DEVELOPMENT OF RESEARCH SKILLS AND FORMATIVE RESEARCH IN HIGHER EDUCATION

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KEYWORDS		ABSTRACT
Formative *research* Research training Research development Research skills Research planning.	skills	The university has been using the concept of formative research for the fulfillment of one of its functions within the framework of the law. Since then we have conducted research on the development of research skills in the university classroom, we present activities developed by professors, which bring us closer to the use of tools that allow the development of research skills from the training process. Material and methods: it was based on an exploratory descriptive descriptive research, as well as on the documentary analysis carried out at different times. First: institutional diagnosis on formative research, second: design of the conceptual model and third: construction of exploratory scenarios.

1. Introduction

Today's university faces new challenges in the formation of excellence and quality, one of them is training in and for research, "training" in and for research" through activities that are not necessarily part of a concrete research project (Pla-Campas, Arumí-Prat, Senye-Mir, & Ramírez, 2016).

Strengthening the relationship of research with the skills that are part of professional training is one of the fundamental objectives of higher education institutions and is, therefore, an element of essential importance for the generation of new knowledge (Velandia-Mesa, Serrano-Pastor, & Martínez-Segura, 2017). From this perspective, it is intended that the student travels the path of research through a continuous and systematic praxis, and thus, fulfill the profile of the graduate. Research training should make use of all those actions oriented to the process of "learning to learn" with the purpose of strengthening and consolidating skills and knowledge in students that allow them to successfully perform the activities associated with scientific research, development and innovation (Renzella & Cain, 2017).

Its intention is to familiarize the student with research, with its nature as a search, with its phases and operation" (Restrepo Gómez, 2003), the university has research as its commitment and essence, therefore, formative research should promote research culture and this research culture should promote better scientific research (Pla-Campas et al., 2016). That is, it is not about changing the research we traditionally do, the main purpose of formative research is to contribute to it (Kowalski, & Gardner, 2009).

Zimmerman et al. point out: "It is possible to create, for example, less costly ways of diagnosing a disease. It is also possible to add value to our products and stop exporting only raw materials, which will give us more income. Or it is possible to create a process with cleaner ways of extracting ore. All this is done with research and that is why it is important to invest in it"(Zimmerman, Muraski, Estes, & Hallmark, 1997).his is the first paragraph. Please use Cambria, font size 11. The opening paragraph is not indented.

2. Development of the research

For the Development of the research we take into account work, formative research through project-oriented learning: a proposal for innovation in the degree of pedagogy of (Vilà Baños, Rubio Hurtado, & Berlanga Silvente, 2014), mention that formative research focuses on three main principles:

- The question "the doubt": learning is the result of processes of knowledge construction by the students, assuming an active role of self-learning and self-management.
- Non-directive teaching: the formative search requires a way of relating to students as a facilitator of learning, as an expert guide, respecting the different points of view that arise from the work. In this way, autonomous learning is favored.
- -Inductive teaching, with interaction between the environment, the educational community and the curriculum. The very concept of research problem, understood as a complex thematic nucleus of inquiry necessarily articulated with others, allows multiple approaches (interdisciplinarity), the dialogue of knowledge about the object of teaching for its integral understanding.

These principles are ratified in the research carried out.

The unavoidable task of quality research according to (Calderón Polanía, 2015), will be boosted with formative research, with the research culture generated since the student enters, in all subjects little by little, from a good monograph, in the first semesters, to R+D+I projects, as a consequence (Shuhidan & Mohamad, 2013). For a university teacher and according to the area, biomedical, social or engineering, not all alternatives will be useful, however, defining and characterizing them, will serve to choose the most appropriate according to the analysis proposed by (Suhonen & Sutinen, 2005).

One of the objectives of the Universidad Nacional del Altiplano is to strengthen formative and scientific research in the academic community; likewise, the programming of learning-teaching activities within the framework of competencies, considering formative research strategies, from a methodological point of view, a training impact project should consist of the following phases (Párraga Martínez & Cuello Medina).

