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The Complexity Paradigm: a transdisciplinary context for an emancipatory education

O Paradigma da Complexidade: contexto transdisciplinar para uma educação emancipadora

El paradigma de la complejidad: un contexto transdisciplinario para una educación emancipadora

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Abstract

This text proposes reflections by recognizing emerging educational approaches as developments of the educational paradigm of complexity, meeting the needs of this third millennium. To understand the intertwined concepts, the methodology used was qualitative research, as it sought to understand the phenomena studied, interpreting contexts and theories about the complex panorama and its developments in contemporary times. In contrast to the statement that it has not yet been possible to implement all the procedures that education has been

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striving for since the beginning of the 20th century, with innovative paradigms, it must be recognized that, even if in minimal proportions and in homeopathic doses, the fruits of the efforts achieved are being reaped. Among the main authors cited are Paulo Freire (2020; 2020b; 2020c), with his progressive educational approach, extremely relevant to the development of complexity, and Edgar Morin (2015; 2018; 2020), precisely because of the way he presents his complex thinking, which builds the current paradigm. In the end, it can be concluded that this perspective broadens the horizons of teaching and learning, stimulating the collective construction of knowledge by preparing ethical and supportive subjects to face the global and existential challenges of the 21st century, always remembering that it is in the symbolic space of the heart that the key to overcoming the current planetary crisis resides.

Keywords: Paradigm of Complexity. Transdisciplinarity. Emancipatory education.

Resumo

Este texto propõe reflexões ao reconhecer abordagens educacionais emergentes como desdobramentos do paradigma educacional da complexidade, satisfazendo as necessidades desse terceiro milênio. Para a compreensão dos conceitos entrelaçados, a metodologia utilizada foi a pesquisa qualitativa, à medida em que buscou-se pela compreensão dos fenômenos estudados, interpretando contextos e teorias sobre o panorama complexo e seus desdobramentos na contemporaneidade. Em contraposição à afirmação de que ainda não foi possível implantar todos os procedimentos pelos quais a educação vem se esforçando desde o início do século XX, com os paradigmas inovadores, deve-se reconhecer que, mesmo que em proporções mínimas e em doses homeopáticas, colhem-se frutos dos esforços conquistados. Entre os principais autores citados estão Paulo Freire (2020; 2020b; 2020c), como sua abordagem progressista educacional, extremamente relevante para o desenvolvimento da complexidade, e Edgar Morin (2015; 2018; 2020), justamente pela maneira como apresenta seu pensamento complexo, edificador do paradigma vigente. Ao final, pode-se concluir que esta perspectiva amplia os horizontes do ensino-aprendizagem, estimulando a construção coletiva do saber ao preparar sujeitos éticos e solidários para enfrentar os desafios globais e existenciais do século XXI, lembrando-se sempre que é no espaço simbólico do coração que reside a chave para superar a crise planetária atual.

Palavras-chave: *Paradigma da Complexidade. Transdisciplinaridade. Educação emancipadora.*

Resumen

Este texto propone reflexiones al reconocer los enfoques educativos emergentes como desarrollos del paradigma educativo de la complejidad, que responden a las necesidades de este tercer milenio. Para comprender los conceptos entrelazados, se empleó una investigación cualitativa, buscando comprender los fenómenos estudiados, interpretando contextos y teorías sobre el panorama complejo y sus desarrollos contemporáneos. En contraste con la afirmación de que aún no se han implementado todos los procedimientos que la educación ha buscado desde principios del siglo XX, con paradigmas innovadores, cabe reconocer que, aunque en proporciones mínimas y en dosis homeopáticas, se están cosechando los frutos de los esfuerzos realizados. Entre los principales autores citados se encuentran Paulo Freire (2020; 2020b; 2020c), con su enfoque educativo progresista, de gran relevancia para el desarrollo de la complejidad, y Edgar Morin (2015; 2018; 2020), precisamente por la forma en que presenta su pensamiento complejo, que construye el paradigma actual. En conclusión, se puede concluir que esta perspectiva amplía los horizontes de la enseñanza y el aprendizaje, estimulando la construcción colectiva de conocimiento al preparar individuos éticos y solidarios para enfrentar los desafíos globales y existenciales del siglo XXI, recordando siempre que es en el espacio simbólico del corazón donde reside la clave para superar la actual crisis planetaria.

Palavras-chave*: Paradigma de la Complejidad. Transdisciplinariedad. Educación Emancipadora.*

Introduction

Contemporary times are marked by unprecedented and interconnected challenges—climate change, social inequalities, political crises, and rapid technological transformations—all of which demand equally complex and innovative responses from education. In this context, it has become increasingly necessary to rethink educational strategies and tools traditionally grounded in conventional models of teaching and learning. Many current choices remain rooted in fragmented perspectives, often disconnected from actual social and human needs.

It is within this scenario that the paradigm of complexity has emerged, developed by various thinkers and educators concerned with contemporary education, such as Edgar Morin. The pursuit of ideal educational practices thus centers on an epistemological and methodological alternative capable of addressing present-day issues in a more integrated and comprehensive way.

