Cogent Education

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/oaed20

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To cite this article: Mauro Marino-Jiménez, Inés Liliana Ramírez-Durand, Antonio Pareja-Lora & Augusto Cieza-Esteban (2024) Research in Latin America: bases for the foundation of a training program in higher education, Cogent Education, 11:1, 2319432, DOI: 10.1080/2331186X.2024.2319432

To link to this article: https://doi.org/10.1080/2331186X.2024.2319432

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Published online: 20 Feb 2024.

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COGENT EDUCATION
2024, VOL. 11, NO. 1, 2319432
https://doi.org/10.1080/2331186X.2024.2319432

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Research in Latin America: bases for the foundation of a training program in higher education

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ABSTRACT

Research is a common feature in developed countries. Those who dedicate themselves to this activity produce important tools for individual, community, and national development. However, developing countries suffer the opposite situation. In these nations, little investment is devoted to research, and they lack dissemination mechanisms, while offering few possibilities of capitalizing on its benefits. For this reason, the present study carries out an analysis of the relevance of the research, an establishment of these proposal needs in the Latin American context, and the establishment of the bases for a systemic proposal based on a research training program. In that sense, this proposal takes into account the limited economic resources and the lack of investigative culture in the Latin American territory. It is accompanied by a prototype of the training program, based on good practices and lessons learned so far.

ARTICLE HISTORY
Received 19 July 2023
Revised 9 January 2024
Accepted 7 February 2024

KEYWORDS
Research seedbed; formative research; university research; research training program

REVIEWING EDITOR
Serafina Pastore, Università degli Studi di Bari Aldo Moro, Italy

SUBJECT
Higher Education; Research Methods in Education; Study Skills; Sustainability Education; Training & Leadership

Introduction

According to the Sustainable Development Goals (SDG), research is a necessary activity for every human society that is characterized by the exercise of reflections and methods consistent with the solution or improvement of processes (United Nations, 2023). Therefore, there is (or should be) an intrinsic link between vocational training, knowledge and technology creation, and social development. This is especially manifested in undergraduate and postgraduate programs, whose main mission is to transfer this knowledge and technology to real scenarios, generating transformations and innovation (Hernández et al., 2020; Marino-Jiménez & Morán-Ramos, 2021). This principle is evident in the generation, analysis and deployment of ideas that favor the social environment, the economy, the productive activities, and people's quality of life (Smith et al., 2023; Vigren et al., 2022; Wang & Liu, 2022).

However, there is a disparity in research funding with serious consequences for low and middle income countries: the preeminence of primary activities over industrial ones, the limitation in the development of innovations, low citizen participation in public life, as well as a reduced percentage of qualified personnel (Coq-Huelva & Asián-Chaves, 2019; Robles & Carvajal, 2022; Torres & Mascareño, 2019). All these activities favor inequality, preventing them from social, technological, and inclusive development in the different sectors of these countries.

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An example of this stagnation is the contrast in research participation by region. In that sense, in Latin America this ratio amounts to 613 pax per million inhabitants, and in Sub-Saharan Africa it is as low as 97.5 pax per million inhabitants. The opposite happens in developed territories. North America devotes 4788 pax per million inhabitants to research, while in Europe this ratio has reached 3704 pax per million inhabitants (UNESCO, 2023). On the other hand, the funds and incentives for research in science, technology, engineering and mathematics (STEM) surpass and/or exclude those destined for social sciences and humanities. It warns about the need to revalue and promote the vocation and visibility of research in the social sciences and humanities, especially with the advent of artificial intelligence (AI), and the need to develop operating systems based on ethics (Grenouilloux, 2023; José, 2022). In addition, social sciences and humanities are essential to analyze human transformations, facilitate communication between disciplines and people(s), and establish collaboration between work teams (Henny et al., 2022; Vallée-Tourangeau et al., 2022; Windsor & Kronsted, 2022).

All this means an important challenge for research activities in regions such as Latin America, in which economic deficiencies, social inequality and the lack of conditions for the development of research vocations must be compensated. This implies a series of actions that promote research within academic training at the university stage, evidencing its benefits in spite of the costs associated with this type of initiatives, and consolidating this practice as part of professional activity. This idea of training also involves strategies that can be attended to with a minimum of resources (such is the case of public universities), but also through the support of other entities that join this idea (such as R&D and/or industrial companies and corporations interested in research issues, as well as private universities and other institutions), which can consider it as a success story, but also as an option to improve their reputation (Ferro-Soto et al., 2018; Mishra et al., 2023; Patuelli & Saracco, 2023).

In this sense, this paper analyzes the literature related to research training programs (such as seedbeds, research groups, and initiatives of interdisciplinary teams), with the purpose of generating the bases for a research training program called *Young Researchers Program* (in Spanish, *Programa de Jóvenes Investigadores*, PJI henceforth). The PJI is an initiative that combines the scientific, academic and social interest of research (Akkermans & Hirschi, 2023). However, a particularity of this work is that the knowledge generated in the different actions of the program will be openly disseminated through publication, interdisciplinary collaboration, and cooperation of different institutions. That is, the use of resources will be optimized with the purpose of strengthening learning and promoting collaborative participation. This is particularly significant in territories such as Latin America, where Branch Plant R&D (lack of attention from the private sector towards R&D) is common.

