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Pre-professional practice systematization and its relationship to research skills

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This article focuses on the examination of pre-professional practice systematization and proposes a theoretical-methodological model that draws from Oscar Jara's framework and incorporates insights from neuroscience and critical complex thinking. The objective is to enhance the understanding and implementation of effective pre-professional practice. A sample of 1,150 students was selected from four universities and a pedagogical institute in Peru to investigate the systematization processes, efficiency levels, and research skill articulation of pre-professional practice. Among them, 289 students were chosen to participate in the application of the proposed model. Data collection was conducted using a virtual survey and questionnaire, employing descriptive-correlative and quasi-experimental designs. The study revealed a concerning level of inadequacy and limited research capacity in pre-professional practice systematization. The analysis also established a significant relationship between these variables and demonstrated the positive impact of the model's application within an experimental group. Based on these findings, it is recommended that institutions allocate more resources and create additional opportunities for comprehensive systematization during pre-professional practice. This will facilitate the development of research skills among students and adequately prepare them for future research engagement. Overall, this study underscores the importance of an efficient systematization approach in pre-professional practice, highlighting the need for institutions to prioritize research skill cultivation in their educational programs.

KEYWORDS

pre-professional practice, research skills, systematization, articulation of areas, higher education

1. Introduction

Pre-professional practice is essential for realizing educational and professional competencies, capacities, or objectives that different curricular plans propose for various university careers fundamentally related to the social sciences and humanities. Pre-professional practice constitutes a link between the university academic system and the labor system (Moreira, 2016); thus, Peru has typified it as a source of an application of knowledge, skills, and aptitudes through the

performance of students in real work situations (Law N° 28,518, 2005) and has recognized it as work experience for university and non-university higher education students (*Ley N° 31396, 2022*). Furthermore, in this sense, the Ministry of Education (*Ministerio de Educación del Perú, 2023*) and the National Superintendence of Higher University Education (*Superintendencia Nacional de Educación Superior Universitaria, 2023*) have established guidelines for its development through curricula in non-university education and other university careers, respectively.

Despite the existence of regulatory documents and policies such as those referred to above, pre-professional practice has not been recognized as a source of knowledge or space to develop research skills, since the Pedagogical Institutes have limited themselves to integrating or articulating such areas (*MINEDU, 2019*) because they have not assumed them as concomitant elements. In the case of universities, it has been observed that practice and research work as differentiated and disjointed curricular areas, having to provide in the subjects of their curricula actions that lead to formative research within the framework of the reforms of the Education Model Quality for the Accreditation of Peruvian professional careers (*Alvitres et al., 2014; Salas-Ruiz, 2020*) and of university policies leading to research as one of its purposes (*Julca, 2016; Arrieta and Avolio, 2020*).

This study aims to show that there is a positive relationship between the pre-professional practice systematization and research skills. Moreover, it aims to show that an exclusive model of pre-professional experience systematization could generate and enhance research skills in university students and higher learning institutions. To this end, the study began with a diagnosis of 1,150 higher-level Peruvian students from various university careers: education, administration, law, psychology, and sociology. This revealed that only 5% systematized their practice efficiently, and only 16% considered they had developed their research skills. An experiment was applied to 289 students from the same population, in which the dependent variable was the level of development of research skills, and the independent variable was the systematization of pre-professional practice.

1.1. Context of the systematization of the practice

During the 1970s, Peru began a process of literacy for the adult population and the coverage of popular education for the poorest and most vulnerable sectors; a process that was a challenge due to the novelty of its methodology since learning was built based on the experience and daily life of the literate and to which the literate teacher had to adapt. In this process, professionals recapitulated their experiences, reflected on them, and carried out exchanges that led them to delve into the applied conceptions and strategies (*Jara, 2018*).

Through regional workshops, this initiative was projected toward the neighboring countries of Honduras, El Salvador, Mexico, Panama, Costa Rica, Guatemala, and Nicaragua. The participants formulated reflections on their diverse experiences, analyzed similar and different aspects, and reached a joint synthesis, thus achieving a theorization based on the knowledge obtained from their daily professional praxis (*Jara, 2018*). In this context, systematization was born to describe experiences, reflections, and historical reconstruction (*Jara, 2018*).

