

EPISTEMOLOGY OF COMPLEXITY: the interconnections of a way of thinking that connects planetary life

EPISTEMOLOGIA DA COMPLEXIDADE: as interconexões de um pensamento que religa a vida planetária
EPISTEMOLOGÍA DE LA COMPLEJIDAD: las interconexiones de un pensamiento que reconecta la vida planetaria

Kênia Paulino de Queiroz

PhD in Education in the Amazon from the Federal University of Tocantins (UFT) and PhD in Environmental Sciences (UFT). Master's in education (UFT). Pedagogue (FECIPAR/FEPAR). Professor at the State University of Tocantins (Unitins). Director of the Paraíso Campus (Unitins). Member of the International Network of Creative Schools (RIEC). kenia.pq@unitins.br



0000-0002-7352-824X

Maria José de Pinho

Post-Doctorate in Education from the University of Algarve-Portugal. PhD in Education and Curriculum (PUC-SP). Master's in Education (UFP). Degree in History (FAFI-BH) and Pedagogy (ICNPF). Professor and supervisor of the Masters and Doctorate in Education and Languages at the Federal University of Tocantins (UFT). Member of the International Network of Creative Schools - RIEC. mjpgon@mailuft.edu.br



0000-0002-2411-6580

Saturnino de La Torre

Doctor of Philosophy from the University of Barcelona (UB). Emeritus Professor at the University of Barcelona (UB). Researcher, trainer and pollinator of creativity for over 40 years. He coordinated the Didactic Research and Advisory Group (GIAD). He chaired the Asociación de la Creatividad and its magazine Creatividad y Sociedad. He has coordinated various creativity networks, including the International Network of Creative Schools (RIEC in Portuguese). sentipensar@yahoo.es



0000-0003-3898-0465

Mailing address: State University of Tocantins - Paraíso Campus. Rua Amâncio de Moraes, n. 927, centro, CEP: 77600-000, Paraíso do Tocantins - TO, Brazil.

Received: 04/01/2024

Accepted: 09/01/2024

Published: 11/30/2024

ABSTRACT:

The complex epistemology approached in the educational field by the scientist Edgar Morin, presents the possibility of reflection on the dimension of the integral formation of the human being, as a link that provides the sense of various connections between different lives in the universe. To this end, we sought to reflect on the interconnection between human beings, society and the environment in a planetary dimension, based on complex epistemology. Thus, using a qualitative approach, we propose to continue our studies on complex epistemology by presenting Edgar Morin's concept of interconnection, which grew stronger between the 20th and 21st centuries, revealing the need for a change in thinking to recognize interconnections on a planetary scale.

KEYWORDS: Complex thinking; Reconnection; Human being; Planetary.

Introduction

The discussion that begins runs through the connections that complex epistemology provides through the reconnections of a way of thinking that opens to the inevitable, to imperfections, to what is apparently isolated, disregarded, and disconnected in a planetary dimension, which is also made up of environmental diversity and all that is life, including that of the human being.

Academic works referring to complex epistemology take different approaches to the terms. Various forms are found in research, often as synonyms: complexity theory, complex epistemology, complexity paradigm, complex thinking, and simply complexity.

However, this study does not intend to present right or wrong; if it did, it would already be outside a discussion whose principle is to value connections.

What we are proposing with this production is a careful look and, therefore, we highlight the misconception of some studies in associating complexity with what is seen as complication. Etymologically, the origin of the word complexity is "Latin, coming from *complectere*, whose root *plectere* means to entwine. [...] the presence of the prefix 'com' adds the sense of the duality of two opposing elements that are closely intertwined, but without annulling their duality" (Morin, Ciurana, & Motta, 2003, p. 43). Thus, complexity represents the weaving together of elements that complement each other (Morin, 2001a).

In this regard, with a qualitative approach (Gil, 2002, 2008), this text¹ seeks to reflect, based on complex epistemology, on the interconnection between human beings, society, and the environment, in a planetary dimension. To this end, we propose to continue studies in the field of complex epistemology by presenting Edgar Morin's interconnecting concept, which was approached between the 20th and 21st centuries. "A pluralist thinker, Edgar Morin, born in 1921 in Paris, merges the human sciences with biology and physics, among other disciplines of knowledge, to study the problems of the contemporary world" (Silva, 2003, p. 9).

