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Research Article

Aesthetic Experience and Scientific Understanding in Ecological Science: A Relational Framework

Doświadczenie estetyczne a rozumienie naukowe w naukach ekologicznych: ujęcie relacyjne

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Abstract

The climate crisis, biodiversity decline, and ecological risks increase the gap between the ability to receive scientific information and the ability to understand relationship structures, interdependencies, and the consequences of actions. The study aims to examine how scientific knowledge is transformed into scientific understanding and the role of aesthetic experience in that transformation. The study applies conceptual and critical analysis with interdisciplinary and relational synthesis. The results identify visualization, metaphor, imagination, perception, and embodiment as mediating processes that organize information into intelligible relationships. The transdisciplinary environment is established as a constituent condition of understanding, where knowledge, skills, feelings, tools, and practices adjust to each other. The study proposes a structure for the relationship between subjects, objects, and the environment to reposition the cognitive value of aesthetic experience by distinguishing aesthetic mediation from evidential warrant. Aesthetic value gains scientific significance when it supports judgment testing, expands understanding, and translates knowledge into the capacity to act responsibly. Ecological science makes this mediation especially relevant because its objects are dynamic, multiscalar, interdependent, and uncertainty-laden. The framework's distinctive contribution is to treat the research environment as a constitutive third term that mediates reciprocal adjustment between the subject and the ecological object.

Keywords

aesthetic experience; scientific understanding; embodied cognition; ecological science; transdisciplinary research; scientific visualization; knowledge co-production

Abstrakt

Kryzys klimatyczny, spadek bioróżnorodności oraz zagrożenia ekologiczne pogłębiają rozdźwięk między zdolnością do przyswajania informacji naukowych a umiejętnością rozumienia struktur relacyjnych, współzależności oraz konsekwencji podejmowanych działań. Niniejsze opracowanie ma na celu zbadanie, w jaki sposób wiedza naukowa przekształca się w rozumienie naukowe oraz jaką rolę w tym procesie odgrywa doświadczenie estetyczne. Zastosowano w nim analizę pojęciową i krytyczną, połączoną z syntezą interdyscyplinarną i relacyjną. Wyniki wskazują, że wizualizacja, metafora, wyobraźnia, percepcja oraz ucieleśnienie (embodiment) stanowią procesy pośredniczące, które porządkują informacje w zrozumiałe układy relacji. Środowisko transdyscyplinarne zostaje tu określone jako konstytutywny warunek rozumienia - przestrzeń, w której wiedza, umiejętności, odczucia, narzędzia i praktyki wzajemnie się do siebie dostosowują. W artykule zaproponowano model relacji między podmiotami, przedmiotami poznania a środowiskiem, pozwalający na nowe ujęcie poznawczej wartości doświadczenia estetycznego poprzez rozróżnienie między mediacją estetyczną a uzasadnieniem opartym na dowodach. Wartość estetyczna zyskuje znaczenie naukowe, gdy wspiera weryfikację sądów, pogłębia rozumienie oraz przekłada wiedzę na zdolność do odpowiedzialnego działania. W naukach ekologicznych mediacja ta nabiera szczególnego znaczenia, ponieważ przedmioty ich badań mają charakter dynamiczny, wieloskalowy, współzależny i obarczony niepewnością. Istotnym wkładem proponowanego ujęcia jest potraktowanie środowiska badawczego jako konstytutywnego trzeciego elementu, który pośredniczy we wzajemnym dostosowywaniu się podmiotu poznającego i przedmiotu badań ekologicznych.

Słowa kluczowe

doświadczenie estetyczne; rozumienie naukowe; poznanie ucieleśnione; nauki ekologiczne; badania transdyscyplinarne; wizualizacja naukowa; współtworzenie wiedzy

Introduction

The accelerating climate crisis, biodiversity decline, and growing ecological risks are outpacing scientific knowledge, creating a cognitive problem: more information does not ensure that people understand explanatory relations, dependencies, and action-relevant consequences associated with complex phenomena (Juanchich et al. 2025). Charts, models, and data help organize evidence, but explanatory validity declines when the recipient lacks the conceptual framework or necessary skills (Naud et al. 2025). The gap between knowledge and understanding becomes an urgent issue when social decisions require risk identification, responsibility, and the transformation of awareness into action (van Eck and van der Meer 2025). Aesthetic experience offers an approach in which perception, emotion, imagination, visualization, metaphor, and embodiment contribute to scientific understanding of the phenomenon (F. H. M. Liu et al. 2026). Many approaches still analyse aesthetic value as a unique attribute of the model or image or within a binary subject-object relation, leaving the research environment conceptually secondary (Bravo et al. 2026). Interdisciplinary and transdisciplinary practice has clear limitations, as knowledge moves between communities of expertise

and lived experience (Díaz and Pascual 2025). The paper examines how aesthetic experience contributes to the transition from scientific knowledge to scientific understanding under research conditions relevant to complex ecological issues. In this article, scientific knowledge denotes warranted propositions, data, models, and practical know-how, whereas scientific understanding denotes the capacity to grasp explanatory relations and use them in judgment and action.

1. Overview of the Research Situation

Research on the relationship between aesthetics and scientific understanding has produced many approaches (Schellekens 2026). One group of theories associates understanding with the ability to recognize unity among phenomena, in which simplicity, harmony, and unity help regulate perception (N. Liu et al. 2026). Another group emphasizes visualization, imagery, and the ability to manipulate expressions as ways to increase the intelligibility of theory (Gu et al. 2025). Studies of embodied cognition expand this perspective by distinguishing theoretical knowledge, practical skills, and the ability to integrate concepts and actions (Antonides et al. 2026). Imagination and thought experiments are also seen as a means of investigating possible structures, identifying relationships, and examining the consequences of assumptions (Richmond 2026). The process-oriented approach shifts the emphasis towards levels of understanding, the capacity to select information, and continuous adjustment among cognitive objects, models, and tools (Azevedo 2026).

The above research directions have expanded awareness of the role of aesthetics, but three main gaps remain (Y. Lin et al. 2026). Much of the analysis of these developments occurs within individual disciplines, making it difficult to explain how understanding forms and develops in interdisciplinary and crossdisciplinary research. Understanding is often conceptualised in terms of propositional knowledge, visual expression, or expert competence, which reduces the role of embodied feelings, skills, imagination, and experience (Bara, Cross, et al. 2025). Aesthetic experience is also often reduced to individual attributes of theories, models, or scientific products, leaving dialogue, lived experience, and the role of the research environment inadequately explained (Estrada Gonzalez et al. 2026).