The complexity paradigm calls for a rupture with the reductionist and linear logic that has historically shaped scientific knowledge and pedagogical practices. In contrast to traditional educational models, it urges consideration of the multiple dimensions of phenomena—their interactions, contradictions, and uncertainties. This perspective aligns with a transdisciplinary approach that seeks to transcend rigid disciplinary boundaries, fostering an ecology of knowledge and openness to dialogue among diverse forms of knowing. In pedagogical practice, these principles advocate for an approach that not only informs but also forms transformative agents—going beyond the mere transmission of content to promote learners' emancipation.

Within this debate, Paulo Freire's progressive pedagogy is revisited as fertile ground for the flourishing of the complexity paradigm. Through his unwavering commitment to dialogue, problematization, and critical consciousness, Freire provides an indispensable ethical and political foundation for envisioning education oriented toward autonomy and social transformation. His advocacy of dialogical and participatory practices strongly resonates with the principles of complex thought, reinforcing a vision of education rooted in freedom, responsibility, and solidarity.

The primary objective of this text is to explore the complexity paradigm and its implications for education, establishing connections with Paulo Freire's transdisciplinary and emancipatory pedagogy. The aim, therefore, is to outline a conceptual framework that contributes to the development of pedagogical proposals more attuned to the plurality, uncertainty, and interdependence that characterize the contemporary human and social condition.

The complexity paradigm

The current planetary crisis reflects a symptom of the dominant Western paradigm, now challenged by what is known as the Complexity Paradigm. According to Morin (2020), a paradigm shift is a long, complex, and turbulent process that encounters considerable resistance from entrenched structures and deeply rooted mindsets. Edgar Morin, an eminent French philosopher and sociologist widely referenced in contemporary discourse, has played a pivotal role in advancing complex thinking in education—particularly through his analyses of transdisciplinary approaches and the dynamics of teaching and learning. He argues that we must critically reflect on our trajectories and our interactions with the world around us. As Morin (2020, p. 22) states: "The unpredictable future is in gestation today. Hopefully, it will be for the regeneration of politics, for the protection of the planet, and for the humanization of society: it is time for a change of path."

This text proposes reflections that recognize the emergence of new educational approaches as part of a broader shift toward a complex educational paradigm—one that seeks to respond to the demands of the third millennium. In this regard, we observe increasing efforts within education aligned with the complexity

paradigm. However, these efforts have yet to be fully and effectively integrated into curricular practices. In other words:

> Considering complexity in educational planning means engaging with an ontological dimension that helps us understand and navigate uncertainties through a systemic and ecological perspective, enabling the articulation, reconnection, contextualization, and globalization of knowledge (Pedroso & Machado, 2021, p. 279).

The complexity paradigm emerges as a counterpoint to the principles and procedures of the Newtonian-Cartesian paradigm. It challenges the traditional compartmentalization of knowledge into isolated domains and instead advocates for reconnection and integration. In this view, the human being is no longer perceived as an isolated entity but, rather, as an integral part of a larger system—a member of a society that must come together, reorganize itself, and collectively forge a new world and a new way forward (Morin, 2018). To clarify the significance of the transition from one paradigm to the other, the following key points stand out:

> Since the early 20th century, particularly in the 1920s, the shift from the mechanistic paradigm to the complexity paradigm has unfolded in various ways and at different paces across multiple fields of knowledge. Prigogine, Edgar Morin, and other scholars have proposed concepts that marked a definitive break from deterministic dominance, giving rise to a more systemic understanding of the purposes, structure, and rationality of modern science (Lobón, 2021, p. 186).

One of the main distinctions between conservative paradigms and the paradigm of complexity is the latter's recognition of the importance of diversity and difference. Within this approach, students are encouraged to explore multiple perspectives and to value a plurality of opinions and lived experiences. Traditional models, by contrast, have typically prioritized standardization and uniformity, often neglecting the individual and cultural particularities of students (Moraes, 2012).

Much has been said about the persistence of traditional educational models in current practices, particularly in light of longstanding critiques. Questions continue to arise regarding why strategies developed over decades—grounded in more innovative paradigms—have not yet been fully implemented within educational systems. Despite ongoing efforts, there remains a struggle against a traditional scientific worldview that disregards the complexity, context, and multidimensional nature of reality, as well as the holistic development of both students and teachers.

Contrary to the claim that it is still impossible to implement the educational ideals envisioned since the early 20th century, it is important to acknowledge that, even if only in small and gradual ways, the fruits of these efforts are beginning to emerge. The inclusion movement, for instance, represents a direct outcome of the processes initiated by Paulo Freire—one of the most influential educational thinkers—whose legacy is recognized globally. His theories on hope, freedom, and autonomy laid the groundwork for a fundamental shift in education.

