Building knowledge from complexity

Torres-Soler Luis Carlos
Matemático, MSc. Ingeniería de Sistemas, MA. Ciencias de la Educación
Doctorado en Pensamiento Complejo
Áreas de interés: Creatividad, Complejidad, Investigación, Inteligencia artificial
Docente-investigador Universidad El Bosque

Vargas-Sánchez Germán Gonzalo
Ingeniero de Sistemas, Magister en Software Libre.
Doctorado en Pensamiento Complejo
Áreas de interés: Complejidad, Ingeniería de software, Aprendizaje profundo.
Docente-investigador Universidad El Bosque

Abstract: It lives in the information society, arisen perhaps from the abundance of information that a person can acquire through different technological tools that provide information and communications technologies (ICTs); however, it is an increasingly complex society, perhaps due to the globalization of economies, the same information and different aspects, which has led to education being digital, otherwise virtual, so students must build their know from what they read, write, analyze, synthesize, observe and imagine, among others. Technological development encourages the use of the different devices that come onto the market, not only for communication and establishing social relationships but to realize meaningful learning.

Keywords: complexity, knowledge, construction, reality.

Introduction

The construction of knowledge from the dimension of complexity leads to analyze the thought processes that emerge from people's experiences, by the dynamic and complex action of cognitive processes for the construction of knowledge, which includes doing so with complex thinking. For different meanings that emerge from living complex situations, in general of crises, must be understood, which in addition to the qualitative approach, methods such as phenomenological and hermeneutics must be used, since it is necessary to know, understand and interpret what is observed, the details that exist there and the experiences that are lived to assign them the proper meaning.

The richness of the programmatic contents that teachers must cover, leaves little space in the classroom to perform any reflective or research work that contributes to the construction of knowledge, the development of thought in students and of different capacities, since above all, the teacher must comply with the contents, whether or not they project in the environment; therefore, beyond traditional activities and exercises that students perform to appropriate information, other activities do not emerge, in particular those that give spaces for the development of creativity, observation, curiosity and imagination, among others, in order to be theory and practice combined and in this way strengthen the task of the educational act.

We live in the information society, in a time when everything is more complex, in which processes change, even educational ones and, therefore, new generations move away from the previous ones, since digital communication through social networks or other tools, lead to human relationships being complex, digital, which leads to the perception of being dehumanized. Perhaps this is why it is necessary to start cross-examination in order to find a new management of human resources in different fields and in multiple orders of life, because human communication is everything, perhaps at all times, to integrate elements of dissimilar reference, and to reflect on the different situations for a unitary understanding in the multiple and thus give greater meaning to the reality in which knows are built that integrate the known and what is known and what you want to know [Morin, 2001].

Complexity

There is much that can be said on this subject, more deeply; however, here it is considered in ways of perceiving, which are related. One with the difficulty of understanding an object or situation, and the other as a quality of the object [Ugas, 2006]; that is, understanding it allows to explain and describe situations using holism and the systemic, where complex thinking integrates the parts into the whole and the whole to the parties, always taking into account that it is impossible to know the whole. Therefore, complexity must be regarded as a way of thinking, of reflecting, of accepting that order, disorder and organization must be linked.

Complexity is a fabric of inseparably associated heterogeneous constituents; where there are interactions, retroactions, determinations, chances, that constitute that phenomenal world. Complexity is presented as a disturbing feature of the tangled, the inextricable, of disorder, in which the uncertain is ruled out, but priority is given to the selection of elements of order and certainty, since ambiguities must be removed, to clarify, distinguish, hierarchical. Therefore, the paradox of one and the multiple is present; whose difficulties focus on uncertainty, contradiction; besides, that complexity in the brain of 'homo sapiens' should be considered to exist. The brain is the most complex organ in the universe, even perhaps more than this one, where the complexity of the brain must be understood with the same brain.

Complexity is present in all biological and social processes; so education must train people to come up with answers and build knows from complexity; this leads to building a thought that complexity would be the challenge of educational processes. That is perhaps why a holistic approach, with systemic vision, would be of great help to understanding the complexity from the early years of school. But it must be borne in mind, that developments in artificial intelligence demand, in a certain way, the construction of knowledge bases, where knowledge must be structured so that the machine can manipulate it and according to the algorithms it possesses can infer new knowledge [Torres-Soler and Garzón-Torres, 2012].

