



REVIEW ARTICLE

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Research in the University Curriculum: A Review of Approaches and Strategies

La investigación en el currículo universitario: revisión de enfoques y estrategias

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Abstract

This review article aims to analyze the approaches, strategies, and factors that influence the integration of research into undergraduate curricula in face-to-face modalities, with a particular focus on the Paraguayan university context. The methodology followed a systematic review based on the PRISMA protocol, analyzing 25 peer-reviewed scientific articles selected from indexed databases such as SciELO, ERIC, Web of Science. Findings were organized into four key categories: pedagogical, technological, institutional, and teacher training. The results revealed that, although there are policies and proposals to promote the incorporation of research into higher education, several barriers persist, such as traditional teaching models, insufficient methodological training for faculty, and weak alignment between institutional policies and classroom practices. Additionally, the use of ICTs, research-based learning, and faculty mentoring were identified as key strategies for developing research competencies. The study concludes that mainstreaming research in the undergraduate curriculum requires a systemic approach that integrates pedagogical, technological, and institutional governance changes to strengthen the research culture in higher education.

Keywords: Higher education, Curriculum, Educational research, Teacher training, Information technology.

Resumen

El presente artículo de revisión tiene como objetivo analizar los enfoques, estrategias y factores que inciden en la integración de la investigación en los planes de estudio de carreras de grado en modalidad presencial, con especial énfasis en el contexto universitario paraguayo. La metodología empleada fue una revisión sistemática siguiendo el protocolo PRISMA, a partir del análisis de 25 artículos científicos seleccionados de bases de datos indexadas como SciELO, ERIC y Web of Science. Los hallazgos se organizaron en cuatro categorías: pedagógica, tecnológica, institucional y formación docente. Se evidenció que, si bien existen propuestas y marcos normativos que promueven la incorporación de la investigación en la formación universitaria, persisten barreras como el enfoque tradicional de enseñanza, la escasa formación metodológica del profesorado y la débil articulación entre políticas institucionales y prácticas docentes. Además, se identificó que el uso de TIC, el aprendizaje basado en la investigación y la mentoría docente son estrategias fundamentales para el desarrollo de competencias investigativas. Se concluye que la transversalización de la investigación en el currículo requiere un enfoque sistémico que contemple cambios pedagógicos, tecnológicos y de gobernanza institucional para fortalecer la cultura científica en la educación superior.

Palabras clave: Plan de estudios, investigación educativa, educación superior, formación del profesorado, tecnología de la información.

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Introduction

Strengthening research in higher education constitutes one of the fundamental pillars for the development of quality education systems and the generation of relevant knowledge in both global and local contexts. Within this framework, the integration of research into undergraduate curricula has been widely addressed in the scientific literature as a strategy for developing students' research competencies.

In this context, the systematic review serves to provide a theoretical foundation for the study and to place it within an empirical context through the synthesis of scientific evidence available internationally.

This article presents a systematic review of the literature conducted in accordance with the PRISMA 2020 guidelines, with the purpose of identifying, analyzing, and synthesizing the approaches, strategies, and factors that influence the integration of research into higher education curricula.

The objective of this study is to analyze the scientific evidence regarding the approaches, strategies, and factors that influence the integration of research into higher education curricula through a systematic literature review conducted under the PRISMA protocol. The study forms part of a broader research project aimed at analyzing the implementation of processes for integrating research into undergraduate curricula at a public university in Paraguay during the 2022–2025 period.

In terms of the national context, in Paraguay, the National Congress, through Law No. 2072 (2003), established the National Agency for the Evaluation and Accreditation of Higher Education (ANEAES), whose purpose is to ensure the quality of higher education in the country. This marked the beginning of efforts to develop evaluation criteria that include research as an important component of higher education institutions (HEIs). However, the effective integration of research into the teaching-learning process continues to pose a challenge for the country's universities.

According to the 2023 report of the National Council of Science and Technology (CONACYT), although

scientific output in Paraguay has increased in recent years, the country continues to face difficulties in expanding its research production compared with other countries in the region. According to the most recent data, Paraguay ranks 133rd worldwide and 17th in Latin America in terms of the number of scientific publications produced annually (UNESCO, 2025).

Likewise, although scientific output has increased in recent years, the country continues to lag behind other regional contexts, highlighting the need to strengthen research capacities at the undergraduate level.

From a theoretical perspective, recent literature emphasizes the relevance of Research-Based Learning (RBL) as a strategy that promotes the generation of knowledge through the solution of real-world problems by integrating the scientific method into the educational process. In this regard, Casares Antón (2023) highlights the potential of this approach to articulate theory and practice within the educational process.

