



The significance and challenges of formative research in Nutrition and Dietetics: A faculty perspective in Colombia, 2025

Significados y desafíos de la investigación formativa en Nutrición y Dietética: Una perspectiva docente en Colombia, 2025

Significados e desafios da pesquisa formativa em Nutrição e Dietética: uma perspectiva docente na Colômbia, 2025

ABSTRACT

Introduction: Formative research plays a crucial role in developing essential competencies during the training of future dietitian-nutritionists. However, no previous studies have explored this topic from the perspective of faculty members.

Objective: To understand the meanings and challenges of formative research in undergraduate Nutrition and Dietetics programs in Colombia, 2025. **Materials and methods:** A qualitative study based on grounded theory was conducted. Data were collected through in-depth interviews and field notes. Analysis was conducted through open, axial, and selective coding and categorization processes. Methodological rigor criteria included saturation, reflexivity, triangulation, credibility, auditability, and transferability. Thirteen coordinators and faculty members from research tracks across seven Colombian universities participated, selected via theoretical sampling by saturation.

Results: Findings indicate that, within Colombian undergraduate Nutrition and Dietetics programs, formative research is understood through multiple conceptual interpretations, its importance for assimilating disciplinary knowledge and fostering comprehensive professional training, and its value as a cross-cutting curricular component. **Conclusion:** Faculty members recognize formative research as a fundamental component of undergraduate education; nevertheless, significant challenges remain regarding faculty pedagogical competence, institutional support, financial resources, and alignment of core university functions.

Keywords: Research; professional training; dietitian-nutritionists; Colômbia. (Source: DeCS, Bireme).

Sustainable development goals: Quality education; Decent work and economic growth. (Source: SDG, WHO).

RESUMEN

Introducción: En la formación de los futuros nutricionistas dietistas, la investigación formativa cumple un papel crucial para el desarrollo de las competencias. Sin embargo, no se habían realizado estudios, que permitieran conocer la perspectiva de los docentes. **Objetivo:** Comprender los significados y desafíos de la investigación formativa en los pregrados de Nutrición y Dietética de Colombia, 2025. **Materiales y métodos:** La investigación tuvo un enfoque cualitativo, aplicando el diseño de la teoría fundamentada. Se aplicaron entrevistas en profundidad y diario de campo. Para el análisis se llevó a cabo el proceso de codificación y categorización abierta, axial y selectiva. Los criterios de rigor metodológico fueron la saturación, reflexividad, triangulación, credibilidad, auditabilidad y transferibilidad. Participaron 13 coordinadores y docentes de núcleos de investigación de pregrados de Nutrición y Dietética de siete universidades colombianas, seleccionados mediante muestreo teórico por saturación. **Resultados:** Se encontró que, en los programas de pregrado de Nutrición y Dietética en Colombia, los significados de la investigación formativa incluyen varias acepciones de este constructo, su importancia para la apropiación del saber disciplinar y la formación integral del nutricionista dietista, y se valora su configuración como componente transversal del currículo. **Conclusión:** Los docentes valoran la investigación formativa como componente fundamental en el pregrado, no obstante, aún hay retos significativos por superar, en materia de competencia pedagógica docente, soporte institucional, recursos financieros y articulación de las funciones misionales.

Palabras clave: Investigación; formación profesional; nutricionistas dietistas; Colombia. (Fuente: DeCS, Bireme).

Objetivos de desarrollo sostenible: Educación de calidad; trabajo decente y crecimiento económico. (Fuente: ODS, OMS).

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RESUMO

Introdução: Na formação dos futuros nutricionistas-dietistas, a pesquisa formativa desempenha um papel fundamental para o desenvolvimento de competências. No entanto, não haviam sido realizados estudos que permitissem compreender a perspectiva dos docentes. **Objetivo:** Compreender os significados e desafios da pesquisa formativa nos cursos de graduação em Nutrição e Dietética na Colômbia, 2025. **Materiais e métodos:** A pesquisa adotou uma abordagem qualitativa, utilizando o delineamento da teoria fundamentada nos dados. Foram realizadas entrevistas em profundidade e registros em diário de campo. Para a análise, efetuou-se o processo de codificação e categorização aberta, axial e seletiva. Os critérios de rigor metodológico incluíram saturação, reflexividade, triangulação, credibilidade, auditabilidade e transferibilidade. Participaram 13 coordenadores e docentes de núcleos de pesquisa de graduações em Nutrição e Dietética de sete universidades colombianas, selecionados por amostragem teórica por saturação. **Resultados:** Constatou-se que, nos programas de graduação em Nutrição e Dietética na Colômbia, os significados da pesquisa formativa abrangem diversas concepções desse constructo, sua importância para a apropriação do saber disciplinar e a formação integral do nutricionista-dietista, além de sua valorização como componente transversal do currículo. **Conclusão:** Os docentes valorizam a pesquisa formativa como um componente fundamental na graduação; contudo, ainda persistem desafios significativos em relação à competência pedagógica docente, ao suporte institucional, aos recursos financeiros e à articulação das funções misionais.