Thus, the concept of complexity, on the other hand, does not mean only the tangling by variety of interrelationships of an extremely large number of elements (components) in a system; does not mean complete knowledge of an entire system. It is not synonymous with complication that appears by the immeasurability or multidependence of what is sought to know. The complexity is to discover the multiple dependencies or unravel the intricate relationships in a phenomenon to understand it; complexity is a background problem, not a surface problem [Morin, 2005].

Complexity is an amalgam of interactions in a system that cannot be conceived only analytically, i.e. it makes no sense to consider possible variables in isolation to know the system; because we must see and consider the constraints, restrictions and emergencies that generate internal qualitative leaps, nonlinear development and unpredictable behaviors.

Complex systems work with uncertainty, noise or clutter. Complexity is a continuous questioning not an answer, it is a challenge to thought and not a recipe, it is a knowledge about its behavior [Morin, 2000]. The complexity is to recognize uncertainties and contradictions, but also the acceptance of a determinism, of distinctions and separations, but which need to be integrated for the construction of knows.

Since man arose on Earth there is complexity in different situations of biological and physical reality, and due to it, being social beings has led to a complex reality, where one must be more aware of what is and where it is lived [Fogelman-Soulié, Havelange and Milgram, 1991]; from this can be derived that the complexity of the world leads to the circumscribe of situations of chaos, evolutionary and adaptive dynamics, establishing many times that there is a new order.

Under these aspects of complexity, a building of knows (knowledge) must be complex, characterized by looking at phenomena rather than disciplines, rather than in statistical regularity; and his method is by observation and intervention on the planes of epistemology and general theory [Morin, 2001a]. Therefore, a complex vision of the social, the human, the environmental, leads to the thinking of a reality, which translates into economic by the different human needs; all because human beings have them; also, desires and passions. Economic phenomena generate mass crises, panic, coexistence, and can be claimed to be generated by human decision in search of greater power.

To approach a situation that has been addressed from complexity, it should be borne in mind that it is inscribed in a set of open systems, influenced and in turn influencing the environment where they are developed; this induces that they must be addressed interdisciplinary; perhaps see beyond the boundaries of the different fields of knowledge, since it is necessary to observe the internal relationships of its components, the feedback processes, the interactions, the dynamics, the contradictions, that is, to look like a whole.

Complex thought determines that complexity is not the key to the world, but a challenge to face [Morin, 2005], therefore, this thought does not prevent or suppress the challenge, but helps to reveal it and even, perhaps, to overcome it.

The construction of knowledge based on living in the information society is becoming more complex. The know generated in university should provide appropriate, non-repetitive answers to theoretical content, perhaps already obsolete, and which should be adapted and linked to the ecosystems of these situations.

Morin [cited in Ugas, 2006] states: social systems have interrelated structures, but they are not tangible, they are complex units in which the "everything" cannot be reduced to the parties or the parties to "everything"; complementary and antagonistic joints should therefore be used at the same time. Theories of complexity are supported by three theories: Systemic, Cybernetics and Information; perhaps for this reason for its complementation are integrated those deduced from the study of complex systems in the different disciplines.

The systemic thing is because the situations in the classroom, complex in themselves, for their solution

to be integral, must be seen and studied systemically, as an open system, since it exchanges and interacts with its environment, which is characterized by being dynamic and changing; therefore, it requires a complex, systemic, holistic thinking that has the ability to see the influence of "everything" on the "part" and the "part" in the "everything", that is, it must be seen as events, things happen in the real context, which is not the same as in a laboratory or in texts.

Cybernetics is an interdisciplinary field that addresses the problems of the organization and the processes of control (feedback) and transmission of information (communications) in living machines and organisms. Feedback updates the information and makes the machine or organism behave for new updated purposes. Likewise, humans change behavior continuously, much more if there is that feedback (control type) that tells you what to do and what not to do [Munné, 1995].

The Theory of Information is one of the pillars that underpin complex thinking, which must be taken into account for the construction of knowledge in the dimension of complexity, because the information obtained by students has the characteristic of being a non-linear process between the sender (teacher) and the recipient (student), other than that the construction of knowledge is not repetition of knowledge transmitted by the teacher; but the student evolves and collaborates with dialogue to nurture and interrelate the knowledge that he possesses and in this way confronts the one possessed by the teacher [Zabala, 1999].

