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RESEARCH ARTICLE

Ontological literacy: a pragmatic framework to foster ontological diversity in policy, research and education

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Abstract

Background

Policy, research, and education in the EU rely on secular-scientific ontologies, creating an “ontological blindness” that excludes diverse worldviews and more-than-human agency. Current scholarship lacks practical tools to operationalize ontology in decision-making domains, limiting responsiveness to ontological power imbalances and epistemological diversity.

Methods

This study employs an interdisciplinary theoretical synthesis drawing from philosophy, anthropology, neuroscience, political ecology, and critical pedagogy. Through a comprehensive literature review and peer-refined conceptual development, it distinguishes between ontological pluralism (the existence of multiple realities) and ontological diversity (intentional shared meaning-making). The research proposes “ontological literacy” as a pragmatic framework and methodological toolbox – including silhouetting, categorizing, mapping, and transforming ontology – to bridge these concepts.

Results

The framework for ontological literacy outlines four overlapping core commitments: ontological descentering, ontological awareness, planetary purpose, and regenerative action. These commitments enable practitioners to identify worldview-based conflicts, engage

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respectfully with alternative ontologies, acknowledge non-human agency, and design interventions that resonate across diverse stakeholders. This approach facilitates “root-streaming” sustainability, embedding ontological considerations deeply within educational and policy frameworks rather than merely mainstreaming compliance-based measures.

Conclusions

Integrating ontological literacy into environmental education and transdisciplinary practices allows the integration of more-than-human perspectives within policy, education and research spaces in the EU. By translating abstract philosophical concepts into actionable pedagogical tools, ontological literacy addresses systemic crises through holistic, embodied intervention and meaningful engagement to honour the plurality of worlds coexisting on our shared planet.

Plain Language summary

Many current environmental education and policy frameworks rely on a secular-scientific view of reality, that is, a form of understanding what exists based on what we can observe and measure. In this perspective, a forest is primarily a carbon sink, a river a water resource, and a bee a pollinator. While scientifically accurate, this framing often overlooks the relational depth of nature. It assumes that providing sufficient data will lead people to act rationally to preserve these resources. However, human beings live in worlds of meaning. For some, a forest is sacred; for others, it is ancestral land or a site of spiritual renewal. When education ignores these diverse ontologies – or fundamental ways different groups understand what exists and how these elements relate to each other – it risks creating a form of “ontological blindness,” where only one form of perceiving reality is validated.

To address this, the article proposes ontological literacy: a pedagogical toolkit that develops the capacity to identify and navigate multiple realities. Consider a tree: while science teaches us about photosynthesis and growth rings, an ontologically literate approach asks, *What is my relationship to this tree? Is it a commodity? A neighbour? A deity? An ancestor? Is a tree rational?* By exploring these questions, we move from fact to relational knowledge. The framework outlines four steps to integrate this literacy into practice: 1) questioning our own assumptions about what is “real” (ontological descentering); 2) engaging respectfully with alternative worldviews (ontological awareness); 3) redefining our role within the broader human and more-than-human web of life (planetary purpose); and 4) taking steps that honour these diverse connections (regenerative action).

By adopting this approach, we can move beyond “mainstreaming” sustainability (adding green topics and skills to existing curricula) toward “root-streaming” – embedding environmental care into deeper life-meaning values.

Keywords
Ontological literacy; Ontological diversity; Ontological shifts; Ontological shocks; Environmental education; Transdisciplinarity; More-than-human; Worldview

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To Paulo Freire

"I remember very distinctly my feelings when I was young: on the one hand the intense desire to learn and to understand; on the other the dissatisfaction with a pure concentration upon knowledge and the intense desire for action … where I felt I could be of use."

Excerpt of a letter from Franz Boas to Elsie Clews Parsons in Zumwalt (2022, pp. xxiii–xxiv)

"Everything Is Nature.

If there is one sentence this essay circles again and again, it is the one in its title: everything is nature.

Everything.

Forests, mountains, fungi, rivers, estuaries, coral, mosses, ancestors, weather. Children, tears, breath, menstrual blood, wrinkles, bones, gestures, silence. Languages, songs, stories, ceremonies, prayers, grief, laughter, longing. Infrastructures, mines, data centers, supply chains, cargo ships, warehouses, fibre optic cables, undersea cables. Cities, borders, prisons, hospitals, universities, factories, archives. Algorithms, code, models, interfaces, datasets, chips, rare earth metals, lithium brines, cobalt, copper. Corporations, venture capital, patent offices, advertising, platforms, attention markets, content moderation queues, ratings systems. Policies, budgets, balance sheets, elections, treaties, war rooms. Cults, memes, fandoms, influencers, addictions, recovery programs, twelve-step rooms. Medications, surgeries, meditations, exercise regimes, diets, rituals of purification. Extraction, dispossession, occupation, genocide, ecocide, starvation, displacement. Grief, shame, envy, rage, tenderness, hope, dissociation, joy. Also life. Also death. Also what lives as it dies and what dies as it lives. Also modernity. Also the tech companies. Also the critique of the tech companies. Also the platforms on which the critique circulates. Also AI. Also us, writing this. Also you, reading it."

Machado de Oliveira & Senge (2026, p. 44)

"We too must give ourselves to the text, must surrender to it. In order for that to happen, we must equally avoid other fears that scientism has instilled in us. For example, there is the fear that our emotions, our desires, may ruin our objectivity. Whatever I know I know with my entire self: with my critical mind but also with my feelings, with my intuitions, with my emotions. What I must not do is stop at the level of emotions, of intuitions. I must place the objects of my intuition under serious, rigorous investigation; I must never disregard them."

Paulo Freire in *Letters to Those Who Dare Teach*, Second Letter (2005, p. 54)

"Now, in our time, these three rivers – anguish for our world, scientific breakthroughs and ancestral teachings – flow together. From the confluence of these rivers we drink."

Macy & Brown (2014) in *Coming Back to Life*, 3. Shift in Perception and Values

1. Introduction

Policy, research, and education are deeply entangled with the ontological assumptions of those who design them. When decision-makers assume a single, secular-scientific reality, they inadvertently exclude vast segments of the population whose understandings of existence differ fundamentally. This exclusion undermines the credibility and effectiveness of secular-scientific spaces. By ignoring the ontological underpinnings of target populations, policy, research and education fail to resonate with deep-seated meaning systems, leading to superficial inclusivity and persistent conflict. The primary objective of this research is to make ontology useful as a tool for advancing social and environmental justice, by facilitating the possibility of all beings – human and more-than-human – to experience and negotiate well-being under conditions of respect and consideration.

In order to do so, we propose a pragmatic framework for operationalizing ontology as a meaningful and applicable tool for audiences beyond the philosophical discipline. Specifically, we develop the concept of ontological diversity and

ontological literacy as an actionable pathway to make policy, research, and education ontologically aware and inclusive. Ontological literacy should serve as a pedagogical bridge, enabling practitioners to identify, navigate, and co-create multiple realities.

The paper proceeds by first defining ontology from an interdisciplinary perspective, highlighting its elusiveness and incomplete nature. We then review the nascent literature on ontological literacy across governance, health, science, and education, positioning it as a meta-relational practice. Building on this foundation, we propose two pragmatic presuppositions: that consensus is reached through ontological translation rather than homogeneity of beliefs, and that ontologies have scope and power. Finally, we present a methodological framework and toolbox for ontological literacy, including techniques for silhouetting, categorizing, mapping, and transforming ontology. These tools aim to integrate ontological literacy within transdisciplinary and environmental education approaches, ultimately seeking to advance social and environmental justice through ontological descentering, awareness, purpose repositioning and regenerative action.

2. Objectives, context and methodology

2.1 Objectives

The primary objective of this research is to make ontology useful as a tool for advancing social and environmental justice. Namely, this paper:

- Addresses a critical gap in current scholarship that ignores the role of ontological assumptions in key structuring domains such as policy, research and education (Hay, 2013; J. Newman, 2019).
- Proposes a pragmatic framework for operationalizing ontology as a meaningful and applicable tool for audiences beyond the philosophical discipline, particularly in decision-making spaces within policy, research and education.
- Develops the concept of ontological diversity and ontological literacy as an actionable pathway to make policy, research and education ontologically aware and ontologically inclusive, gaining responsiveness to power imbalances.

By moving beyond abstract philosophical debates on the nature of reality, this paper seeks to translate ontological concepts into practical instruments for navigating unequal and polarized contexts where divergent realities collide.

2.2 Why ontology matters

Operationalizing ontology is crucial because policy effectiveness depends on the alignment between a particular policy and the way people understand it within their perceived reality. When policies ignore the ontological underpinnings of their target populations by assuming ontological homogeneity, they often fail to generate the necessary engagement or behavioral change. Ignoring these assumptions leads to policies that are dismissed or rejected by those whose worldviews differ from the dominant paradigm (Daigneault, 2014). In the fields of Western-based social and environmental justice, the dominant paradigm is secular-scientific (Latour, 2004), although as of late, other worldviews are gaining prominence and acceptance – e.g. indigenous cosmovision or Catholic stewardship through the Laudato Si encyclical (Puglisi & Buitendag, 2022) – as the scientific paradigm seems to be shifting towards ontological uncertainty (T. S. Kuhn, 1962; Žižek & Lawson, 2026). This humble leap into a more plural understanding of reality is not enough to generate ample consensus around environmental care, and broader consideration is needed in regards to ontological plurality both in the North and in the South.

Significant disparities exist in how populations understand and enact environmental action (Fernández-Aballí & Fernández-Aballí, 2025). For example, climate risk perception ranges from 90% in Chile to less than 60% in high-emission economies like the USA and Germany (N. Newman, Fletcher, Schulz, Andı, & Nielsen, 2020). Political polarization and mistrust in science further exacerbates this divide, with stark differences in climate concern between left- and right-wing voters, where right-wing voters are more dismissive of the environmental crisis (Dietz, Shwom, & Whitley, 2020). By operationalizing ontology, policymakers can move beyond an assumed homogeneity of beliefs towards a process of axiological translation, where meaning can be constructed differently for different understandings of reality, including environmental stewardship. This allows different ways of being and believing to coexist while finding shared values for action (Blaser, 2013; Fernández-Aballí, 2019; Taves, 2022).

Without acknowledging foundational differences, such as the ones embedded in ontological plurality, efforts to foster inclusivity remain superficial, excluding large segments of the population and undermining the credibility of secular policy, research and education spaces. Tools that make ontology operational allow us to map these elusive socio-

cognitive structures, identify conflicts that are rooted ontologically, and design interventions that resonate with the deep-seated meaning systems of diverse stakeholders.

2.3. Methodology

In order to develop a framework to make ontology operational beyond disciplinary confines, this research engages in an interdisciplinary exercise in three phases: 1) literature review on ontology across a diversity of fields such as anthropology, philosophy, ecology, policy and education; 2) theoretical synthesis; and 3) peer review of the proposed framework.

Consulted literature fell in at least one of the following disciplinary domains, as shown in Figure 1:

Table 1. Emerging ontological fields of study.

	Focus on Constituents (Structure/State)	Focus on Process (Mechanism/Action)
Focus on the individual	Subjective ontology	Cognitive ontology
Focus on the collective	Social ontology	Political ontology

Note: Heuristic categorization of emerging ontological fields of study by focus on constituents versus processes, and individual versus collective configurations. Source: the author.

