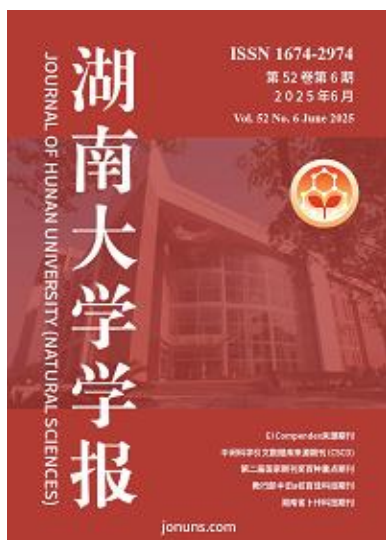




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Strengthening Research Competencies in Elementary School Teachers: A Study of Knowledge Transfer and Pedagogical Impact in Peru

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Abstract: This study examines the influence of research skills acquired by regular elementary school teachers in Peru through graduate-level education on the development and transfer of research competence in classroom teaching practice. It aims to enhance teacher-student interaction in research-oriented learning environments, thereby fostering students' cognitive development and appropriation of research tools. A cross-sectional, quantitative, non-experimental, explanatory-causal design was employed, with a sample of 455 in-service teachers enrolled in master's



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or doctoral programs at public and private universities. Probabilistic sampling was applied with a 95% confidence level and a 5% margin of error. Four reliable and validated questionnaires were administered via Google Surveys. Data were analyzed using the AMOS statistical software (version 26), and confirmatory factor analysis was conducted. The measurement model demonstrated a good overall fit: $\chi^2 = 103.534$, $df = 101$. The structural equation modeling indicated that the model required no further modification and was deemed adequate. The results show positive and statistically significant correlations ($p < 0.05$) for hypotheses H2, H4, and H6, with a 99% confidence level. The findings reveal that informational competence, technological proficiency, and teamwork collectively account for 45.7% of the variance in teachers' research competence. Thus, the proposed model is empirically validated. The novelty of this research lies in its focus on graduate teacher education as a catalyst for strengthening research competence at the elementary level; this topic is underexplored in the context of Peruvian educational research.

Keywords: Informational competence; research competence; technological mastery and teamwork, teacher professional development, graduate education, knowledge transfer.

加强小学教师的研究能力：秘鲁知识转移与教学影响研究

摘要：本研究考察秘鲁普通小学教师通过研究生教育获得的研究技能对课堂教学实践中研究能力发展和迁移的影响。本研究旨在加强研究型学习环境中的师生互动，从而促进学生的认知发展和研究工具的运用。研究采用横断面、定量、非实验、解释因果设计，样本为455名就读于公立和私立大学硕士或博士课程的在职教师。采用概率抽样，置信水平为95%，误差幅度为5%。通过谷歌问卷调查发放了四份可靠且经过验证的问卷。使用AMOS统计软件（版本26）分析数据，并进行了验证性因子分析。测量模型总体拟合度良好： $\chi^2 = 103.534$ ，自由度 = 101。结构方程模型表明该模型无需进一步修改，且足够充分。结果表明，假设H2、H4和H6呈正相关，且具有统计学显著性（ $p < 0.05$ ），置信水平为99%。研究结果表明，信息能力、技术能力和团队合作能力共同解释了教师研究能力45.7%的变异。因此，所提出的模型得到了实证验证。本研究的创新之处在于其关注研究生教师教育作为加强小学阶段研究能力的催化剂的作用；在秘鲁的教育研究中，这一主题尚未得到充分探索。

关键词：信息能力；研究能力；技术掌握和团队合作、教师专业发展、研究生教育、知识转移。

1. Introduction

Across diverse geographical contexts, changes in learning practices [1] are being driven by institutional educational demands that regulate these processes, as well as by the concerns of academic leaders who seek to implement innovative strategies aligned with evolving societal needs.

In Latin America, the development of research competencies has traditionally originated in higher education [2]-[3]. However, in several educational systems, such as those in Mexico, Colombia, and Costa Rica, increasing emphasis has shifted toward basic education. This shift is reflected in meaningful and innovative initiatives led by teachers, highlighting a growing commitment to the continuous improvement of pedagogical practices.

