CHAPTER 23

Complex causality and metacomplexity, elements for building university omniknowledge

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Omar Ricardo Pericón Pacheco
La Paz – Bolivia
E-mail: omarpericon@hotmail.com

ABSTRACT
It was possible to identify that university knowledge is not supported by the epistemic, meta-complex and meta-reflexive subject, university teaching is not really related to the requirements of the environment, problems arise when the student concludes their academic training, there are needs, emergencies and uncertainties and they have to face reality. The general objective of the research was to build the concept of 'university omniknowledge' by linking the elements of complex causality and metacomplexity. The methodology used analytical argumentation, including emergencies, developing complexities, the relevancies considered were: theoretical, methodological, social and transdisciplinary, the method was deductive, explanatory and transdisciplinary, questions, objectives and hypotheses were raised, the research was based on the pragmatism, covered the epistemological and ontological field, exploratory and descriptive studies were carried out, the research design was exploratory transectional and techniques and instruments were used. The research was an original work, obtaining significant information that benefits the individual-society-environment, starting from the educational base, with which it was possible to build university omniknowledge, which is not limiting, specifies useful knowledge, is capable of integrate and allows access to all kinds of knowledge, is practical and is accompanied by experience.

Keywords: Complex causality, Metacomplexity, University omniknowledge, Construction.

1 INTRODUCTION

It has been identified on the basis of logic and rationality that university knowledge does not rely entirely on the epistemic, metacomplex and meta-reflexive subject.

The university student should reflect from, in and on the practice, besides that such subject in recurrent form should be able to exercise reasoning, additionally he possesses the innate competence to learn at all times and therefore has the possibility to develop formal and non-formal learning.

But it is also identified that university education is not really linked to the requirements of the environment, which causes problems for students when they finish their academic training, since they do not have all the tools to face reality.

For the university student, the lack of an integral knowledge and an effective exchange of experiences causes that at the conclusion of their academic preparation there are doubts about the amount of knowledge they have acquired and how much of this will be effectively applied, all this is a consequence that there is no complete contextual knowledge to seek and propose solutions to problems of the environment.

Today, the university student has to challenge a complex reality, where mainly needs, emergencies and uncertainties are presented.

In this framework, the present research has direct incidence in the educational and social areas, in this understanding, complexity and transdisciplinarity should not be left aside as two ways of thinking that

nowadays are added to the search for an integrating perspective of knowledge and reality, opposing the atomizing and fragmenting situations.

Now, causality, due to its direct relationship with research, is said to be complex, because every phenomenon or fact has a cause, nothing happens without a cause, everything that comes to be is for some reason, every beginning has a cause, these situations are multidimensional, so causality is in the field of complexity, based on these characteristics causality is the primary link with metacomplexity as will be seen below, in addition to providing elements to build the university omniknowledge; on the other hand, what is produced becomes the effect.

This complex causality uses as its foundation the Theory of Knowledge, composed of natural relations, where similarities, contiguity and therefore complex ideas are produced that include philosophical relations, modes and substances, initially seen from the classical approach.

Complex causality is also structural as a consequence that allows the generation of ideas, concepts and therefore the emergence of new knowledge. Thus, causality transcends the connection between phenomena, events, structures, explanations, transfers, dependencies, discoveries, thoughts and/or constructions, causing dialogues to manifest themselves.

For its part, the idea of metacomplexity is based on the following:

Metacomplex is that which cannot be summarized in a master word, in a synthesis, that which cannot be reduced to a law, that which cannot be reduced to a simple or mechanistic idea (Morín, 2005: 9).

The metacomplex is the way of seeing the world, where the observer becomes aware of the complex reality.

Metacomplexity is the characteristic of a pedagogical action that forces us to rethink the ways of teaching and learning from metacognition, that is, from the coexistence of the opposite, the incorporation of chance, uncertainty and awareness of what is known or learned.

It is a fact that human beings are complex, "hyper-complex" and even more metacomplex, where uncertainty, anguish and disorder appear as part of their being and existence (Morín, 2005:3).

Meta-complexity can put in crisis the capacity of orientation and response to the different problems that emerge from this relative situation; originating in individuals and social groups, in general, a "spatio-temporal" crisis and in particular, a break in the pedagogical act, by questioning the identity and role of those who "teach" and those who "learn" (Rosas, 2004:22).

Thus, the metacomplex goes beyond metacognition, breaking space, dimension and time as limiting elements in the conformation of ideas for the construction of knowledge.

On the other hand, omniknowledge is the concept that is developed in this research, it is the proposal, the place where it is integrated and identified that the human being (individual) can access all kinds of knowledge with their respective relationships, applying useful knowledge, using complex causality and metacomplexity.

The omniknowledge, is all the knowledge that the university student requires to face the

environment and reality.

2 MATERIALS AND METHODS

For the development of the research, the methodology used took into consideration the analytical argumentation related to the object of study and to provide an alternative solution to the problem, additionally we proceeded to make the informed argumentation, which incorporates the problem and the hypothesis, the design of the research strategy was used to give coherence to the formalization of the intentions and in turn, the feasibility was verified in the development of the research, which is supported.

The research included emergencies, as part of the procedures of the materials and methods of the research; then emergencies are the response to complex causalities, therefore, they can be considered as the effect, since they are unexpected situations that have emerged from something, it is the new thing that is presented by the interaction of the different systems, phenomena or facts that make reality.

In fact, an emergence is a quality that is produced by the sum of the parts, but it cannot be confused with the totality, coexisting the emerging whole, the emergence is a particular characteristic of the whole. Thus, the whole is often more than the sum of its parts and at each level of complexity new and extraordinary qualities emerge that do not have a direct correspondence to the attributed characteristics of the constituents.

Emergencies have the potential to change society and the environment, this is achieved when the individual is able to develop the dimensions of being, thinking and acting..

The emergency according to Morín, 2006:

> "Emergency is a product of organization which, although inseparable from the system as a whole, appears not only at the global level, but eventually at the level of the components. Thus, the qualities inherent in the parts within a given system are absent or virtual when these parts are in an isolated state; they cannot be acquired and developed except by and in the whole". (p. 131)

An emergency is one that comes on suddenly and is equally:

a) Unexpectedness of the emergency effect and
b) the link of what emerges with its source, from within itself. (Sotolongo, 2009, p. 57).

For the specific case of the present research, social emergencies were taken into account, which are constituted by the society-education-environment system; where society continually presents complex situations at different levels of reality, has multiple connections, is active, is not in equilibrium, and this is the scenario in which the student must develop.

Education includes the teaching-learning process with its own particularities, seeks to integrate knowledge or knowledge, takes into account the adequacy of pedagogical theories, the new role played by technology within the educational process, also includes the performance and development of the university student and the alignment to his life project.

Referring to the environment, it is that which surrounds the university student, it is composed of the family, society, the environment, currently this environment has been amplified, because it is globalized, the environment supposedly is the one that dictates or raises the needs in which future professionals can develop and apply their knowledge, it is also composed of multidimensionality and self-organization among other aspects to be mentioned.

In this way, the integration of society-education-environment, makes situations emerge or appear with which the individual has to face, in this context new uncertainties are generated.

Therefore, complementarily emergencies have been confronted, considering the rationality to act, think and evaluate in a consistent way, it has been defined what was logically sought within the criteria of truth and knowledge of reality, determining the usefulness of university knowledge, so that these can be managed and used optimally, so as to be able to challenge the future through creativity, research, innovation and learning from mistakes, also religions to unite and disunite knowledge, concepts, ideas and thoughts, remembering what Morin, 2007 said, "the cause acts on the effect and the effect on the cause" (p. 99), this is how feedback is produced, then with these actions or responses to emergencies the consistency to the concept of university omniknowledge was granted.

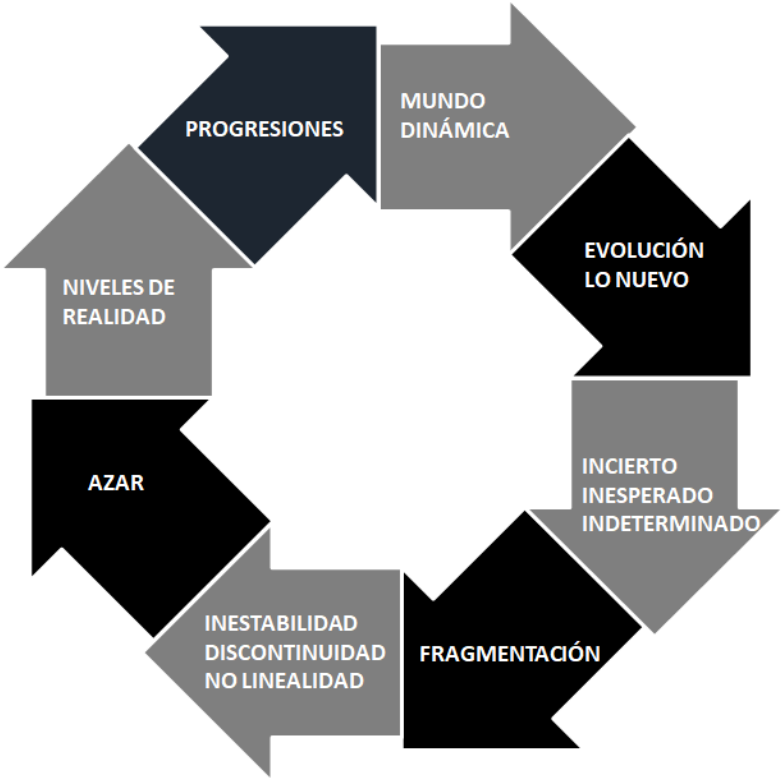
Based on Heisenberg's uncertainty principle (National Geographic, 2012), it is said that although there are some mechanisms to verify what is learned by the university student, there are also restrictions to determine in a real way the teaching-learning relationship, since there are external factors that affect the described relationship, externalizing the "disturbance" and in turn the emergence of uncertainty, where the areas of indeterminacy and unpredictability are found in the real.

The individual is surrounded by uncertainty due to the presence of the dynamics of the environment, where reality is not predictable, so that conjectures can occur, in uncertainty the existing and the non-existent are managed, for that reason, it is necessary to move on the possibilities that actions have in time.

The uncertainty principle affects the students' thinking, it has a direct influence on the philosophical question of "causality", it retains implications for science, which are not those commonly assumed, it makes all certainty about nature null and void and shows that science does not know and will never know where it is going and that scientific knowledge is at the mercy of the unpredictable wills of the universe, where it does not necessarily follow the "cause". (p. 11)

The emergence of uncertainty makes the complex, because it has elements of order and disorder, therefore, it is related to eventualities, it is the complex thinking that incorporates uncertainty and admits that which is contextualized, globalized, assuming the singular and the concrete, uncertainty is the way to face certainties, it makes the different areas perceive in a main way the uncertainties that have emerged in education, the need to have principles to face problems, the unexpected and the uncertain is born. (López et al, 2004).