Paulo Freire's pedagogy, which emphasizes the multidimensional development of both teachers and students, is considered liberating for many reasons. Chief among them is its focus on dialogue as a tool for constructing meaningful educational experiences. Through dialogical engagement, students and teachers critically examine the teaching-learning process, challenging its relevance and direction. Freire believed that it is through dialogue that students come to understand what they truly need and want to learn. As he wrote: "Dialogue is this encounter of people, mediated by the world, to pronounce it, and is therefore not limited to the I-you relationship" (Freire, 2020, p. 109).

At the heart of this pedagogical approach is a commitment to student autonomy in the learning process—liberating students from the notion that the teacher is the sole authority and bearer of knowledge. As Freire himself stated:

> In this sense, teaching is not the mere transmission of knowledge or content, nor is training the act by which a creative subject imposes form, style, or soul upon an indecisive and passive body. There is no teaching without learning; the two are inseparable, and their subjects—despite connotative differences—are never reduced to being mere objects of one another. Those who teach, learn through teaching; and those who learn, teach through learning. To teach is always to teach something to someone. For this reason, from a grammatical standpoint, the verb "to teach" is a transitive relational verb (Freire, 2020b, p. 25).

In the current context—marked by growing diversity and the relentless pursuit of equality—the inclusion of Black individuals, transgender people, people with disabilities, and youth from peripheral neighborhoods in universities is of fundamental importance in the construction of a more inclusive and just society. This paradigmatic shift reflects not only an evolving understanding of justice in social relationships, but also the realization of theories, predictions, and efforts advanced by thinkers such as Paulo Freire. His liberating pedagogy, grounded in the valorization of dialogue and the promotion of critical consciousness, has become a guiding framework for shaping an inclusive educational system.

By opening the doors of universities to historically marginalized groups, the foundational principles of Freirean pedagogy are brought to life. Inclusion ceases to be merely theoretical; it becomes a bold and concrete step toward creating an academic environment that reflects the richness and complexity of society. The presence of these groups in higher education not only diversifies perspectives but also confronts entrenched stereotypes, fostering a deeper understanding of the human condition. In this way, the classroom transforms into a space of cultural exchange, where diverse experiences intersect, weaving a more complex and empathetic social fabric.

However, it is essential to emphasize that the pursuit of truly inclusive education does not end at the university gates. It is necessary to implement policies and practices that ensure the retention and professional development of these students, guaranteeing access not only to higher education but also to the full realization of their potential.

These issues emerge within a broader panorama of complexity, grounded in the understanding that the world is an interconnected and ever-evolving system. Learning, therefore, is understood as a non-linear, dynamic process in which students are encouraged to think critically and creatively, constructing knowledge in inclusive and collaborative ways. Teaching is no longer driven by conservative procedures but is oriented toward innovative pedagogical practices. The emphasis shifts to the development of skills such as problem-solving, effective communication, and the ability to navigate unexpected and novel contexts (Behrens, 2013).

The current context of complexity calls for a dynamic classroom that ensures educational practices align with the principles upheld by transformative pedagogical approaches, because:

> From the perspective of complex thinking, the classroom is a space of communication and social interaction, grounded in the practical experiences of the learning subject, who continuously constructs new knowledge in order to act effectively and reflectively in the world. As a form of cultural production, the classroom is a humanly constructed environment that has been redefined throughout history through new perspectives—ones that embrace the plurality and dialogue of knowledge, now understood as provisional and open to questioning in response to the fundamental needs of the individual (Pedroso & Machado, 2021, p. 280).

Educational approaches within the complex landscape are, therefore, oriented toward the humanistic development of students, addressing the social, political, ecological, artistic, mystical, and economic dimensions of society in the current planetary era, as conceptualized by Edgar Morin in several of his works. The overarching and global objective of education is not solely the pursuit of progress but also the survival of humanity. As Morin (2018, p. 68) affirms, "the education of the future must teach the ethics of planetary understanding."

Accordingly, the complexity paradigm centers on both the individual development of students and their relationship with the collective, increasingly positioning them as active agents in their own learning process. Students are called to become aware of, and take responsibility for, their holistic human

development—social, personal, and professional. As Morin (2018, p. 54) states: "Education should show and illustrate the multifaceted destiny of the human: the destiny of the human species, the individual destiny, the social destiny, the historical destiny—all intertwined and inseparable."

In this sense, complexity is inherently connected to a questioning way of being in the world—one that embraces uncertainty and the formulation of deep, often difficult questions, without the assurance of immediate or simple answers, because:

> First of all, I must say that complexity, for me, is a challenge—not an answer. I am searching for a way to think through complication (that is, infinite inter-retroactions), through uncertainty, and through contradiction. I absolutely do not recognize myself in the claim that I position the antinomy between absolute simplicity and perfect complexity. For me, complexity necessarily involves imperfection, as it embraces uncertainty and acknowledges the irreducible (Morin, 2015, p. 102).

A learning environment aligned with the educational paradigm of complexity is one that, beyond providing the technological resources necessary for inquiry-based teaching, is constructed as a space of human connection—grounded in the relational dynamics between teachers and students. These relationships must arise from the specific contexts of each subject and learner, fostering an environment characterized by love, empathy, resilience, and humanism.