To achieve meaningful educational experiences in basic education, teachers play a central role as key agents whose professional practice must be grounded

in the development of research-oriented approaches [4] that strengthen teaching processes. In this context, the continuous professional development of teachers is essential to ensure effective knowledge transfer and students' holistic development, supported by a well-structured, coherent, and clearly defined curriculum [5]. Furthermore, teachers should be trained comprehensively across cognitive, procedural, and attitudinal dimensions, encompassing knowing, doing, and being, to foster deep and transformative learning.

Teachers are fundamental professionals in guiding and managing student learning [6]. They act as facilitators who, through their expertise and the

application of appropriate pedagogical strategies, strive to make the educational process meaningful and student-centered. Equally important are their competencies in methodology, technology, and communication, as well as their ability to collaborate in teams and locate relevant information. These skills, developed within structured research processes, enable effective knowledge management and support the practical transfer of knowledge and innovation in the classroom [1].

In this scenario, priority should not be limited to curriculum design and lesson planning but must also extend to the adequacy of teaching environments, logistical capacity, regulatory frameworks, foundational principles, and, crucially, teachers' willingness to embrace change. These factors collectively contribute to the consolidation of the academic competencies that students need in today's educational landscape [7]-[9]. To this end, teachers must engage in continuous reflection and updating of their professional competencies [4], [10], [11] to meet evolving societal and educational demands.

Achieving these goals requires educators to actively participate in professional development programs aimed at enhancing their qualifications. Beyond initial certification, pursuing advanced academic studies enables teachers to update their knowledge and validate their expertise. As a result, many are enrolling in fourth-level programs, such as specializations, master's degrees, and doctoral studies, which strengthen their professional competencies, with a particular focus on research skills.

In the Peruvian context, research activities in regular elementary schools remain underdeveloped [12]. This gap stems largely from the weaknesses in research training within higher education institutions responsible for certifying education professionals. Many teacher training programs do not require the completion of thesis-based research, allowing graduates to obtain their degrees through alternative modalities. As a result, teachers often lack foundational experience in designing and conducting scientific research.

This deficit is reflected in the limited number of publications by basic education teachers in indexed journals, particularly in the field of educational research [12]. The absence of robust research competencies not only affects pedagogical practices but also impacts the overall quality of education. Recognizing this challenge, national educational authorities have acknowledged the need to strengthen teachers' research skills and have implemented strategies to address this gap; these efforts are critical for advancing academic development and improving educational outcomes.

These initiatives, intensified following Peru's performance in the most recent PISA assessment, have contributed to improvements in educational indicators.

Although these results are promising, they require consolidation through sustained teacher motivation and genuine engagement with research practices [13]-[16].

In this context, and driven by personal initiative and an awareness of the existing gaps in research training, teachers from regular basic education institutions are increasingly enrolling in fourth-level (postgraduate) programs to strengthen their research competencies. By pursuing specializations, master's, or doctoral degrees, they aim to enhance their professional development, obtain formal academic recognition, and update their pedagogical and methodological knowledge. These advanced studies equip them with the tools necessary to design and implement research-based practices in their classrooms, thereby fostering research-oriented teaching at the elementary level.

The primary objective is to strengthen teachers' research competencies to facilitate the effective transfer of knowledge in classroom practice. This, in turn, enhances teacher-student interaction within research-rich learning environments, promotes the development of students' cognitive skills, and supports their appropriation of research methods and tools. Ultimately, this approach encourages students to explore meaningful, real-world topics from cross-curricular and interdisciplinary perspectives from an early age.

Such transformative experiences contribute to the consolidation of teachers' professional competencies and lead to improved student learning outcomes in research-based education (RBE) [17]-[19].

2. Investigative Competence: Theoretical Background

Competences are understood as integrated performances that emerge from habitual actions and involve the application of socio-cognitive and emotional capacities to solve problems and develop effective strategies within the learning process [20]. In the context of research, research competencies refer to cognitive abilities that enable individuals, whether as researchers or professionals, to generate scientific knowledge [21].

These competencies are essential for identifying and analyzing information, interpreting data, constructing evidence-based arguments, and proposing viable solutions to complex situations. They contribute to the development of key cognitive skills such as observation, investigation, data recording, organization, experimentation, and systematization of information gathered from real-world problems [8], [21], [23]-[26]. Crucially, they are grounded in creative potential, fostering the generation of innovative ideas and original solutions [27].

As such, research competencies encompass not only cognitive skills but also dispositions, behaviors, and professional attributes necessary to act effectively,

drawing upon acquired knowledge to understand and respond to specific contextual challenges.