Figure 1. Uncertainties in building omniknowledge. Own elaboration, 2021



PROGRESIONES: PROGRESSIONS
MUNDO DINAMICA: DYNAMIC WORLD
EVOLUCION LO NUEVO: EVOLUTION THE NEW
INCIERTO, INESPERADO, INDETERMINADO: UNCERTAIN, UNEXPECTED, UNDETERMINED
FRAGMENTACIÓN: FRAGMENTATION
INSTABILIDAD, DISCONTINUIDAD, NO LINEALIDAD: INSTABILITY, DISCONTINUITY, NONLINEARITY
AZAR: CHANCE
NIVELES DE REALIDAD: LEVELS OF REALITY

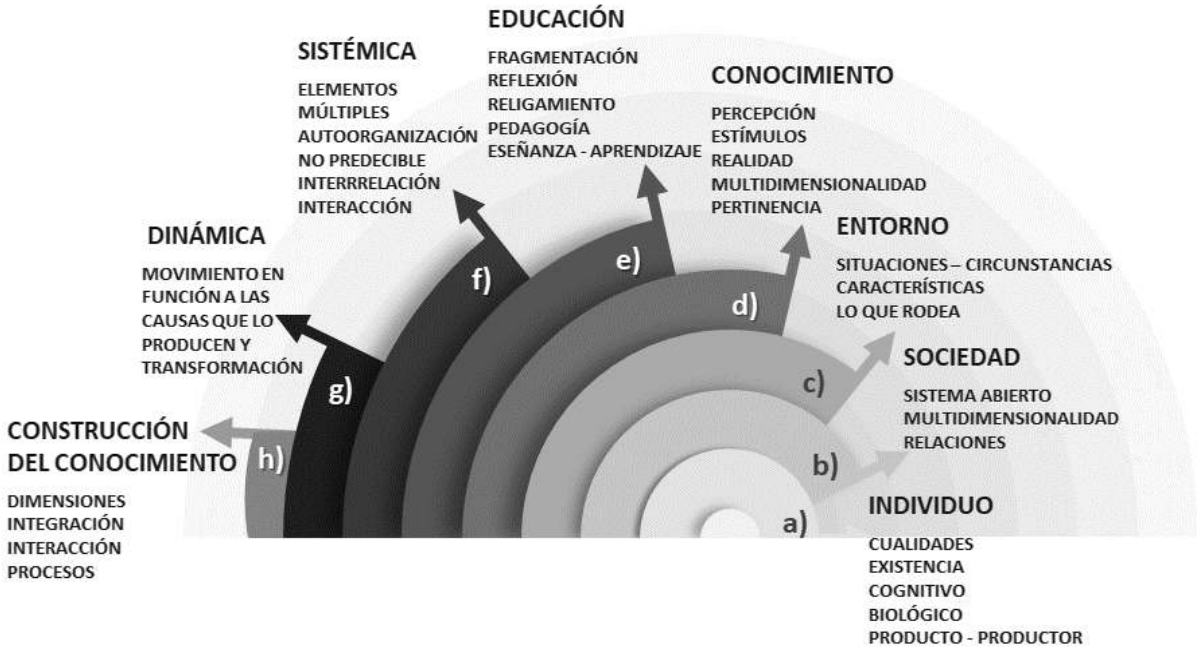
The complexities developed in the research are divided into a set of arguments that facilitate the understanding of the work (Da Conceição, 2008). This as part of the methodology employed.

For Da Conceição De Almeida, 2008, in relation to complexity, he expresses the following:

A constellation of diverse properties and understandings surround the notion of complexity. What is it? A method? A theory? Both? A property belonging to some systems? An attribute of all phenomena? These questions could multiply, since, with the increasing use of the word complexity in science, the meanings imputed to it are also multiplying. This side of the construction of knowledge is positive because it avoids the crystallization of a single meaning, but it also hinders a more accurate understanding of the notion of complexity and trivializes it "to avoid explaining", says Morin, "it is increasingly affirmed 'this is complex'. It is necessary to proceed to a real revolt and to show that complexity constitutes a challenge that the mind can and must overcome, appealing to some principles that allow the exercise of complex thought". (p. 23)

For the research, causalities have been identified that should be understood as the complexities developed.

Figure 2. Complexities developed. Own elaboration, 2021.



h) CONSTRUCCIÓN DEL CONOCIMIENTO: CONSTRUCTION OF KNOWLEDGE
DIMENSIONES: DIMENSIONS
INTEGRACIÓN: INTEGRATION
INTERACIÓN: INTERACTION
PROCESOS: PROCESSES
g) DINÁMICA: DYNAMICS
MOVIMIENTO EN FUNCIÓN A ALAS CAUSAS QUE LO PRODUCEN Y TRANSFORMACIÓN: MOVEMENT ACCORDING TO THE CAUSES THAT PRODUCE IT AND ITS TRANSFORMATION.
f) SISTÉMICA: SYSTEMICS
ELEMENTOS: ELEMENTS
MÚLTIPLES: MULTIPLES
AUTOORGANIZACIÓN: SELF-ORGANIZATION
NO PREDECIBLE: NOT PREDICTABLE
INTERRELACIÓN: INTERRELATION
INTERACCIÓN: INTERACTION
e) EDUCACIÓN: EDUCATION
FRAGMENTACIÓN: FRAGMENTATION
REFLEXIÓN: REFLECTION
RELIGAMIENTO: RELIGION
PEDAGOGÍA: PEDAGOGY
ESEÑANZA – APRENDIZAJE: TEACHING - LEARNING
d) CONOCIMIENTO: KNOWLEDGE
PERCEPCIÓN: PERCEPTION
ESTÍMULOS: STIMULOS
REALIDAD: REALITY
MULTIDIMENSIONALIDAD: MULTIDIMENSIONALITY
PERTINENCIA: PERTINENCE
c) ENTORNO: ENVIRONMENT
SITUACIONES – CIRCUNSTANCIAS: SITUATIONS - CIRCUMSTANCES
CARÁCTERISTICAS: CHARACTERISTICS
LO QUE RODEA: WHAT SURROUNDS
b) SOCIEDAD: SOCIETY
SISTEMA ABIERTO: SISTEMA ABIERTO
MULTIDIMENSIONALIDAD: MULTIDIMENSIONALITY
RELACIONES: RELATIONS
a) INDIVIDUO: RELACIONES
CUALIDADES: QUALITIES
EXISTENCIA: EXISTENCE
COGNITIVO: COGNITIVE
BIOLÓGICO: BIOLOGICAL
PRODUCTO – PRODUCTOR: PRODUCT - PRODUCER

Now, to understand the research problem, initially the situation was described (contextualization), then it is said that currently in several universities still applies university teaching (all - whole), referred to a single subject, so the student acquires a unique or universal knowledge of the specific subject being taught, other knowledge or knowledge from other people, cultures, areas, etc. are left aside; so this process is still identified by the direct interaction between the teacher and the university student.

University teaching is not really connected with the environment and this is due to its dynamics, which restricts the assignment of specific capabilities to students, since new scenarios are continuously occurring, there are limitations regarding the development of thinking and the opportunity to generate knowledge, there is no effective exchange of experiences between subjects to seek and propose solutions to problems of reality and therefore knowledge is not consolidated.

The opportunity to acquire multidisciplinary knowledge that comes from the environment is not being taken advantage of, so university knowledge is not strengthened either.

Then, it is considered that the knowledge does not become integral, making the university student at the end of his academic preparation does not know about the scope of the knowledge acquired in his training process, to this is added that the student does not question the knowledge obtained by him, so he does not have a contextual knowledge.

The teaching-learning process is still linear, it does not take into account that teachers or other people transmit other knowledge, knowledge or experiences on a common topic, restricting the student so that he/she can expand his/her knowledge frontier and use it in the best way.

It is not identified that there is social responsibility on the part of the environment, so that university students know what knowledge they should acquire to be applied in that context.

A global cognitive justice is not observed academically so that the university student can think, act and reflect on society in an integral and holistic way, so that he/she reaches a multiple but useful knowledge, a real distinction between subject and object does not prevail either, the union with nature or the environment is not identified in a way that stimulates the translation of knowledge, knowledges and practices, in addition that go towards the restitution of common sense knowledge.

Although the university student goes through a training stage, where the teaching-learning processes take place, accessing data, information and knowledge, he is not entirely ready to face a new reality at the end of his academic training.

In this context, it is necessary to determine for the individual-university student what is the knowledge with which he must face the new reality, or what is the knowledge that he has really acquired that will allow him to perform his professional activities, on the other hand, he must be able to respond with his knowledge to complex causalities, being able to adapt by making use of his academic preparation, using the tools acquired, using the information he has and integrating his knowledge to solve problems in the complex reality.

The individual faces an uncertain environment, where demands vary, thus, knowledge must facilitate access to means and resources, in addition to proposing and generating changes, satisfying the needs of society and therefore the environment.

The education received by the student should facilitate and allow him/her access to opportunities, in addition to being able to acquire experience and be prepared to undertake undertakings.

In addition, other limitations are identified since interdisciplinary knowledge that contribute to the development of multiple skills is not provided, reasoning in many cases is not critical, which means that the interpretation and reflections on each situation are not adequate, the individual is conditioned to visualize difficulties and project solution alternatives from the knowledge acquired in specific disciplinary areas.

The individual should be able to use the knowledge to have mastery of his profession; developing in the activities in a suitable, skillful and professional way, additionally, thanks to the application of such knowledge, he should use strategies that lead him to develop conveniently in the environment and society.

The university student has not assumed a total commitment to become the protagonist of his own learning, he has not realized that it is not enough to accumulate knowledge in disciplinary areas, but should complement his training with the acquisition of other knowledge and identifying his abilities and skills.

In addition, the strengthening of knowledge is affected because it presents a delegation of activities without a defined purpose, the aspects of self-training and self-regulation are still not understood, there is a lack of understanding and comprehension to develop cognitive and interpersonal skills, to this is added that there is no real development of the mentality of self-determination and adaptability, to cope with the environment and society.

Based on the above, the questions that guided the research are the following: how is the concept of university omniknowledge constructed through the use of complex causality and metacomplexity, what is the relationship between complex causality and metacomplexity, what is understood by knowledge, and what factors incorporate complexity and transdisciplinarity in relation to knowledge?

Regarding the theoretical relevance of the research, it is based on the use of the complex and transdisciplinary approach, since it allows having a wide scope in the research, since it can be verified, rejected and theoretical contributions can be made in relation to the construction of the concept of university omniknowledge, a concept that has not been previously developed by any person or researcher.

Theoretically, the present work also takes relevance because it conceives the reflection about the epistemological, ontological and methodological dimensions to access the information that is produced, so theories, information and results have been compared, likewise it was sought through the use of theory, the connection with the level and depth of what was raised, showing the articulation and organization of the information, giving way to the generation of new knowledge and the development of a new concept.

In relation to the methodological relevance, the use of research methods, techniques and procedures was used, so that the knowledge used was valid and reliable, these were applied directly in the construction

of the concept of university omniknowledge, these aspects allowed standardizing its use for further research.

In turn, the methodological relevance of the work was given by the presence of contributions of a theoretical nature, various instruments were also used, consequently techniques had to be assumed to be applied to the research topic.

While the research acquires social relevance because it has a direct impact on society and therefore on the individual, as it is directly connected with education that includes knowledge, aspects that serve to develop in a complex environment, at the same time contributing to meet the demands of society by solving problems.

The transdisciplinary relevance was in accordance with the guidelines mentioned by Espinosa (2014):

- Transdisciplinarity will help integration and religation.
- It will be accepted that it is impossible to bring together in a single discipline all the knowledge produced and yet to be produced.