Figure 1. How to implement a Training Impact Assessment project (Párraga Martínez &Cuello Medina).
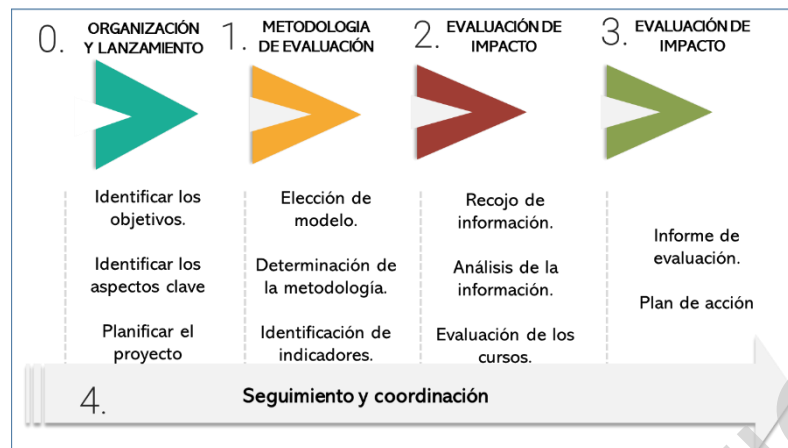
In the methodological processes, the university regulations consider that the teacher must: Apply methodological processes that activate critical-reflective and creative thinking skills of students, so that they develop experiences linked to formative research, innovation in a way that responds to the challenges of the knowledge society (Carchiolo, Longheu, & Malgeri, 2001).

One of the aspects that concretizes the aforementioned guidelines is the syllabus of the subject, which indicates that the teacher must include formative research strategies to be developed during the semester in contrast to (Chalmers, Martin, Matthews, Famewo, & Taylor, 2009).

Indicators to measure the impact of training should be related to the levels of Wade's model described above (response, application, results, impact on the organization). in addition, indicators are sought that provide information on the following aspects:

Indicators to measure the impact of training (Párraga Martínez & Cuello Medina).
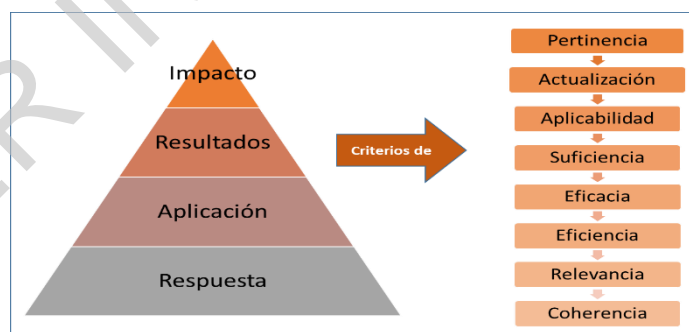
The following is a summary of the structure of the questionnaires applied, not including all the questions asked:

Table 1. General structure of the questionnaire applied (Torres Nupan, 2012).

General structure of the questions	STUDENT	TEACHER
Level of applicability of of formative research of at of curricular component th e	• Very important (4) • Important (3) • Not important (2) • Indifferent (1) Likert scale	

Concept of formative research	from	Open-ended question to obtain inputs to build the concept adopted by this community in relation to with formative research.	
Research indicators of applied in the curricular component		Question open about those indicators whose applied in jobs in charge.	Question open-ended question about the indicators applied in the syllabus.
Activities carried out related to the formative research		Open question from the activities in which it participates or has participated.	Open question from the activities you encourage in the classroom
Aspects that can to be improved		Open-ended question from the activities that you consider can encourage the development of formative research	

For the study, an exploratory descriptive research was conducted, with the objective of characterizing strategies proposed by teachers of the Universidad Nacional del Altiplano for the development of research skills as part of formative research in the teaching-learning process of students of Initial Education and Electronic Engineering at the Universidad Nacional del Altiplano Puno, during the second semester of the academic year 2017, study that was tested in virtual environments with interactive platforms by (Ferro Soto, Martínez Senra, & Otero Neira, 2009) and (García et al., 2012).The research included literature review and documentary analysis, considering the following functional block diagram.

Figure 3. Documentary analysis of the applied formative research.

For the application of data collection regarding the applicability of formative research in the curriculum, the following methodology was used, considering the strategic indicators shown in Figure 4.

Table 2. Data collection method.

Review bibliographic	Curriculum Review	Teachers' syllabus
Establishment of the state of the art	Establishment of guidelines on formative research	60 syllables 30 per professional program

Frequent research strategies			
ABP	Field notebook	Seedbeds	Analysis
Monograph	Exhibition	Journal	Essay
Virtual classrooms	Portfolio	Documentary analysis	Bibliographic review

Figure 4. Common strategies for applied formative research.

3. Results

We agree with Yeny Calderón Polonía on formative research, who states that research seedbeds constitute a space for collective formative research, which favors learning by discovery, the formulation of questions and the articulation of formative research with scientific research in the strict sense, to the extent that these processes are carried out simultaneously. From the general research training carried out by the seedbeds, networking should focus on: a) management, b) training and c) socialization and dissemination of research, so that the processes are carried out in a plural, effective and comprehensive manner (Calderón Polanía, 2015).

