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Research Competencies and Formative Research in Higher Education

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Abstract: The purpose of this article is to establish the importance and interaction between the concepts of Investigative Competence and Formative Research in Higher Education Institutions (HEI); for this purpose, a documentary review is carried out that addresses the complexity that underlies competency-based training, specifying various positions that guide the insertion of the same in higher education. Subsequently, we delve into the notions and conceptual bases of competencies to contrast them with research training in HEIs and to specify the role of the teacher in the development of research competence. The scientific novelty consists of the systematization of the concept of investigative competence, in its origins and development, which allows us to propose a construct whose relevance to the current historical moment is centered on an integral humanistic perspective that entails the transformation of the social context where socio-educational knowledge is generated, produced, and applied from a social pedagogical vision. To do so, the concept of competency is discussed from its initial application in the world. The role of formative research that students receive as part of their learning process of research competencies is highlighted in that some challenges that HEIs have to assume in the face of the demands of contemporary society emerge, where the research profile of graduates requires mastery of various skills, abilities, knowledge, and multifaceted techniques that must be accounted for in their professional performance. Aspects of interest in teacher-

student interaction and the knowledge and practices involved in research didactics are described, and an outline is offered highlighting this knowledge as a perspective, where context, school, and research practice are oriented towards the understanding of formative research as a route for the formation of professionals whose graduate profile allows a complete and contextualized professional performance.

Keywords: competence, research, higher education, professional training

高等教育的研究能力和形成性研究

摘要：本文的目的是确定高等教育机构(HEI)中调查能力和形成性研究概念的重要性和相互作用；为此，进行了文献综述，探讨了基于能力的培训背后的复杂性，明确了指导将其纳入高等教育的各种立场。随后，我们深入研究能力的概念和概念基础，将其与高等教育机构的研究培训进行对比，并明确教师在研究能力发展中的作用。科学创新在于系统化调查能力概念的起源和发展，这使我们能够提出一个与当前历史时刻相关的构想，该构想以完整的人文主义视角为中心，涉及社会背景的转变，从社会教育学的视角产生、生产和应用社会教育知识。为此，我们将从能力概念在世界上的最初应用开始讨论它。形成性研究是学生在学习研究能力过程中所接受的一部分，它的作用突出表现在高等教育机构面对当代社会需求时必须承担的一些挑战，其中毕业生的研究概况要求掌握各种技能、能力、知识和多方面的技术，这些都必须体现在他们的专业表现中。本文描述了师生互动中令人感兴趣的方面以及研究教学法所涉及的知识和实践，并提供了一个大纲，强调了这些知识作为一种视角，其中背景、学校和研究实践都以理解形成性研究为导向，将其作为培养专业人员的途径，其毕业生概况允许进行完整和情境化的专业表现。

关键词：能力、研究、高等教育、职业培训

1. Introduction

Humanity is undergoing an accelerated process of change, which manifests in various spheres of political, social, economic, scientific, and cultural events. We are immersed in the beginning of a new civilization era, in which education, knowledge, and information play a major role. Contemporary society is characterized as a society in which knowledge becomes the main input of the new productive paradigm; higher education and universities are at the center of this society because of the key role they play in the creation, transmission, dissemination, and application of knowledge.

In this sense, we subscribe to the criterion of higher education proposed by Tünnermann [1], based on what is expressed by the United Nations Educational, Scientific and Cultural Organization UNESCO, which states that it includes: "all types of studies, training or training for research at the post- secondary level, provided by a university or other educational establishments that are accredited by the competent authorities of the State as centers of higher education"

This knowledge and the training offered in higher education institutions represent a social good, but also an individual good that is generated, transmitted, and recreated for the benefit of society. In accordance with this principle, any policy at this educational level should be based on the recognition that, regardless of its source of financing, higher education is a public service; therefore, higher education institutions, whether public or private, must assume a social commitment–that is, a commitment to the general interests of the society in which they are inserted [1].

From this perspective, the relevance of the concept of research competence is not only circumscribed to the fulfillment of the university's substantive mission, but also because its integrality implies a way of acting, thinking, and being of research competence, which defines skills, abilities, knowledge, and ways of assuming the research exercise that must be learned by new researchers within the formative research process; that is, undergraduate students must know the statutes, paradigms, and research methods of their disciplinary field to complement and be in tune with their profile of graduation as professionals.

Investigative competence (as an object of training) and formative research (as a training process) are not limited only to research activities per se but are part of the way in which professional practice is approached and carried out. It is a management process and a fundamental axis in the curricular structure of a profession, which is directly related to educational processes, since it is conceived, that professionals must respond to problems specific to their profession.

This competence goes beyond the theoretical and promotes ways of thinking that transcend the concrete, spatial, and temporal aspects of human existence, to provoke dialectical and asynchronous reflections around real problems that human beings face in their relationship with others.

In the daily work of any professional, recourse is

made to knowledge specific to the discipline in question and the way in which that knowledge is structured, for the assessment and intervention of specific aspects of the object of knowledge specific to the career.

This epistemological reflection, regarding the nature of the object of knowledge specific to that area of knowledge and level of training, is based on the conceptualization of the object of knowledge; the use of a series of techniques and instruments that allow capturing and addressing the object of knowledge; and the establishment, implementation, and analysis of a series of actions aimed at influencing the object of knowledge associated with the object of training.

The research methodology is based on documentary analysis from a qualitative research approach, as a systematic review of the existing literature on the development of research competence in higher education has been elaborated. A series of categories is established to guide this document, from which the approach to the phenomenon and its analysis are made. This study has a descriptive scope because it is proposed to describe and analyze the results found in the review, specifying the fundamental and relevant elements in relation to the established categories: competencies, formative research and higher education.

Research design: The study contemplated a systematic design in which data collection was carried out to employ open coding of the categories and continue with selective coding in which the most relevant categories were established [2].

The eligibility criteria for the selection of academic papers included recent studies in relation to the problem posed, and the papers included relevant information on competencies, research competencies, and higher education.

The search strategy was based on the establishment of the categories of competence, research competence, and higher education, through which research was carried out in various databases and governmental and international pages: Digitalia, Elsevier, ERIC, Redalyc, Scielo, Google Scholar, the Ministry of Education, Congress of the Republic of Colombia, etc.