Palavras-chave: Pesquisa; capacitação profissional; nutricionistas; Colômbia. (Fonte: DeCS, Bireme).

Metas de desenvolvimento sustentável: Educação de qualidade; Trabalho decente e crescimento econômico. (Fonte: MDS, ONU).

INTRODUCTION

Higher Education Institutions in Colombia are called to exercise the research function and the articulation of knowledge with the core institutional pillars of teaching and outreach⁽¹⁻³⁾.

In undergraduate programs, the emphasis is placed on Formative Research (FR), which is understood as an approach aimed at enhancing the research spirit and culture, focusing on cross-cutting competencies of university education such as literature searching, critical reading of texts, data analysis, academic writing, and communication with professors and peers⁽⁴⁻⁷⁾. It represents one of the most effective pedagogical approaches for integrating scientific knowledge and theoretical principles with professional practice, employing a strategy that promotes the search, organization, and construction of knowledge by the student⁽⁸⁾. It is operationalized through curricular strategies such as essays, problem-based learning, pre-investigative seminars, collaborative learning, case studies, and lectures, as well as extracurricular strategies such as degree theses and student participation and/or involvement in university research projects led by professors or researchers^(9,10).

The development of research competencies is a priority in the training of future professionals^(11,12) and represents a major challenge for faculty members whose objective is to educate critical individuals who act to transform reality⁽¹³⁾. These competencies must be specific to each program, deepen students' understanding of disciplinary knowledge, and not be restricted to research training per se or focus on a generic application of methods; that is, they must promote FR. In this way, the training of Dietitian-Nutritionists (DNs) aims to fully encompass these principles to establish the professional as an individual who needs to know, know how to do, and know how to be, within the cognitive domain⁽¹⁴⁾.

The International Confederation of Dietetic Associations (ICDA) defines the Dietitian-Nutritionist (D-N) as a health professional qualified and recognized by competent national authorities, who applies the science of nutrition to the feeding and education of individuals in states of health and disease throughout the life course⁽¹⁵⁾. In Colombia, the undergraduate program in Nutrition and Dietetics emerged to address the food and nutritional problems of the population⁽¹⁶⁾.

Given that research constitutes a fundamental component of undergraduate education, it is pertinent to ask: What goals should DN training pursue? And what is the role of research in realizing these goals? A first philosophical response is found in Nussbaum⁽¹⁷⁾, who argues that the primary task is the creation of a community of individuals whose priority tasks consist of developing critical thinking, seeking truth beyond class, gender, and national barriers, and respecting diversity and the humanity of others. However, despite the importance of FR, no specific studies were found in Nutrition and Dietetics (N&D).

The objective of this study was to understand the meanings and challenges of FR in undergraduate Nutrition and Dietetics programs in Colombia, 2025; a novel study that expands understanding of this construct beyond purely theoretical perspectives, while generating relevant information to identify opportunities for quality improvement in these essential processes for future professionals. Within the framework of symbolic interactionism, meaning is conceptualized as the sense attributed to a phenomenon with three basic features: it emerges or is a product of social interactions, it is used and transformed through interpretive and intersubjective use, and it guides human actions, in that people act based on the meaning that things or phenomena hold for them⁽¹⁸⁾.

MATERIALS AND METHODS

This study adopted a Straussian Grounded Theory approach (works by Corbin and Strauss), characterized by systematicity and flexibility in data collection and analysis to construct theories from the perspective of social actors, allowing for the understanding and explanation of a specific reality, particularly meanings, perceptions, or lived experiences⁽¹⁹⁾. It originated in 1967 with Barney Glaser and Anselm Strauss as a methodological strategy, but currently, other authors are recognized, such as Kathy Charmaz, who differ on epistemological, methodological, and theoretical matters^(20,21) (Table 1).