This research gap requires a relational account of aesthetics and scientific understanding that goes beyond fragmented models. The article therefore has three objectives: first, to clarify how visualization, imagination, metaphor, perception, and embodiment mediate the transformation of scientific knowledge into scientific understanding; second, to examine the transdisciplinary research environment as a constitutive

condition of cognitive experience; and third, to develop a subject–object–environment framework that repositions the cognitive value of aesthetic experience. Existing relational, embodied, aesthetic, and transdisciplinary approaches illuminate important parts of this process, but they do not fully explain why the same scientifically warranted representation can generate different degrees of understanding when the subject's capacities or the conditions of practice change. The proposed subject–object–environment framework addresses this explanatory problem by treating the environment as a constitutive component of scientific understanding rather than as a neutral background. The framework does not claim novelty for visualization, embodiment, relationality, or transdisciplinarity as separate concepts. Its contribution lies in specifying their functional relation and assigning the research environment an explanatory role as a constitutive third term.

2. Research Methods

The study combines conceptual and critical analysis with interdisciplinary and relational synthesis to investigate the role of aesthetic experience in scientific understanding of ecological phenomena. Conceptual analysis distinguishes scientific knowledge, scientific understanding, aesthetic experience, visualization, imagination, perception, and embodied cognition and examines the role of each component in transforming knowledge into the capacity to identify relationships and orient action. Critical analysis examines the limitations of approaches that locate aesthetic value primarily in the properties of theories, images, or scientific representations. Interdisciplinary synthesis draws on aesthetics, philosophy of science, cognitive science, environmental studies, education, and transdisciplinary research to examine the relationships among affect, skills, representation, evidence, and practice. Illustrative cases from climate research, biodiversity studies, art–science collaboration, and knowledge co-creation are used to examine the scope and explanatory adequacy of the argument. The results are then synthesized into a subject–object–environment model in which the cognitive value of aesthetic experience is assessed by its capacity to enhance understanding, support critical verification, and translate knowledge into responsible action. The literature was selected purposively for its conceptual relevance rather than through a systematic-review protocol. The illustrative cases are used to explore the framework's scope and are not treated as empirical tests that independently verify it. For analytical purposes, aesthetic experience denotes a perceptual, affective, and imaginative mode of engagement with scientific representations or practices and is not treated as evidence in its own right. Visualization denotes the organization of abstract relations into perceptible form; metaphor denotes a controlled mapping of relations

between conceptual domains; imagination denotes the exploration of possible configurations under constraints supplied by knowledge and evidence; perception denotes the selective organization of sensory information around task-relevant relations; and embodied cognition denotes the integration of conceptual knowledge with bodily perception, action, feedback, and skill. The term mediating process is used analytically for functions connecting representations, subject capacities, object characteristics, and conditions of practice; it does not denote an empirically established cognitive mechanism. Aesthetic judgment concerns the experiential organization and salience of a representation, whereas epistemic judgment concerns evidential warrant, explanatory adequacy, and reliability. Aesthetic judgment can support epistemic judgment but cannot replace it.

3. Discussion

3.1. From Aesthetic Attributes to Cognitive Structures: The Limits of Fragmented Models of Understanding

Debates about the role of aesthetics in scientific understanding often begin with attributes assigned to scientific theories, models, or expressions, such as simplicity, unity, harmony, visual ability, or evocation. Hommen describes an approach to "make modelling methods in science intelligible through their analogy with aesthetic descriptions" (Hommen 2025, 389). The attribute-based approach favours the identification of evaluation criteria, but it easily narrows the aesthetic experience to a set of relatively static qualities of the cognitive product (Boger and Firestone 2025). When cognitive values are reduced to individual qualities, the relationship between the researcher, the object, the means of expression, skills, feelings, and the circumstances of practice becomes fragmented. The fundamental limitation lies in the fragmentation between aesthetic attributes and cognitive structures that create meaning in the practice of science. Here, cognitive structure refers to the organized relation among subject capacities, representational forms, constraints imposed by the object of inquiry, and conditions of practice through which information becomes intelligible and usable in judgment.

The uniformity-based model clearly illustrates the above limitations. Simplicity and consistency help subjects recognize relationships between discrete phenomena, organize data into a whole, and reduce perceptual complexity. Cognitive value arises from the ability to detect relationships, not from the theory's inherent beauty. A simple model can still obscure important relationships, while a complex structure can still

have high cognitive value when it reflects the phenomenon's correct organization. Aesthetic criteria are cognitively effective only when they are tied to the structure of the phenomenon, evidence, objectives, and the subject's capacity to interpret and manipulate the representation (Vessel and Ovadia 2025).

The same limitation appears when visualization and imagery are treated as central processes of understanding. Visualization helps clarify structures, mechanisms, or patterns that are difficult to grasp with abstract statements. The cognitive value of the visual form depends on the degree of compatibility between the mode of expression and the structure of the object as well as the decoding capacity of the receiver. An easy-to-understand chart for the professional community can still become an obstacle for subjects from other practices, as with climate graphs carrying uncertainty bands or simplified food-web diagrams (Abell 2026). The image can also create a sense of clarity while obscuring the model's limitations. Apparent clarity of comprehension obscures the need to examine the relationship between expression, phenomenon, and context of use. A climate diagram, for example, can compress relations among variables in a form that specialists read efficiently while remaining opaque to participants without the relevant representational literacy.

Fragmentation is also revealed when knowledge is attributed to propositional knowledge or expert expressive knowledge. The proposition-first cognitive framework generally assumes that comprehension increases with the degree of grasp of theories, terminology, and professional explanatory structures. This assumption suits many specialized tasks, but it struggles to explain cases in which practical skills, sensations, bodily manipulation, or implicit knowledge play a decisive role. Comprehension also involves selecting relevant information, recognizing relationships, adjusting judgments, and translating knowledge into action. The process conception in the source emphasizes understanding, knowledge selectivity, and adjustment through multiple intermediate layers, undermining the view of propositional knowledge as an all-encompassing form of cognitive achievement (Earley 2026).

Treating each aesthetic feature as an independent unit creates further limitations. Emotions, intuition, art, and methodological norms can be distinguished for analytical purposes, but scientific practice does not operate through such isolated domains (Abrutyn 2026). Emotions frame attention; participation influences the perception of relevant features; intuition draws on implicit knowledge; and methodological choices can themselves be shaped by judgments of simplicity, coherence, or balance (Conwell et al. 2025). The cognitive value of aesthetic experience therefore arises from the coordinated configuration of several components rather than from any single attribute (Ayele et al. 2026). Classification remains analytically useful, but it becomes

limiting when distinctions introduced for analysis are mistaken for boundaries within lived cognitive experience. Baumann and Price emphasize the importance of "disentangling aesthetic experience from mere endorsement or participation with cultural objects" (Baumann and Price 2026, 12). A binary subject–object model likewise overlooks the role of the research environment in organizing affect, practical engagement, and interpretation. Terrone similarly notes that the relational approach "points out the crucial role that the encounter with a concrete entity plays in art appreciation" (Terrone 2026, 541).