Once the information search was completed, the bibliographic documents were systematized in an Excel database for subsequent categorization and a new search for information focused on the established tracking categories to continue with the contextualization of the problem. Once the information was collected, the results and their respective analyses were presented to generate the conclusions of the study.

2. Literature Review

2.1. Competency-Based Training in the Contemporary Context

In contemporary society, higher education is taking on increasingly complex functions that are likely to give new dimensions to its essential mission of searching for truth. This is not only with regard to the advancement, transmission, and dissemination of knowledge but also as a center of critical thinking. This critical and civic function must be exercised with scientific rigor, intellectual responsibility, impartiality, and adherence to ethical principles [1].

Between savage and civilized capitalism, between neoconservatives and neoliberals, between postmodernists and radicals, universities are at the center of contemporary debates on the future of society, development and democracy, for many reasons [3].

The predominance of technical administrative knowledge over social, humanistic, and scientific knowledge is a trend with a high level of importance and is often neglected in the analysis of change.

For the United Nations Educational and Cultural Organization (UNESCO), adopting a market approach is not convenient because of the different structures related to universities. In particular, two important considerations are expressed: the criteria of efficiency of the companies are primarily of an economic order and, more precisely, financial. The criteria of universality of higher education are of another order: human and economic resources have a primarily social, that is, external, purpose. It is the criterion of social relevance, quality of services, and equity that must govern it, which justifies the principle that public support for higher education remains essential while recognizing the need for institutional and financial diversification.

Higher education institutions, while retaining responsible autonomy, cannot function in isolation and are enclosed in an ivory tower. They are in close relationship with local, regional, and international institutions that have to define development policies. They must defend policies based on forms of sustainable human development for the benefit of everyone. Higher education works in the long term, and its impact is therefore more difficult to quantify [3].

The technocratic vision of education demarcates its aims and objectives within the criteria of economic profitability, which is typical of the demands of the market in the globalized world, and is directed towards the supply of qualified personnel or labor to operate within the sphere of supply and demand that sustains the production of goods and services.

In this order of ideas, the education that is promoted with greater impetus is education for work; within the policies that, throughout the last century, have had an influence on the educational contexts of the continent (this arose motivated by the oil crisis in 1973), a concept that was based on the understanding that economic contradictions affect the main structures of societies, in this case, the educational subsystem. Such a perspective prompted the orientation of an approach in which the effectiveness of schoolwork is associated

with vocational training and the world of work [4].

Some of the decisions taken for public education within the neoliberal economy were justified from pedagogical and decentralized perspectives. From a pedagogical point of view, the relationship of the educational crisis concentrated the analysis on the quality of education based on the determination of basic learning needs, which include the knowledge, skills, attitudes, and values necessary for people to survive, improve their quality of life, and continue learning. Decentralization intervened to regionalize investments towards interested population sectors, and thus contributed to the proliferation of private financing of education, forgetting the spirit of the reforms promoted by UNESCO to establish an education with quality and equity for all [4].

The current context of Latin America, the Caribbean, and especially Colombia, does not escape the trends that guide globalized industry, commerce, and culture; we are increasingly interconnected through electronic media, and the flow of passengers and goods has increased significantly [5].

This is how the role of education in training for work is considered a preponderant; this is a particular situation because it affects the educational policies of the 80s, 90s and early 21st century, framed in the neoliberal discourse of development promoted by the Washington consensus [5]. A discourse in which administrative and managerial vision creates a climate of competition at the local, regional, national, and global levels based on performance in work environments [5-11].

In this order of ideas, the Colombian educational context is described by the Ministry of National Education, referring to the training of professionals in Higher Education Institutions, mentioning deficiencies and deficiencies in what refers to the research training of future professionals; the research component does not occupy a place of preeminence nor does it fulfill main functions within the academic processes, nor is it recognized as a basic form of action for the professional performance of educators. [12]

Figure 1 shows the relationships between the different variables discussed in relation to competency-based training in the contemporary context.

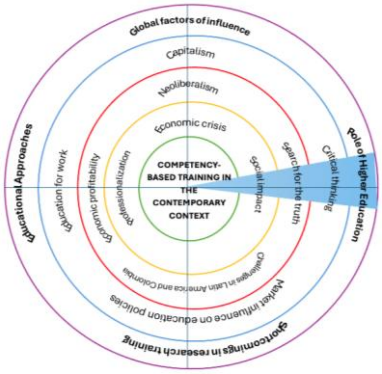

Figure 1. Competency-based training in the contemporary context (developed by the authors)

2.2. Notions and Conceptual Bases about Competences

The polysemy of the concept can be traced back to the beginnings of Greek philosophical schools when Aristotle in his *Metaphysics* mentions that all men have the same faculties, which, understood as capacities for knowledge, equalize men; the difference is perceived in the use that each one gives to it. Thus, action starts from the power to execute it: "... that one has power only while one acts, and that, when one does not act, one has no power; for example, that he who does not build has no power to build, but he who builds has it while he builds; and the same in other things" [13]. It is based on the referenced to say that the builder will cease to be a builder if he does not perform the action; in the same way, the researcher will be one as long as he is working from the various activities that a research process demands.

It is a matter of common sense to understand that the polysemy of the concept of competence, its profusion of meanings, makes it complex to approach without taking into account the different contexts of enunciation; however, from the lexical semantics, its ductility and adaptability have led it to find a place for its development in areas of human affairs such as business and school.

The difficulty of grasping and anchoring the concept in the synthesis of meaning is a characteristic of the globalized world [14], liquid modernity [15] and forms of complex thought that deal with the uncertainty of human knowledge and the multiple ways of approaching it, which is typical of the intellectual context of an explosion of re-readings and reinterpretations of the theories and concepts most dear to science.

As a characteristic of this era, the principles of uncertainty have become challenges of thought in the face of the decline of the deterministic order of the world and history and, in the face of the origins and limitations of thought that reduce and compartmentalize [16].

The horizon of meaning of the time is conducive to the discussion on the meaning of what is understood by competence, especially in the business and educational fields, and the implications that the curriculum and teaching have on the concept [8-10, 17-19].

In the field of education, the concept of competency has prospered so much that many scholars have dealt with it in such a way that, from different conceptions, the competency-based education approach is today a field that has yielded profuse bibliography and is at the center of the educational reforms of several countries in Latin America and the Caribbean [4]. As a result, there is a permanent relationship between business and education, with a significant background in the graduation profile of professionals and their entry into the labor market.