This also implies that the program will have an established ecosystem with roles, products and forms of incorporation. In other words, it will be managed with a mixed model, which will allow having a permanent team, but also for the incorporation of other members who may join later, through collaborative activities (alliances between institutions, organization of academic events, projects, etc.). For this reason, this proposal extends to different levels of work in higher education. Furthermore, it can be managed with few resources from the public sector.

State of the art & related research literature

The development of research training programs in higher education is a key point for scientific, social and cultural strengthening (Meurer et al., 2023). Its attributes are transversal to all kinds of societies: those that are in the process of development, and those that have implemented consistent policies to promote these actions. Due that in Latin America there are no initiatives or documentation that evidence a strong connection between research and productive sectors (which usually use developments carried out in other regions), it is necessary to review what exists in other latitudes. In the actions developed it is worth highlighting (1) the integral development of the individuals who carry out the research, (2) the provision of solutions of the social sciences and humanities to current problems, (3) the contribution of the social sciences to decision-making, and (4) the conformation of a research career line. All these will be discussed below.

The first factor is associated with the integral development of the individual or group that investigates, as a consequence of their own doing. This activity influences personal success by making

informed decisions, maintaining a productive mental activity and improving self-confidence. Belton et al. (2022) emphasizes the influence of the lines of knowledge on the personal development of young people. By carrying out investigative activities, students learn to make decisions, establish judgments, and communicate proposals. On the other hand, Tsang (2022) highlights the development of investigative skills, such as listening, understanding, processing, and communicating information. All this generates better academic performance and improves self-esteem. Von Bastian et al. (2022) has done a similar analysis, considering the benefits of exercising analytical skills. Its benefits throughout life provide a better mental health and a higher quality of life. On the contrary, long breaks without learning or extended periods without productive activities are harmful and degenerative, especially when social problems based on risk ages are generated (Kromydas et al., 2022; Nyemcsok et al., 2022). Although learning and research represent a productive activity in themselves, they are also productive for the preservation of one's own health. Practicing research, for instance, can protect researchers against degenerative diseases, typical of advanced ages. Finally, this transversality on the exercise of research is added to the benefits of health sciences, whose knowledge is optimized in patients trained in learning, and more willing to understand their own conditions (Burke et al., 2023).

This correlation between research training and benefits for researchers is significant in several ways. It generates a cultural approach to research, so that it can become an attractive activity to develop interpersonal interests and clear benefits (Cristini, 2022). It also highlights mental training and reasonableness to deal with one's own life changes. It can be useful for young people who are going through accelerated changes in maturity and growth. And also for adults who find motivation in learning, solving problems, or improving community living conditions.

The second factor to comment on is the contribution that the social sciences and humanities provide to the solution of current problems, such as mental health care, citizen participation and decision-making. Although research in the humanistic and social areas, in general, has not gained the prestige of the natural sciences and the development of new technologies, its benefits in terms of the increase and enhancement of our knowledge of the human being and of society are significant. For instance, the study by Cecchin et al. (2022) corroborates the relationship between psychological research at the university and suicide prevention. Therefore, it is essential to develop knowledge about one's own emotionality, thought processes and self-inquiry. In addition to this, it is possible to carry out prevention campaigns based on characteristics such as age groups, productive activities and social conditions. All this is essential for all communities as well as for the prevention of risk situations (World Health Organization, 2023).

Another example treated by the social sciences is exclusion. For this reason, studies such as that of Padilla-Zea et al. (2022) offer interdisciplinary proposals, such as the combination of gamification products, social participation and the assumption of roles. Young participants further develop social performance so that they can act autonomously in different situations. Similarly, Mremi et al. (2023) analyzed the development of a mentoring program at the university level during the undergraduate years of study. The results were not only positive as for the discipline mastery level (in the health sciences), but also in social development. The postulate that education is an interactive process between people is reinforced, which is corroborated by comparing the results between the years of quarantine due to the COVID-19 and the activities carried out in a shared space (Abdullah & Kauser, 2023; Mekonen & Adarkwah, 2023).

Thirdly, there are social science studies with significant contributions towards decision making. For example, Izzo et al. (2022) highlights the participation of young people in the development of leadership models in the field of business sciences. This is particularly significant since, besides providing tools for the development of social skills, it also generates the opportunity to promote a leadership based on corporate social responsibility (CSR) and oriented towards compliance with the SDGs (Chen et al., 2022). In other words, it promotes the development of ethical criteria to protect the environment, strengthen institutions and seek community development (Taplin et al., 2022).

As has been observed, the contribution of research in the humanities and social sciences is essential to address social problems, learning experience, and humanity improvements. These facets also complete professional profiles which are not restricted to technical aspects, but extend to the assumption of criteria for a broader vision of contemporary situations. The systems thinking theory takes a stand based

on the overthrow of the apparent linearity in organizations, in order to get oriented towards collective participation, dynamic relationships between stakeholders, and prospective decisions. The influence of intersubjectivity is decisive to prevent errors, optimize results, and achieve the sustainability of institutions (Clancy, 2018; Marino-Jiménez & Ramírez-Rodríguez, 2022; Senge, 1990, 2006). A similar case is the design thinking model, in which the proposal receives feedback during each step of the development process, generating more solid and people-oriented projects (Zainal-Abidin et al., 2023). Finally, Lean Startup uses the scientific method to propose an action-research dynamic on the products offered by the company. They obtain information on their use and future possibilities, with the purpose of transforming a prototype into a successful product (Becker & Endenich, 2023; Ries, 2022). All these approaches are solidly supported in the social sciences, and corroborate its multiple benefits.