From the above it follows that transdisciplinarity has its starting point in disciplinarity; that is, it accepts the advantages of disciplinary knowledge insofar as it allows the production of a large amount of knowledge, deepening the understanding of reality, and therefore it promotes, but it invests it with a new meaning that allows the producer not to get lost in the fragment, but to contextualize it in the totality.. (p. 35)

The research methods used are as follows:

> In contrast to the deductive method, the inductive method was used because it started from particular aspects to reach the general, working with four groups composed of individuals related to the research topic, who provided answers that later became generalized. We started from individual data and synthesized them by similarities, subsequently obtaining general propositions that allowed us to explain and understand the particular cases, thus favoring the interpretation of the results. To this is added the analysis of the documentation of specific aspects in order to make generalizations.
> This method was adapted to the research, since it focused on obtaining answers about what a certain part of the reality under study is like, a situation that was achieved through the surveys conducted with the four groups in the sample.
> The explanatory method was also used, which helped to find the causes within the object of study, thus facilitating the understanding of the fact and the conditions under which it occurs. It focused on the identification of the origins or causes of the set of facts present in the research, where the objective was to know why they occur, for which we proceeded to delimit the existing causal relationships.
> The complex aspect linked the diversity of knowledge and knowledges obtained, epistemology, theory and methodology were included, a dialogue was carried out among the answers and the emergencies raised were considered.
> The transdisciplinary helped to integrate the information, achieving the unity of knowledge, it also allowed to relate to scientific knowledge, it visualized the aspects of reality, it was possible to know the nature of the problems, although the research was in the field of uncertainty, finally, it was possible to transform the previous knowledge although it was within the framework of the dynamic structures that make reality.

For the development of the research, the following objectives were set: to construct the concept of university omniknowledge through the linking of complex causality and metacomplexity, to identify the relationship that exists between complex causality and metacomplexity, to examine the notion of knowledge and to determine the factors that incorporate complexity and transdisciplinarity in relation to knowledge.

The hypothesis was the following: the construction of the concept of university omniknowledge with the use of complex causality and metacomplexity will allow determining the structure of university knowledge and its impact on society and the environment.

The development of the work was supported by pragmatism because it is an element that proposes knowledge as valid when it has a practical utility, which is aligned with the research, in turn, causality was presented because it establishes the meaning of things or facts according to the relationships that are presented, helping to determine what is practical or not, the links between the practical and useful were important, seeking to generate knowledge in this context for the defined purposes.

In addition, pragmatism made it possible to motivate the change of reality, from the point of view of social utility, where society is within the environment, it is not purely subjective and neither is it framed in closed systems, on the contrary, it goes towards action and the objective. Pragmatism in the context of research facilitated new forms and principles that should govern the knowledge of the individual.

When pragmatism is taken into account as a method, it is directly related to the object of study, where reality is multidimensional, knowledge is comprehensive and admits the interpretation of the individual's experience, being conditioned to the interpretation of the cause-effect factor, for which there must be empathy with the individual-society in order to reach an understanding of the truth, where previously there has been an encounter between the statement and the facts.

Pragmatism within the work performed, is associated with the practice developed in the research, providing a guide for action, which consists in the analysis of the truth at different levels of reality. Pragmatism does not accept those practices that are forced and imposed, as long as they are not those developed by the individuals themselves as a consequence of the experience of their daily lives.

Pragmatism is amplified in the complex and transdisciplinary field, as a result of the fact that, besides reflecting reality, it goes beyond, since it identifies the usefulness or advantage of the knowledge that the university student should have.

In relation to the research about the epistemological field, Domínguez, E. (2006) refers to Michel Foucault and indicates that he has called "episteme" and also "epistemological field" to the underlying structure and, thus, unconscious, that delimits the field of knowledge, the ways in which objects are perceived, grouped, defined. Thus the episteme is not a human creation; it is rather the "place" in which man is installed and from which he knows and acts according to the resulting structural rules of the episteme. (p. 74)

This epistemological field is given by the nature of knowledge, which is in direct relation to the work that was investigated, where truths, beliefs and justifications are integrated, framed in reality, besides that it is also a real attempt to analyze the knowledge possessed by the university student.

The research developed was connected with the explanatory epistemology that deals with the "third why", allowing to scientifically base the starting point of the research, making the detection of the relationship between the object and the attribute, then we speak of complex causality and metacomplexity with its intervening and related elements thus constituting its own attributes.

Similarly, externalist epistemology was used as a support, where different points of interest were treated: complex causality, metacomplexity and knowledge; considering that experience and the relationship with reality are the starting point of all knowledge, for our case it was developed the omniknowledge, assuming and establishing it as a valid knowledge.

Then, epistemology is aligned with the research, because there is an edification and representation of the environment, in turn, scientific and humanistic knowledge are present, an exploration of knowledge was conducted, having made a review of various aspects and issues in a specific way to reach the general.

In the research there was the purpose of determining what was the real knowledge that the university student should have to face a new reality at the end of his studies, where useful knowledge is present or inserted in each individual. There was the attempt to clarify and deepen the term "to know" as it is incorporated in each person; so that the individual can interact with reality.

For the present study, epistemology has satisfied the following conditions:

a) Concerns the science itself..
b) It deals with philosophical problems, the causes and effects of natural things and especially of the individual..
c) Proposes solutions to a particular problem, solutions that fit the reality of the research..
d) Provides supported research.
e) Suggests promising new approaches.

The epistemological problems covered by the research were based on the indications of Mario Bunge:

a) Gnoseological problems:
   - Based on the observation of the facts and what they represent.
   - Empirical and theoretical concepts.
   - Use of the concept of probability according to the available information..
b) Methodological problems.
   - Control of the social phenomenon
   - Theoretical confirmation of the hypothesis.
c) Ontological problems.
   - It is not possible to respond from a traditional point of view.
   - It includes to be.
   - Abstract and concrete reality.
d) Axiological problems
   - The validation.

- Cognitive value and practical value.
- Decision theory.

The treatment of the object of the research was given by the:

a) Empirical knowledge: For there is a knowledge of the facts and an apparent order, explanations were given, based on experiences and knowledge obtained from others..
b) Scientific knowledge: It is present, since an analysis of the fact was provided, the causes were identified, a methodology was followed, the reasons were explained, it was general, methodical and systematic..
c) Philosophical knowledge: It came about through immediate realities, which, being of a suprasensible order, transcend experience. Reflection was accessed in order to obtain knowledge, and in turn, explanations were accepted..

With epistemology, the previous knowledge accepted as valid was questioned, it is assumed that, in the reflections carried out, epistemology did not influence the object of study of the research, that is, that the techniques and procedures of the method to obtain knowledge, organize it and the criteria to validate it were not affected..

The ontological sense for the present research was used in relation to the conceptual deformations of the concept of "construction of a new object" or "construction of the scientific object". It is not a question of ignoring the ontological or "material" existence of a reality beyond discourse. It is not an ontological but an epistemological construction. That is to say, it is not about "fabricating" in a material way a new object but about the construction of new knowledge, of new categories of analysis that make us discover, unveil aspects that until some moment were invisible. They make us discover aspects of reality hidden behind appearances. In other words, the new knowledge emanating from a research makes us visualize "a new object" ignored until that moment, not in the ontological sense of what there is, what exists, what is, but "new" in the epistemological sense of "new" in the epistemological sense. (Sirvent y Rigal, 2012, p.173).

It must be taken into account that the presence of the reality of existing and concrete facts in the individual also originates from a reality of possible, non-existent and abstract facts..

From the ontological point of view, the research covered the following areas:

- The unique and multiple reality.
- The relationship between thought and reality.
- Descriptivism to eliminate what does not exist from the view of reality as homogeneous.

The ontology in this research was given by the identity of the individual-university student, who not only reasons to reach conclusions, but on the contrary is produced by the relationship he has with his operations. The university student possesses intangible resources that are knowledge, which allows him to have a tool that can be used as a strategy to face reality in its multiple dimensions.

It is identified that the connection of contextual knowledge is a primordial component, and at the same time one of the greatest challenges in its use, due to the complexity of reality it is no longer enough

to use traditional methods, techniques and tools, to be practical and efficient it is necessary to know what is really useful.

Ontology in this research should be understood as the knowledge representation system. Ontology sought the understanding of omniknowledge, which contains the knowledge of the individual and is necessary to make inferences, but based on complex causality and metacomplexity.

In the methodological field, transdisciplinarity had its own characteristic, according to the object of knowledge to be constructed (the omniknowledge), the environment, the sociocultural scenarios and the availability of resources.

Therefore, in this field of transdisciplinarity we do not refer to a method as such, but to a strategy, where the elements become interrelated. Thus, the discovery of real and useful knowledge was sought, with the intervention of everything that surrounds the university student.

At this point it is important to mention that beyond the fact that all knowledge contains power, the idea would be to complexify and try to dialogue the principles of uniqueness, specialization and integration (Teves, 2009).

On the other hand, complexity in the same way implies referring to the interrelationships that can occur if the methodology is considered from a systemic approach, since the parts integrate the whole that allows relationships that are not simple, but rather are exchanges and complementarities.

Therefore, the methodology used in this research has different types of methods that complement each other adequately.

Thus, methodologically, transdisciplinarity translates into the use of the necessary tools to cover the approach to the object/process of study, which means incorporating tools from different disciplines. It also implies creating the necessary tools for the research in progress and that the researcher should think precisely according to his/her needs.. (p. 17)

According to the methodology used for the research, exploratory studies were carried out because the objective was to examine the topic or research problem, which has been little studied, and there were many doubts or it had not been addressed before. The literature review revealed that there were only unresearched guidelines and ideas vaguely related to the topic of study, and other connections and areas were investigated from different perspectives. Exploratory studies served to familiarize ourselves with the relatively unknown facts, gaining information about the possibility of carrying out a more complete investigation of the particular context, examining new problems, identifying promising concepts or variables, establishing priorities for future research, suggesting assertions and postulates. Exploratory studies rarely constitute an end in themselves; they generally determine trends, identify areas, environments, contexts and situations of study, potential relationships between variables; or set the "tone" for further, more elaborate and rigorous research. These inquiries are characterized by being more flexible in their method compared to descriptive, correlational or explanatory ones, and are broader and more dispersed (Hernández, R. Fernández, C. and Baptista, P., 2014, p. 91).

At the same time, facts, situations, contexts and events were described; this was to detail how they are and how they manifest themselves. Thus, it was resorted to using the type of research on descriptive studies, it was sought to specify the properties, characteristics and profiles of people, groups, processes, which are subject to the analysis of the research. Only information was collected independently and jointly on aspects related to the research. Just as exploratory studies serve fundamentally to discover and prefigure, descriptive studies are useful to show with precision the angles or dimensions of an event, context or situation. It is possible to define, or at least visualize, what will be measured and about what or whom data will be collected (people, groups) (Hernández, R. et al, P., 2014, p. 91).

The research design that suited the work was the exploratory transectional, the purpose of this design was to begin to know a new situation, where the results are valid exclusively for a time and place. It was an initial exploration at a specific time. This design was adapted to the research because it is used within the qualitative approach, so it is called "field immersion".

According to Cuauro, 2014 in reference to the techniques says:

a) Techniques

The technique is a set of practical knowledge or procedures to obtain the desired result, then, the technique is applied in any field of science: art, education, communication, among others. Therefore, the technique for the collection of information constitutes the practical means that was applied in obtaining information in this research.

The word technique in its etymological sense has two meanings: as an art and as a form of action. In both meanings it is related to forms or procedures of practical action. In the methodological field, when we speak of research techniques, we refer to the "how to do" that is proper to science. It should be specified then that in the methodological process, the primary function of research techniques is to carry out the observation of empirical phenomena and to obtain information to later contrast it with the theoretical model adopted or to generate a substantive theory based on them (Yuni, Ciucci, 2005, p. 169).

The instrument for the collection of information was the set of tangible means that made it possible to record, preserve and capture all that was investigated through the techniques used that facilitated the collection of information.

Therefore, observation was used as a technique to visualize the phenomenon and the context that was studied. It was a practical procedure that made it possible to discover, evaluate and contrast realities in the field of study. Direct observation was used in the collection of information, specifically in relation to the research, obtaining first-hand information.