To effectively implement transdisciplinary teaching, it is essential to create experiential spaces that expand students' reflective capacities and stimulate transformative actions. In this regard, cultivating an environment of affection and encouragement for research becomes vital, so that students feel motivated to engage in the production of knowledge, deepening their understanding on multiple levels. The learning space, in connection with extracurricular contexts, should thus be understood as a living environment where knowledge subjects intersect—coexisting in their diversity and engaging in dialogue among various ways of knowing: cognitive, rational, intuitive, imaginary, magical, and spiritual—both within and beyond the university setting.

Such a space for coexistence, inquiry, and practice becomes a locus of invention and discovery, initiating the pursuit of new knowledge. A relational approach that respects the unique individual contexts of each student contrasts starkly with Freire's (2020) concept of the oppressor-oppressed dynamic, avoiding the imposition of one consciousness over another. It instead fosters humanistic educational processes, distancing itself from the contradictions inherent in the traditional paradigm. As Freire (2020, p. 48) asserts, "Overcoming the contradiction is the birth that brings into the world this new man, no longer an oppressor; no longer oppressed, but a man liberating himself."

Taking action, then, becomes an inevitable outcome for students immersed in environments grounded in dialogical practice and open to alternatives beyond binary oppositions of right and wrong. Such spaces nurture freedom and emotional experience, allowing students to fully engage in their own educational journeys.

The educational paradigm of complexity, therefore, demands the creation of transdisciplinary environments where living knowledge can emerge organically through actions that cultivate a favorable, multidimensional atmosphere. Multidimensionality thrives only in spaces where it is nurtured through intentional pedagogical design.

Fragmented knowledge, by contrast, limits the ability to perceive and respond to the new and multifaceted problems of a world increasingly shaped by complex interrelations and actions rooted in lived knowledge (D'Ambrosio, 2012). More than merely transmitting content, the aim of education under this paradigm is to nurture meaningful human relationships, recognizing the importance of the "other" in each individual's process of becoming. It is, therefore, essential to reconnect with the soul of the student, to welcome them and support the development of deep and meaningful connections, because:

> Transdisciplinarity leads the individual to become aware of the essential nature of the other and of their own integration into social, natural, planetary, and cosmic reality. A direct consequence of this

> essentiality is that such integration can only occur through relationships grounded in respect, solidarity, and cooperation—with others, and by extension, with society, nature, and the planet—all of which are interconnected within cosmic reality. This represents the awakening of consciousness in the process of acquiring knowledge. The great transformation humanity is currently experiencing is the convergence of knowledge and consciousness (D'Ambrosio, 2012, p. 227).

According to Morin (2015), experiencing complexity is an invitation for the human mind to transcend the limiting boundaries of traditional disciplines and to engage with the interconnectedness inherent in real-world systems. Complex thinking, therefore, involves embracing a system composed of numerous interconnections and layers of meaning that characterize reality. Rather than fragmenting knowledge into isolated categories, Morin advocates for the exploration of interactions, reciprocal influences, uncertainties, and failures that permeate all dimensions of life. This approach challenges us to think relationally and contextually, recognizing that understanding emerges not from reduction, but from the integration of diverse and often contradictory elements.

Transdisciplinarity and the complex thinking of Edgar Morin

The concept of transdisciplinarity was first introduced during the First International Meeting on Multidisciplinarity and Interdisciplinarity, held at the University of Nice, France, in September 1970, by Jean Piaget. In his explanation, Piaget illustrated the evolution of thought, emphasizing that collaboration between knowledge domains and fields of study needed to advance to the stage of transdisciplinarity—achieving interaction within a complete system without boundaries separating different disciplines (Sommerman, 2006). Transdisciplinarity, therefore, serves as a critique of the positivist approach that segregates sciences into isolated disciplines, which promotes intense specialization but restricts a comprehensive view of knowledge.

In 1957, Edgar Morin co-founded the journal Arguments with some friends, marking the beginning of his reflections on the theoretical foundations of complexity, particularly as it relates to the human world. This reflection evolved over the course of thirty years, culminating in his seminal work, The Method. In March 1968, Morin participated in a conference in Milan on the international nature of the student revolts in France and also served as a substitute professor at the University of Nanterre during the unrest leading up to the May 1968 student uprising. Beyond student demands, this period was marked by movements for women's emancipation, the liberalization of customs, and the increased understanding of homosexuality, as Morin (2020) explains.

The release of the Meadows Report in 1972 awakened environmental consciousness by predicting that the deterioration of the biosphere would precipitate the decline of the anthroposphere, thereby affecting food security, resources, health, and human psychological well-being (Morin, 2020). Having already developed ecological awareness during his visits to California in 1969 and 1970, Morin became a pioneer of ecological politics, influenced by the insights of the Meadows Report.