From there, the concept of systematization has been growing and adapting to each discipline due to the involvement of each researcher; For example, for *Silva (2012)*, systematization is a “process of

organization and logical sequencing that interrelates, on the one hand, the conceptualization of a certain discipline, with the experience of own practices that are configured within a particular context.”

Nevertheless, the systematization of practice or experiences in practice in higher education has been closely related to research. It has been assumed as a form of knowledge production that is generated from reflection on practice (*Sánchez, 2016*); as a methodological proposal for contextualized research, its own and specific way of researching practices (*Silva, 2012*); and as a method through which the researcher penetrates the dynamics of living social processes (*Jara, 2006* cited in *da Silva, 2020*).

The systematization of practice has been more welcome in the field of teacher training, being included since the year 2000 in the Peruvian national curricula as a sub-component of the practice curricular area. This area used to be articulated with the research area until it was consolidated into a single curricular module whose objective is for students to propose innovative solutions to improve their pedagogical interventions based on their reflections on their work and theory (*MINEDU, 2020*).

Unlike the pedagogical institutes, universities have been characterized by their development of more research that is more theoretical than practical; that is, the practice curricular area has yet to be developed from the first cycles until the intermediate or final cycles of the careers, especially those belonging to the social sciences and humanities. However, as a result of the policies of educational quality and accreditation, curricular changes have been raised, placing more emphasis on research, which must be planned in the different academic cycles and according to the professional practice of the students, which generates staggered intellectual productions during its formation (*Salas-Ruiz, 2020*).

1.2. Systematization processes

Jara (1994) indicated that there are no predefined steps or an exact way to systematize but shares a methodological proposal that is only a usable instrument with some indicative guidelines and that is susceptible to being questioned or changed, which consists of five stages: having a record of experiences, initial questions, recovery of the process lived, background reflection, and points of arrival that include the formulation of conclusions.

The *MINEDU (2013)* proposed a strategy for the systematization of the practice based on the deconstruction of the experience and the student's reflection on the context and environment of their practice, reconstruction, and theorization. However, for articulation with the research area, the processes must be oriented toward the analysis and reflection of the students on their practices and on the practice of others, with accompaniment and feedback that allows them to design research projects and apply them in educational scenarios (*MINEDU, 2019*) and professional contexts.

A proposal for the systematization of the practice that can be articulated with the investigation would have to have a process of accompaniment or supervision, reconstruction of experiences, feedback, and theorization.

Accompaniment and monitoring go beyond guiding, directing, or imposing the teacher's opinions on what the student or a group of teachers should or should not do since students and teachers open up to new ways of horizontal and democratic interaction where everyone contributes, decides, builds, and proposes ideas, solutions, or strategies

for the transformation of pedagogical practices (Trujillo, 2021). Monitoring is a management tool that verifies the achievement of planning goals and objectives and that the curricular activities scheduled in the academic cycles are carried out. With this, strengths and weaknesses are identified, and measures are taken to optimize the academic development of students (Loyola, 2019).

The reconstruction of experiences is compatible with what Jara (1994) called the stage of recovery of the lived process, which is when the different components of the lived process are reconstructed in a disaggregated way, that is, the history of the experience and the main events occurring chronologically and sequentially through the narrative.

Feedback is a process that is non-explicitly present in Jara's proposal due to the novelty of his proposal since more contributions on this topic have been developed. One was proposed by Nicol (2010, cited in Padilla and López, 2019), who favors a dialogical perspective, including interactive and reflective feedback between teacher and student and between peers, intending to help students to develop the processes of self-regulation of learning. Moreover, in this sense, feedback must be understandable, timely, contextualized, without prejudice, personal, and adapted to their needs, considering the uniqueness of each student, despite how difficult this could be due to time issues (Padilla and López, 2019). Feedback is of great importance in the teaching–learning process of higher education because it affects the acquisition of knowledge, identifying the factors of most significant relevance, and it impacts student achievements and practices (Hattie & Timperley, 2007, cited in Parra et al., 2021).