The limits of the bipolar structure become more apparent in interdisciplinary and transdisciplinary studies. Scientific practice operates within a framework of methodology, technical language, tools, community, goals, and partnerships (Davis et al. 2025). When multiple domains of knowledge are involved, differences in methods, concepts, skills, and assessment standards create cognitive asymmetry. A clear form of professional expression may not work for someone from another domain. The aesthetic model relies on fixed criteria, making it difficult to explain how experience transforms into knowledge as it moves between communities of practice (Bara, Ramsey, et al. 2025). The collaborative environment forces understanding to occur through the negotiation of meaning, the transformation of modes of expression, and the adjustment of tools (Altenmüller and Plewe 2026). The heterogeneity of practice exposes the limits of conceiving an individual aesthetic attribute as the universal pathway to knowledge. In another direction of interdisciplinary analysis, Declos observes that "the study of aesthetic biases opens an interdisciplinary research agenda" (Declos 2026, 14).

Criticism of the fragmentation model does not deny the importance of simplicity, unity, visuality, or other aesthetic criteria (Berryman 2026). The problem concerns the cognitive status assigned to these features. They acquire significance only within a relational network that includes the structure of the phenomenon, cognitive objectives, evidence, tools, skills, and practical circumstances. Simplicity can support understanding when complexity is reduced without eliminating constitutive relationships, whereas oversimplification can obscure the structure of the object (Brainard 2026). Visualization can increase intelligibility under appropriate conditions, but an ill-suited representation may instead create an illusion of understanding. Imagination can open a space for exploring possibilities, but its cognitive value diminishes when it becomes detached from the constraints imposed by the phenomenon. Aesthetic judgment, which concerns formal, perceptual, or affective qualities, differs from epistemic judgment, which concerns evidential warrant and explanatory adequacy; aesthetic judgment acquires scientific significance only when it remains constrained by evidence, methods,

and research objectives (Smith 2025). Aesthetic experience should consequently be understood as part of a relational cognitive structure in which theoretical knowledge, practical skills, perception, imagination, objects, and environments mutually regulate one another.

The shift from attributes to cognitive structures clarifies the role of the human subject in scientific activity. The subject is not a passive recipient of theories, images, or models, but an organism with a body, sensations, memories, skills, imagination, and the capacity to act. Understanding develops through the interaction between the subject's capacities and their specific environment. The fragmentation approach makes it difficult to grasp the organic interrelationships between competencies, thereby separating cognition from practical life. A more relevant theory should explain how knowledge is translated into the ability to orient oneself, evaluate, and act in relation to complex systemic phenomena. The cognitive value of aesthetics lies not in the pleasant sensation or the beauty of the form itself, but in its ability to make the structure of the phenomenon intelligible in relation to the evidence, objectives, and environment of practice. By shifting the focus from attributes to cognitive structures, it lays the foundation for investigating the mediating processes that transform knowledge into understanding through visualization, imagination, metaphor, perception, and embodiment.

3.2. From Visualization to Embodiment: Mediating Processes between Scientific Knowledge and Scientific Understanding

Scientific knowledge does not automatically become scientific understanding merely because information, propositions, or models are available. The gap between knowing a statement and understanding a phenomenon arises when the subject has not yet identified relevant relationships or mechanisms, or lacks the capacity to work with appropriate representations of the phenomenon. Visualization can help bridge this gap by transforming abstract structures into forms that support observation, comparison, and the direction of attention (Arioli et al. 2025). Its cognitive effectiveness depends on organizing data into meaningful relationships rather than on visual form alone. Diagrams, images, and models acquire cognitive value when their representational structure corresponds adequately to the structure of the phenomenon and to the recipient's capacity to interpret them (Liang et al. 2026). A representation that is clear to a professional community may remain opaque to those who lack the relevant conceptual framework or skills. Scientific understanding therefore depends not on surface clarity alone, but on the subject's capacity to interpret and use

representations in relation to the phenomenon. Visualization, metaphor, imagination, perception, and embodiment are treated here as distinct but interacting modes of mediation. Their order is analytical rather than temporal: different processes can precede, overlap with, or modify one another according to the subject's capacities, the representation used, and the research environment.

Metaphor opens another path from representation to understanding. By relating an unfamiliar conceptual domain to a more familiar domain of experience, metaphor can create a cognitively useful mapping (Altman and Phelan 2026). Its value lies in transferring relationships between domains rather than merely substituting one expression for another. In complex systems, metaphors of interweaving, linkage, or flow can help make interdependence, movement, and constraints more intelligible. Because metaphors are selective, however, they highlight some relationships while leaving others in the background; their cognitive validity therefore depends on the scope and limits of the mapping. Climate research materials, for example, use embroidery to represent relationships among water, energy, and food (Meijers et al. 2025). Thread and manual manipulation can thereby transform an abstract conceptual structure into a material and experiential form of engagement.

Imagination continues this transition by creating a space for exploring relationships that are not yet directly present to the senses. The subject puts theoretical structure within hypothetical scenarios, transforms conditions, monitors consequences, and evaluates explanatory possibilities. The cognitive value of imagination depends on the constraints of the relevant knowledge, the characteristics of the phenomenon, and the consistency of inference. Thought experiments illustrate this mediating process: when a hypothetical situation allows manipulation, the cognitive outcome depends on the ability to clarify the premises, relationships, and the theory's limitations. Imagination creates the possibility of testing the structure before bringing it back into relation to the evidence. Knowledge moves from static speech to the field of possibilities, where the subject transforms, compares, and predicts consequences. Hannigan et al. point out that "Once preferable futures have been imagined, we can begin to understand the actions we need to take to realize them" (Hannigan et al. 2025, 11). The imaginative process connects symbolic representation with position, movement, and experience by tying the cognitive scenario to these elements. The way experience is formed also suggests that "the external world and an individual's internal processes shape the emergence of experiences, particularly aesthetic ones" (Kathofer et al. 2025, 9).

Perception takes knowledge beyond mere expression. Sensation is not a passive reception of discrete

stimuli, but is organized into meaningful structures through attention, motor experience, and discernment (Liao 2026). The subject sees, hears, touches, or moves in pursuit of a cognitive goal, then adjusts behaviour based on feedback. The shift from seeing to knowing how to approach, manipulate, and react marks the transition from represented information to knowledge integrated into human capacities (Børte and Zeivots 2026). Immersive practice in biodiversity research clarifies the mediating processes through which participants engage their bodies, feelings, and imagination to approach ecosystems from a different position from their usual experience (Tomasetig et al. 2026). The feeling associated with attaining cognitive value, when understood in relation to a practical task, is not an isolated subjective state.