Generations grow up believing that the knowledge they transmit to them is complete, finished, above all because from it there is substantial progress in different areas of life, which leads to forging ideals and high goals, perhaps in search of having power and moral strength.

In this information society, technologies provide various advantages, but there are not always good results, because there are failures to observe, conceive and represent reality, perhaps everything is the product of certain blindness that has been generated, in illusions that have been built and that lead to a kind of decrease of cognitive capacities in the human being.

There is a subversion of the system, in which computers set up a new eros, the electronic eros, which can be called the third environment, in which children and grandchildren will be developed. It is a society in which there is no culture, but several cultures, where the particular and the general, the singular and the universal do not stipulate that they can coexist.

Progress is made, but it is also returned, since it is always sought to make the answers simple. It advocatesinclusion, butexclusion prevails, it is inevitable to seek civility and coexistence, there is power force that retracts critical reflection.

The truth is that in dealing with different situations the mind has become more complicated, entangled, more so when the community is a network society, in which all people must be there, children, youth and adults, out of sheer necessity, because otherwise is lived far from a new reality, digital, where own money exists.

So, in the educational processes, certain effects are reflected as a result of complexity in the world and its multidimensionality, which requires generating changes in the 'here and now', otherwise inconveniences will arise that may be major.

Understanding reality

Scientific and technological developments are immense, although the plot and separation of knowledge in disciplines restrict seeing "what is woven together", that is, some blindness is structured for understanding, reflection, the global view of what is analyzed. But there is a need to build the knowledge by supplementing it by improving the process of building knowledge, since it is necessary to participate in the world. But the fundamental thing is to observe reality in another way by articulating the various knows. All because the reorganization of knowledge has implications since it reorganizes the interaction of relations between knowledge, with other people, that is with the world, which can improve life [Morin, 1995].

In educational institutions, human beings are prepared by separating the sciences and humanities, knowledge is not articulated, the sense of the human, the social and, therefore, the sense of responsibility and understanding is lost. So, in educational processes it is not easy to build the knowledge of it by supplementing it; there are multiple feelings of deprivation, especially because they are far from the deep and serious problems of society; there is no link between the practice and problems of the educational institution, the environment, society and the country; there is total incommunicado discipline with other knows.

Educational institutions and processes respond to the model of reduction, rejection, disjunction, that is, to schemes of a simplified know. People are prepared by fragmenting problems, more than once not knowing them because they are taken from the texts.

Recognizing complexity is about relearning what was considered sufficiently well-known, because it was reduced to basic elements to generate general principles. It is required for the construction of knowledge of other models or paradigms of knowing and making human.

Teachers are overwhelmed by so much mobility and diversity, so much information in the network;

however, there is no capacity to harmonize it. Theoretical elaboration goes from the simple to the complex; the educational process must be another, according to internal and external changes, that suggest that the subject has fewer guarantees and more risks than ever before to determine what his learning is like [Morin, 1997].

Reality encourages, intellectually speaking, to consider the idea of totality, in relation to those of complexity and complementarity, which becomes something motivationally irreversible, more when one becomes aware of its diffuse boundaries [Nicolis and Prygogine 1994]. As Morin [2000a] points out, aspiration for totality is an aspiration to the truth, but recognizing the impossibility of totality is a more important truth, which infers that totality is both truth and non-truth.

The pedagogues speak of integral educational action in their best aspiration, that of encompassing the whole being. It is, of course, an illusion, because a lot of action depends on different conditions that affect educational action. Arguably, the intent is a holistically relevant utopia, as it is based on the condition of integrity with reflection and action.

The term 'holistic' arises from the lexeme 'holos', which is inferred in the formation of many words, Latin and romances, with the meaning of totality. So seeking a holistic understanding of reality is to perform structural analysis, not fragmentary, of relationships in all their complexity, between the whole (which is in each part) and their parts (knowing that they are at all). Then the whole is always more, much more than the sum of the parts.

It is conceived that there can be a holistic dimension of reality, which would be a vital force responsible for forming the sets. For example, atoms and molecules in physics, cells in biology or ideas in psychology. It leads to the view that a hologram should be made with extensive properties, precisely, because the whole is in each part and that the parts, in turn, are in the whole. In addition, the knowledge of each part serves, in a way, to know the whole; something essential to reaching an understandable wholeness in its relationship with its parts. So, the interrelationship of all beings to the world is something totalizing, but also singular.