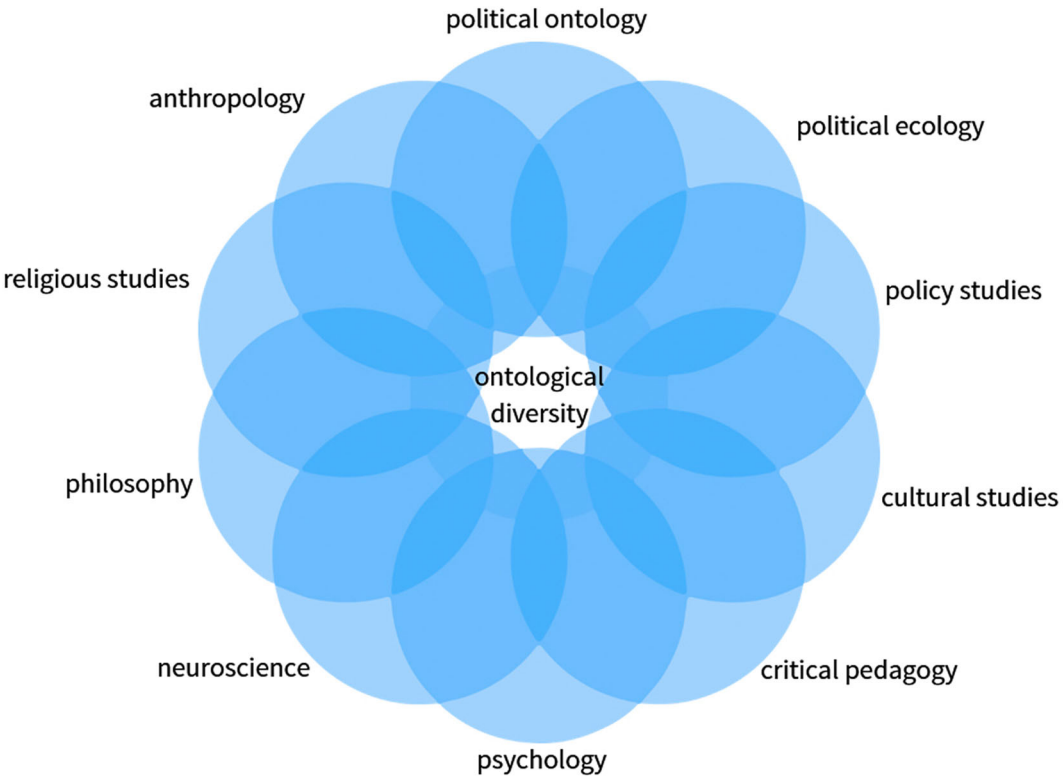


Figure 1. Disciplinary foundations of ontological diversity. Visualization of the interdisciplinary fields contributing to the study of ontological diversity: political ontology, anthropology, religious studies, philosophy, neuroscience, psychology, critical pedagogy, cultural studies, policy studies, and political ecology. Source: the author.

Each domain contributed differently:

- Philosophy, including the history and philosophy of science, as well as epistemologies of the South and critical posthumanism, provide insights on the construction of secular-scientific traditions, its socio-political implications, its evolution to become the dominant ontological paradigm underlying academic and scientific knowledge production, as well as decolonial approaches to science (Barad, 2007; Gómez-Marín, 2025; Haraway, 1985, 2015, 2017; Searle, 2007; Tortosa, 2011; Weir, 2012; Zylinska, 2014).

- Political ontology, anthropology and religious studies provide the foundational framework for understanding the conflicts arising from multiple worlds and worldmaking. For example, Blaser's (2009) concept of political ontology, Descola's (2016) varieties of ontological pluralism, Wilson's (2017) concept of ontological justice, or Taves (2022) big question model help articulate how different groups experience reality in fundamentally distinct ways, and offer critical insights into the subjective dimensions of belief and worldview formation.

- Neuroscience and psychology add an emerging biological dimension to this analysis. Recent work on cognitive ontology and brain processing networks suggests that our perception of reality is strongly neurobiological, offering new ways to understand how worldviews are entrenched and potentially shifted (Brigard & Sinnot-Armstrong, 2022; Woollacott, Shumway-cook, & Tassell-matamua, 2023), and helping to explain how individuals process reality, belief, and identity, particularly in situations that have an effect at the ontological level (Duván Ávalos Flórez, 2025; Janssen, Klein, & Slors, 2017; Mack, 1994).

- Critical pedagogy and cultural studies inform the methodological approach to engaging constructively and respectfully with ontological difference. These fields ensure that the tools developed are accessible and transformative, drawing on individual and collective reflexivity practices to collaborate with diverse actors and bridge science-based and community-based knowledge (Berry, 1997; Cohen-Emerique, 1999; Fals Borda, 2014; Fernández-Aballí, 2018; Freire, 1970, 1984, 2007; Garcia Canclini, 1989; Hall, 1976; Tortosa, 2011).

- Policy studies and political ecology provide the practical frameworks for analyzing how these ontological differences manifest in governance, resource management, and environmental justice. They help identify where current policies fail due to ontological blindness and propose pathways for inclusive decision-making that accounts for power imbalances (Bormpoudakis, 2019; Daigneault, 2014; Ferdinand, 2022; J. Newman, 2019).

The methodology began with keyword search in scholarly databases and extensive snowball reading. During literature review, theory systematization was based on identifying different definitions of ontology and how these were constructed and used across disciplines, in order to relate them, identify gaps and map the current landscape. This was followed by peer-review refinement through the presentation of results in a diversity of interdisciplinary academic settings.[1]

3. What is ontology?

Philosophically speaking, ontology is the scientific study of existence. From an interdisciplinary perspective, **ontology is the entangled perceptual and neurocognitive configuration that sustains the experiences of reality onto which our belief systems are engrained.** We can use a heuristic categorization to situate key approaches to the study of ontology by distinguishing between the constituents of reality (the structural elements or "what exists") and the processes that generate them and through which these constituents relate to each other (the dynamic mechanisms or "how reality is constructed"). As such, ontology can be studied by focusing on the following:

- on its parts or constituents (what exists)

- on its processes (how constituents exist and coexist)

- on whether the configuration is individual

- on whether the configuration is collective

[1]The framework for ontological diversity was presented in four academic meetings used regularly for peer reviewing of work: "Converses ISOR", the peer review monthly meetings of the Sociology of Religions Research Group at the Autonomous University of Barcelona; the webinar series hosted by the Centre for Religion, Conflict and Globalization at the University of Groningen; the "Sustainability Working Group" of the Marie Curie Alumni Association; and the "Empowerment, Inclusiveness & Equity Working Group" at the European Citizen Science Association At a later stage, it was presented at two international academic conferences: the Religion/Imagination 2025 conference of the Dutch Society of Religious Studies and the TANC | The Apocalypse is Not Coming International Transdisciplinary Conference to an interdisciplinary audience. In total, over 50 scholars were presented with the theoretical proposal for discussion and feedback.

Different fields of study on ontology will occupy themselves differently, in accordance to these four areas, allowing the understanding of ontology from a multiplicity of angles. Namely:

An indicative set of definitions that are useful to understanding these four disciplinary approaches to ontology are as follows:

- Subjective ontology refers to the interlinked yet fundamental difference between structure (objective reality) and agency (subjective reality), where structure will be inextricably mediated by the singular, dynamic and active subjectivity attributed to specific personal identities (Archer, 2007).

- Social ontology, or the "ontology of social reality" (Searle, 1995, 1998) is concerned with the building blocks of social reality, namely, "collective intentionality, the assignment of function, and constitutive rules and procedures" (Searle, 2006, p. 51).

- Cognitive ontology is defined as [1] "a nomenclature: […] a set of standardized terms which researchers intend to use in a systematic way in order […] to capture the current state of cognitive neuropsychology; [2] a domain: […] new ways of carving up or structuring cognitive systems; [and 3] a set of basic metaphysical categories [that] indicate whether the relationship between levels is one of composition, constitution, or something else." (Janssen et al., 2017, p. 124)

- "Political ontology is fundamentally a pragmatic proposition regarding how to go about disrupting reasonable politics' attempts to cancel expressions of the pluriversal." (Blaser, 2025, p. 14)

These four domains are rapidly evolving and contested fields (Brigard & Sinnot-Armstrong, 2022; Janssen et al., 2017) and although they are far from identical, as they refer to distinct aspects analytically speaking, they are often used interchangeably. This is because there appears to be no clear conceptual boundary to date between individual, process-based, and collective understandings of reality (Woollacott et al., 2023). Regardless of this ambiguity, the importance of ontology is growing across disciplines, which in turn is generating an increase in conceptual and analytical clarity, and as science advances in the way it is able to measure complex and elusive phenomena, questions about the nature of reality come unavoidably into focus (Gómez-Marín, 2025).

In philosophy, particularly in the philosophy of mind (consciousness) and the philosophy of science (epistemology), debates on ontological pluralism and derived epistemological paradigms as well as the hard problem of consciousness (Chalmers, 2020) continue to evolve (R. L. Kuhn, 2024; Simmons, 2022; J. Turner, 2010; Žižek, 2000). In information systems, ontology is a growing field that informs how data are structured and interpreted, and thus how all data-based systems are structured and interpreted (Machado De Oliveira & Senge, 2026; Valverde-Pérez, 2020). In neuroscience, the study of consciousness is shedding light on the role that biological processes have on subjective experience, and how we perceive and construct reality (Brigard & Sinnot-Armstrong, 2022). Fields in the social sciences and humanities that hold a decolonial and intercultural perspective, are increasingly using ontological frameworks in education, religious studies, cultural studies, anthropology, and ecology to bridge epistemological differences amongst highly distinct cultural groups (Espinosa Arango, 2021; Meurer, 2021; Tummons, 2021).

4. Key aspects to understanding ontology

4.1. Ontology is a changing field of study

For millennia, the question of what exists remained largely confined to philosophy, theology, metaphysics, and in the last centuries, to anthropology and other social sciences, often circumscribed to abstract debates about the origin of life, the elements and processes that make up reality, singular versus multiple ways in which these realities are articulated, and its effects on the experience of being.[2] Today, however, ontology is undergoing a radical transformation as it moves beyond these traditional boundaries into new fields of knowledge, including neuroscience, artificial intelligence, and transformative learning. This shift is driven by the realization that understanding consciousness - how we perceive, construct, and interpret reality - is inextricably linked to ontological inquiry. However, the "we" of consciousness, or, in other words, the "what" and the "who" of consciousness is currently an intense debate, ranging over 350 theories of the mind, that span from panpsychism that posits that consciousness is fundamental to all matter, to eliminative materialism the considers consciousness as folk psychology, and theorizes about its replacement with a proper neuropsychological theory (Foss,

[2]A concise and robust historical account of the term is provided in the section 'Ontology in historical perspective' in the introduction by Latsis, Lawson, & Martins (2007) or in Bhaskar (2007) chapter on theorising ontology, where he provides a comparative overview of ontology, particularly in regards to Kant, Heidegger, and Marx.