Sensory awareness leads to embodied perception. The ability to perceive motion, materials, pace, or relationships cannot easily be replaced by propositional descriptions (Lacerda et al. 2026). Practical competence is formed through repetition, adjustment, and feedback between the body and the subject (Bishop et al. 2026). Implicit knowledge involves choosing movement direction, knowing when to react, and distinguishing meaningful signals. When the skill is integrated, the subject does not need to translate every action into a clear statement to act correctly. However, the distinction should be kept because "we can speak of skill without requiring understanding" (Helliwell 2026, 15). Embodied understanding manifests itself in the ability to act appropriately based on the alignment of theoretical knowledge, feeling, and skills (Di Paolo 2026). The body functions as a direct means of perception because the motor structure is involved in approaching and differentiating phenomena. Murphy et al. emphasize that "humans are both epistemic and aesthetic beings, and successful science depends on the integration of these aspects of ourselves" (Murphy et al. 2026, 20). The source distinguishes theoretical understanding, embodied understanding, and integrated understanding, establishing a complementary relationship between conceptual commitment and practical skills. At the process level, "Knowledge and knowing blur. Past and future blur. Being and becoming blur" (Freeman and Valencia Mazzanti 2026, 246).

Visualization selects relationships for representation; imagery organizes them into an overall structure; metaphor transfers relations into a familiar domain; imagination explores possible configurations; perception identifies relevant signals through action; and embodiment stabilizes appropriate perceptual and practical skills. Each mediating process performs a complex form of reduction (Beath et al. 2026). Complexity reduction is different from arbitrary reduction because understanding requires retaining explanatory relations and identifying the part that is excluded from expression. The concept of process understanding places the

capacity to select knowledge into the development structure of knowledge, distinguishing the accumulation of information from the ability to grasp phenomena. Images trigger imagination; imagination leads to manipulation; manipulation creates feelings; sensations prompt the correction of patterns; patterns remain perceptually oriented (Caldarola 2026). Understanding develops through feedback loops between expression, action, and evaluation. In another technological context, the evaluation process also "remains the responsibility of the user, depending on their knowledge, skills, and active engagement with the platform" (Formiga Sobrinho 2026, 11).

The interaction among visualization, metaphor, imagination, perception, and embodiment changes the standard for evaluating the cognitive role of aesthetics. The central question is no longer whether a theory or representation is beautiful, simple, or easy to visualize, but whether aesthetic forms help transform scientific knowledge into the capacity to understand, test, and act. Visualization is cognitively effective when it makes relevant relationships perceptible; imagery is cognitively effective when it organizes a mental model without obscuring the limits of representation; metaphor when it provides a controlled mapping between domains; imagination when it opens a space for exploring possibilities under the constraints of reality; and embodiment when it integrates knowledge into appropriate perceptual and practical skills (Barkela and Ress 2026). Scientific knowledge becomes scientific understanding when the subject can organize information into relationships, visualize structures, test possibilities, perceive relevant signals, and adjust action to the characteristics of the phenomenon (X. Lin et al. 2026). Visualization thus moves knowledge from abstraction toward perceptible expression, while embodiment integrates it into lived cognitive and practical capacities. This analysis provides the basis for examining how such mediating processes operate in transdisciplinary research environments, where differences in expertise and practice alter the conditions under which understanding is formed.

3.3. Transdisciplinary Research Environments as Constitutive Conditions of Aesthetic Experience and Scientific Understanding

The transdisciplinary environment should be understood as a constitutive condition of scientific understanding rather than as a neutral context surrounding cognitive activity. Scientific practice takes place within a relational network of subjects, objects, methods, tools, technical languages, collaborative institutions, and research goals (Mies et al. 2026). When multiple fields of knowledge are involved, participants approach

the phenomenon through different systems of concepts, skills, evaluative standards, and experiences (Apine et al. 2026). Understanding therefore develops through adjustment among the subject, the object, and the conditions of research. The literature identifies interdisciplinary and transdisciplinary environments as co-constructive spaces of knowledge in which different forms of expertise work together to address complex problems and negotiate differences in methodology, concepts, and cognitive resources (Mesa-Jurado et al. 2025). Bohnet et al. describe a structure that "links science and other types of knowledge in a transdisciplinary research process" (Bohnet et al. 2025, 11). In complex sustainability issues, this requirement also includes "integrating not only explicit, but also tacit forms of knowledge into the problem conceptualization and solution development" (Horvath et al. 2025, 558).

Ecological science places distinctive demands on understanding because ecological objects are dynamic, multiscalar, temporally extended, and marked by uncertainty, while relevant relations span organisms, habitats, climate processes, models, instruments, and human practices. Scientific understanding therefore depends on preserving interdependence, scale, and uncertainty as knowledge moves between representations, embodied observation, and collaborative interpretation. These conditions make aesthetic mediation especially relevant when it renders relations perceptible without replacing empirical evidence or methodological verification.

The climate-related example drawn from the cited art-science collaboration studies clarifies the constitutive role of the research environment. The cited climate-oriented art-science collaboration brings together artists, climate scientists, philosophers of science, sustainability researchers, and artistic experts to build a form of communication that fosters understanding and capacity for action (Stadlbauer et al. 2025). The co-creation process incorporates scientific information into collective, musical, and performance embroidery activities (Lustig et al. 2025). Climate data is no longer represented solely in graphs or diagrams, but is incorporated into bodily manipulation, pacing, materials, and the overall experience (Dominguez Lacasa and Mietzner 2025). Embroidery makes the relationship between water, energy, and food visible through threads, movement, and the time involved in the activity. Collaborative environments facilitate the movement of knowledge between forms of expression, opening more avenues for approaching phenomena (Mathie and Omholt 2026).

The tension between scientific charts and artistic experience has clear cognitive implications. Graphs are valid in a professional setting because the research community has the reading skills, interpretive

standards, and goals that match their use. When the same form shifts to a different community of practice, visual clarity alone cannot ensure comprehension. The artist experiences the process of compressing complex information into a diagram as a form of cognitive dissonance. The transdisciplinary environment tests the assumption that scientific expression is universal. Complex climate systems require a balance between simplification and the preservation of relationships within the system. Aesthetic experience contributes to this process of regulation by keeping complexity at a level that allows perception, imagination, and manipulation (Aremu et al. 2026).

The biodiversity case illustrates a different response to the same epistemic problem. The research process brings together natural scientists, social scientists, local communities, and stakeholders to simulate decision-making in an ecological context (Boxerman et al. 2026). Participants assume the roles of managers, residents, conservationists, organisms, water flows, plants, and other ecological elements. Through participatory role-playing, they are required to enact these positions bodily rather than merely describe them conceptually. Imagination, movement, and perception thereby contribute to an embodied understanding of systemic interdependence. Participants respond from the relational position of the entities they represent, making visible vulnerabilities, dependencies, and conflicts of interest that may be obscured when decisions are framed primarily in terms of direct human interests.

