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EDUCACIÓN DISRUPTIVA: SISTEMA INTEGRAL DE FORMACIÓN PARA LA ENSEÑANZA DE LA INVESTIGACIÓN

EDUCATIVE DISRUPTION: INTEGRAL SYSTEM OF FORMATION FOR THE RESEARCH EDUCATION [1]

EDUCAÇÃO DISRUPTIVA: SISTEMA DE TREINAMENTO ABRANGENTE PARA O ENSINO DA PESQUISA

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ABSTRACT

The challenges that the scientific community and the society raise to the University have brought about a reflection on the function of research in the formation processes in the university. The following article has the purpose of answering the question: How is formed an

1 The following article arises from the Doctoral Thesis that has the title: "Integral System of Training of the University Teaching for the Teaching of the Investigation" which is a result of a research realized in the Catholic University of the East (Universidad Católica de Oriente).

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integral system of formation for the research education and the research management for teachers and advisors? The article is the result of a study, developed in the Catholic University of the East (Universidad Católica de Oriente - UCO for its abbreviation in Spanish), through a mixed methodology with a projective scope in which teachers, advisors and research students participated. The manuscript gives an account of the product of the findings and the discussion, which refers to the components that make up the integral system of teacher training and advisors that guide and accompany the teaching and learning processes of research.

Key words: System of formation, Research, Formation in Research, University

RESUMEN

Los desafíos que la comunidad científica y la sociedad plantean a la Universidad han provocado una reflexión sobre la función de la investigación en los procesos de formación que se lleva a cabo en esta. El siguiente artículo tiene el propósito de responder a la pregunta: ¿Cómo se configura un sistema integral de formación en enseñanza de la investigación para el profesroado universitario? Es el resultado de un estudio proyectivo en el cual participaron profesores, asesores y estudiantes de investigación. El manuscrito da cuenta del producto de los hallazgos y la discusión, que hace referencia a los components que configuran el desarrollado en la Universidad Católica de Oriente (UCO) a través de una metodología mixta con un alcance sistema integral formación de docentes y asesores que guían y acompañan los procesos de enseñanza y de aprendizaje de la investigación.

Palabras claves: Palabras clave: Sistema de formación, Investigación, Formación en Investigación, Universidad

RESUMO

ResumoOs desafios que a comunidade científica e a sociedade impõem à Universidade provocaram uma refle objetivo responder à questão: Como se configura um sistema integral de formação em ensino de pesquisa para o magistério universitário? O artigo é resultado dxão sobre a função da pesquisa nos processos de formação realizados nela. O artigo a seguir tem comoe um estudo, desenvolvido na Universidade Católica do Oriente (UCO), através de uma metodologia mista com um escopo projetivo em que professores, orientadores e estudantes de pesquisa participaram. O manuscrito dá conta do produto dos resultados e da discussão, que se refere aos componentes que compõem o sistema integral de formação de professores e orientadores que orientam e acompanham os processos de ensino e aprendizagem da pesquisa.

Palavras-chave: Sistema de formação, Pesquisa, Formação em Pesquisa, Universidade

INTRODUCTION

The contemporary university looks for rising to the different challenges the society represents with all its functionally differentiated systems. Within these, science has become into the most demanding system to the university, since this system is nourished with the results of the university processes; and, at the same time, it is the place where the future scientists and researchers are formed, within rigorous frameworks that they support from their research processes on the different disciplinary and interdisciplinary fields that form part of science. This implies that, although the university trains professionals to work in other partial systems of the society - health, education, economy, law, politics, religion, among others –, it is simultaneously in charge of the formation of those who must transform these systems, based on the identification of problems, the development

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of research methods and the construction of proposals for the solution of those problems. This leads to the reflection that it is no longer sufficient with the formation in a specific professional field - with the development of abilities to work on it - but it becomes necessary the promotion and integration of abilities that allow the professional to think his task on a rigorous (scientific) way and to transform it by proposing new solutions to real problems that appear in the specific field.

Therefore, to think about a university that tends to the idea mentioned before, implies as well, to understand that this is not the only place where a formation with this aim is set out. It becomes evident that the modern vision of university faces other types of formation that go beyond the theoretical-academic scope, and it is formed in the light of technological knowledge that leads young people to think towards pragmatic/applied situations, when speaking Gardner (2016) about APP (abbreviation for application) generation, where he thinks about how this generation has other forms to manage knowledge, their own identity, their ways to relate, etc. Forms that are characterized by their rapidity, their form to respond to the demands and needs, appearing at the moment they are required; and in this sense, they shape the way young people think and act by giving them some kind of short cuts to confront, which they consider, their problems and realities. These new forms of being in the world come to the university to bring up challenges that can find answer from formation processes which take to rethink the dynamic of configuration for these practices, not to refute them and to eliminate them, but to understand them and articulate them to the proper fields of the academy, the research and the professionalization. This situation demands the university the creation of new forms to think the processes that the university carries out from the established parameters in which they have been called substantive functions of the university, as it is teaching, research and extension, which can come together in the processes of formation for the students, in a well-articulated form.