There is no univocity in its meaning and there are many synonyms with which it is related, some of which are capacity, ability, disposition, authority, dominion, skill, expertise, and mastery; its antonyms can also help us to understand it, as that which it is not, for example, incapacity, inability, insufficiency, and clumsiness.

In the competency-based curriculum concept, for example, the student's graduation profile is based on the training processes that take place in the HEI, which attests to the learning achieved by the students, facilitating the early incorporation of its graduates into the labor market [20].

The analysis of the existing literature on the subject of competencies is profuse, but within such a quantity of relevant information, for this research it has been possible to establish a classification that corresponds to observing competencies in two development contexts that are, in turn, perspectives, namely, the world of the company and factories, and the universe comprising education and its fields.

In the analysis of the concepts of competence, some may correspond to the demands of the company with greater precision; however, we understand that the concept, being ungraspable, can move appropriately in both contexts, which makes the reflection exercise more complex.

As already mentioned, from a semantic perspective, the term alludes to suitability, expertise, expertise, possibility to apply, to be gifted for something, to perform, to respond to, requirements, knowledge built, and applied in terms of context.

The use of the competency construct in a climate of growing competitiveness and demands for the performance of workers means that high doses of suitability in execution are required. Of course, this makes it necessary to think of a labor world that begins its transit through competencies demanding from its workers not only professional qualifications but also concrete performances in the performance of tasks, flexibility to adapt to the changing and vertiginous world of technologies, as well as permanent training, creativity, leadership, teamwork, and, very importantly, suitability to meet organizational goals [9].

This leads us to think that the concept of competence has been linked from its beginnings to the world of work because of the know-how, and especially from a technical point of view, related to the production mode, in a materialistic key, of man's activity in the factory; that is, counting on the skills and abilities that he must demonstrate in his performance to minimize costs and time in the transformation of raw materials into finished products.

It is in this context of the market and the sphere of production that its connection and its most expensive repercussions can be verified, especially if it is understood within the context of competitiveness as an ingredient of struggle typical of markets where it is more similar to what, from the fundamentals of evolutionary theory, is known as the survival of the fittest company and the factory, competence responds to a behavioral logic in which the execution of simple tasks, typical of the worker or employee, associated with know-how, simply responds to standardized schemes already prescribed, mounted on production lines, and chained production processes [21].

That is why competition from this technical conception of the positivist paradigm, which is inspired by the models of Fordism and Taylorism, finds a much clearer sense in the world of manufacturing and the market, the space where manufactured products and services come from and go to, which must reflect the actions of transformation executed by man, modifying the products offered from his skills, abilities, and manual and intellectual skills. The quality that they must exhibit are depositaries of the skill with which men transform that raw material into products that can compete in a market where suppliers expect to obtain the best profits.

Some approaches have been used to understand the significance of the concept of competence in the work world. Thus, in the Weberian tradition and from the viewpoint of the sociology of work with a technocratic vision, competencies can be measured and operationalized, while in the ethnomethodological approach, human capabilities are not only a matter of reason, intellect, or knowledge; they are said to be unconscious.

Likewise, Delors [22] points out the competencies in the context of professional practice, describing them as complex know-how that requires a set of knowledge, skills, attitudes, values, and virtues. These elements must guarantee efficiency in responsibility and excellent professional performance. This is the beginning of an approach to the integration of elements oriented towards a broader humanistic perspective by mentioning values and virtues within the complex understanding of competencies.

A definition of its specificity in technological training, which allows us to ascribe it to the technical perspective of the world of work in the performance of specific tasks, is the one issued by the Instituto Tecnológico de Educación Superior de Comfacauca, (Popayán, Colombia). Competence is: "... a know-how in front of a specific task, which becomes evident when the subject comes into contact with it. This Competence supposes the knowledge, know-how, and skills that emerge in the interaction established between the individual and the task, for which they are not always there beforehand. Competence is always referred to as a field or context in which it materializes" [23].

The following definition is given from a behaviorist perspective, limited to the individual's response capacity in work occupation contexts, understood as the ability to perform: "Being capable, being able or skilled in something. Competencies tend to convey the

meaning of what the person is capable of or competent to perform, the degree of preparation, sufficiency or responsibility for certain tasks" [21].

Likewise, as cited by [21], competence is inscribed in the behaviorist, technocratic perspective that recognizes it as the ability to successfully develop a given action, which is acquired through learning.

This context obviously alludes to a successful life within the regime of the market of objects and sumptuary goods of the capitalist world, supporting, in this way, a criticism of the inexistence of a formation for life based on values, respect for citizenship, respect for the environment, and the formation of critical thinking, aspects as necessary as pertinent in the environment of an integral education for life as a supreme and general good. That is to say, from a neoliberal ideological background, education throughout life has been promulgated as decreed since the World Declaration on Education for All (1990) to mask the objectives of education as training in competencies to continue with the cycle of training–submission for the proper work of this economic system.

The same project, OECD [6] recognizes key competencies such as acting autonomously from the relative autonomy and identity of the subject, using tools inter actively, that is, in the interaction of the individual with the world through physical and sociocultural tools, and the category of functioning in socially heterogeneous groups, related to individual interaction with the other, which is always different [24]. Such an approach allows us to observe the integration of elements in positivist and interpretative approaches.

As has been observed in the previous paragraphs, most of the concepts are characterized by common elements that, as a tendency, circumscribe them to the labor and productive sphere. This does not mean that in the numerous definitions, one cannot find features that are nuanced as proper to the universe of culture with its symbolic elements proper to the interpretative paradigm; the intention has been to highlight in the grouping what corresponds to competence in the world of work, that is, related to the performance in the professional field of specific tasks of fulfillment.

In this way, we can see how the way is being paved towards the educational context, from the different concepts of competence that, although initially adjusted appropriately in the world of work and economy, have turned out to occupy an important place in the discourse of educational institutions at all levels, given the common elements between public policies and institutional will.