Theorizing is a process that originates from the verb theorize: “a practice that generates a body of knowledge formulated explicitly about a certain field” (Díez and Moulines, 1997, cited in Trovero, 2015). It is a process of scientific activity that generates diverse knowledge in the field in which it is carried out and whose characteristic is dynamic because it is in constant movement, unlike the theory that evokes something closed, already constituted, and finished (Trovero, 2015). Theorization should not be confused with the theory-grounded methodology, even though both have very similar aspects, such as the importance of rooting reality in theory and *in situ* observation to understand the phenomenon and let it speak for itself; the collection of information focuses on the complexity of reality and building concepts and hypotheses during the analysis of the phenomenon (Trovero, 2015).

1.3. Teacher trainers in higher education

The systematization of educational practice must then constitute a kind of delimitation and specification of this assumed conception, which is compatible with the arguments on teaching practice proposed by Schön (1998), who described the practice as complex. Developing content or possessing the knowledge contributing to the professional area is insufficient. The teaching profession requires an artistic and reflective practice in which, in addition to applying career techniques to interact and perform, thought must be used to recognize the contributions to the results fostered in action.

Higher education presents many challenges, such as seeking and contributing to sociocultural and economic development, which demand highly trained teachers, the mastery of methodologies that develop skills, and quality teaching and research (Torres Díaz et al.,

2021). Therefore, teachers must know well how specific competencies are developed through processes that are developed in both their students' work practices (Torres Díaz et al., 2021) and their research processes. For this purpose, the dominant role of teacher educators must be to mediate and monitor the competencies to be developed in their students to take them from the beginning of achievement to achievement and from what has been learned to what is new to learn (Frazante et al., 2019).

In addition, the investigative role implies that teachers who teach research must continue researching to guarantee that their pupils internalize their learning empirically and theoretically (Achilie-Valencia et al., 2021). This vision is novel because it does not focus on the disciplinary knowledge of what research is, popularly known as content, but emphasizes know-how and its interconnection with professional action (Achilie-Valencia et al., 2021).

On the other hand, teacher educators can perform more effectively through science and train people and generations by responding to social needs according to their characteristics (Grau and Rockett, 2023). This professional role is that of a developer because it allows teachers to solve problems in their daily academic lives with their human values, knowledge, and instructional skills.

Although the educational trend globally prioritizes the development of competences, this trend does not underestimate attending to the cognitive processes that are part of such development and that constitute helpful tools to make learning viable and to achieve academic success. Therefore, students' mental processes must be optimized using collaborative activities in work teams and with facilitators (Schiavio et al., 2019) so that they can become analytical, critical, holistic, creative, dynamic, and autonomous agents capable of managing their learning consciously and in a self-regulated way. This ability allows them to function effectively in their daily and academic lives. In this way, they become beings that exercise their intelligence and are defined by flexibility, analytical capacity, problem-solving, and the ability to adapt to novel situations (Lemos et al., 2016).

However, the emotional aspect is also important to consider since emotional formation considers volitional aspects such as appreciation in social interactions and even empathy, which are essential for dialogical, multicultural learning with a global perspective (Hauerwas et al., 2023). Thus, the emotional aspect complements and consolidates the other aspects discussed above.

1.4. Neuroscience and neuroeducation

Through recent advances in brain science or neuroscience, we now understand the predominance of individuals' brain and mental functions in operational fields, such as health and marketing, and especially in education. The last is particularly important since individuals must obtain the knowledge that emerges from this discipline to guide educational policies and teaching tasks in the organization of their teaching–learning strategies directed under the referential framework of how the brain learns and not by pseudoscientific beliefs (Simoes et al., 2022).

Hence, neuroeducation is a new teaching perspective based on neuroscience that provides tacit aspects such as the neurophysiological basis of learning and the factors associated with it, such as memory, attention, motivation, and perception, among others. Neuroeducation

also serves as the basis of learning problems that also concern education (Chang et al., 2021).

Neuroeducation focuses on the neuroscientific literacy of teachers and starts from the notion of brain plasticity. Brain plasticity posits that the brain goes through a maturation process stimulated by the interaction between the biological organism and the social organization to which the individual is exposed. This interaction mediates an individual's learning, social interaction, emotions, and personal development (Jolles and Jolles, 2021).