Role-playing clarifies the role of the physical environment in perception. Participants must orient their bodies in space, choose how to move, respond to other participants, and associate sensory experience with the characteristics of their assigned roles. Perceptual skills develop through activity, while meaning emerges from the relationship between action and context. The boundary between sensation and understanding becomes more flexible when perception is organized around the recognition of relationships. The value of the exercise lies in its capacity to create a temporary cognitive position from which participants can experience relations of dependence and vulnerability from perspectives different from their own. Through such embodied and imaginative positioning, simulated environments can generate forms of practical knowledge that are difficult to obtain through propositional description alone (Figueroa 2026).

Two cases clarify the common characteristic of crossdisciplinary research: knowledge is transformed as it travels through multiple communities of practice. Each transition requires the restructuring of forms of expression, relevant criteria, and methods of interpretation. Experts often clash over evidence, clarity of expression, appropriate methodology, or the reliability of results. Conflict has a critical value when it forces

each community to identify the limits of its own tools. Aesthetic experience can mediate such differences by providing shared perceptual and imaginative forms through which competing interpretations become comparable and open to criticism (Stamkou and Keltner 2026). Art, metaphor, performance, or role-playing do not guarantee scientific truth on their own. Its value emerges when multiple cognitive positions examine the means of producing knowledge, clarify missing relationships, and expand the capacity of actors with different backgrounds to participate (Benblatt and Kelly 2026). Its mediating value therefore depends on making differences in evidence, interpretation, and practical position available for examination rather than on producing agreement by itself.

The environment also constitutes understanding through the social dimension of cognitive activity. Knowledge co-constructivism distributes explanatory capacity among multiple subjects, undermining the assumption that the expert is the only source of complete knowledge (Uebel and Hamamra 2026). Expertise shapes concepts, evidence, and methods; local experiences, practical skills, memories, and feelings provide information that propositional knowledge cannot easily replace (Johner et al. 2025). Partnerships enable different forms of knowledge to be brought together, evaluated, and integrated according to the task. Crossdisciplinary structures are valuable when differences are not erased to create a formal consensus, but are organized into a source of mutual criticism. Understanding reaches a higher level when the subject recognizes the effective scope of his or her own knowledge and the degree of dependence on the cognitive capacities of others.

The environment provides a physical structure for perception through sound, movement, space, materials, and tempo; organizes social relations through role formation, cooperation, dialogue, and the negotiation of meaning; and establishes a cognitive horizon through research objectives, problems to be solved, and the limits of the phenomena under study. The analysis presented here treats the environment simultaneously as an object of cognition, a medium of relation, and a condition for organizing perception, emotion, imagination, and evaluation. Conceiving the transdisciplinary environment as a constitutive field helps overcome the limitations of associating aesthetics with static attributes and of treating understanding as a closed subject–object relation. Aesthetic experience emerges through participation in the research environment, while understanding develops through the adjustment of knowledge, skills, affect, imagination, and the demands of the phenomenon (Käyhkö et al. 2025). The transdisciplinary environment thus organizes the relations through which knowledge becomes intelligible and capable of informing action. This conclusion

provides the basis for the subject–object–environment framework developed in the next section.

3.4. Structure of Subject, Object and Environment Relationships: Repositioning the Cognitive Value of Aesthetic Experience

The relationship among the subject, the object, and the environment provides the basis for repositioning aesthetic experience within scientific understanding. Attribute-based models typically locate aesthetic value in features such as simplicity, unity, harmony, intuitiveness, or the evocative power of scientific representations. The relational approach shifts attention to how understanding emerges through interaction among the capacities of the subject, the characteristics of the phenomenon, and the conditions of scientific practice. Aesthetic experience is therefore not treated as a set of qualities added to a theory or model, but as a mode of organizing perception, imagination, affect, skills, and evaluation in relation to the object of inquiry. The proposed framework places the subject, with its knowledge, skills, and affective capacities, the object or target phenomenon, and the research environment within a single explanatory structure. This approach is consistent with the notion that "scientific understanding is a process of embodied enactment of scientific knowledge through aesthetic experiences" (Poliseli 2026, 22). Existing relational accounts foreground relations, embodied and enactive approaches foreground bodily engagement, scientific-aesthetic accounts foreground representation, and transdisciplinary approaches foreground collaboration. The proposed framework integrates these dimensions by treating subject, object, and environment as reciprocally adjusting components of one explanatory structure. Its specific explanatory gain is to account for variation in scientific understanding when subjects with different capacities or operating under different research conditions encounter the same knowledge or representation. Prior knowledge, disciplinary expertise, practical skill, and representational literacy therefore condition how far the same scientifically warranted representation can be converted into understanding; expert and non-expert recipients may reach different levels of understanding without any change in the representation's evidential status.

Subjects are human beings with bodies, memories, emotions, knowledge, skills, and imaginative abilities. Comprehension cannot be reduced to the possession of the correct proposition or the ability to reproduce the model. The subject achieves understanding by recognizing relationships, distinguishing relevant information, manipulating representations, adjusting judgments, and translating knowledge into action-oriented competencies (Achella 2026). Aesthetic experiences contribute to this process by organizing

attention, highlighting structures, triggering imagination, and supporting the development of perceptual skills. Aesthetic reactions have cognitive value when evaluated against evidence, methods, and research objectives. A sense of beauty, elegance, or harmony alone is not enough to create scientific understanding. The object, understood here as the ecological phenomenon under investigation rather than the aesthetic representation, plays a role in cognitive binding because it has its own structure, mechanisms, formation history, and complexity. Simplified visual representations can still obscure important ties; evocative metaphors can still lead to inferences that deviate from the phenomenon's structure; and emotionally rich embodied experience still needs to be evaluated against knowledge and evidence (Brown 2026). Truth plays a regulating role in distinguishing experiences that support genuine understanding from those that merely create an unfounded sense of understanding. Representations mediate access to the object and remain answerable to its evidentially constrained structure.

The environment adds dimensions that subject–object models often overlook. It includes physical conditions, tools, professional language, cooperative relationships, methodological standards, research objectives, and practices that shape how knowledge is produced. Materials, spaces, movements, and collaborative structures influence perception, exchange, and judgment. The environment therefore establishes a field of possibilities in which some relationships become easier to identify while others remain obscured (Beckford 2026). Aesthetic perception becomes a process of cognitive positioning when the subject adjusts modes of perception and reasoning to the structure of the field of practice. Within the proposed framework, the environment functions simultaneously as an object of perception, a medium of relation, and a condition for organizing perception, emotion, imagination, and evaluation (Andersson et al. 2026).