Investigative competencies are grounded in the theoretical framework of educational constructivism, which posits that individuals, when confronted with a contextual problem requiring an effective solution, draw upon their internally constructed cognitive schemas. Through a process of comparison and reflection, they reconstruct understanding and resolve the challenge [28]-[30]. This competence involves the development of intellectual capacity through the application of scientific methods and specialized research techniques, enabling educators to function effectively as researchers [31]-[32]. It also encompasses the integration of scientific and technological knowledge with innovation, fostering the development of analytical skills that allow teachers to critically examine and interpret educational reality [33]-[35].

According to [23] and [31], the key components of investigative competence include:

- 1) Subject-matter knowledge,
- 2) Problematization, theorization, and verification of reality
- 3) Pedagogical content knowledge (PCK) and
- 4) Teachers' attitudes toward science teaching

These components enable educators to foster critical thinking and problem-solving skills in students and to design instructional strategies that promote meaningful learning [36]. Importantly, this competence extends beyond technical knowledge to include higher-order skills such as critical reflection, creativity, and problem solving [6], integrated through the transversal principle of research ethics.

At the basic education level, the development of research skills is essential for fostering a culture of inquiry and contributing to social progress [37]. It is critical to prepare educators and students as knowledge producers capable of addressing societal challenges and advancing collective well-being through systematic investigation. This involves competence in key research processes, including: designing research projects, searching for and organizing relevant information, critically evaluating the state of the art in a given field, selecting appropriate instruments and data collection methods, analyzing both quantitative and qualitative data, writing research reports, solving complex problems, and engaging in goal-oriented decision-making [27], [38].

Research competence demands complex cognitive processes, including heuristic and epistemological thinking, creativity, continuous reflection, and critical questioning. It reflects an active, critical, and creative stance toward knowledge construction, structured around five core dimensions:

- 1) Epistemic-referential (understanding of knowledge foundations),
- 2) Semiotic (interpretation of signs and

representations),

- 3) Procedural mediation (mastery of research methods and tools),
- 4) Scientific research leadership (ability to guide and manage inquiry),
- 5) Hermeneutic (interpretive capacity in context) [34].

In this study, research competence is operationalized through three key dimensions: informational competence, technological mastery, and teamwork, which are empirically grounded in the literature and aligned with the practical realities of classroom-based research in basic education.

2.1. Informational Competence

Informational competence is an essential component of research competence [20], [23] that enables the development of strategies for acquiring the skills required to conduct high-quality research [6], [39]. It allows teachers to contribute to solving problems in both the pedagogical process and the teaching-learning field [23], [40]. This requires a comprehensive collection of literature, data, and information [41]-[43], and their effective, critical, and ethical analysis in research [27], [36]-[39]. This competence facilitates the identification, access, evaluation, and effective use of quality information to solve problems, make decisions, and develop continuous learning skills [23], [31], [44].

In the context of teacher training and educational research, informational competence requires technological mastery [39], as effective research processes depend on solid technological skills that facilitate the search, analysis, classification, selection, and use of relevant information [45]. Informational competence equips researchers with the necessary skills to identify, evaluate, and use information effectively [6], [36], [46], and is crucial for the production and communication of scholarly work [47].

Informational competence contributes significantly to research competence, and technological mastery is a fundamental aspect within the framework of research competencies, particularly in today's knowledge society, where the volume of available information is overwhelming and constantly changing [44]. Based on the above, the following research hypotheses are proposed:

H1: Informational competence influences research competence.

H2: Informational competence is related to technological mastery.

2.2 Technological Proficiency

Integrating technology into the educational context improves collaboration and communication, while preparing educators to work effectively in increasingly digitized and diverse environments [31], [39], [48]. In modern, increasingly digitized education, technological mastery is an integral part of research

competence, and the research processes carried out by teachers and students require skills in integrating technological tools and resources into research and pedagogical practice, that is, in research and learning processes [27], [36]-[39], [49]. It is crucial in the current educational context [37]; supported by advanced technological tools, it enables the development of data collection and analysis processes and their clear and precise presentation, addressing areas such as information and data literacy, communication and collaboration, creation of digital content, security, and problem solving [6].

