

II.   METHODOLOGY

For the development of this study, a systematic literature review was conducted through the identification, evaluation, and synthesis of available research on the topic (Perez-Penup, 2019). Two reasons prompted the selection of this methodology. Firstly, it allows for a deep understanding of the state of the art of existing literature in a specific field of study (Paul et al., 2021). Secondly, it identifies gaps in current research, thus contributing to advancing knowledge in the studied field (Paul et al., 2021).

For the systematic literature review, the protocol suggested by Perez-Penup (2019) was applied based on the stages proposed by Okoli and Schabram (2010), which include planning, selection, extraction, and execution.

During the planning stage, Google Scholar and Scopus were determined as search engines, as they are widely used databases in scientific literature. Those published in English and Spanish between 2008 and 2023 were considered to identify relevant articles. Initially, the following keywords were used in the search engines: "research competencies" and "university professors,"; "research skills," and "faculty members," and their equivalents in Spanish. Articles whose titles included these keywords were preselected. As a result, a total of 65 articles were obtained.

In the selection stage, two procedures were carried out. First, a reading of the abstracts of the preselected texts was performed to verify that they met the inclusion criteria. In this regard, the included articles had to:

- Investigate the research competencies of teachers.
- Address the context of university professors.
- Be primary research (experimental, case study, etc.).
- Follow the MRD structure (Methodology, Results, Discussion).
- Have undergone peer review.

Applying these criteria, 27 articles were included in the systematic review.

Second, articles were evaluated based on the criteria list proposed by Kmet et al. (2004), including specific quantitative and qualitative research criteria. From this list, criteria applicable to both types of research were selected, resulting in the selection of eight criteria, detailed below:

1. The research question and objective were described.
2. The study design is consistent with the research question and objective.
3. The study's context is clearly defined.
4. The research is grounded in a theoretical framework.
5. The sampling strategy is described, relevant, and systematic.
6. Data collection methods are clearly described.
7. Includes verification methods to ensure credibility.
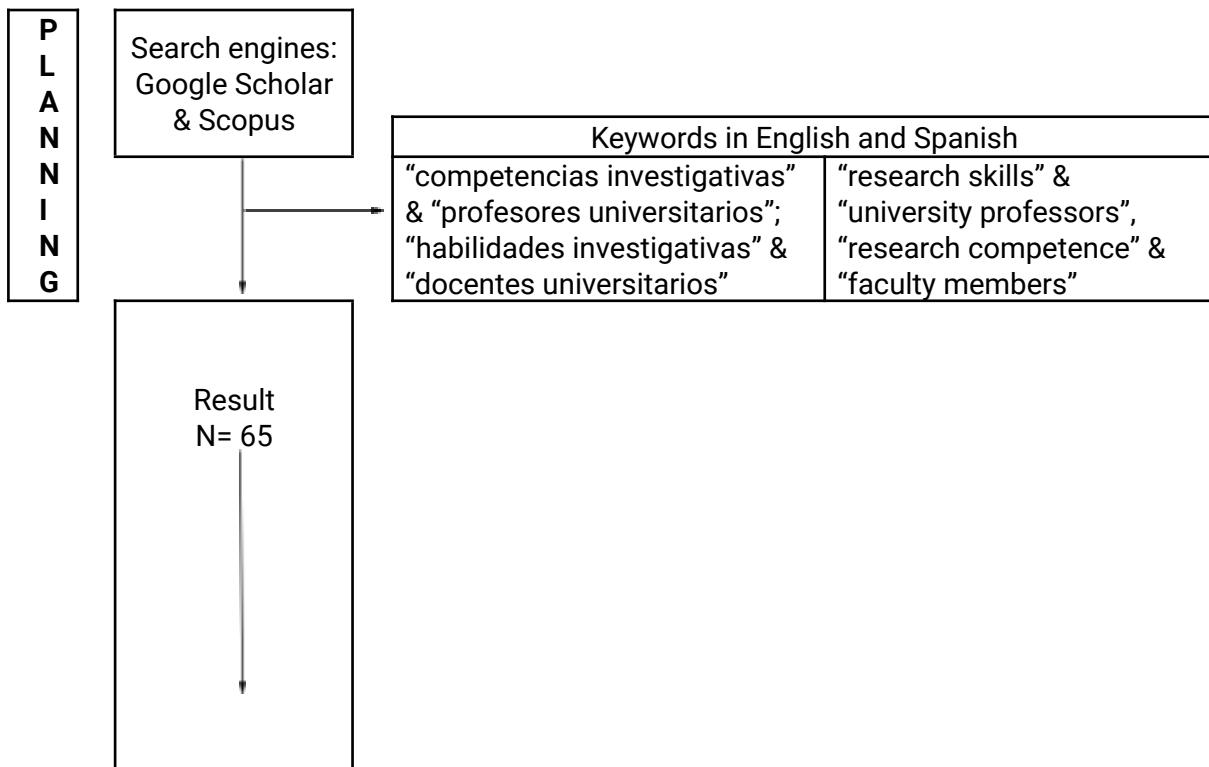8. The results support conclusions.