This panorama is described in The Previous Future, elaborating a synthesis that serves as an introduction to this complex step taken to adapt educational systems to the trends of the globalized world. When governments and social groups cannot understand the need to activate devices and policies of universalization and extension of different learning and knowledge, invest adequately in education, and promote scientific and technological innovation, the results in school performance of students and teachers began to be strongly criticized by society, considering them ineffective, not relevant, reproducing results always below international averages of performance in skills and general procedures, and being below the rankings suggested as quality benchmarks, in a world that has privileged its commodification and standardization. The inadequacy of the educational system became very evident [25].

In an analytical sense, this arrival of the concept of competence in the world of education has allowed, according to some authors, to move from a memoristic, banking pedagogy to a pedagogy oriented towards the development of "competent minds" mediated by the didactic principle of "learning what one does not know, by doing it" [12].

An approach to the pedagogical elements of the concept of competence, in an educational and technocratic context, establishing a relationship between contextualized performance and the coordination between knowledge, skills, and attitudes under the denomination of learning by doing, is the definition of As quoted by [21], where the sense of performance supported in human action that executes a task of any order, even educational ones, is circumscribed. As such, the concept of competence is understood as the learned ability to perform tasks, duties, or roles adequately. It has two distinctive elements: it is related to specific work in a particular context and integrates different types of knowledge, skills, and attitudes; it is acquired through so-called learning-by-doing or learning-by-doing. Unlike knowledge, skills, and attitudes, this form of action or performance cannot be evaluated independently because the above-mentioned elements are immersed in its performance.

Lausier's definition, cited by Saez, is also relevant because it contains characteristics that denote an ethical and contextual know-how; he defines it as: "a complex know-how resulting from the integration, mobilization and adequacy of capacities, skills and knowledge used ethically in situations that have a common character" [24].

In educational environments, the definitions of competency, referenced by [12], mention that teaching by competencies must necessarily start from problem situations, using methods and forms of teaching that allow responding to situations, conflicts, and problems close to real life; within this practice, the teacher must be able to use strategies and design problem-situations close to the student's reality and to mobilize his cognitive resources to find solutions to the situations posed and, in this process, make decisions and self-regulate his learning. Likewise, they assume an

educational and humanistic context taking into consideration the teaching-learning context as a dynamic phenomenon whose corollary, learning, is constituted by the capabilities demonstrated by the student at its conclusion. Thus, according to [19], "the learning context is a dynamic phenomenon whose corollary, learning, is constituted by the capabilities demonstrated by the student at its conclusion". "... They represent a dynamic combination of attributes, in relation to knowledge and its application, attitudes and responsibilities, which describe the learning outcomes of a given program or how students will be able to develop at the end of the educational process" [21].

Another aspect that is important to highlight in the Tuning Pilot Project refers to general competences as transferable competencies, indicating that they are skills such as capacity for analysis and synthesis, a necessary general culture, capacity for independent work, awareness and involvement in projects, the international European dimension of problems, collaboration and communication, tenacity, capacity for leadership, and organizational and planning skills.

That is, they are abilities and skills that can be used in many situations; they are developed using appropriate teaching and learning methods and forms; and the specific competencies that are recognized as those that are linked to the areas of study (theoretical, practical, and/or experimental knowledge and skills specific to the area).

This project has a strong emphasis on learning and emphasizes that what is central is the work of students, that is, student-centered education. The role of the teacher has the greatest determination in the design of objectives, educational activities, the concept of acquisition for learning, and organization of learning. Of course, here, the figure of the teacher acquires the role of companion, of the learning guide, to achieves previously defined objectives [24].

Accordingly, competencies were classified into instrumental competencies, such as those that have an instrumental function, that is, cognitive, methodological, technological, and linguistic skills; interpersonal competencies that have to do with individual skills related to the ability to express one's feelings, teamwork, and expression of ethical or social commitments; and systemic competencies, such as skills and abilities related to more global problems, where several knowledge or skills are usually brought into play, including research skills [24].

Note that the latter is laying the foundations to initiate an exegesis on what is called research competence and that, in the context of the academy, has a weight that highlights the importance of research as a form of action, where the understanding and elucidation of the problems of the context establish the confluence between knowing how to know and knowing how to do with an ethical sense, which then prefigures a pedagogical and research perspective.

As can be observed, this last competence, research skills, is a systemic competence, in the sense of a functional articulation of several parts to a whole that brings them together. In the order of ideas, the fact that research skills are recognized as such places them as a competence for the academic performance of both teachers and students within the teaching-learning process.

Expanding this approach to competencies, authors such as Sergio Tobón [25], serve as a reference for the delimitation of the concept: Competency-Based Training. He mentions that there are four types of knowledge to achieve an ideal performance at the level of development of a competency: knowing how to know, as knowledge linked to the understanding of the problem or activity within the context; knowing how to do, related to the execution of specific procedures to solve the problem or task, planning, regulation, and evaluation; knowing how to be associated with ethical commitment, motivation, sense of challenge, and interest in a job well done, cooperation with others and the search for suitability Finally, knowing how to be with living, whose dimensions are in the location in the context, the sense of belonging, flexible performance with suitability in different professional labor scenarios, tolerance, love, respect, inclusion and diversity.

According to [26], competence is the psychological configuration that integrates cognitive, metacognitive, motivational components, and personality qualities in close functional unity, self-regulating the actual and specific performance of the individual in a specific sphere of human activity, in correspondence with the socially constructed model of desirable performance in each specific historical context. In the same vein, professional competencies not only constitute the possession of a set of cognitive and affective resources, but also incorporate the capacity to self-regulate and mobilize them in their unity and functional integration in a specific professional activity, in an efficient manner. In addition, mentions a research-cognitive competence that allows for the efficient realization of self-preparation, self-improvement of the teacher, and the use of the scientific method for the resolution of professional problems, besides propitiating the attainment of information for the approach of problems encountered in teaching practice

Table 1 shows how various theoretical proposals conceive of research competencies from their perspectives: the orientation of the cognitive processes developed and the advantages and disadvantages that may occur in the development phases of the formative research process are highlighted.