The three components do not function as independent units that are merely combined at the end of the cognitive process. The subject engages with the object within a particular research environment; feedback from this engagement modifies the subject's strategies of perception and interpretation; and the environment itself can be reconfigured through research tools and practices. Relationality therefore consists in reciprocal adjustment. A visual model is cognitively effective when it helps the subject recognize the structure or mechanism of a phenomenon under appropriate research conditions. When the model loses explanatory power, the subject must modify the representation, method, or mode of engagement. Imagination, metaphor, embodiment, and sensory perception operate as mediating processes within this relation. The framework consequently clarifies the transition from scientific knowledge to scientific understanding: theoretical

knowledge directs attention, practice provides feedback, perception distinguishes relevant signals, imagination opens possible configurations, and conceptual analysis organizes the results into explanatory relationships (Lopes and Zappulli 2026). Understanding emerges when these cognitive domains interact without erasing the functional distinctions among evidence, affect, imagination, and judgment.

The cognitive value of aesthetic experience must be assessed in relation to the validity of the relationships it helps disclose. Aesthetic experience is epistemically valuable when it enhances structural recognition, expands perception, reveals previously overlooked relationships, supports the testing of assumptions, or enables more appropriate action. This criterion prevents aesthetics from being reduced to decoration or treated as a form of independent evidence. Aesthetic experience cannot replace empirical evidence and does not by itself establish the truth of a theory. Rather, it mediates among phenomena, forms of representation, and the cognitive capacities of the subject. When this mediating function is detached from verification, aesthetic coherence may create only an illusion of understanding. When constrained by evidence, methods, and cognitive goals, however, aesthetic experience becomes a resource for organizing and extending scientific understanding (Demirtaş and Acer 2026).

Repositioning according to the relationship structure also changes the concept of objectivity and subjectivity. The subjectivity of feelings does not mean arbitrariness. Aesthetic judgment is influenced by the subject's position, but can still be compared, modified, and examined in relation to the judgements of others and the subject's own experience. Scientific objectivity does not require removing the body, emotions, and imagination from the cognitive process. The control mechanism should be based on evidence, the ability to repeat the operation, the critical dialogue, and the relevance of the explanations. Relational structural objectivity is achieved through the adjustment of multiple cognitive capacities under the constraints of reality (Klaus et al. 2026).

The relationship between aesthetics and understanding is also linked to the right to participate in knowledge production. The model relies too heavily on specialized forms of expression, which easily creates a distance between experts and subjects outside the specialty. Relational structure expands opportunities for participation through images, metaphors, practical skills, feelings, and imagination, but still requires verification. Expertise is placed in relation to forms of experience capable of detecting the limits of specialized expression. When knowledge is directly related to ecological crises and survival conditions, knowledge needs to be associated with the ability to identify dependency, vulnerability, responsibility, and the consequences of

action (Lau et al. 2025). Aesthetic experience helps people approach complex relationships in a cognitive and practice-oriented way. The structure of subjects, objects, and environments repositions the aesthetic experience from an auxiliary attribute to an intermediate element in scientific cognition. Cognitive value is established through its ability to increase relational knowability, support the critical examination of judgements, and translate knowledge into capacity for responsible action (Aykut and Wiener 2026). This approach examines the relationship between aesthetics and scientific structure without equating aesthetics with evidence, keeping the body and emotions in perception without turning one's own experience into a norm of truth (Armayones Carranza and Viñé Rius 2026). The contribution of the proposed framework lies not in any of these components taken separately, but in explaining their reciprocal adjustment within a subject-object-environment structure and the resulting variation in scientific understanding.

Conclusions

The study establishes aesthetic experience as a mediating cognitive component that contributes to the transformation of scientific knowledge into an understanding of ecological phenomena. The critique of attribute-based models clarifies the limitations of separating simplicity, visuality, imagery, and emotion from the practices in which they acquire cognitive significance. Cognitive value emerges when perception, imagination, metaphor, skill, and embodiment are organized in relation to evidence and to the characteristics of the phenomenon. The transdisciplinary research environment also plays a constitutive role by coordinating knowledge, tools, collaboration, and embodied experience. On this basis, the study proposes a relational subject–object–environment framework for understanding ecological science. This relational framing is consistent with accounts that emphasize the encounter with a concrete entity in aesthetic appreciation (Terrone 2026) and with enactive approaches that understand aesthetic cognition through embodied engagement (Di Paolo 2026). Aesthetic experience mediates among phenomena, forms of representation, and cognitive capacities; its value lies in making relationships intelligible, supporting critical judgment, and orienting responsible action. Scientific understanding acquires practical and ethical significance when knowledge enables the recognition of dependencies, vulnerabilities, and responsibilities and supports action in response to ecological crises. The framework's distinctive contribution is to identify the research environment as a constitutive third term through which the capacities of the subject, the structure of the ecological object, and the conditions of practice jointly regulate the transition from scientific knowledge to scientific understanding. The proposed mediating processes are conceptualised as analytical relations rather than as stages in a fixed

empirical sequence, and their cognitive value remains constrained by evidence and method.

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No new data were created or analysed in this study.

AI Tools Declaration

During the preparation of this manuscript, the author used Grammarly (Grammarly, Inc.) for translation support and Codex (OpenAI) to format the manuscript and standardize in-text citations and the reference list. No artificial intelligence tools were used to write or edit the scholarly content, identify sources, or analyse the subject matter. The author reviewed the resulting output and takes full responsibility for the content of the manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

References

Abell, Catharine. 2026. “Art and aesthetic appreciation by description.” *The British Journal of Aesthetics*. Advance online publication. https://doi.org/10.1093/aesthj/ayag006.

Abrutyn, Seth. 2026. “Imagining an affective sociology.” *Sociological Theory* 44 (3): 229–248. https://doi.org/10.1177/07352751261440890.

Achella, Stefania. 2026. “Networked humanity: An enactivist paradigm for aligning humans, nonhumans, and machines.” *Topoi*. Advance online publication. https://doi.org/10.1007/s11245-025-10354-6.

Altenmüller, Marlene Sophie, and Miriam Clivia Plewe. 2026. “(Not) alone in the museum: Implicit social influence on art appreciation.” *Psychology of Aesthetics, Creativity, and the Arts* 20 (3): 535–543. https://doi.org/10.1037/aca0000713.

Altman, Irida, and Caleb Labbe Phelan. 2026. “Musical performance as translation: A hermeneutics.” *The British Journal of Aesthetics* 66 (3): 667–689. https://doi.org/10.1093/aesthj/ayag001.

Andersson, Erik, Johan Enqvist, Maria Tengö, and Valtteri A. Aaltonen. 2026. "Transforming the nature of cities: Stewardship and more-than-human agency." *Current Opinion in Environmental Sustainability* 80: 101628. https://doi.org/10.1016/j.cosust.2026.101628.

Antonides, Joseph, Anderson Norton, Michael T. Battista, and Karen Zwanch. 2026. "Spatial structuring and units coordination: Building and illustrating a coordinated theoretical framework." *Cognition and Instruction* 44 (3): 271–314. https://doi.org/10.1080/07370008.2025.2571509.