In this regard, research competencies have been defined as the ability to apply scientific knowledge to identify problems, obtain and analyze information, and draw well-founded conclusions. According to Duche Pérez et al. (2023), these competencies constitute a central component of contemporary university education. Their development is linked to student-centered educational approaches that promote active learning and the strengthening of transferable skills, including scientific communication and the use of digital technologies (Adam Alcocer & Gracia García, 2023).

These approaches are grounded in competency-based educational models, which define the capabilities that students are expected to develop, as well as the pedagogical principles guiding teaching and learning processes in higher education. Within this framework, Tapia Sosa et al. (2024) argue that such models provide the guiding framework for comprehensive education at the university level.

Likewise, approaches involving the cross-curricular integration of research have been proposed with the aim of systematically articulating research teaching

and practice throughout the curriculum. In this regard, Gato Cisneros (2020) emphasizes the need to incorporate research as a structuring component of the curriculum, thereby contributing to both students' academic performance and professional development.

Within this framework, the literature has also distinguished different perspectives on the integration of research into higher education. Cabrera Berrezueta et al. (2020) identify approaches oriented toward compliance with institutional policies and accreditation requirements, as well as others focused on training researchers through the scientific method.

Furthermore, recent studies have identified academic factors that influence the development of formative research. In particular, Álvarez Contreras et al. (2023) show that, despite certain advances, traditional teaching models centered on the transmission of knowledge continue to persist.

At the institutional level, it has been noted that knowledge generation in higher education depends on structural conditions such as infrastructure, technological equipment, and human resource development. In this regard, Illanes Velarde (2018) emphasizes the importance of institutional support and the commitment of the stakeholders involved in research processes.

With regard to teaching and learning strategies, methodologies such as practical classes, autonomous learning, and active student participation have been found to foster the development of research skills. Empirical studies have shown that these strategies contribute to strengthening competencies such as observation, analysis, and hypothesis formulation, although challenges remain in incorporating collaborative work as a central component of the co-construction of knowledge (Amarilla & Garay Fernández, 2024).

To analyze this issue, the study adopts a classification comprising four dimensions: pedagogical, technological, institutional, and teacher training, which will guide the presentation of the results and the discussion.

Methodology

The present study is a systematic literature review conducted in accordance with the PRISMA 2020 guidelines (Page et al., 2021). A systematic search was carried out in high-impact databases such as SciELO, ERIC, and Web of Science. Indexed articles addressing the integration of research into the curricula of face-to-face undergraduate programs were selected. The inclusion criteria were as follows: articles published in indexed journals, studies focusing on higher education, and publications from the 2020–2025 period. Non-indexed studies, research conducted outside the field of higher education, and articles that had not undergone peer review were excluded.

The search strategy was implemented using the TITLE-ABS-KEY field (title, abstract, and keywords). The canonical search equation used was as follows: (TITLE-ABS-KEY ("research integration into the curriculum" AND "higher education" AND ("research competencies" OR "teacher training") AND ("pedagogical factors" OR "technological factors"))). The search was conducted between January and August 2025.

The PRISMA method was applied to guide the identification, selection, and analysis of the studies, which were assessed according to their relevance and methodological quality. Finally, the findings related to the factors that facilitate the cross-curricular integration of research into undergraduate programs were synthesized.

Following implementation of the search strategy in the selected databases (SciELO, ERIC, and Web of Science), a total of 320 records were identified. Subsequently, 85 duplicate records were removed, resulting in 235 unique records for screening. During the initial selection phase, based on a review of titles and abstracts, 220 records were excluded because they did not meet the established inclusion criteria (subject area, educational level, and publication type), leaving 15 articles for full-text assessment. During the eligibility phase, the full texts of 5 articles could not be retrieved; consequently, 10 studies were ultimately assessed. In addition, a review of the reference lists of the included articles (manual searching or

snowballing) identified 15 additional studies, bringing the total number of articles included in the systematic review to 25.

The complete process of study identification, screening, eligibility assessment, and inclusion is presented in Figure 1, in accordance with the PRISMA 2020 guidelines. Since the present study is a systematic literature review, no direct participants were included. The unit of analysis consisted of previously published scientific articles addressing different stakeholders in the educational process (faculty members, students, and academic authorities) within the context of higher education.

The sample consisted of a total of 25 articles that met the inclusion criteria.

The main variables analyzed were the pedagogical, technological, and institutional factors influencing the incorporation of research into undergraduate curricula. These variables were examined through the selected articles, which address topics such as the development of research competencies, pedagogical strategies, and technological infrastructure.