Consolidating this type of teaching competence is crucial in today's society and fundamental for conducting research that responds to the needs of the social environment through the proactive use of knowledge [21], [37], in digital environments, evaluation of online resources, and participation in intercultural virtual experiences, all supported by digital devices, online platforms, educational applications, and multimedia resources [20], [21], [42]. These authors highlight the importance of technology in teaching processes and the relevance of technological mastery for educators in these fields, supporting its role in research competence [50].

Technological mastery is a relevant aspect in the context of teacher training and educational research [49], [51], and involves not only the ability to use technological tools but also the ability to adapt to different applications in research, promoting innovation and the creation of relevant knowledge in academic and scientific settings [27]. It requires the effective use of technology in the development of research competencies among university students and in research training [51]-[54], to facilitate team collaboration, communication, and the exchange of ideas between educators and students, as well as the improvement of educational quality [52]-[55], elements that contribute to the development of teamwork skills [45].

The integration of technological tools in teacher education fosters collaboration and teamwork among educators, which is fundamental to the development of intercultural competencies and preparation for diverse educational environments [39]. Technological proficiency is a crucial skill for teamwork in education, enabling educators and students to access relevant resources, collaborate effectively, and adapt to the demands of an increasingly digitized and diverse educational environment [39].

Technological mastery and teamwork are closely related and are crucial elements that influence the development of investigative competencies in the educational setting [21], [27], [31], [44], [53], [55]-[57]. Based on this, the following research hypotheses are proposed:

H3: Technological mastery influences research competence.

H4: Technological mastery is related to teamwork.

2.3 Teamwork

Team collaboration fosters greater teacher engagement with content and enriches the student learning experience, demonstrating its importance in the context of educational research [27], [36], [49]. This competence is essential for fostering collaboration and knowledge sharing among teachers, aimed at achieving success in the educational environment through common goals [6], [20], [23], [51], where they can collaborate effectively and prepare students for diverse educational settings. It represents an essential component of research competence [6], [31], [39], [44].

Teamwork promotes the benefit and use of acquired knowledge, as well as the development of interpersonal relationships and motivation in the learning process [31]. Teachers should be able to stimulate discourse, debate, and discussion in small groups on research questions, predictions, answers, and explanations, encouraging active interaction in the research process to generate knowledge through new experiences and study strategies [23]. It is relevant to consider that this skill enables the achievement of a shared goal through the contribution of each member with a responsible attitude and effective commitment, contributing positively to research progress [20], [58]-[60]. This skill implies the ability to positively manage uncertainty, handle conflicts, and maintain empathic and assertive relationships within a healthy professional community [10], [34]. Consequently, the following hypotheses are proposed:

H5: Teamwork influences research competence.

H6: Teamwork is related to informational competence.

In summary, the development of research skills in teachers enables the elaboration of scientific educational studies. Research contributes to the improvement and implementation of heuristic and critical argumentative skills as well as to the updating of socio-cultural topics. Research conducted in schools by teachers and school leaders reinforces the need to provide learning spaces for developing scientific proposals aimed at improving educational practice. Therefore, the following hypothesis is proposed:

H7: Informational competence, technological mastery, and the ability to work in a team influence research competence.

The theoretical review allows the proposal of the following research model (Figure 1). Three essential dimensions of research competence are specified, establishing relationships and influencing them.

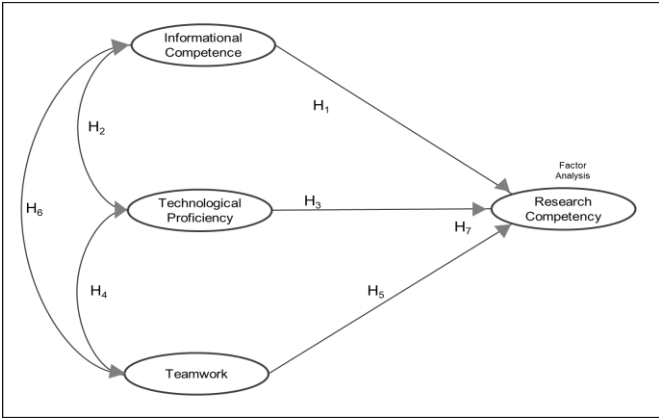


Figure 1. Research model (developed by the authors)

3. Method

The research was conducted using a quantitative approach and followed the hypothetical-deductive method, based on a cross-sectional, non-experimental, causal, and explanatory design [61]. The population consisted of 561 teachers, from which a probabilistic sample was drawn with a 95% confidence level and a margin of error of 0.02, resulting in a final sample of 455 teachers of Regular Basic Education who were enrolled in master’s or doctoral programs at public and private universities. The selection of the research sample focused on teachers currently enrolled in graduate programs, based on the premise that their academic training is likely to influence their research competence and pedagogical innovation. This choice reflects the need to understand how advanced studies translate into improved classroom practices and the promotion of a research culture among students.

