SCIENTIFIC CULTURE
www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 12, No. 4, (2026), pp. 8563-8573
Open Access. Online & Print

DOI: 10.5281/zenodo.12426849

LEVEL OF RESEARCH COMPETENCIES IN FIFTH-GRADE PRIMARY SCHOOL STUDENTS IN TIPACOQUE, BOYACÁ

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Received: **18/11/2025**
Accepted: **11/01/2026**

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ABSTRACT

This research describes the level of research competencies in fifth-grade students from educational institutions in the municipality of Tipacoque, Boyacá, Colombia. It was framed in the methodology of holistic research (Hurtado de Barrera, 2012), with a descriptive type, holopraxic method and field design, cross-sectional, contemporary and univariate. The population was made up of 70 fifth-grade students from eight educational sites; given the small size of the population, the entire population was worked on without resorting to sampling. The study event, research competencies, was defined as the set of skills, knowledge and attitudes aimed at exploration, discovery and knowledge of the environment, and was operationalized in three synergies: cognitive, procedural and attitudinal. The data collection technique was the survey and a questionnaire of 84 items with a dichotomous scale (0-1) was used, transformed into 100 points. The instrument presented a content validity of 0.89 by expert judgment and a reliability of 0.854 according to Cronbach's alpha coefficient. The results indicate that the overall level of research competencies was in the regular category, with a median of 41.67 out of 100, which shows that 85.72% of the students are located between the low and regular categories. Procedural synergy was the most critical (median 29.03, low category), followed by cognitive synergy (median 44, regular category). Attitudinal synergy was the most developed (median 57.14, regular category), with 48.57% of students in the high and very high categories. The diagnosis shows a multidimensional deficit that compromises the cognitive, procedural, and attitudinal phases of the research cycle, with a total absence of cases in the very high category for the global event.

KEYWORDS: Research competencies, basic primary education, cognitive synergy, procedural synergy, attitudinal synergy

1 INTRODUCTION

Scientific research is a fundamental pillar for the human, social, and technological development of nations. From the first years of schooling, training in research skills transcends the limits of memorization and mechanical repetition, to project itself towards the development of critical thinking, problem solving, and the generation of knowledge applied to the context. In this sense, UNESCO (2017) affirms that education is an essential right based on the achievement of sustainable development, which reaffirms the need to prioritize educational policies in accordance with the requirements of each context.

On the global stage, the results of the Programme for International Student Assessment (PISA 2022) reveal that even the most advanced nations are experiencing worrying setbacks in research skills. In Latin America, more than 57% of basic education students perform poorly in these skills (Arias et al., 2023), and Colombia is no exception: the results of PISA tests and national assessments confirm a negative trend that particularly affects elementary school students.

The municipality of Tipacoque, department of Boyacá, Colombia, is a community with eight educational sites, seven of them rural that serve students in multigrade modality and one headquarters in the urban area. This context presents specific challenges in research training, since pedagogical resources, connectivity, and specialized teacher training are limited. The results of the standardized tests applied in this municipality show performances consistently below departmental and national averages, which suggests the need for local diagnostic studies to guide contextualized interventions. The fifth grade of basic primary education is a particularly relevant level, as it corresponds to the end of the primary cycle and determines the consolidation of the basic competencies that will facilitate the transition to secondary education. At this level, students should be able to describe phenomena, formulate hypotheses, and develop elementary processes of inquiry (MEN, 1998). However, evidence shows that gaps accumulate from early stages and progressively worsen if timely interventions are not carried out (Barón Pinto, 2019).

This article presents the diagnosis of the level of research competencies, in its cognitive, procedural and attitudinal dimensions, presented by fifth-grade students of the educational institutions of the municipality of Tipacoque, Boyacá. The precise identification of strengths and weaknesses in each synergy allows to guide pertinent didactic proposals that contribute to improving the research performance of Colombian students in rural and urban contexts.