The survey technique was used for the collection of information, since it avoids the biases of the persons surveyed. The survey was based on a questionnaire or set of questions that were prepared with the

purpose of obtaining information from the people, which included four groups: teachers, students, businessmen and professionals.

For the search of articles, the following databases were used: Scientific Electronic Library Online (SciELO), Red de Revistas Científicas de América Latina y el Caribe, España y Portugal (Redalyc), Dialnet, Google Scholar (Google Académico) and Red Iberoamericana de Innovación y Conocimiento Científico (REDIB).

Likewise, books and different web pages were reviewed, so that the information gathered would support the research work.

The search for information covered more than 5 years, because there is limited information on the research topic, so the search period had to be extended.

The surveys were elaborated with Microsoft Forms and were carried out digitally; for the analysis of the surveys we resorted to the use of Excel spreadsheets.

3 RESULTS

The research conducted had very little background because it is a new topic, there were only some aspects that were connected with the research, therefore, a theoretical compilation was carried out due to the lack of information, complemented with questionnaires, observation and experience.

An analysis was made of how the phenomenon of knowledge is currently presented in students, and to determine what is useful for them, so that individuals can face a new reality once they graduate, performing for this the interpretation of information and data with their attributes or particularities, in addition to verifying their interrelationships. Thus, we proceeded to carry out the exploration of information in four specific groups previously described and the review of printed documentation.

We resorted to non-probabilistic sampling, since we do not have access to a complete list of the individuals that make up the population (sampling frame) and, therefore, we do not know the probability that each individual will be selected for the sample.

For this research, we proceeded to carry out a convenience sample, which consisted of determining four groups:

- Teachers.
- Students.
- Graduates.
- Entrepreneurs.

Convenience sampling was based on selecting a sample of the population because it was accessible. That is to say, the individuals used in the investigation were chosen with a statistical criterion. This

convenience translates into great operational ease and low sampling costs, in addition to the fact that it does not detract from the validity of the sample.

Based on the analysis of the surveys conducted, the findings are as follows:

Findings from the information obtained from teachers.

a) According to the information obtained from teachers, most of them indicate that only a part of the subjects taught at the university are useful for students in the labor field, so we infer that only some knowledge is really useful for the new professionals.
b) In turn, teachers mention that in order for the new professional to perform in the labor field, he/she must possess competencies, socio-affective behaviors, cognitive, psychological, sensory and motor skills that allow him/her to develop adequately in a task, practice or function, together with the ability to perform a specific activity or job efficiently and effectively.
c) Teachers understand acquired knowledge as the assimilation of the theory.
d) Teachers say that the reasons why students do not acquire knowledge are mainly due to lack of interest and, to a lesser degree, lack of commitment, non-application of ICTs, lack of practice, lack of a previous knowledge base, and also because they think that the knowledge transferred to students will not be useful later in their academic life.
e) Identify as the main strategy for acquiring real knowledge, the realization of internships.
f) They mention that the causes or causalities to obtain knowledge are given firstly by interest, then by motivation and practice.
g) 80% of teachers indicate that there is no connection between the curricula (what is taught) and the needs of the environment, and the other 20% say that the connection is only partial.
h) For teachers, the best way to evaluate the student's knowledge is through the verification of the execution of practical exercises, without leaving aside the way of observing how they solve problems and verifying the solutions presented.
i) Teachers believe that the market requires a new professional who is capable of solving problems, can work in a team and has values.
j) For teachers, the way students apply their knowledge is through contact with the environment and practice, in addition to the application of problem solving.

Findings from information obtained from students

a) University students assume that knowledge is understood as everything that is learned and that will allow them to develop professionally.
b) The acquisition of knowledge for students occurs through the assimilation that takes place in the teaching-learning process, receiving information, in addition to practice, among other aspects.
c) They consider that useful knowledge is the specific knowledge taught in a professional career, as well as knowledge acquired through practice; others indicate that all knowledge is useful and is also the assimilated theory.
d) The students believe that the application of knowledge in the labor field occurs when theory is put into practice and, to a lesser extent, when solving problems in the environment.
e) The causes or causalities to obtain knowledge, according to the students, are essentially given by the need, in addition to the commitment with the environment and interest that each person gives to access knowledge.
f) According to the students, the barriers for acquiring knowledge are focused on the lack of interest, due to the fact that teaching is not related to real cases and, on the other hand, there is laziness on the part of the students themselves.
g) Students think that the labor market requires or demands a professional with efficiency, practical performance, who is continuously trained, who is also able to perform smoothly, master the theory and adapt to the environment.

h) For most of the students there is no connection between the curriculum and the environment; another percentage assumes that this is only partially the case.
i) In order to perform in the labor market, they believe that one must have a practical mastery and in-depth knowledge of the subjects learned at the university.
j) Students consider that in order to relate or connect knowledge there must be interest on their part; they also say that it is important to take into account the teacher's way of teaching.

Findings from the information obtained from the titled persons

a) Graduates indicate that the acquisition of knowledge during university life occurs through study, practice, transmission of knowledge and research.
b) Knowledge that is useful refers to theoretical knowledge, which has to be put into practice, while scientific and academic knowledge is also relevant.
c) For the graduates, the causes or reasons for obtaining knowledge are in line with the needs and to put into practice what they have learned.
d) According to the graduates, only 10% indicate that they apply 100% of the knowledge acquired at the university, another 20% say that it is only applied between 50% and 70%, the rest allude to other percentages that are between 60%, 40%, 35% and 10%.
e) Graduates identify that the labor market requires a new professional to have experience, broad knowledge of different areas and a predisposition to continue learning.
f) 60% of the respondents say that there is no connection between the curricula (what is taught at the university) and the needs of the environment, while only 30% say that there is such a connection.
g) 90% of the graduates identify that in order to perform in the labor market, theory must be put into practice.
h) According to the qualifications, to evaluate an acquired knowledge, this can be done through the evaluation of the result obtained.

Findings from information obtained from entrepreneurs

a) According to the employers, an acquired knowledge is evaluated according to its knowledge in ICT and the specialized or specific knowledge that the person has.
b) Employers say that the problems encountered by new professionals in applying knowledge are mainly due to lack of practice and experience.
c) The causes or causality for a person to acquire knowledge is produced by the person's desire for self-improvement.
d) The best way to verify whether the new professional applies knowledge is through his or her practical performance and through the results obtained.
e) Regarding the connection between the curricula (what is taught at the university) and the needs of the companies, 40% indicate that they are connected, another 40% say that they are only partially connected, and 20% indicate that they are not connected.
f) For entrepreneurs, knowledge is evaluated through the execution of practical work and the resolution of real case problems.
g) Among the various comments on what the labor market requires of a new professional, the application of knowledge stands out, but they indicate that the attitude of the person is also a determining factor.
h) According to the employers, the means for the new professional to apply his or her knowledge is through practice.

4 DISCUSSION

Referring to Selltiz et al (1976), the research objectives that have been set are in the first group and are those that have been proposed to be achieved, obtaining knowledge of the phenomenon or discovering

new aspects about it, as a result of which the research problem has been formulated with greater precision, until the hypothesis has been formulated.

The research questions have been formulated, according to the methodology described above, the same that covered the problem, which, through the analysis of the data and information and its interpretation, have made these questions to be answered, in addition, helped to follow the direction of the chosen theme.

What was intended to be known through the research was obtained. The development of the specific objectives allowed to reach the general objective and therefore the expected results of the research.

The research objectives are precise because they identify what was desired to be achieved throughout the research; they are related to the research problem and the type of study.

The objectives provide clarity to the research, since they are easily understood.

Table 1. Hierarchy of objectives

LEVEL OF COMPLEXITY	OBJECTIVES
LOW	**DESCRIBE / INDICATE** Se concentran en indicar rasgos o circunstancias de algo.
INTERMEDIATE	**DEFINE / EXEMPLIFY / NARRATE** Exigen una labor más detenida de focalización en los rasgos o circunstancias de algo.
HIGH	**ARGUE / EXPLAIN / COMPARE** Proponen un conocimiento más profundo del por qué, el cómo y el para qué de algo.
VERY HIGH	**ANALYZE / SYNTHESIZE / EVALUATE** They propose a deeper knowledge since they propose the above and aim at linking something with other things (similar, different, opposite, parts of it, etc.).

Note: Information based on Universidad del Salvador (del Salvador University), 2021. Own elaboration, 2021

The objectives set out in the research are located in the high and very high level of complexity, due to the characteristics they present.

The hypothesis is written based on a real situation, the statement already made it to be considered true, a situation that was verified with the development of the research. It is a complex hypothesis, since it predicts the causal relationship between the variables, both the dependent and the independent.

That is to say that with the statement of the problem the working hypothesis was born, in turn, the methodology establishes the researcher's link between theoretical and empirical knowledge, which presumes an initial dialectical relationship between both types of knowledge, where the theory guides the empirical research and the latter transforms the theoretical foundations.

The relationship between the general objective and the hypothesis suggests that both are consistent; it is also observed that there is a direct and exact link between them. In this framework, the coherence between the title, the problem, the objectives and the hypothesis is also present methodologically.

During the development of the research, coincidences and discrepancies of the information obtained have been found.

Coincidences:

a) It is considered that only some knowledge is useful to develop in the environment.
b) Knowledge comes from the assimilation of theory and research.
c) Knowledge is generated because there is interest and motivation in the individual.
d) Useful knowledge is considered to be knowledge that makes people specialists in a given area.
e) In general, there is no relationship between what is taught and what university students learn, therefore, it is not aligned with what is really required by the environment.
f) The way to verify knowledge is through practical development, problem solving and with the results obtained.

Discrepancies:

a) The student does not have the knowledge to develop the following competences.
g) In addition to knowledge, the individual is expected to be a team player and to possess values.
h) Knowledge is not acquired because there is no practice.
b) Knowledge is not acquired because real cases are not taught at the university.
c) They believe that knowledge is transferred depending on the way the teacher teaches.
d) Only some people believe that all knowledge is useful.
e) Knowledge is produced because needs arise in the environment.
f) A minimum percentage of people think that 100% of the knowledge acquired at university is applied.
g) It is thought that the new professional must have experience, including a broad knowledge of the different areas of knowledge.
h) The method for verifying the knowledge possessed by the individual is not clearly identified.

According to the information gathered, the contrasts between coincidences and discrepancies were contrasted and an analysis was carried out in order to have a deeper understanding of the elements that are part of the construction of omniknowledge.

Table 2. Contrasts between coincidences and discrepancies

COINCIDENCES	DISCREPANCIES	ANALYSIS
Only some knowledge is required.	Not only knowledge is required.	Most people believe that only a few skills are necessary to get by in the environment.
Knowledge is gained through assimilation of theory and research.	Knowledge is produced because needs arise. Knowledge is not acquired because real cases are not taught and there is no practice.	Knowledge is given by assimilating theory and conducting research, but this is restricted when it is not related to reality.
Knowledge happens because there is interest and motivation.	Knowledge is not given because the individual does not develop competencies.	Interest and motivation to obtain knowledge is key, which must be complemented by the development of competencies.
Useful knowledge is what makes individuals specialists.	All knowledge is useful. The new professional must have experience, as well as a broad knowledge of different areas of knowledge.	Most people accept that only some knowledge is necessary, but the complexity of the environment requires access to all knowledge, because everything is useful.
There is no relationship between what is taught and what students learn.	Knowledge is not connected due to the way teachers teach. Only a minimum percentage of knowledge acquired at the university is applied in the environment.	Knowledge is still fragmented.