Given this interconnected concept, we understand that "complexity" and "complex thinking" are part of complex epistemology, which is transformative thinking driven by its cognitive operators (Morin, 2003) and are therefore terms of a whole that is part of this epistemological reflection.

The point of also using "complex epistemology" is to understand it as knowledge that has an established theoretical basis—at the same time, it opens up and doesn't close off as a single path, constantly constructing and reconstructing.

If it were otherwise, it could run a greater risk of taking up other perspectives that even preceded the epistemology of complexity from an antagonistic perspective. Thus, "complex epistemology is understood not as the center of truth, but as various perspectives and various looks" (Petraglia, 2001, p. 30).

To this end, we dialogued about the epistemology of complexity, understanding that it is an open, flexible, and interconnecting connection, which is not presented as a model to be followed or as the absolute truth but seeks to understand and complement

¹ A study refers to a segment that is part of research for a doctoral program.

constructions, interconnections, knowledge, and life in a socio-environmental dimension.

Socio-environmental interconnection from the perspective of complex epistemology

The intention to bring this epistemological perspective to the socio-environmental dimension leads us to the perception of the connections that exist between different lives that are part of the same space, our planet. At the very least, it raises questions about how such a discussion becomes feasible. Thus, by understanding the interconnections, this reflexive proposition for the socio-environmental context becomes possible.

This possibility stems from the very dimension that complex epistemology encompasses, by positing the existence of a planetary-level connection, in other words, a universe in which everything is connected directly or indirectly - whether in a short or long time frame, or geographically - but all as part of the same planetary space.

This epistemological journey is developed through the lens of complex epistemology, based on the French thinker Edgar Morin, who sees the connection between the environment, human beings, and society as weaves that interconnect without interruption but complement each other.

It is important to know a little about when the words that surround this discussion came into being. The word complex in the French language, according to Morin, Ciurana and Motta (2003, p. 43), "[...] appears in the 16th Century: it comes from the Latin *complexus*, which means 'that embraces', participle of the verb *complector*, which means I embrace, I connect. From *complex*, complexity and complexion are derived" (p. 43). However, the latter form appeared in the Spanish language in the 1250s and originated "from the Latin *complexio*, which means amalgam or set" (Morin, Ciurana, & Motta, 2003, p. 43). These are words and derivations that arose at that time and have not yet been presented as terms directly linked to discussions of weaving together (Morin, 2003).

Although the term "complexity" was not used in the 19th century, epistemological constructions were intertwined at that time, because, according to Morin (2003, p. 76), "in the 19th century, when science ignored the individual, the singular, the concrete, the historical, literature and especially the novel revealed human complexity, from Balzac to Dostoyevsky and Proust".

This gaze at interconnections went through the lives of Balzac, a French writer; Dostoyevsky, a Russian writer; and Proust, a French chemist. From the novel, they presented the being in its singularity, in everyday life; a being that thinks and feels in the face of its multiple dimensions, identities, personalities, fantasies, and dreams (Morin, 2007b).

Even before the term "complexity" was understood, its connective constitutions already permeated different perspectives. The construction of knowledge starts from what exists and begins to be reconstructed in a complementarity that forms new knowledge. Morin (2003) goes on to recount the history of this connector view, when he talks about its first characteristics, back in the 20th century.

Complex thinking was first developed in the interstices of disciplines, by mathematicians (Wiener, von Neumann, von Foerster), thermodynamicists (Prigogine), biophysicists (Atlan), and philosophers (Castoriadis). The two scientific revolutions of the century can only stimulate him. The first revolution introduced uncertainty through thermodynamics, quantum physics, and cosmophysics, and gave rise to the epistemological reflections of Popper, Kuhn, Holton, Lakatos, and Feyerabend, who demonstrated that science was not about certainty but hypothesis; that a proven theory was not definitive and remained "falsifiable"; that there was something non-scientific (postulates, paradigms, themata) within scientism itself.

The second scientific revolution, more recent and still unfinished, is the systemic revolution, which introduces organization into the earth sciences and ecological science; it will undoubtedly continue as a revolution of self-organization in biology and sociology (Morin, 2003, pp. 76–77).