The criteria for the multivariate technique were met, as the sample size exceeded the recommended ratio of respondents to items across the four questionnaires (36 items per 10 respondents). The study sample satisfies the guidelines proposed by [62] and [63], exceeding 300 respondents and 40 times the number of independent variables, respectively.

Four instruments were designed to measure the variables, with established validity and reliability, based on existing theories. They were administered via Google Forms to the aforementioned sample, with informed consent obtained from all participants.

Data analysis for the dependent variable exploratory factor analysis (EFA), followed by confirmatory factor analysis (CFA). Table 1 shows the 36 items corresponding to the variables under study.

Table 1. Items of each questionnaire (compiled by the authors)

Variable I1: Informational Competence (IF)	
Nº	Item
CI1	Do you look for relevant information in books and academic journals in the library?
CI2	Do you search for relevant information in electronic journals?
CI3	Do you search for information in electronic databases?
CI4	Do you elaborate on the documentary cards and bibliographic worksheets?
CI5	Do you use a referencing system to credit the sources consulted?
CI6	Can you distinguish scientific evidence from other types of evidence?
CI7	Can you contrast the approaches and positions of different authors about the phenomenon under study?
CI8	Can you make a critical evaluation of the different theoretical positions reviewed?
Variable I2: Technological Proficiency (TP)	
DT1	Do you use the Word program for the theoretical elaboration of your research?
DT2	Do you use the Excel program for the methodological elaboration of the research?
DT3	Do you use the PowerPoint program to show research advances?
DT4	Do you use the Internet during the development of the research process?
DT5	Do you use computerized statistical packages in the research?
DT6	Use specialized databases for the research
Variable I3: Teamwork (TW)	
TE1	Do you show empathy for teamwork?
TE2	Do you lead a research proposal assertively?
TE3	Do you show autonomy in group decision making?
TE4	Do you show punctuality in the elaboration of a research report?
TE5	Do you show responsibility in the completion of a research report?
TE6	Do you manage funding for a research project?

Dependent variable (DV): Research competence (RQ).	
CI1	Do you pose the problem of the reality to be solved through research?
CI2	Do you define a research question that helps to solve the problem posed?
CI3	Do you write the research objective(s)?
CI4	Do you choose a type of study and/or research design that allows you to answer the question posed?
CI5	Do you make an adequate selection of the sample to be studied, in terms of size and type, at the level of generalization established in the research question?
CI6	Do you perform an adequate delimitation of the study population?
CI7	Do you develop a data collection instrument for the research?
CI8	Do you use and describe an objective and controlled procedure for the collection of information?
CI9	Do you adequately describe in the text the information obtained and did you use tables and graphs in the research?
CI10	Do you apply spelling rules when writing the research report?
CI11	Do you present a list of the sources consulted based on the same reference format used to give credit to the authors in the research?
CI12	Do you write the research report with order and methodological structure?
CI13	Do you argue clearly and punctually the theoretical and methodological framework of your research?
CI14	Do you present the results obtained from the research data collection?
CI15	Do you have a vocabulary appropriate to the scientific field and graduate level?
CI16	Do you present a research report clearly and accurately at a conference?

4. Results

The collection of information allowed for the characterization of the sample based on the following findings: 46.4% belong to the 42–52 age group; 31.4% to the 31–41 age group; 20% are older than 52 years;

and 2.1% are teachers younger than 31 years. 59.3% are female and 40.7% are male, indicating that women are the most frequent participants in postgraduate programs (female = 270, male = 185). 57.9% are doctoral students and 42.1% are master's students.

Of the study sample, 69.3% had never participated in a research project; only 30.7% had participated or are currently participating. Regarding publications during postgraduate studies, 80% indicated they had not published, and 20% had. With regard to the teacher's methodology in curricular research experiences, 56.4% reported that the teacher performed well, 40% rated it as average, and only 3.6% as poor. The teacher is thus observed to be a key factor in improving research competencies among graduate students. Likewise, 54.3% felt motivated to conduct research, 44.3% had doubts or preferred to postpone it, and 1.4% preferred not to continue with research activities.