Knowledge can be verified through the practical development of the individual, through the resolution of problems, in addition to evaluating the results obtained.	No clear way to verify knowledge is identified.	Most people indicate that the way to evaluate knowledge is through practice, solving problems and visualizing the results.

Note: Differences are shown according to the information obtained. Own elaboration, 2021

Las diferencias se muestran según la información obtenida. Elaboración propia, 2021:

- The theory regarding physics oriented to the construction of omniknowledge

For Galindez, 2007, when referring to quantum physics, he mentions that:

> "For classical physics the description of the motion of macroscopic objects is obtained with a precision close to accuracy; quantum physics explains the microscopic world with a margin of uncertainty. This margin of error is what has led to great research in search of minimizing this uncertainty." (p. 19)

Framed in this context, the theory of quantum physics refers to harmony and overcoming fragmentation, which provides the basis for developing omniknowledge, where not only generalizations are given; in turn, quantum physics starts from the real as something influenced by the observer, and there is a parallelism with the present research.

According to Klimenko, 2011, the term quantum physics also invites us to reflect on the relativity of the nominal value of knowledge: on the one hand, it is important to cultivate knowledge in human beings in order to better understand the world in which they live, and to build their actions in a more evolved way; however, the accumulation of knowledge itself can lead people to alienate themselves from the world and from themselves. (p. 166)

- Cognitive science theory oriented to the construction of omniknowledge

Ojeda, 2001, when speaking of cognitive sciences, insinuates the following:

> "Cognition" derives from the Latin word cognosco, which means "to know by the senses," "to see," "to know," "to recognize." But also, "to know by intelligence", "to understand" or "to be informed". For its part, the expression "cognitive sciences" corresponds exactly to the well-known word of Greek origin "epistemology", a term perhaps nowadays in disuse, possibly due to its long historical trajectory (more than 25 centuries), which prevents it from giving an understanding of the novel nuance that cognitive science attributes to itself, and which in Spanish means "theory of knowledge", i.e., the attempts to explain how we know. Varela defines cognitive science as "the modern scientific analysis of knowledge in all its dimensions". Of course, that we know seems to be of immediate evidence, and this knowing is something that human beings and many other living beings do, at least in the case of the cognitive sciences. (p. 1)

Cognitive sciences aim to understand what knowledge is and how we learn, they are a multidisciplinary space in which different disciplines concur, they also carry out the interdisciplinary study of the mind and intelligence, reflect on education creating links and structuring knowledge derived from psychology, neurosciences, social sciences and theories of intelligent artificial systems.

- The theory about knowledge oriented to the construction of omniknowledge

For Vargas-Mendoza, 2006, on knowledge, both point out that:

> "In the phenomenon of knowledge, consciousness and object meet face to face: the subject and the object. Therefore, knowledge can be defined as a determination of the subject by the object. A knowledge is true if its content agrees with the object mentioned.
> Knowledge has three main elements: the subject, the image and the object. Seen from the side of the subject, the phenomenon of knowledge approaches the psychological sphere; from the side of the image with logic and from the side of the object with ontology.
> We cannot advance a single step in knowledge if we do not start from the assumption that everything that happens takes place regularly and is governed by the principle of causality. This principle is expressed by saying that every change, every process has a cause.". (7, 8 y 22)

Knowledge is based on the perception of the senses, where stimuli are converted by the brain, generating a personal interpretation of reality, it is the action and effect of knowing, that is, obtaining information to understand reality through reason, understanding and intelligence. It is the result of the learning process, where reality is reflected and reproduced in human thought, in addition to experiences, reasoning and learning. Knowledge is a network of relationships, it is a conscious and intentional fact to learn the qualities of the object.

- The theory of transdisciplinarity oriented to the construction of omniknowledge

In relation to transdisciplinarity, Nicolescu, 1996, postulates that:

Transdisciplinarity comprises, as the prefix "trans" indicates, that which is at once between disciplines, across disciplines and beyond all disciplines. Its purpose is the understanding of the present world, and one of its imperatives is the unity of knowledge. (p. 37)

The three pillars of transdisciplinarity are: the levels of reality, the logic of the included third party and complexity, these pillars determine the methodology of transdisciplinary research.

a) Reality levels

i) Training based on three levels of the person's reality

Espinosa, 2011, refers to Galvani, 2007a, on the three types of learning linked to three main dimensions or levels of reality of the subject:

- Linked to the theoretical-epistemic or cognitive level, we sought to learn to think, through research and through the 3 pillars of transdisciplinarity and the 7 principles of complexity, trying to generate complex thinking;
- Related to the practical level, emphasis was placed on learning to dialogue, distinguishing and linking disciplines, assuming their limits and complementarities, seeking their interaction through dialogue (open versus discussion or persuasion) and collective exploration;
- Linked to the ethical or existential level (reintroduction of the sensitive and ethical dimensions), we worked with the perspective of learning to learn about self-knowledge, our own prejudices,

social, historical and personal conditioning of our beliefs and certainties, our inspiration and vocation, affinities, limits and possibilities, but also to generate reflections on knowledge and knowledge of knowledge. (p. 42)

ii) Object reality levels

Nicolescu, 2009, refers to two levels of reality, he indicates that these are different if, in passing from one to the other, there is a rupture of the laws and a rupture of the fundamental concepts (e.g. causality) (p. 23). According to the object in nature, two realities are given:

- Macrophysics
- Microphysics

iii) Levels of social reality and in the subject

According to CeuARKOS, 2016, and mentioning De La Torre and Moraes, these levels of reality are given by the following:

- Physical-biological
- Emotional
- Psychic

iv) Subject's reality levels

According to CeuARKOS, 2016, and by mentioning D'Ambrosio, 2007 and Nicolescu, 2006, these levels of reality are produced by the following:

- Individual
- Social
- Planetarium
- Cosmic

b) The logic of the included third party

The knowledge generated causes the existence of contradictory pairs that are mutually exclusive, such as knowing and not knowing, in this respect Nicolescu says that the logic of the included third party is used, which allows to distinguish the elements without separating them and to connect them without confusing them, this understanding is given by the fact that there is a "third term T that is both A and not A".

The included third party is also known as the "logic of inclusion", where contradictory coexist, it serves to understand how to move from one level of reality to another, helps to explain that a coherence at another level is an incoherence, then it is transdisciplinary and transformative, according to Bohr, the included third party is the complement that tends to merge and merge, without confusion…

The research applies the logic of the included third party with its respective laws, as referred to by Max-Neef, 2004:

> "First law of transdisciplinarity: 'The laws of a given level of reality are not self-sufficient to describe the totality of phenomena occurring at that same level'. (p. 15)
> Second law of transdisciplinarity: 'Every theory at a given level of reality is a transitory theory since it inevitably leads to the discovery of new levels of contradiction at new levels of reality'. (p. 16)
> Third law of transdisciplinarity: 'Only because of what is not, it is possible for what is to be, and only because of what is, it is possible for what is not to be.'". (p. 21)

c) The complexity

Morin, 1998, mentions that the term complexity can only express our confusion, confusion and inability to define in a simple way and put our ideas in order. The simplifying modes of knowledge mutilate more than they express those realities or phenomena they try to account for, it becomes evident that they produce more blindness than elucidation, a problem then arises. The word complexity carries with it confusion, uncertainty, disorder. Its first definition cannot provide any clarity: that which cannot be summarized in a master word, that which cannot be reduced to a law, that which cannot be reduced to a simple idea, is complex.

It is a matter of exercising a thinking capable of dialoguing and negotiating with reality.

> For Nicolescu, 1996, complexity is everywhere, in all the exact or human sciences, hard or soft. Social complexity points out, to the point of paroxysm, the complexity that pervades all fields of knowledge. (p. 33)

Transdisciplinarity is the desire to possess the most complete knowledge possible, it seeks to link knowledge located inside and outside the academic field (in our case the university), it determines the demand for usable knowledge, it integrates new knowledge, it uses the dialogue between two or more disciplines, it has the vision of reality as a whole, the approach that transdisciplinarity assumes makes different knowledge connect, thus accessing the globality and integration of reality.

In this field of complexity, the systemic-organizational, hologrammatic, retroactive, recursive, dialogic, self-eco-organizational, reintroduction of the cognizing subject, ecology in action and alienation principles are those that also allow the construction of a systemic knowledge, so that different nexuses are considered and uncertainties are faced; thus counterposing the fragmentation of knowledge with the integration of dispersed knowledge, avoiding simplifying and reductionist ideas of multiple facts, they try to modify thinking and leave aside the traditionalist paradigm, then they correlate with the proposal of university omniknowledge.

Cause and effect:

Chacón, 2015, mentions Morin (2007) who indicates that: "the cause acts on the effect and the effect on the cause" (p. 99). Therefore, the response or feedback obtained will change the course of the initial action, since it can be "inflationary or stabilizing" (Morin, 2007, p. 99), positive or negative. (p. 77)

For Sandre, within the recursive principle: products and effects are at the same time causes and producers of that which produces it. It breaks with cause-effect linearity, and leads to cyclical self-organization (p. 1)

The effect of a given cause is conditioned by some factors, and may lead to the assumption that this observed effect has only the variables under study as the only elements influencing the result. (Guzmán and Peeters, 2006, p. 1)

In the new paradigm of science the subjective acquires a new hierarchy, the mechanistic model is replaced by a probabilistic one, causal relationships are neither direct nor unique, each effect is the result of many causes including desires, fears, apprehensions, longings, fears; the relationship between cause and effect is relative, proportional; categorical statements are no longer accepted; and there is no longer any doubt that the observer's vision influences the phenomenon. (Lifshitz, 2019, p. 1)

Cárdenas and Andrade, 2020, mention the following: complexity theory emerges as a proposal and opportunity, in the face of the notable epistemological and explanatory gaps of the hard sciences (Morin, 1977), so called because of their particularity of understanding reality and the phenomena that compose it, based on biased, disjunctive, hierarchical and limited visions, hierarchical and limited, which reduce phenomena to cause-effect logic, and avoid uncertainty and non-linearity, that is, they restrict knowledge to a linear logic that scarcely takes into account the dialogue of knowledge, transdiscipline or the possibility of jointly weaving knowledge. (Andrade, 2018a). (p. 1)

Thus, cause and effect can be transformed reciprocally, therefore, cause becomes effect and effect becomes cause, but it must be taken into account that there is no effect without cause, in any case there is the phenomenon of retroaction, in which there are no determinisms that are absolute.

When linearity is excluded, there is an incoherent manifestation that encompasses a great sensitivity to initial conditions, there is no direct relationship between causes and effects, emergencies arise, imbalances, interruptions and uncertainties occur, and it is here where complexity provides flexibility, opportunity in responses and adaptability.

The cause and effect relationship is present in the individual, society and the environment, so that every action causes a reaction, a consequence or a result.

Among the causes that produce knowledge are the teaching-learning processes, cognitive processes, observation, analysis, experience, memory, reception of information, in addition to the development of creativity, providing the ability to solve problems and the execution of practice.

The complex causality:

Causality should be understood as the relationship between cause and effect, it is the cause or origin of something as its result, it is the effect or consequence, the causal nexus, it is the axis of union between a cause and its effect.

For Acosta and Bravo, 2015, in reference to causality they say:

> "The approach of causality based on complexity, proposes a different model of analysis, where causes are neither unique, nor multiple, but complex; moreover, the new theories of complexity provide a new way of apprehending reality, and help to distinguish a complex problem from a linear one or to recognize when one transforms into the other. The causality approach based on the complex system proposes a different model of analysis, which becomes a new way of learning reality and understanding behavior and the social environment; these new theories help to distinguish a complex problem from a linear one". (pp. 45-46)

It should be understood that complex causality does not renounce the presence of linear causality, only that complex causality has the scope to complex systems that are present in the environment, from the approach that has the complexity, but in parallel you can continue to analyze the non-complex systems from the point of view of simplicity.

