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A strategic model for institutionalizing formative research in higher education

Modelo estratégico para la institucionalización de la investigación formativa en educación superior

Modelo estratégico para a institucionalização da pesquisa formativa no ensino superior

Abstract

Introduction: formative research articulates teaching and scientific inquiry in higher education to consolidate research competencies and critical thinking. Its institutionalization often faces barriers due to a normative-practice disconnect and the lack of institutional support to guarantee protected teaching time and practice spaces. **Objective:** to design a strategic management model to institutionalize formative research at the Pontificia Universidad Católica del Ecuador, Sede Manabí. **Method:** using a projective case study with a mixed convergent triangulation design, the research was based on a qualitative diagnosis of 53 institutional documents and was quantitatively validated through the judgment of a panel of 9 international experts. **Results:** the proposed model structures management through institutional inputs and outputs that feed a formative core composed of five components (curricular training, seedbeds and research groups, collaborative learning, graduation incentives, and academic dissemination), whose theoretical rigor and relevance received the endorsement of the expert panel. **Conclusion:** the designed management model contributes to organically integrating research practice into the curriculum, enabling the transformation of isolated regulations into articulated learning communities.

Keywords: learning, curriculum, teaching, higher education, formative research

Resumen

Introducción: la investigación formativa articula docencia e indagación científica en educación superior para consolidar competencias investigativas y pensamiento crítico. Su institucionalización frecuentemente enfrenta barreras por la desconexión normativo-práctica y la falta de soporte institucional para garantizar tiempo docente protegido y espacios de práctica.



Objetivo: diseñar un modelo de gestión estratégico para institucionalizar la investigación formativa en la Pontificia Universidad Católica del Ecuador, Sede Manabí. **Método:** mediante un estudio de caso proyectivo con diseño mixto de triangulación convergente, la investigación se fundamentó en un diagnóstico cualitativo de 53 documentos institucionales y se validó cuantitativamente mediante el juicio de un panel de 9 expertos internacionales. **Resultados:** el modelo propuesto estructura la gestión a través de entradas y salidas institucionales que alimentan a un núcleo formativo compuesto por cinco componentes (formación curricular, semilleros y grupos, aprendizaje colaborativo, incentivos de titulación y socialización académica), cuyo rigor teórico y pertinencia lograron el respaldo de dicho panel de expertos. **Conclusión:** el modelo de gestión diseñado contribuye a integrar orgánicamente la práctica investigativa al currículo, viabilizando la transformación de normativas aisladas en comunidades de aprendizaje articuladas.

Palabras clave: aprendizaje, currículo, docencia, educación superior, investigación formativa

Resumo

Introdução: a pesquisa formativa articula ensino e investigação científica no ensino superior para consolidar competências investigativas e pensamento crítico. Sua institucionalização frequentemente enfrenta barreiras pela desconexão entre normas e prática e pela falta de suporte institucional para garantir tempo docente protegido e espaços de prática. **Objetivo:** desenhar um modelo de gestão estratégico para institucionalizar a pesquisa formativa na Pontificia Universidad Católica del Ecuador, Sede Manabí. **Método:** por meio de um estudo de caso projetivo com desenho misto de triangulação convergente, a pesquisa fundamentou-se em um diagnóstico qualitativo de 53 documentos institucionais e foi validada quantitativamente pelo juízo de um painel de 9 especialistas internacionais. **Resultados:** o modelo proposto estrutura a gestão por meio de entradas e saídas institucionais que alimentam um núcleo formativo composto por cinco componentes (formação curricular, semilleros e grupos, aprendizagem colaborativa, incentivos de titulação e socialização acadêmica), cujo rigor teórico e pertinência obtiveram o respaldo do referido painel de especialistas. **Conclusão:** o modelo de gestão desenhado contribui para integrar organicamente a prática investigativa ao currículo, viabilizando a transformação de normativas isoladas em comunidades de aprendizagem articuladas.

Palavras-chave: aprendizagem, currículo, docência, ensino superior, pesquisa formativa



Introduction

In recent years, Latin American higher education has steadily expanded its enrollment (Márquez Vásquez & Caicedo Consuegra, 2025). This growth has brought more students into the system, yet it has simultaneously raised the bar for quality management and curricular renewal. The challenge lies in integrating into the curriculum those empirical experiences that develop scientific capabilities and critical thinking (Labraña & Brunner, 2022).