The idea explained here comes from a research process developed, as a specific case, in the Catholic University of the East, and of which general intention was the configuration of an integral system of formation for the research education. And for which some targets were questioned like the formative strategies and actions, the strengths and weaknesses of the education process, the theoretical, epistemological and methodological positions from which the process of formation in research, and the possible impacts it has had in relation to the development of internal and combined capacities, are guided. All this was done from a methodology with mixed approach (qualitative and quantitative), with a projective scope and a design of documentary, cross curricular subject, multi-category field. For which they were used probabilistic (simple random) and non-probabilistic (intentional and voluntary work) techniques of sampling for the selection of the focal group; and techniques of information compilation of a qualitative nature, such as the participant observation, the interview, the focal group and the documentary revision, and quantitative techniques like a survey with a questionnaire under Likert scale. The analyses were done from quantitative techniques, as the analysis of automatic classification (Cluster) and univariate statistics analyses for data in the ordinal level. In the same way, qualitative techniques were used allowing the reach of several levels of detailing in its interpretation, as they were the literal, significance, connotative and integrative levels. For the development of these levels they were taken into account the next techniques: content analysis, graph analysis of relations and analysis by triangulation of information, in which Atlas Software (Qualitative data analysis) Version 6.2.25 was used. The findings accounted for the need to raise processes of formation in research education for teachers and advisors in charge of

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guiding and accompanying the students in the development of internal and combined abilities related to research. Since this need, four possible fields of formation were identified and they form the focus of the formation system it is developed in this article and it is exposed below.

An integral-participative vision applied to the consolidation of a goal-system for the research education.

In this section some of the principles that support this conceptual, theoretical and methodological stake will be exposed, with a reading in perspective of educative, environmental, communitarian aspects and taking the territory as a transversal axis. It is important and necessary to clarify it is not the aim to make a final framework in which these principles are outlined, because due to their complexity we can state that their divisions are very wide and deep; this is the understanding of the educative scenes (as real scenes of learning) in which they come together a countless number of dynamics and we are beginning to study them at the moment.

It is possible to state according to Wilber (2010) that every phenomenon is formed at least from three basal components and they are integrated in order to understand it as a whole. Thus, from the integral perspective, it is possible to make an approach to the world of education and its complex relations with the territories, this will be observed when exposing the organizational premises that articulate the goal-system of formation for the research education as a model for the Catholic University of the East.

According to the idea previously exposed, and in the line with Wilber's approach, we expect to make an interpretation that allows the construction of an integral map of the educative scenes or real scenes of learning (Franco, 2016) made from the experiences, life lessons, conceptions, positions, attitudes, etc., of teachers, advisors and students in the different processes of formation in research, all this based on the following question:

Which are the components or elements that support the interpretation from this approach?

From the integral theory, we have considered some basic elements that stand this approach, they are: quadrants, levels, lines, states and types. These elements form a kind of integral map which stands behind, according to Wilber (2010), that "we consider all the involved factors, in spite of we are working in the field of the company, the medicine, the psychotherapy, the law, the ecology or we are simply immersed in life and daily learning" (p.17), that is, in all the fields in which the own existence is developed and grown. This takes us to the thought about the need, that from the beginnings it has signified to the human being, to shape maps (myths, legends, religion, philosophy, science, etc.) that help him to sail the bottomless ocean of life and the relations that throughout the time have woven together and obeyed to the processes itself of growth, development and evolution; changing, renovating, becoming themselves complex and fitting to the ways of reading, understanding , explaining and taking part of the world (Luhmann, 2006)

In order to assume this integral perspective, it implies therefore to take a series of resources that make possible the understanding of the relational dynamics present in the educative scenes in which it is developed the task of education itself and the research learning in the university, by allowing in this way "to see to ourselves and to the world that surrounds us in a comprehensive and effective way" (Wilber, 2010, p.17). Nevertheless, it is important to understand that like all maps what it is exposed here is incomplete; thinking in an integral perspective it is simply a tool (map) and not the territory itself. However, when questioning the educative scenes in which the formation in research moves and is promoted, they can be identified some

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base elements or components, as mentioned in previous paragraphs, and that we will present below.