Each criterion was critically read to evaluate the articles, and a score of "1" was assigned if it was met and "0" if not. Articles that met at least seven of the eight criteria were selected for data analysis. As a result, 22 articles met the quality standard for the systematic review.
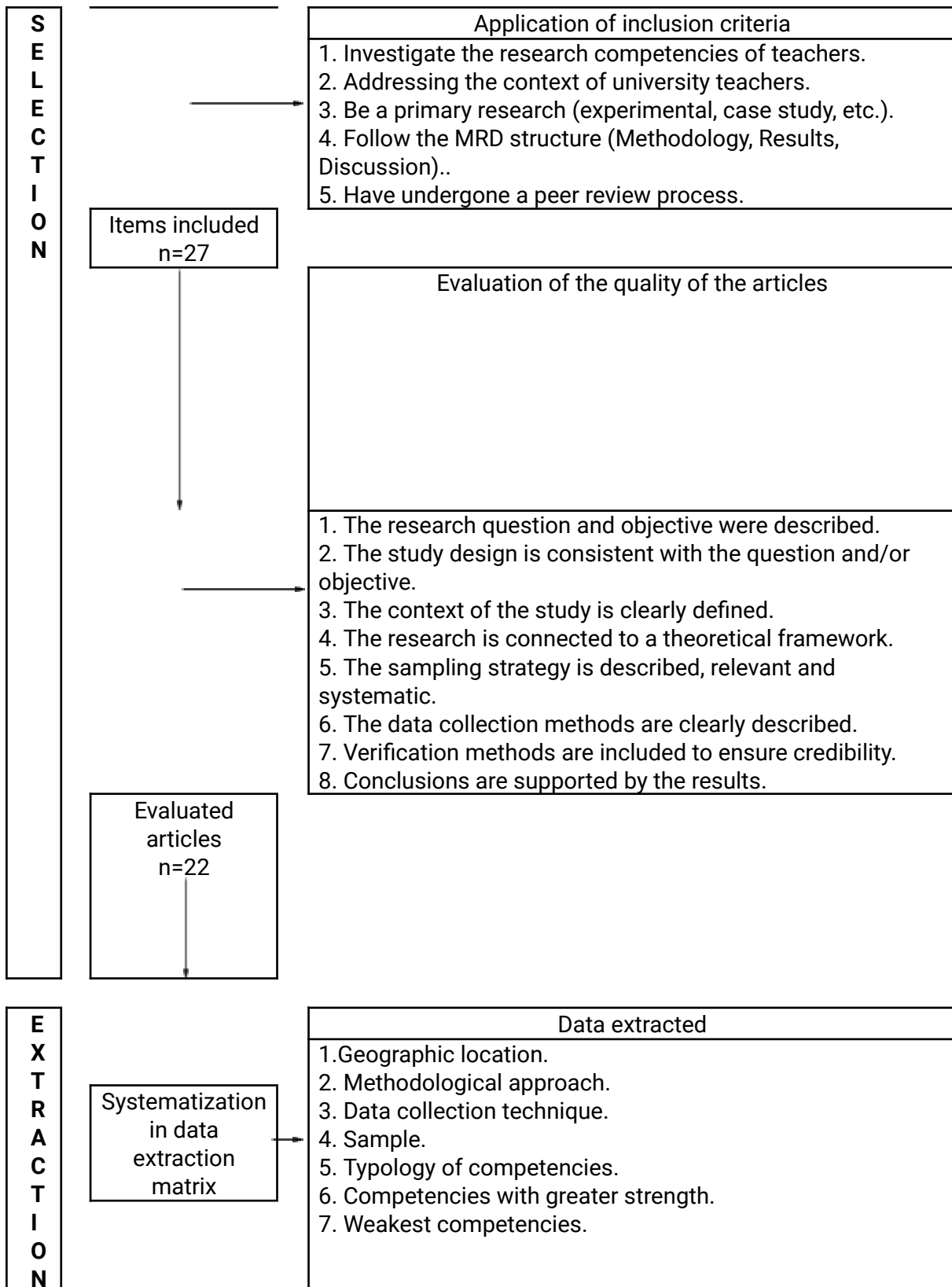
The final stage consisted of extracting information from the evaluated articles. For this purpose, a data extraction matrix was used, facilitating the orderly collection of information and comparing and analyzing articles. The extracted information included:

- Geographical location: Refers to the country of origin of the study reported in the article.
- Methodological approach: Refers to the approach guiding the collection and analysis of data reported in the article.
- Data collection technique: Refers to the specific method used to collect information in the study.
- Sample: Refers to the type and number of population selected for the research.
- Typology of competencies: Refers to the article's classification of highlighted research skills.
- Competencies with strengths: These are those skills that the studied population positively highlights.
- Competencies with weaknesses: These skills present deficiencies or shortcomings in the investigated population.
- Subsequently, data synthesis and analysis were conducted using a descriptive quantitative approach with the obtained information, allowing for objectively understanding and identifying trends and patterns in the systematically reviewed studies (Hernández Sampieri et al., 2014).

The following diagram summarizes the process applied for the systematic review of the selected articles.

Figure 1: Systematic review process of articles.

SELECTION

Application of inclusion criteria
1. Investigate the research competencies of teachers.
2. Addressing the context of university teachers.
3. Be a primary research (experimental, case study, etc.).
4. Follow the MRD structure (Methodology, Results, Discussion)..
5. Have undergone a peer review process.

Items included n=27

Evaluation of the quality of the articles
1. The research question and objective were described.
2. The study design is consistent with the question and/or objective.
3. The context of the study is clearly defined.
4. The research is connected to a theoretical framework.
5. The sampling strategy is described, relevant and systematic.
6. The data collection methods are clearly described.
7. Verification methods are included to ensure credibility.
8. Conclusions are supported by the results.

Evaluated articles n=22

EXTRACTION

Systematization in data extraction matrix

Data extracted
1.Geographic location.
2. Methodological approach.
3. Data collection technique.
4. Sample.
5. Typology of competencies.
6. Competencies with greater strength.
7. Weakest competencies.

III.   RESULTS

The review of articles identified four main trends in studies related to the research competencies of university professors, regarding the origin of where the competencies were conducted, the research methods used, the classification of the investigated competencies, and the strengths and weaknesses identified in the studied university professors. Table 1 presents a summary of the analysis conducted.

Table 1: Analysis of the articles.

Criteria	Result	Quantity	%
Geographic Location	America: Ecuador, Colombia, Peru, Costa Rica, El Salvador, Venezuela, Cuba.	14	63.64
	Europe: Spain.	1	4.55
	Asia: Philippines, Indonesia, Afghanistan.	7	31.82
Methodological Approach	Quantitative	14	63.64
	Qualitative	3	13.64
	Mixed	5	22.73
Data Collection Technique	Survey	13	59.09
	Interview	3	13.64
	Both	5	22.73
	Test	1	4.55
Sample	Teachers	20	90.91
	Students	1	4.55
	Both	1	4.55
Typology of Competences	Specific	15	68.18
	Both: Specific and General	7	32.82
Competences with Greatest Strength	Literature Review	8	36.36
	Teamwork	1	4.55
	Writing	1	4.55
	Scientific Problem-Solving	4	18.18
	Scientific Production	1	4.55
	Data Analysis	1	4.55
	Research Design	2	09.09
	Ethics	1	4.55
	Not specified	3	13.64

Competences with Greatest Weakness	Statistical Analysis	5	22.73
	Technology	2	09.09
	Ethics	1	4.55
	Dissemination and Publication	5	22.73
	Teamwork	1	4.55
	Resource Management	1	4.55
	Research Design	3	13.64
	Administrative Aspects	1	4.55
	Discipline	1	4.55
	Not specified	2	09.09

Study of Investigative Competencies in Emerging Countries

A trend observed in the studies was that 96% (21) of the research was conducted in emerging countries. Specifically, 63.64% (14) of them were carried out in Latin American countries, such as Ecuador (e.g., Álvarez-Ochoa et al., 2020; Moscoso & Carpio, 2022), Colombia (e.g., Correa, 2019), Venezuela (e.g., Balbo et al., 2015), Peru (e.g., Casimiro et al., 2021), Costa Rica (Campos et al., 2012), and El Salvador (Martínez et al., 2022). 31.82% (7) were conducted in Asian countries, such as the Philippines (e.g., Pedrajas & Bito-onon, 2022; Rodríguez et al., 2021), Indonesia (Sondari et al., 2016), and Afghanistan (Tahsildar & Hasani, 2021).