Morin presents the continuity of this construction of the term "complexity," rescuing the process by which it was built up through the various studies of various scientists, even though this term was not yet used in the social sciences.

Regarding this epistemological construction that has transformed the worldview of many people who are open to new knowledge, Petraglia (2013, p. 15) explains that "the core of the epistemology of complexity, proposed by the French thinker Edgar Morin, who incorporated the term cybernetics into his work in the 1960s," lies in the meaning of the word of Latin origin *complexus*, which means what has been woven together (Morin, 2003).

Complex epistemology lies in the fabrics of complementarity; it is not about a specific area or discipline but about interconnections, which is why its view of dialogue

has no limits, because everything is interconnected in the different dimensions; among them, the human and environmental ones stand out, in other words, the socio-environmental ones, which we have addressed in this construction of knowledge.

Morin, an emeritus researcher, has gone beyond disciplinary limitations: he is a philosopher, anthropologist, and sociologist. He also has a background in law, history, and geography. His studies are connected to various areas of knowledge. Even if someone wanted to classify his constructions in one disciplinary area, it wouldn't be possible, because there is no specific approach but rather an interconnected one. This can be seen even in the bookstores that organize his works by area: there is no specific area in which the works of this thinker are placed in all bookstores, because they move around and connect.

If we consider the disciplinary bias and which area can use his studies, we will see that with his works we can delve into history, geography, philosophy, politics, physics, chemistry, mathematics, medicine, biology, and other areas of knowledge, which in Morin's thinking are connected, not isolated. From this perspective presented by Morin, we can also understand the interconnection between human beings, society, and the environment as parts of a whole, of a planet.

Returning to the epistemological construction of complexity addressed by Morin, we saw that the term "complexity" has been used in many areas since the 1930s. But as a construction of the epistemology of complexity, Gaston Bachelard was one of the pioneers. In his production entitled *The New Scientific Spirit*, in the 1930s, he pointed out the need to overcome "Cartesianism and the functionalist vision of simplification and reduction. Commenting on work of Bachelard, Jean-Louis Le Moigne provides a good comprehensive key to the term 'complexity'" (Morin, Ciurana, & Motta, 2003, p. 49).

Even so, Bachelard didn't want to move forward and remained hidden under the success of the functionalist, positivist, and analytical vision that was very much in vogue at the time. However, studies to systematize complex epistemology continued.

A key pioneer in the construction of an epistemology of complexity was Niels Bohr. This author understood the implications of the theoretical transformations he was leading in the field of microphysics, because he realized their fundamental epistemological scope: the deterministic ideal of classical science was coming to an end, the place of observation was revitalized, subject and object were no longer separable. Bohr proposed a fundamental logical problem: the acceptance of the principle of "complementarity" in the field of microphysics (Morin, Ciurana, & Motta, 2003, p. 50).

The vision that was beginning proposed a change in thinking. However, it does not exclude but presents itself as complementarity; that is, it does not leave one logic to include another but rather integrates them. It does not exclude order or disorder; instead, both complement each other. According to Petraglia (2013, p. 16), Morin's complex epistemology "highlights the intercommunications and multidimensional dependencies of knowledge, such as biology, anthropology, sociology, physics, and also places mythical-symbolic-magical thinking in relation to rational-logical-scientific thinking".

In this thinking, this perspective of complexity "affects, above all, our logical schemes of reflection and forces us to redefine the role of epistemology. In this sense, we must speak of complex thinking to differentiate it from deterministic chaos theories" (Morin, Ciurana, & Motta, 2003, pp. 50–51).

The term "complex thinking" thus emerged as a way of avoiding the many confusions in which the term "complexity" has been involved. The authors go on to justify that we need to talk about "complex thinking because we are introducing a second-order epistemology or knowledge of knowledge. A complex epistemology whose effort is oriented not so much towards the study of observed systems" (Morin, Ciurana, & Motta, 2003, p. 51).

Faced with so many appearances of complexity with various divergent meanings of complex epistemology, there is a context in which Morin, Ciurana, and Motta (2003, p. 51) value its appropriation, because even though complexity emerged "in the field of natural sciences, it is no less true to say that if there is a sphere to which the qualification of 'complex' corresponds by antonomasia, it is the social and human world".