Apine, Elina, Marta Payo-Payo, Amani Becker, Marta Meschini, Constantinos Matsoukis, and Sara Kaffashi. 2026. "Navigating interdisciplinary coastal research in the UK: Challenges and solutions from an early career perspective." *Cambridge Prisms: Coastal Futures* 4: e2. https://doi.org/10.1017/cft.2025.10022.

Aremu, Toyib, Travis Reynolds, and Fritz Sager. 2026. "Patterns of evidence use in Nigerian policymaking: Insights from latent class analysis." *Policy Sciences* 59 (1): 77–99. https://doi.org/10.1007/s11077-026-09600-4.

Arioli, Maria, Nicola Canessa, Alessandra Gargiulo, Matteo Zardin, Andrea Falini, and Alberto Sanna. 2025. "Combined fMRI and eye-tracking evidence on the neural processing of visual ambiguity in photographic aesthetics." *Scientific Reports* 15 (1): 12971. https://doi.org/10.1038/s41598-025-97945-w.

Armayones Carranza, Laura, and Lluís Viñé Rius. 2026. "A participatory future scenario-building methodology for Europe's just transition by sectors: The FITTER-EU case." *Politics and Governance* 14: 12281. https://doi.org/10.17645/pag.12281.

Ayele, Samrawit Tariku, Luca Cecchetti, and Rolf Reber. 2026. "Ingredients for a good meme: Cognitive, emotional, and social factors of internet meme appreciation." *Psychology of Aesthetics, Creativity, and the Arts* 20 (4): 1014–1025. https://doi.org/10.1037/aca0000744.

Aykut, Stefan C., and Antje Wiener. 2026. "From climate action to climate agency: Mapping social drivers and the opportunity structure for global decarbonization." *Earth System Governance* 28: 100322. https://doi.org/10.1016/j.esg.2026.100322.

Azevedo, Roger. 2026. "Using real-time process data of domain-specific learning processes to provide adaptive support for learning and instruction: Challenges and opportunities." *Learning and Instruction* 104: 102363. https://doi.org/10.1016/j.learninstruc.2026.102363.

Bara, Ionela, Emily S. Cross, and Richard Ramsey. 2025. "The role of art knowledge training on aesthetic judgements and executive functions." *Royal Society Open Science* 12 (2): 240175. https://doi.org/10.1098/rsos.240175.

Bara, Ionela, Richard Ramsey, and Emily S. Cross. 2025. "AI contextual information shapes moral and aesthetic judgments of AI-generated visual art." *Cognition* 257: 106063. https://doi.org/10.1016/j.cognition.2025.106063.

Barkela, Berend, and Julia Ress. 2026. "Does art make a difference? An experimental investigation of differential perception and processing in the reception of artistic and non-artistic apocalyptic climate images." *Empirical Studies of the Arts* 44 (1): 147–170. https://doi.org/10.1177/02762374251320816.

Baumann, Shyon, and Taylor Price. 2026. "A graded conceptualization of taste." *Poetics* 115–116: 102092. https://doi.org/10.1016/j.poetic.2026.102092.

Beath, Hamish, Chris Smith, Jarmo S. Kikstra, Mark M. Dekker, Matthew J. Gidden, and Joeri Rogelj. 2026. "A weighting framework to improve the use of emissions scenario ensembles of opportunity." *Nature Climate Change* 16 (3): 305–312. https://doi.org/10.1038/s41558-026-02565-5.

Beckford, Corey A. 2026. "Faked nature? A Kantian proto-environmental aesthetics." *The British Journal of Aesthetics* 66 (2): 237–251. https://doi.org/10.1093/aesthj/ayae057.

Benblatt, Jordana, and Kristy Kelly. 2026. "Who gets to learn through research? Rethinking undergraduate research as inclusive pedagogy." *Teaching in Higher Education*. Advance online publication. https://doi.org/10.1080/13562517.2026.2670361.

Berryman, Jim. 2026. "On style and mere stylishness in AI-generated art." *The Journal of Aesthetics and Art Criticism* 84 (2): 153–162. https://doi.org/10.1093/jaac/kpaf042.

Bishop, Laura, Anna Niemand, Sara D'Amario, and Werner Goebl. 2026. "Moving together, feeling together: Body coordination, pupil size, and musical togetherness in classical duo performance." *Psychology of Music*. Advance online publication. https://doi.org/10.1177/03057356261436796.

Boger, Tal, and Chaz Firestone. 2025. "The psychophysics of style." *Nature Human Behaviour* 9 (12): 2497–2509. https://doi.org/10.1038/s41562-025-02249-8.

Bohnet, Iris C., Rosalind Bryce, Inger E. Måren, et al. 2025. "Co-creating cultural narratives for sustainable rural development: A transdisciplinary learning framework for guiding place-based social-ecological research." *Current Opinion in Environmental Sustainability* 73: 101506. https://doi.org/10.1016/j.cosust.2024.101506.

Boxerman, Jonathan Z., Cheryl Ramirez Sangueza, and Sharon Nelson-Barber. 2026. "Culturally grounded STEM education: Three cases of broadening participation among Indigenous Islanders." *Education Sciences* 16 (1): 17. https://doi.org/10.3390/educsci16010017.

Brainard, Lindsay. 2026. "Creativity, formula, and constraint." *The Journal of Aesthetics and Art Criticism* 84 (1): 6–17. https://doi.org/10.1093/jaac/kpag003.

Bravo, Isaac, Stefanie Walter, Katharina Prasse, and Margret Keuper. 2026. "Visualizing climate change in the media: A systematic literature review, challenges, and future research." *Annals of the International Communication Association*. Advance online publication. https://doi.org/10.1093/anncom/wlag011.

Brown, Carol A. M. 2026. “Science education’s responses to misinformation: A scoping review.” *Studies in Science Education*. Advance online publication. https://doi.org/10.1080/03057267.2026.2654793.

Børte, Kristin, and Sandris Zeivots. 2026. “Active learning in higher education: Inheriting pasts and emerging futures.” *Active Learning in Higher Education* 27 (2): 207–219. https://doi.org/10.1177/14697874261426575.

Caldarola, Elisa. 2026. “What is a spatial art?” *The British Journal of Aesthetics*. Advance online publication. https://doi.org/10.1093/aesthj/ayaf050.

Conwell, Colin, Daniel Graham, Chelsea Boccagno, and Edward A. Vessel. 2025. “The perceptual primacy of feeling: Affectless visual machines explain a majority of variance in human visually evoked affect.” *Proceedings of the National Academy of Sciences* 122 (4): e2306025121. https://doi.org/10.1073/pnas.2306025121.