The educative scene, like a system of social interaction, can be observed in four fundamental perspectives: which allow to understand that any process appears or emerges as the objective of the phenomenon; and it refers to “the general aspect of the individual contemplated from the outside, which usually includes his physical behavior, his material components, his matter, his energy and particular body” (Wilber, 2011, p.54). As the subjective of the phenomenon, that is the inner aspect of the individual, where “the immediate thoughts, feelings, sensations, etc.” come together (p.53). As the inter-subjective of the phenomenon (cultural dimension, agreements, consensus and dissents), formed in the interactions, which means being in relation to the others, shaped as culture, as the construction of the common to several subjects which (Wilber, 2011) understands as “the inner consciousness of the group, with its vision of the world, with its common values and feelings, etc.” (p.56). And the fourth perspective is related to the social dimension of the phenomenon, which is related to “the forms and the external behavior of the group” and they are clear in the contexts, the atmospheres, the institutions, the communities, for example (in a contextual, environmental, ecological, organizational, etc. way) this is according to Wilber (2010) that all phenomenon “owns an inner dimension, an outer dimension, an individual dimension and a collective dimension” (p. 67).

As a result we can understand that in the educative interventions done by teachers and advisors in the different educative scenes for the formation in research, they are permanently present behaviors, actions, resources, individuals, actors, agents, with their beliefs, feelings, thoughts, expectations; and they form a scheme of relations, conversations, communications; in contexts, places, spaces which consolidate meaningful territories through the language and the action.

Understanding that every phenomenon (and in our case, the educative phenomenon) experiences at least four dimensions or quadrants, takes to raise in the same way that any educative scene related to the formation in research (classroom, work group, research group, research assistant, among others) shows “some type of growth, development or evolution, that is, they all fold out following some level of development” (Wilber, 2011, p.57) of learning. However, to suggest this it is not to affirm this evolution or development occurs or follows a linear sequence or even that it is predictable; but it is possible to state that, in the middle of a real scene of learning (educative scene) as the one here, we can identify changes in the perspective of the idea mentioned before by the name of quadrants. Here we accept with Luhmann (1998) that every system (scene of educative interaction) can change its own structures from the operations that it carries out, and in the case of an interaction system, the basal operation is communication. Now, in this sense we can consider that the structural changes of evolutionary nature are described based on the distinctions among the variation mechanisms, of the selection of variations and their stabilization. We can only speak about evolution when the three mechanisms, that are different according to the kind of system, can be different. (Corsi, G., Esposito, E. and Baraldi, C., 1996, p.77)

In this way the evolution, growth or change that can be caused in the educative scenes (real scenes of learning) appears these three mechanisms, not as relations of direct causality (in sequence to the causal linearity), but in a complex and series relation considering some specific moments, of mutual incidence, adaptability and adjustment.

A second element or basis, that forms the

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integral map, with which we are making a read of the educative territory in the real scenes of learning for the research education structured in the model, is related to the fields or stages of development. These fields go through the stages or levels that are mutually included, that is they appear as essential fulcrum for the consolidation of the following basis. With the experience in mind, they have been called as **Field of Formation in Research**, where in an initial moment or descriptive/exploratory stage, defined as a contextual diagnosis, we try to recognize the previous knowledge and capacities related to the research of the participating individuals, by admitting and being aware of (the objective, the subjective, the cultural and the contextual aspects) in relation to the interests, conceptual, theoretical, methodological positions and conceptions, epistemological obstacles (Bachelard, 2000), feelings, experiences, intentions; this is, the present state of teachers in relation to research.

This field is set up from several moments, at the same time they are formed as axes of formation in the interior of the model.

- Diagnosis process (strengths and weaknesses in the process of formation in research for the participating teachers)

- Epistemologies, speeches and paradigms in research

- The top scientific thought, limit problems, and inter and trans-discipline research

- Phases/stages in the development of the research processes

- Disciplinary and interdisciplinary methodology for research (methods, designs, modalities, strategies)

- Products of research.

- Ethics in research.

As a systemic model it is important to clarify that, each one of the fields becomes previous stages of the subsequent fields. That is, they are integrated like holons (totality parts) that form a more and more complex whole and more attempting in relation to research in the university. Connected to the field of formation in research, we come to the **Field of Formation in Research Management**, where the participants work and develop internal and combined capacities related to the way of doing the operations implied in the management of projects, direction, monitoring and adjustment to other projects, at the same time as understanding the dynamics of the research production, from all the scenes of formation and developments in research and innovation, based on the planning, the organization, the accomplishment, the monitoring and the evaluation.

The formation axes linked to this field are

- Planning and order of research

- Monitoring and evaluation of the research process

- Products of innovation

- Research writing (types of reports) (quotation guidelines and references in research)

- The social appropriation of knowledge

- The scientific publication (where, what, how and when to publish) (technological monitoring)

- Meters in Science and Technology.