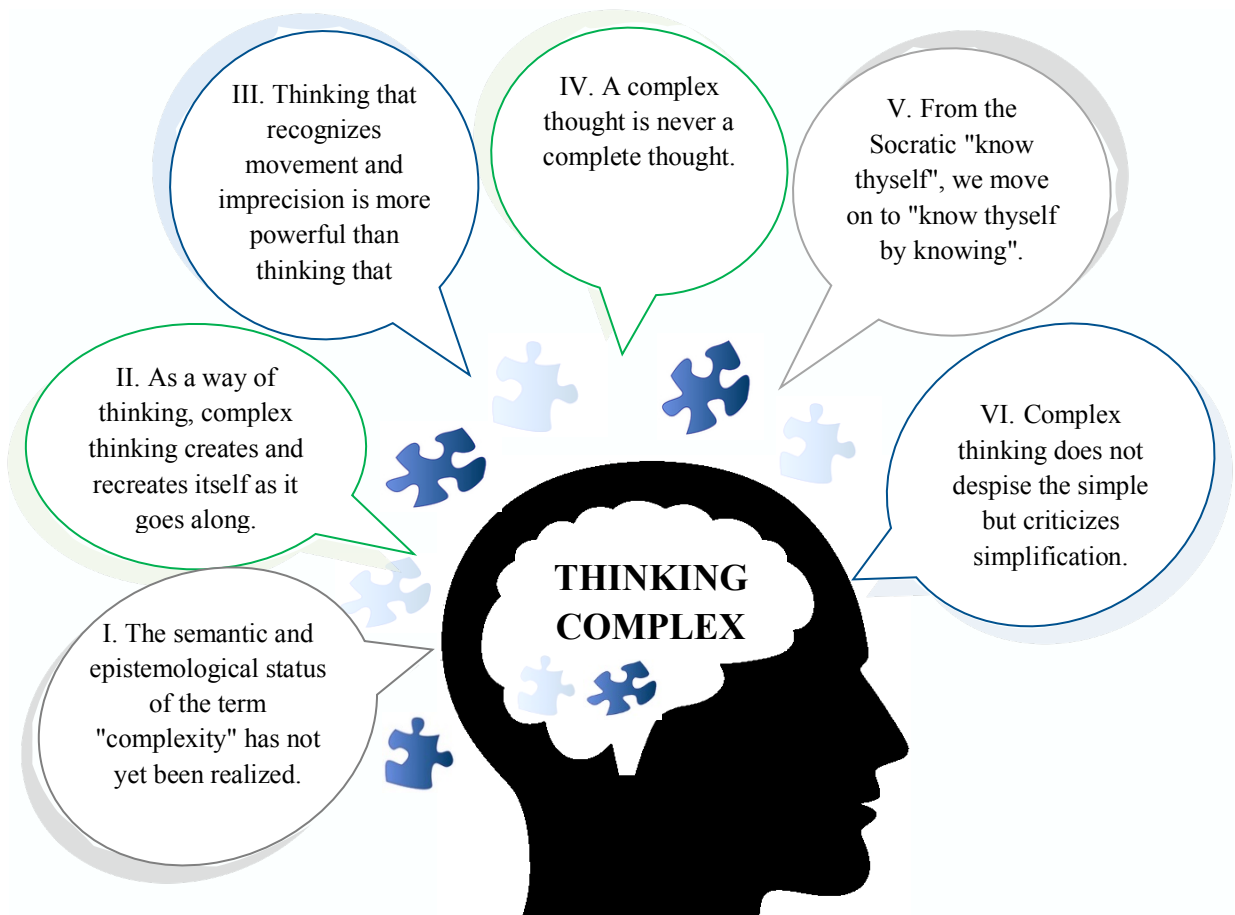
This appreciation by the authors of the use of complex epistemology in a social and human context is aimed at actions designed to transform attitudes in educational action. With this, we integrate the environmental context into the social and human context, and this triad becomes a planetary interconnecting dimension (Moraes, 2019).

To understand complex epistemology, we start from the immense challenge that still exists in the 21st century of "educating 'in' and 'for' the planetary era. There is an interrelationship between the planetary becoming of the complexity of societies and the complex becoming of planetarization" (Morin, Ciurana, & Motta, 2003, p. 51).