In line with Salguero Rosero et al. (2025), this study defines formative research (FR) as a strategic approach that promotes the progressive development of technical, cognitive, attitudinal, and methodological skills. These competencies equip students to interpret and apply knowledge critically and contextually. The transformative potential of FR was underscored by these authors, who cautioned that "the learning of theoretical concepts is not an end in itself, but a means to develop practical skills that improve students' ability to investigate critically, generate relevant knowledge, and respond to real-world challenges" (p. 16).

From a curricular standpoint, these activities introduce students to the logic of the scientific method through pedagogical strategies that link theory with practice to address everyday problems (Castillo Montúfar et al., 2026). In doing so, they strengthen collaborative work and prepare future professionals for the demands of their environment (Winchez Aylas & Bejarano Alvarez, 2025). Thus, whereas productive research involves developing projects aimed at generating new knowledge and disseminating findings to broad audiences to consolidate faculty research lines, FR is fundamentally concerned with teaching the scientific method to students through seedbeds and integrative projects (Parada Trujillo et al., 2025).

Chávez-Arizala and Soria-Quijaité (2026) framed as an imperative "the need for comprehensive academic training that allows for the harmonious development of all students' faculties, especially those related to research" (p. 419). Meeting this condition requires that higher education institutions (HEIs) provide effective support and adequate formative strategies to successfully integrate these competencies across the curriculum. In this regard, the ISO 21001:2018 standard "Management Systems for Educational Organizations" offers HEIs technical guidance for ordering educational management, including curriculum and research practice, through documented processes, learning evidence, and review mechanisms along the student trajectory (International Organization for Standardization [ISO], 2018).

The integration of FR into the student trajectory is consolidated when research skills are progressively developed throughout the curriculum and generate outputs that can be leveraged for the degree thesis (Parra, 2004; Corona Meza, 2023; Hensel, 2023). While "teacher scaffolding plays a crucial role in enhancing constructive engagement" (Gutiérrez-Braojos et al., 2024, p. 149), Parada Trujillo et al. (2025) rightly assert that the success of formative research depends on faculty possessing not only disciplinary knowledge but also methodological and didactic expertise, enabling them to apply theoretical-practical strategies that move beyond the abstraction level of science. If research training requires this comprehensive guidance, it follows that HEIs should promote faculty professional development, which is a decisive factor for the successful curricular integration of FR as a supervised and verifiable practice (Alharbi, 2024; ISO, 2018).

However, despite the existence of technical standards and quality benchmarks for educational organizations, these do not always translate into stable institutional practices for FR, such as defined research products per course, common rubrics, seedbeds with recognized teaching loads, or student projects linked to research lines (Turpo-Gebera et al., 2020; Borja Tomás et al., 2025). The regional literature has also warned that the disconnect between the educational model and teaching practice perpetuates inertias that constrain research development. Examples include the displacement of research toward the end of the program, its concentration in a single methodology course, or its confinement to seedbeds poorly connected to the curricular trajectory. This is especially true when faculty professional development fails to keep pace with the concrete demands of contemporary university education, for instance, methodological guidance for theses, academic writing, or review of learning evidence (Alharbi, 2024; Borja Tomás et al., 2025; Corona Meza, 2023).

In Ecuador, institutional research is recognized as a substantive function under the Ley Orgánica de Educación Superior, enacted in 2010. Complementarily, the Reglamento de Régimen Académico of the Consejo de Educación Superior establishes formative research as one of the two levels of institutional research, further recognizing it as a component of the academic formation process and a cross-cutting axis of the curriculum (Asamblea Nacional del Ecuador [AN], 2010; Consejo de Educación Superior [CES], 2022). The massification of enrollment brings with it a broadening of academic demands. Herein lies the need to articulate teaching and research more effectively within concrete formative processes (Labraña & Brunner, 2022). In this way, from an institutional management perspective, processes aimed at linking mass instruction with systematic spaces for scientific practice acquire considerable importance.

In this context of expanding academic demand, beyond merely incorporating research activities into the curriculum, management capable of organizing responsibilities, resources, practice spaces, and monitoring mechanisms is required (Ros-García et al., 2023). For this reason, management models prove relevant for articulating FR with the student's academic trajectory and connecting courses, seedbeds, research groups, and academic products within a more stable institutional logic (López Ávila et al., 2025; Chigbu et al., 2023).