With the fields previously presented in mind, and understanding the dynamics of research and the research management, the model proposes to work on one of the fields supported by the development of this research, and in essence it is the answer to the raised thesis in relation to the research education. Therefore, through the **Field of Formation in Research Education**, we want to answer to one of the weaknesses

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found throughout this research, and it consist on the lack of knowledge about pedagogy, didactics and evaluation for the direction of the processes of formation in research the students have. This field looks for teachers in charge of the researchers training to develop internal and combined abilities by allowing them to guide and share this formation with larger tools, which contribute to the research pedagogy and didactics; for the construction, implementation and evaluation of real scenes of learning in research. From this field forms of analysis are planned, reflections and critics are developed in relation to problems present in the area of the research education, accepting some of the possible networks of relations and existing tensions from the four quadrants and their functionality; developing from it transformations in the educative practices.

This field includes the following axes of formation

- The function of pedagogy and didactics in the research education.

- The processes of making pedagogical and didactical the research education.

- Pedagogical, didactic and evaluative strategies for the research education.

- Construction of real scenes of learning for the research education and learning.

- Integral and systemic vision applied to the research education and learning.

- Research as pedagogical and didactic strategy in the teaching and learning processes of the disciplines. (Research in the classroom)

- The role to orient and to accompany the formation in research from the different scenes for the learning (teachers, coordinators of work groups, advisors, tutoring)

A last field of formation is constituted from the findings related to the curricular proposals of the programs which present a linear and closed vision of the formation in research, in a subject-way perspective. **The Field of the Curricular Management for the Formation in Research** opens the possibilities of critical analysis in relation to the way how the curricula of the programs for the formation in research are internally planned. In this sense we want to observe how the macro-curriculum, the meso-curriculum and the micro-curriculum are established in relation to the form in which the teachers guide and accompany the process of formation in research, by examining the convergences and divergences present in this process.

In this field some axes of formation are:

- The importance of research in the undergraduate and postgraduate programs: Alternatives for new learnings.

- The Macro, Meso and Micro-curricular planning in the process of formation in research of the programs.

- Analysis and curricular assessment (a critical and constructivist perspective of the research curriculum)

The development of these fields will make possible, from all the learnings ,the configuration of proposals made by the teachers that will allow, from a comprehensive level of the research education, to interact in the different real scenes from learning, in which, with suitable tools, we can observe and evaluate the processes, and then reshape and construct new proposals which make possible the development of the level of integrative character in which we shape more and more contextual forms of educative intervention and with a relevance and coherence character, from which “direct actions” on the part of the participants are contemplated (teachers, students) where they come into play, come together and mobilize

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interior resources (subjectivities) and external resources (behaviors, matter, energy, objects, etc.), relations, communications, decisions, among others. Therefore we have four fields of development, evolution and growth in the interior of the four quadrants.

The fields of development are evident or explicit in the dynamic of the considered model, as experience-based scenes from which different dimensions of connection are worked like: the cognitive dimension, in which we try to develop what Wilber (2011) calls the consciousness about what it is, that is, about what it is known in the light of the dialogue of endogenous knowledge with exogenous knowledge, in order to construct the sense of the acquired knowledge, applicable to the context. The ethics-morals dimension that Wilber (2011) shows as the consciousness of must be; which in the sense of the interaction it is understood as a collective construction, it is implemented in the self-reference and internalization (reflection) of the participants. The emotional dimension that defines feeling, thinking and acting as a human event proper of the participants, and at the same time, it forms a medium in which the own sense of knowing is invigorated, therefore we can come up with there are not knowledge (to know), moral (interaction), without emotion. That is to say that what the participants think, feel and do are mobilized through emotion.

Another dimension of connection is the one that it is formed as a system of educative interaction, and it is related to the way how the participants relate each other, from the operation of communication in the middle of the sense (Luhmann2006). It is important to clarify that, as a system, the considered interactions are closed according to their operation of communication, but they are open when establishing certain type of relation with the environment, so that it is irritated, stimulated and therefore it can permanently change, learn, evolve; and being the most dynamic dimension by its proper nature. The psycho-environmental dimension, that is formed based on the self-care, as integral part of the care for the other by legitimizing it: this dimension becomes, along with the socio-environmental dimension in the interaction axes of the whole proposal, since it appears as the dialogue between internal (speech) and external (excursus) from which the other dimensions are interconnected. The esthetic dimension, becomes the possibility of relational reconfiguration with the felt and lived conception of beauty, the art, taking to understand that the evolution, the co-evolution itself is beauty and this is sided up with kindness (the sense of the benefit of the other and by the other, legitimizing it) and the truth (the sense of the transformative and constructive understanding of reality that enables the conceptual, theoretical, epistemological, methodological, etc. movement, and generates new ways of understanding the dynamics of life from the objective, the subjective, the interactional and the inter-objective).

Two other dimensions exist – they are not less important- and go beyond the clearly material scope of the proposal, they are related to the historical construction present in the subjects and the communities, and the vision of important connection (with one's self, with the other and with the specific other in research). The first dimension has become the reference framework of the feeling-thinking-action, and it guides the specific task of the formation for the research education, this dimension is related to the personal and social values. The second dimension looks for the understanding of the dynamics of connection in the research scheme, the relations between the independence and the interdependence of the participants in the formation process.