Only one of the studies was conducted in a developed European country, specifically, Spain (Mas-Torreló, 2014). It is worth noting that no studies in this field were carried out in Africa or English-speaking countries, except for the Philippines, which suggests a gap in research in these regions.

Quantitative Approach in the Study of Investigative Competencies

Regarding methods, the review identified a predominance of quantitative methods, representing 63.44% (14) of the total articles. These studies utilized self-administered surveys as tools to determine investigative competencies based on teachers' perceptions (e.g., Ayala & Barrera, 2018; Gacrama & Baptista, 2019), with the exception of one study (Roman, 2021), which employed a 75-item test to gather data. Through this test, participating teachers applied their research knowledge to assess the level of competency development. On the other hand, 22.73% (5) employed a mixed method, using both interviews and self-administered surveys as research instruments (e.g., Mas-Torreló, 2014; Correa, 2009). Only 13.64% (3) of the studies utilized a qualitative method, conducting interviews to explore teachers' investigative competencies (Álvarez et al., 2022; Sondari et al., 2016; Suárez, 2018). It is worth noting that all reviewed studies collected data based on teachers' perceptions, except for Casimiro et al.'s research (2021), which utilized students' perspectives to evaluate teachers' investigative

competencies. Another exception is Mas-Torreló's study (2014), which, in addition to gathering teachers' perceptions, included those of students to provide a contrast between both sources.

Typology of Mostly Studied Research Competencies

The results of the review demonstrate that 68.18% (15) of the articles focus their research on identifying specific research competencies of teachers, i.e., those solely applicable in research processes, such as problem formulation, data analysis, and dissemination of results (e.g., Balbo et al., 2015; Gómez & Panaligan, 2013). The remaining 32.82% (7) of studies focused on specific and generic competencies, measuring teamwork, resource management, and organization (e.g., Campos et al., 2012; Suarez, 2018). These findings suggest a preference for studying competencies oriented explicitly toward research, overlooking other generic competencies.

Predominant Research Competencies

In 36.36% (8) of the reviewed studies, the most developed specific research competencies in teacher surveys are those related to skills for literature review, such as information retrieval from databases, identification of appropriate literature, and synthesis of relevant information (e.g., Ruiz et al., 2016; Álvarez-Ochoa et al., 2020). Secondly, competencies related to scientific problematization stand out, i.e., the ability to formulate research questions and pose problems, with 18.18% (4) of articles (Álvarez et al., 2022; Yangali et al., 2020). Other reported strengths to include research design (e.g., Martínez et al., 2022), scientific production (Mas-Torreló, 2014), writing (Gómez & Panaligan, 2013), and data analysis (Roman, 2021). Regarding general research competencies, only two studies report strengths in teamwork (Campos et al., 2012) and ethics (Sondari et al., 2016). 13.64% (3) of the articles do not specify strengths, as they focus solely on identifying skills, as in the studies by Suárez (2018) and Moscoso & Carpio (2022). On the other hand, Casimiro et al. (2021) do not specify the most developed competency because, in their research, they found that surveyed teachers report having all research skills developed to a reasonable level without specifying one skill that stands out more than another.

Less Developed Research Competencies Among University Teachers

According to 22.73% (5) of the reviewed studies, specific competencies related to statistical analysis, such as handling statistical software and selecting statistical analysis techniques, are the least developed by teachers (e.g., Campos et al., 2012; Rodríguez et al., 2021). Similarly, another 22.73% (5) of the articles agree that competencies necessary for article publication, such as article writing and participation in dissemination activities, are skills that teachers should continue to strengthen (e.g., Balbo et al., 2015; Pedrajas & Bito-Onon, 2023).

Another weakness reported by 13.64% (3) of articles is related to research design, such as the development of research projects and data collection techniques (e.g., Gómez & Panaligan, 2013). Other studies reported opportunities for improvement in the following general competencies: teamwork (Casimiro et al., 2021), ethics (Roman, 2021), technology (Gacrama

& Baptista, 2019; Tahsildar & Hasani, 2021), resource management (Correa, 2019), administrative aspects (Mas-Torreló, 2014), and discipline (Yangali, 2020). Only 9.09% (2) of the studies do not specify weaknesses (Moscoso & Carpio, 2021; Suárez, 2018).