Table 1. Theoretical positions regarding research competencies (developed by the authors)

Theoretical Position	Main Description	Main Authors	Advantages	Limitations
Cognitive and Metacognitive Competencies	It focuses on the development of critical thinking and reflection skills, such as hypothesis formulation, data analysis and evaluation.	Flavell (1979), Pozo and Monereo (1999)	It promotes autonomy and self-regulation in the student.	Can neglect social and collaborative skills.
Constructivist Approach and Active Learning	It promotes active and meaningful learning through knowledge building and direct experimentation.	Vygotsky (1978), Bruner (1966)	It facilitates practical and in-depth learning by actively engaging the student.	It requires a high investment of time and resources, both in teaching and infrastructure.
Sociocultural Approach	Research competencies are developed in a social context, through collaboration and learning in communities of practice.	Wertsch (1998), Lave and Wenger (1991)	It highlights the importance of collaboration and socialization in investigative learning.	Difficult to apply in education systems that prioritize individualization.
Formative Research	Gradual development of competencies through a progression of research activities, from basic to complex.	Zeichner (2005), Méndez (2011)	Reduce the risk of frustration by progressively integrating competencies.	It may be ineffective in short programs that do not allow for long-term training.
Holistic and Integrated Approach	It integrates cognitive, ethical, affective and attitudinal competencies for responsible research training.	Le Boterf (2000), Zabala and Arnau (2007)	It promotes comprehensive education, considering social responsibility and ethics.	It requires structural changes in educational institutions and in academic culture.

From another approach, the holistic character of the concept of competence is distinguished by taking references in culture and work context [27]. In this sense, the concept is worked from the training promoted by an educational institution not only thinking that competence must be designed in terms of the incorporation of the subject to productive life through employment, but rather taking into account that from professional training, which, in addition to promoting the development of certain attributes (skills, knowledge, attitudes, aptitudes, and values), considers the occurrence of several tasks (intentional actions) that occur simultaneously within the context (and the culture of the workplace) in which the action takes place, and at the same time allows some of these intentional acts to be generalizable [28].

A sociological vision, close to humanism, is offered in [29], which stipulates that competence is a capacity that is executed in a social context of action and defines it as the capacity to functionally use knowledge and skills in different contexts. It implies understanding, reflection, and discernment, taking into account simultaneously and interactively the social dimension of the actions to be performed.

Once this reflective path has been taken, the synthesis elaborated in [21] offers the grouping of three characteristic elements of the competencies, which provides a synthetic vision on common elements of the competencies towards an approach to their understanding, which can be summarized as follows:

a) They articulate conceptual, procedural, and attitudinal knowledge, but... they go beyond the fact that accumulating knowledge does not necessarily imply being competent. The mere accumulation of knowledge and skills does not lead to competence. Being competent implies a further step: it implies, from the whole body of knowledge, one possesses (or can access), selecting what is relevant at that time and situation (disregarding other knowledge that one has but that does not help us in that context) to solve the problem or challenge we face.

b) They are linked to personality traits, but... they are learned: Innately possessing certain intelligences is a good starting point, but does not guarantee me to be competent. Competencies must be developed with initial training, lifelong learning, and life-long experiences. It is possible to be competent today and not be so tomorrow or to be competent in one context and not be so in another context that is unfamiliar to me. Competencies, therefore, have a recurrent and continually growing character. One is never "competent" forever.

c) They make sense in action, but... with reflection: The fact that they have an applicative dimension (insofar as they involve transferring knowledge to practical situations to solve them efficiently) does not

imply that they involve the mechanical and unreflective repetition of certain patterns of action. In contrast, to be competent, reflection is essential, which distances us from the standardization of behavior [21].

2.3. Formative Research and Higher Education Institutions

The General Education Law [30] states that education is a process of permanent, personal, cultural, and social formation based on an integral conception of the human person, his/her dignity, rights, and duties. It establishes general norms to regulate the Public Service of Education, which fulfills a social function in accordance with the needs and interests of individuals, the family, and society. It is based on the principles of the Political Constitution on the right to education that every person has, on the freedoms of teaching, learning, research, and teaching, and on the character of public service.

The same law organizes formal education at preschool, elementary (primary and secondary), and middle school levels, non-formal and informal, aimed at school-age children and young people, adults, peasants, ethnic groups, people with physical, sensory, and mental limitations, people with exceptional abilities, and people requiring social rehabilitation.

Higher education is regulated by Law 30 [31], which sets forth the most important general characteristics of education at this level.

It is understood as a public service that can be offered both by the state and by individuals, and is carried out after secondary education.

Several types of institutions have been defined according to their nature and objectives (Professional Technical Institutions, Technological Institutions, University Institutions and Universities).

There is a National Quality Assurance System.

The State guarantees the quality of the educational service through the practice of supreme inspection and surveillance of Higher Education.

The National Intersectoral Commission for Quality Assurance in Higher Education (CONACES) and its chambers organized by fields of knowledge is the body in charge of studying compliance with minimum quality conditions and giving its opinion to the Ministry of Education for the granting of the Qualified Registration of the programs.

The National Accreditation System is a member of the National Accreditation System, which is responsible for publicly attesting to the high levels of quality of higher education institutions and their academic programs.

One of the greatest challenges for research in our country is to articulate policies to support higher education within the policies of the National Science, Technology, and Innovation System (SCTI).

With regard to research and, more specifically, research activity in HEIs, the university plays a formative role in commitment to society, considering that in these academic spaces knowledge is generated, transmitted, created, and recreated in different fields of knowledge and from different epistemological and methodological perspectives.

In this sense, the idea is based on the idea that in HEIs, knowledge must support their academic offer and define research projects, with the purpose of responding to the requirements of the analysis and solution of the problems to be addressed. However, the National Policy on Science, Technology, and Education [32] states that it is up to the free autonomy of HEIs to place greater or lesser emphasis on generating knowledge from research processes, or to be a professionalizing institution. This should be expressed in the institutional projects and curricular plans.

According to the Institutional Educational Projects PEI, these define the type of institution, its profile, and capabilities, and imply different organizational structures, financing, and promotion systems, according to the specificity, location, resources, and possibilities.

Consequently, it is a challenge for the SCTI Science, Technology, and Innovation System, in which higher education institutions are a fundamental axis, to identify the products derived from the research activities of higher education institutions; therefore, quality assessment is supported by diversity and takes into account the institutional stakes in this area [33].

Now, when discussing research, it also refers to the process of research and experimental development (R&D), defined as creative work, carried out systematically, to increase the volume of human, cultural, and social knowledge, and the use of this knowledge to derive new applications in all fields of science and technology. It involves basic and applied research and experimental development [33].