The fourth factor in the literature is represented by a clearly defined career path for researchers. This is supported by the sustained growth of the science, technology and innovation (STI) triad in recent years, with special emphasis on developed countries (European Commission, 2022; IBISWorld, 2023). Therefore, among its attributes are the constitution of a professional improvement, and the innovation of praxis in its different facets and territories. Examples of this are, on the one hand, the works of Ahmed et al. (2021) and Hoes et al. (2020), on the advantages that physicians find when obtaining a doctoral degree, and specializing in surgical innovation. On the other hand, studies such as those by Dennen et al. (2020), Kaisler & Missbach (2020) and Zukin & Torpey (2020) highlight the benefits of knowledge of the digital environment and community efforts for the development of young researchers in society. Finally, the proposal by Kerawalla & Messer (2018) delves into the need to establish community efforts to analyze the way in which young researchers in the social sciences conceive and develop their ideas for sustainability and community development.

The diversity of fields of knowledge in these previous works shows that, although there are clearly established career lines, and with tangible objectives for the areas of health and technology, carrying out research in the social sciences and the humanities entails also a number of benefits. Therefore, the use of knowledge and methods from various disciplines should enrich production, dialogue and interdisciplinary work, no matter the scientific or technological area they belong in. This is a characteristic of interdisciplinary research projects, in which specialists from different branches and hierarchical relationships establish a clearly disciplinary contribution, but also based on communication, negotiation, and social knowledge. The skills to establish this type of mediation offer the possibility of strengthening one's own career line and its effects at a scientific, social, and economic level.

The integration of these contributions, which combine personal development, societal problem solving, the value of the social sciences for one's own knowledge and decision-making, and the development of the research vocation in different disciplines make clear the need to include a comprehensive, inclusive and diverse program. It should meet the specific needs of certain groups, but also provide access to larger communities, dissemination and discussion of scientific and technological production. For this purpose, success stories of seedbeds and research training programs that have been developed in different environments will be revised. This will allow the development of a model that meets both conditions sought in this section, and the proper management of sustainable research teams (Nalick et al., 2023). After that, it will be established if the PJI meets these characteristics.

Initiatives linked to research training

The collective participation initiatives between higher education institutions and research groups have resulted in significant benefits, because of the integration of knowledge, the optimization of efforts, institutional support and a solid culture of research activity (Aryal et al., 2023; Golhasany & Harvey, 2023; Mitrović et al., 2023). However, the information about research seedbeds is scant and (due to its characteristics) generally oriented to emerging countries (in which there is an incipient research culture) and presents them as low investment initiatives, mostly focused on their respective countries and realities. However, in line with the contributions to researchers, the role of the social sciences and the career line, it is pertinent to observe the constitution of programs similar to the PJI, their common features, and assess their success based on the conditions of work that they have set for themselves.

Martínez-Daza (2022), Ruiz-Morales (2021) and Nishihara (2022) provide three consistent examples about the position and development of the researchers themselves. The first of these three works discusses the generation of a motivating and collaborative environment, the value of knowledge management between different agents that assume roles and participation, the teaching actions towards students and a constructivist methodology in the Colombian context. It also shows its development stages, that is, learning about the student experience, preparing the systematization plan, recovering the process lived, establishing in-depth reflections and determining a point of arrival. The second one, also taking place in Colombia, analyzes the reflections generated by the research at the school level, promoting curiosity, observation, analytical skills and communication of ideas at an early age. This is important for the student's training, the construction of their own ideas, and the motivation to discover ways to solve problems (Freire et al., 2020; García et al., 2018). Finally, the third work mentioned studies the degree of identification with the new name of a higher-level educational space for women in Japan. In this case, the change of the name generated a significant psychological response, which meant a notable increase in initiatives and research products. This demonstrates how the degree of identification can lead to more productive results, which are transmittable in the long term.

According to what was observed, all these investigations highlight institutional identification, the importance of the process (and information gathering by the participants), and the generation of a space for positive creation to motivate research achievements (Mostofa et al., 2023).

Although these initiatives seem to address more details than substantive issues for the operation of an organization, the characteristics of a seedbed are strongly associated with the personal dimension. They contribute to the generation of confidence in their own thinking, offer them proposals to train their research skills, and exercise a social model to strengthen identification with the research actions. Therefore, this positive scenario provides for the exercise of thought, for the consequent publication of research, and/or participation in research projects (Zulherman et al., 2023).

Institutional support for the generation of praxis is also a fundamental component for the consolidation of seedbeds and research training programs. For this reason, studies such as those by Castro Rodríguez (2022) and Garza et al. (2021) are worth mentioning. The first of these refers to the learning experience through a society of students specializing in stomatology in Peru. This is an activity based on experience and on the contribution of spaces that emphasize early professional practice and economic sustainability. Both factors are necessary for the program to achieve long-term permanence. Similarly, the second case, contextualized in Colombia, establishes a series of institutional requirements for the formation of research seedbeds.