2. Materials and methods

The research design was multi-methodological (Schwarz et al., 2020) with a descriptive–correlative level design, “whose objective is to examine the relationships between two random variables in a population” (Lemboye, 2019), and with a quasi-experimental design in which a sample group participates was evaluated through a pre-test and post-test, whose objective was to examine causality in situations where control of the research environment is impossible (Ghorbanmovahhed et al., 2023). It also comprised theoretical methods for analyzing the proposal's information, sources, and modeling.

The population consisted of 1,150 students from four universities and a pedagogical institute in Peru; they were distributed in education careers, with 289 students, 224 in administration, 207 in law, 234 in psychology, and 196 in sociology. The students of professional careers attended the ninth curricular academic cycle, except those of law who participated in the eleventh. The distribution of the population was by age—773 under 21 years of age and 377 older—and by gender—497 men and 653 women. The reason for choosing the universities and the pedagogical institute was because the researchers reached the information through teaching to collect the information and carry out the study. The selected careers were social disciplines with a common framework, such as their interest in aspects of individual and collective life, and sharing fields of study besides being accessible to researchers through teaching (Puga, 2009).

The sampling was probabilistic, obtained by a lottery method (Huang et al., 2023) between the careers of the population, and included 289 students of the education career, yielding a 95% reliability and a 5% error. The sample was proportional: 191 under 21 years of age and 98 over; 94 men and 195 women.

The questionnaire used to evaluate the systematization of pre-professional practice consisted of four elements related to each process: monitoring, experience reconstruction, feedback, and theorizing, with descriptions referring to the component in the form of a question seeking to verify if the process occurs efficiently; the dichotomous answers to mark were no or yes, valued at one and two points, respectively, with a total of 8 points. The questionnaire to evaluate research skills consisted of six elements with descriptions of performances and achievements of the students in the first person concerning discursive management and the construction of an academic text, the formulation of the problem, objectives and hypotheses, use of statistical methods to the validity of instruments, testing, statistical analysis of data, and finally the management of the APA style and norm for citation and referencing since this was used in its formation; the dichotomous answers to mark were no or yes, valued at one and two points, respectively, with a total of 12 points.

The experiment proceeded in four stages. The first stage was data collection, during which the instruments for both variables were prepared. The first instrumental variable contained our model's four aspects of pre-professional practice systematization—monitoring, experience reconstruction, feedback, and theorizing—with dichotomous responses to four items. The second instrument for the research skills variable consisted of two dimensions measured through six items. Two professors reviewed the instruments from the practice and research areas. They gave their opinions only for the sake of drafting the instrument since the construct validity and reliability were obtained statistically with the data. The first instrument was tested through factorial analyses with Kaiser–Meyer–Olkin (KMO) and Bartlett's tests, and its reliability was measured by the anti-image correlation of the measures of sampling adequacy (MSA). The second instrument was a self-perceptive questionnaire validated by a principal component analysis and reliability by two halves. The questionnaires were captured virtually and sent through an instant messaging application.

The second stage was the general diagnosis, in which the population data were collected based on the two variables. Descriptive statistics were obtained, such as the level of pre-professional practice systematization and research skills development. These initial data were organized using the population distribution of each variable's percentiles to obtain their level and analyzed through their relative frequencies.

In the third stage, homogeneity tests were performed to select the statistic that would demonstrate the behavior of both variables. The Spearman test was selected due to the population's non-homogeneity and the variable type. The research question that guided the correlative study was whether the systematization level of pre-professional practice was related to the research skill level. At this stage, a general view of both variables' behavior was obtained, with results that warranted further study.

In the fourth stage, the experiment was carried out with the sample, applying an effective model of pre-professional practice systematization based on four components: monitoring, experience reconstruction, feedback, and theorizing. The experiment was applied in seven academic cycles at the pedagogical institute where the sample population studied and from whom the previous data were collected. The research question was whether the pre- and post-test values differed significantly when a group was treated with the model. The statistical test was Wilcoxon for paired samples.

3. Results

The first instrument was determined to be valid through factorial analyses with KMO and Bartlett's tests, which yielded a value of 0.586 and reliability values of 0.610, 0.571, 0.613 (see Table 1), and 0.575 in

TABLE 1 KMO and Bartlett test.

