



Perception of research, innovation, and entrepreneurship skills among university students¹

Percepción de competencias investigativas, innovación y emprendimiento en estudiantes universitarios

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ABSTRACT

Objective: This research aims to analyze the perception of development the research, innovation, and entrepreneurship competencies of students and teachers at the Universidad Mariana, Colombia, to create research training programs and strategies for the academic community. **Method:** It was a quantitative, empirical, analytical, and descriptive study, applying Likert-type instruments to 263 students enrolled in the research subareas courses at the Universidad Mariana. **Results:** The results indicated that the development of research, innovation, and entrepreneurship competencies in students is not perceived as an essential part of their training process and only stands out in students from the faculty of Accounting, Economics, and Administrative Sciences. **Conclusions:** It is concluded that developing and grooming a researcher is a gradual process, which requires constant training, experience, and contact with more experienced researchers. It also includes a degree of responsibility and commitment that the researcher assumes with the disciplinary area, the environment that surrounds them, and the integration of the curriculum with the researcher's academic life, being an institutional responsibility to provide the resources to strengthen research, innovation, and entrepreneurship competencies.

Keywords: competencies, research, innovation, university.

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RESUMEN

Objetivo: analizar la percepción del desarrollo de competencias investigativas, de innovación y emprendimiento de estudiantes de una universidad privada de la ciudad de Pasto, Colombia, para generar programas y estrategias en formación investigativa en la comunidad académica. **Método:** Estudio cuantitativo, empírico analítico y descriptivo, aplicando instrumentos tipo Likert a 263 estudiantes de los cursos de la subárea investigativa de una universidad privada. **Resultados:** La percepción del desarrollo de competencias investigativas, de innovación y emprendimiento en los estudiantes, no se evidencia como una competencia esencial en su proceso de formación, resaltándose en estudiantes de la facultad de Ciencias Contables, Económicas y Administrativas. **Conclusión:** la formación de un investigador es un proceso gradual, que requiere constante capacitación, experiencias y contacto con investigadores más experimentados, aunado a ello, el grado de responsabilidad y compromiso que asume dicho investigador con el área disciplinar, el medio que lo rodea y la integración que se logre tanto del currículo con los agentes de la vida académica, siendo una responsabilidad institucional proveer los recursos para fortalecer las competencias de investigación, innovación y emprendimiento.

Palabras clave: competencias, investigación, innovación, universidad.

INTRODUCTION

The Ministry of National Education (MEN, 2017) establishes the importance of research in higher education from the innovation and relevance projects, which establishes three fundamental points: relevance for innovation and competitiveness, consolidation of the human capital management strategy, and promotion of the internationalization of higher education.

When referring to relevance for innovation and competitiveness, MEN (2017) seek higher education institutes with the conditions to generate research, strengthen human capital, and develop the country based on strategic activities to strengthen capacities for research training in a way that solutions to the country's needs are generated from higher education.

The institutional strategic plan of Universidad Mariana, Colombia, in strategic focus 2 of Research, technological development, and innovation with social impact, presents the institutional capacity to promote quality research and innovation with regional, national, and international relevance. This plan results in several researchers being trained in scientific, technological, and disciplinary knowledge and shows indicators that are related to scientific production and research training, which involves not only teachers but also students who receive comprehensive training.

However, despite institutional efforts to promote research and scientific development, measures must be established to ensure quality in the research process. To do so, it is necessary to study how students and teachers perceive research skills; the results aid in creating programs and strategies around the promotion of research and innovation in compliance with the indicators set out in the strategic plan for institutional development.

According to Murcia (2015), research in the educational field has significant value as it provides a common place where both teachers and students are interested in analyzing and reflecting on ideas. This is further encouraged through pedagogical strategies that lead to criticism, arguments, and problem analysis and solving. The discussions can also pertain to environmental needs or a hypothetical situation or context of a specific field. According to Ayala & Barrera (2018):

The role of universities in improving the country's quality of life is directly related to the quantity and quality of human resources and the talent that it possesses, focused on the ability to generate and transfer innovative and creative knowledge to meet the needs of the environment in which they are developed from a public and/or private profile. (p. 74)

Private universities, faced with the constant task of rethinking the university from its context and the organization of its substantive functions, specifically from formative research, seek to identify curricular and extracurricular programs and strategies that contribute to research training (Rojas Arenas et al., 2020). To this extent, some activities tend to articulate research, but there is no established research training program, which should be institutionalized as it facilitates the means and institutional conditions to develop research competencies in university students.