Description of the problem

Education in the twenty-first century requires the training of citizens capable of investigating, analyzing, and transforming their environment. In this framework, research competencies are recognized as the articulating axis of the academic, professional, and social training of human beings, since they integrate knowledge, skills, and attitudes aimed at the systematic exploration of reality (OECD, 2019). Gómez and León (2025) point out that the acquisition of these competencies in the school environment favors not only academic performance, but also intellectual growth, academic self-esteem, and the construction of an active and informed citizenship.

However, there is deep concern at the global level about the absence of consistent development of research skills from basic education. The PISA 2022 results (OECD, 2023) reveal that one in four young people does not apply basic research knowledge, and in 18 OECD countries more than 60% of students are underperforming. This deterioration follows a downward trajectory that began before the COVID-19 pandemic, a situation that worsened significantly during that period.

In Latin America, the picture is equally alarming. The World Bank (2022) reports that before the pandemic, 50% of students completing basic primary education in the region did not understand a simple text; a figure that rose to 80% in the post-pandemic period. The 2019 Regional Comparative and Explanatory Study (ERCE) confirmed that 44% of third-grade students did not reach the minimum level of performance in reading, a basic competence for the development of research skills (Arias et al., 2023). In science, 57% of Latin American students performed poorly in research skills, compared to 24% in OECD countries, which implies a lag of 33 percentage points (Arias et al., 2023).

In Colombia, the results of the PISA 2022 tests registered an average of 409 points in writing competence, significantly lower than the 476 points of the OECD average (OECD, 2023). According to ICFES (2024), the percentage of students located at the lowest level of reading comprehension increased from 43% in 2015 to 51% in 2021, which shows a continuous regressive trend. This situation is replicated in research competencies associated with natural sciences: in 2022 Colombia obtained 411 points, 74 points below the OECD average, with sustained declines since 2015 (ICFES, 2024).

The results of the Ministry of National Education's (MEN) Evaluate to Advance strategy in fifth grade show that in 2016, 45% of students did not correctly answer questions of the investigative writing competence, and 47% presented deficiencies in

reading comprehension (MEN, 2016). By 2017, these figures remained at 42% and 37% respectively (MEN, 2017). Although there is some improvement, about 42% of fifth-grade students still do not reach the basic levels of the competencies required for research.

In the department of Boyacá and in the municipality of Tipacoque, this problem is also clearly manifested. The results of the ICFES tests in grade 11 of the municipality show a paralysis in low ranges (between 49 and 52 points), always lower than the departmental average (MEN, 2023). In grade 5, the Evaluate to Advance tests of 2016 and 2017 reveal that around 50% of students do not adequately apply basic research skills, replicating the critical patterns of the national context (MEN, 2016; MEN, 2017). Among the factors that explain this deterioration are the prevalence of transmissionist teaching models, the scarce experimental practice, and the absence of didactics specifically oriented to the development of research competencies. Studies in Mexico confirm that 82% of classes are limited to the passive reception of knowledge, and only 3.4% incorporate activities that strengthen research (Fernández Nistal & Tuset Bertrán, 2008, as cited in RICYT, 2018). In Chile, 40% of teachers proposed experimental activities less than twice a year (Cofré et al., 2010, as cited in RICYT, 2018). This situation perpetuates a cycle in which students do not develop the research skills necessary to face the challenges of the twenty-first century. Against this backdrop, training in research skills from basic primary education becomes an urgent need. Barón Pinto (2019) argues that it is not necessary to teach methodology to children so that they learn research skills from an early age; what is relevant is the development of basic skills that allow them to formulate questions, search for evidence, analyze causes, and communicate findings. The postponement of this training until postgraduate degrees generates an absence of the necessary skills to assume complex methodological processes and frustrates the expectations of scientific progress of nations. In this context, the following research question arises: What is the level of research competencies of 5th grade students in the educational institutions of the municipality of Tipacoque, Boyacá? Correspondingly, the general objective of the research was: To determine the level of research competencies of 5th grade students in the educational institutions of the municipality of Tipacoque, Boyacá. The specific objectives were: (a) to describe the level of research competencies in their cognitive, procedural, and attitudinal synergies; and (b) to analyze the strengths and weaknesses by area within each synergy.