Table 1. Comparison of Grounded Theory perspectives

	Glaser	Strauss and Corbin	Charmaz
Epistemology	Positivism and empirical research	Symbolic interactionism and pragmatism	Social constructivism
Grounded theory	Discovery method	Verification method	Researcher-participant construction method
Definition of theory	Generalizable, explanatory, and predictive formulation. Theory as process, rather than product.	Formulation of concepts within a logical, systematic, and explanatory framework. Adequately constructed and related categories to explain and predict phenomena of interest.	Formulation articulating micro-interactionist perspectives with macro-social and historical elements, explicitly stating the researcher's theoretical assumptions.
Types of theory	Substantive or centered on a specific area or event. Formal or development of concepts within a discipline	Differentiates description, conceptual ordering, and theorization. Also uses the distinction between substantive and formal	Positivist (objectivist) seeking causes to explain and generalize. Interpretive emphasizing the emergence of multiple and provisional realities

Recently, Adele Clarke has sought to transition from positivist to postmodern GT, focusing on differences and multiplicities among participants, moving beyond a theory with universal explanatory traits to one that is more situated or determined by spatial and temporal moments, and more contingent in socio-historical terms^(20,21).

Epistemological foundation

Grounded theory is based on pragmatism and symbolic interactionism. Pragmatism was proposed by William James and Charles Sanders Peirce, including postulates such as: i) we do not perceive the world and things directly; there is always sign mediation; ii) the sign influences actions and is external to individuals; iii) the meaning of something can be explained by its experiential effects. Subsequently, John Dewey indicated that pragmatism enables prediction through systematic recording of observations, and George H. Mead indicated that language, thought, and action are determined by social interaction, emphasizing the importance of the social context^(20,21).

The ideas of James and Mead served as the foundation for Herbert Blumer's symbolic interactionism. Interactionism is characterized by the following premises: i) society, reality, and the self arise from sign-mediated interaction; ii) action is determined by meanings rather than stimuli; iii) its core is meanings. Regarding the latter, the three basic postulates of interactionism are: i) subjects act toward phenomena based on the meanings those events hold for human beings; ii) meaning emerges from social interactions; and iii) meanings can be transformed as the person experiences and interprets the phenomenon^(20,21).

Despite the above, Charmaz and Clarke have pointed out that the grounded theory of Glaser and Strauss did not explain these epistemological foundations and was closer to positivism, whereas their own is grounded in social constructivism^(20,21).

Participants

In 2025, when this research was conducted, Colombia had 23 undergraduate programs in N&D across 12 departments in the country, of which 34.8% (n = 8) were public institutions. All directors of these programs were invited so that the institution they coordinated could participate in the study; this invitation requested that it be extended to all faculty members. Seven institutions agreed to participate and provided contact information for eligible faculty members. Thirteen coordinators and faculty members from research tracks in the seven participating universities were included, selected via theoretical sampling by saturation of pre-established and emerging categories (Table 2).

Table 2.
Description of the study group, Colombia,
2025

Code ^a	Undergraduate education	Graduate education	Age group (years)	Years of work experience	Geographic zone (department)
H_1	Food Science and Technology Professional	M.Sc. in Administrative Engineering, Specialist in Organizational Management with emphasis on Human Talent	50 – 60	30	Antioquia
M_2	Biologist	M.Sc. in Marine Biology	50 - 60	30	Valle del Cauca
M_3	Dietitian-Nutritionist	M.Sc. in Human Nutrition, Ph.D. in Health Sciences, Postdoctorate in Clinical Nutrition	40 - 50	20	Bogotá D.C.
M_4	Food Science and Technology Professional	M.Sc. in Pharmaceutical and Food Sciences	30 - 40	15	Antioquia
M_5	Dietitian-Nutritionist	M.Sc. in Nutrition and Metabolism, Ph.D. in Nutrition and Food	40 - 50	20	Santander
M_6	Dietitian-Nutritionist	Ph.D. in Pharmaceutical and Food Sciences	30 - 40	15	Antioquia
M_7	Dietitian-Nutritionist	M.Sc. in Food Sciences and Human Nutrition	30 - 40	15	Antioquia
H_8	Dietitian-Nutritionist	M.Sc. in Biochemical Sciences, Ph.D. in Nutrigenomics and Personalized Nutrition	40 - 50	20	Santander
H_9	Dietitian-Nutritionist	M.Sc. in Public Health	30 - 40	15	Bogotá D.C.
M_10	Dietitian-Nutritionist	M.Sc. and Ph.D. in Food and Nutrition	30 - 40	15	Antioquia
M_11	Dietitian-Nutritionist	M.Sc. in Public Health	30 - 40	15	Antioquia
M_12	Dietitian-Nutritionist	Specialist in Public Health Nutrition, M.Sc. and Ph.D. in Public Health	40 - 50	20	Antioquia
H_13	Dietitian-Nutritionist	M.Sc. in Education, Ph.D. in Nutrition	40 - 50	20	Norte de Santander