The Colombian educational context is described by the Ministry of National Education, referring to the training of education professionals in Higher Education Institutions, mentioning shortcomings and deficiencies regarding the research training of future professionals; the research component does not occupy a place of preeminence nor does it fulfill main functions within the academic processes, nor is it recognized as a basic form of action for the professional performance of educators. For the Ministry of National Education, the research component in the training of professionals is nothing more than a subject that is imposed in the curriculum on students in the last semesters, to provide them with methodological elements that can develop their degree work, without it being a proposal for the construction of new knowledge that contributes to scientific-technological development [34].

According to [33], the Agreement for Higher Education 2034, Proposal of Public Policy for the Excellence of Higher Education in Colombia in the Scenario of Peace, National Council of Higher

Education CESU, with a view to strengthening research, in a projection towards the year 2034, has identified a series of problems that summarize the current state of research in the country with a view to strengthening research, in a projection towards the year 2034, identified a series of problems that summarize the current state of research in the country, and they point out the following nodal problems related to research in HEIs:

1) The current regulations leave the Ministry of National Education at the margin of the definition and implementation of plans and programs to promote research in HEIs and promote the doctoral training of their professors;

2) lack of coherence and coordination among SCTI actors;

3) low investment in science, technology, and innovation, which represents only 0.46% of GDP;

4) the low production expressed in indicators related to STI, such as the low number of patents, the low number of PhDs, and the scarcity of publications in indexed journals and other products resulting from research;

5) the absence of regulations and guidelines for the integration of the regions and HEIs in the joint development of technical proposals;

6) the lack of clarity in the research requirements, according to the typology of HEIs;

7) the absence of a policy on ethics and integrity for the exercise of research;

8) the absence of a research career and the lack of long-term incentives for researchers in the public and private sectors; and

9) a low percentage of university professors with doctoral degrees (16 PhDs per million inhabitants, 7%): [35];

10) weakness of the relationship between higher education and the productive and social sectors;

11) limited exercise to improve the social diffusion of knowledge by HEIs;

12) scarce cooperation among most HEIs in Colombia;

13) the lack of investment planning for science, technology, and innovation actions is synchronized with the priority needs of the country;

14) the difficulty in objectively defining quality standards for some research products;

15) serious limitations of the physical and technological infrastructure to develop STI in the country.

Mission: The Colombian higher education system is one of the main axes of transformation and social mobility, the basis for sustainable human, social, academic, scientific, economic, environmental, and cultural development in our country.

Vision 2034: By 2034, the higher education system will be one of the pillars on which Colombians will have built a peaceful society (just educated, democratic, supportive, prosperous, competitive, and inclusive) in which free, ethical, responsible, and productive citizens live together in dignity and peace. Taking vision as a starting point, three fundamental objectives for higher education are recognized in relation to access and inclusion, quality and relevance, and research (science, technology, and innovation).

To face this scenario that links HEIs with society in the year 2034, giving priority to research as a development-promoting activity, it is necessary to comply, in addition to the following requirements, with the training and continuous improvement of the research competencies of professors, directors and juries of graduate work; For this, there will be: Higher education institutions that will have perfected organizational and administrative structures that facilitate real research processes with international references and regulations that make them viable; a decisive contribution of higher education institutions to the innovation system and to the social appropriation of knowledge; The inclusion of social innovation as an alternative for the development of applied research in the human and social sciences; a significant number of PhDs and other higher education graduates with consolidated contributions to the innovation system.

Guidelines to be developed based on topics. The themes are as follows: Inclusive education: access, permanence, and graduation; quality and relevance; and research, science, technology, and innovation.

Finally, pedagogical strategies should be strengthened in higher education programs that stimulate competencies for the development of research activities through cross-cutting components of the curriculum.

On the other hand, Decree 1330 of 2019, issued by the Ministry of National Education [36], concerning the quality conditions for the granting and renewal of the qualified registration of academic programs for research training, stipulates that, to comply with the quality conditions, programs must observe, among others, what is referenced in the Article that deals with research, innovation and/or artistic and cultural creation, where HEIs must establish in the program the strategies for training in research-creation that allow professors and students to be in contact with disciplinary and interdisciplinary developments, artistic creation, technological advances and the most updated disciplinary field, in such a way that critical and/or creative thinking is developed.

Specifically, the following training purposes are indicated, once the areas, lines or topics of research on which the efforts and projects will be focused have been defined; this, according to the following training purposes:

a) Theoretical understanding of the formation of innovative thinking with the capacity to build, execute, control, and operate the means and processes for the solution of problems demanded by the productive and

service sectors of the country.

b) Incorporation of research training for students in accordance with educational level and objectives and the use of information and communication technologies.

e) The development of new products, processes and uses of existing products.

d) The capacity to provide transforming answers to local, regional, and global problems and to inquire about social and environmental reality, among others, based on the use of knowledge as a tool for development.

e) Those programs that explicitly incorporate research, innovation, and/or artistic creation shall evidence their results in accordance with the guidelines established by the national system of science and technology or other related ones [36].

2.4. The Role of the Teacher in the Formative Research Process

Now, understanding the role of university professors in formative research processes should be directed towards objectives that seek to implemented in students a vision of transformation of society through the acquisition of knowledge and skills that enable the understanding of their social reality as real concrete, and its role as an agent of change.

The structuring of a curricular model from the competency approach, on which an important discussion has been made in the previous paragraphs, conceives training as a totality. This means that in its formation, the human, social, and disciplinary aspects are integrated in a holistic manner. Therefore, in this process, competence is considered as the integrating category of social and professional commitment; in the curricular aspect, it manifests the level of development of being, knowing, and doing of the student, being a synthesis of knowledge, skills, attitudes, and values that can be visualized in the execution of specific actions in a context.

The above implies assuming competence as an articulated set of knowledge, skills, abilities, attitudes, and values that allow the development of students'' capabilities in an area of knowledge for quality professional performance. As an organizing principle of training, competence can be seen in specific actions that make a learner capable of performing and solving particular problems.

The performances and their assessment are oriented from a communication between teacher-student with assessment rubrics; its horizon is the recognition in the student from the dimension of knowledge (knowing), aptitude (doing), as well as behavior-attitude; therefore, there are some inherent approaches: the behavioral approach in terms of knowing how to be, the constructivist approach in terms of knowing how to be, and the functional approach in terms of knowing how to do; where the abilities, skills, and performances are present in order to achieve materialization and the results expected by the competencies determined for the learning unit foreseen in a particular course of training.