2 THEORETICAL BASIS

Research competencies: definition and components

Research competencies are defined as the set of knowledge, skills, habits, and attitudes (Navas López, 2025) that enable the positioning of the subject in processes of inquiry, analysis, and knowledge production. This definition integrates the ability to formulate relevant questions, search, record, and analyze information, interpret data, propose solutions, communicate findings, and design appropriate methodologies in real or simulated contexts. Maldonado et al. (2007) emphasize that research competence comprises the epistemological, methodological, technical, and social dimensions, and that its strengthening implies the development of skills to observe, question, record, experiment, interpret, and write about practice.

Research competencies were operationalized based on the approaches of Tobón (2006, 2015), who conceives competencies as the articulation of three types of knowledge: knowing how to know (cognitive dimension), knowing how to do (procedural dimension), and knowing how to be (attitudinal dimension). This knowledge is constituted in an integrated fabric where each component enhances the others (Tobón & Jaik Dipp, 2019). Digital technology was incorporated transversally into the three synergies, in correspondence with the approaches of Vuorikari et al. (2016) and Bonilla et al. (2022) on digital competence as an essential component of the contemporary research profile.

Cognitive synergy of research competencies

The cognitive dimension of research competencies has to do with the management of information and thought processes that include the ability to define, recognize attributes, explain concepts, make inferences, deductions, anticipate and establish logical relationships. Castillo Vallejo (2011) argues that this dimension corresponds to the structuring and mastery of intellectual processes that lead to the construction of thinking skills and various research alternatives. The MEN (1998) establishes that at the fifth grade level of basic education, students must be able to construct and manage knowledge, describe objects and events, support arguments with explanatory schemes, establish causal relationships and contrast hypotheses.

The cognitive competencies of research are also expressed in the comprehension, argumentation, and communication skills evaluated by ICFES (2007) in the area of language, as well as in the competencies to identify, formulate, and analyze scientific phenomena in the area of natural sciences. Pérez

Rocha (2012) specifies that the cognitive component encompasses knowing how problems and hypotheses are formulated, how objectives are written, what techniques and instruments are used, and how data are interpreted. Without this cognitive foundation, the student cannot participate meaningfully in any of the stages of the research process.

Procedural synergy of research competencies

The procedural dimension involves the development of practical skills related to searching, recording information, developing procedures, and using digital technologies in real or simulated situations. Guity and Méndoza (2018) highlight that the procedural component allows for the concrete application of the knowledge acquired in problem solving. Castillo Vallejo (2011) lists procedural competencies in: (a) question formulation, (b) observational competencies to record data, (c) analytical competencies to organize and make sense of results, and (d) communicative competencies for the writing of the final report and the dissemination of findings.

The MEN (1998) establishes that in fifth grade, students must pose questions, document themselves to answer them, formulate hypotheses based on theory, use data, propose and conduct experiments, and address technological and environmental problems. ICFES (2007) emphasizes the competencies of inquiry, explanation, and communication as those specific to the procedural component in natural sciences. The integration of technological tools in procedural processes constitutes a differentiating element of contemporary research training, since the mastery of digital instruments becomes a necessary condition for the systematization and communication of results (Vuorikari et al., 2016).

Attitudinal synergy of research competencies

The attitudinal dimension of research competencies focuses on the attitudes, disposition, and motivation that the subject manifests in their interaction with the research process, which include discipline, perseverance, teamwork, curiosity, and the acceptance of constructive criticism (Guity & Méndoza, 2018). Pérez Rocha (2012) places learning to be in the attitudinal dimension, which involves values such as commitment, respect, tolerance, autonomy, and participation.

The MEN (2004) establishes essential scientific attitudes that fifth-grade students must develop, among which honesty in data collection, persistence, open-mindedness, critical capacity, willingness to work in a team, and assessment of the consequences of scientific discoveries stand out. ICFES (2007) assesses collaborative work and the willingness to recognize the open and changing nature of knowledge at this level. Benites Valverde et al. (2023) describe the competencies of know-how as positive and critical disposition, open-mindedness, honesty, curiosity, flexibility, and perseverance in the face of adversity, values that stand as the motivational foundation of any research process.