But one has to be prepared, because complexity and simplicity or simplicity and complexity can be interchanged, so situations of imbalance and sudden changes can arise, for which one has to be ready to recognize these situations.

Complex causality is capable of integrating, of having dialogical relationships, uncertainty, order and disorder, processes, phenomena and concurrent and antagonistic facts, where the effects are, at the same time, causes and producers of that which produces them, thus eliminating linear causality. This complex causality has a necessary and temporal link.

In this context, complex causality for the present research incorporates the individual as a complex being: rational and delirious, hard-working and playful, empirical and imaginative, economic and dilapidator and prosaic and poetic (Morin, 1999, p. 27), while society has its own dynamics, is a producer, has a systemic character in which knowledge is linked, generates uncertainty, carries out interactions, etc. Finally, the environment, which is nothing more than that which surrounds the individual and society, are cause and effect and vice versa.

Now, as for the university, there we also find causality, through the teaching-learning process, interactions, the university is a producer of transformations, it responds to the needs of society and the environment, although in a limited way.

Table 3. Identified elements that cause or generate knowledge

No.	IDENTIFIED ELEMENTS THAT CAUSE OR GENERATE KNOWLEDGE
1	Putting theory into practice

2	Motivation
3	Understanding of reality
4	Need to know
5	The need to solve problems
6	Attitude
7	Experience
8	The teacher's role in motivating the student
9	Interest
10	Use of appropriate teaching-learning strategies
11	Research
12	The needs of the environment
13	Internal commitment
14	The need to apply knowledge
15	Having opportunities in the environment
16	Study

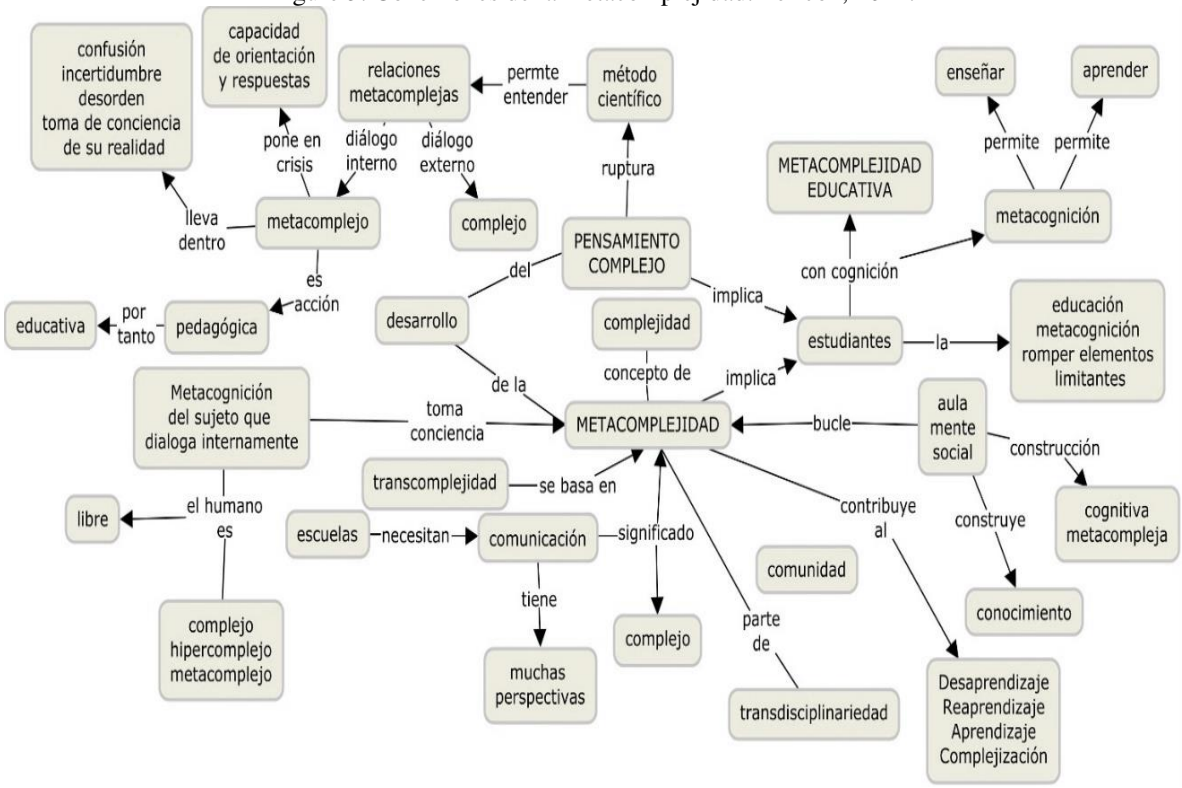
Note: The most relevant elements that cause or generate knowledge are detailed. Own elaboration, 2021.

Additionally, knowledge is caused or generated by cognitive processes, perception, memory, by information acquired from oneself, society and the environment, by the processes performed by thought, representations and abstractions of reality, the interaction that occurs between the subject and the object, in turn when knowledge itself generates knowledge and by the relationships between abstract or physical entities.

The effect produced by knowledge is given by the understanding of emotions, decision making, understanding of reality, development of skills, problem solving, adaptability, application of theory to practice, identification of emergencies, how to cope with uncertainty and adaptation to the environment.

The other element that allows the construction of university omnicomplexity is metacomplexity, which has its own connections.

Figure 3. Conexiones de la metacomplejidad. Pericón, 2021.



TRADUÇÃO FIGURA 3:

confusion
incertidumbre
desordem
toma de conciencia de su realidad:
confusion
uncertainty
disorder
awareness of their reality
capacidad de orientacion y respuestas: orientation and response capabilities
lleva dentro: carries within
pone en crisis: puts in crisis
relaciones metacomplejas: metacomplex relationships
diálogo interno: internal dialogue
metacomplexo: metacomplex
complejo: complex
diálogo externo: external dialogue
permite entender: allows to understand
método científico: scientific method
ruptura: ruptura
pensamiento complexo: complex thinking
del: of
desarrollo: development
complejidad: complexity
concepto de: concept of
implica: implies
metacomplejidad educativa: educational metacomplexity
con cognición: with cognición
estudiantes: students
ensenãr: to teach
aprender: to learn
permite: allows

metacognición: metacognition
educación, metacognición, romper elementos limitantes: education, metacognition, breaking down limiting elements
aula mente social: social mind classroom
construcción: construction
cognitiva metacomplexa: cognitive metacomplexity
construye: constructs
contribuye al: contributes to the
conocimiento knowledge
desaprendizaje,, reaprendizaje, aprendizaje, complejización: unlearning,, relearning, learning, complexification
comunidad: comunity
parte de: parto f
transdisciplinariedad: transdisciplinarity
complejo: complex
implica: implies
bucle: loop
metacomplejidad: metacomplexity
de la: of
toma conciencia: become aware
se basa en: is based on
significado: meaning
transcomplejidad: transcomplexity
comunicación: communication
tiene: has
muchas perspectivas: many perspectives
necesitan: needs
escuelas: schools
es acción: is action
pedagógica: pedagogical
por tanto: therefore
educativa: educational
metacognición del sujeto que dialoga internamente: metacognition of the subject who dialogues internally
el humano: the human
libre: free
complejo, hipercomplejo, metacomplejo: complex, hypercomplex, metacomplex

Table 4. Elements involved in and related to metacomplexity

No.	ELEMENTS INVOLVED IN AND RELATED TO METACOMPLEXITY
1	Pedagogical action
2	Approach to realities
3	Classroom
4	Classroom-mind-social
5	Chance
6	Coexistence of opposites
7	Complexity
8	Communication
9	Complex consciousness
10	Confusion
11	Knowledge
12	Metacomplex cognitive construction
13	Knowledge construction
14	Worldview

15	Disorder
16	Dialogue
17	External dialogue
18	Internal dialogue
19	Teacher
20	Education
21	Emergencies
22	Teaching-learning
23	Student
24	Uncertainty
25	Interculturality
26	Intersubjectivity
27	Complex research
28	Transdisciplinary research
29	Metacognition
30	Motivation
31	World
32	Nature
33	Observation
34	Paradigm
35	Pedagogy
36	Thinking
37	Complex thinking
38	Complex processes
39	Educational processes
40	Reality
41	Complex reality
42	Reflection
43	Relationships
44	Religion
45	Semiotics
46	Human Being
47	Society
48	Awareness
49	Transcomplex
50	Transdisciplinarity

Note: The elements were subjected to an analysis to verify their effective connections. Pericon, 2021.
Although complexity and transdisciplinarity are ideas and concepts that have been circulating for a long time, it is in recent times that they are becoming more prevalent, both ideas are connected with society and education, to this, several people have associated the concept of metacomplexity, along with relevant aspects such as dialogicity, the human being, the world, the worldview, among others.

Metacomplexity is produced in the classroom, it is also related to teaching and learning, where the student's metacognition is present, it makes the student and his environment understandable, metacomplexity is confusion, uncertainty, disorder and awareness of reality, it is connected with educational processes, it has internal and external dialogicity, admitting the individual and social

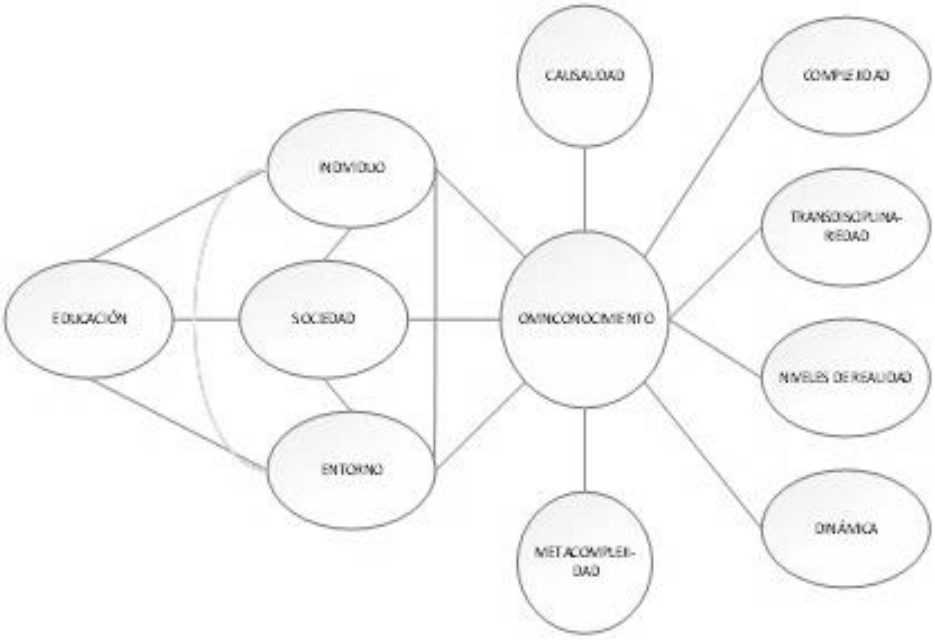
construction and deconstruction, it is complex consciousness, it has the ability to locate and respond to various problems that arise from different situations.