In complex thinking, thinking about society implies thinking about the planet, since lives that are part of a universe are not isolated but connected. "Complex thinking means scientifically understanding the interdependence and interconnection between all physical, natural and social phenomena" (Sá, 2008, p. 62).

The Figure 1 shows the main characteristics of complex thinking. An action that is possible from the human being, who looks, feels, listens, and interconnects various dimensions. These characteristics can complement the conceptions that have been constructed and contribute methodologically to a rethinking of attitudes.

Figure 1 - Points relating to the characteristics of complex thinking



Source: Prepared by Souza (2019) based on Morin, Ciurana, & Motta (2003).

In Figure 1, there is a representation of the key parts relating to the characteristics that make up complex thinking. At first, it leads us to an understanding of epistemology, not in the sense of the understanding that many summarize in an attempt to simplify, but in order to know and be able to be, think, and act in an open and flexible way in the

face of transformative possibilities in different contexts, especially in the context in which we are dialoguing: as a complementary focus on the socioenvironmental dimension.

Regarding the first characteristic of complex thinking, we saw at the outset how the term "complexity" has been used in different senses in various areas of knowledge. However, there is an increasingly frequent tendency to generalize, even if it's because of the wide range of connections that the term itself has. This is why it is still under construction, both semantically and epistemologically.

The second characteristic shows that, in view of the various meanings used, many people are already differentiating between what is complex and what is complicated. This differentiation shows a certain approximation to the understanding that it is about science, but far beyond that, it refers to politics, ethics, society, the socio-environment, poetry... among others. It is therefore a question of thinking, of a worldview involving a general epistemology (Morin, Ciurana, & Motta, 2003).

Complex thinking is formed in the face of problematic issues that arise from simplifying thinking, in which its action is based on reorganization through its principles, which are also known as cognitive operators. In the literal sense of the word, it is an exercise in the mind, seeking to overcome the thinking of certainty that modern science presents in order to open up to other possibilities, including starting again, seeing that what has been built is no longer the absolute truth, and thus opening up to questioning, uncertainty, and new searches.

In the third characteristic, we understand that neither inflexibility nor exclusion are part of complex thinking, even if it is a reductionist view, because its action will be one of complementarity, and it is not based on ready-made knowledge. Apparently, leaving the supposed security and certainty that science alone provides seems to be an act of "scientific madness." However, when we reflect on this way of doing science, we can see how much it has already excluded, separated, divided, and destroyed society, human beings, and the environment. We can also rethink the recognition that complementarity can provide from within science itself, as it is not intended to exclude it, but rather to reconnect it with other paths.

With the fourth characteristic, we see that the essence of complex thinking is complementarity, but this is different from being complete. As much as it aims for completeness, it will not be considered complete, because it involves lives in movement, which generate diverse changes, multidimensional dimensions, which consequently open up to a new aggregate, and everything (re)connects, starting this whole process all over again.

For theorists in the field, it is impossible to obtain complete knowledge, especially in the theoretical dimension, because "the path to knowledge is for complex thinking what the elaboration of a poem was for Paul Valéry, something that is never finished" (Morin, Ciurana, & Motta, 2003, p. 54). Thus, we understand that complex thinking can differ from others, even presenting specific characteristics and constructions of its epistemology, but it never isolates itself from other thoughts, as it seeks constant integration and (re)connection through reconstruction.

The fifth characteristic highlights the recognition of knowledge under construction and of what precedes it; in this case, we can talk about ignorance, because before knowing, there is ignorance with regard to the knowledge that is wanted, and only then is it achieved. This view differs from simplistic thinking, in which there is no tolerance for ignorance and not even the patience to wait for this condition to emerge, which requires time for construction.

Complex thinking understands the existence of two forms of ignorance: one that exists provisionally, because it is in the interest of the person who has it not to have it anymore, because they want to acquire knowledge; the other ignorance, however, which is more risky, involves the person who believes they have complete, definitive, and linear knowledge. However, if they don't open themselves up to relearning by learning, they will run away from the possibility of leaving this state of ignorance.

Addressing this last type of ignorance does not mean that we want to deconstruct or devalue existing constructions. We are considering the importance of regaining recognition of what exists, seeking to remain on the path of constant investigation and thus continuing to interconnect, consciously complementing, in other words, doing science with awareness (Morin, 2001a). Even "science can also produce ignorance, because knowledge closes in on specialization" (Silva, 2003, p. 10).