Levels of development of research skills

Chona et al. (2006) define three levels of development of research competencies: initial, intermediate, and advanced. The initial level includes skills such as formulating questions about facts, proposing possible explanations, identifying pertinent experimental designs, establishing variables, presenting information through texts, solving simple problems, and searching for relevant information. Tejada, Tejada, and Villabona (2008) call these basic research competencies, which include the ability to identify and formulate problems, self-questioning, work in a team, and develop communicative reading and writing skills.

Students in the fifth grade of basic primary education are located, approximately, at the initial level of research competencies, which implies the development of observation skills, description of problems, formulation of elementary hypotheses, basic documentary review, data collection, simple experimentation, analysis of results and communication, in correspondence with the curricular references of the Colombian MEN (MEN, 1998; MEN, 2004).

Related Research

Various studies corroborate the importance of research competencies in educational training and the relevance of early interventions. In Peru, a systematic review found that the development of research competencies from an early age generates benefits in the assimilation of academic content and in subsequent professional performance, and confirms that having research competencies generates benefits in the assimilation of content in the academic field and, subsequently, in performance as a professional (Ulloa Olano, 2022). In Ecuador, a study with graduate students revealed that shortcomings in research competencies accumulate due to the absence of investigative pedagogical practices from the earliest educational levels (Gómez-Escorcha et al., 2020). In Chile, the acquisition of research competence in initial teacher

training was influenced by the perceptions and experiences of the educational process at the different levels of training, which reaffirms the need for curricular mainstreaming that goes beyond isolated courses (Calisto Alegría, 2020).

In Colombia, research in Boyacá identified that students in elementary school institutions did not have favorable attitudes towards research due to the absence of pedagogical practices that cultivated them (Reyes Albañil, 2023). For their part, Colombian researchers established that the research competencies of elementary school students constitute the basis for good school performance, intellectual growth, and the construction of active citizenship (Gómez & León, 2025). This background justifies the relevance of a diagnosis of the level of research competencies in the specific context of Tipacoque, Boyacá.

3 METHOD

The research was based on the holistic understanding of the research (Hurtado de Barrera, 2012), which integrates diverse perspectives under a syntagmatic vision to understand the study phenomenon as a complex whole. The method used was the holopraxic, which includes the transit through different stages of research from less to more complexity (Hurtado de Barrera, 2017). For the purposes of this article, three descriptive stages are addressed, which correspond to the three synergies of the study event.

The type of research was descriptive, the design was field, cross-sectional, contemporary, and univariate. It is field because the information was collected from living sources in its natural environment; cross-sectional because the study was carried out at a single time; contemporary because information was obtained from a current event; and univariate because only the event of research competences was addressed. The approach was cosmological, exogenous, and ethical, which implies that the research was based on pre-existing concepts and theories, arose from the researcher's questions, and the analysis was carried out from the researcher's expert perspective (Hurtado de Barrera, 2000).

The study event was the research competencies of students in the fifth grade of basic primary education, made up of three synergies: cognitive, procedural, and attitudinal. Research competencies were operationally defined as the set of responses of students in relation to the cognitive (knowing how to know), procedural (knowing how to do), and attitudinal (knowing how to be) components in the field of research.

The population was represented by fifth grade students from the Educational Institutions of the municipality of Tipacoque, Boyacá. Tipacoque is a municipality located in the Northern Province of the department of Boyacá, Colombia, with an urban headquarters and seven rural campuses where teachers guide between two and five grades simultaneously. The total population was 70 students. Given its small size, no sampling was carried out and the entire population was worked on as a census sample.