The participation of the institution through regulations, incentives and resources to promote research seedbeds is important. Binding dimensions converge with the proposal of a certain team, but it also provides for the synergistic relationship with the entity to which it belongs. It broadens the contribution mentioned about the individual to the collective, offering a scenario where the latter can direct their efforts towards greater objectives (Song, 2023; van der Wouden & Youn, 2023). The two cases presented offer several advantages: they allow the establishment of protocols, work routines, lines of succession in actions, as well as the identification of the academic community with the initiative. In this sense, although the Peruvian case is specific (a single specialty) it is recognizable and lasting. In Colombian research, the formalization of the process is uncommon but neccessary for the Latin American sociocultural environment (Mbaye & Dinardi, 2019; Schulz et al., 2023).

Finally, highlighting the results is also an initiative that acts in accordance with the interests of all the agents involved. That is, with the professional growth of researchers, with the positioning of the institution and the consequent social development. Such is the case of the study by Rodríguez-Vargas et al. (2022), which demonstrates the improvement in research skills and its production through the seedbed strategy. In a similar way, studies like those of Arenas et al. (2020) and Alfaro-Mendives & Estrada-Cuzcano (2019) also acts in favor of the generation of a dynamic within the university community, achieving a comprehensive educational proposal, where professional and researching actions manifest a reciprocal and complementary relationship. This is also in line with the organization of initiatives that integrate the actions of this training space towards obtaining resources through calls for funds for the development of research projects (Cánovas-Saiz et al., 2020).

All these initiatives are in line with what was previously observed. The establishment of the seedbed as a strategy for the process of growth and self-knowledge of future researchers is linked to the integral development of the people who investigate. The establishment of institutional support formulates a way for the social sciences to participate as spaces for communication and integration between different disciplines. Finally, the interests of all the agents involved provide a scenario for the constitution of research careers, together with all the commitments and benefits that this entails (see Table 1).

Although these premises are essential for the establishment of a research training program, it is necessary to participate in a strategy that assumes responsibility with the main existing dynamic relationships. In accordance with what was previously observed, it is important to identify the elements that make up an ecosystem. However, the combination of their relationships is determinant for its sustainability. For this reason, the next section will contrast the conception of the PJI with the support of the systems thinking theory.

The system thinking-based PJI

As has been observed, the presented cases of recent literature come mainly from emerging countries, such as Colombia and Peru. This implies paying attention to complex realities, in which there is a lack of resources, low state collaboration, and high social heterogeneity. Therefore, actions must be taken to gather the objectives (*outputs*) in a consistent way with these conditions (Garcés-Velástegui, 2022).

It requires a creative dynamic that provides for constant interaction, strengthening relationships of trust, and establishing mutual recognition of team members. It means registration, regulation, mentoring, discussion, monitoring, and evaluation (Almarcha et al., 2022; Cain et al., 2022). This type of process has been stated by authors such as Arnold & Wade (2015), Clancy (2018), and Senge (1990, 2006) as systems thinking. This implies a form of complex analysis that encourages the interaction of all the stakeholders that make up a certain system, understands their relationships, and establishes strategies so that their permanence and compliance are sustainable in the long term. In addition to this, it also generates a communication model that allows to determine the common factors to all systems: objectives, hierarchy, dynamic relationships and equifinality. The characteristics of this model are compatible with those previously exposed, because they are organized into archetypes that represent decisions and strategies common to a large number of cases, which can be extrapolated to different fields of knowledge and management models (Senge, 1990, 2006).

Most archetypes focus on representing cases of reactive leadership, symptomatic attention to a crisis, establishment of statutes based on personal criteria, lack of consultation with experts, or attention to strategies without clear processes, among others. Said actions have historically led organizations to bankruptcy, suspension of activities, loss of reputation, and critical failures in innovation processes (Marino-Jiménez & Ramírez-Rodríguez, 2022; Prakash, 2023).

For this reason, it is plausible that research production that is developed without considering what is observed in the corresponding literature or partial attention to it generates subsequent problems due to this neglect. Such is the case of *Shifting the Burden* archetype, a kind of decision that pays attention to measures that seem to solve problems in the short term, but that pays no attention to the main issue, and focuses on addictive behavior patterns. For example, in the absence of consistent research production (since it is an indicator of international rankings), a university may focus on hiring new researchers in different specialties with long experience, but who (still overloaded with publication goals) are far from satisfying global demand (Grech & Eldawlatly, 2024). Therefore, the generation of new hirings is

Table 1. Inputs and outputs of the research seedbed as a research training strategy.

Inputs (from the seedbed literature)	Seedbed strategy for the growth of future researchers	*Outputs* (from the formative research)	Comprehensive development of people who investigate
	Establishment of institutional support		Participation of the social sciences in the integration of workspaces
	Interest of the stakeholders		Constitution of research careers

Elaboration: own.

Note. Although there is a correspondence between inputs and outputs, the actual relationships can be established using a non-linear type of representation. It is a work ecosystem that develops various dynamic relationships.

forced and generates higher expectations. All this creates a situation in which production continues to be insufficient (see Figure 1).

A correction of this measure implies, precisely, the generation of research seedbeds that, as expressed in the previous section, generate reciprocal benefits for researchers in training, to the educational institution, and society in general. This measure will present situations such as the one shown, but it will avoid dependency relationships on hirings more researchers. In addition, it will be established as a training space for new researchers at different educational levels (see Figure 2).