The Pontificia Universidad Católica del Ecuador (PUCE) is currently updating its management processes with the aim of transitioning toward strategic research, leveraged by strengthening its academic capacity and incorporating doctoral-level faculty. To organize scientific production, the institution has established six major academic domains that function as national reference frameworks: 1) habitat, infrastructure, and mobility; 2) economic policy, institutional competitiveness, innovation, entrepreneurship, productivity, and leadership; 3) politics and law for social participation and the establishment of just relations; 4) identities, education, cultures, communication, and values; 5) sustainable management of natural resources; and 6) dignified life and comprehensive health.

From these macro-domains, the Manabí Campus (PUCE-SM) has derived and prioritized seven specific research lines for its regional context. These lines ensure

socio-environmental relevance and are oriented toward contributing to the Sustainable Development Goals of the 2030 Agenda, addressing issues through axes such as biodiversity conservation; comprehensive health, social determination, and human development; and design, infrastructure, and social and environmental systems for a sustainable habitat. Nevertheless, the focus of scientific production still tends to favor indicators associated with institutional accreditation.

Consistent with this, student participation in projects, publications, and academic socialization spaces remains limited. This phenomenon reveals an underlying disconnect that underscores the need to consolidate research as an essential and inescapable part of the teaching endeavor, since the quality of the formative process depends directly on the link with a faculty member engaged in research. This weak articulation between faculty's own scientific production and their pedagogical work is reflected in degree theses that, while meeting formal requirements, exhibit recurrent weaknesses in epistemological coherence and methodological design. Consequently, curricular mentoring remains insufficiently articulated, and students' research experiences are discontinuous.

In this sense, Chigbu et al. (2023) concluded that "all aspects of teaching and learning should focus on student training, including the culture, technologies, strategies, actors, infrastructure, and policies of higher education institutions" (p. 10). This idea makes it clear that university management cannot be reduced to isolated pedagogical actions; rather, it must be oriented toward creating institutional conditions capable of sustaining FR over time.

Corona Meza (2023) organized formative research around the epistemology of FR, the development of research skills, teaching practice, and institutional strategies. While this author enumerated the main components of the phenomenon, no management mechanism to articulate them into a unified system was proposed. From a curricular perspective, Hensel (2023) argued that research integrated into introductory courses allows students to "learn to be good observers, ask actionable questions, defend their ideas, use evidence, and work collaboratively" (p. 230). In a different vein, López Ávila et al. (2025) placed emphasis on seedbeds, showing that these spaces foster "reflection, critical thinking, and collaborative work" (p. 575), while Paucar-Curasma et al. (2024) and Paucar-Curasma et al. (2025) shifted attention toward the use of technological resources and problem-solving methods to promote a positive attitude toward research among engineering students.

In the literature reviewed, the strategic integration of FR into institutional management remains an insufficiently addressed theme. Nevertheless, several studies detail experiences, strategies, and analytical frameworks that affirm its formative value.

The ISO 21001 standard "Management Systems for Educational Organizations" posits that FR integration requires academic management oriented toward quality and continuous improvement (ISO, 2018). For PUCE-SM, this poses the challenge of establishing conditions that allow FR to be integrated throughout the curricular trajectory, in line with Corona Meza's (2023, p. 2) observation that FR is "carried out throughout an institutional university curriculum."

In this framework, clarifying responsibilities, securing resources, providing

faculty mentoring, documenting evidence of progress, and reviewing results become necessary. Accordingly, the objective of this study was to design a strategic management model for the institutionalization of formative research at PUCE-SM.

Methods and materials

This research was conducted under a mixed-methods approach with a convergent triangulation design, structured as a projective case study (Hurtado de Barrera, 2024; Yin, 2018). The qualitative phase allowed for an examination of the structural problem stemming from the disarticulation between educational policies and their practical application at PUCE-SM. The quantitative phase, in turn, was oriented toward statistically validating the strategic proposal designed to transform this institutional reality. The research process was organized into three consecutive phases: theoretical grounding, institutional diagnosis, and content validation of the proposal.

Phase 1. Theoretical-conceptual and contextual grounding

A conceptual exploration of recent scientific literature was carried out to identify the pedagogical foundations of FR and the organizational factors required for its institutional sustainability. The Ecuadorian regulatory framework (AN, 2010; CES, 2022) and PUCE-SM planning instruments (Pontificia Universidad Católica del Ecuador [PUCE], 2019, 2021, 2024, 2025) were also analyzed to establish the feasibility conditions of the proposal. Additionally, the principles and quality criteria of ISO 21001:2018 (ISO, 2018) were studied with the aim of grounding the mechanisms that articulate formative research as a cross-cutting pedagogical approach within institutional management.