Regarding contemporary environmental challenges, Morin views the coronavirus pandemic as a renewed awakening of ecological consciousness. However, he warns that humanity might need to reach the brink of catastrophe before truly embracing the imperative for vital salvation. As he stated:

> I have dedicated myself to this cause for half a century. But I situate it within a broader conception—one in which politics integrates ecology, and ecology integrates politics. In this view, the global techno-economic frenzy, fueled by an insatiable thirst for profit, is the driving force behind the degradation of both the biosphere and the anthroposphere. This brings me back to my stance of resistance (Morin, 2020, p. 18).

In intellectual and political resistance to the barbarities he witnessed throughout his 103 years, Edgar Morin developed his ideas—formulated since the 1980s and expressed through numerous books, articles, and conferences. These ideas were further updated in response to the immense crisis unleashed by

the coronavirus pandemic, which, while profoundly surprising to him, ultimately confirmed his way of thinking. Morin describes himself as a product of all the crises he has lived through and, despite expecting the unexpected, he remains concerned about setbacks, outbursts of barbarity, and the looming possibility of historical cataclysms (Morin, 2020).

Throughout his education and career, Morin transcended disciplinary boundaries with remarkable versatility, engaging deeply with philosophy, sociology, anthropology, and education—fields in which complexity has been a central theme. His work stands as a living testament to complex thinking, weaving together events, ideas, and people that shape our world. In this way, his intellectual contributions have transformed abstract concepts into profound reflections on the human condition, culture, education, and politics, because:

> The interdisciplinary construction of knowledge, from Morin's perspective, demands cognitive approaches that move away from generalized theoretical frameworks and reject ready-made explanations. Complex rationality requires a spirit of inquiry that is open to interdisciplinary dialogue, as well as an intelligibility capable of grasping the antagonistic and competing interrelations between human societies and their respective geographic spaces (Stroh, 2021, p. 223).

Edgar Morin turned his attention to educational processes in the late 1990s at the invitation of UNESCO, when he wrote the influential book The Seven Necessary Knowledges for the Education of the Future (2018). This work is crucial for educational institutions seeking to rethink their direction for education in the third millennium. In 1998, UNESCO Brazil published Jacques Delors's report Education: A Treasure to Discover, which established the four pillars of contemporary education: "learning to be" (focusing on the holistic development of the human being); "learning to know" (engaging the learner in continuous knowledge acquisition); "learning to do" (integrating theoretical and practical knowledge); and "learning to live together" (emphasizing coexistence within communities).

Based on the Delors Report, as it came to be known, Morin concluded that there are seven types of knowledge that society as a whole should learn. These are presented as chapters in his book, each dedicated to exploring one of these essential knowledges. Morin's work is concise and clearly explains his rationale for why these knowledges are necessary for the education of the future. Although written more than 20 years ago, the book remains highly relevant today, continuing to inspire a new generation of teachers and students.

On this new journey, Morin led us to deeply question conventional teaching methods and recognize that education has yet to reach its transformative potential, because:

> It is a body of knowledge integrated into complex thinking that transcends disciplinary boundaries, forming a holistic view of the world and of phenomena, in a circular and interactive relationship with learning subjects. As principles of articulated thinking, they should not be mistaken for something inherently difficult or complicated to understand. On the contrary, reality must be approached through a comprehensive, inclusive, and multidimensional perspective (Pedroso & Machado, 2021, p. 282).

In *The Seven Necessary Knowledges for the Education of the Future* (2018), Edgar Morin argues that late-20th-century education failed to meet the complex and interconnected demands of the contemporary world. His work is based on the premise that traditional education is fragmented and compartmentalized, rendering it incapable of addressing the intricacies of present-day reality. Morin thus suggests that the education of the future—already underway in the present—must transcend disciplinary boundaries and promote a more holistic understanding of knowledge. He proposes seven essential knowledges for the education of the future, each of which highlights indispensable aspects that must be incorporated into the teaching-learning process in order to develop individuals better prepared to face the challenges of the 21st century.

The Blindness of Knowledge: Error and Illusion. In the first chapter, Morin addresses the concept of "the blindness of knowledge," emphasizing error and illusion as common obstacles to understanding reality. He argues that the pursuit of knowledge is often hindered by this blindness, which can stem from

oversimplification, the fragmentation of knowledge, and rigid thinking. Morin contends that such blindness is inherent to the human condition and underscores the need for a more complex, multidimensional approach to reality. He advocates for what he calls "complex thinking," which involves integrating diverse perspectives and understanding the interconnections among various elements.

This chapter also underscores the importance of recognizing and engaging with error as an inherent part of the learning process. Morin maintains that the search for truth is not linear and that acknowledging the inevitability of error is essential for growth and improvement.

Thus, this chapter examines intellect, reason, and illusion, and calls for the acceptance that no knowledge is absolute. According to Morin, no form of knowledge is immune to being challenged by error or illusion (Morin, 2018). This includes perceptual errors—such as those revealed through optical illusions—which demonstrate that even our senses can deceive us. In other words, we cannot fully trust what we see. There is also the error of interpretation, which emerges when people miscommunicate or misunderstand one another. For example, someone may say one thing and be interpreted quite differently, especially when emotions interfere with rational thought, increasing the likelihood of misunderstanding.