Results

Table 1 presents a summary of the 25 studies included in the systematic review, detailing authorship, context, main focus, and their contribution to the integration of research into the university curriculum.

Geographical Distribution of the Included Studies

To analyze the representation of the topic across different contexts, a geographical distribution of the studies included in the systematic review was conducted (Figure 2). The results show a greater concentration of research in Colombia ($n = 5$), followed by Spain ($n = 4$), as well as in Latin American countries such as Peru ($n = 3$) and Ecuador ($n = 3$). Mexico ($n = 2$) and Paraguay ($n = 2$) show an intermediate level of research output, while countries such as Argentina ($n = 1$), Finland ($n = 1$), and Costa Rica ($n = 1$) are less represented in the literature analyzed (Figure 3).

In contrast, the limited number of studies from Paraguay and neighboring countries suggests that this area has yet to become an established line of research within the field of research integration into the university curriculum. Consequently, a relative gap can be identified in the scientific literature, reinforcing the need for empirical studies to examine the implementation of these processes and to strengthen knowledge production and academic exchange at the regional level.

Pedagogical Dimension. Teaching Approaches and Research Training in the University Classroom

Based on the analysis of the studies included in the systematic review, the pedagogical dimension shows that formative research promotes a research culture in universities, whether through its integration into the curriculum, research groups, or the participation of faculty and students in academic projects (Ríos et al., 2010, cited in Rojas Arenas et al., 2020).

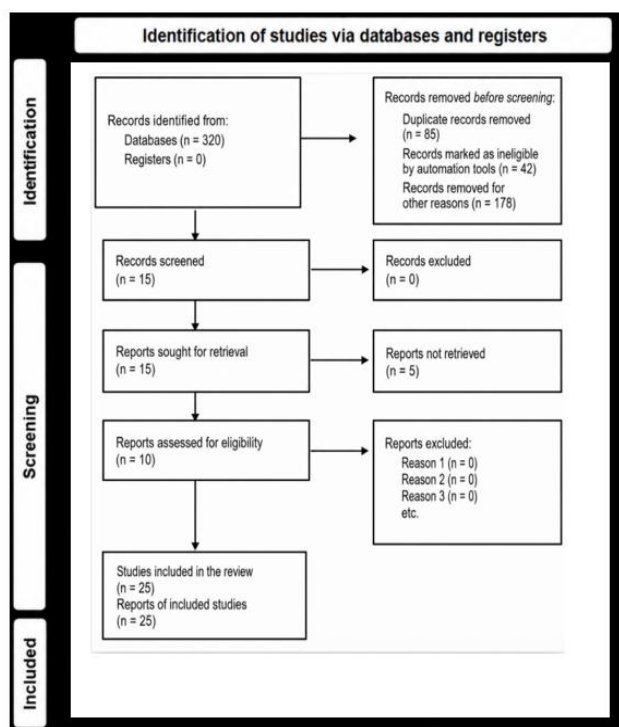


Figure 1. PRISMA flow diagram. **Note:** Format adapted from Page et al. (2021).

Table 1. Synthesis matrix of the studies included in the systematic review.