Research as a substantive function of a private university under study is present in all undergraduate and graduate academic programs. Therefore, each academic program has courses that contribute to training in research, innovation, and entrepreneurship skills; as a result, they have teachers in charge of this course (Universidad Mariana, 2007). However, upon reviewing the information available in the Research Department on the research training strategies used by teachers, it was found that there is no clarity on the terms, or curricular or extracurricular processes related to research, innovation, and entrepreneurship; moreover, there is no discrimination as to which strategies are directly related to the development of research competencies.

Consequently, creating and designing a program for research training would seek to articulate on the research developed from the courses of the research subarea in each curriculum, including extracurricular strategies to strengthen research training processes with a theoretical foundation consistent with the institutional pedagogical model, the results of which would respond to quality indicators required in institutional accreditation processes of the private university in which this study was carried out (Universidad Mariana, 2007).

The university under study has not developed studies that analyze data on research competencies of students based on their self-assessment; hence, solutions can be proposed for the knowledge gaps and contribute to the development and professional improvement of teachers and the academic performance of students. This would achieve help the university results that would enhance its position in the generation, transfer, and allocation of new knowledge at the regional, national, and international levels.

The research proposal would indicate a beginning for the processes of evaluation and monitoring of research, innovation, and entrepreneurship that involves not only the generation, transfer, and allocation of new knowledge but also the pedagogical strategies used for research training and the development of relevant competencies with achievements from the knowledge, doing, and being of the students (Universidad Mariana, 2019).

As is well known, training professionals to use scientific methods for the benefit of development and social impact is an activity that takes place in the classroom (Vera et al., 2022); however, it raises practice questions: Does students' research training allow them to develop the necessary competencies for the generation, transfer, and allocation of new knowledge? Do all teachers have the research competencies for the generation, transfer, and allocation of new knowledge, as well as for training students in research? Based on these questions, the following research question is posed: What is the perception of the development of research, innovation, and entrepreneurship skills of students at a private university in the city of Pasto, Colombia?

In higher education, it is inherent that the training of future professionals is framed in the development of competencies in knowing, doing, and being, with research as one of the skills that the learner must possess to "collect and interpret data and information to support their conclusions, including reflection on issues of a social, scientific, or ethical nature in the field of their area of study" (Rubio et al., 2018).

Several studies are related to student research in higher education. For the present proposal, a study conducted at the University of Barcelona (Rubio et al., 2018) is referred to, whose interest was to know the self-perception of students in the area of research skills during the completion of their degrees. The results showed that they present medium-high levels of perception in research skills related to writing, data collection techniques, and qualitative analysis, with lower performance in bibliographic search, citation, and quantitative methods. This study highlights those students who believe research topics should be further analyzed in a way that research skills are optimal to develop their degree tasks and that bibliographic citation and referencing and the teaching of scientific writing and searching for specialized databases should be emphasized. The study was framed within a quantitative approach, applying a questionnaire comprising three dimensions (data from the final thesis work, self-perception of research skills knowledge, and importance of research skills) and contextual or sociodemographic data, with numerical ratings from 0 to 4. The sample was 109 students enrolled in the pedagogy program.

Another reference that guides the present study is the one called assessment of research competencies of graduate students in administration, developed in Mexico (Cardoso & Cerecedo, 2019). The objective of the study was to assess the levels of development of research competencies of students in graduate programs, with an exploratory, descriptive, and quantitative approach, using a Likert-type questionnaire with a scale ranging from 0 (not developed) to 4 (very developed). The sample consisted of 150 students from six graduate programs. The results indicate an insufficient level of development in their research competencies on design, instrumentation, and management of knowledge dissemination. The contribution of this study is aimed at the methodological process to obtain the information as the use of an instrument to collect information through a Likert scale is considered for this proposal.

In Honduras, a study related to the evaluation of the development of research competencies in distance learning students at the Universidad Pedagógica Nacional Francisco Morazán (Estrada, 2019) was developed from a mixed approach, with participation from 163 students in professional practice and 6 teachers who guide the research courses. The results showed that the student's level of research is intermediate-advanced and that teachers implement active, collaborative, and theoretical-practical teaching strategies. The instrument used to collect information from the students in this study is noteworthy as it is made up of five research competencies: information search, use of technological resources in research, ability to develop research methodology, ability to communicate research results, and ability to work in a team. It is essential to point out that for the present proposal, it is necessary to evaluate the type of instrument, according to the institutional dynamics and requirements of the research context. It is the same way that the referenced study proposes adapting instruments according to the needs and characteristics of its context in its methodology.