1995; R. L. Kuhn, 2024). There are all sorts of in-betweens, allocating consciousness to lesser or greater complex living organisms (from bacteria to humans), and as a phenomenon produced within the mind (like a lamp produces light) or a located outside the mind but transmitted by it (like a prism channels light), in what is coined, respectively, as the productive versus transmissive models for consciousness (Gómez-Marín, 2025).

Consequently, subjective, cognitive, social, and political ontology, are rapidly evolving, with tangible implications for how we structure information, understand power, and bridge epistemological divides across cultures. As these fields develop, critical theorists (e.g. postcolonial, feminist, structuralist, critical realist and Marxist scholars, among others) are weighing in by contributing emancipatory approaches to thinking ontologically (Kaipayil, 2002; Richardson, 2023). Critical approaches are mostly concentrated within social and political ontology, as subjective ontology or cognitive ontology seem to be of less interest for socio-structural considerations. Nevertheless, there is reason to assume that further critical theory will be developed four all four ontological domains as these areas of study consolidate. For example, it is possible to argue that the "critical ontology of ourselves" established by Foucault (Foucault, 1997, p. 316) "as a work carried out by ourselves upon ourselves as free beings" could be the seed to critical subjective ontology.

Despite the growing conceptual clarity and analytical utility of these frameworks, both in their general or critical form, they remain inaccessible to non-specialists for whom the term "ontology" means close to nothing, and who do not generally dedicate time to thinking about their assumptions on the nature of reality, and the implications that those assumptions have as they weave the material conditions that shape our understanding of the world.

4.2. Our information about ontology is incomplete

What can we know to be ontologically aware? In order to operationalize ontology, it is important to address this question. A relatively simple approach to understanding the incomplete nature of our ontological understanding is by expanding Taves' (2022) binary framework of articulated and enacted worldviews through the application of Luft's (1982) four-quadrant Johari's Window, and applying it to ontology. Originally developed to analyze interpersonal awareness, Johari's Window categorizes knowledge based on what is known or unknown to the self, versus what is known or unknown to others. By applying this matrix to ontology, we can distinguish between four modes of ontological commensurability, as shown in Table 2:

Table 2. Johari's window applied to ontology.

	Known to self	Not known to self
Known to others	**Articulated ontology** (reasoned discourse and action)	**Enacted ontology** (unconscious action that can be perceived by others who hold different assumptions)
Not known to others	**Introspective ontology** (privately held beliefs withheld from public view due to stigma, fear, or strategy)	**Hidden ontology** (what is unknown about reality in an irreducible way for ourselves or others)

Note: Heuristic categorization of four modes of ontological commensurability based on self-other knowledge dimensions. Source: the author.

This framework reveals that ontological awareness is a dynamic negotiation between a multi-layered reality filled with reasoned and unconscious action that remains purposefully concealed or which escapes us entirely.

- The articulated quadrant represents the most visible layer of ontology, where beliefs are codified into visible and even measurable language and action. For example, when someone self-declares as a materialist (the view that matter is the fundamental substance of reality), or when someone self-declares as an idealist (the view that physical reality is fundamentally spiritual or mental).

- The enacted quadrant refers to unconscious assumptions about reality that can only be made visible in contrast to alternative ontological assumptions. For example, in a context where materialism is a shared and unquestioned assumption, an idealist would be able to call out and cancel the universal neutrality of this ontology, and, by contrast, circumscribe it to a specific set of beliefs.

- The introspective quadrant refers to deeply held, often controversial or traumatic ontological commitments that an individual keeps hidden from public view due to social stigma, fear of persecution, or strategic silence. This quadrant highlights the political weight of ontology; here, beliefs are kept private as a strategic

response to stigma or fear, revealing how power dynamics force certain truths into silence. For example, given a specific political or religious context, both a materialist and an idealist might choose to avoid disclosure for fear of retaliation or mockery if neither of these were the dominant articulated ontological paradigm.[3]

- The hidden quadrant exposes the limits of ontological knowledge, pointing to aspects of reality that remain unknown to both self and others in an irreducible way. These are truths about the nature of reality that are not currently accessible to reach overarching and undeniable consensus. For example, until either idealists or materialists (or any other ontological theory) can fully prove their claim about the nature of reality by explaining the totality of empirical phenomena in a way it is epistemologically legitimate for the other group, the true nature of reality will remain hidden.

4.3. Ontology is elusive

Regardless of the fact that we can reflect about ontology in its multiple dimensions and forms, even the more knowable parts of ontology are difficult to grasp. A useful way to get a sense of the elusiveness of ontology is by building on the notion of Franz Boas' cultural lens: "We are tied […] to the tradition in which we live, but we can liberate ourselves if we can understand deeply the approaches to life from another, totally different cultural perspective, through the eyes, words, and actions of others" (Zumwalt, 2022, p. xxxv). This idea was later nuanced through the development of cultural studies, and further exploration of the hidden dimensions of culture (Hall, 1976) which gave rise to commonly used metaphors in cross-cultural studies: the iceberg (we can only see the tip of culture) and the onion (culture is layered). Albeit static and simplistic (Nguyen-Phuong-Mai, 2017) these are useful illustrations to explain the complexity of culture. In a similarly basic way, ontology can be understood using a "glasses, eyes, brain" metaphor:

- Our visible actions (including our discourse) are our glasses: they are external and accessible for others and for ourselves to describe and scrutinize. We might even be able to take them off or change them.

- Our belief system is our eyes: we know they are there because we can see a part of them in others and in ourselves through sensing and through mirrors, but we cannot really see them in their entirety, unless we take them out of their sockets and inspect them. A close inspection of the eye will give us quite precise information of how these work. In cross-cultural training, "the eyes" or the "hidden dimensions of culture" are referred to as the cultural frame of reference (Cohen-Emerique, 1999; Ramos Vidal, Maya Jariego, & Holgado, 2011) and there are specific and highly effective methodologies in intercultural education (e.g. intercultural forum theatre or critical incident methodology, just to name a couple) that allow us to gain in-depth awareness of our own frames of reference and that of others, in the similar way in which a physician could learn about the eye by slicing it open or by testing its functions empirically.

- Our ontology is our brain: it is not visible at all when we are alive, and when accessing it through, for example, inspection of a dead brain or through brain surgery, there is no way in which we can see what happens inside it, as the brain tissue tells us minimal information about the enormous complexity of brain functions.

In other words, ontology is the bedrock of our belief system. The enormous amount of layering that clouds and impedes intellectual access to ontology might render any attempt at grasping ontology overwhelming and futile, particularly for people who do not specifically deal with ontology as a central concern in their work or interest. However, given the current state of the world, ontological awareness is increasingly becoming an ethical and moral imperative in successful and just inter-group interactions with humans and more-than human beings, just as racial and gender awareness became moral and ethical imperatives in societies that wished to ascertain themselves as just.

Ontology is a difficult word to engage with for many reasons, some of which hopefully have been clarified in the prior sections. However, difficulty is no excuse to shy away from paths that could prove fruitful in increasing ontological literacy. In Freire's second letter "Don't Let the Fear of What Is Difficult Paralyze You" in his *Letters for Those Who Dare to Teach*, he writes (Freire, 2005, pp. 49–50)

[3]One of the most extremes cases of introspective ontology is that of the "extra-terrestrial abduction" community.

> "We fear not being able to overcome the difficulties involved in understanding a text. There is always a relationship between fear and difficulty … When faced with fear of any kind, one must first objectively ascertain whether there are real reasons for that fear. Second, if those reasons do exist, one must match them against the available possibilities for overcoming them successfully. Third, if an obstacle cannot be overcome right away, one must determine what steps to take toward becoming better capable of overcoming it tomorrow."

The objective of the next sections is to provide the conceptual tools that might help ease the difficulty for those who do not have the time to grind through the thick and exasperating layers of trying to grasp what reality is and what it means, with the hope that a more accessible path might generate increased ontologically awareness, and that, in turn might have an impact, albeit humble, in fostering social and environmental justice.

5. What is ontological diversity?

In recent decades, a pragmatic approach to ontological diversity has gained traction. Ontological diversity, is used in the literature interchangeably as ontological pluralism, ontology of difference, ontological multiplicity, among other equivalent terminology, particularly within political ecology and political ontology (Blaser, 2009, 2013; Blaser & De La Cadena, 2018; Bormpoudakis, 2019; Leff, 2015; Meurer, 2021; Tola & Santos, 2020; B. Turner, 2019). Ontological pluralism has increasingly been used to theorize deep, fundamental differences that extend beyond epistemology (i.e. ways of knowing), proposing that human groups experience reality in fundamentally distinct ways, and has been widely discussed, from Aristotle to become a central anthropological debate (Descola, 2016; Pickering, 2017; Pina-Cabral, 2009, 2014; Rapport, 2023; Simmons, 2022; J. Turner, 2010).

Contemporary studies of ontology in social groups have focused mostly on the tensions between indigenous ontologies and the predominantly Western ontologies that underpin capitalist, militaristic, and colonialist extractivism (Escobar, 2005, 2011; Espinosa Arango, 2021; Hooks et al., 2004). The ontological turn in anthropology has generated critical conceptual debates around these differences while also leading to practical applications. Political ontology, in particular, has been explored as both a lens for understanding conflicts with indigenous groups and a means for envisioning alternative solutions. A handful of sources related to agroecology, resource management, indigenous studies, and new materialism offer preliminary – yet still limited – insights into the practical implications of ontological diversity (Awâsis, 2020; Conesa, 2021; de Pater, Elands, & Verschuuren, 2021; Dring et al., 2022). Arturo Escobar's *Designs for the Pluriverse* (Escobar, 2018) is an example that bridges theoretical discussions on ontological diversity with concrete approaches to life-making across cultures, with nature at the center.

While indigenous ontologies are being rigorously examined by both indigenous and non-indigenous scholars, less attention has been given to the ontological foundations of dominant epistemological paradigms – such as positivism, post-positivism, constructivism, and critical theory – and their implications for policymaking in the Global North. A serious reconsideration of the underlying ontologies of these traditions would enable a reassessment of the assumptions embedded within policy based on secular-scientific paradigms, opening space for new ways of thinking about both *the who* and *the what* of policy, research and education. One possible avenue of analysis is the one proposed by James & Steger (2023) who describe the evolution of the academic articulation of the encounter of ways of knowing and ways of being as "pluriversal theory" in its versions 1.0 (orientalism studies and southern theories), 2.0 (epistemologies of the South), and 3.0 (ontological tensions). This last wave of analysis requires the study of ontological underpinnings in both global South and global North, as the idea of tensions puts the focus in the interrelation between ontological configurations. This slow turning of the ontological mirror to make visible and question the notions of reality underlying the secular-scientific paradigm as it stands in relation to other ontologies, could be titled pluriversal theory 4.0 (ontological literacy).

Within the frame of ontological literacy, it is important to distinguish between ontological pluralism and ontological diversity as follows:

- Ontological pluralism is the existence of multiple understandings of reality converging in a given space and time.

- Ontological diversity is the intentional fostering of positive encounters and shared meaning-making amongst these plural ontologies.

Ontological literacy is the pedagogical know-how that should allow moving beyond ontological pluralism towards ontological diversity as a desirable condition of plural societies, much in the same way that cultural literacy is employed intentionally to foster cultural diversity in multicultural societies.