No.	Author(s) and Year	Country/Context	Main Focus	Contribution to the Topic
1	Niemi & Nevgi (2014)	Finland	Teacher training and real-world experiences	Research practice strengthens professional competencies and critical thinking.
2	Guijarro Intriago et al. (2018)	Ecuador	Curriculum and pedagogical strategies	A project-based approach improves research skills.
3	Gutiérrez Rojas et al. (2019)	Latin America	Curricular integration and social relevance	There is an urgent need to institutionalize research practices at the undergraduate level.
4	Serrano Guzmán et al. (2018)	Colombia	Academic writing	Workshops strengthen the structure of scientific articles.
5	George Reyes & Salado Rodríguez (2019)	Mexico	ICT and doctoral education	Deficiencies in the critical evaluation of digital sources.
6	González Chacón (2024)	Costa Rica	Digital transformation	An innovative institutional culture and technological training are necessary.
7	Cabrera Berrezueta et al. (2020)	Ecuador	Training model	An integrated model for faculty and students.
8	Benítez (2022)	Paraguay	Research practices of university faculty	Identifies weaknesses in the use of reference managers, participation in projects, the use of statistical tools, and scientific publishing; proposes strengthening institutional spaces for faculty research.
9	Salas-Ruiz (2020)	Peru	Institutional management and policies	Impact indicators and an integrated R&D&I system.
10	Sarthou et al. (2022)	Argentina	Institutional policy and external engagement	Interdisciplinarity as an integrating axis.
11	Paredes & Maldonado (2023)	Paraguay	National science policies	Need to measure and strengthen technology transfer.
12	Puche (2023)	South America (9 countries)	Teaching competencies	Paraguay stands out for its favorable attitude toward new methodologies.
13	Navarro-Navarro et al. (2024)	Spain	Mentoring and institutional perception	Ambivalence between institutional theory and pedagogical practice.
14	González Castro et al. (2024)	Colombia	Teacher training in research competencies	Emerging areas: ICT, transfer, and assessment.
15	Tua García (2020)	Venezuela	Teacher training	Faculty perceive a strong need for training in research.
16	Amarilla & Garay Fernández (2024)	Paraguay	Classroom strategies	Practical classes and autonomous learning as important components.
17	Adam Alcocer & Gracia García (2023)	Spain	Communicative competence	Participatory approaches foster scientific skills.
18	Tapia Sosa et al. (2024)	Ecuador	Institutional educational model	Defines competencies and pedagogical principles.
19	Casares Antón (2023)	Spain	Research-based learning (RBL)	Integration of practical experience and the scientific method.
20	Duche Pérez et al. (2023)	Peru	Definition of research competencies	Application of knowledge to the understanding of scientific phenomena.
21	Gato Cisneros (2020)	Mexico	Research across the curriculum	Need for a systemic approach in law education.
22	Álvarez Contreras et al. (2023)	Colombia	Academic factors in secondary education	Formative research remains subordinate to a transmission-based model.
23	Rojas Arenas et al. (2020)	Colombia	Institutional pedagogical strategy	Research groups and institutional integration foster a research culture.
24	Illanes Velarde (2018)	Bolivia	University policies	The role of infrastructure and institutional support.
25	UNESCO (2025)	Paraguay (global analysis)	National scientific output	Need to increase publications and technical capacities.

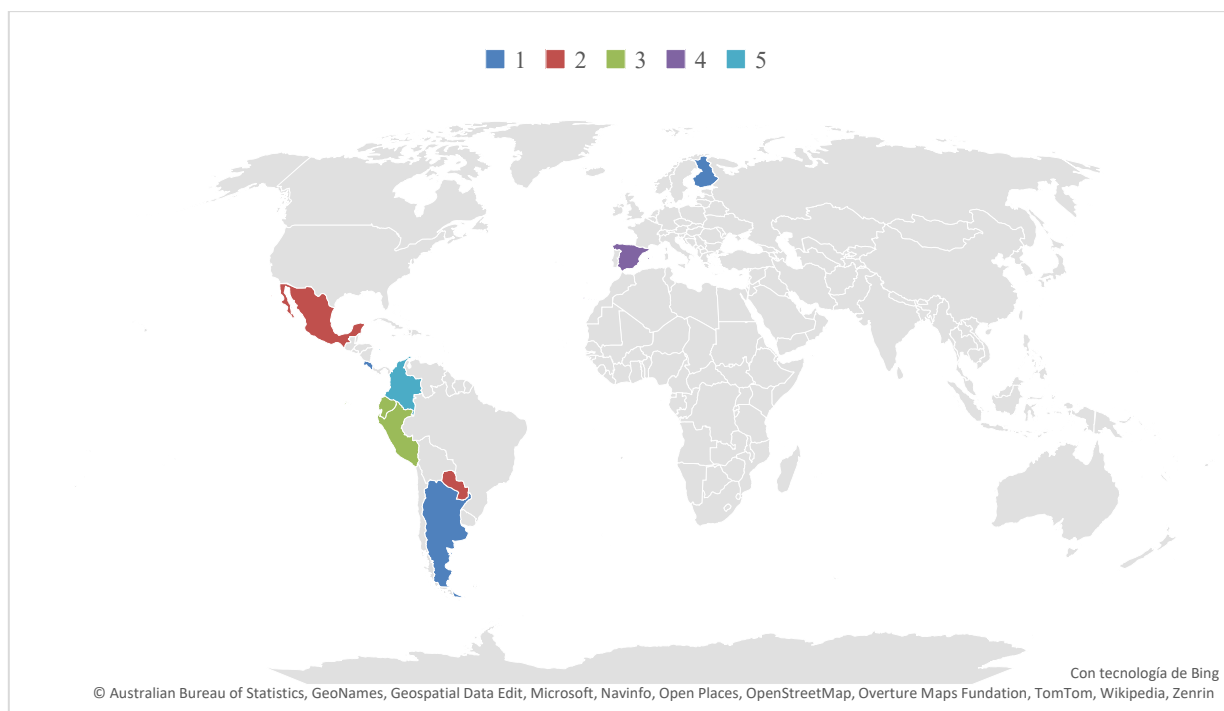


Figure 2. Geographical distribution map.