Table 3. Level of importance of formative research, corroborating with (Torres Nupan, 2012).

Level of importance of the formative research	Very Important (4)	Important (3)	Unimportant (2)	Indifferent (1)
Students	68,23%	20,21%	10,79%	0,77%
Teachers	70,56%	23,86%	5,58%	0,0%

A very important aspect for formative research is the assisted education with u-learning environments applied by (Velandia- Mesa et al., 2017) seems to extend this panorama and affects the quality of education, our recommendation coincides in taking as a strategy the accompaniment, monitoring, adaptation and situational learning with respect to the current applicability of our university environment that applies the tools of the virtual classroom in e-learning platform. After the theoretical and epistemological foundation and the strategic planning of the methodological design, informed consent was given to the participating students. subsequently, the pilot test was carried out in three sessions of training, personalization and configuration with the two learning environments proposed in the study.

Table 4. Frequent formative research strategies applied in the survey population.

Item	Frequent Formative Research Strategies	Percentage of implementation of the Strategy
1	Portfolio	20%
2	Essay	25%
3	Research Seminars	5%
4	Monograph	22%
5	Critical analysis	25%
6	Case studies	23%

7	Research work with proposal for improvement	23%
8	Field notebook	5%
9	ABP	7%
10	Others	1%

Now, applying the model of (Baelo Álvarez, 2009) implies that the results are oriented to "e-learning", however, the complex conception of e-learning that encompasses those applications and services that, based on ICT, are oriented to facilitate the teaching-learning process, and result in a higher apprehension of 70% of cognitive resources.

The research included a bibliographic review and documentary analysis, which was based on the review of the curricula and syllabi of 60 teachers, 30 of them from the Electronic Engineering and Initial Education Programs. The empirical method used was a survey of 30 permanent teachers and semi-structured interviews and consultation with Professional Program research coordinators. The established ethical standards were taken into account and the percentage value was used for the qualitative analysis of the variables studied, which included: teachers' criteria on the integration of strategies for the development of research skills (sufficient or insufficient), in their subjects, need for training in the area (very necessary, necessary, unnecessary, do not know), and achievement of research skills by students (all, some, none).

The results of the documentary analysis of 60 selected syllabi, considering curricular components of specific training and specialty, give us the following results:

In 60 syllabuses, formative research is mentioned as a teaching and learning strategy, and in 17 syllabuses it is not specified, it is only a subtitle, a situation that hinders a better understanding of the application part of formative research (Frunza, 2014). A critical knot in a large number of analyzed syllabi (34) is that formative research is confused with research itself, and that in some cases another type of strategy is consigned as formative research (Connell, 2015). This highlights the weakness in the policy and guidelines from the curricula in formative research (Froyd, Imbrie, & Reed, 2013).

In the survey of 30 permanent professors, the criteria of the professors on the integration of strategies for the development of research skills resulted in the insufficient use of these strategies. The interview with the research coordinators of both professional programs identified the need to implement training processes to improve and diversify the application of formative research strategies, as well as the need to standardize the process and define the strategies specifying the purposes, basic criteria and evaluation indicators. Regarding the need for training 83% consider it very necessary, and 17% necessary, which reflects the interest and motivation of teachers, as for the directors of studies, both considered training in formative research for the 2018 academic year, incident at the virtual platform level with (Frunza, 2014). A critical knot is the achievement of research skills by students, teachers consider that students achieve research skills however evaluation indicators are not specified and evidence is not precise, discordant to that raised by (Isa, Yusoff, Latif, & Yusoff, 2010).

Formative research contributes to the process of generating new knowledge with a view to action, in accordance with the model proposed by (Dlab, Katic, & Candrlic, 2015); the development of research skills is configured as a category of knowledge placed in direct relation to the analysis of the reality that interacts with mobile devices for proactive inquiry of their learning, as proposed by (Lee, 2015).

4. Conclusions

The main problem in incorporating formative research is that there is still no clear definition; it is necessary to characterize formative research from an institutional policy that can be contrasted with the model of (Jong & Schellens, 2000).

Formative research requires the university professor to adopt a different posture towards the object of teaching and towards the students; in the former, to highlight the complex, dynamic and progressive

nature of knowledge and in the latter, to recognize and accept the potential of students to assume the responsibility of being the protagonists of their learning converging with (King & Robinson, 2009).

The university as an institution of Higher Education has research as its commitment and essence, therefore, formative research that drives the research culture and this research culture (Raluca & Bocoş, 2013) fosters better scientific research for innovation and development of teachers and students, supported by mobile virtual environments and tools as raised by (Renzella & Cain, 2017).

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