The holistic perspective has the effect of countering the backs of a Newtonian-cartesian view of reality, typical of a mechanistic paradigm, which is a type of reductionism; also influenced by a binary-cartesian logic (simplification) that separates mind and body, or that conceives the individual without history and social relationships.

Binary is not only theoretical, it is also implemented, which is evidenced in the classroom, inducing that there are only two values of truth, that there is only good or evil, to be saved or condemned, separating being from its cognitive and affective dimensions.

In short, the holistic approach considers each element as something that reflects and contains all the dimensions of the whole. Besides, the whole and each of its synergies are totally linked by constant and paradoxical interactions. If anything should be considered is that it is one and multiple at a time. Hence, human beings are not separated from unity, they are part of it, although it does not perceive itself as observers and observed, the less you can be in a swirl to write down its turns and speeds, you cannot objectively analyze it.

Education, what tipe?

The process of knowing, today, depends on the paradigm that provides a simplified vision and has been dominant since the 17th century. The process of building knowledge has the following elements: subject, object, and method. A subject is known and an object to be known is separated by a scientific method. Today this paradigm raises many doubts, apart from the very best possible to fully apply it in the different situations, and although it should not be denied, but rather improve it, since it is thought that from it is that problems arise with known.

This model of building knowledge requires, in a way, dividing a problem (situation, object) into as little parts as possible, examining each part to solve it and then "uniting" those knows to know the whole. That is, it emphasizes the analysis, the separation of the whole, the simplification of the complex. But today it is perceived that rationality coexists and sometimes springs from irrational substrates or intuitive indeterminate, so emotions and passions are also founders of reason [Ciurana, 2010]. Therefore, the separation between the known subject and the object that is known is questioned. It is a model that gave birth to the paradigm of simplification, since its function is to reduce the knowledge of a whole to its parts, restricts the complex to the simple; therefore, intelligence is plotted and compartmentalized, generating a reductionist, mutilating and disjunctive vision; it also fragments the complex, unidimensionalizes the multidimensional to produce incomplete, perhaps blind and irresponsible responses [Gutierrez, 1998].

The simple does not exist, there is only the simplified [Bachelard, cited in Morin, 2005], but it is always sought to simplify the complex by not being able to understand reality, its events and phenomena. Science, in large part, has been building its objects in this way, for which it takes them out of context, analyses them one-dimensionally and does not interrelate the various knows.

A key point of education is that in the classroom students see the possibility that it is a community of learning and inquiry [Santos-Rego, 2000] that at all times fosters creativity, interdependence, self-regulation, self-learning, self-organization and cooperative teamwork; it also promotes the construction of subjects with high responsibility and solidarity. Do not forget that is lived in the information society, where much of cognitive resources are required rather than materials; therefore, it returns and emphasizes, education must employ different pedagogical dynamics for students to develop their capacities in order to develop a consciousness that looks for life.

Learning communities must be inclusive, that is, to connect everything that drives the dynamics of a situation in the classroom for the benefit of all, as well as relationships between all. For through interaction is that communication skills are improved and learning is articulated. In other words, a learning community is the result of social and cultural transformation in educational institutions and their environment, where integrated, participatory and continuous education for learning is sought.

An essence in education is holism, synthesis, the construction of knowledge and, above all, educating human being as a whole. The educational process must aim for the maximum integration of the dimensions of being. Complex and holistic education is a functional and integral model focused on varying strategies according to the needs of the student, the teacher and the social environment. That is, it is synonymous with a set of teaching strategies designed to cover the variety of individual needs, which exist because of differences in mental schemes.

The proposal, thus, can be nothing more than introducing pedagogical actions into the educational process that address the different problems, diversity, cognitive ability of students, among others, and that promote interaction, motivation and potential competence to learn.

It must be concerned with generating spaces to reflect critically on known, thinking and having "compensatory strategies" that introduces the interrelationship of knowledge, with the unequivocal intention of improving the method of learning.

The educational process using technologies must be advocated by cognitive-affective development, as using the computer opens up new intellectual perspectives and other far undeveloped capabilities can be improved. Education, with all the nuances are wanted, is a technology of human construction; therefore, new technologies must be complementary.