With regard to the sixth and final characteristic addressed in this epistemological dialog, we see a critical eye. The fact that it constantly seeks to complement itself doesn't mean that it doesn't take a critical look at what is simplified and even at itself. The critical gaze also permeates the constructions of complex thinking itself, as it reinvents itself and rethinks its own uncertainties. Petraglia (2013, p. 16) explains that Morin, "in his reflections, usually opposes reductionist, linear and simplifying thinking".

In this way, complex thinking differs from simplifying thinking by connecting different perspectives and not by reaching an endpoint, but by opening itself up to reconstruction, because the journey to reach a point is a process of other constructions that are interrelated. When you reach the planned point, it becomes a new beginning,

rather than an end; and everything starts again, in a complementary dimension. Complexity, in this sense, does not only refer to "[...] the union of complexity and non-complexity (simplification); complexity is at the heart of the relationship between the simple and the complex because such a relationship is both antagonistic and complementary" (Morin, 2007b, p. 103).

In view of these interactions, in order to understand the relationship between human beings, society, and the environment in an interconnected way, it was first necessary to take this whole path of complexity epistemology, to realize that, as long as we remain in the reductionist, isolated view, and in the construction of piecemeal knowledge, we will not be able to understand and contribute to the multidimensional realities that we constantly face, especially in the socio-environmental dimension.

Among the many situations that arise in reality, one of the many problems we have experienced is the actions we take with respect to the environment. Just as the professional and human formation of the human being, when built in a disciplinary, hyper-specialized way, consequently also relates to socio-environmental life from this fragmented viewpoint.

Faced with the problems we face, which are multidimensional because they involve various situations and planetary dimensions, disciplinary knowledge cannot understand the whole, only the parts. As parts are perceived, other parts and, above all, the whole remain with the problem situations and with the additions of others, generated by constant movement. This is because an initial state and the interference in parts are not static: they move and are reconstructed. In this way, problem situations are becoming more and more intense on a planetary scale.

Morin and Kern (2003) speak of an awakening to the issues threatening the planet, and with this, since the 1980s, a planetary ecological awareness has been forming. This awareness began with a multiplicity of degradations that occurred at that time, as well as pollution, covering all continents, which constituted a threat to planetary life.

Therefore, this awareness was based on the need not only to save but also to safeguard the integrity of planet Earth. Even with the beginning of this look at the Earth, since the 1980s, the problem situations continue to intensify. In contemporary times, we still experience issues in which human beings, society, and the environment seem to be in different universes or, instead of connecting, seem to be fighting a triad war. With regard to these multidimensional problems, Moraes (2014, pp. 22-23) points out four more issues that involve this triad relationship.

- 1) competitive globalization resulting from a unilateral vision of development;
- 2) exacerbated consumerism, shaping human desires, wishes, and relationships;
- 3) unquestionable material development, but few (sic) of those who truly enjoy it, while at the same time causing unprecedented ecosystem and environmental degradation in the history of our civilization, reducing the quality of life on planet Earth;
- 4) a Western civilization that is insensitive to the problem of hunger, as the geography of poverty expands more and more.

Faced with so many issues that have arisen on a planetary scale, many of us human beings have shown ourselves to be insensitive and oblivious to the situations of others, of society, and of the environment. For a long time, human beings have been placed outside the construction of knowledge, as observers looking at the object as if it were possible to be detached from each other. And this way of doing science has had a few consequences for planetary life.

This separating thought has distanced this being from his surroundings, from himself, and from the environment. In view of this, we understand that it is necessary to rescue this human being, the authorship of his life path, "of his training process and as co-author of collective constructions, we are, in reality, re-establishing the relations of this apprentice with the triangle of life, that is, with the relations between individual, society and nature" (Moraes, 2019, p. 177).

So, we ask ourselves: could this be one of the ways to re-establish the connection with the reconnection of complex thinking? Would bringing this being into a multidimensional context, interconnecting it with the knowledge we have built up, change the fragmented path we are on? Would reintroducing the human being as an interconnected part of the same global process bring about a reconnecting change in thinking and attitude?