On the other hand, a professor who guides students in their research processes is one who must perform functions within the research mission, which implies raising and solving problems in the professional, productive, academic, and personal contexts within the framework of a research project, enabling the appropriation/production of knowledge; in addition, as a complement to a comprehensive view, he/she must comply with the missions of teaching and social projection.

A research problem is an uncertain situation, which implies a solution for reducing uncertainty. In this sense, the approach and solution of problems require a complex process, from common sense to rigorous research processes, using scientific methods. In general, it requires the following stages:

Research is considered one of the pillars of training in higher education, so it is vital to understand the role of knowledge as an engine of development and growth in societies, their production capabilities must be based on lifelong learning whose fundamental requirement is "to have research skills" [16].

Developing an investigative culture in institutions leads students to develop an investigative spirit and attitude, substantiate statements and conclusions, answer questions, and value judgments regarding the method used.

The contribution to quality improvement, optimization of productive processes, and demands participation in research groups and processes. Access to knowledge implies the meaning it produces and how it can affect different contexts. This type of competence "encompasses" others; in other words, it requires competences in oral and written communication, problem posing and solution, teamwork, etc.

Therefore, preparing students for the profession means giving them the skills to think about the functions and tasks of the profession in the context where they will work for one day. In this order of ideas, skills and competencies are embodied only in situations where they will act [24].

Sociologist Talcott Parsons, who argues that the relationships between disciplinary knowledge and the real context of performance form, in their articulation, the skills, and capacities for a contextualized professional practice based on experience, says: a high degree of professional expertise cannot be communicated by giving students only abstract knowledge; the student must work with knowledge in concrete real situations in which this knowledge is used for it to become truly qualified/specialized in its application [24]. The same context can be recreated and understood when research projects are developed that establish dialogues with the environment and allow the

interrelation between theory and practice.

Following this line of reasoning, formative research is conceived as a tool of the teaching-learning process, that is, its purpose is to disseminate existing information and encourage the student to incorporate it as knowledge (learning) [16]; in this regard according to [26], formative research can also be called teaching through research or teaching using the research method.

Formative research is a fundamental piece for the training of professionals and responds to several concerns, such as the search for questions, problems, hypotheses, populations, to structure research projects, that is, to give shape to concrete research from the logic and methodology of what it means to talk about research, and formative research serves as an enabler of transformation in action or practice. This type of research is oriented towards the development of research projects in community work, where the actual formation takes place in the exercise of research itself, that is, in practice. What differentiates formative research from research in the strict sense is the depth of the study, its methodological criteria, and the conformation of lines, programs, and research projects based on the lines.

This formative research has two characteristics: it is research directed and guided by a teacher and the research agents are students. Therefore, to develop the pedagogical act in the classroom, both teachers and students require basic training in research methodology [16].

At this point, it is necessary to establish anchor points to elaborate an approach to the concept of research competence that contributes to complementing teaching competence.

Some orientations come from [37], where research is defined as an academic, social, and cultural action, understanding that research must be articulated with the daily practice of teachers and must be included in its development.

When referring to students, it is understood that they are students who are being trained as professionals, generically it is said of their education as the training of professionals, a process that is approached from different aspects: on the one hand, cognitive training in a field of knowledge; on the other hand, the development of cognitive, communicative, technical, and research skills that are imbricated in the training itself; and on the other hand, the development of attitudes, which has to do with the disposition one has to execute something. It is important to develop attitudes towards science, learning science, and social implications.

When pursuing this type of change in training, such as that of attitudes, different specific mechanisms of social learning must be considered. For this reason, the researcher's laboratory is in everyday life, in his daily life, in each word in the textbook, in the notebook, where he exercises dominion and power, there where he has the word. In this way, one is a researcher in all areas of life and for this reason it is intended to break the paradigm that conceives it as a practice of "wise men" and promotes the development of a teacher researcher where research is his or her training method; training that gives meaning to research [37].

Marx's reference in his *Thesis on Feuerbach* (thesis VIII) on social life allows us to understand the way in which action as practice gathers meaning in the transformation of the environment from its material basis to its link with knowledge: Social life is, in essence, practice. All the mysteries that lead theory astray into mysticism find their rational solution in human practice and in the understanding of that practice [38].

Professional space and performance make the proper place where students' competencies are built thanks to the training they should receive from good teachers,. Therefore, a stable body of knowledge is necessary during training, as it is a sure advance for practice throughout their professional careers.

In the real world of education, problems are not already established and given; problems must be constructed from situations. Constructing the problem involves contextualizing and framing it in such a way that it can be approached in the reality where it is presented, without previous reductions or narrow limitations that hide it and force situations [24].

Reflection in action is a process in which, when people face uncertain and complex situations, human thought turns on itself, thinking about what they are doing while doing it [24].

Following the guidelines of [9], under an exercise of interpretation of his postulates, we have that investigative competence, besides including knowledge and knowledge of research methodologies (notions, propositions, concepts, categories), should tend towards the teaching of that knowledge and its tendencies. It should also allow the student to worry about knowing what it is to know and thus develop thinking skills; that is, what the teacher should transmit when teaching research.

First of all, he/she teaches and transmits theoretical knowledge; that is, "proven" theories and knowledge; normal science paradigms. The teacher teaches and transmits practical knowledge; that is, knowledge situated between theory and practice.

Know-how does not remain at the level of knowledge: it is not merely conceptual knowledge, but knowledge that guides and regulates action that inspires operation. It is necessary to understand that the operative moment of knowledge is not alien to knowledge itself, nor is it a secondary moment, not even second to knowledge, but its extension. It is knowledge becoming [39].

As know-how, the teacher, when guiding the students' research processes, must allow articulation

with the context, manifesting itself in responsibility, integrity, and quality of personal and social life. It is an enlightened, calm action; it is a reflective operation.

Finally, knowing how to be related to the affective-emotional field of sensitization, personalization of information, and coordination makes the research process of the student's degree work suitable; open-mindedness, interest, willingness, and sense of challenge are factors that characterize the performance in the research activity [9]. The meaning and ultimate values of scientific work must be transmitted, the whys and wherefores, of an ethical-political nature of the scientific generation, the question about the values of social and humanistic research must never be omitted: the defense of human rights, the critical spirit, and its emancipatory and libertarian character [39].