Not every problem can be reduced to relevant issues, to a few variables, to just a few dimensions. There is no reality that can be understood in a one-dimensional, linear, or static way. Reality requires addressing the existence of structures that have a multitude of strongly interrelated variables. Is lived in a world where complexity is a state.

Holism means visualizing everything as a system, which requires a non-reductionist thought, a complex thought, which leads to capturing and even civilizing the knowledge of phenomena. And in the face of the problem of complexity, blindness persists to capture reality as it is. This leads to replacing the disjunction/unidimensionalization paradigm with anotherof distinction and conjunction, with which it can be differentiated without disarticulation, associating without identifying or reducing. Thus, without much thought, a mutilating thought necessarily leads to mutilating actions and mutilated knowledge.

Perhaps it is time to think that the education system should teach complexity; therefore, a new logic is required, perhaps a new educational epistemology. The complexity paradigm is a way to secure and analyze problems globally, what happens in the nearby environment can have repercussions on far-off lands.

The complexity of the educational system is typical of its object, transforming human beings, but this normative structure, dynamic interaction with other systems, which leads to an open system, the results are perceived in the long term, which arises a lot of uncertainty, in addition there are many difficulties due to contradictions, dynamics, conflict and excess linear politic.

To educate in these times of change and uncertainty is to look for ways for people to have a holistic view of reality, for which there must be cognitive, affective and behavioral means that involve that global and complex vision. In short, developing its capabilities for construction and interpretation of the world. So, the process is not to transmit information, but rather to indicate, guide, how information that can be acquired through the Internet, which increases its complexity, is interpreted, interrelated and synthesized.

It is easy to preach a holistic approach to reality, more difficult to apply in the search for explanations of what is happening. Crises, tragic events both in the environment and on the planet, social conflicts, bullyng, drug addiction of young people at school. For these events the answers are sober, "the ability to empathize has not developed", that is, there is no understanding of the self and the other.

In the face of the globalization of the world, it is determined that companies must be governed by the principle of competitiveness, otherwise they die, they are forced to end; however, economic dynamics are violent, so what is required is the ability to adapt to the different changes, including a social logic that must go beyond the walls of the school to help the transformation. So the problem, therefore, is to prepare the student to

be competitive, compassionate not only with himself, but with the other and with the planet, that is, to show sensitivity and responsibility. Then, the affective, emotional dimension should be nurtured as much as possible, while boosting aptitude and academic performance.

The situation or problem of education should not be exclusive, on the contrary, be inclusive, for which it is appropriate for the teacher to make use of different approaches, combine them, determining different routes to stipulate a method of learning; in addition, making the classroom a space in which interest and motivation develop. Just like balance and inclusion, you should look for the connection. That is, that the student connects with his environment, that he integrates. The connection that virtual provides points to the relations of topics at different levels, especially linking a novel to history, mathematics, social development, in other words, integrating subjects.

The curriculum and teaching practices determine, between the lines, the understanding of the subject far apart from reality, but it is necessary to recognize it with critical meaning. And the classroom, where the subjects are detached, there are also separate skills, separate goals, linear methods, separate assessments, etc., not to mention the isolation that many students suffer from different factors.

The profound imbalances in cultures that affect thoughts and feelings, values and attitudes, social and political structures, are not all for integration, competition, cooperation, expansion and different social processes, perhaps simply due to a social, ecological, moral and spiritual crisis.

A paradigm of thought, a way of knowing reality, corresponds to an ethical paradigm, an aesthetic paradigm, a paradigm of life [Juarroz, 1994]. When they are omitted and partially known, without taking into account that everything is "woven together", it falls into the danger of forgetting or ignoring, of blindness, with consequences for knowledge, which leads to forgetting the responsibility, solidarity, understanding and compassion, necessary for human life. "Partial and mutilating thoughts lead to partial and mutilating actions; a one-dimensional thought leads to a one-dimensional man" [Morin, 1999], in other words, a mutilated thought is not harmless, but leads to blind actions that tear, cut and suppress threads of the social.

The simplified thinking in plotting knowledge, despite being the basis for great findings in scientific and technological progress, those that improve living conditions, also generates beastly ills identified as modern, with pandemics, global pollution, ecological degradation, increased rich-poor inequality, overpopulation, famines and migrations, among many others, leading to a crisis of cultural identity, to disastrous governments that seriously endanger survival in a territory.