Morin also argues that no scientific theory is eternally free from error. Technological advancements have revealed flaws in previously accepted theories. The invention of the microscope, for instance, demonstrated that many diseases are caused by microorganisms that were previously unknown (Morin, 2018).

In this first chapter, Morin identifies several factors that prevent knowledge from ever being 100% true or definitive. He explains that mental errors—arising from the confusion between reality and imagination—can distort our understanding. For example, some people claim to have seen mythological beings, confusing imagined experiences with reality. Memory, according to Morin, can also be a source of error, as it is prone to distortion and selective recall.

The Principles of Pertinent Knowledge. In the second chapter, Edgar Morin argues for the importance of engaging meaningfully with knowledge and emphasizes the role of fundamental human faculties, such as curiosity, in this process. He stresses the necessity of understanding human beings in their full complexity—biological, psychological, social, emotional, and cognitive dimensions must be considered in an interconnected way.

On a broader scale, Morin highlights that societies are shaped by a multitude of "languages"—history, economics, sociology, and religion, among others. However, he critiques the tendency within disciplinary sciences to neglect global issues by approaching knowledge in a compartmentalized manner. This fragmented view hinders the development of effective, comprehensive solutions to contemporary problems, as essential elements that should be interwoven are instead treated in isolation.

In this chapter, Morin explores the concepts of context, globalization, and what he terms the Planetary Age. He addresses the challenge of situating knowledge in a world where everything is increasingly interconnected. Events occurring in one part of the globe—such as China—can have immediate and significant impacts elsewhere, including Brazil. The world is no longer composed of isolated, self-contained cities, nations, or continents. With globalization and digital technology, access to information has grown exponentially, and the ways we engage with it continue to evolve (Morin, 2018). Therefore, education must enhance its capacity to organize and make sense of the vast and interconnected knowledge available in today's world.

Morin contends that contemporary problems require an approach grounded in multidisciplinarity, multidimensionality, transversality, globality, and planetarity. When knowledge is addressed in isolation, these essential aspects are ignored. He argues that context provides meaning to knowledge—without context, knowledge becomes fragmented and inadequate.

The global refers to the relationship between parts and the whole. A community, for instance, manifests itself in each individual—through their language, understanding, responsibilities, and shared rules (Morin, 2018). However, focusing solely on the whole can also obscure important details. Thus, both the whole and the parts must be considered together.

Multidimensionality refers to complex entities—such as human beings—who are not merely biological organisms but also social, psychological, emotional, and rational beings. Similarly, a community cannot be understood solely in terms of its present state; it also encompasses historical, economic, sociological, and religious dimensions. It is a mistake to isolate any one part and treat it as the absolute truth.

In this context, Morin defines complexity as the integration of all these interconnected elements. The very etymology of the word complex implies something composed of multiple interrelated parts. Morin argues that education must cultivate comprehensive intelligence—an ability to understand complexity, context, and multidimensional reality within a global framework (Morin, 2018).

Teaching the Human Condition. In the third chapter, Morin explores the essence of the human being, emphasizing the importance of overcoming geographical and cultural barriers through the recognition of our shared humanity. He asserts that understanding history is essential for this process. Within this framework, he introduces the concepts of the Planetary Age and the Cosmic Condition. The exploration of the Earthly Condition—our existence on Earth—leads to the construction of an earthly identity, where biological equality coexists with cultural diversity. These differences, rather than dividing humanity, enrich it, highlighting a fundamental similarity amid diversity.

Despite regional, cultural, and linguistic differences, Morin argues that all human beings share a common condition. At their core, all individuals are simply human beings in pursuit of happiness. While they are biologically alike, they differ culturally, and this interplay between sameness and difference is what Morin calls uniduality (Morin, 2018). Unity does not erase diversity, and diversity does not eliminate unity. This recognition of our dual condition—both one and many—is essential for the education of the future. It teaches that although we are all human, each individual has their own distinctions that must be respected and understood, without losing sight of our shared humanity.

Teaching Earthly Identity. In the fourth chapter, Morin takes a historical perspective, tracing humanity's origins from the dawn of Homo sapiens through processes of evolution and diaspora to the formation of ancient civilizations. He argues that the increasing interconnectedness of the world demands the development of an earthly identity and a global consciousness. Such identity formation implies learning how to coexist, communicate, collaborate, and cultivate ecological awareness—not only for present generations but also for those to come.

From this chapter forward, Morin's concepts begin to resonate more clearly with contemporary experiences. The notion of earthly identity challenges humanity to reflect from a broader perspective—one that encompasses not just the current human condition but also the historical trajectory that has led us to the Planetary Era (Morin, 2018). He stresses that to understand today's globalized and hyperconnected world—marked by the rise of telecommunications, the internet, and digital information—we must examine the past: the emergence of the first humans, their migrations, the formation of early societies, and the development of civilization.