4.1. Test of Reliability, Validity, and Exploratory Factor Analysis

The reliability of the four latent variables was assessed, indicating good internal consistency: informational competence = 0.862, technological mastery = 0.804, teamwork = 0.896, and research competence = 0.906. The dependent variable, research competence, showed evidence of validity through exploratory factor analysis, which was used to extract the following factors: methodological domain (F1), oral communication (F2), and written communication (F3). The total variance explained was 47.618%, and according to the Kaiser-Meyer-Olkin test, it was adequate, with a coefficient of 0.852 and statistical significance at $p < 0.05$ [65], [66].

4.2. Confirmatory Factor Analysis

The second stage of validity evidence was carried out by means of the maximum likelihood estimation method [66] using the AMOS statistical software version 26 and the results of the confirmatory factor analysis indicated a good overall fit of the measurement instrument that measures research competence with $X^2 = 103.534$ and degrees of freedom = 101, validating the model since it complies with $X^2/df = 1.03$ approximately < 3 [67] and $p = 0.41$. The Goodness of Fit Index (GFI) evaluates whether the model should be adjusted. As a result, 0.973 was obtained, confirming that the proposed theoretical model should not be adjusted. Likewise, the AGFI = 0.0963; TLI = 0.976; CFI = 0.980; RMSEA = 0.007, CI [0.000 - 0.026], which indicates that the instrument is valid for the evidence presented and represents a good model (Figure 2).

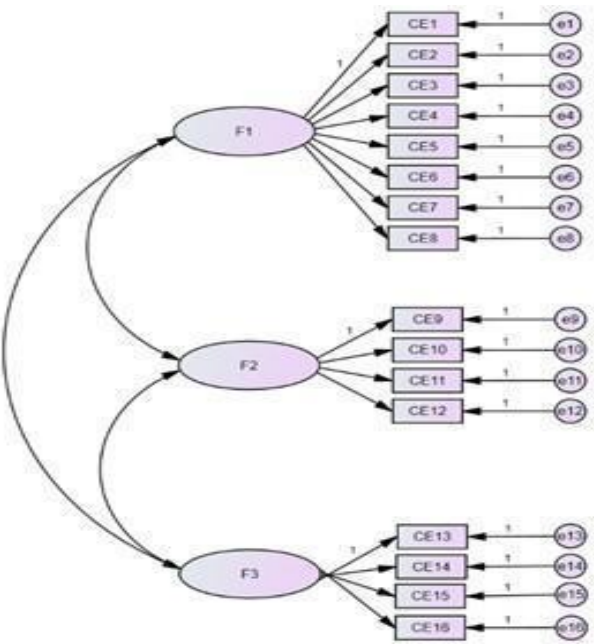


Figure 2. CFA of the research competencies variable (developed by the authors)

4.3 Hypothesis Testing of the Structural Equation Modeling

Considering the research hypotheses and the data collected through the measurement instruments, the data were analyzed using structural equation modeling (SEM). Table 2 presents all model fit indices meet the established criteria, indicating an adequate model fit. The GFI index = 1.000 (criterion: >0.9), the comparative fit index (CFI) = 1.000, and the root mean square error of approximation (RMSEA) = 0.048 (Figure 2).

Table 2 shows the results of the unstandardized coefficients of each of the independent variables to the dependent variable.

H1: Informational competence-research competence, there is an influence of 45.7%,

H3: Technological mastery-research competence is explained by 56.2%, and

H5: Teamwork-research competence by 64% in a representative sample of 455 teachers.

Table 2. SEM analysis results (compiled by the authors)

			Estimate	S.E.	C.R.	p
Research Competency	<--	Informational Competence	0.457	0.080	5.720	0.000
Research Competency	<--	Technological Proficiency	0.562	0.091	6.148	0.000
Research Competency	<--	Teamwork	0.640	0.086	7.472	0.000

Table 3 shows the degree of correlation between the independent variables that validate H2: Technological mastery-informational competence (P = 0.463), H4: Technological mastery-teamwork (P = 0.492) and H6:

Teamwork-informational competence (P = 0.407), where the relationships are positive and significant (p < 0.05) at a 99% probability of success.