KMO and Bartlett test		
Kaiser–Meyer–Olkin measure of sampling adequacy		0.586
Bartlett's test of sphericity	Chi-squared approx.	116.090
	df	6
	Sig.	0.000

the MSA's anti-image correlation (see Table 2). The principal components analysis of the second instrument yielded values of 0.885, 0.885, and 0.486 for the first component and 0.646, 0.519, and 0.747 for the second component (see Table 3). Their reliability statistics were tested with Cronbach's alpha (0.736 and 0.518) and the Spearman–Brown coefficient (0.631) in the unequal length (see Table 4).

The second-stage results showed that only monitoring and accompaniment materialized in 55% of the population (Table 5). This result indicates that only a little more than half of the students were monitored or accompanied in their pre-professional practice. The other processes were well below the average, with values that represented only a third of that population that was able to reconstruct the experiences derived from their practice, that had received feedback identifying the pros and cons of their activities in practice, that could identify the theory that supported them in their actions in practice, and that developed new knowledge through the theorization process. Other descriptive statistics were obtained, such as the practice's systematization level, which was at very low or poor levels, representing 53% of the population studied (Figure 1). The research skills were descriptively analyzed, and the results indicated that a large proportion of the population had not developed them (Figure 2). The result corresponded to the previously obtained practice systematization.

In the third stage, the Kolmogorov–Smirnov homogeneity tests verified the non-normality of the data, with a significance level of 0.000 for both variables (Table 6). Therefore, the Spearman test was selected, evidencing the strong and positive relationship between the students' macro-systematization processes and their research skills (Table 7), with a rho of 0.414 and a high significance level of 0.000.

Finally, through the Wilcoxon test, the experimental study demonstrated the effectiveness of the pre-professional practice systematization model based on the four components. These components developed research skills, with differences with higher positive ranges in the post-test in 167 of 84 of the negative ranks (Table 8) and with an asymptotic significance of 0.000 (Table 9).

4. Discussion

Through the results, it was possible to demonstrate the relationship between the systematization of pre-professional practice and investigative skills, starting from the independent exploration of both variables in the chosen social areas that revealed their situation rooted toward the poorest and most inefficient levels, despite the policies of educational quality and accreditation in the university and non-university higher education in the Peruvian context (Salas-Ruiz, 2020). It is inferred that education has little impact.

The lack of development of investigative skills is because these have to be made viable in practice and not in mere theory; an example of this is that different results are obtained when we tell a student how or what to do compared to when they do it themselves and verify it in real practice. We believe this was the argument for establishing curricular changes in two areas, pre-professional practice and the research area, and integrating these into one (Ministerio de Educación del Perú, 2020). These changes have only occurred in pedagogical institutes but not in universities.

We have observed in systematization a powerful method through which the researcher of the social and human areas could develop their investigative skills since it allows us to penetrate the living social processes and reveal their dynamics through the other research processes (Jara, 2006, cited in da Silva, 2020). However, it is clear that at present, we cannot assume the systematization of pre-professional practice as a method with staggered and unique steps (Jara, 1994; MINEDU, 2019) that allows us to continue creating procedures or aspects framed in a logical sequence of the practice itself (Silva, 2012), which is essentially the purpose of this work.

In this sense, the results obtained from the experiment on the systematization of pre-professional practice confirmed that it is indeed influential in the development of investigative skills, and this agrees with the fact that both variables have been closely related and that the systematization of practice produces knowledge generated from its reflection (Sánchez, 2016). In addition, the policy of integrating the systematization of practice and research in a single curricular module in teacher training helped promote them with proposals and models; simultaneously, the students developed their research skills (MINEDU, 2020).

The results obtained by each aspect in the systematization of the practice showed that the accompaniment and monitoring are processes that are carried out regularly, and this is because of the teaching role of verifying the fulfillment of the educational and curricular objectives to optimize academic achievement of the student (Loyola, 2019). In this dynamic, students and teachers would contribute together to innovate the practices (Trujillo, 2021).

Although our work has been framed in a population of social and human careers, it should be noted that monitoring is in overall development in other modalities and careers; for example, exclusive models for such monitoring, such as that developed by Mershad and Said (2022), are aimed at university students in a distance education context or through platforms such as Zoom or Webex. Lee et al. (2022) have generated productions that help students in their accompaniment and help universities monitor students' perceptions of the usefulness of curricular support mechanisms. Studies have also been conducted

TABLE 2 Anti-image correlation.