6. Ontological literacy: literature review and conceptual framework

Ontological literacy is an emerging concept that lacks a consolidated theoretical framework. As of July 2026, the term yields zero results in Google N-grams and approximately 65 hits on Google Scholar, indicating its nascent status. This review examines a select group of authors who have employed the term across diverse disciplines – including governance, health sciences, artificial intelligence, education, archaeology, complex systems, and international relations. Despite the scarcity of literature, a consistent pattern emerges: ontological literacy is defined as a relational capacity to accommodate multiple interpretations of realities, with a focus to make space and develop integrative or relational ontological approaches, without reducing them to dominant Western categories based on the Cartesian separation between human and nature. The disciplinary breadth of these few key texts suggests that ontological literacy may serve as an overarching theme for addressing contemporary crises, yet it remains fragmented, lacking a unified pedagogical structure.

In **governance**, (Iman, Irwanto, Ismoyo, & Nurfadillah, 2026) position ontological literacy as a methodological prerequisite for engaging with Indigenous political concepts. Drawing on a case study with the Bissu community in Indonesia, the authors introduce the term pluriversal democracy, as a relational political system which requires the capacity to engage with distinct assumptions about identity, agency, and social organization. Central to pluriversal democracy, the authors develop the concept of ontological citizenship, as a translation of Bissu political understanding into individualist worldviews that structure liberal political theory, conceptualizing citizenship "beyond juridical membership" (Iman et al., 2026, p. 2). In order to develop ontological literacy to sustain liberal-Indigenous engagement, the authors call for ethnographic and theoretical work to create analytical frameworks adequate to Indigenous political sophistication. Methodologically, this involves "cosmological translation," where Indigenous principles are articulated in ways that resonate across cultural boundaries while maintaining their integrity. For instance, the 3S ethics of the Bissu political framework – sipakatau (mutual humanization), sipakainge (mutual accountability), and sipakalebbi (mutual honor) – offer relational procedures for political interaction that do not require shared metaphysical beliefs but do demand commitment to relational responsibility.

In contrast, (Bao, 2026, p. 21) defines ontological literacy more restrictively, framing it as "the ability to 'read' and respond to the animate signals of more-than-human worlds". Based on field work with Tuvalu and Kiribati islanders, Bao develops a framework for "adaptive relational reontologization" of heritage governance, in contrast to the UNESCO preservationist approach, as a key way for climate adaptation strategies to sustain obligations "across generations and species" (Bao, 2026, p. 1).

Similarly, in **archaeology**, Hussain (2025) calls for ontological literacy as essential for developing "zoo-ontologies" that challenge the Western binary between human and animal. Hussain notes (2025, pp. 17–18):

> "… the 'animal' has historically functioned as a constitutive other in Western thought, conducive to its achievements as well as its harms. Animality is thus only the flipside of the kind of humanity currently conceived (Armstrong Oma 2018a), and it is a crucial task of ontological human–animal archaeologies to devise approaches to the archaeological record, which enable us to ask how other societies sorted through the nonhuman world, categorized and hierarchized nonhuman others – or not – and therefore what significance the human–animal asymmetry (Derrida 2010) holds in comparative perspective. The 'animal' must consequently receive the same critical attention as concepts such as 'function' and 'representation,' and it is here that animal archaeologies can perhaps make particularly important contributions to broader multispecies studies and the anthropology of othering. This is because such 'zoo-ontological' archaeologies ultimately bring into view alternative ways of being human themselves."

Hussain focuses on the ontological question of what it is to be human, questioning the term in itself. This is a conceptual move that exceeds the notion of integrative relationality that move from human-versus-nature towards human-as-nature, to question the contours of humanness in itself as spoken by archaeological traces of past societies.

In **health sciences**, ontological literacy appears in regards to nursing care framed as a way to re-humanize patients. Cultivating ontological competencies enables nurses to become "biogenic," fostering life-affirming, transpersonal healing moments (Caballero-Muñoz & Alves Pereira, 2023, p. 5). "The ontological literacy competencies [include] pattern seeing, listening, grasping the essence, learning to appreciate the arts, hermeneutic-dialectical interpretation, and valuing diversity." These competences are used in order to "create a patient profile that reflects the wholeness of the person, different from and complementary to the patient history" (Cowling, 2008, p. 47). Ontological literacy is tied to the quality of presence, suggesting that healthcare outcomes are deeply influenced by the caregiver's ontological alignment with the patient's experience of being.

In **science and technology**, the rise of artificial intelligence has accelerated the urgency of ontological literacy, pushing for a relational model that transcends the tool-partner dichotomy, in order to question what assumptions about reality are coded into tools and institutions, and how attention, dependence, and authority are reorganized through AI. Ontological literacy in this context involves understanding how technology shapes being, not just functioning (Mahardhika, 2026). Machado De Oliveira & Senge (2026) understand ontological literacy as a "meta-relational educational practice", that is, an "ontological pedagogy" for "existential literacy", in order to critically navigate the uncertainty posed by the human-technology-nature relationship.

In **education**, Chamat Garcés (2025, p. 1540) argues for the cultivation of ontological literacy as:

> "the ability to navigate and co-create multiple realities … [Students should have] the ability to move between different truth regimes, inhabit multiple worlds simultaneously, and engage in ongoing practices of worlding and re-worlding. Drawing on Indigenous and decolonial perspectives, communal learning approaches envision education as a collective process of world-making, rooted in relational ontologies that recognize the interdependence of all beings within place-based ecologies."

In environmental education, Alves Pereira frames ontological literacy through the concepts of "cosmocene ecology" (Alves Pereira, 2019b), "environmental ontology" (Nabaes & Alves Pereira, 2016) and "cosmocene pedagogy" (Alves Pereira, 2019a). He argues for a fundamental shift in the field, moving beyond technical and epistemological approaches to embrace a new rationality rooted in relational ethics that challenges anthropocentrism and capitalist extractivism. Alves Pereira, more than other authors addressing ontological literacy, establishes a clearer normative hierarchy amongst ontologies. He explicitly calls for the gradual replacement of anthropocentric paradigms with cosmocentric and ecocentric ones, positioning environmental education as the vehicle for this ontological substitution. His proposal – cosmocene pedagogy – is based on a hermeneutic pedagogical process of joint reading and discussion of texts, in order to address eight specific forms of learning: 1) relational humanist learning; 2) learning as a process of valuing life; 3) hermeneutic learning of unacknowledged knowledge; 4) learning of caring; 5) learning of the primal knowledge; 6) learning with differences; 7) transcendental learning; and 8) learning of the environment altogether.

In **complex systems**, Moleka (2026) calls for ontological literacy be incorporated in academic programs through the teaching of "ontorics", defined by Moleka as the science of ontological diagnostics of complex systems. Rooted in the Ubuntu cosmovision, ontorics employs a multi-layered analysis based on three levels: the symptomatic (observable phenomena and performance metrics), the paradigmatic (structural beliefs and dominant logics), and the ontological (underlying worldviews and cultural epistemologies). By examining these interlinked levels concurrently, practitioners in systems science can trace systemic behaviors to their foundational assumptions, ensuring that interventions are capable of driving foundational transformation within a systems logic.

Among the fields reviewed, **international relations** offers the most structured pedagogical attempt at operationalizing ontology, through a term coined by Townsell (Townsell, 2021b, 2021a) as "ontological agility." For the author, "fostering ontological pluralism can help rebuild socio-cultural-historical self-esteem in post-colonial contexts" (Townsell, 2021a, p. 58). Townsell's pedagogical approach to ontological agility centers on "provincializing" the dominant Western ontological register of International Relations by exposing students to the existential assumptions that underlie different theoretical frameworks. The method relies heavily on juxtaposing dualistic logics rooted in human-nature separation (such as those found in English School or Marxist thought) with parity-based relations grounded in interconnection, as seen in queer theory or Andean philosophy. By analyzing how concepts like heteronormativity emerge from a logic of either/or versus an and/or logic, students learn to identify their own "fishbowl" or *timespacescape* – the naturalized worldview they inhabit. This process inevitably triggers "guided existential discomfort," which Townsell frames as a productive signal that deep-seated beliefs are being challenged. To manage this, she provides coping strategies, such as reframing the anxiety of "not knowing" as a temporary state, and encourages students to observe their emotional responses as learned reactions derived from specific ontological filters. Through this "existential calisthenics," students practice shifting their modes of engagement from fear to curiosity, ultimately learning to navigate multiplicity and recognize how specific ontological commitments afford certain possibilities while disallowing others.

Based on the prior revision of the literature, we can define **ontological literacy** as the relational capacity to identify, navigate and co-create multiple realities that move beyond dualistic human versus nature frameworks to incorporate integrative and relational ontological configurations. It is an over-arching cross-disciplinary existential competence that involves recognizing how fundamental assumptions about being shape our perception of the world and our engagement with others, favouring complex understandings of reality and our role within it, challenging material reductionism, and advocating for a pluriversal approach to knowledge and action. Regardless of the discipline, four core commitments of ontological literacy remain consistent: a) the ability to observe one's own ontological framework through contrastive

engagement, b) the ability to identify and articulate one's one framework in order to engage with difference without assimilation, c) the ability to recognize the agency of the more-than-human and integrate it through shared meaning-making, and d) the ability to participate responsibly in ongoing processes of world-making.

As such, and in response to these core commitments, ontological literacy is based in a pedagogical process composed of four overlapping phases:

- ontological descentering (corresponding to core commitement a)
- ontological awareness (corresponding to core commitment b)
- planetary purpose (corresponding to core commitement c)
- regenerative action (corresponding to core commitment d).

These phases, which can take place in any order, can be defined as follows:

- Ontological descentering: This is the foundational skill of recognizing one's own worldview, by questioning the cultural framework that conforms and confirms our perception of the world. This is about entering a state of mind where everything we think is true might not be, and everything we think impossible might actually be true, allowing us to see our perceptions as contingent rather than absolute. By trying to imagine ourselves outside our "default" setting (Trownsell would call it our timespacescape or our fishbowl), we create the mental space necessary to question what we take for granted and remain open to make sense of possibilities that previously seemed inconceivable.

- Ontological awareness: Building on descentering, this is the capacity to articulate one's own worldview in dialogue with differing worldviews, avoiding being dismissive or reductive. When needed, ontological awareness might require turning to useful tools for conceptual and categorical translation such as images or other polysemic dispositifs that allow different ontological interpretations to emerge. It allows people to identify their deeply rooted biases (ontological, epistemological, axiological, etc.) and recognize the legitimate existence of alternative ontologies and their embedded worldviews. This awareness assures that diverse ways of being are understood on their own terms, and translation mechanisms are used critically to increase cross-ontological understanding.

- Planetary purpose: This refers to the ability to acknowledge the agency of non-human entities and weave it into shared systems of meaning. It moves beyond human-centric goals to align personal and professional trajectories with the health of the broader ecological community. By rooting identity and purpose in relationships with human and more-than-human beings, individuals can orient their lives toward reciprocity and cultivate a sense of purpose integrated into a broader understanding of world-making.

- Regenerative action: This is the practical application of ontological literacy, defined by the critical and responsible participation in ongoing processes of world-making, by engaging the body, emotion, intellect, and territory in collective efforts. Regenerative action transforms ontological understanding into tangible transdisciplinary practices that sustain life and well-being of humans and more-than-humans and foster renewal, addressing systemic crises through holistic, embodied intervention.