Strategies

General project information was presented to institutional administrators who agreed to participate, followed by the signing of informed consent and scheduling of interview times. In-depth interviews began with a personal presentation to create an atmosphere of trust, after which three initial topics of interest were introduced with the following questions: i) Could you describe how research is applied in your program's courses? ii) How do you promote research in your undergraduate program? iii) Could you share some experiences from your department? Based on participants' responses, follow-up questions were asked to explore emerging themes and clarify initial answers, to understand the structure, functioning, and objectives of the research units. Upon completion, a summary of key elements was prepared, research objectives and ethical elements (confidentiality, risk-benefit assessment, etc.) were reiterated, and participants were invited to a follow-up interview to validate analyses or adjust axial and selective categorization.

Interviews were complemented by field notes in which researchers recorded the following types of entries: i) methodological notes to refine topics, questions, and follow-up questions in subsequent interviews; ii) theoretical notes to expand key concepts for data analysis; iii) descriptive notes regarding interactions with interviewees and non-verbal language; iv) interpretive notes or reflections occurring during or immediately after the interview; and v) reflexive notes to make explicit the role and effect of the researchers during data collection (treating the researcher's experience as an object of reflection). In addition to seven interviews with program directors, five additional interviews and four focus groups were conducted with faculty members from each participating university.

Procedure

Thoroughness in data collection was guaranteed through category saturation; reflexivity was applied in field notes and categorical analysis; investigator triangulation was conducted by comparing coding, categorization, and interpretations between both researchers; and theoretical triangulation was performed by comparing categories with previous studies. Rigor criteria of credibility (trust with participants), auditability (triangulation, participant validation, reflexivity), and transferability (among nutrition undergraduate programs) were followed⁽²²⁾.

Data analysis

Audio recording and transcription of interviews were performed, followed by coding with pre-established and emerging concepts, open categorization to identify descriptive categories, axial categorization for analytical ones (categories and subcategories), and selective categorization to establish categorical relationships and proceed with conceptual ordering. The analysis culminated in the development of a substantive theory regarding the meanings and determinants of formative research⁽¹⁹⁾.

Ethical aspects

The study adhered to ethical requirements defined in the Declaration of Helsinki and Resolution 8430 of 1993 of the Ministry of Health of Colombia. Confidentiality was guaranteed and participant identity was protected; all interviewees and group participants approved their participation by signing an informed consent form detailing: study title and objectives, risks and benefits, procedures (interview, duration, number of subjects), right to withdraw, voluntariness, privacy protection, funding, confidentiality, and research team contact

information. The project was approved by the Bioethics Committee of the Facultad de Odontología at Universidad de Antioquia, under Minute No. 191-2024, dated May 24, 2024.

RESULTS

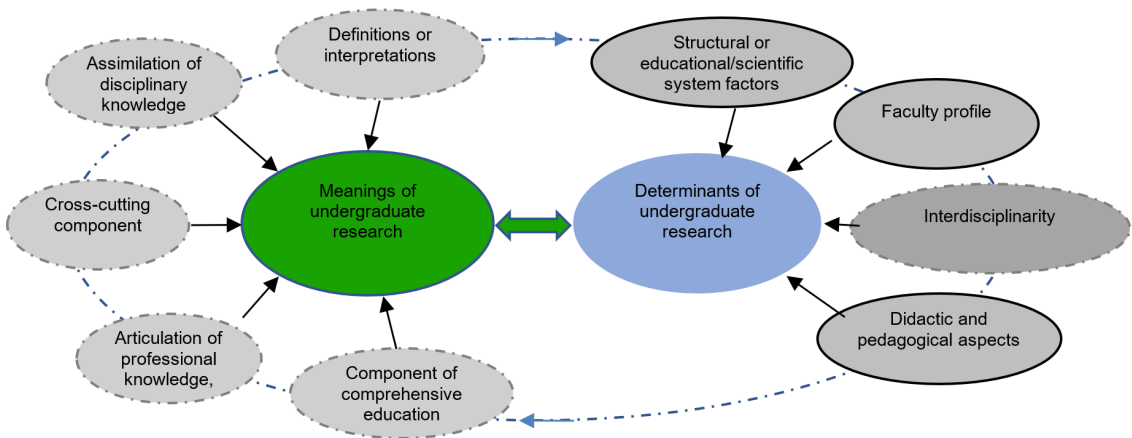
The study group comprised 13 participants. The study categorical system consisted of two analytical categories: i) meanings of undergraduate research, and ii) determinants of undergraduate research, each with five subcategories. The contents of each subcategory are presented in the following paragraphs (Table 3 and Figure 1).