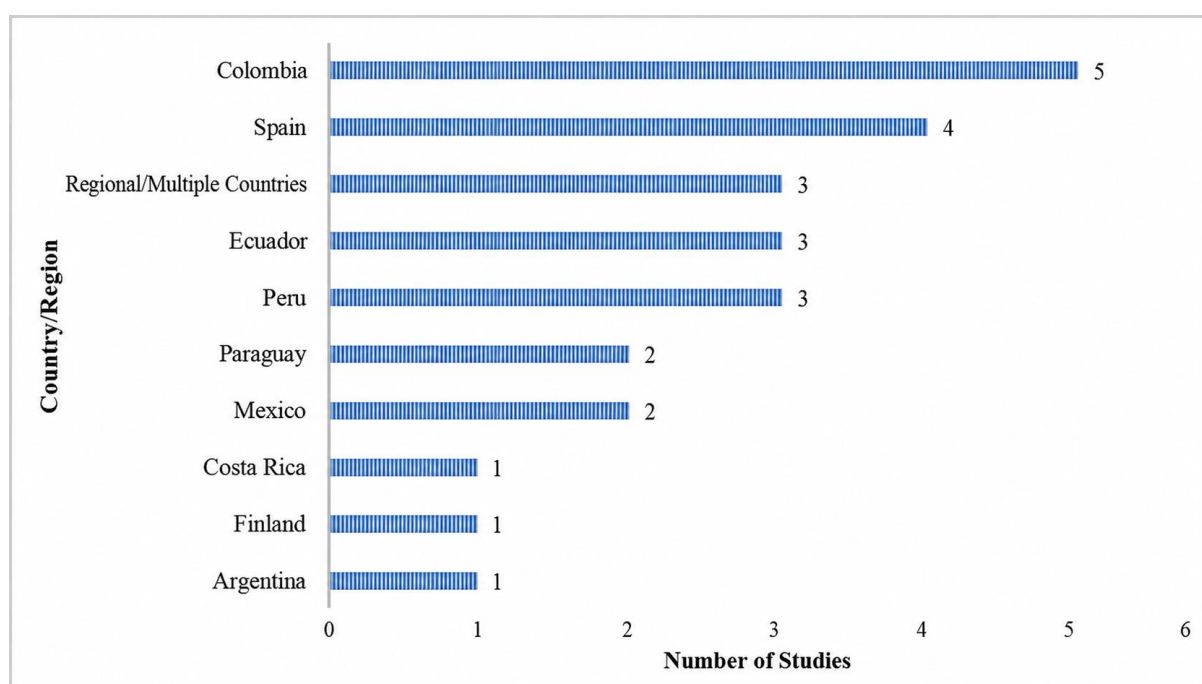


Figure 3. Presence of studies by geographical distribution.

The study by Serrano Guzmán et al. (2018) highlighted the need to incorporate educational strategies that promote research, particularly academic writing, as an essential component of professional training. Initially, 94% of the students recognized the importance of mastering this competency, although only two-thirds had prior

knowledge of it. Following the workshop, all participants acquired the ability to organize their research according to the standards of a scientific article, although recurring errors in grammar and punctuation remained. To address these limitations, practices such as the analysis of scientific texts and collaborative peer review were reinforced.

Guijarro Intriago et al. (2018) point out that, although both the curriculum and faculty recognize the importance of research training, it is not effectively developed because of the weak integration of fundamental skills such as critical reading, analysis, and academic writing, as well as the lack of appropriate pedagogical tools.

To address this issue, a holistic strategy was implemented with Tourism students, demonstrating that a project-based approach significantly strengthens research competencies and facilitates the incorporation of formative research into university education.

The study by Niemi and Nevgi (2014) examines the impact of authentic research experiences on the initial training of prospective teachers in Finland. Based on surveys of 287 students from two universities, the study found that these practices are not only valued by participants but also strengthen their professional competencies, foster evidence-based practice, and develop twenty-first-century skills.

Active learning enhanced these benefits, although its success depended on key factors such as the quality of supervision, curricular integration with other subjects, and the effective implementation of projects.

Similarly, Gutiérrez Rojas et al. (2019) maintain that the integration of education and research is essential for relevant higher education, but requires intentional curricular strategies, research training beginning at the undergraduate level, and the institutionalization of contextualized practices. Structural and methodological challenges persist, particularly in Latin America, where curricular transformation oriented toward social engagement and scientific thinking is needed.