Phase 2. Situational diagnosis and FR needs analysis

Qualitative content analysis (Krippendorff, 2018) was applied to a corpus of 53 internal documents generated between March 2023 and September 2025. The analysis yielded an initial diagnosis of institutional dynamics regarding normative-practical alignment over five consecutive academic periods.

The analytical corpus consisted of self-assessment reports, minutes issued by the Directorate of Research, Outreach, and Innovation (DIVi), graduate tracking records, and undergraduate theses (Table 1). From these inputs, quantitative efficiency indicators were also extracted to gauge the magnitude of the institutional problem. Specifically, faculty-student co-authorship, participation in formal projects, and attendance at scientific events were examined.

Table 1

Characterization of the documentary corpus

Document source (N=53)	Issued by	Function in the diagnosis
Annual self-assessment reports per program (n=14)	Quality assurance committees	Identification of declared gaps in curricular planning and program-level resource needs.
DIVi session minutes (n=9)	DIVi	Analysis of real decision-making dynamics, management bottlenecks, and funding allocation criteria.
Graduate tracking records (n=3)	DIVi	Retrospective assessment of research competencies and evaluation of training impact on professional performance among graduates of International Business, Physiotherapy, and Marine Biology.
Undergraduate theses (n=27)	Students	Analysis of the final formative product to determine the level of methodological competence and epistemic coherence attained.

Source: Authors' own elaboration.

Complementarily, a qualitative analysis aimed at identifying challenges hindering FR implementation was developed. The interactive model of Miles et al. (2014) was followed. The unit of analysis consisted of corpus fragments expressing clearly delimited ideas about the problem. These were subsequently grouped according to recurring themes, and institutional gaps related to FR were thereby identified.

Phase 3. Design and validation of the strategic proposal

The axial categories identified in the diagnosis were contrasted with the pedagogical principles, organizational factors, and regulatory requirements systematized in the theoretical grounding. From the results of this contrast, the model's components and their objective were defined.

The preliminary proposal was validated through the expert judgment method. An international panel of 9 specialists with backgrounds in research management and university pedagogy was formed. Each was sent via email a rubric with a 5-point Likert scale to assess the proposal against five rigor criteria: relevance, coherence, sufficiency, clarity, and feasibility. With the data collected, Aiken's V was calculated to seek evidence of content validity, and inter-rater reliability was analyzed by computing Kendall's W coefficient. SPSS v.25 statistical software was used for this purpose.

Results and discussion

Institutional diagnosis of formative research

Corpus analysis revealed weaknesses in the systematic implementation of formative research. While degree theses rarely led to co-authored publications, formal research projects maintained low levels of student participation. To this was

added a reduced student presence at scientific events, revealing an incipient culture of academic socialization. These issues were cross-cut by insufficient research competencies, fueled by a limited offering of practice and recognition spaces, and aggravated by weak incentive and institutional communication mechanisms (Table 2).

Table 2

Synthesis and triangulation of qualitative findings from the diagnosis

Axial Category (Finding)	Self-Assessment Reports	Graduate Surveys	Thesis Analysis	Minutes and Reports (DIVi)
Insufficient competencies	Indicate deficiencies in methodological rigor and writing.	Reported lack of tools for thesis preparation.	Detect weaknesses in structure and results analysis.	Documented need to reinforce critical thinking, methodological rigor, and scientific writing training.
Limited practice and recognition opportunities	Identify absence of budget and protected time for faculty research and student research mentoring.	Report nonexistence of channels for co-curricular research practice and training focused exclusively on course compliance.	Shows disconnection of degree projects from institutional research lines.	Documents the need to create formal bridges between curriculum and research groups.
Lack of incentives and communication	Identify the need to strengthen dissemination and the research communication strategy.	Report unawareness of group existence and lack of economic/time support to participate.	Indicate scarce scientific production derived from degree theses.	Documents the need for a plan to ensure active promotion of FR and creation of curricular incentives to foster student participation.

Source: Authors' own elaboration.

Note. The table presents a synthesis of the most relevant and recurrent aspects obtained from the different sources analyzed.

The absence of methodological mentoring throughout the program is later reflected in degree theses that struggle to formulate research problems or justify methodological decisions. This formative weakness extends beyond the student. It also responds to an academic trajectory centered on course completion, with little connection to institutional research projects and scientific production. These evidences support the proposal of the model as an instrument to articulate curricular elements with institutional conditions that make a more sustained research practice possible. The following strategic components of the model emerge from the complementary integration of the institutional diagnosis, in which document review evidenced the magnitude of gaps in research practice, while qualitative analysis allowed for understanding the structural barriers this design seeks to overcome.