Morin concludes the chapter by asserting that the world is becoming more unified. As a result, there is an urgent need to foster both earthly identity and planetary consciousness. Humanity must learn to live on this planet responsibly—to coexist, to communicate with empathy, and to develop a deep ecological awareness. This consciousness must also be nurtured in future generations through education that embraces sustainability, interdependence, and planetary ethics.

Facing Uncertainty. In the fifth chapter, Morin addresses how to educate for uncertainty, proposing an approach that emphasizes caution, adaptability, and resilience in the face of the unknown. He acknowledges that life is unpredictable and that change—whether positive or destructive—is an inherent part of the human experience. It is essential, therefore, to prepare individuals to navigate unforeseen events with clarity and courage.

Since knowledge is not absolute or final, education must teach people how to live with doubt and ambiguity. Morin asserts that uncertainty is a defining feature of our existence and that it must be embraced rather than denied. There are not only creations and innovations, he says, but also collapses and losses—yet even destruction can be a source of renewal and progress (Morin, 2018).

He stresses the importance of teaching children how to manage uncertainty, frustration, and risk. Every decision involves uncertainty, and not all consequences can be predicted—especially in the long term. Thus, education should focus not only on transmitting knowledge but also on equipping individuals with the emotional and cognitive tools to confront complexity, volatility, and change.

Teaching Understanding. In the sixth chapter, Morin distinguishes between teaching technical knowledge—such as mathematics—and educating for human understanding, which involves much more than the transmission of information. He emphasizes that education must cultivate understanding of the human condition, a mission that requires great care, as it is intrinsically tied to the formation of ethical, empathetic citizens.

Understanding, in this context, involves the practice of active listening, the ability to place oneself in another's position, and the development of values such as empathy, sympathy, and generosity. Morin stresses the ethics of understanding, which calls for a selfless attitude—understanding others not for personal gain, but as a moral imperative.

He also underscores the importance of intercultural learning. By engaging with diverse cultures, including religious traditions, learners can develop a deeper respect for difference. According to Morin, recognizing others in their uniqueness reaffirms our own humanity. This openness to difference not only broadens our perspective but also transforms our behavior and our relationships with those around us.

Educating for understanding, therefore, is not merely about acquiring knowledge but about shaping attitudes and values. Teaching a discipline like mathematics is one kind of experience; teaching for human understanding is another—one that must be continuously pursued. While specific content is necessary for informed citizenship, the ultimate goal of education must never be lost: to cultivate empathy, generosity, and moral responsibility. Morin reminds us that sometimes we must give up our own desires for the greater good—and that doing so is not easy, but essential for coexistence (Morin, 2018).

The Ethics of Humankind. In the seventh and final chapter, Morin proposes an integrated vision of education through what he calls the ethics of humankind. This ethics synthesizes all previous knowledges and introduces the concept of anthropoethics—an ethical framework based on the dynamic interplay of three elements: the individual, society, and the human species. This triadic structure influences human consciousness and should guide future educational practices.

Morin stresses that ethics must consider the complexity of the human being—encompassing biological, cultural, social, ideological, and emotional dimensions. This holistic perspective promotes the interconnection between the various forces that shape human identity and morality, allowing for a more complete understanding of ethical and existential issues.

According to Morin, anthropoethics is the central anthropological mission of the new millennium. It calls on humanity to work toward its own humanization by fostering global unity, respecting diversity while preserving identity, cultivating solidarity, and embracing an ethics of mutual understanding and shared responsibility. In this sense, the future of ethics—and of education—is one in which humanity must take on the task of safeguarding its own existence and the planet itself. The results may be slow, but the moral obligation remains undeniable (Morin, 2018).

Based on the seven knowledges proposed by Edgar Morin, we can understand attitude as a mobilizing force behind human action. It goes beyond mere behavior; it expresses a deeper positioning in relation to knowledge, to the object of study, and to others. Attitude influences how individuals relate to peers, motivates action, and shapes the reasons behind human choices.

In this light, education must not only transmit content but foster attitudes that support reflection, empathy, cooperation, and ethical engagement with the world. The goal is to broaden the scope of educational reflection and spark new contributions—ones that make the pursuit of knowledge not only intellectually stimulating but also profoundly human.

Transdisciplinary practices are only possible when an open form of rationality is adopted—that is, when the boundaries of traditional scientific fields are transcended to embrace the subject of knowledge in their entirety, including their creativity, life experiences, and the cultural contexts in which they are

embedded (Moraes, 2012). It is, therefore, essential to acknowledge that outdated teaching and learning models are no longer viable, as students today are immersed in a new technological, social, cultural, political, spiritual, and anthropological era.

In transdisciplinary practices, attitudes refer to the learning agents—both students and teachers—and encompass their capacity for action and reflection, as well as their values, commitments, desires, and intentions. These attitudes influence how individuals make decisions and position themselves in the world. Consequently, authoritarian and hierarchical behaviors cannot be considered valid social systems, as they are based on relationships of mutual negation (Maturana, 2001). When teachers adopt oppressive practices, they inhibit the formation of emotional bonds with students—relationships that are essential for the educational paradigm of complexity.