Using knowledges, boundaries are overtaken to gain in comfort, quality of life or well-being, but they are also lost quickly. It entered a destructive age because this loss beats the disease to health, the unease to tranquility, the violence to peace, the hatred of love [Moles, 1995].

Problems that alter quality of life, have complexity, interactivity and globalist, and cannot be treated with reduced models of perception, organization or management as others of past times. For traditional visions often do not perceive or understand emergencies of new challenges that must be met globally. They cannot be treated by "specialists" who, although they know a lot about a discipline, do not know ramifications and evolution of knowledge and situations, because in themselves they favor local approaches over global approaches, and the solutions found rather increase problems, particularly. It cannot continue to face and try to understand new problems with old ideas; new visions, new approaches, new interrelationships and new methods are needed; that is, new concepts and intellectual tools are needed to seek answers to the challenges of an increasingly interdependent, uncertain, vulnerable and complex world.

To think of reality in a complex way, with a complex thought is to conceive that society is unitas-complex, and to have the vision to act in the world in the face of all situations [Morin, 1999]. Because by accepting that society is what the subject conceives, it leads to relativizing the different conceptions that cultures, social groups and people have of reality, although it relates to different attitudes in recognizing pluralism; because when we think that society is not built by human beings, but depends on history, then attitudes of solidarity and understanding towards others should be reflected continuously.

The dynamics of individual actions based on the principles of a thought that articulates knowledges, will be of great value to the quality of life, the survival of the human species; therefore, of the planet, and for the understanding of the self and the other, especially because one becomes aware of the risks of continuing in the devastation of natural resources. However, for these actions one must interrogate the process of building knowledge, what thought is like, understanding oneself and understanding the other in all its complexity. Something not easy, because the custom is not to pay the slightest attention [Vilar, 1997].

Today, there is a perceived need to articulate what is separate, since complexity always exists in reality [Morin, 2002]; therefore, it was circumvented, so it is necessary to define and understand it. Simplification is required, but it must be relativized, leading to a conscious reduction without what is found as an absolute truth. It is pertinent to develop a complex thought, accompanied by the systemic and holistic, so that the construction of knowledge is the product of the integrality of different contexts of the human being: cognitive, spiritual,

biological and ethical.

Final considerations

It is true that, currently, there are varied crises, some concern the principles and structures of knowledge, which prevent the perceiving and conceiving of the complexity of the real, the complexity in being and the complexity of knowledge [Morin, 1999]. Crises arise from different causes, not relevant when contextualizing the problem, because they are the product of other crises that have been half-resolved, in general, a process was carried out that provides palliatives.

The way reality is conceived and thought generates consequences in individual and social life. Civilizations are organized and acted according to a vision without also forgetting that from an organization and action a vision is also built. Since the beginning of humanity all civilizations have shown an "intuitive core" or "cultural imprint" that constitutes their vision, direction, ways of working, feeling, understanding and behaving, "core" that emerges from political and economic organization, myths and beliefs, in the way of thinking and social organization, in general of the structure of thought that determines education, which in itself is linear, being that phenomena in nature, around them always have a nonlinearity. But it must be considered that, in a way, knowledge is selective, it follows that the ability to select and process information relates to how social reality is understood.

It is necessary to determine new ways of understanding the formation of subjects in their environment, integrating the dimensions of knowledge with the dimensions in which there is a development of the human being that learns, cognitively and affectively speaking. Education must therefore have epistemologically precise springs for explanatory approaches to open ways to interrelate and build knows.

Education should guide students in a continuous intellectual quest, especially to understand a true holistic understanding of reality. It is clear that knowledge evolves; therefore, teachers should be attentive to the new, the changes and, above all, indicate strategies so that the student in the future can adapt to the new environments.

Neuroscience is directed in one direction and perhaps pedagogy in another, but they are complementary fields, even if they are non-comparable fields of study. This has led to the formation of multidisciplinary teams to collaborate in studies whose purpose is to expand knowledge about brain processes, and by integrating pedagogy into these studies you will gain great gain by gaining new neurobiological knowledge.

A pedagogical action of a holistic nature overcomes, in a certain way, the traditional pedagogy, since it deals with a very significant differential, the hiatus between tacit thought and express thought, in addition to combining the world, the self and the values.

Interconnection between subjects is not feasible in traditional education, although it is possible to do something for it, in particular because teachers are not able to generate values, understanding of the self and the other and, above all, prospecting a complex thought in the face of the various situations that happen in the daily life.