The two last dimensions show an integrating character of the whole proposal, since they are formed like internal and combined abilities

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and they appear in the length, width and interior of the whole formative process. It is as well as the creative and innovation dimension can establishing relations between the other dimensions, the fields and the quadrants by enabling to understand better the ways how the participants can form from the inside, and what they get from their (external) contexts, possibilities of creation and solution of concrete problems which are present in every field or the combination of these fields.

When we talk about types in this map or integral cartography, we make reference to the different agents or participants who interact in the diversity of the proposed educative scenes. In this sense, we can designate the teachers of the different programs which guide and accompany the process of formation in research; the advisors who accompany processes of thesis direction; the directors of work groups and the research teachers who want to guide processes of formation different from the tutoring of auxiliary students in some research.

The following graphics provides a partial view of the configuration of the map or goal system as a theoretical model.

Goal Integral System of Formation for the Research Education and the Research Managemen

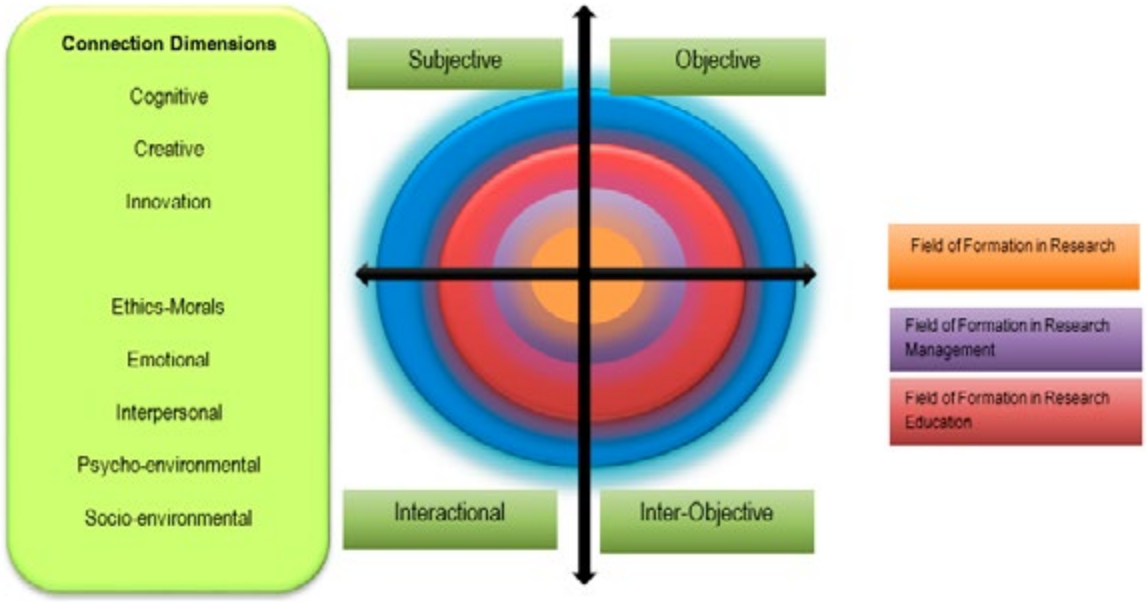

Figure 1. Relation among the quadrants, development fields, evolution and connection dimensions as a goal-system integral map that guides the processes of the Environmental Education Model of the Catholic University of the East. Authorship