The data collection technique was the survey and the instrument, a questionnaire called "Questionnaire of students' research competencies", composed of 84 items with a dichotomous response scale with four alternatives, where each item was scored with 0 (does not evidence competence) or 1 (evidences competence). The instrument yielded a maximum gross score of 84 points, transformed on a scale of 0 to 100 divided into five categories: very low (0-20), low (20.1-40), fair (40.1-60), high (60.1-80) and very high (80.1-100). The items were grouped into three synergies: cognitive (25 items), procedural (31 items) and attitudinal (28 items). Construct validity was obtained through the judgment of three experts, with a validity index of 0.89, higher than the expected minimum of 0.70. The overall reliability was 0.854 according to Cronbach's alpha coefficient, an excellent result that exceeds the minimum acceptable value of 0.75. For the statistical analysis, the median was used as the central measure, given the ordinal nature of the variable, accompanied by the analysis of quartiles, minimum and maximum values, and frequencies by category.

4 RESULTS

The following are the results of the descriptive analysis of the research competencies event and its three synergies: cognitive, procedural and attitudinal-, in the 70 fifth grade students of the Educational Institutions of the municipality of Tipacoque, Boyacá. The analysis was carried out based on the transformed scores (0-100) obtained from the application of the questionnaire, using the median, quartiles, minimum and maximum values, and frequencies by category.

Global analysis of the event Research Competencies

Table 1 presents the descriptive statistics of the research competencies event. The median of the research competencies event was 41.67 points out of 100, located in the regular category. This result indicates that students present considerable difficulties in the development of the competencies

necessary for research. The minimum score recorded was 19.05 (very low category) and the maximum was 76.19 (high category).

Table 1 Median, quartile, minimum and maximum of the event research competencies

Statistician	Score (0-100)
Minimum	19,05
Q1 (Quartile 1)	32,14
Medium (Q2)	41,67
Q3 (Quartile 3)	53,57
Maximum	76,19

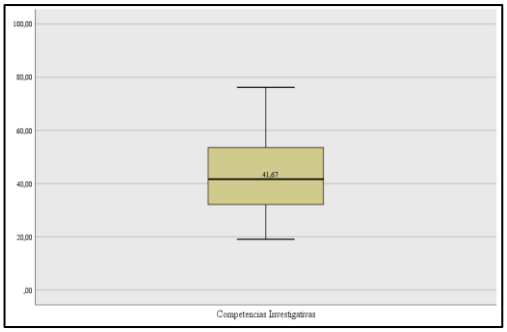

Figure 1 Box Plot and Mustaches of the Event Research Competitions
Note: In original language Spanish.

The interquartile path (Q3 - Q1 = 21.43) and the total route (57.14 points) show heterogeneity in the group. The box and whisker plot reveals an asymmetrical distribution skewed to the left, with most cases concentrated in the lower categories and no students in the very high category.

The data in Figure 2 indicate that 42.86% of the students are in the regular category, 41.43% in the low category, and 1.43% in the very low category, which shows that 85.72% of the group has performed between low and regular. 14.29% of the students are in the high category and in the very high category there are no cases. This analysis reveals a critical state of the research competencies in the group under study.

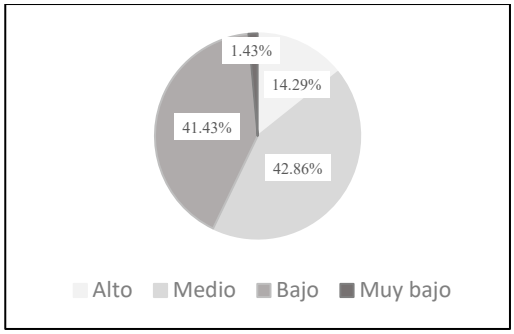

Figure 2 Frequency and percentage of students by category in research competencies
Note: In original language Spanish.

Analysis by synergies of the event research competencies

Table 3 shows that the three synergies have different medians. The cognitive synergy obtained a median of 44.00 (regular category), which indicates that the students have minimally mastered the basic cognitive processes for research.

Procedural synergy is the most critical, with a median of 29.03 (low category), a result that reflects severe difficulties in the practical application of research knowledge.

Attitudinal synergy was the most developed, with a median of 57.14 (regular category), suggesting that students have a favorable disposition towards research, although without consolidating the attitudes necessary to research autonomously and rigorously.