On the other hand, a seedbed with the characteristics described in this paper, complies with the integral development of the people who research, promotes the participation of the social sciences, disseminates its results online, thus establishing bilateral communication and promoting the construction of research careers. In this sense, the developers of the PJI have sought the integration of inputs and outputs. That is, strategic participation has been included in the training of future researchers, the establishment of institutional support and the interests of the stakeholders to meet goals related to research training, the strategic participation of social sciences and the constitution of research careers (see Figure 3).

In that sense, the PJI is conceived on recognition, communication and training between age groups with different levels of research skills, disciplinary diversity and production styles linked to them. To achieve collaboration between undergraduate and graduate students, the sponsorship of the organizing institutions is essential, which would facilitate the connection with other entities. In addition, they would provide for a greater cultivation of research activity from the first years of university studies (a characteristic little developed in Latin America). (Campos-Ugaz et al., 2022).

Therefore, so that the actions can provide mutual reciprocity in the generation of ideas, production processes, and dissemination of the acquired knowledge, communication and the establishment of distinctive and complementary actions are pertinent. During the first years of study, the presence of specific training activities is decisive (workshops, reading of recommended bibliography, and academic event attendance); while the last years of undergraduate study, the master's degree and the doctorate will seek the participation and organization of researchers to generate research products, constituting a career line dedicated to scientific production. On the other hand, the co-participation between researchers and students of different levels (through joint actions within the training program, such as articles, mentoring and research projects) makes it possible to distinguish the reciprocal contribution of different ways of observing reality, the application of methods, and the constitution of a diversity of research

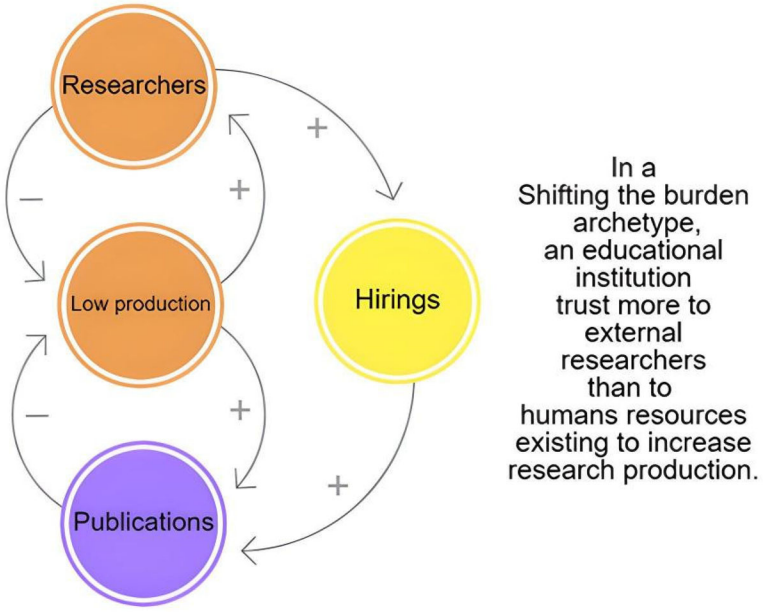

Figure 1. *Shifting the Burden* archetype in the research production of a university. Elaboration: own. *Note*. In this model, the proportionality of scientific production will always result in a deficit. The hired researchers will be more focused on publishing than on sharing their knowledge.

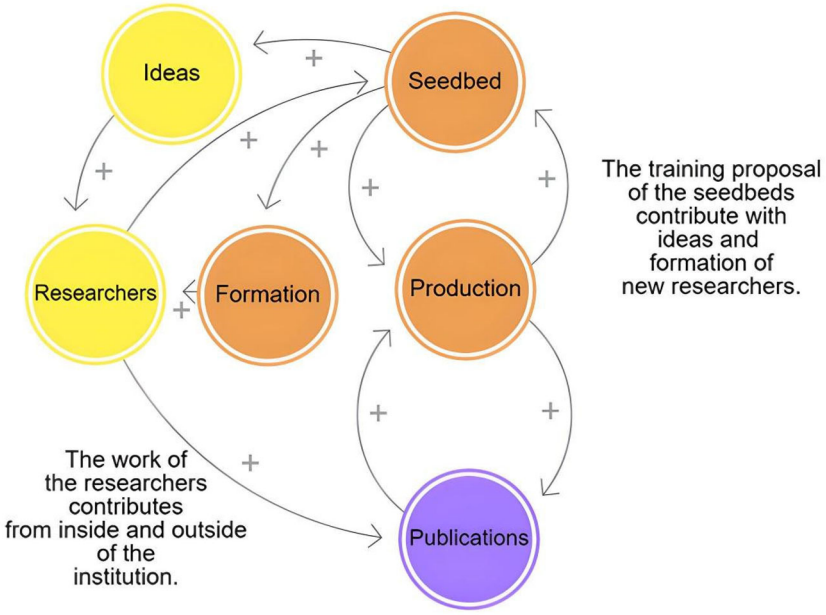

Figure 2. Correction of the *Shifting the Burden* archetype in the research production of an educational institution, through the participation of research seedbeds. Elaboration: own. *Note*. Research seedbeds contribute to dynamic relationships between stakeholders (students of different levels, university, and society) (Li, 2023).