Table 3. Relationship between variables (compiled by the authors)

		Information Competence	Technological Proficiency	Teamwork
Information Competence	Pearson correlation		0.463**	0.407**
	Sig. (bilateral)		0.000	0.000
	N		455	455
Teamwork	Pearson correlation	0.407**	0.492**	
	Sig. (bilateral)	0.000	0.000	
	N	455	455	

** . The correlation is significant at the 0.01 level (bilateral).

Research competence is explained by informational competence, technological mastery, and teamwork in 40.2% of cases (Figure 3). The remaining 59.8% is accounted for by other variables, such as research-focused teaching courses delivered by Renacyt

researchers, leadership and participation in educational research projects, engagement in research networks, participation in academic events, intrinsic and extrinsic motivation of the professional, work and research culture, and attitudes toward research, among others.

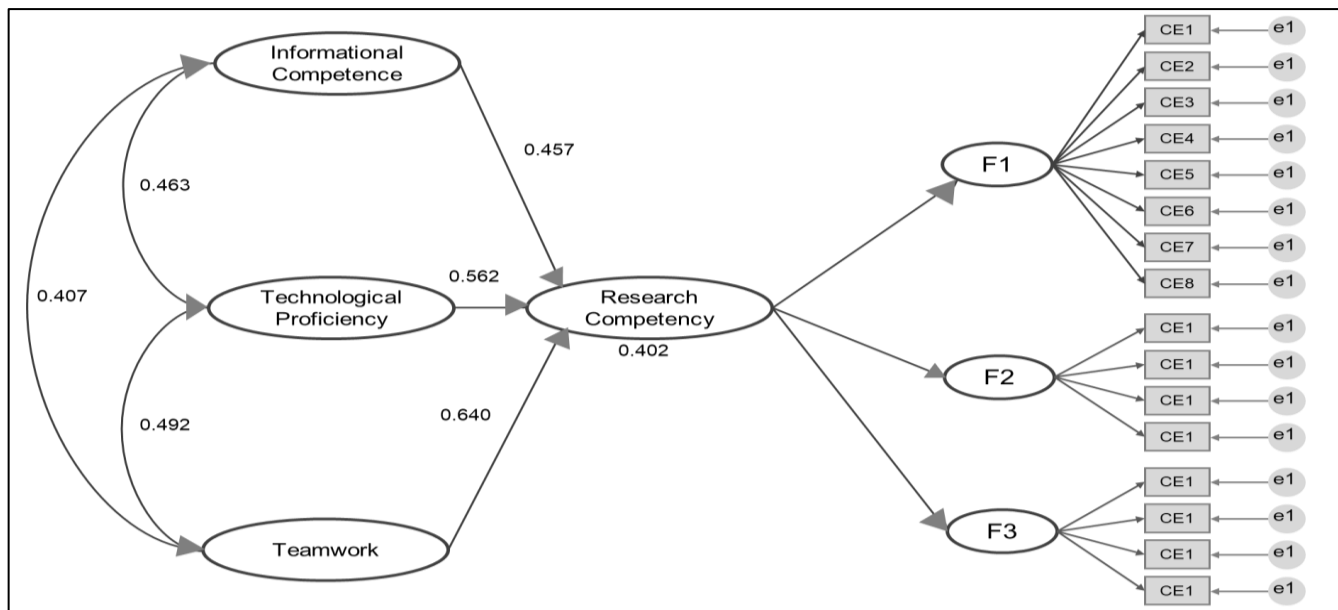


Figure 3. Final model with SEM (developed by the authors)

5. Discussion

In Peru, research demands are currently high, prompting individuals, particularly those in the educational field, to seek the necessary tools to engage in training processes that provide and strengthen research skills and abilities, enabling them to undertake and lead research in alignment with societal, and specifically scientific, demands. These research skills require certain domains or competencies, which were supported and specified in the theoretical model proposed in this study. This model was validated through statistical analyses and found to be adequate according to established criteria.

The importance of informational competence, technological mastery, and teamwork, and their influence on research competence, is confirmed; this finding is supported by theoretical frameworks [20], [21], [27], [31], [44], [53], [55]-[60]. The domains of information, technology, and teamwork are essential components in relation to research competence.