Table 3.
Categorical system of the study

Category	Subcategories	Type
Meanings of undergraduate research	Definitions or interpretations	Emerging
	Assimilation of disciplinary knowledge	Emerging
	Cross-cutting component	Emerging
	Articulation of professional knowledge, professional identity, and practice	Emerging
	Component of comprehensive education	Emerging
Determinants of undergraduate research	Structural or educational/scientific system factors	Pre-established
	Faculty profile	Pre-established
	Interdisciplinarity	Emerging
	Didactic and pedagogical aspects	Pre-established

Figure 1.
Relationships between categories and subcategories in the study

Dotted shapes: indicate emerging categories.
Continuous shapes: indicate pre-established categories.



Meanings of undergraduate research

Definition or interpretation of undergraduate research

In the interpretations of research within N&D undergraduate programs, some formal definitions closely aligned with graduate programs were identified, alongside others that prioritize formative or pedagogical elements suitable for undergraduate students. That is, some interviewees expressed conceptions in which research methods are viewed as an end in themselves, while others described conceptions of research as a means to optimize teaching-learning processes.

When defining research as an end, a series of courses and methodological resources included in N&D undergraduate programs are described, aimed at enabling students to define a research question within a theoretical framework, rigorously formulate research objectives, apply methods specific to an epistemological paradigm or tradition, and produce a research output aligned with parameters of the Ministerio de Ciencia, Tecnología e Innovación of Colombia - MinCiencias (such as a scientific paper or research project). The following quotes illustrate this conception:

"It encompasses all student activities, supported by faculty from all areas—human nutrition and food, public health, food service management—working together to produce a final research output". (H_9).

"These are strategies translated into research-focused activities. It starts with a research question and from there steps are proposed. Research is not just for those who want to become researchers; research methodology is cross-cutting across all areas using specialized literature". (M_5).

Among those who conceive research as a means to optimize teaching-learning processes, emphasis is placed on guiding N&D students to learn the scientific method and apply it to everyday problems, whether in clinical nutrition, public nutrition, or another field. This group assumes that all areas of food and nutrition demand the application of various research competencies—such as observation, recording, contrast, analysis, and synthesis—which are used implicitly or explicitly in professional practice, interprofessional work, integration into healthcare teams, etc. The following statements reflect properties of this subcategory:

"Research is an opportunity for students to acquire skills and competencies allowing them to address needs. It is also a tool enabling them to develop capacity for observation, comparison, analysis, and interpretation". (M_11).

"It means teaching autonomous skills for seeking quality information through research methodology. The method is cross-cutting across all nutrition practice: critical reading, answering practice-based questions technically. Therefore, they need to know research methods to support their decisions [clinical or public health] with high-quality scientific evidence]". (M_3).

Assimilation of disciplinary knowledge

Regardless of the initial conception of undergraduate research, all interviewees agreed on the importance of allocating a high percentage of credits to research tracks or components, as these are key to helping students improve the grasp of their disciplinary knowledge and act with rigor regarding specific objects of study in this profession. Interviewees emphasized that research is cross-cutting across all areas of nutrition; unfortunately, this often seems to be a late discovery made during professional practice. Hence, there is a need to improve research courses and their integration with all curricular subjects from early stages of the program.

Program coordinators described this as follows:

"Health professionals face increasingly diverse situations, not all of which are written in a textbook or article. So, if we don't connect the method to nutrition problems, formative research gets lost, and students see it simply as filler. Many students say, 'Oh no, I don't like that research stuff.' So, I feel they still don't see it in a practical way". (H_1).

"It must be emphasized that research is embedded in everything they are undertaking—what will constitute their professional, clinical, or care-oriented practice—and later they will also have the capacity to investigate reality". (M_2).