The transdisciplinary approach seeks to understand the world through the dynamic interaction between the external world of objects and the internal world of the knowing subject. This interaction fosters self-discovery, genuine experience, emancipation from oppressive systems, and the realization of authentic being (Ferreira, 2005). Educational processes rooted in a transdisciplinary perspective not only generate new forms of knowledge but also inspire new ways of learning, being, feeling, and acting. In this sense, transdisciplinarity is a living, evolving practice that enables understandings that would otherwise remain inaccessible.

Importantly, transdisciplinarity should not be confused with the mere integration of disciplines. It must be understood as a form of collaboration that occurs between, through, and beyond disciplinary boundaries. Transdisciplinarity is not defined by a specific object of study, but by its connection to diverse units of knowledge that come together to form a cohesive whole. Its primary concern is with the development of the capacity to solve problems in an engaging, creative, and autonomous manner. That is:

> Transdisciplinarity represents a level of disciplinary integration, interconnection, and interrelationship aimed at achieving a more complex vision. It involves an interaction among disciplines that goes beyond interdisciplinarity, as it seeks to integrate and interconnect various interdisciplinary systems within a broader and more comprehensive context (Behrens, 2012, p. 153).

Transdisciplinarity, therefore, is associated with the attitudes required to engage in a process that involves a distinct logic, a complex approach to reality, and a dialogical perception of phenomena. Transdisciplinary teaching demands an attitude of openness toward life in its many dimensions—an attitude marked by curiosity, reciprocity, and the ability to perceive connections among phenomena, events, and processes that go beyond superficial, everyday observation.

The transdisciplinary process, centered on problem-solving, is closely related to the capacity to integrate diverse forms of knowledge and to share personal experiences in the pursuit of collective action.

Transdisciplinary teaching is developed through relationships, and thus, when considering effective strategies, priority should be given to an attitudinal approach rather than a purely procedural or technical one. In other words, the attitudinal dimension encompasses the full range of human potential, as it manifests in all relationships—including those involved in learning—which go beyond the mere execution of isolated tasks.

Final considerations

What is currently understood about the Complexity Paradigm is the idea of an “environment” that breaks away from the conservatism of traditional educational approaches, valuing diversity, interconnection, and collaboration—principles pursued by innovative educational paradigms such as Paulo Freire’s progressive pedagogy, holistic and complex education, and the teaching-through-research model. This is not to suggest a dismissal of the need for structured systematization. On the contrary, any emancipatory

proposal is only made viable through the recognition of systematization, ideally grounded in meaningful teaching and learning experiences.

The reflections presented in this text were thus constructed and systematized based on the contributions of various educational traditions and thinkers who, throughout the 20th and 21st centuries, have strived to respond to contemporary realities and emerging trends.

The Complexity Paradigm, as articulated by Edgar Morin, offers an innovative and necessary perspective for addressing the educational challenges of our time. It calls for the abandonment of reductionist simplifications and the fragmentation of knowledge, advocating instead for the recognition of interdependence, uncertainty, and the emergent nature of phenomena in today's world. When paired with a transdisciplinary approach, this paradigm further expands the educational horizon, transcending the limits of isolated disciplines and enabling the construction of integrated knowledge—knowledge that is attentive to cultural, social, ecological, and planetary diversity.

In this context, Paulo Freire's progressive pedagogy proposes a truly emancipatory education, as it promotes dialogue, critical consciousness, and social transformation. Freirean education, grounded in respect for the lived knowledge of learners and the collective construction of meaning, resonates deeply with the principles of complex thought—particularly in its recognition of the incompleteness of knowledge and the ongoing process of its reconstruction. Education, in this light, becomes not a mere transmission of content but a practice of freedom, where teachers and students are active subjects engaged in critically reading and transforming the world around them.

The articulation of Freire's pedagogy, Morin's complex thinking, and the transdisciplinary perspective not only enriches collaborative educational approaches but also provides concrete alternatives to outdated, technocratic, and "banking" models of teaching and learning. The aim is to foster an education that values autonomy, creativity, and collective responsibility—preparing individuals to confront the complexity of contemporary life.

Experiencing a complex paradigm in education, therefore, represents an invitation to profoundly rethink the aims, methods, and meanings of educational practice. The pursuit of emancipatory education—anchored in dialogue, critical reflection, and transformative action—requires educational agents capable of integrating multiple perspectives while acknowledging the uncertainties and contradictions of the human condition. Only in this way can we cultivate ethical, compassionate individuals prepared to address the global, local, and existential challenges of the 21st century.

To conclude, as inhabitants of a troubled contemporary world and concerned with reclaiming our lost sense of humanity, it is vital to remember that the heart forms before the brain in the human embryo—and it is perhaps in this metaphor, this poetic truth, that we find the key to overcoming the planetary crisis we now face.

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