At the national level, the study on "Research competencies in university teachers" (Ayala & Barrera, 2018) is taken as a reference. The objective was to determine the competencies of university teachers in the Department of Architecture at the Universidad Francisco de Paula Santander de Cucuta, using a quantitative and descriptive field approach; using the survey and descriptive statistics, the sample consisted of 25 teachers. It was possible to establish a high level of research competence in teachers, favoring their teaching practice to implement teacher and student research processes. However, low percentages could be seen in data analysis, composition, and writing of research reports, as well as methodological aspects related to the population and sample. This study's contribution to the present

proposal is that it shows how results can generate strategies that contribute to professional development and improvement, in addition to replicating the evaluation with the instrument applied in the research.

The last study that has been referred to as "Investigative competencies and creative leadership in students of mathematical sciences and computer science at the National University of Central Peru" (Espinoza, 2017), which analyzed the relationship between research competencies and creative leadership in students, with a descriptive research type and a correlational design. This study applied an instrument of 71 items for the research competency variables and a questionnaire of 40 items for the creative leadership variables with a sample of 89 students. This study was chosen because it shows the instrument that evaluates research competencies, from not only a structural perspective about the research process but also the attitudes, values, and motivation of the students toward research.

METHOD

This is a quantitative study with an empirical analytical approach. The study is also a descriptive type with convenience sampling represented by all full-time and part-time teachers and students of all academic programs enrolled in courses of the research subarea. The sample comprised students from all private university programs under study. To determine the sample, a non-probabilistic convenience sample was chosen, under the parameter of the inclusion criteria determining that they are full-time and part-time teachers and students enrolled in the research subarea of the undergraduate programs. The sample size was 263 students who agreed to participate voluntarily by signing the informed consent form.

The data was collected using a Likert-type questionnaire instrument:

Student Research Competencies Questionnaire: It was developed by Espinoza (2017) and considers the following four dimensions: Knowledge of the scientific research process (21 questions); Research skills (26 questions); Research attitudes and values (13 questions); and Research motivation (11 questions). In addition to containing general data such as department, program, and semester, the questionnaire was supplemented with 10 questions related to innovation and entrepreneurship, which were validated by a professor of the Entrepreneurship Unit of the university under study.

The questionnaires created in Google Forms were applied to students through their institutional email in May 2021, with prior application validation by teachers of the Entrepreneurship Unit and the Systems Engineering program. The questionnaire is self-reporting and easy to understand and use; it asks about knowledge of the scientific research process, research skills, attitudes and values in research, motivation toward research, and knowledge about innovation and entrepreneurship. It is based on a Likert frequency scale, with parameters such as never, almost never, sometimes, almost always, and always, coded from 0 to 5, respectively, to facilitate the statistical analysis process using the free Epidat 4.2 software.

It should be noted that since the instrument is applied electronically, approval of the informed consent is secured before completing the questionnaire, following the ethical guidelines for the research described in the Colombian regulations with Resolution 8430 of 1993. The research was approved by the Ethics and Bioethics Committee before the board of the Department of Health Sciences of the university through Agreement 087 of May 11, 2021.

RESULTS

Table 1. Knowledge dimension of the scientific research process.

Department	Never	Almost never	Sometimes	Almost always	Always
Education			26	57.8	44.4
Health Sciences	4.0	6.4	30	36.8	24.5
Engineering	1.9	3.3	28.7	46.6	23
Humanities and Social Sciences			30	45	33.8
Accounting, Economics, and Administrative Sciences	9.1	20.8	46.8	45	15.9

Most of the students perceive that they *almost always* acquire knowledge of the scientific research process in the last year of the research subarea, except the students from the Department of Accounting, Economics, and Administrative Sciences, who say that they *sometimes* gain knowledge on this topic.

Table 2. Research skills dimension.

Department	Never	Almost never	Sometimes	Almost always	Always
Education	20	35	34.3	55	41.1
Health Sciences	5.6	9.3	22	36.3	26.7
Engineering	3.5	6.3	23.6	45.1	25.6
Humanities and Social Sciences	22.2	13.6	20.3	24.8	52.7
Accounting, Economics, and Administrative Sciences	13.6	10.6	46.5	42.8	12.4

Regarding the development of research skills, it is observed that the majority of students in the departments of Education, Health Sciences, and Engineering perceive that they *almost always* develop their research skills, whereas in the Departments of Accounting, Economics, and Administrative Sciences, the students tend to develop their skills *sometimes*.