Ontological literacy is a path full of uncertainty and conflict, which necessarily brings to light – and to question – the most profound existential components of our identity: where we come from (in the cosmic sense), how we nurture ourselves, how we give meaning to life and death, and our role in the life and death of all and everything that surrounds us. All beings – human and more-than-human – have something to say about these questions, if we just care to ask and to listen, in the broad sense of these terms.

7. Ontology and more-than-human political representation in policy, research and education

The policy-making process, whether in governance, research or education, is not neutral; it is deeply entangled with the ontological assumptions of those who design it. As such policy-makers who wish to assure ample representation should engage in ontological literacy training. To understand the relationship between ontology and political representation, we can look at the Policy-Belief Cycle below, as shown in Figure 2:

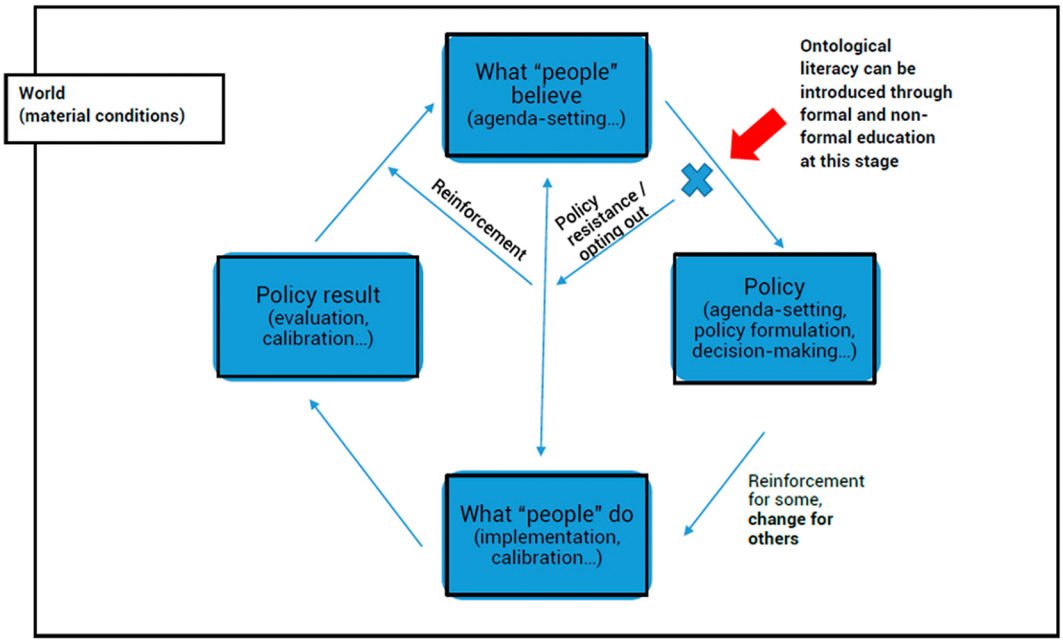


Figure 2. The Policy-Belief Cycle. Conceptual model illustrating the iterative relationship between policy formulation and belief systems, synthesizing frameworks from Daigneault (2014), Grin & Van de Graaf (1996), Jann & Wegrich (2006), Jenkins-Smith & Weible (2025), Jones & Mcbeth (2010), J. Newman (2019), Ostrom (2011), Schneider & Ingram (1993), Veselý (2024), and Weible, Olofsson, & Heikkila (2023). Source: the author.

This cycle illustrates how material conditions shape what people believe, which in turn informs policy formulation, implementation, and eventual evaluation. Crucially, effective policy creates a feedback loop where results reinforce beliefs, keeping stakeholders engaged in the cycle. When policy ignores prevailing beliefs, people tend to opt out or resist, bypassing the policy entirely and moving directly from belief to action. This disconnect renders the policy ineffective.

This brings us to a fundamental question ontological in nature: who counts as "people" in this cycle? The definition of the policy subject can range from highly restrictive to radically inclusive, where policy can be "made by" and "taking into account the interests of" (active and passive representation) different groups. Consider a hypothetical policy on accessibility in the French Alps. Depending on the ontological framework adopted by policymakers, the legitimate subjects of this policy might be framed as follows:

- White, French-born males aged 30–60 living in the area
- All white, French-born individuals connected to the area (e.g., villagers, urban hikers, conservationists)
- All humans connected to the area, including informally settled migrants requesting basic services
- All human and non-human animals (e.g., birds, squirrels, mountain fauna)
- All beings—human, non-human, organic, non-organic, and spiritual (e.g., ancestors, mountains, rivers, soil).

Who gets represented as a subject (a being that merits consideration), and who is relegated to the status of an object (a being that will be forced to be at the service of the subjects, no questions asked) is directly tied to how the policymaker perceives reality and what they accept as true. Representation leaps are not always linear; for example, some policymakers may exclude certain human groups while simultaneously granting legitimacy to God or domestic pets. On the other hand, devices and policy tools for inclusive more-than-human representation have been increasingly developed, reflecting a rapidly growing field of more-than-human politics (Chwalisz & Reid, 2024; Latour, 2018; Purrmann, 2023; Seed, Macy, & Fleming, 2007; Tummons, 2021; Veen, 2024; Zylinska, 2014).

However, while the discussion on ontological pluralism may be intellectually stimulating, it holds little political weight unless it offers practical avenues for influencing human decision-making and driving meaningful change. Lasting, inclusive, and purpose-driven transformation happens when we effectively bridge the gap between *what people believe* and *how they act.* This requires policy design that accounts for both dimensions rather than disregarding either, making them visible by recognizing and incorporating the available information about these two elements (beliefs and actions) into policymaking.

Dissent at deeply rooted levels tends towards polarization. Avoiding ostracizing dissent is in the best interest of policy effectiveness. This requires finding ways to include – rather than neutralize or homogenize – diverse perspectives. But how can this deep-rooted polarity be bridged? Understanding differences at an ontological level provides a more comprehensive analytical framework to enhance diversity among policy subjects, identify common ground, and develop innovative ways forward.

Including diverse subjects, particularly non-human or spiritual ones, as is common practice in Indigenous policy-making contexts (Bao, 2026; Iman et al., 2026) requires complex conceptual and methodological translations. Regardless on advances in human-animal communications (Sharma et al., 2024), a bird or a mountain cannot enact their own epistemology in a policy-making room full of humans born and raised in an ontology of human-nature separation, without the room feeling confounded at best, unless these humans have been trained for more-than-human ontological agility (Trownsell, 2021a). This would apply equally to a room full of researchers and educators. To be ontologically agile, or ontologically literate, they need to possess the concrete tools to represent, and maybe even embody, to the best of their possibilities – albeit imperfectly – a plurality of political human and more-than-human subjects.

In a Parliament of Things, Latour (2018) argues for the coming together of administration, politics and science, where he considers, debatably so, scientists to be the most adequate source of passive representation for the more-than-human. Alternatively, in frameworks like Deep Ecology's "Council of All Beings," (Seed et al., 2007) humans are invited to embody a non-human being (it can be a rock, a leopard, a fruit, a spirit, or a river, for example) through a set of artistic processes, usually a forest walk, followed by mask making, followed by body and breath work for the embodiment of the being. Once the embodiment has taken place, the group sits and converses in council form, many times in political terms, that is, by expressing concrete desires and many times denouncing effects of specific policies, as well as conflicts taking place. Latour might have enjoyed trying out a Council of all Beings, as he might have realized the following (Boal, 2013):

a) the symbolic and physical experience of embodiment yields a broad spectrum of nuances to political representation

b) being-to-being direct conversational interaction has a completely different character in terms of representation, as it is not the same to speak "about the bird", then to speak directly "to the bird", albeit through performativity.

As such, bringing in performativity into the policy, research and education space to strengthen representation of the more-than-human in, for example, governance structures, research design or classroom activities, could provide powerful and distinctive elements to foster ontological literacy.

This is better understood by categorizing the different levels in which passive representation and engagement with the more-than-human in Western and Westernized political, educational and research spaces could happen. We propose the following categorization:

- Disregarded engagement: the more-than-human is considered to be irrelevant for the decision-making process and no form of representation is provided for them.

- Indirect engagement: the decision-makers are provided with written information about the more-than-human.

- Engagement through consultation: the decision-makers ask others who have been in contact or have knowledge of the more-than-human, usually scientist specialising in the issue at hand or communities of traditional and Indigenous knowledge.

- Singular direct engagement: decision-makers invite a specific epistemic community, usually accredited scientists or experts, to be part of the decision-making process, usually following strict discursive and procedurals forms.

- Plural direct engagement: decision-makers include a diversity of epistemic communities (scientists, non-specialists citizens, Indigenous or community leaders, etc.) as part of the decision-making process, which usually involves more complex dialogue facilitation tools.

- Embodied engagement: more-than-human beings join the decision-making process through performative embodiment.

This last form of engagement has begun to take form within the European context. In a 2024 report on "More-than-human governance experiments in Europe", Chwalisz & Reid, (2024) document a diversity of practices, highlighting the emergence of the field and ways forward. Another interesting experiment, among many, was the *De-Mooo-cracy! A performative experiment with a cow-human citizen's assembly* that took place, prior structured preparation, in 2023 during the Earth System Governance Conference at Radboud University in Nijmegen (Veen, 2024).

Performative and artistic methodologies to engage with the more-than-human, such as different techniques within Deep Ecology's the Work that Reconnects (Macy & Brown, 2014) or Theatre of the Oppressed (Boal, 1998), just to name a few available currents, are culturally native or near-native to Europe and integrate the secular-scientific paradigm in what Macy & Brown (2014) call "drinking from three rivers", referring to science (knowledge in all its structured forms), experience (body) and ancestry (heritage and our connection to the dead). Performative approaches demand an epistemological shift (e.g. learning to read the nuances that performativity offers in regards to political representation) rather than a full ontological leap (e.g. believing a river has a spirit that can speak through a human), making it more feasible to integrate into mainstream policy than Indigenous cosmovisions, which often face greater friction within Western institutional frameworks. Nevertheless, the uptake of plural direct engagement or embodied engagement in decision-making frameworks in contexts where the secular-scientific paradigm is dominant, require ontological literacy to function as an extended framework of intercultural, green, and citizenship competences, at least as these are currently defined in the EU today (Bianchi, Pisiotis, Cabrera, Punie, & Bacigalupo, 2022; European Commission, 2019).

8. Pragmatic presuppositions to operationalize ontology

8.1. Pragmatic stance 1: consensus is reached through ontological translation and not homogeneity of beliefs

There is a pervasive paradox within secular-scientific progressive spheres: diversity is fostered as a key underlying ethical imperative, yet mass consensus is required around what progressives identify as key issues. For example, anthropogenic climate change is treated as an ideological baseline within these circles. Deviations from adherence to anthropogenic climate notions often result in some form of cancellation. This leads to a kind of "pick-and-choose" scenario regarding points of view that are acknowledged as legitimate, ultimately excluding large ontological understandings (e.g. people who believe that climate change is caused by Gods will and design), and undermining the credibility of secularity as a space that is genuinely capable of sustaining plurality, even if that plurality is upheld under the most a-scientific (what many would call "misinformed") epistemic construct.