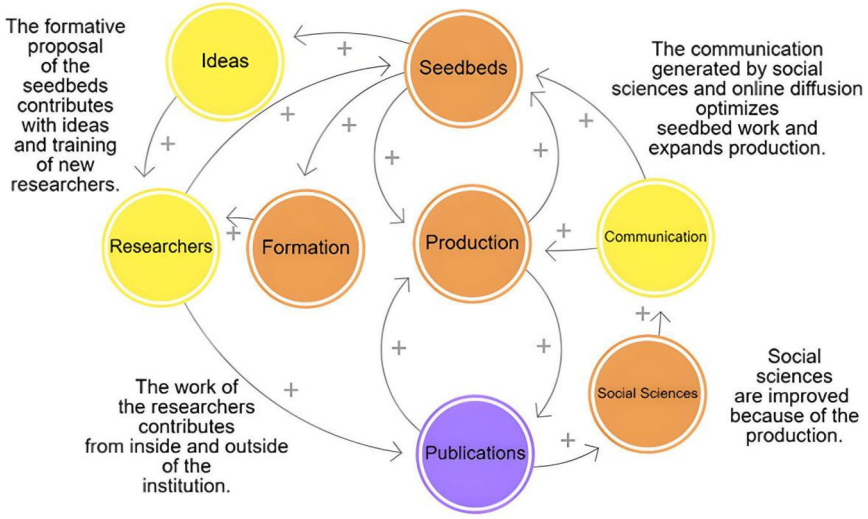

Figure 3. Optimization of the *Shifting the Burden* through the participation of the PJI. Elaboration: own. *Note*. The generation of spaces for dialogue allows greater growth and the possibility of establishing collaboration between institutions. At the same time, the presence of social sciences is included to promote communication regarding seedbeds and scientific production (STEM, social sciences and interdisciplinary studies).

products. This factor, relatively common in developed countries, is poorly attended to in most Latin American countries. Some reasons that currently limit attention to this point are the requirements for university teaching (most professors do not require a doctorate), the distribution of teaching load (many more class hours than in developed countries), and the consequent scarcity of research careers (which correspond more to the exception than the rule). Therefore, the optimization of joint actions such as those offered by the PJI generates valuable learning (González-Parias et al., 2022).

Attention to the research training with interés in collaboration with many institutions includes the decision to develop this initiative in an open content. This is represented on a public website (https://jovenesinvestigadores.org) where updates on the work carried out, discussion spaces and research products that have been generated as a result will be published regularly (see Figure 4). Participation within

Figure 4. PJI Website. Source: https://jovenesinvestigadores.org. *Note*. Participation on the website will be determined by committees.

Table 2. PJI proposal, according to their level of training.

Educational level	Training service offered	Predominant product type	Means of production and/or dissemination
First years of undergraduate program	- Workshops - Recommended bibliography - Call for academic events	- Research ideas - Promotion of events	- Website of the PJI
Last years of undergraduate program	- Workshops - Calls for collaboration in publications - Calls for participation and organization of academic events	- Posters and research projects - Promotion and organization of events	- Website of the PJI - Academic events
Master and doctoral degree	- Calls for participation and organization of academic events - Calls for participation in scientific publications	- Scientific articles - Promotion and organization of events - Research projects - Publication of results of academic events	- Scientific journals - Academic events - Scientific communities

Elaboration: own.

the website or in other activities will be carried out (in a non-exclusive manner) according to the level of development (see Table 2). This open content alternative has similar advantages to collaborative courses, which are enriched by attention to a diverse audience, as well as the joint participation of experts from different realities, and whose knowledge is complementary (Joyner et al., 2023). On the other hand, teaching and learning experiences provide situations for ideation of new initiatives (articles, research projects, etc.).

The interaction between students from different institutions and realities will strengthen the recognition of the working conditions of others, as well as their relationships of trust (Zalewski & Brudvig, 2022). On the other hand, public access to the materials of the workshops, events and publications developed within the framework of the PJI, represents a core contribution to the comprehensive training of many other students and interested academic communities. In this way, dialogue with environments that share the same interests are encouraged. To facilitate this process, they will prepare a directory of the contact of the community participants, information about research groups, research support institutions, and tools to facilitate initiatives related to this purpose (see Figure 5).

In order to assume an institutional commitment, the PJI work team will be constituted by an interdisciplinary and interinstitutional team, with professors and students who, permanently or itinerantly, will develop actions to promote, stimulate, regulate and innovate. Therefore, three groups will be formed: a *management team* (MT), a *scientific committee* (SC) and an *editorial committee* (EC).