		Anti-image matrices			
		Monitoring	Reconstruction	Feedback	Theorizing
Anti-image correlation	Monitoring	0.610 ^a	-0.130	-0.088	-0.058
	Reconstruction	-0.130	0.571 ^a	-0.044	-0.190
	Feedback	-0.088	-0.044	0.613 ^a	-0.115
	Theorizing	-0.058	-0.190	-0.115	0.575 ^a

^aMeasures of sampling adequacy (MSA).

TABLE 3 Principal components analysis.

Component matrix ^a		
	Component	
	1	2
Formulation	0.885	-0.435
Academic writing	0.885	-0.435
Validation	0.460	0.470
Sampling	0.695	0.157
Statistic analysis	0.421	0.617
References styles	0.486	0.382

Extraction method: principal component analysis. ^aTwo extracted components.

TABLE 4 Reliability statistics.

Reliability statistics			
Cronbach's alpha	Part 1	Value	0.736
		N of elements	3 ^a
	Part 2	Value	0.518
		N of elements	3 ^b
	Total N of elements		6
Correlation between forms			0.460
Spearman-Brown coefficient	Equal length	0.631	
	Unequal length	0.631	
Guttman coefficient of two halves			0.627

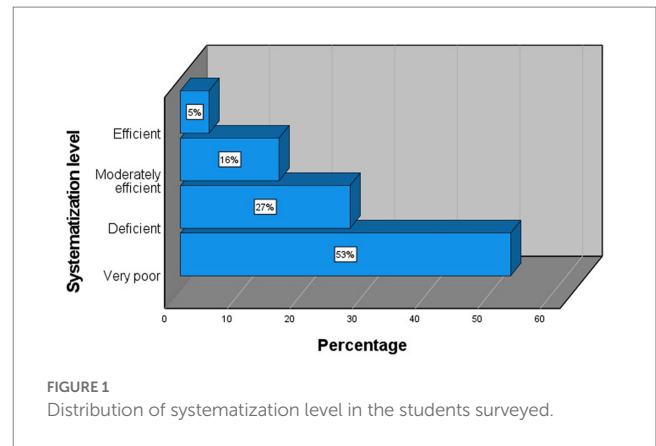
^aThe elements are formulation, academic writing, and validation. ^bThe elements are sampling, statistical analysis, and reference styles.

TABLE 5 Preliminary diagnosis to the systematization of pre-professional practice.

	No		Yes	
	Count	Row N%	Count	Row N%
Monitoring/ accompaniment/ supervision	517	45%	633	55%
Reconstruction of experiences	797	69%	353	31%
Feedback	801	70%	349	30%
Theorizing	745	65%	405	35%

on accompaniment, which is differentiated slightly from follow-up. The first is based on horizontality and cultivates relationships of trust, companionship, and empathy with openness to exchange experiences. On the other hand, the second is based on verticality since leadership or management uses this tool to verify the activities carried out in the work of its subordinates (Loyola, 2019).

On the other hand, supervision, which is synonymous with monitoring and accompaniment, marks a conceptual distance because it is an old and little-studied term. However, some institutions still practice it and advise practice monitoring and tutoring by the most experienced teacher to strengthen students' teaching identities (Andreucci-Annunziata & Morales, 2020). However, no representative sample has demonstrated the impact of supervision



per se. Our study considered follow-up, accompaniment, and supervision in the best sense. We saw a percentage close to the average that engages in these activities in teaching practice. Teachers pay attention to this aspect of their practice since the curricula often contemplate it. However, teachers do not assume that it serves as a constitutive component of pre-professional practice systematization but regard it as something separate.

Teachers who monitor and accompany students in carrying out their pre-professional practices must promote permanent learning for students, considering those tasks that imply reducing the gap between theory and practice due to the disarticulation of the knowledge areas that overlap in professional and pedagogical training (Villalón et al., 2016). Among other key aspects of a quality education is that the teachers in charge of the research and practice areas must generate their students' knowledge and reflective practices to resolve the various conflicts such students face in their practice centers (Villalón et al., 2016). Doing so allows the students to improve their praxis and build research skills such as observation and planning.