However, changing deeply rooted beliefs takes time, if possible at all, and this is where ontological literacy can play an important role. Consensus at axiological (what is valuable), epistemic (what is knowledge) and at ontological level (what is real), is difficultly reached through homogeneity, and finds much better accommodation through symbolic translations that allow different ways of being to remain different, while still being able to understand (not necessarily agree with) the value propositions and actions of other ways of being. This will not eliminate tensions – for example, metaphorically, the wolf will still poses a danger to the sheep, even if the sheep understand that the wolf is hungry and needs to eat – but it provides a starting point for some form of negotiation or open engagement. Useful methodologies for translation and navigation at deeply rooted belief levels include the Critical Incidents Methodology (Cohen-Emerique, 1999; Ramos Vidal et al., 2011), Deep Democracy Open Forums (Amy Mindell, 2008; Arnold Mindell, 2002) or the application of Sociocratic methods (Bockelbrink, Priest, & David, 2026), just to name a few, where facilitated dialogue allows identifying short-term consensus about key issues, following the sociocratic principle: "Good enough for now, safe enough to try".

Participatory spaces could show the way to overcome ontological polarization, but these must first find a way to integrate ontological literacy. The design of many participatory processes still fails to acknowledge plurality at the ontological level (Ludwig & El-Hani, 2025), simply because ontology operates at cognitive layers that are not directly visible or graspable. It can only be fuzzily sketched through the comparison of derivatives, that is, articulated and enacted beliefs and actions, which are not strictly ontological but derived from particular ontologies. Rethinking concrete participatory methodologies with ontological literacy in mind is an avenue of research worth pursuing.

8.2. Pragmatic stance 2: ontologies have scope and power

"Worlding" is a central notion within political ontology. It is used to depict the idea that there are as many worlds as elements exist capable of interpreting the world (Rapport, 2023). The more similar an element is to each other, the more similar its particular interpretation of the world will likely be. The more number of similar elements, the more sizable a particular interpretation of the world is. The more powerful the element is – understanding power as the ability to access and make use of competing resources, including the ability to enact power over life and death – the more impactful the particular interpretation is for other elements and their singular interpretations.

For example, the world of an ant (that is, the interpretation that an ant has of the world) is probably shared to a large extent among ants in general, making it of a significant size, as late studies have shown that there are 2.5 million ants for every human. The world of a human is less sizable than an ants, but more powerful, as humans can eradicate if not all ants, a good portion of ants using their technologies (such as pesticides), so that ants *are no more*. Geological agency (Gandolfi, Vivas, Omodeo, Patkauskas, & Fava, 2026) held by the dynamic ecosystem that is Planet Earth could eradicate if not all humans, a good portion of humans by means of what some human interpretations call "natural disasters", other humans call it God's punishment and others do not make anything of natural disasters at all. So comparing ants, humans and the planet, we could say that ant worlding is the most sizeable, the Planet's worlding is the most powerful, and human worldings are somewhere in between. Understanding ontologies in terms of scope and power, allows us to visualize, albeit heuristically, the relational structure between human and more-than-human ontologies.

9. A methodological framework and toolbox for ontological literacy

9.1. Silhouetting ontology

Operationalizing ontology requires moving beyond the abstract question of which worldview is "true" toward the pragmatic question of whose worldview is being enacted. In the context of policymaking, research, and education, the metaphysical debate over the ultimate nature of reality is largely secondary to the political reality of legitimacy. As debates on ontological pluralism suggest, the true nature of existence may be ungraspable or irreducibly multiple; therefore, assuming a singular, objective ontology is neither empirically defensible nor politically neutral (Žižek & Lawson, 2026). Instead, the most robust approach is to assume the coexistence of multiple ontologies and to examine how power distributes legitimacy among them.

To make ontology actionable, we must identify whose ontology is being legitimized in any given decision-making space. We propose the concept of **silhouetting ontology**: the practice of mapping the invisible contours of an ontology by observing its visible projections onto three domains of legitimacy. An ontology is rarely stated explicitly; rather, it is revealed through who is granted the *right to know (epistemological legitimacy)*, the *right to value (axiological legitimacy)*, and the *right to act (praxeological legitimacy).* These three forms of legitimacy, inspired by Taves' big questions (Taves, 2022), constitute the silhouette of the dominant ontology in any process:

- Epistemological legitimacy: The right to define what counts as valid knowledge. This determines who exists as a subject of knowledge production and who is relegated to the status of data or object.
- Axiological legitimacy: The right to establish value priorities. This determines whose well-being, flourishing, or interests are considered worthy of protection and advancement.
- Praxeological legitimacy: The right to agency and action. This determines who has the authority to initiate, implement, and govern processes, and who is subjected to those processes without consent.

When these three legitimacies align around a specific group or set of beings, that group's ontology is the operative framework of the policy.

When these three legitimacies align around a specific group or set of beings, that group's ontology is the operative framework of the policy. Conversely, those excluded from these legitimacies are rendered ontologically irrelevant in the decision-making sphere, even if they are materially necessary to the system (e.g., as labor, as resources, as the so-called ecosystem services, as waste, etc.). In this sense, they become objects: present in the material world but absent from the ontological community of subjects. In the Global North's policy, research and education, the process of objectivization is usually enacted through the product cycle of extractivist subjectivity: objectification takes on the form of "productization". This process – applicable to both our relationship with the human and more-than-human – encompasses a set of socio-cognitive and emotional mechanisms (Fernández-Aballí, 2021, p. 45):

- Productization: Once deprived from ontological relevance, human and more-than human lives are perceived as product.
- Legitimization of use: The dominant group creates rationalizations for moral claims over the objectified-products.
- Commodification: Ownership is formalized, establishing force-imposing systems (through laws, education, military, etc.) to manipulate, exploit, price, and commercialize the objectified-products.
- Obsolescence: The dominant group determines that the objectified-product no longer holds value.
- Disposal: What remains of the objectified-product is discarded, generating waste or "garbage."

Through this process, the objectified-products become structurally excluded from epistemological, axiological, and praxeological legitimacy cycles: present in the material world but absent from the ontological community of subjects. Ontological silhouetting is useful to visibilize the humans and more-than-humans who have been objectified-into-product by any given dominant consensus, particularly in social structures where capitalist market forces operate.

This diagnostic tool is essential for fostering ontological diversity in policy, research and education spaces. Ontological literacy involves deliberately widening this silhouette: re-instating epistemological, praxeological and axiological legitimacy amongst humans and more-than-human beings who have been subjected into becoming object-products.

Activities to introduce ontological silhouetting in a policy, research or education reflection circle

Using the body (for groups of more than 10 people, exercise adapted from a game commonly used in intercultural competence training to discuss social rank)

Select as many elements as people in the group (see list below), and using post-its, write one element per post-it in a way it is easily readable. Do not let anyone in the group see the post-its. Place a post-it in the back of the person, one per person, without them seeing it. Ask them to walk around the room in complete silence, so that people can all read each other's post-it as they walk past each other. As they read each other post-it's, they must try to play, in their minds, their reaction if they encountered that being/element, but must not physically react, just walk by. After 2-3 minutes of walking around (depending on the size of the group), ask them to – in complete silence – order themselves in a line from least regarded to best regarded. Once everyone is comfortable with their chosen spot, ask them to remove the post-it from their back to discover who they were, and discuss the results.

Using words

In this room/shared-space, if _____ walked in and started talking in a language we understood, would they be able to: 1) Be considered as truthful?; 2) Decide what matters?; 3) Enact change?. Are they here now? If yes, how? How are they being given legitimacy or enacting it on their own terms? How are they being stripped away from legitimacy? What tensions or conflicts surround their legitimacy or lack-there-of?

Examples of beings/elements to place in the blank space: bird, tree, mother, bacteria, flower, fruit, nelson mandela, river, salmon, cow, shrimp, dog, 6-month-old baby, god, 6-year-old child, refugee, jesus christ resurrected, trump voter, mountain, ai algorithm, earth-flatter, corporate shareholder, indigenous ancestor, steve jobs, a ghost, migrant worker, plastic waste, ocean current, homeless person, student loan debt, forest fire, bee colony … . (adjust to context).

9.2. Categorizing ontology

To operationalize ontology beyond abstract debate, we must categorize the specific dimensions through which beings perceive and construct reality. We propose a four-layered model of ontological stratification: material, living, aware and rational, as shown in Table 3. These layers are nested structures, functioning much like a Matryoshka doll: each inner layer is contained within and shaped by the outer ones. Disturbances in any single layer ripple outward, creating an ontological shock (Mack, 1994) – a profound destabilization of one's sense of reality. This differs fundamentally from a cultural shock. While cultural shock arises when expected social norms fail to manifest (Cohen-Emerique, 1999), ontological shock occurs when the foundational assumptions about *what exists*, *what lives*, *what knows*, or *what reasons* are challenged or invalidated.

Table 3. Ontological Layers.

Ontological Layer	Continuum of possibilities	Defining question	Boundary inquiry
Material Layer	The World ↔ Worlds	What is real?	What distinguishes objective reality from subjective interpretation? Where does "THE" reality end and constructed worlds begin?
Living Layer	Living ↔ Non-living	What is alive?	What is the boundary between the living and the non-living? What constitutes life?
Awareness Layer	Conscious ↔ Non-conscious	What is conscious?	What constitutes consciousness? Where is the threshold between mere existence and self-aware experience?
Rationality Layer	Rational ↔ Irrational	What is rational?	What constitutes rational behavior? How do we distinguish logical coherence from irrationality?

Note: Analytical framework identifying key ontological layers, their continuums, defining questions, and boundary inquiries. Source: the author.

Every individual and community holds articulated, enacted, introspective, and hidden answers to the defining questions of these four layers. Mapping these layers allows us to pinpoint exactly where ontological conflicts arise in policy, research, and education.

The Material Layer (The World ↔ Worlds)

This is the outermost shell. It addresses the fundamental question of existence: What is real? Here it is possible to distinguish three main types: monists, dualists and pluralists (Dupré, 1988). Ontologically speaking:

- Monists argue that the world is made of one single fundamental substance, and span from realist materialism, also known as physicalist or reductionist materialism, where everything is made out of matter and their physical interactions, to idealists where "all that exists are ideas and the minds, less than divine or divine, that have them" ("Idealism," 2015).

- Dualists argue that the world is made of two irreducible fundamental substances. For example, Cartesian dualism considers reality to be made of soul and body, a concept later secularized to mind and matter. Dualist collapse the ontological continuums of the material, living, aware and rational into dichotomies, acknowledging only the possibility of existence at the ends of the continuums, so something can either exist or not exist, be alive or dead, be aware or unaware, be rational or irrational. "And" and "in-between" categories of these continuums are not envisioned under dualist ontologies.

- Pluralists argue that the world is made up of many ways of being and existence. For secular pluralists, "if one accepts the conception of ontology that accords existence to whatever is required for the explanation of observable phenomena, and rejects a reductionist assumption about explanations, one will be committed to a rich and varied ontological pluralism" (Dupré, 1988, p. 53).