Table 3 Median, quartiles, minimum and maximum by synergy

Synergy	Minimum	Q1	Medium	Q3	Maximum	Category
Cognitive	8,00	32,00	44,00	56,00	76,00	Regular
Procedural	6,45	19,35	29,03	45,16	70,97	Low
Attitudinal	28,57	42,86	57,14	67,86	89,29	Regular

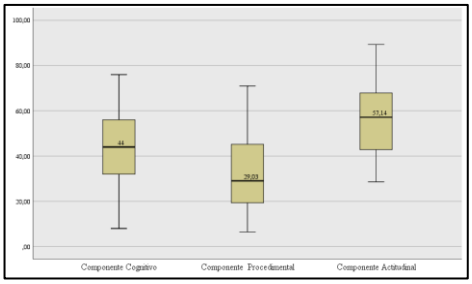

Figure 3 Box and whisker diagram of the three synergies
Note: In original language Spanish.

Cognitive synergy

Cognitive synergy includes the management of information and the essential cognitive processes to define, recognize attributes, explain concepts, make inferences, deductions and establish logical relationships. The median of 44.00 on a scale of 100 places the students in the regular category, with a minimum of 8.00 (very low) and no students in the very high category. 44.28% of the group is located in the low and very low categories, 32.86% in the regular category and only 22.86% shows an advanced level.

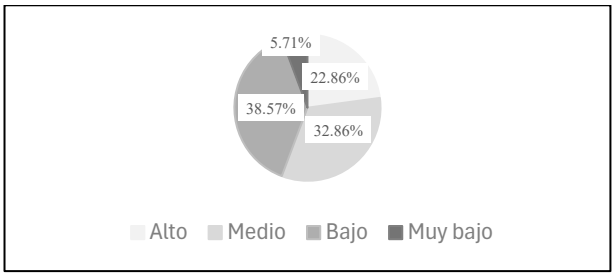

Figure 4 Frequency and percentage of students by category in cognitive synergy
Note: In original language Spanish.

Among the strengths of cognitive synergy, the following stand out: 77.14% of students recognize the main problem to be investigated in a text, and 62.86% describe a problem associated with a situation. These strengths show that students can access the most basic level of investigative thinking: recognizing that there is a problem.

However, the weaknesses are more numerous and critical. 68.57% cannot infer the causes of a situation, 64.29% do not adequately define a research problem, and 60.00% do not recognize a hypothesis. In the area of document review, 61.43% cannot define what a document review is. In writing, 70.00% do not recognize a poorly written text and 68.57% do not describe processes with good writing. The area with the greatest deficit is data analysis: 80.00% of students cannot define what results analysis consists of, which seriously compromises the understanding of the central purpose of the research. In communication of results, 71.43% do not recognize the key aspects to be communicated and 68.57% do not define the concept.

Procedural synergy

Procedural synergy, referring to the practical skills to search for and record information, develop procedures and use digital technologies, is the weakest of the three synergies, with a median of 29.03 (low category). 67.14% of the students are located in the low and very low categories, 28.57% in the regular category and only 4.29% in the high category, with no students in the very high category.

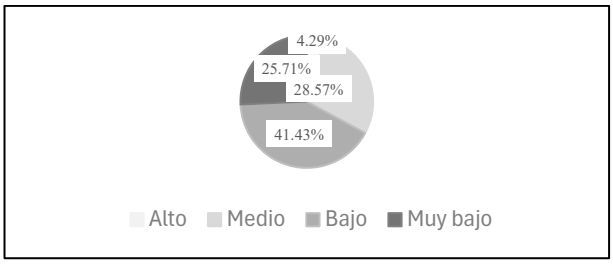

Figure 5 Frequency and percentage of students by category in procedural synergy
Note: In original language Spanish.

The few strengths of this synergy are concentrated in the identification of problems in real situations (60.00%), the formulation of research questions based on the context (58.57%), the use of cell phones to create videos with forecasts (61.43%) and the writing of information with their bibliographic sources (61.43%). These points of strength represent the most elementary procedural competencies of the research cycle.