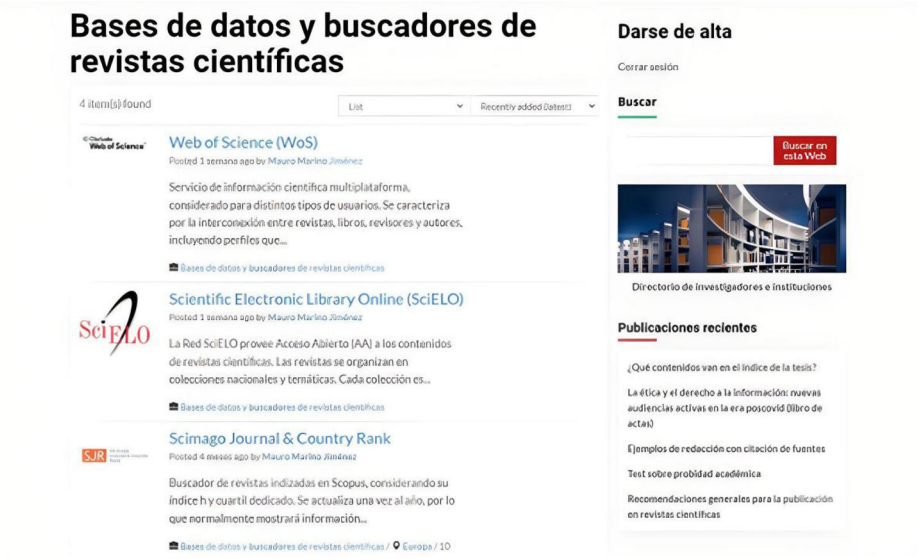

Figure 5. Directory of researchers and institutions on the PJI website. Source: https://jovenesinvestigadores.org/directorio-de-investigadores-e-instituciones/. *Note*. Important information to find spaces that promote research, training spaces, professional contacts, among others, are centralized in this space.

Figure 6. Circuit of the editorial process for the PJI Web page. Elaboration: own. *Note*. The process seeks to replicate the procedures that are developed in a scientific journal.

The MT is constituted by researchers from different disciplines and institutions, permanently associated with the PJI. They are primarily responsible for its conception, development, execution and regulation. They have similar deliberative powers to the SC's when it comes to approving research products to be published on the website, or their recommendation for submission to a scientific journal.

The SC comprises researchers from different disciplines and institutions, invited to collaborate specifically, to evaluate or propose research products for publication on the PJI website, or their recommendation for submission to a scientific journal. In both cases, two members of the SC are required to obtain a favorable opinion.

The EC consists of a team of students and graduates from different disciplines and institutions, directly linked to the PJI, who can participate for fixed or indeterminate periods, through their own publication proposals, or received as a collaboration. It also constitutes the first evaluation filter before the submission of these proposals to the SC and determines the final opinion for publication (see Figure 6).

The sections to be developed on the PJI website are *Semillero de ideas* (Seedbed of Ideas), *Pósters y productos de investigación* (Posters and research products), *Talleres* (Workshops), *Recomendaciones* (Recommendations), *Creación* (Creation) and *Anuncios* (Announcements). The *Seedbed of Ideas* is a space for research proposals, published with the purpose of being improved or shared within the work teams for later realization. The post can be open to the entire community or private to team members. *Research Posters* is a section that includes illustrated summaries of research projects, which can be represented and exposed in a concise way. *Workshops* includes the knowledge that the MT and the AC offers for researchers in training inside and outside the teams. *Recommendations* offer concise guides on the research processes: thesis preparation, publication in scientific journals, project preparation, among others (see Figure 7). *Creation* is a section that corresponds to works of a literary or artistic nature that the teams have chosen to share with the community. Finally, *Announcements* gathers the activities, events and calls related to research, which may be of interest to the community in general (see Table 3).

In addition to what is expressed in the framework of systems thinking, dynamic relationships between all team members can be visualized and improved. That is, an in-depth look at the role that the PJI assumes that contributes with the proposed outputs. Its management and expansion is based on collaboration and optimization of efforts. In this sense, although the low use of economic resources allows for