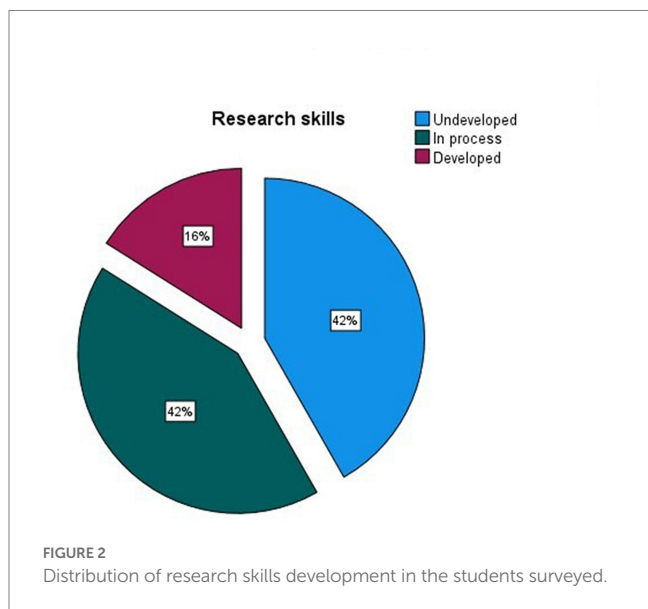
Systematization's other components are not generally present among undergraduate students. However, such components occur during the practicum period outside the curricular stage or study cycles that are popularly governed in health areas, such as medicine or nursing (Raposo-Rivas & Martínez-Figueira, 2018). Nevertheless, this study addresses the ability to incorporate these components into study cycle development, which has arisen fundamentally in recent years. This incorporation corresponds to many study plans, but the results show that the systematization practice processes result in practitioners' experiences remaining theoretical, without guidance and without taking advantage of those executions that achieved substantial changes. Systematization and its processes occur during professional performance, that is, at higher study levels such as the postgraduate. Thus, doctoral students develop a clinical professional practice with interprofessional support among their peers with accompaniment; they theorize their experiences as a result of their applied research, all of which is recorded and becomes part of the feedback loop (Morley et al., 2011). Therefore, theorization is not typical in pre-professional practice, nor is it common in Peruvian pedagogical institutes, unlike universities, until this past decade, when due importance has been given to the role of each teacher of teachers and the use of research as form of transversality in the development of their areas.

A similar process occurs when professional practice experiences are reconstructed and recorded, processes that are rare during the initial professional training in education or other social sciences careers. However, a literature review revealed work in the health area by Chamblee et al. (2015), indicating that since 2005 in the United States, some institutions have implemented clinical-scale programs to progressively recognize and reward the effective practice of practicing professionals in the nursing area. Such programs use recorded evidence of the professionals' reconstructed experiences, which are compiled and are evaluated through a professional performance evaluation tool: Performance Excellence and Accountability. This tool is based on the advanced practice roles of physicians, consultants, researchers, and educators.

Feedback is a learning evaluation process and tool that has strength in the initial vocational education and training for all careers. However, it has yet to be carried out during the systematization process of the study population in pre-professional practice. It is a fundamental axis because it would guarantee better rescheduled interventions due to the mediation of the supervising teacher and classmates. Relatedly, Zhang and Zheng (2018) explored feedbacks' usefulness in improving learning, finding that students require more feedback from their teachers and that providing such feedback could have an immediate effect on student language practices. However, the feedback we posit in pre-professional practice is not only the role of teachers but also peers. This position aligns well with Gong et al. (2020), who analyzed Chinese workers in their professional context, determined the importance of coworker's feedback to improve job performance, and correlated their findings with follow-up.

Systematization and research skills were positively correlated, a result that can be contrasted with the large-scale study of Australian undergraduate graduates carried out by Ain et al. (2019). The authors demonstrated that employed graduates had skills, such as critical thinking and problem-solving, that were either developed or not developed during their university education and that affected their professional praxis. However, the authors found contradictions between the workers' and students' perspectives: the latter had a higher appreciation of their generic and research skills than the former. Similarly, Willison et al. (2020) argued for the impact of evidence-based practice and research skills on the attitudes of graduates who were subsequently employed in Australian oral health clinics.