Table 3. Attitudes and values in research dimension

Department	Never	Almost never	Sometimes	Almost always	Always
Education		20	20	45	49.2
Health Sciences	3.5	4.9	15.9	36.2	38
Engineering	1.9	3.3	19.3	41.7	36.7
Humanities and Social Sciences			22.2	41.9	41
Accounting, Economics, and Administrative Sciences		18.2	42	43.4	14

The majority of students indicate that they *always* or *almost always* have the appropriate attitudes and values while doing research.

Table 4. Motivation toward research dimension.

Department	Never	Almost never	Sometimes	Almost always	Always
Education			20	40	50.9
Health Sciences	5.6	5.9	21.2	36	31.2
Engineering	2.5	7.7	30.9	38.9	20.4
Humanities and Social Sciences	11.1	11.1	24.4	51.5	21.2
Accounting, Economics, and Administrative Sciences		9.1	60.9	36.4	13.6

In relation to the motivation that students perceive toward research, they are *always* and *almost always* motivated to do research, whereas in Accounting, Economics, and Administrative Sciences, students are only *sometimes* motivated to conduct research.

Table 5. Innovation and entrepreneurship dimension.

Department	Never	Almost never	Sometimes	Almost always	Always
Education			25.7	49	34.5
Health Sciences	2.9	5.4	24.4	35.6	31.8
Engineering	1.9	3.4	20.9	51.8	23.7
Humanities and Social Sciences		11.1	23.2	45.4	29.2
Accounting, Economics, and Administrative Sciences		9.1	47.9	35.6	15.7

It is clear that students *almost always* acquire knowledge related to innovation and entrepreneurship; however, in the Department of Accounting, Economics, and Administrative Sciences, they only *sometimes* acquire this knowledge.

On analyzing the results, it is important to point out that the perception of the development of research, innovation, and entrepreneurship competencies in students is not seen as an essential part of their training process, standing out in students of the Accounting, Economics, and Administrative Sciences Departments.

In the School of Education, the need to further understand competencies that were classified as *sometimes*, related to research skills, followed by knowledge of the research process, innovation, and entrepreneurship, is visible. Although it does not have a great emphasis on professional work, the latter can allow students, as future teachers, to generate educational innovation strategies as part of their teaching practice for the communities they serve.

In the Department of Health Sciences, most of the answers point to the development of competencies from an adequate perception, which has been qualified as *always* or *almost always*; however, the need to strengthen the knowledge of the research process that affects research skills cannot be ignored, followed by competence in innovation and entrepreneurship.

In the School of Engineering, the perception of the students regarding motivation toward research, classified as *sometimes*, followed by knowledge of the research process, is striking. Although a perception almost always appears in all the items, the need to address top-

ics that motivate the student toward the development of research competencies cannot be ignored, starting from their own interests that motivate their performance in the research field.

In the Department of Humanities and Social Sciences, there is a perception that they *sometimes* acquire knowledge of the research process and that they *never* acquire research skills; contrary to the fact that the majority used *always* or *almost always* to classify these two competencies, it is necessary to strengthen these two aspects in particular through the training plan.

Finally, in the Department of Accounting, Economics, and Administrative Sciences, the need to study all the dimensions further is clear. These were mostly evaluated as sometimes acquired, especially in the motivation toward research, which in some way influences the other competencies.

DISCUSSION

According to the results obtained, referring to the development of research skills and the acquisition of knowledge of the research process, the perception of most students is positive, referring to it as *almost always*, except for one department that refers to it as *sometimes*. These findings are in contrast to the level of research skills of a group of students from the Professional School of Education at the National University Santiago Antúnez de Mayolo (Ayala, 2020), who present a high percentage rating of average (77.3%) and poor (11.4%) and only 11.4% is good.

Hence, there is a latent need to prioritize the development of knowledge, competencies, and research skills in the university under study because, as mentioned by Rojas (2019, cited by Ayala, 2020, p. 5), it constitutes "an accurate response to the social demands of companies and the characteristics of the knowledge society and in which their future graduates will perform."