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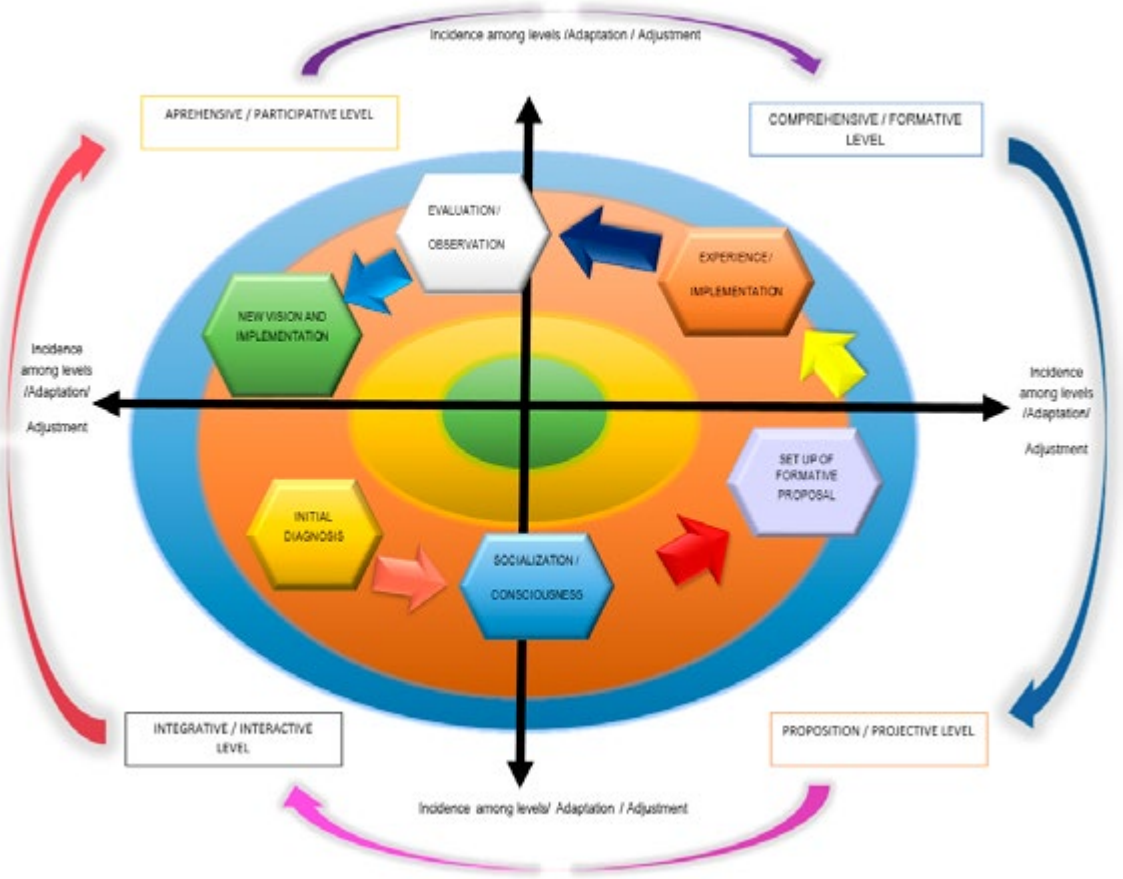

Figure 2. Heuristic model and its components from which we can settle the System of Formation for the Research Education and the Research Management. Authorship

HEURISTIC MODEL

The exhibited heuristic model in figure 2 is formed like a spiral that circulates from the four quadrants (objective, subjective, interactional and inter-objective) and four fields, stages of formation (Investigation, Research Management, Research Education and Curricular Management). However, it is important to emphasize that the connection dimensions come together in each of these fields like guide lines of the different moments they are formed, and that they become more visible in the strategic model. That is to say that these dimensions are intertwined in each one of the fields, components and strategies which theorize, conceptualize and operate the general model.

The heuristic model is formed by a central axis that is the System of Formation for the Research Education and the Research Management, and six components of process and the relations with the development levels, which as they are invigorated, they are mutually influenced, adapted and they are adjusted, at the same time as they are articulated in a species of dynamic spiral that comes from:

A diagnostic component, which is formed from a mental systemic cartography and of expectations that make possible the identification of needs (weaknesses, risks, conflicts, obstacles, difficulties, among others), potentialities (capacities, strengths, opportunities, possibilities), expectations (intentions, objectives, purposes), knowledge

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(acknowledgement of endogenous and exogenous knowledge, like previous knowledge, experiences,), resources (material, financial, logistic, technological, computer, among others), relations (like the set of networks, groups in which we participate) and the teachers' abilities (basic, internal and combined). This diagnosis is participative; that is, it is done in an individual form, then it is socialized by groups and we create a general cartography for the group.

A component of socialization and formation in which we account for the findings present in the diagnosis. It is formed and created the team in charge of guiding and accompanying the development of the formative processes in relation to the fields. This makes clear that, according to the diagnosis and the systemic cartography, everything what it is implied, and from the identified requirements, it is created a new team of trainers, and with this in mind, it will be constructed the proposal of a formative contextual intervention.

A component of the construction of the formative proposal. At this moment, the team of trainers designs the proposal for the intervention in context, so it answers the approaches demonstrated in the diagnosis. The conceptual, theoretical, epistemological and methodological bases that will orient the proposal are settled down; we will create specific strategies, activities and actions for the construction and implementation of the real scenes of learning

A component of implementation, this refers to the set in motion of the proposal. Therefore its aim is to stimulate the transformation in the participants of the formative process from the practice and the reflection, no longer from an ideal framework, but from a real conception, with specific problems to solve in an integral perspective.

Component of observation/evaluation, it is formed from four specific positions, a self-evaluation done by the trainers on their own process, an hetero-evaluation that is done by the community (all the participants) to the process and the trainers, and by the last ones to the community, a co-evaluation that is done by the colleagues each other, and a meta-evaluation that is the evaluation done to the proposed evaluation by other pairs who do not participate in the process, with the aim of improving it. This process of evaluation although it appears in a specific place of the model, it is done in each one of the components, and the exploration and adjustment of the levels, by enabling to generate permanent improvements and changes in it. Nevertheless, at the end it allows to form new perspectives or an action plan closer to the reality that the formation context presents. And this leads us to the last component.