These questions are part of a whole under construction, which does not seek a specific answer, nor even a simplification, but rather a restart of the journey interconnected to the paths consciously built and which is positioned to reconnect being to be knowing and doing, in other words, to attitudes. According to Morin (2007a), on this journey of reconnection we need to go beyond awareness, because we need awareness and formative and transformative attitudes in the dimension of complex thinking. We know that being aware of the problems facing our planet and our society alone does not lead to reconnection.

Given this, we understand that one of the contexts with transformative potential is linked to educational institutions, where it is possible to reconnect the dimension of consciousness and attitude, while at the same time forming and transforming.

To achieve this formation and transformation through complex thinking, Morin points out that a greater effort is needed. It requires a reform of one's own thinking and the reform of the institution in an interconnected way (Morin, 2015). This is a reform that cuts across all institutional dimensions, from the pedagogical to the administrative, as well as connecting with the human beings who are directly and indirectly part of the training process.

This reform connects societies, it connects human beings and, together, they connect as attitudes with the environment. When we say, "as attitudes," we signal that we are already interconnected with the environment, since we understand that it is impossible to see it as separate. However, as thoughts and, consequently, as transformative attitudes, many of us are separated. However, we need to move in the direction of recognizing the existence of the one and the human complex "by bringing together and organizing the knowledge dispersed in the Earth Sciences, the Human Sciences, Literature and Philosophy, and showing the indissoluble link between the unity and diversity of everything" (Morin, 2015, p. 141).

Complex thinking connects human beings with themselves, with others, and with the planet. It connects and interconnects what is distant in a complementary way and brings not only the meaning of the parts but also the new meaning that is constructed and reconstructed through this reconnection. Based on this reconnecting thought, we understand nature in a global dimension, which is "a complex totality. Man is not an isolated entity in relation to this complex totality: he is an open system, with a relationship of autonomy/organizing dependence within an ecosystem" (Morin, 1974, p. 11). Therefore, in an interconnecting connection, this triad of human being, society, and environment interconnects and transforms itself, as it moves around, also transforming its surroundings.

Final considerations

This discussion in the field of complex epistemology shows us that Morin is a scientist who has dedicated himself a great deal to contributing not only to science, but above all to changing conceptions, to looking at his surroundings and the world. He has produced dialogues in various areas, showing the interconnections that exist in life's problem situations and the possible ways of understanding these issues.

When we talk about the need to overcome simplifying thinking, we are talking beyond educational contexts that work through specialization, with increasingly piecemeal knowledge. Our discussion goes further: it leads us to realize not only this reductionist construction of knowledge, but also the existence of multidimensional realities, where specialization fails to understand what is happening in the lives of human beings, in society, and in the environment.

Problematic issues, such as the degradation of nature, cannot be viewed only through the lens of specialized knowledge. And even if different areas of knowledge make different analyses, each may still present a reductionist view. That's why complex epistemology stresses the importance of opening, broadening your gaze and realizing that there are webs of connection in this planetary dimension.

In this epistemological journey, we find the interconnection between the characteristics of complex thinking. They are connected by complex epistemology, which recognizes the connection between human beings, society, and the environment as a planetary whole.

With this flexibility, we can review how we think and connect, in other words, we can value the knowledge we have already built up and connect it with others, to complement and allow ourselves to be rebuilt, in a circle in which we no longer know where the beginning or end is, but which is always in motion.