The uncertainty, contradictions, antagonisms and complementarities that exist in various situations of educational processes cannot be ignored, so a holistic understanding of reality must be promoted, with a view to building dynamic structures and schemes that can be coupled with the flow of possibilities yet to be found and developed [Torres-Soler and Vargas-Sánchez, 2018].

BibliographicReferences

[1]. JUARROZ Roberto (1994). "Algunas ideas sobre el lenguaje de la transdisciplinariedad". Ponencia, En *Memorias, 1er. Congreso Mundial de la Transdisciplinariedad*. Convento de Arábida. Disponible en: https://studylib.es/doc/6279329/algunas-ideas-sobre-el-lenguaje-de-la-transdisciplinariedad, [15/02/20]
[2]. CIURANA Emilio (2010). Humanismo y responsabilidad. Disponible en: https://emiliorogerciurana.com/2010/10/12/humanismo-y-responsabilidad1/, [11/10/2019].
[3]. FOGELMAN-SOULIÉ Fran çoise, HAVELANGE Véronique y MILGRAM Maurice (1991). Les théories de la complexité: autour de l'oeuvred'HenriAtlan. Seuil, Paris.
[4]. GUTIÉRREZ Alfredo (1998). "Edgar Morin y las posibilidades del pensamiento complejo". En *Revista Metapolítica*, vol. 2, no. 8, octubre-diciembre.
[5]. MOLES Abraham (1995). *Las ciencias de lo impreciso*. UAM-A - Porrúa, México.
[6]. MORIN Edgar (2005). *Introducción al pensamiento complejo*. 8va reimp., Gedisa, Barcelona.
[7]. MORIN Edgar (2002). *El método II. La vida de la vida.*5ta ed., Cátedra-Teorema, Madrid.
[8]. MORIN Edgar (2001). *El método V. La humanidad de la humanidad*. 3ra ed., Cátedra-Teorema, Madrid.
[9]. MORIN Edgar (2001a). *El método IV. Las ideas*. 5ta reimp., Cátedra-Teorema, Madrid.

[10]. MORIN Edgar (2000). *El método I. La naturaleza de la naturaleza*. 4ta ed., Cátedra-Teorema, Madrid.
[11]. MORIN Edgar (2000a). *La mente bien ordenada*. Seix Barral, Barcelona.
[12]. MORIN Edgar (1999). *El método III. El conocimiento del conocimiento*. 3ra ed., Cátedra-Teorema, Madrid.
[13]. MORIN Edgar (1997). *Ciencia con conciencia*. 3ra ed., Anthropos, Barcelona.
[14]. MORIN Edgar (1995). *Sociología*. Tecnos, Madrid.
[15]. MUNNÉ Frederic (1995): "Las teorías de la complejidad y sus implicaciones en las ciencias del comportamiento". En: *Revista Interamericana de psicología*, vol. 29, no 1.
[16]. NICOLIS Gregorie, PRYGOGINE Ilya (2008). *La estructura de lo complejo*. 2da. Ed., Alianza Universidad, Madrid.
[17]. SANTOS-REGO Miguel A. (2000). "Educación y comprensión holística de la realidad". En: Santos Rego Miguel A. (ed.): *A educación en perspectiva. Homenaxeó Prof. Lisardo Doval Salgado*. Servicio de Publicaciones de la USC, Santiago de Compostela, España.
[18]. TORRES-SOLER Luis Carlos, GARZÓN-TORRES Néstor Manuel (2012). *Inteligencia artificial*. EAE, Madrid.
[19]. TORRES-SOLER Luis Carlos, VARGAS-SÁNCHEZ Germán Gonzalo (2018). *Pensamiento complejo y sistémico*. Editorial Universidad El Bosque, Bogotá.
[20]. VILAR Sergio (1997). *La nueva racionalidad: comprender la complejidad con métodos transdisciplinarios*. Kairós, Barcelona.
[21]. UGAS Gabriel (2006). *La complejidad: un modo de pensar*. Ediciones del Taller Permanente de Estudios Epistemológicos en Ciencias Sociales, Venezuela.
[22]. ZABALA V. Antoni (1999). *Enfoque globalizador y pensamiento complejo: Una respuesta para la comprensión e intervención en la realidad*. Graó, Barcelona.