Structure of the model for FR management

To address the need for greater integration of the curriculum with practice spaces and academic products around the student's research trajectory, the Model establishes five interconnected components that place the student at the center of management (Figure 1):

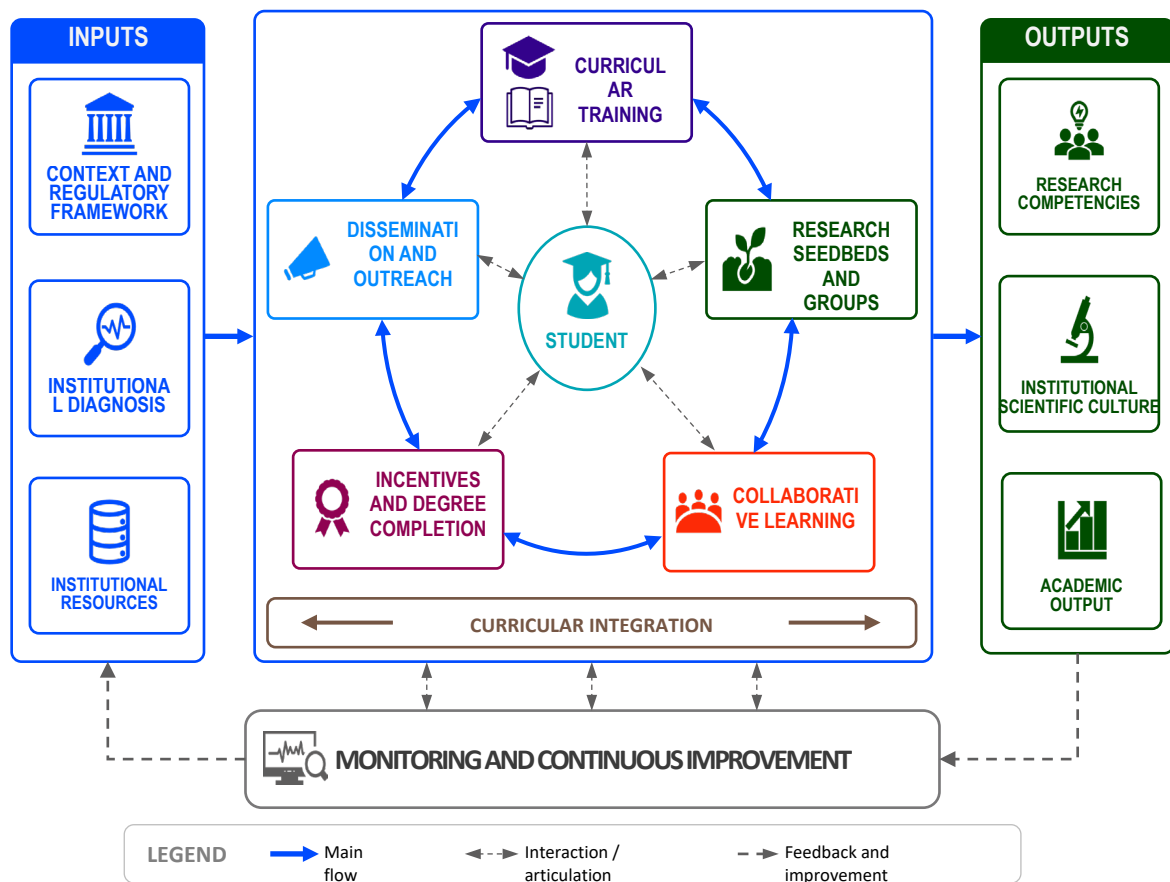
Curricular training (C1): introduces research into regular coursework. It creates a curricular foundation for FR to advance throughout the program with greater coherence.

- Seedbeds and groups (C2): promote student participation in institutional research spaces.
- Collaborative learning (C3): collective construction of advances and academic products.
- Incentives and degree completion (C4): links these advances to recognizable academic products.
- Dissemination and outreach (C5): opens spaces to communicate partial or consolidated results.

These components are immersed in a flow that starts from institutional inputs, concentrates work on them as a student-centered formative core, and projects outputs subject to feedback. The DIVi is responsible for conducting and providing support while faculty-tutors provide methodological mentoring to students.

Figure 1

Formative research management model



Source: Authors' own elaboration.