The weaknesses are broad and affect practically all methodological phases. In the area of problem description, 80.00% do not use graphic organizers to present the problem, 74.29% do not use WhatsApp to clarify concerns, and 68.57% do not consult scientific videos on the internet. In hypothesis, 67.14% do not search for theories on the internet to support them and 62.86% do not perform testing experiments.

In document review, 60.00% do not implement document processes and 81.43% do not use PowerPoint to present information. The most severe deficiencies are found in writing, 90.00% do not use word processors such as Word), in data collection, 78.57% do not use spreadsheets to record data) and, especially, in communication of results, where 92.86% do not communicate findings, 90.00% do not use social networks to socialize results and 75.71% do not participate in debates and discussions. This inability to communicate results represents a collapse in the very purpose of the research.

Attitudinal synergy

Attitudinal synergy, which is focused on willingness, motivation, discipline, teamwork, curiosity and acceptance of criticism, is the most developed of the three, with a median of 57.14 (regular category). 48.57% of the students are in the high and very high categories, 31.43% in the regular category and 20.00% in the low category, with no cases in the very low category.

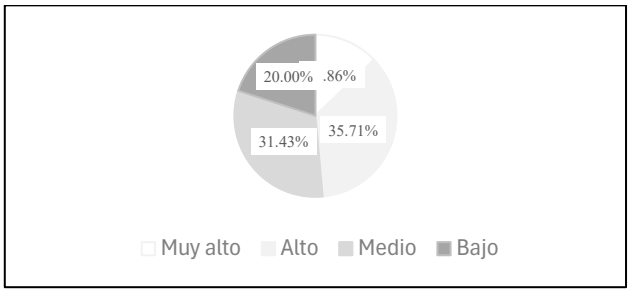

Figure 6 Frequency and percentage of students by category in attitudinal synergy
Note: In original language Spanish.

The strengths of this synergy are notable in the collaborative and openness dimensions. 90.00% are

willing to seek help when they have difficulty identifying a problem, 88.57% are willing to work in a team and 80.00% are open to listening to opinions on the research question. In hypotheses, 74.29% accept constructive criticism and 68.57% are willing to look for alternatives if their hypothesis is not proven. In writing, 81.43% persist until they manage to write something when they encounter difficulties. The most critical weaknesses are concentrated in resistance to feedback and low resilience: 78.57% do not assume positive criticism about their own work and 62.86% do not perceive difficulties as a challenge. The absence of reading discipline affects 78.57% of the group, which seriously compromises documentary review. 71.43% do not defend their hypotheses with arguments and do not feel confident when writing; 55.71% do not show interest in writing frequently. The most important conclusion is that the positive disposition of the students, which is valuable as a starting point, is not enough to develop research skills without the specific didactic mediation that turns it into concrete research practice.

5 DISCUSSION OF RESULTS

The overall results show that 85.72% of fifth-grade students in Tipacoque are concentrated between the low and regular categories of research competencies, with no cases in the very high category. This distribution is not an isolated phenomenon; Ulloa Olano (2022) confirms that in national and international contexts there is a progressive decrease in research performance, which affects society because students are not being trained to solve situations that the environment demands. The shortcomings present from fifth grade onwards compromise performance in secondary, middle, and higher education, and generate a progressive lag that is difficult to reverse without timely intervention (Gómez-Escorcha et al., 2020).

The fact that the three synergies show deficits confirms the multidimensional nature of the problem. Pacherres (2021) identified that more than half of fifth-grade high school students in Peru had a low level of research skills in observation, problem posing, data collection and analysis, interpretation, and scientific writing, which coincides with the profile diagnosed in Tipacoque and points to the structural nature of these deficiencies. Cantillo (2023) reinforces this perspective by pointing out that the distance between research competencies and the actions that teachers must implement means that students do not develop the skills, knowledge, and attitudes necessary for research.