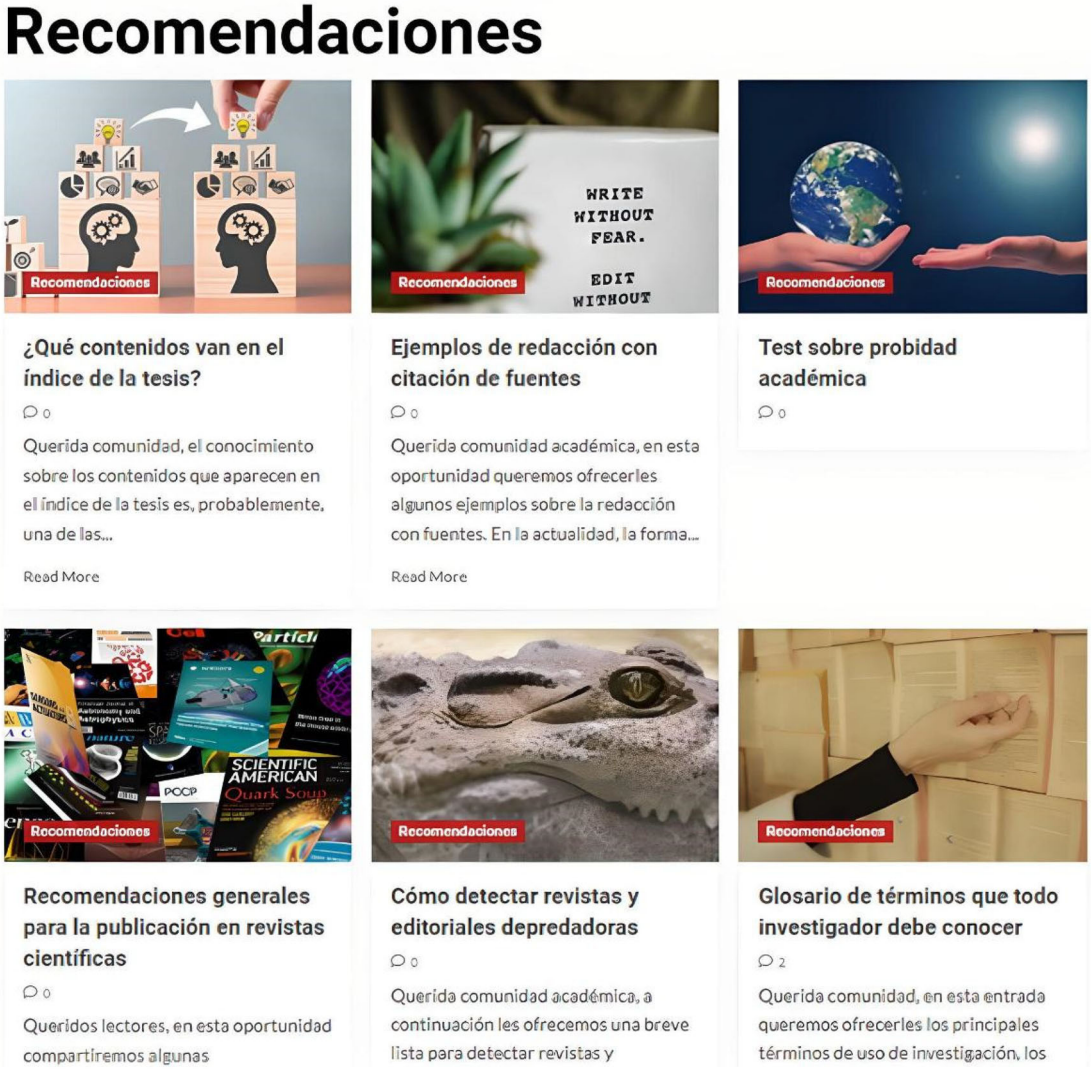

Figure 7. Recommendations section in the PJI website. Source: https://jovenesinvestigadores.org/index.php/category/recomendaciones/. *Note*. This section was conceived to answer frequently asked questions in research, but also to strengthen good practices. Such is the case of examples of writing style, a glossary of terms and evaluation of academic honesty.

Table 3. Sections of the PJI website.

Section	Description	Main authors	Outputs
Seedbed of Ideas	Space for the presentation and improvement of research proposals.	Researchers in training	- Comprehensive development of people who investigate.
Posters and research products	Section dedicated to the graphic representation of investigations.	Researchers in training	- Participation of the social sciences for the integration of workspaces.
Workshops	Repository of educational materials and research training activities.	Researchers in training	- Constitution of research careers
Recommendations	Space for the solution of frequently asked questions and good practices.	All the teams	
Creation	Space for the publication of artistic and literary works.	All the teams	
Announcements	News, events and calls related to research activities. Promotional activities in the student work circle through events.	All the teams and guests	

Elaboration: own. *Note*. This diversity of options is intended to contribute to all the outputs mentioned. A cultural integration to the research activity is sought, in which are promoted dialogue, understanding and collaboration between the members of the PJI and the community.

the management of a program such as the PJI for public universities, its impact on collaboration and development of training experiences can be transferred to the environment of private universities. Academic outreach could manage mimetic institutional pressure on the latter, generating interest in participation and/or actions (Latan, et al., 2018; Wang, et al., 2018).

Finally, once the PJI is implemented, it will be measured through the content, the formative results, and the consequences of the developed actions (mentioned as outputs). Such is the case of the website metrics: visit traffic, subscriptions, time spent, etc. On the other hand, the direct result of the training activities will be taken into account with workshop satisfaction surveys, consultations carried out, discussions in the forums, etc. Finally, the generated production will be assumed through collaborations from different entities, research products published on the website, research careers, and research actions generated from the community. That is, an analysis of the entire circuit of the system, considering the optimization and/or attention to those that can enhance its success. The need for it to exist will also generate the possibility of its being maintained in the long term (Ciriello et al., 2024; Pianykh et al., 2024).

Conclusions

Research is a transversal activity for professional, institutional and social development. The relevance of this is consistent with the degree of progress that occurs in decision-making, innovation and actions to improve people's quality of life. For this reason, it is essential to strengthen actions and skills throughout the university career and professional performance, through various interconnected activities, such as the establishment and development of research seedbeds, research groups, among others. This is a particularly useful practice in emerging countries, with low resources and high complexity. It also contributes to the comprehensive development of researchers in training, the management of productive communication and the strengthening of career lines. In that sense the PJI is based on the review of proposals formulated in the literature, and with the goal to consolidate itself as an open network of research development. Although it is still in an initial stage, the communication premises and mechanisms have been established on reviewed bases, and with the possibility of improvement.

Participation in the development of research skills corresponds to a transversal praxis in all disciplines. That is why the PJI is enriched by its public, social and international character. All this, with the purpose of providing spaces for initiatives of different levels of training, managing the approach of research to the university population, promoting the shared construction of knowledge, and developing mutual knowledge of the different disciplines that converge in this project. This particular proposal is integrated into the framework of a larger proposal for expansive, collaborative and open growth for people and institutions with common interests. Finally, it has a humanistic approach, in which developing the

individual within a community focused on research provides them with the tools for a positive production, which allows them personal development and a contribution to satisfying the needs of their society.

The evaluation of the PJI prototype will be addressed in detail in its future implementation. Although it is associated with a series of elements considered by the literature, it is necessary to guarantee the sustainability of inputs, attention to outputs, and the positive renewal of the staff. In this sense, this practice will be a reason for future research around the PJI, as well as other similar programs.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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