Cross-cutting component of all courses

Consistent with the previous subcategory, the meanings of research in undergraduate N&D

highlight its cross-cutting and longitudinal nature, referring to the importance of connecting the research component with all other subjects in an academic semester, as well as its development across all academic levels. This subcategory underscores the need to approach research competencies as a core training area with its own pedagogical foundation, while simultaneously developing it as a pedagogical and didactic strategy across all other subjects and units in the programs.

As a specific core area with its own pedagogical basis, interviewees described research in their programs within the curricular structure, which includes conventional courses on epistemology, research methodology, statistics, and epidemiology. As a didactic strategy across all units, it was noted that research has not yet been fully integrated into core subjects in clinical nutrition, public health nutrition, and other areas, representing one of the main challenges.

The cross-cutting nature of research in N&D was also described through two types of relationships: reciprocity or consubstantiality. In the former, it is highlighted how research can be incorporated into other subjects, while disciplinary subjects can simultaneously improve research instruction. In the latter—which presents the greater challenge—it is argued that in professional practice, research competencies are intrinsic to the work of the Dietitian-Nutritionist and should therefore be subsumed within disciplinary contents. However, it is recognized as difficult to avoid fragmented teaching in curricula lacking a competency-based approach, or in current times characterized by the fragmentation inherent to specialized knowledge.

"We should start developing many nutrition activities and methodologies by making their scientific rigor more explicit, because I think it is clear to all of us as faculty that research is precisely the way to generate new knowledge, and we can take great advantage of information from our disciplinary courses". (H_1).

"Research has been very separated in our curricula, but its cross-cutting nature is

evident. Internally, we need mechanisms to truly feel it is cross-cutting and articulated with everything we do across all areas of nutrition. Faculty members themselves need to thoroughly understand this conceptualization of research and how we can work with it to promote it more horizontally across all courses". (H_1).

Articulation of professional identity, and practice

The meanings of research also refer to its importance in bridging and integrating professional knowledge and practice, as previously described, as well as connecting with professional identity ("being"). Research competencies not only enhance the understanding of N&D study objects and professional performance, but also foster capacities such as teamwork, personal reflection, oral and written communication, situational and critical analysis, flexibility, adaptability, achievement orientation, and problem solving, encompassing both hard skills (technical/specific) and soft skills (personality traits and interpersonal characteristics guiding social interactions). Additional properties of this subcategory are captured in the following quote:

"As professors, we always tell students that theory is one thing and practice is another. Yes, we express it nicely, but we are failing to say: 'Look, if practice is different and we are discovering or learning other things there, let's bring that into the educational process right from the start of the program". (H_1).

Component of comprehensive education

The final subcategory highlights research as a central component of comprehensive education, as it fosters personal growth, commitment to social needs, and the social projection of the professional being, knowing, and doing of DN's. In this subcategory, the comprehensiveness promoted by research in N&D undergraduate programs manifests in several ways: i) integration of competencies of being, knowing, and doing; ii) intersectionality of hard and soft skills; iii) excellence in scientific, technical, social, and human terms; iv) horizontal (between semesters)

and vertical (within a semester) integration of curricular areas; and v) consistency between theory and practice. One representation of this comprehensiveness is captured in the following testimonial:

"Our students specialize their interests very early in their training. They pick the area they like best and see no other path. So, those who say 'I like clinical nutrition' publish research there, while ignoring other areas. We have insisted that undergraduate education must prepare a well-rounded professional capable of performing across any field of nutrition". (H_1).

Determinants of undergraduate research

The meanings held by interviewees regarding research in N&D undergraduate programs transition through various stages or phases. Some remain strictly within curricular boundaries (courses forming the research core), others address the challenge of making reciprocal or consubstantial relationships between research and disciplinary courses explicit, and others emphasize that undergraduate programs should not train researchers, as this belongs to graduate studies. Regardless of these variations among analyzed programs, key determinants influencing the meanings of research in N&D were highlighted. In the view of interviewees, these order into macro-, meso-, and micro-social elements of DN education, or are categorized into external university factors, program-specific factors, and student-centered factors, analyzed in the following subcategories.

Structural or educational/scientific system factors

In this subcategory, interviewees indicated that despite the potential of undergraduate research, structural determinants inhibit its development, reducing undergraduate research training to traditional models centered on research methodology courses with limited connection to comprehensive learning. These determinants include limitations within the Colombian educational and science/technology systems, where public funding for undergraduate research

is minimal, traditional instruction dominates with little room for constructivist or critical approaches aligned with research meanings, funding is prioritized for master's and doctoral programs, and barriers or lack of incentives impede inter-institutional agreements that could promote broader research visions.