IV. DISCUSSION

The results presented in this study offer an overview of the current state of research on the research competencies of university teachers. Firstly, they reveal an interest in emerging countries in characterizing teachers' competencies. One possible explanation for this finding could be related to the low levels of scientific productivity present in many of these countries, which limits the competitiveness of their workforce and, consequently, the region's development (Nazer et al., 2021; Iqbal & Mahmood, 2011). In this regard, identifying the research competencies of university teachers allows for the development of training programs and desirable academic profiles to fulfill the research function of universities in these countries (Lukovics & Zuti, 2015).

Regarding the methods employed in researching these competencies, the results indicate a preference for quantitative methods, collecting data through self-administered surveys. This preference may result from prioritizing individual perceptions and the complexity of measuring competencies (Tobón, 2007). On the other hand, it is worth noting the suggestions of Dipp (2013) and Creswell (2002), who recommend the use of methods that yield valid and reliable results regarding the research competencies developed by teachers. In this sense, studies with a mixed approach or surveys that have undergone review processes through piloting reduce risks of biases and subjectivity in the results (Creswell, 2002). These processes have been present in most of the reviewed studies, indicating reliability in their results.

Another result concerns the trend of studies focusing on the specific research competencies of university teachers. This finding suggests that researchers recognize the importance of identifying skills oriented towards the research process, as they are central axes in the development of quality research (Iqmal & Mahmood, 2015). On the other hand, this approach contradicts the idea that teaching competencies should be addressed comprehensively, considering both specific research skills and other cross-cutting competencies, such as teamwork and leadership (Dipp, 2013; Buendia-Arias, 2018). Difficulties in measuring and evaluating some generic skills could explain their exclusion from the reviewed studies (Barthakur et al., 2023).

Finally, the reviewed studies reveal the concern for characterizing university teachers, identifying their strengths and weaknesses regarding their research competencies. This approach may be related to the need to improve the training and professional development of university teachers in the research field (Di Virgilio et al., 2007; Cuevas et al., 2011). By identifying the levels of competency development, areas requiring greater attention and training to enhance the quality of research in the university setting can be observed.

V. CONCLUSIONS

This study aimed to comprehend the current state of research on the research competencies of university professors and the gaps in this field of investigation through the analysis of available scientific literature from 2008 to 2023 on the subject. To achieve this, a systematic literature review was conducted, the results of which have several implications.

1. The interest of emerging countries in exploring the research competencies of university teachers reveals their commitment to academic development and their concern for enhancing the region's competitiveness through research.
2. The predominance of quantitative methods and the use of self-administered questionnaires as data collection instruments in the study of research competencies suggest the need to incorporate other techniques to support these instruments to strengthen the methodological design of research in this field.
3. Most studies focus on determining the specific research competencies, reflecting the concern to develop technical skills inherent to scientific research. However, it is essential to consider generic skills that also play a role in executing research projects, such as critical thinking and teamwork.
4. The reviewed studies show the need to provide training that is aligned with teachers' needs, based on the most and least developed research competencies. Likewise, knowledge of strengths and weaknesses allows for creating an appropriate academic profile for teachers that responds to the context of universities and research demands.

The conclusions of this study offer an enlightening view of the current state of research on research competencies. However, it is crucial to address some limitations that must be considered, as they could influence the generalization of these findings. One of them is the number of databases used for extracting the articles reviewed in this study. Restricted access to several databases and payment barriers to access some articles limited the inclusion of relevant research on the topic. Secondly, the authors discussed those articles that did not meet the quality criteria to reach a consensus on the evaluation; however, there is a recognized possible risk that some articles may have been omitted.

Considering the limitations, gaps emerge that can be addressed by future research. Firstly, future studies can focus on identifying research competencies from a comprehensive approach, using mixed methods and validated instruments to obtain a more complete view of teachers' research skills. Likewise, subsequent research can study teachers' perceptions of their skills and contrast them with those identified using instruments such as tests and observations. Similarly, studies can identify how each type of competency is related to the scientific productivity of teachers. This could allow understanding of the individual impact of competencies to prioritize them in training processes. Finally, future studies could explore whether the level of research competency of teachers influences students' academic performance or the quality of research produced in those institutions.

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