H1: Informational competence influences research competence, a relationship that was statistically confirmed in the study context, consistent with the findings of [6], [18], [20], [23], [36], [44], [46], [47]. All teachers should possess and have consolidated the basic competencies that enable them to identify, evaluate, and use information effectively in the development of high-quality research and the achievement of its outcomes.

H2: Informational competence is positively and significantly related to technological mastery ($p < 0.05$), with a 99% probability of success. In these educational contexts, integrating technology into research and pedagogical practice is essential [39], embedded in data collection processes and the construction of specialized and robust information sources, where documentation related to specific

research areas and lines is available. These associations facilitate the development of information that can adapt to contextual demands, contributing to the creation of relevant academic and scientific knowledge [27].

H3: Technological mastery influences research competence. Technological mastery explains 56.2% of research competence; therefore, when researchers use technological tools to express themselves in digital environments and interact with different platforms, mastery of these tools is crucial for the development of research processes, in alignment with contextual demands [37], [49], [51].

H4: Technological mastery is related to teamwork. This relationship is supported by positive and significant associations ($p < 0.05$) with a 99% probability of success. Mastering technological tools, when supported by collaborative and cooperative teamwork, enables the consolidation of efforts and the integration of individual capacities and competencies to achieve the successful completion of research projects and outputs that sustainably improve educational quality [21], [27], [31], [44], [45], [53], [55]-[57]. These authors support H5: Teamwork influences research competence, enabling the generation of valuable knowledge in a collaborative and cooperative manner [57].

Similarly, a positive and significant relationship ($p < 0.05$) at a 99% probability of success was demonstrated for H6: Teamwork is related to informational competence.

6. Conclusion

Research competencies are outlined in teachers as basic skills for the development of their academic activities; this implies teaching-learning processes that require mastering aspects related to information,

technology and work teams. The influence of the independent variables with respect to the dependent variable is demonstrated. Informational competence requires the mastery of tools to capture information, organize it, classify it and identify its level of interest and relevance in the projection of research to generate innovative knowledge that feeds science. Technological mastery was essential to consolidate the informational competence, since handling technological platforms allows one to move through virtual spaces and to have skills that are essential in the context of today's society. As a complement to the above, teamwork represents a competence that allows directing the efforts of the group to achieve common objectives from the research field and consolidate scientific production goals in the educational field.

The contribution and originality of this work lie in the direct linkage between research skills acquired in master's and doctoral programs and their application in everyday pedagogical practice, highlighting their influence on student interaction and the development of an evidence-based research culture within schools.

The findings are expected to inform institutional decisions regarding teacher training programs, promote evidence-based pedagogical strategies, and contribute to policy development aimed at improving research capabilities in basic education settings.

Declarations

Author Contributions

Conceptualization: Fernando A. Nolasco Labajos. Data curation: Giuliana Saravia Ramos. Formal data analysis: Dora L. Ponce Yactayo and Irma M. Carhuancha-Mendoza. Acquisition of funds: Fernando A. Nolasco Labajos. Research: Fernando A. Nolasco Labajos and Dora L. Ponce Yactayo. Methodology: Fernando A. Nolasco Labajos and Dora L. Ponce Yactayo. Project administration: Fernando A. Nolasco Labajos and Dora L. Ponce Yactayo. Resources: Fernando A. Nolasco Labajos, Rosana A. Meleán Romero, Giuliana Saravia Ramos, Dora L. Ponce Yactayo, Irma M. Carhuancha-Mendoza. Software: Fernando A. Nolasco Labajos, Rosana A. Meleán Romero, Giuliana Saravia Ramos, Dora L. Ponce Yactayo, Irma M. Carhuancha-Mendoza. Supervision: Fernando A. Nolasco Labajos. Visualization: Rosana A. Meleán Romero. Editing - original draft: Rosana A. Meleán Romero. Preparation, creation or presentation of the published work, specifically the writing of the initial draft: Rosana A. Meleán Romero

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Institutional Review Board Statement

Rigorous ethical guidelines were adhered to throughout the study to ensure participant privacy and data confidentiality in compliance with institutional and national research standards.

Informed Consent Statement

Informed consent was obtained from all involved in the study.

Data Availability Statement

The data presented in this study are openly available at https://docs.google.com/spreadsheets/d/1p4K5V2OGvgqoflUt2h6lZz_gkikXDE5/edit?usp=drive_link&oid=109789187067306438722&rtfpof=true&sd=true

Conflicts of Interest

The authors declare no conflicts of interest.

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