"There is really no funding for research conducted by students, except when an institutional project is formulated and student involvement is included; however, students act mostly as assistants while the professor handles actual research tasks. Additionally, faculty are not assigned dedicated non-teaching time for this in the program". (M_2).

Faculty profile

This subcategory serves as a primary determinant of research meanings in N&D undergraduate programs, as faculty combine multiple challenges: instructors from different generations with varying visions of research; mixing of individuals with undergraduate degrees in N&D and other fields; diverse graduate backgrounds, sometimes creating tension (e.g., ongoing divides between qualitative and quantitative approaches); varying professional experience in nutrition; differing levels of pedagogical training; and varied research designs.

"Many of us faculty members were practicing professionals who suddenly became instructors... we lacked formal training in teaching, which impacts quality. I have always insisted that to be a good professor, one must have professional experience. We must ensure our faculty have practical experience, ideally combined with experience in formative research processes". (H_1).

"A instructor who was an excellent student goes through a research master's or doctoral program and then comes to teach research. But how do they teach it? From a theoretical standpoint. They haven't applied it or connected it to practical nutrition because they lack field experience. There must be a

combination of practical experience and understanding field realities; otherwise, when teaching, examples and real experiences are missing to strengthen the teaching-learning process". (H_1).

"Advising senior thesis projects in the final semester is currently handled by three faculty members: one focused on the nutrition specialization, one on statistics, and another supporting writing and methodology. We occasionally invite other colleagues to reinforce specific topics, but this was only possible because we requested additional teaching hours for the process". (M_2).

Interdisciplinarity

This subcategory emerged with a dual significance: as a core element within the meanings of research and as one of its determinants. As a meaning of research, it connects to comprehensive education, research competencies, and assimilation of disciplinary knowledge. As a determinant, interdisciplinarity is highlighted as essential for addressing research problems rigorously, recognizing disciplinary boundaries, optimizing interprofessional work, and contributing to solutions in professional practice, while fostering awareness of nutrition's contributions across fields.

"If you have a clear understanding of your object of study, it is easier to identify its limits and know when other disciplines are needed. Teamwork must be part of this training process, because research is sometimes mistakenly viewed as an isolated effort". (H_1).

"Nutrition faculty, particularly in sports nutrition, work directly with sports leagues, where student practicals take place, fostering valuable synergies between professionals". (M_2).

"In some settings, we are fortunate to collaborate with medical residents in pediatrics, obstetrics, and other specialties, creating an enriching environment for dietitians". (M_4).

Didactic and pedagogical aspects

This subcategory intersects with all previously analyzed dimensions, as pedagogical and didactic practices depend on national and institutional policies, faculty profiles, and undergraduate research meanings. Consequently, pedagogical reflection is needed to define the scope of undergraduate research and establish consistent methods. Interviewees highlighted positive experiences from their faculties, including: i) integrative seminars involving multiple faculty members, research groups, and N&D domains; ii) continuous advising by multidisciplinary faculty teams (clinical nutrition, public health, food service, epidemiology, qualitative methods); iii) inter-institutional agreements for early and professional practica, particularly in healthcare institutions providing valuable data for N&D students; iv) research incubators (semilleros), ideally combining health disciplines; v) collaboration with graduate students and research groups; and vi) formal recognition of time allocated by faculty and students to extracurricular research activities.

DISCUSSION

The results of this study show that FR in undergraduate N&D programs in Colombia continues to face significant structural and pedagogical challenges, despite its recognition as a cross-cutting axis of higher education in health. FR is conceived as a process that articulates teaching, outreach, and research, promoting the development of research competencies and critical thinking in students from early university semesters^(23,24). However, findings reveal limited integration of research into curricular practices, with a predominance of traditional approaches focused on content transmission and a weak connection between theory and practice.

Several authors argue that DN education in Latin America has historically maintained a strong biomedical orientation, prioritizing biological and technical content over social, reflective, and research components^(10,14,15). This impacts graduates' capacity to generate contextualized knowledge, innovate in professional practice, and contribute to solving collective food and

nutritional problems⁽²⁰⁾. Similar findings have been reported in Brazil, where scientific training remains fragmented and research is often treated as a curricular requirement rather than a transformative learning practice⁽²⁵⁾. Current educational trends point to the need for aligning instruction with professional reality using action-research methodologies to promote reflection and reconstruct theory from practice^(26,27). Emerging healthcare profiles require higher education institutions to adopt active methodologies that engage students in critical-reflexive processes through problem-posing strategies and early exposure to practice⁽²⁸⁾. In this context, FR emerges as a student-centered approach to developing research competencies⁽²⁹⁾.