Finally, the results show that the extent to which a systematization model of pre-professional practice includes monitoring, experience reconstruction, feedback, and theorizing guarantees the development of investigative skills during the undergraduate course. Systematization processes in practice make scientific reasoning viable; therefore, they promote inquiry-based learning, which serves as not only an input for other areas of university education but also for future citizen science projects (Bruckermann et al., 2022) in which practitioners are likely to engage in their professional lives. Walkington et al. (2011) were pioneers in justifying the incorporation of research and inquiry skills early in professional training in the undergraduate curriculum and in recommending that such skills be explicit for students. Similarly, Lexis and Julien (2014) stated that developing research projects with tangible and sustainable praxis for at least 3 years of the undergraduate degree enhances students' research skills.



5. Conclusion

The model of practice systematization that includes the processes of monitoring, experience reconstruction, feedback, and theorization proves effective in developing research skills during university and higher pedagogical training. Therefore, we recommend its execution in pre-professional practice.

This study demonstrates the relationship between pre-professional practice systematization and investigative skills. Better systematization levels result in better developed student research skills. Therefore, during pre-professional practice in universities, spaces must be generated to allow for adequate systematization. Doing so will guarantee the development of the research skills that all students require to carry out their future research work.

The systematization model of pre-professional practice that contemplates monitoring, experience reconstruction, feedback, and theorization has been shown to generate significant positive changes in the research skills of student populations. Hence, it should be applied and generalized throughout the curriculum during the

TABLE 6 Normality tests.

	Kolmogorov–Smirnov ^a			Shapiro–Wilk		
	Statistical	df	Sig.	Statistical	df	Sig.
Systematization	0.204	1150	0.000	0.901	1.150	0.000
Research skills	0.174	1150	0.000	0.903	1.150	0.000

^aLilliefors significance correction.

TABLE 7 Correlation between systematization level and research skills.

		Systematization	Research skills
Rho de Spearman	Systematization	Correlation coefficient	1,000
		Sig. (two-tailed)	.
		N	1150
	Research skills	Correlation coefficient	0.414**
		Sig. (two-tailed)	0.000
		N	1150

** Correlation is significant at the 0.01 level (two-tailed).

TABLE 8 Wilcoxon signed-ranks test.

		Ranks		
		N	Mean rank	Sum of ranks
Post-test – Pre-test	Negative ranks	84 ^a	99.30	8341.00
	Positive ranks	167 ^b	139.43	23285.00
	Ties	38 ^c		
	Total	289		

^aPost-test < Pre-test. ^bPost-test > Pre-test post-test. ^cPost-test = Pre-test post-test.

TABLE 9 Test statistics.

Test statistics ^a	
	Post-test – Pre-test
Z	–6.531 ^b
Asymp. Sig. (two-tailed)	0.000

^aWilcoxon signed-rank test. ^bBased on negative ranks.

initial period of the professional training of those careers that consider the practice area in their study plans.

It is recommended that the areas of practice and research be integrated, that the disciplinary lines in which students have more interest and skill be recognized, and that they be contextualized towards scientific problems. These scientific problems can be quickly identified and described in the systematization of the practice and therefore investigated.

This study presents some limitations, such as the lack of analysis to characterize the population; it could have been deepened based on the differences between each race and according to gender and age and likewise with the sample. Another limitation is the lack of control, which could have been obtained using one of the other races as a control group.

Data availability statement

The original contributions presented in the study are publicly available. This data can be found here: <https://doi.org/10.5281/zenodo.7731100>.

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Ethics statement

The studies involving human participants were reviewed and approved by National University of Saint Agustin. The patients/participants provided their written informed consent to participate in this study.

Author contributions

MGA and ERN contributed to the methodology. MGA and MG contributed to the validation. MGA, YAA, and AF contributed to the formal analysis. MGA, ERN, EDG, MG, and RP contributed to the investigation. MGA, ERN, and EDG contributed to the data curation. All authors contributed to the writing – original draft and manuscript review, read and approved the submitted version, and contributed to the conceptualization.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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