Finally, the same author points out, in correspondence with our position towards research and directed research of our students: making practice the axis of research teaching does not mean reducing this alternative to a new set of rules, norms, procedures different or opposed to those in force so far in the generation of knowledge: it consists rather in conceiving first and foremost research as practical knowledge, as knowing how to do something (in this case, to generate knowledge), and in conceiving research teaching as the transmission of a craft [39].

Figure 2 shows the different aspects of the role of teachers in formative research processes.

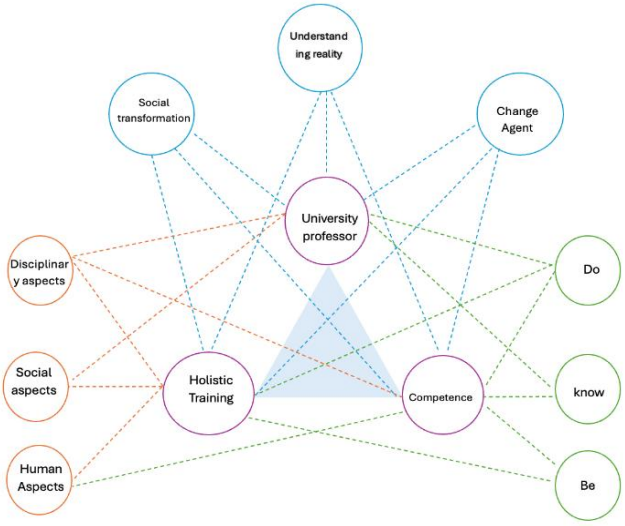

Figure 2. The role of the teacher in formative research (developed by the authors)

3. Results and Discussion

The process of change to improve the quality of education represents a permanent challenge in the development of the teaching and learning processes of formative research; therefore, knowing the educational reality in order to improve it is one of the main purposes for educational work to have the positive and necessary impact that the local context demands from the IES.

The social task that contains the investigative exercise as a mission offers a route for the knowledge and understanding of reality, as well as for its transformation, since from the investigative diagnostics, that is to say, starting from them, problems can be identified, which as fundamental contradictions are susceptible to transformation.

Formative research within HEIs seeks to bequeath to the new generations of students and future professionals, not only the disciplinary research protocols but also a spirit that, as Bachelard said, allows them to enter into the mysteries of inquiry about objects and their emanations, the product of scrutiny, of searching, of *in vestigium ire*. In this way, the cycle of knowledge is completed when the office of the wise man is transmitted, that is to say, from the very essence of the human being who always doubts and seeks to clear the cloud that prevents him from opening up to the cosmos from the incompleteness of his knowledge.

Thus, from knowing how to know, knowing how to do, and knowing how to be experienced by novice researchers and experienced researchers, a professional is formed who knows the disciplinary problems, their performance spectrum, and the methodologies or routes to know and act in accordance with the contextual reality. This is the sense of the social that proclaims that what the social being thinks, does, says, and feels remains in the context of its space-time, indicating its commitment to its history.

Therefore, it is important to recognize that research skills are acquired and must be trained as researchers in a permanent exercise, and the relationship between knowledge, knowledge, practice, and ethical commitment completes the picture of formative research.

In this process, the accompaniment of the teacher, who is a researcher but also a research didactic, must possess the research competencies, as such, but must also have the educational resources to achieve the transmission of the craft, to achieve, in this process of formative research, the formation of a professional who knows the disciplinary foundations, the ways to acquire that foundational knowledge but also the courage to approach that universe of the unexplored, which is what research invites.

This article intends to point out, through the conceptual review achieved, that there are certain clarities about research competencies and formative research, but it is the responsibility of HEIs and their research methodology professors to continue with this task.

The documentary review suggests that the development of research skills in the educational field is essential for training critical professionals capable of addressing complex problems. Research competencies include skills, such as question formulation, research design, data analysis, and interpretation of results. These competencies allow students not only to acquire theoretical knowledge but also to develop practical

skills applicable to their area of study.

However, theoretical positions on research competencies in higher education reveal a diversity of approaches, from those who see these competencies as a series of technical skills to those who perceive them as comprehensive and complex skills. While some theories focus on teaching as an individual process, others view the social context and institutional environment as fundamental. This contrast suggests that the development of research competencies in higher education is a multidimensional process and its effectiveness depends on integrating different approaches to respond to both academic demands and the needs of the current social and professional context.

Formative research is an effective strategy for developing research skills in a gradual and practical way. This methodology, which focuses on learning through research experience, allows students to apply their knowledge in a real context, thereby promoting a better understanding of the principles of scientific research and the development of analytical, reflective, and problem-solving skills.

Finally, they allow the development of transferable skills; research competencies not only benefit students interested in a career in research or academia but are also valuable in any professional discipline. Skills such as problem-solving, data analysis, and effective communication of results are transferable to multiple work contexts, which increases the employability and versatility of graduates.

3. Conclusion

3.1. Implications of the Study

This research develops the concepts of formative research and investigative competence, establishing the relationship between the missionary functions of higher education, to establish the importance of assuming formative research from an integral perspective that considers it a basic aspect of the graduation profile and the practice of any professional.

The aspects discussed allow the establishment of a progressive development between the entry profile and the graduation profile, where the general, specific, and transversal competences must be related to investigative competence, understanding it as an aspect integrated into professional competence.

3.2. Future Research

The results obtained support the development of two doctoral training investigations and endorsed by the Dean of Research of the Antonio Jose Camacho University Institution: the first, which deals with the function of professors in the orientation of degree works (PD 0618); the second, assumes investigative qualification as a strategy to assume educational attention to diversity as an object of training from the way in which this project has been constructed (PD0118).

Declarations

Author Contributions

Conceptualization, J.C.M.M. and H.Z.A.; methodology, J.C.M.M. and M.E.R.V.; formal analysis, J.C.M.M. and H.Z.A.; writing—original draft preparation, all authors contributed equally; visualization, M.E.R.V.; project administration, J.C.M.M. All authors have read and agreed to the published version of the manuscript.

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The data presented in this study are available in this article.

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Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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