Monism and dualism can be secular or incorporate divine, spiritual or religious components. Pluralism operates differently, and will accept a fuzzy mix of strong and weak articulations of the fundamentals of reality, constructed over dynamic and negotiated epistemic structures born out of relationships and meaning-making. Regardless of their form, all ontologies will incorporate ways of knowing, that is, an epistemology and an accompanying methodological arsenal. In a secular-scientific episteme – which can be present in monist, dualist and pluralist ontologies – there is an assumption of a world, in whole or in part, that can be measured and verified, or that will be able to be measured and verified as we develop the necessary technologies to understand the emergent and causal properties of reality. Conflict here arises when one group insists their version of reality is the only valid one, dismissing other experiential realities not susceptible to measurement as illusions or errors, and creating a hierarchy that binds truth, knowledge and observable measurement (fact) as equivalent (Gómez-Marín, 2025). These are distinct ways in which to make sense of the material ontological layer, and each ontology has its own understanding of how truth, knowledge and fact are created and intertwined.

The Living Layer (Living ↔ Non-living)

Nested within the material layer is the distinction between the living and the non-living. This layer asks: What is alive? For example, for many Indigenous and relational ontologies, rivers, mountains, and forests are living entities with agency. For ontologies operating under extractivists logics, rivers, mountains, and forests are non-living resources or "ecosystem services." For monotheist religious ontologies, God is alive. For secular-scientific ontologies, live is determined by the presence of concrete dynamic processes such as reproduction, metabolism or response to stimuli.

The Awareness Layer (Conscious ↔ Non-conscious).

Further inward lies the question of subjectivity: What is conscious? This layer determines who or what possesses interiority, feelings, and perspective. Human-centric ontologies reserve consciousness exclusively for humans or higher mammals. Relational ontologies may extend consciousness to the more-than-human in a broader sense. Secular-scientific realist ontologies will accept consciousness if it can be measured. If a being is deemed non-conscious, it cannot suffer, and thus its treatment falls outside moral consideration. Ontological literacy requires examining who is granted the status of a conscious subject versus an unconscious object.

The Rationality Layer (Rational ↔ Irrational)

This layer defines the standards of reasoning accepted as legitimate: What is rational? Scientific rationality prioritizes empirical data and reproducibility. Spiritual or intuitive rationalities may prioritize revelation, tradition or community knowledge. Conflicts in this layer generate strong polarity amongst human groups, as they label each other as "irrational" or "superstitious," thereby delegitimizing the knowledge and values associated with it. It is important to note that inter-human cultural clashes can emerge from different parts of the rationality continuum, so that it is not the same to expect rationality and not receive it, which will produce a cultural shock, than to have an ontological starting point that renders another person constitutively irrational. The most paradigmatic case of this second account is Aristotle's argumentation for the existence of "natural slave" based on the lack of ability of some humans to engage in rational deliberation (Harvey, 2001). The argument for "natural slaves", rooted by Aristotle through ontological and epistemological argumentation, was also evoked during the Valladolid Debate (1550–1551) in regards to native populations during the Spanish *Conquista*, and can be traced until today in imperial and neo-imperial politics (Santana, 2020). From a pluralist perspective, it might be worth-while to question how the "natural slave" logic, which is based on an ontological premise of alleged irrationality, has evolved and is still in use today to morally and structurally sustain the subjugation of human and more-than-human beings.

Activity to introduce ontological categorizations in a policy, research or education reflection circle

In small discussion groups, each group selects one or more being/element to analyse. Examples of beings/elements are: bird, tree, bacteria, flower, fruit, nelson mandela, river, salmon, cow, shrimp, dog, 6-month-old baby, god, 6-year-old child, refugee, jesus christ resurrected, trump voter, mountain, ai algorithm, earth-flatter, corporate shareholder, indigenous ancestor, steve jobs, a ghost, migrant worker, plastic waste, thief, ocean current, homeless person, student loan debt, forest fire, bee colony, or any other element better suited for the context.

Each group should reflect about the being/element in accordance to the following questions:

Is _____ real?

Is _____ alive?

Is _____ conscious?

Is _____ rational?

After some time to discuss, each small discussion group can share with the larger group what questions where easy to answer and why, and what questions were difficult to answer and why. Discuss about how existence is different for the different elements, and how the way existence is conferred to these elements/beings in regards to materiality, aliveness, awareness and rationality can help us situate our ontological configuration.

9.3. Mapping ontologies

With a defined ontological silhouette and categorization, it is possible to map ontologies. Based on the way philosophical paradigms and worldviews are articulated and enacted, it is possible to situate these as ontologically inclusive, exclusive, or in-between. The diagram below visualizes this mapping across the four ontological layers: Material, Living, Awareness, and Rationality. It is important to note that not all paradigms or worldviews articulate around all ontological layers. Table 4 positions specific philosophical currents along these axes, illustrating how they range from exclusive,

Table 4. Mapping Ontologies.

	Exclusive		Inclusive	
Material layer	**Monisms** Reality is one single substance. Truth is unified and objective.	**Dualisms** Reality consists of two irreducible substances (e.g., Mind/Body, Sacred/Profane).	**Critical Realisms** Acknowledges an external reality but interprets it through social/ historical lenses.	**Pluralisms** Multiple co-existing realities. Truth is negotiated, contextual, and relational.
Living layer	**Anthropocentrism** Only humans have intrinsic value/ agency. Nature is a resource or service.	**Ecocentrism** Entire ecosystems have agency and value. Humans are part of the ecosystem web.	**Biocentrism** All living beings have intrinsic value, regardless of utility to humans.	**Indigenous Cosmovisions** Relational legitimacy. Kinship with more-than-human beings.
Awareness layer	**Human Exceptionalism** Only humans are conscious/rational subjects. Others are objects or automata.			**Panpsychism** Consciousness is a fundamental feature of all matter.
Rationality layer	**Determinism** Defines rationality narrowly in an "all-or-nothing syndrome" (Pina Cabral, 2009).			**Pluralism** Recognizes multiple valid ways of reasoning and being (Pluriverse). Ontology functions as islands of stability **(Pickering, 2017).**

Taxonomy of ontological positions across material, living, awareness, and rationality layers, categorized along a continuum from exclusive to inclusive worldviews. Source: the author.

hierarchical stances to inclusive, relational ones, thereby revealing the distinct ontological commitments underpinning a diverse range of worldviews.

9.4. Transforming ontology: ontological shifts and ontological shocks

Despite ontological assumptions being deeply entrenched, these can be transformed through specific mechanisms that disrupt the ways in which a person perceives reality. Recent research suggests that certain practices have the ability to increase our sense of compassion and our sense of connectedness to other humans and to the more-than-human, changing our ontological configurations and worldviews through neural rewiring: time spent in the wild, participating in the arts, storytelling, reading, meditation, psychedelics, near-death experiences (also termed recalled experiences of death), and reporting having experienced an alien abduction (Alcadipani & Hassard, 2009; Greyson, 2021; Irvine, Luke, Harrild, & Gandy, 2023; Mack, 1994; Magsamen & Ross, 2023; Michael, 2026; Parnia, 2024; Woollacott et al., 2023).

It is possible to distinguish between two primary modes of ontological transformation: ontological shifts and ontological shocks.

- Ontological shifts are gradual adjustments to the cognitive dissonance (Eddie Harmon-Jones & Mills, 2019) produced by decentring our deeply embedded frames of reference through sustained engagement in safe spaces.

- Ontological shocks are sudden and profound disruptions to one's foundational sense of being, and which can have important consequences for a person's well-being, including trauma (Mack, 1994).

Whether an ontological transformation happens through shifting or through shocking depends on four key aspects:

- The epistemic sources, where the more familiar the sources, the less disruptive the experience. Epistemic sources can be of different forms and can be compounded (more than one source operates simultaneously): interoception, or the sensing of internal bodily states (Guu et al., 2023; Millière, Carhart-Harris, Roseman, Trautwein, & Berkovich-Ohana, 2018); perception (seeing, hearing, touching, tasting, smelling); narrative transportation (Green & Brock, 2000); testimonial; and revelation.

- The intensity of the experience, where the more intense the experience is, the greater the risk of ontological shock. Intensity will depend on the level of tension between the existing ontological configuration and the experience.
- The level of exposure, which should be directly inverse to the intensity of the experience.
- The perceived sense of safety, where a persons perceived sense of safety will cushion the discomfort or disorientation.

We argue that discursive engagement through ontological literacy allows for interpretative questioning of deep-seated concepts. This could be a useful tool for ontological transformation, particularly for policy, research and education spaces, as the formal nature of these institutions makes other approaches unfeasible. The underlying goal of ontological literacy is to, at least, instigate greater self-knowledge of our deeply embedded biases and assumptions, and at most, provoke shifts towards more inclusive, relational and plural ontologies, with the hope that greater openness to the more-than-human might facilitate a caring ecological transition out of our current global socio-ecological polycrisis (Rakowski et al., 2025). Ontological literacy would rely on a different epistemic source than the previously mentioned: hermeneutic descentering (Jenkins, 2025, pp. 1379–1380):

> Hermeneutic decentering is a kind of labor which sets one up to acquire and appropriately deploy hermeneutic resources that are suited to capture the experiences of members of groups to which one does not belong. In accordance with W.E.B. Du Bois's (1903) theory of double consciousness, therefore, one might predict that certain forms of hermeneutic decentering are routinely performed by marginalized people, who are expected and required to understand and interpret the world from the perspective of dominant groups, and hence need to be competent with the requisite hermeneutical resources to achieve this. There is no comparable pressure on dominant groups to hermeneutically decenter the privileged "we"s to which they belong. This predictably leads to an inequitable distribution of hermeneutic labor.

Ontological literacy can have a varying intensity depending on the context. Exposure should be carefully adjusted, and safety measures, included the provision of emotional and mental health support if needed, should be carefully planned, informed and made readily available. Given the incipient nature of ontological literacy, further research will have to be undertaken to understand how to best assure the framework's impact, what additional hermeneutic resources can better respond to the frameworks intent, and what set-up assures the most effective take-up within policy, research and education spaces.

Table 5 offers a categorization of the different experiences of ontological transformation by key aspect, including ontological literacy.

Table 5. Experiences that foster ontological and worldview transformations.

	Epistemic source that enables the transformation	Intensity of the experience	Exposure levels	Perceived sense of safety	Risk of ontological shock
Ontological literacy	Hermeneutic decentering	Varying, but usually low to mid	Varying	Varying, but usually high with the appropriate safety measures in place	Low to mid
Meditation, mindfulness and breath work	Interoception	Varying, but usually low to mid	Varying	Varying, but usually high	Low
Participating in arts, reading and storytelling	Interoception, narrative transportation, perception, testimonial	Varying, but usually low to mid	Varying	Varying, but usually mid to high if proper measures are taken	Low to mid
Contact with the wild	Interoception, perception	Varying	Varying	Varying, but proper measures should be taken	Low to mid

Table 5. *Continued*

	Epistemic source that enables the transformation	Intensity of the experience	Exposure levels	Perceived sense of safety	Risk of ontological shock
Use of psychedelics	Interoception, perception	High to very high	Varying, but exposure should be carefully considered	Varying, requires careful consideration of safety measures	Mid to high
Near-death experiences	Interoception, perception, revelation	Very high	Is usually a once-in-a-life time event	Undefined, as NDEs are usually reported as highly pleasant and harmonious	Certain
Perceived alien abduction	Perception, revelation	Very high	Usually once, although abductees many times report repeated abductions	Varying, but usually very low	Certain

Comparative analysis of transformative experiences based on epistemic source, intensity, exposure levels, perceived safety, and risk of ontological shock. Source: the author.