In order to have a greater objectivity in the components of metacomplexity, the following is detailed as argued by Pericón, 2021:

> "... the elements that intervene and are related to metacomplexity are in the complex, transdisciplinary, transcomplex, metacognitive, complex thinking, complex consciousness, society and education, facilitating the understanding of oneself and the world.
> It is observed and identified that metacomplexity incorporates uncertainty, disorder and awareness of reality, in addition to having the capacity to place answers in crisis.
> The foregoing determines that metacomplexity has a global scope and that it contributes to society and education as an integrating element and of application in development and knowledge, having the human being or subject as the preponderant participant.
> ... it has been possible to establish relationships between facts, which are actions that happen because of an effect or action, so this leads previously to mention that metacomplexity is intertwined with complexity, transdisciplinarity, the human being, the world, nature, cosmovision, education, awareness, cognitive, knowledge, the classroom, dialogue, research, thought, processes, emergencies, metacognition and reality. (pp. 52, 53 and 54)

So in all this context and to have a broad understanding of the new concept, referred to omniconocimiento, it should be said that it mainly focuses on useful knowledge, in an area where knowledge is abundant and are linked, it is also considered the validity and permanence of relevant knowledge for the individual once completed their university education can develop conveniently in the environment, then the first task is to locate and identify the macro connections that has the university omniconocimiento, for which the following scheme has been developed:

Figure 4. Location and macro relationships of the omniconocimiento. Own elaboration, 2021



TRADUÇÃO FIGURA 4:

EDUCACIÓN: EDUCATION
INDIVIDUO: INDIVIDUAL
SOCIEDAD: SOCIETY
ENTORNO: ENVIRONMENT
CAUSALIDAD: CAUSALITY
OMNICONOCIMENTO: OMNI-KNOWLEDGE
METACOMPLEXIDAD: METACOMPLEXITY
COMPLEJIDAD: COMPLEXITY
TRANSDISCIPLINARIEDAD: TRANSDISCIPLINARITY
NIVELES DE REALIDAD: REALITY LEVELS
DINÂMICA: DYNAMIC

As can be observed, omniknowledge has elements that are provided by causality, in this case reality shows that for every phenomenon or fact there is a cause and an effect and that the effect can become a cause as mentioned above, it has elements of simplicity that are used to perform the analysis, warns about imbalances, allows integration and linking, considers the transformations within a context of uncertainty. On the other hand, we have metacomplexity, which comprises broad ideas, is not limited to specific concepts, includes metacognition from complexity, involves people and accesses to become aware of what has been learned.

The individual, society and environment are connected with education and omniknowledge, where the integrating element is knowledge, which is generated at different levels and in different ways.

In turn, knowledge from the perspective of complexity, has to be understood as multidimensional that moves in a spectrum of uncertainty.

At the same time, through transdisciplinarity, we seek to obtain an integral knowledge, which does not fragment knowledge, capable of dialoguing between different knowledge at other levels of reality.

At the same time, the ontological axiom shows the fundamental pillar of transdisciplinarity, and accepts that there are different levels of reality with different levels of knowledge and perception, where a level of knowledge reaches its real meaning within the existence of other levels.

The dynamics of the environment, conceives uncertainty, where knowledge must be able to self-organize, coordinating, synchronizing processes and possessing the quality of autopoiesis.

Having identified the characteristics of complex causality and metacomplexity, we proceed to build the university omniconocimiento, the same that determines the knowledge that is useful to face reality and develop in the environment.

The omniconocimiento is constructed by means of the volume of knowledge that the student assimilates, for which the student must have with himself interest and commitment, which will allow him to conduct himself in the environment.

While the useful knowledge is given by that multidisciplinary knowledge that the student must possess, avoiding fragmentation, (this is still the way of teaching in universities), so that he can solve problems and provide solutions, this knowledge is not limited only to academic knowledge, but also has to do with knowledge of personal development.

The useful knowledge must include the management of transdisciplinarity, so that a complete knowledge is obtained from multiple perspectives, also conceiving emerging knowledge, it is also useful the knowledge about research tools that allows the individual to identify the needs of the environment, it is important that the student has more hours of practice in relation to the theoretical classes, should learn about real cases and not only hypothetical, it is useful that he can have the knowledge to develop competences framed in the application of skills, attitudes and values.

The interaction between complex causality and metacomplexity allows the construction of omnicomplex knowledge.

Table 5. Interactions oriented towards omniknowledge

CAUSALITY	*METACOMPLEXITY*	*OMNI-KNOWLEDGE*
Practice theory Experience	Pedagogical action Approaching reality Classroom Classroom-mind-social Communication Knowledge Metacomplex cognitive construction Knowledge construction Teacher Education Teaching-learning Student Complex research Transdisciplinary research Observation Pedagogy Thinking Reflection Religion Semiotics Human Being Society	Useful knowledge is that which is practical and provides experience, starting from theory, for which it must be supported by the metacomplex elements that are pointed out, allowing the connection of coherent information and data.
Metacognition	Pedagogical action Classroom	Another useful knowledge is the use of metacognition,

	Classroom-mind-social Knowledge Metacomplex cognitive construction Knowledge construction External dialogue Internal dialogue Teacher Education Teaching-learning Student Interculturality Intersubjectivity Metacognition World Paradigm Pedagogy Thinking Reflection Religion Semiotics Human Being Society Awareness	based on the metacomplex elements that it possesses, producing educational research developed during classroom experiences, in order to provide knowledge and control of the learning process, so that the learning of relevant properties related to information and data can emerge.
Need to know Need of the environment Need to solve problems Need to apply knowledge	Approach to reality Motivation Confusion Knowledge Metacomplex cognitive knowledge Knowledge construction Education Teaching-learning Uncertainty Intersubjectivity World Observation Paradigm Thought Reflection Relationships Religion Awareness	The satisfaction of needs is implicit in the human being and serves him to develop individually and in society, being able to interact with the environment, here the useful knowledge is determined by the ability to identify the deficiencies that must be corrected, using the limited resources that exist in a dynamic environment.
Motivation Attitude Interest Internal commitment	Approximation to reality Knowledge Knowledge construction Internal dialogue External dialogue Emergence Motivation World Thought Reflection Relationships Religion Human Being Society Awareness	Another useful knowledge is that of the value and principles of the human being involved in assertive behavior, relating it to the elements of metacomplexity, so that there is no deviation and the goals set for the individual are met.
Teaching-learning strategies	Pedagogical action Classroom Classroom-mind-social Communication Knowledge Metacomplex cognitive construction	There are several teaching-learning strategies, which must be aligned to the metacomplex elements that will be applied according to the situation, but they must have the ability to focus on cognitive skills and

	Knowledge construction Worldview External dialogue Internal dialogue Teacher Education Teaching-learning Motivation World Observation Paradigm Pedagogy Thinking Reflection Relationships Religion Semiotics Human Being Society Awareness	provide meaningful learning, so that knowledge is organized, with which the individual can attend, learn, think and solve problems, on the other hand, as it is known, meaningful learning occurs when new information makes sense or is related to existing knowledge.
Research	Pedagogical action Approach to reality Classroom Classroom-mind-social Communication Knowledge Metacomplex cognitive construction Knowledge construction External dialogue Internal dialogue Teacher Education Teaching-learning Student Uncertainty Interculturality Intersubjectivity Complex research Transdisciplinary research Observation Paradigm Pedagogy Thinking Reflection Relationships Religion Awareness	In turn, it is useful knowledge to learn to investigate, assuming the metacomplex elements with which it is related, which deepens the individual's knowledge of facts, phenomena or others, also helps to seek new knowledge, provide solutions to problems, in addition to providing meaning to reality.
Environmental opportunities	Approaches to reality Complexity Knowledge Worldview Education Emergencies Uncertainty World Observation Reflection Human Being Society Awareness	For this point, the useful knowledge is given by the knowledge of tools of analysis of the environment supported by the metacomplex elements, in such a way that one has a perspective of the reality at a specific point, to determine what is required and how to face the problems, gaining an advantage over the rest of the individuals.
Study	Pedagogical action Approach to reality Classroom	This useful knowledge is given by the knowledge of study techniques that must be

	Classroom-mind-social Communication Knowledge Metacomplex cognitive construction Knowledge construction Teacher Teaching-learning Student Complex research Transdisciplinary research Metacognition Motivation Observation Pedagogy Thinking Reflection Relationships Religion Semiotics Awareness	connected to the elements of metacomplexity, these techniques serve the individual during and after his university life, which enhances learning, can be applied in different areas, allow organizing and retaining information, the techniques are multidisciplinary.
Complexity Transdisciplinarity	Approximation to reality Chance Coexistence of the opposite Complexity Complex consciousness Confusion Emergencies Uncertainty World Observation Complex thinking Religion Human Being Society Transcomplex Transdisciplinarity	Finally, complexity is useful knowledge, as it helps to identify the elements that are linked, reducing uncertainty and therefore it is not simplistic, on the other hand, transdisciplinarity, through the unity of knowledge achieves the identification of the different levels of reality, being able to dialogue.

Note: The relationship of reciprocal actions is described. Own elaboration, 2021

The omni-knowledge is composed of an abundant amount of knowledge, although there is a validity and permanence of knowledge, these are determined by the characteristics of the environment; University omni-knowledge in its generality is composed of specific knowledge, which has to adhere to multidisciplinary knowledge, since all knowledge is valid, to this are added the useful knowledge that are the basis of omni-knowledge and refer to the knowledge obtained thanks to the practice developed, metacognition, identification of deficiencies, application of values and human principles, teaching-learning strategies, learning to investigate, tools of analysis of the environment, study techniques, complexity and transdisciplinarity.

It is assumed that, with the university omni-knowledge, the individual will be able to develop within society and the environment, will have the ability to move in the different levels of reality; this new concept is not only about including the subjects that are taught within the curricula, thus, research tells us that we must have a comprehensive knowledge, which is outside the classroom, complemented with other types of knowledge.

Complex causality and metacomplexity have been a factor that contributed to build the university omniconocimiento framed in reality, a key aspect that is also cause and effect, is constituted by the teaching-learning, where the teacher plays an outstanding role in helping the student to consolidate their knowledge, although the acquisition of knowledge is not directly delegated to the work of the teacher.

The research also shows that education is not connected with the environment, since what is taught is not being applied once the university studies are finished, which makes us rethink the knowledge that is really necessary or useful for the individual.

There is still fragmentation of knowledge and this is produced by the characteristics of teaching and the way of configuring the curricula. Thus, the idea of omni-knowledge re-emerges as a solution, since it allows access to all types of knowledge and is not limiting.

The university omni-knowledge, although it is complex by the different relations of which it is composed, by its understanding and application, is a source to face the environment and reality, which will reduce uncertainty.

Additionally, the environment and reality are the focal points for the processes of change to occur, framed in the dynamics that determine a precise moment, which needs an answer, therefore, the answer is the use of the omni-knowledge that will now be available to individuals.

5 FINAL CONSIDERATIONS

The present research constitutes an original work, in which the scientific methodology has been applied, accompanied by the complex and transdisciplinary components, thus, in the course of the research, novel results have been obtained, which is related to the objectives and the hypothesis proposed, at the same time, the questions formulated, the proposed objectives were answered and the hypothesis has been verified.

It was found that there were no previous research references where the relationship between complex causality and metacomplexity is mentioned.

On the other hand, having clearly identified the elements of complex causality and metacomplexity, significant information was generated, which connected omniknowledge with the individual, society and environment, starting from an educational basis, to which were added the potentialities of complexity and transdisciplinarity, due to the characteristics that these concepts possess.

The elements identified allowed the construction of university omniconocimiento, which is not limited only to possessing specific knowledge, but opens the door for the individual to access all types of knowledge, in addition to providing the individual with the tools to face the environment and reality, the main aspect being the management of useful knowledge.