References

- Gil, A. C. (2002). *Como elaborar projetos de pesquisa*. 4. ed. São Paulo: Atlas.
- Gil, A. C. (2008). *Métodos e técnicas de pesquisa social*. 6. ed. São Paulo: Atlas.
- Moraes, M. C. (2008). *Ecologia dos saberes: complexidade, transdisciplinaridade e educação: novos fundamentos para iluminar novas práticas educacionais*. São Paulo: Antakarana/WHH – Willis Harman House.
- Moraes, M. C. (2014). Educação e sustentabilidade: um olhar complexo e transdisciplinar. In: Moraes, M. C.; Suanno, J. H. (Orgs.). *O pensar complexo na educação: sustentabilidade, transdisciplinaridade e criatividade*. Rio de Janeiro: Wak, pp. 21-42.
- Moraes, M. C. (2019). *Saberes para uma cidadania planetária: homenagem a Edgar Morin*. Rio de Janeiro: Wak.
- Morin, E. (1974). *Paradigma perdido: a natureza humana*. Porto: Europa América.
- Morin, E. (2001^a). *Introdução ao pensamento complexo*. 3. ed. Lisboa: Instituto Piaget.
- Morin, E. (2003). A necessidade de um pensamento complexo. Tradução de Marcos Demoro. In: Mendes, C. (Org.). *Representação e complexidade*. Enrique Larreda (Ed.). Rio de Janeiro: Garamond.
- Morin, E. (2007a). *Educação e complexidade: os sete saberes e outros ensaios*. 4. ed. São Paulo: Cortez.
- Morin, E. (2007b). *Introdução ao pensamento complexo*. 3. ed. Porto Alegre: Sulina.
- Morin, E. (2015). *Ensinar a viver: manifesto para mudar a educação*. Tradução de Edgar de Assis Carvalho e Mariza Perassi Bosco. Porto Alegre: Sulina.

- Morin, E.; Ciurana, E. R.; Motta, R. D. (2003). *Educar na era planetária*. Tradução: Sandra T. Valenzuela. Revisão técnica: Edgard de Assis Carvalho. São Paulo: Cortez; Brasília, DF: UNESCO.
- Morin, E.; Kern, A. B. (2003). *Terra-Pátria*. Tradução de Paulo Azevedo Neves da Silva. Porto Alegre: Sulina.
- Petraglia, I. (2001). *Olhar sobre o olhar que olha: complexidade, holística e educação*. Petrópolis, RJ: Vozes.
- Petraglia, I. (2013). *Pensamento complexo e a educação*. São Paulo: Livraria da Física.
- Sá, R. A. (2008). Pedagogia e complexidade: diálogos preliminares. *Educar*, Curitiba, n. 32, pp. 57-73. <https://www.scielo.br/j/er/a/YqBPRnCVFP8LhGSSfYdfzLH/>
- Souza, K. P. de Q. *Complexidade e ecoformação: um olhar epistemológico na dimensão socioambiental do programa Ciências do Ambiente*. 2019. 156f. Tese (Doutorado em Ciências do Ambiente) – Programa de Pós-Graduação em Ciências do Ambiente – PPGCiamb, Universidade Federal do Tocantins. Palmas – TO, 2019. <https://repositorio.uft.edu.br/handle/11612/1747>
- Silva, M. da. Um pensador chamado Edgar Morin. In: MORIN, E.; KERN, A. B. *Terra-Pátria*. Tradução de Paulo Azevedo Neves da Silva. Porto Alegre: Sulina, 2003.

RESUMO:

A epistemologia complexa abordada no campo educacional pelo cientista Edgar Morin, apresenta possibilidade de reflexão na dimensão da formação integral do ser humano, como elo que propicia o sentido de várias conexões entre diferentes vidas no universo. Para tanto, buscamos refletir, a partir da epistemologia complexa, a interconexão entre o ser humano, a sociedade e o meio ambiente, numa dimensão planetária. Assim, com uma abordagem qualitativa, propomos continuar os estudos sobre a epistemologia complexa ao apresentar a concepção interligadora de Edgar Morin, a qual se fortalece entre os séculos XX e XXI revelando a necessidade da mudança de pensamento para o reconhecimento de interconexões numa dimensão planetária.

PALAVRAS-CHAVE: Pensamento complexo; Religação; Ser humano; Planetário.

RESUMEN:

La epistemología compleja abordada en el campo educativo por el científico Edgar Morin, presenta la posibilidad de reflexión sobre la dimensión de la formación integral del ser humano, como vínculo que

proporciona el sentido de diversas conexiones entre diferentes vidas en el universo. Para ello, buscamos reflexionar, desde la perspectiva de la epistemología compleja, sobre la interconexión entre el ser humano, la sociedad y el medio ambiente, en una dimensión planetaria. Así, a partir de un abordaje cualitativo, proponemos continuar nuestros estudios sobre epistemología compleja presentando el concepto de interconexión de Edgar Morin, que se fortaleció entre los siglos XX y XXI, revelando la necesidad de un cambio de pensamiento para reconocer las interconexiones a escala planetaria.

PALABRAS CLAVE: Pensamiento complejo; Reconexión; Ser humano; Planetario.