9.5. Integration of ontological literacy within transdisciplinarity

Transdisciplinary methodologies, common in policy, research, and education, bring together a plurality of beings to engage with problems with irreducible uncertainty and complexity – known as wicked problems (Fernández-Aballí, 2019) and which cannot be successfully addressed without engaging non-academic perspectives. Transdisciplinarity involves translations between ontological, epistemological, and cultural frameworks, in an inquiry space where identity and power operate under tension (Ludwig & El-Hani, 2025). Environmental degradation, climate warming and planetary health necessarily require transdisciplinary approaches. Common forms of transdisciplinarity include participatory action-research, design thinking and performative knowledge (Philipp & Schmohl, 2023). Transdisciplinarity is different from other research approaches in the following:

- Multidisciplinary research: research questions and methods are segmented by discipline, and epistemic legitimacy is reserved to academic stakeholders.
- Inter-disciplinary: the research question is shared, methods are segmented by discipline, and epistemic legitimacy is reserved to academic stakeholders.
- Transdisciplinary research: The research question is shared and negotiated, methods exceed disciplines and are shared and negotiated, and epistemic legitimacy is shared and negotiated amongst academic and non-academic stakeholders.

In transdisciplinary work, how we react to people, ideas, situations, and tensions as the research advances, tell us as much about ourselves as they do about the context we are working in, sometimes more about the former than the latter. Paying attention to our emotions and resistances is a key. Imagine transdisciplinarity is a tangled ball of yarn that needs to be untangled and re-rolled. The thread will inevitably be full of knots. Ignoring the knots and pulling on the thread will only make the knots worse. Instead, identifying the knots to untangle them before continuing is necessary, but sometimes, the knots do not yield, and untying them just enough to keep the thread rolling is the way forward. Its imperfect, but it gets the job done. In transdisciplinary research, discomfort is like the knots on yarn. Sometimes knots will be untangled, but others, the process has to work with them and in spite of them. Usually, rolling the yarn back into a ball while knowing where the knots are, is already a substantial research outcome.

Ontological literacy can helps participants identify the knots and navigate disorientation and discomfort more safely, transforming these into guided and structured learning opportunities, and building on diversity as a bridge-building creative force.

9.6. Root-streaming environmental education through ontological literacy

Environmental education (EE) is understood as the set of "approaches, tools, and programs that develop and support environmentally related attitudes, values, awareness, knowledge, and skills that prepare people to take informed action on

behalf of the environment" (Ardoin, Bowers, & Gaillard, 2020). Since the UNESCO-led Tbilisi conference of 1977, environmental education has been considered a topic of global importance. Nearly 50 years after, and in the face of the current climate emergency, environmental education is championed as a policy priority at all levels. However, as indicated by the UNESCO (2024) report "Education and climate change: learning to act for people and planet", EE is still insufficiently implemented; and when implemented.

The conclusion of literature and statistical information is that wealth inequality, as well as political and religious polarizations are important factors in hindering education towards active engagement and behavioural change in favour of effective environmental action (Fernández-Aballí & Fernández-Aballí, 2025; Marshall, 2014). Thus, ontological literacy can provide fertile ground to:

1) move beyond ideological and epistemological blockages,

2) impact with more depth and more breadth than environmental education frameworks that are built purely on secular-scientific knowledge.

Ontology has been pointed out as relevant to environmental education for decades. As early as 1995, Phillip Payne (p. 83) was already critiquing environmental education as "positivist, behaviourist, masculinist, and instrumentalist", and pointing towards ontology as a key idea for a curricular praxis. Still today, and despite numerous claims for an ontologically plural environmental education (Lotz-Sisitka, 2009), structural transformations in the field are still pending. Ontological diversity, as a key pedagogical component, has yet to find its way to become structural in environmental education (Cui, 2026). The framework for ontological literacy bridges this gap, by providing a structural, pragmatic and pedagogical approach to ontology that can be integrated within existing over-arching environmental education frameworks and strategies, such as the EU's leading competence framework for learning for sustainability, GreenComp (Bianchi et al., 2022).

The framework for ontological literacy enables "root-streaming" (incorporating ontological considerations) rather than merely mainstreaming (assuring compliance or "check-listing") environmental care within broader contexts of education, research and policy. Beyond understanding the quantitative and qualitative impacts of human behavior, lifestyles, and infrastructures on the environment, ontological literacy introduces a relational approach. It shifts the pedagogical emphasis from purely scientific analysis to an examination of intersubjective and more-than-human relationships. For instance, it is not solely about the science of a tree, but about one's relationship to that tree; it is not only about the biology of bees or rivers, but about how one's relationship to a bee or a river entails questions of life and death for the bee, the river and the human alike, and how that relates to our own experiences. Ultimately, caring for the environment involves knowing about the science of nature, as well as making sense of it through an understanding of our emotional connections and purpose within the greater web of life.

10. Limitations of the research and future directions

The research that resulted in the ontological diversity and ontological literacy framework has limitations which can be addressed through future directions:

- Limited empirical base: the framework for ontological literacy started off as a theoretical reflection on ontological diversity for environmental education, without crisp categorical limits. This earlier concept informed the transdisciplinary empirical applications (Viable Unknowns, EVA, TANC and Drinking from Three Rivers) that took place simultaneously as these concepts and tools were being developed. However, in its current form, the frame needs to be empirically tested.

- Limited linguistic and cultural scope: the research is based mostly on Spanish-speaking and English-speaking context, resources and peer-review, based on a hybrid cultural approach that bridges Latin American Southern Epistemologies with European critical paradigms. Additional peer review by scholars from other latitudes would serve the framework well.

- Additional resources should be developed within the framework, creating ways in which to make the framework applicable for a multiplicity of contexts beyond what is envisioned in these pages.

11. Conclusions

This paper proposes ontological literacy as a pragmatic framework to make ontology useful for advancing social and environmental justice. By translating abstract philosophical concepts into actionable tools, we aim to expand the

opportunity for fruitful collaboration and negotiation in policy, research and education spaces amongst a plurality of ontological configurations. The framework addresses a critical gap in current scholarship that ignores the role of ontological assumptions in key structuring domains, and moves towards inclusivity by offering specific methods for silhouetting, categorizing, mapping, and transforming ontology. These tools allow practitioners to identify conflicts rooted in divergent understandings of reality, and design interventions that resonate with a plurality of deep-seated meaning systems.

The primary contribution of this work is the distinction between ontological pluralism and ontological diversity, and the proposal of ontological literacy as pedagogical bridge between the two. While pluralism describes the existence of multiple worldviews and points towards the power imbalance amongst them, diversity involves the intentional fostering of positive encounters and shared meaning-making. Ontological literacy allows decision-makers to navigate polarized contexts without demanding homogeneity of belief. Instead, consensus is reached through ontological translation, while simultaneously recognizing that different ontologies have scope and power. Although the framework requires further empirical testing across diverse linguistic and cultural contexts, it establishes a foundation for making policy, research, and education more responsive to ontological power imbalances. By integrating these practices into transdisciplinary approaches and environmental education, we can create more just systems that honour the plurality of worlds coexisting within our shared planet.

Ethics and consent

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Disclaimer on the use of AI

Thaura AI has been used for light proofreading. All conceptual and analytical contributions present in the paper are my own.

Data availability

This article presents a conceptual framework derived from interdisciplinary literature review and theoretical synthesis. No primary empirical data were collected or analyzed. All referenced materials are publicly available through the citations provided in the reference list.

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This is an ambitious and timely conceptual article that addresses the role of ontological diversity in policy, research and education, with a particular focus on environmental education and "more-than-human" perspectives. The manuscript draws on the literature from various disciplines and proposes "ontological literacy" as a practical framework for recognising and navigating different understandings of reality. The distinction between ontological pluralism and ontological diversity is potentially an interesting contribution, and the four proposed dimensions provide a useful framework for translating an abstract theoretical debate into practice. The main distinctive feature of the article is the ambition to go beyond a purely descriptive recognition of different worldviews, towards practical approaches for dealing with ontological differences. The proposed toolbox may prove valuable for transdisciplinary education and practice. The attention paid to power, legitimacy and the risks of imposing dominant ontologies is also a strong point.

I consider the manuscript suitable for indexing, after some clarifications and improvements to enhance its methodological transparency and conceptual precision:

The main concern relates to the methodological basis of the conceptual framework. The manuscript describes an interdisciplinary literature review and a theoretical synthesis, but insufficient information is provided on how the literature was identified, selected and analysed. It would be helpful to clarify whether this was, for example, a scoping or systematic review, which databases and search terms were used, the inclusion/exclusion criteria, and how the literature from the different disciplines was synthesised.

Similarly, the role of the "peer-review refinement" mentioned in defining the framework should be explained more explicitly. The description suggests that the framework was presented and discussed at group meetings and conferences. Whilst these activities may provide valuable academic feedback and contribute to the refinement of a conceptual framework, they are not necessarily equivalent to a formal or systematic peer-review process. The author should therefore clarify what is meant by "peer review" in this context, including who provided feedback, how the feedback was collected, and how it informed subsequent revisions of the framework. If the

process consisted mainly of presentations and discussions with academic peers, terms such as “academic feedback” or “peer feedback” may be more accurate.

A second issue concerns the distinction between ontology, worldview, epistemology, belief and cognition. These concepts are sometimes used in such a way that they overlap. Greater conceptual precision on this point would strengthen the argument and help readers from different disciplinary fields to understand the conceptual framework.
The distinction between ontological pluralism and ontological diversity is potentially one of the most interesting contributions of the manuscript. However, it would be helpful to explain more clearly how this distinction relates to the existing literature and to acknowledge that encounters between different ontologies may involve conflict, incompatibility or rejection, rather than necessarily resulting in a shared construction of meaning.

Other concerns regarding application and limitations:
The practical toolbox is a valuable aspect of the article. However, its methodological status needs to be clarified. As the proposed activities have not yet been presented as empirically validated, it would be useful to explicitly frame them as a conceptual or practice-oriented framework and to indicate what kind of future empirical research would be required to assess their effectiveness in different contexts.

The ethical discussion is also important and could be strengthened by linking the concept of “ontological shock” more directly to practical safeguards in the use of the proposed activities. For example, participants may feel uncomfortable expressing deeply held assumptions or beliefs, particularly in educational or intercultural contexts. Some brief guidelines on voluntary participation, facilitation and respect for dissent would make the toolkit more useful in practice.
Some aspects of the discussion could also be simplified. In particular, the comparison with phenomena such as psychedelics, near-death experiences and alien abduction experiences seems somewhat peripheral to the central argument and could be reconsidered in order to maintain the article’s focus.

Finally, some assertions regarding a “secular-scientific paradigm” in EU policies, research and education are rather general. A clearer distinction between scientific knowledge, positivism, secularism, anthropocentrism and institutional practices would prevent these from being treated as a single, homogeneous construct. Specific examples drawn from European policies, research or education could also further strengthen this aspect of the argument.

Is the work clearly and accurately presented and does it engage with the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

Are all the source data and materials underlying the results available?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: citizen science, interdisciplinary research, science education, science communication, biodiversity

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.