A component of a new diagnosis/ improvement plan, that leaves from the very process of permanent evaluation and it is shaped as a new diagnosis of the context, a new vision of the system, its achievements and its forms of dealing with the situations, problems or conflicts demonstrated in the formation process, which deserve a renewed glance. It is necessary to keep in mind that the model itself takes to the formation of researchers and research trainers who will become the ones to orientate and accompany the new processes with the students. So, one of the added values of the system refers to offering conceptual, theoretical and methodological tools so the researchers-teachers can work with these tools in the formation processes they guide and accompany. That is to say, that the system itself is functional at the time of being implemented in the formation of undergraduate and other levels students.

OPERATIONAL STRATEGIC MODEL

The question: "How to apply the Integral System of Formation for the Research Education and the Research Management?" it is answered by understanding the spiral dynamic of the

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components defined previously and the fractal structure they are form by. It is then from this last one which each one of the components works and from these components, the system itself. Within the developed framework of the evaluation-reflection and critique, evident in some previous parts of this writing, a set of sequential strategies to approach each one of the components has been settled down. The following table shows these strategies and the different techniques raised for their development.

Each strategy intertwines in each one of the components from some moments that form the development and application of the technique. These moments are considered below:

- **Moment of exploration-description**: a moment is formed from a perceptive scope in which the participating subjects investigate on the context and describe their own experiences and life lessons, and they try to objectify the world (mental, emotional, psycho-environmental, socio-environmental), by making a set of descriptions of the daily life (in relation to research) by constructing the universe of codes, feelings and representations it is formed by. Here it is constituted, from the implemented techniques, a field of relational information among the subjects, the practices, the daily interactions, the own conceptions, perceptions and the community history, and this enables the development of a personal diagnosis.

- **Moment of expression-enunciation**, it is formed from an apprehensive scope, in which from the dialogue of knowledge (endogenous and exogenous), scenes of conversation between the participants are structured; where the own elaborations are socialized and common positions from individual works become established. Here we start to reconstruct the daily existential and experience-based connection in which subject-society-culture-environment are related in a synergistic way and giving the possibility to restore recurring understandings, life lessons and experiences which emerge from what it was stated by the participants.

- **Moment of interpretation-critique**, it makes possible the development of a comprehensive scope, that allows the construction of sense from what it was expressed during other moments. In this moment, we make a questioning, critical and comprehensive reading of understandings, life lessons and experiences that are clear recurrences in the subject-society-culture-environment scheme, taking into account the spaces, the temporality and the interactions that occur. At this moment, “the participants construct and deconstruct new stories, speeches and situations; the experiences and life lessons of others; and this enables to understand other realities in the light of what I am as an individual” (Quiroz, et al., 2002, p. 61)

- **Moment of awareness-transformation**, from the direct participation in each one of the strategies and techniques, the individuals have the possibility of reflecting on their role into them; the life lessons, the experiences - both individual and collective, the way how the communications and the actions occur, the ways to feel and to interact with the other, detailing the aspects that made the previous moments easier or difficult. This makes possible a deeper understanding of the problems and conflicts, in relation to research and the formation in research, and allows in this way a deconstruction, significance and reconstruction of understandings, experiences, senses; for the elaboration of new forms of communicating and to take part of the formative reality.

- **Moment of evaluation-reconfiguration**, this makes possible to recognize strengths, weaknesses, risks, potentialities and limits of the strategic model, that as a last resort it would be reflected in the heuristic model and the whole system, offering large information for the consolidation of new collective strategies for the improvement and the attention, keeping in

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mind the conflicts and tensions that can emerge, in order to work on them again and redirect the formation process.

Table 1.

Strategies and techniques for the implementation of the heuristic model of environmental education.

Systemic cartography	**Real scenes of learning**	**Formative/research praxis**	**Systematization of the experience**
- Mental and expectations cartography - Corporal cartography - Contextual cartography - Problem tree - Photo-language - Mural of situations - Environmental survey - Workshop - “Patchwork quilt” - Quick participating diagnosis	- Pedagogy of the question - Problem-based learning - Project-based learning - Learning by dialogue (dialogue of knowledge) - Learning through inducement	- Research action (participating) - Research action (not participating) - Direct intervention (by the trainers) - Communitarian intervention (the inhabitants of the community) - Workshop - “Patchwork quilt” - Class schedule	- Photo-language - Mural of situations - Interview in depth - Focus group - Group of discussion - Narratives or stories - Recordings

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Strategic and operational model