In cognitive synergy, the only relative strength was the identification of the main problem (77.14%), which represents the most elementary level of investigative thinking. Chona et al. (2006) establish that at the initial level, students must recognize objects and situations in the environment to begin the research process; this strength, without analysis, generates projects that start correctly but do not advance towards a deep understanding of the problem. The most serious deficit is data analysis (only 20.00% manage to define it), a situation that Gamboa Risgo (2025) also identified in basic education teachers in Chile and Colombia, who showed difficulties in the presentation of research products and in the use of analysis tools. The transversal weakness in academic writing coincides with what is pointed out by ICFES (2007) and Pacherres (2021), who state that without explicit mediation of written production, students do not develop research skills.

Procedural synergy was the most critical, with two-thirds of the students in the low and very low categories. Guity and Mendoza (2018) emphasize that the procedural component allows the concrete application of knowledge in real situations, and its absence implies that students cannot autonomously execute any practical phase of the research process. The inability to communicate results (92.86%) is the most serious deficiency and represents a collapse in the very purpose of the research. Castillo Vallejo (2011) points out that investigative communicative competencies – writing the final report and dissemination – constitute the last link in the procedural cycle; without them, research does not generate impact or contribute to collective knowledge. This situation contrasts with the study by Juárez and Torres (2022), who reported that, after implementing active strategies, more than 60% of students improved their argumentation, analysis, and communication skills, which shows the potential for transformation with appropriate intervention.

Attitudinal synergy presents the most favorable diagnosis, with 48.57% in the high and very high categories, which contrasts with what was found by Reyes Albañil (2023) in elementary schools in Chiquinquirá, Boyacá, where students did not have favorable attitudes towards research due to the absence of pedagogical practices that cultivated them. The collaborative disposition identified in Tipacoque – especially the openness to seek help (90.00%) and the willingness to work in a team (88.57%) – constitutes an invaluable attitudinal capital that, if channeled with appropriate didactic strategies, can enhance the development of the cognitive and procedural dimensions. Benites

Valverde et al. (2023) describe these attitudes of openness and cooperation as fundamental components of research know-how.

However, resistance to feedback (78.57% do not assume positive criticism) and low resilience in the face of challenges (62.86% do not see difficulties as a challenge) represent critical attitudinal barriers that directly interfere with the improvement of research performance. ICFES (2007) establishes that students must be willing to accept the open and changing nature of knowledge; Pérez Rocha (2012) points out that teachers must create feedback spaces that strengthen self-esteem and the learning climate to overcome these resistances. The most relevant conclusion of attitudinal synergy is that Tipacoque students want to research, but do not know how to do it, which places the teacher's didactic intervention as the decisive factor in transforming disposition into real competence.

6 CONCLUSIONS

In correspondence with the general objective, the level of research competencies of fifth-grade students in the educational institutions of the municipality of Tipacoque, Boyacá, is predominantly located in the regular category (median of 41.67 out of 100), with 85.72% of the students concentrated between the low and regular categories and no students in the very high category. This result confirms the existence of a multidimensional deficit that compromises the entire research cycle and demands a systematic and comprehensive didactic intervention.

With respect to the level of cognitive synergy, students present a regular performance (median 44.00), with a relative strength in the identification of the main problem (77.14%) and severe deficits in data analysis (only 20.00% master this concept), documentary review and academic writing. These cognitive weaknesses limit the ability of students to advance beyond the initial recognition of the problem to in-depth analysis and the production of knowledge with scientific rigor.

Procedural synergy is the most critical of the research profile evaluated (median 29.03, low category), with 67.14% of students in the low and very low categories. The deficit extends to all methodological phases, with the inability to communicate results as the most serious deficiency (92.86%). This procedural weakness shows that students have not incorporated the basic processes of research into their academic practice and that the research cycle is interrupted before completing any of its final phases.

Attitudinal synergy constitutes the greatest strength of the students' research profile (median 57.14, with 48.57% in the high and very high categories), expressed mainly in the willingness to seek help, work in a team and accept suggestions. However, resistance to feedback and low reading discipline represent the most critical attitudinal weaknesses. Tipacoque students have a favorable disposition towards research, but lack the cognitive and procedural skills necessary to turn it into real research practice, which reaffirms the need for specialized didactic mediation that articulates the three synergies in an integrated manner.

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