In a study on communicative and research skills in FR at Universidad del Altiplano (Puno, Peru), researchers concluded that FR positively impacts skill development. Using strategies such as data collection, research seminars, and monographs alongside supportive faculty, student research and communication scores increased from a baseline mean of 9.78 points (deficient) to 13.9 points (good) post-intervention⁽³⁰⁾.

In Colombia, universities have incorporated FR through methodology courses, seminars, research incubators (semilleros), and degree theses; however, gaps persist between curricular design and pedagogical practice⁽²⁶⁾. Literature indicates that while faculty recognize the value of FR for meaningful learning, they face constraints related to workload, lack of pedagogical training in research, and insufficient institutional incentives^(27–29). These barriers limit the potential of FR as an educational innovation strategy connecting students to real-world public health, food security, and sustainability contexts.

International evidence reinforces that FR is associated with strengthened communication, analytical, and critical skills essential for DN practice⁽³⁰⁾. Experiences in Peru and Brazil show that active methodologies—such as Problem-Based Learning (PBL), cooperative learning, and research seminars—significantly enhance research skills and student motivation^(10,31,32). In Colombia, programs implementing these

methodologies report positive results, though largely concentrated in universities with established research infrastructure and resources⁽³³⁾. Among active methodologies used in health sciences, problem-based and project-based learning serve as alternatives to traditional models by engaging students directly in knowledge discovery, as advocated by Freire⁽³⁴⁾.

Faculty play a decisive role in building a research culture. Instructors must act as mediators and facilitators, encouraging reflection, inquiry, and collective knowledge construction. Continuous pedagogical training and interdisciplinary academic communities can help overcome current limitations, strengthening FR as an integrated educational practice^(31,34). However, studies with nutrition faculty report challenges in implementing active learning strategies and competency-based evaluations, highlighting the need for faculty development⁽³²⁾. Faculty are called to encourage debate on political aspects of the profession, adopt innovative teaching practices, and integrate information and communication technologies (ICTs) to foster critical, creative, and engaged professionals⁽³³⁾.

Furthermore, strengthening student research incubators (semilleros) is key to fostering scientific interest and academic production. Incubators allow students to develop applied projects, learn methodological rigor, and engage early with institutional research^(10,23). Aligning incubators with research groups recognized by the Ministerio de Ciencia, Tecnología e Innovación - MinCiencias can enhance project quality and relevance while raising the scientific profile of N&D departments.

FR also contributes to the development of critical thinking and complex problem-solving skills⁽²³⁾. According to Facione⁽³⁵⁾, critical thinking is essential for evidence-based and ethical decision-making in clinical and community settings. Active student participation in research projects enhances analytical capacity and understanding of relationships between food, health, and sustainability⁽³⁶⁾.

Despite progress, FR in Colombia requires greater institutional commitment, sustainable funding, and faculty support programs. Inter-institutional

partnerships should be strengthened to advance regional and national projects connecting research training with national nutrition priorities. Thus, FR should be viewed not merely as a curricular component, but as a strategy to democratize knowledge, foster innovation, and strengthen social responsibility in higher education.

Nutrition science plays a fundamental role within health disciplines, making reflection on DN training essential. Universities should recognize that while most graduates will not pursue research as their primary career, they must possess the competence to conduct research when required in professional settings⁽³⁷⁾. Understanding the meanings and determinants of FR is therefore critical to developing strategies that enhance research competencies in future dietitians.

Limitations

It was not possible to determine why some invited higher education institutions did not participate in this study; thus, a potential self-selection bias exists toward programs with stronger research cultures. Consequently, categorical systems in programs with less developed research tracks may not be fully represented. Nevertheless, the findings remain relevant to university teaching broadly, beyond the context of nutrition and dietetics in Colombia.

CONCLUSIONS

This study generated a substantive theory explaining the meanings and determinants of formative research, serving as a foundation for strengthening relevant and transformative higher education in N&D programs in Colombia. Results indicate that despite progress in incorporating FR into curricula, persistent challenges remain regarding faculty pedagogical training, institutional infrastructure, funding, and the integration of teaching, research, and outreach.

Ultimately, formative research should be conceived as an educational practice that extends beyond formal curricular requirements, oriented toward the comprehensive education of the DN as a social actor and agent of change. This approach will advance food and nutrition education that is committed to equity, public health, and food sustainability.

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