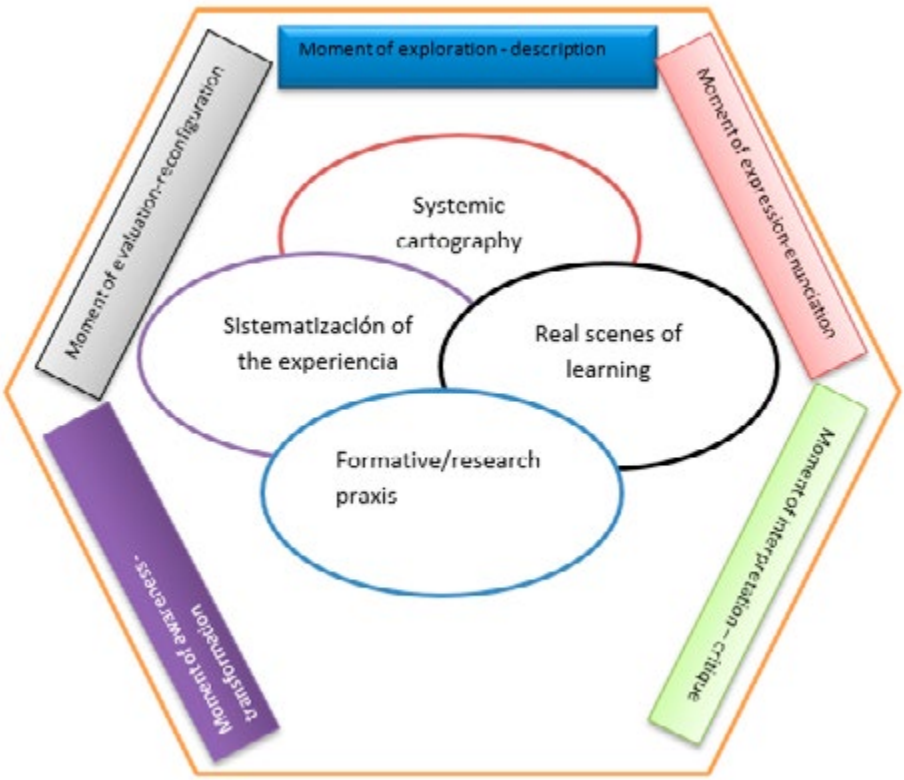

Figure 3. Strategic model which enables the implementation of each one of the components of the heuristic model. Authorship.

CONCLUSIONS

In the Integral System of Formation for the Research Education and the Research Management we initially look for the understanding of dynamics, achievements related to the formation in research; and from there, to construct proposals with relevance and contextual coherence which respond to the needs and potentialities of the individuals, so that it can be formed an academic community created for the research education and the research management, and all its involvements.

It is expected then that the proposed system generates direct influences in the participating population of the different discipline fields, as a first beneficiary, since from this system it is possible to develop a process of formative and research praxis with greater relevance and contextualization, which can solve real problems in relation to the development of research, education and management processes.

With the implementation of the model, we try to generate effects in the institutions and organizations of higher education which want to train the researcher-teachers thus the model itself is transformed and enriched by its implementation, and reformulated in accordance with the dynamics present in them, and giving the possibility of constituting in a program of formation with greater relevance and intervention range.

The system is formed as a scene of permanent evaluation, which enables the constant observation of each one of the components of the model at every moment; and at the same time, to keep it constantly updated and making it

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adjustments according to the problems, conflicts, needs that emerge in it.

The socio-pedagogical strategies and techniques become invigorating tools of the intervention and the formation focused towards the transformation and conformation of communities of thought and construction from the integral perspective, settled by the real scenes of learning, as an invigorating strategy. Likewise, it is from them we settle down the production of new knowledge tending to the improvement and the appropriation of the processes of formation, management and intervention within the occurring of the system itself.

We try to promote, to go beyond, to characterize and to give a greater identity to the Integral System of Formation for the Research Education and the Research Management, so that it is formed within the framework of a research-formation of quality, relevance and updated, that responds to the needs, potentialities and challenges the University faces.

The research provided some results that made possible a vision and critical assessment of the processes carried out up to now in relation to the formation in methodology and research education; from these results, this Integral System has been proposed, in which we kept in mind the necessity of giving answer to the formation of teachers and the advisors who guide and accompany the formation in research. In this sense, we can state that carrying out a permanent critical evaluation will enable an improvement in the possible impacts that it can have in the long term, for the participants, their practices and the academic community in general; all this from the improvement and continuous transformation in the qualification and the implementation of more appropriated new methodologies and strategies of intervention to the needs and potentialities of the individuals and the programs.

We hope that, altogether, from the understanding of the different events present in the whole field for the implementation of the Integral System, we can offer a support of knowledge in accordance with the context, develop new strategies of formation and intervention which can be applicable and help the individual and collective development, at the same time as the participants (community), direct and motivate the growth in all the suggested dimensions.

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