The majority of students recognize that they have good attitudes and values in research, as mentioned by Landazábal et al. (2010, citing Barreto, Ruiz & Sánchez, 2006), who explain that this competence is directly related to how a subject acts against social demands and hence, it involves knowledge, skills, and values. Correspondingly, the support of professors as research advisors is also essential in generating a good attitude and values of integrity toward research (Rocha et al., 2022).

Motivation, which refers to knowing how to be, may be due to the experience obtained in the same research process. As mentioned by Estrada (2014), the presence of motivation is a strength because it gives importance to the affective bond of the subject toward the scientific activity; therefore, satisfaction in participation in the research activity plays an important role, which should be promoted by the research teachers to the students to find solutions to problems (Ñique-Carbajal et al., 2020). In this sense, Estrada (2014) states that "the commitment to problem-solving detected, the independence to handle information, the correct and complete use of the scientific method, as well as the critical and self-critical attitude to judge the points of view" (p. 185).

Innovation and entrepreneurship propitiate creative ability and originality, with skills such as networking and making contacts. This type of strategy enhances the development of scientific competencies and offers the students a significant horizon for their future professional lives (García & Ladino, 2008, cited by Franco-Mariscal, 2015, p. 233). Hence, the great challenge for universities is to promote innovation and entrepreneurship within the educational process as it will be part of the future professional's life, where its exercise will

be predominant for regional impact and growth in search of solutions for the development of the field (Soto et al., 2022), which makes it relevant to promote from the university level without distinction of the academic programs offered.

About the dissemination of knowledge, coupled with innovation and entrepreneurship, it is imperative to state that these reaffirm the communicative and cognitive skills that are fundamental for the formation of a researcher as they encourage the search, treatment, and relation of information through technology (Rodríguez & Martínez, 2003, cited by Numa-Sanjuan & Marquez, 2019, p. 236).

The low perception regarding the development of essential competencies in research, innovation, and entrepreneurship and its relation with the low productivity of research groups, technological development, and the generation of new knowledge can be related to what Campos & Chinchilla (2009) state when mentioning that:

Training of research skills implies not only the participation of an academic staff that must be trained in research but also the implementation of a research pedagogy capable, on the one hand, of promoting meaningful learning processes in the student population and, on the other, of surpassing the traditional teaching of research. (p. 16)

For this reason, the formation of competencies for research has a significant degree of importance and co-dependence with the formation of research groups and incubators, which, in essence, have the task and responsibility of forming the university and social community with research capabilities (Paz Delgado & Estrada, 2022).

As for the research, innovation, and entrepreneurship training program that will cover the needs of university teachers and students, it should be "a joint learning process within a community under construction; thus, those in charge of research training should be researchers and research pedagogues" (Campos & Chinchilla, 2009, p. 14); a continuous research training program is needed, so teachers are constantly updated and students acquire and strengthen these competencies. Thus, research should not be only for a few scholars but should permeate daily academic life; only then will it be possible to speak of the formation of a research culture in the university.

CONCLUSIONS

Research is a substantive function of the university; therefore, it is essential to rethink the what, why, and for what research purpose in the private university under study. Extracurricular strategies such as research workshops are a scenario to reaffirm research, innovation, and entrepreneurship skills.

From the students' perception of the development of research skills and the acquisition of knowledge resulting from the research process, it is possible to conclude that they are achieved at a significant level (almost always); however, it is necessary to opt for different strategies that from the research subarea allow students who are part of the Department of Accounting and Administrative Sciences and in general to strengthen their perception on this issue because the university in its scientific and research training should strive to prepare its students with this type of skills.

The formation of a researcher is a gradual process that requires constant training, experience and contact with more experienced researchers, in addition to the degree of responsibility and commitment that the researcher assumes with the disciplinary area, the environment that surrounds them, and the integration of the curriculum with the agents

of academic life. It is worth mentioning that there is also institutional responsibility in the sense of providing the necessary resources and elements to foster a true research culture that goes beyond research as a requirement and transcends into meaningful learning.

The institutional interest in promoting a culture of research and even its promotion among teachers and students does not guarantee that it will be carried out nor that it will be carried out in the way required by society. For this purpose, it must be organized into a continuous training plan, which can be followed up to demonstrate the organization with the research processes and the needs and problems of the field.

The culture of research as an enduring objective over time is something that is built and cannot be demanded nor can be born out of nothing. There must be an institutional commitment that shapes and permeates it if we want it to have a real impact.

Conflict of interest

No conflict of interest.

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