Technological Dimension. Integration of ICT into University Research Training

Regarding technological factors, the studies reviewed concur that the incorporation of information and communication technologies (ICT) into university research training is not limited to access to digital tools, but also entails the development of specific competencies for their critical and strategic use.

In this regard, Benítez (2022) identified weaknesses in the research practices of university faculty, including the limited use of reference management software, low participation in research projects, and difficulties in using statistical tools.

Likewise, the use of ICT in the development of research competencies is associated with tools for searching, selecting, and organizing scientific information, such as academic databases, digital repositories, and reference management software, as well as collaborative environments that facilitate knowledge construction. In this regard, Cabrera Berrezueta et al. (2020) state:

The use of technologies in the development of research competencies acquires value and converges in a systemic and harmonious manner in the search for scientific information, the selection of relevant publications, and the organization of information, while in turn promoting collaborative and cooperative work through the creation of academic, scientific, and research communities (p. 71).

Furthermore, a Mexican study conducted at three universities using a mixed-methods, exploratory-descriptive approach found, through Likert-scale questionnaires and open-ended questions, that although doctoral students demonstrate proficiency in communication and information-search competencies, they show deficiencies in the critical evaluation of digital sources (the reliability of online information), the use of specialized software for research analysis, and systematic participation in scientific dissemination through digital platforms (George Reyes & Salado Rodríguez, 2019).

These findings highlight that the curricular integration of research into any academic program should prioritize instrumental skills and, above all, the development of critical competencies in the use of ICT to avoid replicating the gaps observed at advanced levels of education.

Similarly, as illustrated by the Costa Rican case examined by González Chacón (2024), the

implementation of plans to integrate research into the curriculum in digital environments requires addressing three interrelated challenges: (1) the development of specific technological competencies, (2) the adaptation of institutional infrastructure, and (3) the creation of innovative organizational cultures that support continuous improvement processes.

Institutional Dimension. Institutional Policies and Regulatory Frameworks for Research Integration

At the institutional level, policies and structures play a fundamental role, as Sarthou et al. (2022) observed when documenting the implementation of an institutional policy at a mid-sized Argentine university whose main objectives were to foster interdisciplinary work and strengthen connections with external stakeholders, prompting questions about traditional research policies.

The Peruvian experience reported by Salas-Ruiz (2020) demonstrates that the integration of formative research requires a management system aligned with institutional policies and national regulations, using impact indicators such as student scientific output (p. 4).

Paraguayan universities are important actors within the National System of Science, Technology and Innovation; however, a study based on the analysis of secondary sources reveals that their contributions—particularly in technology transfer—present measurement challenges (Paredes & Maldonado, 2023).

Although they contribute significantly to national scientific capacity, standardized indicators show that the training of highly qualified human resources and scientific output need to be accelerated in order to achieve the 2030 goals of the Science, Technology and Innovation Policy.

Teacher Training Dimension. The Role of Teacher-Researchers and Their Continuing Professional Development

Finally, the teacher training dimension represents a cross-cutting area that directly influences research methodologies. The trends identified point to processes for supporting faculty in four specific areas: new competencies (in line with educational

innovations), knowledge transfer to the curriculum, technologies applied to research, and methods for developing research competencies. The study concludes that this is an emerging area requiring further development, highlighting the need to implement ongoing strategies that strengthen faculty members' methodological skills in order to achieve a sustainable impact on their research practice (González Castro et al., 2024).

Similarly, a quantitative, field-based, non-experimental, descriptive study with a projective design, conducted with 50 faculty members using a validated questionnaire ($\alpha = 0.96$), found that 96% of faculty considered a training program in research competencies to be "highly necessary" to transform their pedagogical practice by improving skills in report writing, educational assessment, and the methodological application of research in the classroom (Tua García, 2020, pp. 30–32).

However, some less positive findings have also been reported. Navarro-Navarro et al. (2024), for example, examined the role of faculty mentoring in establishing meaningful learning of research competencies in the classroom. Using a qualitative naturalistic paradigm, they interviewed 7 faculty members, 13 students, and 6 experts in scientific methodology. Their findings revealed that the university community's perception of mentoring as a foundation for formative research is ambivalent, indicating that the pedagogical practices employed often contradict the institution's theoretical foundations (p. 776).

It can therefore be inferred that faculty members base their teaching on personal pedagogical assumptions derived from their experience and beliefs, which do not always coincide with the institutional approach, resulting in inconsistencies in research training.