Inputs include the demands of the institutional and regulatory context (research policies, higher education regulations, institutional lines), the results of diagnoses, and the constraints imposed by available resources. With these inputs, the formative core defines where and how FR can be incorporated into the curriculum. In this logic, integrative courses favor students' methodological learning based on discipline-specific content and inquiry activities linked to FR. Meanwhile, monitoring the internal dynamics of the formative core provides vital information on aspects such as project continuity, participation in practice spaces, methodological quality of progress, and faculty mentoring through to degree completion or academic socialization.

The Model's outputs allow for assessing the effects of the student's research trajectory and provide information for improving FR. Specifically, these outputs comprise the development of research competencies, evidenced in better-defined problem formulation and justified methodological decisions; increased student participation in research activities; and the generation of academic evidence of formative progress and derived intellectual production, such as degree products, presentations, or publications. All this translates into concrete contributions to the

institutional scientific culture and provides useful information for adjusting the curriculum, mentoring, or available supports. Ultimately, information emanating from these outputs feeds back into the program as a foundation for continuous improvement, helping to prevent FR from becoming a mere sum of isolated activities or formal compliance.

Components of the formative core

Curricular training (C1)

This component provides mechanisms for recognizing the formative needs of students and faculty through periodic diagnoses supported by academic information from each program. It thus guides faculty training and helps gradually incorporate FR into the curriculum. Curricular integration can be adjusted in scope considering the mentoring required by faculty and the type of research activity envisioned in integrative courses.

Through this component, the strategic model favors the organic articulation of research within the academic curriculum. To achieve this, it envisions the implementation throughout the program of integrative courses (regular courses whose disciplinary content can be approached through problems specific to the profession). In this sense, each academic program defines the number of viable integrative courses and their strategic placement in the curriculum, depending on its mentoring capacity and the frequency established for inquiry activities.

Seedbeds and groups (C2)

This component promotes student participation in concrete research tasks under faculty guidance, with demonstrable progress throughout the process. In this way, students are brought closer to real research practices that take place within teams linked to an institutional line or project.

To optimize the conditions under which students learn to research by doing, the component articulates two research modalities:

- seedbeds are institutionalized as spaces that provide students with facilities to familiarize themselves with study problems linked to the program and constitute an initial approach to the dynamics of scientific research.
- research groups enable students to link up with formal research projects and learn how institutional scientific production is organized.
- Student participation in seedbeds and research groups is expected to be subject to clear and objective criteria regulating their entry and permanence.

Collaborative learning (C3)

This component promotes students' research autonomy through the formation of Study Groups. These are flexible spaces, formed around common interests and led by students themselves, with non-directive faculty mentoring oriented toward channeling research questions and methodological decisions when the group requires it. The institution must ensure adequate conditions to optimize the performance of these groups, as well as provide formal recognition for student



participation. They may also present their progress at the academic conferences provided for in C5.

Study Groups whose work has reached greater maturity can organically link with seedbeds and research groups in C2. Thus, those students who have achieved sufficient competencies and have a favorable attitude toward research have a pathway, supported by specialized mentoring, to consolidate and deepen acquired knowledge through scientific practice.

Incentives and degree completion (C4)

This component envisions the articulation of competitive funds administered by the DIVi with degree theses linked to faculty projects, research groups, or seedbeds with academic production in development. Proposal selection is conducted through public criteria that value the methodological consistency of the design and the expected contribution to the program.

During review, the temporal feasibility of the project with respect to academic degree deadlines must be guaranteed, as well as its capacity to generate a tangible scientific product. Once the proposal is approved, the tutor leads the academic process, with support from the corresponding group or seedbed when the nature of the project so requires.

Faculty-student co-authorship allows degree progress to be prepared for scientific communication. This practice recognizes the student's work at a higher level of demand and can project it toward academic conferences, proceedings, or publications depending on the degree of development achieved. C4 thus extends the reach of competitive funds by favoring the circulation and association of results with the campus's research production.

Dissemination and outreach (C5)

C5 transforms the public presentation of student work into a regular practice of PUCE-SM's academic culture. Its function is to give visibility to results generated throughout the formative trajectory, from integrative courses to the degree thesis, provided they reach a sufficient level of elaboration.

The main mechanism of this component is the academic conference. Its function is formative. Initial advances can circulate there through posters, while more consolidated results may be presented as papers or academic proceedings. In this way, scientific socialization accompanies the formative process and recognizes different levels of elaboration in student work.

Certification and merit distinctions provide academic backing for student participation. The public presentation of these works extends their reach within the university community and contributes to installing formative research as a recognized practice at the campus.