It was specified that useful knowledge is generated by: the execution of practice, the use of metacognition, the ability to identify deficiencies, the application of human values and principles, the use of teaching-learning strategies, the application of tools for analyzing the environment, knowledge of study techniques and knowledge of complexity and transdisciplinarity.

The relationship between complex causality and metacomplexity was given by the correspondence, connection, linkage and/or religiosity of facts; situation that has allowed formalizing the identification of the elements that are the basis of the construction of university omniconocimiento, these elements in its broad context outside the complex causality and metacomplexity are education, reality, needs, practice, experience, research, thinking, awareness, uncertainty, emergencies, uncertainties, problems, knowledge, complexity, transdisciplinarity, the individual, society and the environment.

Meanwhile, the notion of knowledge refers to the implicit link between the individual and reality, where knowledge is produced in a complementary way thanks to the accumulation and processing of data and information about the environment, it is the understanding of theory and practice with its corresponding processing, knowledge is affected by reality, in turn, two elements are involved in it: the subject and the object, it is objective and subjective, it has dynamic characteristics, it is characterized by being true according to time and place, it also includes cognitive processes.

The dynamics of the environment has led to the emergence of supreme and religious knowledge, in this sense it is a great support to resort to the complexity and transdisciplinarity, in turn the field of research has required to resort to these two components, in order to reach the object of study.

Complexity and transdisciplinarity are connected and have factors related to knowledge. Transdisciplinarity helps to respond to complexity, because it incorporates the levels of reality, the third included and complexity, in a complementary way it brings with it a set of knowledge where the processes presented by the different disciplines are included, disciplines that are taught at the university, it does not allow the fragmentation of knowledge, on the contrary it is oriented to the unity of knowledge, it approaches as much as possible to the phenomenon or fact, it deploys in the individual the conscience and coherence to develop in reality; complexity, on the other hand, integrates all areas, where education, society and the environment are also inserted, develops in the context of reality, includes cognitive aspects because they are complex, confronts knowledge, innovates and adapts to the dynamic environment, recognizes networks that intertwine elements, reaches the different scientific areas and seeks solutions to current problems.

The construction of the concept of university omni-knowledge has been based on the following aspects: the capacity of the individual to integrate and access all types of knowledge, using for this the elements provided by complex causality and metacomplexity, so that he/she can face the environment and reality, in addition, the cause - effect and effect - cause loops have been considered, the response to emergencies and the reduction of uncertainties have been taken into account, all knowledge was integrated, the characteristics of practice and experience on the part of the individual have been founded, metacognition was taken into account, the identification of the needs of the human being has been operated taking into account teaching-learning strategies and research, limiting aspects were not suppressed, the management of uncertainties was carried out and the knowledge that is really useful was analyzed, with which the construction of the concept of university omni-knowledge was structured.

The university omni-knowledge becomes a concept that has the sufficiency to change the reality of the educational environment, which favors the individual-society-environment, since it allows for greater efficiency and effectiveness in the activities developed by the individual.

The university omni-knowledge provides the necessary elements to the universities to modify the curricula, adapting them to the needs and reality of the environment, at the same time, it is possible to have professionals with new aptitudes and with optimal capacities to develop appropriately in the environment.

This new concept contributes so that the new professionals can be aware of what is required of them, not limiting themselves to the assimilation of knowledge obtained at the university, therefore, secular, popular, traditional, peasant and other knowledge is also taken as valid, which will generate better life opportunities and will also make individuals build their life project..

REFERENCES

Acosta, M. y Cabrera, N. (2015) *Transformación en epidemiología: Causalidad compleja*. Universidad Mariana - Boletín Informativo CEI 2 (2). Segundo cuatrimestre 2015. Editorial UNIMAR. Bogotá D. C.

Cárdenas, L. y Andrade J. (2020) *El poder: una mirada desde la complejidad*. Recuperado el 11 de diciembre de 2021 de: https://publicaciones.unaula.edu.co/index.php/ratiojuris/article/view/1077/1437

Centro de Estudios Universitarios ARKOS (2016) *Principios*. Recuperado el 29 de noviembre de 2021 de: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=http%3A%2F%2Fwww.ceuarkos.edu.mx%2Fwp-content%2Fuploads%2F2019%2F10%2Fprincipios.pdf&chunk=true

Chacón, M. de J. (2015) *Congruencia del pensamiento complejo de Edgar Morín en la metodología de la educación a distancia*. Revista Año XIV, N.º 30: 75-81, julio-diciembre 2015.

Cuauro, R. (2014) *Guía didáctica metodológica para el estudiant*e. Módulo, Número 2. Recuperado el 11 de julio de 2021 de: https://mestrado.prpg.ufg.br/up/97/o/T%C3%A9cnicas_para_IAP.pdf

Da Conceição De Almeida, M. (2008) *Para comprender la com*plejidad. Multiversidad Mundo Real Edgar Morinm A. C. Sonora. México.

Domínguez, E. (2018) *El octavo saber. Diálogo con Edgar Morin*. Multiversidad Mundo Real Edgar Morin, A. C. México.

Domínguez, E. (2006) *Representaciones colectivas, episteme y conocimientos*. Revista Universidad EAFIT. Vol. 42. No. 144 Colombia.

Espinosa, A. C. (2014) *Abrir los saberes a la complejidad de la vida. Nuevas prácticas transdisciplinares en la universidad*. Centro de Estudios Universitarios ARkos. Puerto Vallarta. México.

Espinosa, A. C. (2014) *Estrategias metodológicas para operacionalizar la práctica educativa transdisciplinaria, en conjunto con los actores universitarios, en las licenciaturas del Centro de Estudios Universitarios Arkos (CEUArkos) de Puerto Vallarta, Jalisco, México*. Revista Electrónica Educare, vol. XV, núm. 1, enero-junio, 2011.Universidad Nacional Heredia. Costa Rica.

Galati, E. (2017) *El pensamiento complejo y transdisciplinario como marcos de investigación científica*. Relmecs, junio 2017, vol. 7, no. 1, e021, ISSN 1853-7863 Universidad Nacional de La Plata. Facultad de Humanidades y Ciencias de la Educación. Centro Interdisciplinario de Metodología de las Ciencias Sociales. Red Latinoamericana de Metodología de las Ciencias Sociales.

Galindez, J. (2007) *La física cuántica en el pensamiento, la acción y el sistema neuronal*. Publicaciones Vicerrectorado Académico CODEPRE. Universidad de los Andes. Venezuela.

Guzmán, S. y Peeters, I. (2006) Una visión metodológica diferente en la investigación en salud: el anti-método. Educación médica. Gac Med Bol v. 29 n. 2 Cochabamba 2006.

Hernández, R. Fernández, C. y Baptista, P., (2014) *Metodología de la investigación.* McGrawHill Education 6ta. Edición. México.

Lifshitz, A. (2019) *Edgar Morin y la educación médica del futuro*. Recuperado el 22 de diciembre de 2021 de: https://medicinainterna.org.mx/article/edgar-morin-y-la-educacion-medica-del-futuro/

López, *et al* (2004) *Cuántica y relatividad TOE´s (teoría del Todo)*. UPV/EHU, Leioa 1º Físicas Fundamentos de Química mayo 2004.

Max-Neef, M. (2004) *Fundamentos de la transdisciplinariedad*. Recuperado el 31 de enero de 2022 de: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=http%3A%2F%2Fecosad.org%2Fphocadownloadpap%2Fotrospublicaciones%2Fmax-neef-fundamentos-transdisciplinaridad.pdf&clen=200206&chunk=true

Moraes, M. C. (2008) *Ecologia dos saberes. Complexidade, transdisciplinaridade educacão. Novos fundamentos para iluminar novas práticas educacionais*. WHH Antakarana. Editora ProLíbera. São Paulo. Brasil.

Morin, E. (2007). *La cabeza bien puesta. Repensar la reforma. Reformar el pensamiento*. (1ª ed., 6ª reimp). Buenos Aires: Nueva Visión.

Morin, E. (2001). *El método I. La naturaleza de la naturaleza*. Sexta edición. Ediciones Cátedra. Colección Teorema Serie mayor. España.

Morin, E. (1999) Los siete saberes necesarios para la educación del futuro. Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura – 7 place de Fontenoy – 75352 París 07 SP – Francia.

Morin, E. (1998) *Introducción al pensamiento complejo*. Editorial Gedisa, Barcelona, 1998.

National Geographic (2012) *El principio de incertidumbre Heisenberg ¿Existe el mundo cuando lo miras?*. Recuperado el 10 de noviembre de 2021 de: http://www.librosmaravillosos.com/heisenberg/index.html#_ftnref1

Nicolescu, B. (1996) *La transdisciplinariedad. Manifiesto*. Multiversidad Mundo Real Edgar Morin, A.C. Edición: 7 Saberes. México.

Klimenko, O. (2011) *Ensayo: La física cuántica, el observador y la creatividad*. Pensando Piscología. Revista de la Facultad de Psicología Universidad Cooperativa de Colombia - Volumen 7, Número 12 / enero-junio 2011.

Ojeda, C. (2001) Francisco Varela y las ciencias cognitivas. Rev. chil. neuro-psiquiatr. v. 39 n. 4 Santiago oct. 2001.

Pericón, O. (2021) *Elementos intervinientes y relacionados con la metacomplejidad*. Ciencia Latina. Revista Multidisciplinar. Edición Septiembre-Octubre, 2021, Volumen 5, Número 5. Ciudad de México. México

Prellezo, J. (2009). *Diccionario de Ciencias de la Educación*. Editorial CCS. Madrid. pp 347, 348, 408

Roque, M. Á. (2011) *Hacia el pensamiento ecologizado*. Entrevista a Edgar Morin. Recuperado el 18 de octubre de 2021 de: https://www.iemed.org/publication/hacia-el-pensamiento-ecologizado-entrevista-a-edgar-morin/?lang=es

Rosas, R. y Sebastián, C. (2004) *Piaget, Vygotski y Maturana constructivismo a tres voces*. Argentina. pp. 3-9.

Sandre, I. (s/f) *Edgar Morin, hacía el siglo de vida*. Recuperado el 17 de diciembre de 2021 de: https://multiversidadreal.edu.mx/edgar-morin-hacia-el-siglo-de-vida/

Sirvent, M. y Rigal, L. (2012) I*nvestigación Acción Participativa. Un desafío de nuestros tiempos para la construcción de una sociedad democrática*. Proyecto Páramo Andino. Impresión Monsalve Moreno. Ecuador.

Sotolongo, P. (2009) *Pensando la complejidad*. No. VIII. 2009. Habana. Cuba.

Teves, L. *et al* (2009). *50 años de Antropología en el Museo de Ciencias Naturales de La Plata: historia, desafíos y perspectivas*. Avá, 14. Obtenida el 20 de noviembre de 2010, de http://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S1851-16942009000100014&lng=es&nrm=iso

Universidad del Salvador (2021) *La redacción de los objetivos de investigación*. Recuperado el 20 de diciembre de 2021 de: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=http%3A%2F%2Fmedi.usal.edu.ar%2Farchivos%2Fmedi%2Fdocs%2F25-que_son_y_como_se_escriben_los_objetivos_de_investigacion.pdf&clen=505521&chunk=true

Vargas-Mendoza, J. E. (2006) *Teoría del conocimiento*. México: Asociación Oaxaqueña de Psicología A.C. en http://www.conductitlan.net/conocimiento.ppt

Yuni, J. y Urbano, C. (2005) *Mapas y herramientas para conocer la escuela. Investigación etnográfica Investigación – Acción*. Editorial Brujas. Argentina.