A South American study by Puche Villalobos (2023) identified a multidimensional set of research competencies—critical, technological, argumentative, and ethical—among university faculty from nine countries, including Paraguay, highlighting the need for continuing professional development to foster these competencies. Regional disparities were found in receptiveness to new methodologies: Paraguay showed a high level of interest (51%), exceeding the

regional average, while Uruguay (60%) and Chile (53%) recorded the highest levels and Colombia (27%) the lowest. These variations suggest context-specific institutional challenges to integrating research into curricula (p. 72).

Discussion

The results of this review indicate that, although there is theoretical and regulatory consensus regarding the importance of integrating research into undergraduate curricula, its practical implementation remains partial and uneven across different institutional contexts. This confirms the observations of Illanes Velarde (2018), who emphasizes that knowledge generation in higher education requires not only a strategic vision but also structural conditions that are often not guaranteed.

Consistent with the findings obtained, the geographical distribution of the included studies reveals a concentration of scientific output in certain contexts, particularly in Latin American countries such as Colombia, Peru, and Ecuador, as well as in European settings such as Spain. This trend suggests that the integration of research into university curricula has reached a higher level of development in these contexts. In contrast, the limited number of studies from Paraguay and neighboring countries reinforces the view that this field is still at an emerging stage at the regional level. This finding not only reveals a gap in the scientific literature but also provides insight into the structural limitations mentioned above, particularly those associated with the weak coordination between policies, teaching practices, and institutional development.

In this regard, the findings suggest that the integration of research into the curriculum does not depend on a single factor, but rather on the systemic interaction among pedagogical, technological, institutional, and teacher-training dimensions.

Within the pedagogical dimension, the studies reviewed agree that the development of research competencies requires a paradigm shift in teaching and learning strategies. Successful experiences, such as those documented by Niemi and Nevgi (2014) in Finland and Guijarro Intriago et al. (2018) in Ecuador,

show that early engagement in research, when appropriately supported and integrated into the curriculum, enhances twenty-first-century skills, fosters autonomy, and strengthens professional education.

However, it is worth considering why contexts such as Finland have achieved significant and sustainable progress in research integration, whereas in countries such as Paraguay it remains limited. Structural factors that may explain this difference include: (1) sustained funding for higher education in Nordic countries, (2) teacher education policies with a strong emphasis on research beginning at the initial training stage, (3) university autonomy linked to accountability for outcomes, and (4) an academic culture in which research is regarded as an integral part of the faculty role.

In contrast, Paraguay faces challenges such as limited funding, insufficient professionalization in educational research, weak coordination between curricula and scientific output, and a university culture that remains largely centered on traditional teaching.

For this reason, it can be argued that traditional models centered on knowledge transmission continue to prevail in the Latin American context, supporting the findings of Álvarez Contreras et al. (2023).

From a technological perspective, the findings reveal a gap between access to digital tools and their critical use in research processes. Although ICT offers extensive opportunities to strengthen research competencies, its impact depends on users' critical capabilities and its pedagogical integration into the curriculum. In this regard, the findings are consistent with George Reyes and Salado Rodríguez (2019), who warn that deficiencies in evaluating digital information and using specialized software persist even at advanced levels of education. Similarly, Cabrera Berrezueta et al. (2020) emphasize that the use of technology in research requires systemic integration linking access to information with processes of analysis and knowledge construction. Furthermore, recent studies underscore that the effective incorporation of ICT into higher education requires not only technological infrastructure but also the development of faculty competencies and the

consolidation of institutional cultures oriented toward innovation (González Chacón, 2024; González Castro et al., 2024).

Regarding institutional and policy-related factors, the findings show that the mere existence of educational policies does not guarantee their implementation. Cases such as those analyzed by Sarthou et al. (2022) and Salas-Ruiz (2020) demonstrate that policies must be accompanied by management structures that guide, evaluate, and support research integration processes. In Paraguay, the study by Paredes and Maldonado (2023) suggests that, although universities actively participate in the national science and technology system, greater efforts are still required to institutionalize sustainable research practices aligned with development goals.

Continuing professional development for faculty emerges as a cross-cutting component in achieving genuine transformation. Both González Castro et al. (2024) and Tua García (2020) agree that there is an explicit demand among faculty for methodological training. However, as Navarro-Navarro et al. (2024) caution, such initiatives must be aligned with the institutional pedagogical model; otherwise, contradictions may arise between institutional discourse and everyday practice. In addition, the regional study by Puche Villalobos (2023) reinforces this need by revealing disparities among countries in their receptiveness to new methodologies, indicating that Paraguay shows a favorable attitude but needs to strengthen its institutional capacities.