Content validation of the model

Analysis of the data obtained from the expert consultation showed moderate-high and significant inter-rater consistency (Kendall's $W = 0.559$; $p < 0.001$). Furthermore, global content validity for the Model showed high values ($V =$

0.86) above the acceptance threshold proposed by Aiken (1985). However, Model Feasibility (Table 3) received a rating below expectations ($V = 0.69$) and prompted an analysis of the causes.

Table 3
Content validation summary by Aiken's V

Criterio de Evaluación	V de Aiken	Resultado
Pertinencia	0,97	Válido
Coherencia	0,89	Válido
Claridad	0,81	Válido
Suficiencia	0,92	Válido
Viabilidad	0,69	Insuficiente
Coeficiente global del modelo	0,86	Válido

Source: Authors' own elaboration.

Note. Values correspond to the average per criterion.

Expert observations pointed to the risk of increased faculty workload that would be difficult to sustain and to the fact that Model implementation required better delimitation of the curricular spaces where formative research would be integrated. In response, the Model design was adjusted to focus curricular integration on a manageable number of integrative courses per program. This delimitation allows for a more manageable implementation by concentrating faculty mentoring in previously defined curricular spaces.

On the other hand, it was specified that before joining applied research spaces, students must work on problem formulation and literature review in the initial semesters. They then advance toward constructing theoretical frameworks, methodological delimitation, and initial instrument design. This aims to reduce improvisation in practice spaces and better orient faculty mentoring. This preparation should occur in the initial semesters (1st through 4th).

Scope of the model

Results show that research practice maintains a weak connection with the curriculum, evidencing that seedbed activity depends on the voluntary impulse of some faculty. Faced with this state of affairs, the Model proposes mechanisms for practice spaces, academic products, courses, and faculty mentoring to be integrated into a coherent research trajectory.

ISO 21001:2018 provides the Model with an educational management reference based on improvement and a process approach. From that logic, FR is

analyzed in terms of its relationship with the campus's academic processes and the value it can generate for students and other interested parties. In the Model, this comprehensive perspective allows components to be understood as parts of a formative trajectory subject to review and improvement, rather than as isolated actions. The relationship between standard requirements and Model mechanisms is synthesized in Table 4.

Table 4

Correspondence between ISO 21001:2018 requirements and Model mechanisms

ISO 21001:2018 Requirement	Management criterion contributed	Model mechanism	Scope in FR management
6.2 Educational organization objectives and planning to achieve them	Objectives should be defined at relevant levels, monitored, and documented information on their achievement maintained.	Definition of FR objectives per program, associated with integrative courses and expected results along the student trajectory.	Allows specification of what should be achieved with FR and how its progress will be verified during the program.
7.1 Resources and 7.2 Competence	The organization must determine resources and ensure the competence of people who impact educational performance.	Identification of faculty-tutors, academic capacities, institutional support, and material conditions to sustain FR.	Connects Model feasibility with real availability of mentoring, faculty time, and practice spaces.
7.5 Documented information	Information necessary for system effectiveness must be identified, available, and controlled.	Use of syllabi, rubrics, minutes, participation records, student products, and academic socialization evidence.	Provides traceability to the student's research trajectory and supports improvement decisions.
8.1 Operational planning and control	Educational processes must be planned, controlled, and sufficient evidence maintained to	Organization of the Model in inputs, formative core, outputs, and feedback, with emphasis on integrative courses	Helps move from isolated research activities to a more controllable curricular management.

ISO 21001:2018 Requirement	Management criterion contributed	Model mechanism	Scope in FR management
	demonstrate execution as planned.	and components C1-C5.	
9.1 Monitoring, measurement, analysis, and evaluation	The organization must determine what will be monitored, with what methods, and when results will be analyzed.	Monitoring of project continuity, participation in practice spaces, methodological quality of progress, and faculty mentoring.	Allows detection of interruptions in the trajectory before they accumulate in the degree thesis.
10.2 Continuous improvement	Improvement should be supported by analysis, evaluation, and review results.	Feedback of information from Model outputs to programs and the DIVi.	Favors curricular adjustments, reallocation of support, and review of academic decisions linked to FR.

Source: Authors' own elaboration.

Note. The correspondence presented is orientative and does not constitute a conformity assessment with ISO 21001:2018.

The curricular integration of the student trajectory from curricular training (C1) to academic socialization (C5) aligns with the perspective of Chigbu et al. (2023), who concluded that "all aspects of teaching and learning should focus on student training, including the culture, technologies, strategies, actors, infrastructure, and policies of higher education institutions" (p. 10). Thus, the proposed model translates the regulatory mandate into concrete mechanisms for articulating teaching with scientific inquiry.

The institutionalization of seedbeds and research groups (C2) as stable mentoring spaces directly converges with the postulates of López Ávila et al. (2025), who reaffirm how student insertion in seedbeds fosters "the development of research competencies, reflection, interaction, and collective work" (p. 593). Ultimately, the progressive mainstreaming proposed by the model's formative core assumes what Hensel (2023) defends as the student's capacity to "learn to be good observers, ask actionable questions, defend their ideas, use evidence, and work collaboratively" (p. 230).

In their study, Enriquez-Gavilan et al. (2025) demonstrated that university students typically present a very favorable affective and cognitive attitude toward research. However, in the behavioral dimension (actual participation) it declines significantly in the face of a lack of institutional opportunities. This gap widens when curricula lack early immersion spaces, causing students to perceive scientific work

as complex and restricted to exclusive academic circles (Martínez, 2025). López-Alonso et al. (2024) proposes that to reverse this inertia, "students' confrontation with real situations is the best didactic strategy to develop their research skills" (p. 10).

Based on these considerations, component C2 (Seedbeds and groups) breaks with the perception of exclusivity by gradually integrating students into scientific practice communities. Component C4 (Incentives and degree completion), in turn, capitalizes on student effort by linking it to tangible results. In this way, the model offers the organizational spaces demanded by the behavioral dimension. It thus contributes to closing the attitudinal gap by potentiating autonomous and comprehensive research learning (Enriquez-Gavilan et al., 2025).

Likewise, the institutional diagnosis revealed a concerning disconnection of degree projects from research lines, a classic symptom of curricula that postpone scientific inquiry until the end of the program. In this regard, Enriquez-Gavilan et al. (2025) advocate for integrating research experiences from the earliest stages of the curriculum, jointly developing theory and practice. Students themselves support this position according to Martínez (2025), who evidenced that they have demanded that "research should be integrated throughout their education, rather than limited to the undergraduate thesis" (p. 568).

In response, the formative core of the proposed model opts to mainstream research from the early semesters through integrative courses (C1) and consolidate it in real environments through seedbeds (C2). The degree thesis is thus transformed into the natural consequence of sustained scientific immersion by students. As demonstrated by Vilà Baños et al. (2025), student skills reach their highest level of consolidation precisely after facing work or practical environments, at which point "students perceive a considerable increase in their specific competencies" (p. 11). Along these same lines, when evaluating the impact of working groups, López-Alonso et al. (2024) concluded categorically that "students' confrontation with real situations is the best didactic strategy to develop their research skills" (p. 10).

The authors of this study concur with Biddix and Bourke (2025) when they caution that curricular mainstreaming of research must guarantee its methodological rigor through faculty mentoring where continuous formative assessment allows for early identification and correction of errors. Considering that the integration of artificial intelligence endows the formative process with the capacity to provide students with personalized and immediate feedback (Yang, 2026), the institutionalization of formative research should also focus on modernizing feedback mechanisms to empower autonomous learning.

Conclusions

A strategic management model for the institutionalization of formative research at PUCE-SM was designed. This study is relevant in the academic and scientific sphere because it provides a structured framework that articulates teaching and inquiry, while also holding social importance by strengthening students'

research competencies and improving the quality of professional training.

As the main finding, the model is organized around a core of five components (curricular training, research seedbeds and groups, collaborative learning, degree incentives, and academic socialization). Grounded in the standardized criteria of ISO 21001, the central value of this contribution lies in its adoption of a process-based approach that enables the real integration of classroom training with research practice. The model provides for the establishment of formative goals and the generation of verifiable evidence, thereby supporting continuous improvement decisions throughout the student trajectory.

These elements were validated by a panel of nine international experts, guaranteeing their theoretical rigor and relevance. Nevertheless, the research process faced certain limitations, such as partial availability of institutional documents and the absence of a pilot implementation of the model, making its validation a primarily theoretical exercise. Consequently, it is recommended that the university advance in the progressive implementation of this design, undertaking systematic monitoring to guide resource allocation and faculty mentoring. In this way, it will be possible to transform isolated policies into truly articulated learning communities.

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Fridel Julio Ramos-Azcuy 1: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Resources, Software, Supervision, Validation/Verification, Visualization, Writing/Original Draft, and Writing/Review & Editing.

Evelyn Virginia Arias-Cedeño 2: Data curation, Software, Validation/Verification, Project administration, Resources, Supervision, and Writing, review, and editing.

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