From a critical perspective, one of the main weaknesses identified is the limited coordination among the different levels of intervention: curriculum, institutional policies, faculty capacities, and technological development. This fragmentation hinders the effective integration of research across undergraduate education, despite the regulatory framework supporting it (Law 2072, 2003).

Conversely, one of the strengths of the present study is its systematic approach, which makes it possible to identify common patterns, gaps, and good practices across different contexts, thereby providing valuable input for the formulation of educational and institutional policies in Paraguay. The findings also

confirm the relevance of Research-Based Learning (RBL) as an integrative and adaptable methodology aligned with the development of scientific and professional competencies (Casares Antón, 2023).

Finally, it should be noted that the findings are not fully generalizable, as the study focused on sources selected according to specific inclusion criteria and within a limited time frame. Nevertheless, they provide a basis for formulating evidence-informed hypotheses regarding the factors that hinder or facilitate the curricular integration of research.

The findings are particularly relevant to emerging contexts such as Paraguay, where empirical evidence on the integration of research into the curriculum remains limited. In this regard, the present study not only identifies critical factors affecting its implementation but also highlights the need to strengthen scientific output and institutional coordination as essential conditions for advancing toward research-based higher education.

Conclusion

This systematic review provides a robust framework for analyzing the processes involved in integrating research into university curricula, making it possible to identify approaches, strategies, and factors that influence their development across different higher education contexts.

The findings show that, although there is theoretical and regulatory consensus, as well as successful experiences at the international level, structural, methodological, and institutional barriers persist that limit the effective integration of research across curricula. In particular, the evidence analyzed highlights the need to address the pedagogical, technological, institutional, and teacher-training dimensions in a coordinated manner as a prerequisite for developing a sustainable research culture.

Furthermore, the geographical distribution of the literature reveals a concentration of studies in certain contexts, while countries such as Paraguay have limited scientific output in this area. This confirms the existence of a relative gap in the literature and reinforces the relevance of conducting empirical

research aimed at understanding the implementation of these processes in specific contexts.

From a comparative perspective, experiences such as that of Finland demonstrate that successful research integration is supported by coherent policies, sustained funding, and research-centered teacher education—elements that are still in the process of consolidation in contexts such as Paraguay.

In this regard, coordinated action among higher education institutions, governing bodies, and the academic community is required to strengthen the alignment between policies, teaching practices, and institutional development, thereby promoting higher education that is more scientific, critical, and oriented toward knowledge generation.

From a methodological perspective, the application of the PRISMA protocol ensured a systematic, transparent, and replicable review process, strengthening the validity of the findings. Nevertheless, the results should be interpreted in light of the limitations inherent in the study design, particularly those related to the inclusion criteria and the scope of the sources consulted. These limitations provide opportunities for future reviews to broaden the scope of analysis and incorporate new methodological approaches.

Author contributions

SLA: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Supervision, Validation, Visualization, Writing – Original Draft, Writing – Review & Editing. **CA:** Conceptualization, Visualization, Writing – Review & Editing.

Research data availability

No primary data were generated in this study. The data analyzed were obtained from the scientific articles included in the systematic review. The evidence extraction and synthesis matrix is available from the corresponding author upon reasonable request.

Peer review comments

This article underwent an anonymous peer-review process in accordance with the journal's editorial transparency policy. The reviewers, who participated anonymously in this process, consented to the publication of the comments provided during the review.

Peer Review Comments 1: Final recommendation: Revise and rewrite the content and resubmit in a future call for a new evaluation. Rationale: The manuscript has merit (a relevant topic, a regional contribution, and four useful dimensions), but it does not meet the standards claimed for a systematic review (PRISMA) or the level of critical synthesis expected in a high-impact journal. It requires substantial methodological rewriting, a stronger synthesis, and standardization of the references. With these improvements, the quality and publication potential of the paper could be significantly enhanced. Recommendations are attached.

Peer Review Comments 2: Recommendations for improvement are attached. The article is suitable for publication subject to revisions.

Peer Review Comments 3: Publish once the author has made the adjustments outlined in the recommendations provided in the review. The manuscript is solid, relevant, and timely; its structure and methodology are appropriate. However, before publication, the following minor but necessary revisions are required: 1. Optimize the abstract (make it more concise and use nominal constructions). 2. Remove the duplicate PRISMA diagram. 3. Clarify the structure of the article in the introduction. 4. Add more specific practical recommendations to the conclusions. 5. Review and standardize all references according to APA guidelines (particularly URLs and DOIs).

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