Davis, Charles C., Jackson Kehoe, Anna C. Knaap, and Christopher D. M. Atkins. 2025. “Science × art: Spotlighting unconventional collaborations.” *Trends in Ecology & Evolution* 40 (2): 104–108. https://doi.org/10.1016/j.tree.2024.12.004.

Declos, Alexandre. 2026. “AI and aesthetic bias.” *The Journal of Aesthetics and Art Criticism* 84 (2): 218–233. https://doi.org/10.1093/jaac/kpag027.

Demirtaş, Duygu, and Dilek Acer. 2026. “Arts-based pedagogy as epistemic mediation in early childhood environmental and sustainability education: A mixed research systematic review and research agenda.” *Educational Research Review* 52: 100811. https://doi.org/10.1016/j.edurev.2026.100811.

Di Paolo, Ezequiel A. 2026. “The enactive elements of style.” *Phenomenology and the Cognitive Sciences*. Advance online publication. https://doi.org/10.1007/s11097-026-10142-6.

Díaz, Sandra, and Unai Pascual. 2025. “Reciprocity towards nature in the biodiversity science–policy interface.” *People and Nature* 7 (5): 1129–1138. https://doi.org/10.1002/pan3.70033.

Dominguez Lacasa, Iciar, and Dana Mietzner. 2025. “Embracing the third mission through art: Pathways to address climate change.” *Technovation* 148: 103336. https://doi.org/10.1016/j.technovation.2025.103336.

Earley, Christopher. 2026. “Social aesthetic cognitivism.” *Synthese* 208 (1): 29. https://doi.org/10.1007/s11229-026-05675-x.

Estrada Gonzalez, Vicente, Kohinoor Monish Darda, Eileen R. Cardillo, Zuha Nasim, Amy Krimm, and Anjan Chatterjee. 2026. “Going beyond beauty: Characterizing the complexity of aesthetic experiences.” *Annals of the New York Academy of Sciences* 1558 (1): e70246. https://doi.org/10.1111/nyas.70246.

Figueroa, Ana. 2026. “Exploring collaborative communities for active learning: Enhancing engagement and critical thinking skills.” *The Clearing House: A Journal of Educational Strategies, Issues and Ideas* 99 (3): 138–150. https://doi.org/10.1080/00098655.2026.2655873.

Formiga Sobrinho, Asdrúbal Borges. 2026. "Exploring how generative AI reshapes artistic creativity." *The Journal of Creative Behavior* 60 (2): e70113. https://doi.org/10.1002/jocb.70113.

Freeman, Melissa, and Cristina Valencia Mazzanti. 2026. "The evidence of the beautiful: Aesthetic returns to education." *Educational Studies* 62 (3): 237–249. https://doi.org/10.1080/00131946.2026.2653492.

Gu, Youlong, Matias Quintana, Xiucheng Liang, Koichi Ito, Winston Yap, and Filip Biljecki. 2025. "Designing effective image-based surveys for urban visual perception." *Landscape and Urban Planning* 260: 105368. https://doi.org/10.1016/j.landurbplan.2025.105368.

Hannigan, Shelley, Danielle Hradsky, Robin Bellingham, Jo Raphael, and Peta J. White. 2025. "Reimagining climate change futures: A review of arts-based education programs." *Futures* 173: 103667. https://doi.org/10.1016/j.futures.2025.103667.

Helliwell, Alice C. 2026. "Can AI create with flair? Artistic creativity and artificial intelligence." *The British Journal of Aesthetics* 66 (3): 595–611. https://doi.org/10.1093/aesthj/ayaf057.

Hommen, David. 2025. "Poetic understanding and scientific knowledge: Models as aesthetic descriptions." *Journal for General Philosophy of Science* 56 (3): 373–391. https://doi.org/10.1007/s10838-024-09707-3.

Horvath, Sophia-Marie, Ulrike Payerhofer, Arjen Wals, and Georg Gratzer. 2025. "The art of arts-based interventions in transdisciplinary sustainability research." *Sustainability Science* 20 (2): 547–563. https://doi.org/10.1007/s11625-024-01614-2.

Johner, Zachary, Nicole Klenk, Christopher Cvitanovic, and Maud Borie. 2025. "How can we better account for experiential knowledge in co-production frameworks?" *Environmental Science & Policy* 171: 104183. https://doi.org/10.1016/j.envsci.2025.104183.

Juanchich, Marie, Karl Halvor Teigen, Theodore G. Shepherd, and Miroslav Sirota. 2025. "Negative verbal probabilities undermine communication of climate science." *Nature Climate Change* 15 (12): 1300–1306. https://doi.org/10.1038/s41558-025-02472-1.

Kathofer, Maximilian, Claus Lamm, Helmut Leder, and Julia Sophia Crone. 2025. "Aesthetic experiences across visual perception and mental imagery: Behaviorally indistinguishable, neurally distinct." *iScience* 28 (6): 112588. https://doi.org/10.1016/j.isci.2025.112588.

Käyhkö, Janina, Mikael Hildén, Ia Hyttinen, and Kaisa Korhonen-Kurki. 2025. "The emerging institutionalisation of knowledge co-production in sustainability research." *Ambio* 54 (8): 1372–1385. https://doi.org/10.1007/s13280-025-02161-5.

Klaus, Valentin H., Franziska J. Richter, Nathan Fox, Davide Andreatta, and Abdesslam Chai-allah. 2026. "Powerful flowers: Public perception of grassland aesthetics is strongly related to management and biodiversity." *Agriculture, Ecosystems & Environment* 398: 110111. https://doi.org/10.1016/j.agee.2025.110111.

Lacerda, Teresa Oliveira, Soraia Chung Saura, Ana Cristina Zimmermann, and Maria Luísa Ávila da Costa. 2026. "Aesthetic reading of speed in contemporary sports." *Journal of the Philosophy of Sport*. Advance online publication. https://doi.org/10.1080/00948705.2026.2645146.

Lau, Sam S. S., Regene P. W. Choi, and Alan Reid. 2025. "How nature experience and nature connectedness matter to school students' attitudes towards biodiversity." *Biological Conservation* 312: 111493. https://doi.org/10.1016/j.biocon.2025.111493.

Liang, Xinyu, Kaixiang Zhuang, Yun Wang, et al. 2026. "Latent neural architecture organising shared aesthetic evaluations of visual artworks." *Nature Communications* 17 (1): 6510. https://doi.org/10.1038/s41467-026-73153-6.

Liao, Shuting. 2026. "*Xiang* 象 as a dynamic perceptual framework: Bridging sensory experience and aesthetic meaning." *The British Journal of Aesthetics* 66 (1): 17–35. https://doi.org/10.1093/aesthj/ayaf003.

Lin, Xin, Mengying Liu, Shuhan Ji, Lei Wu, and Jianping Huang. 2026. "The computational and neural mechanisms of audiovisual multisensory aesthetic information influences on value-based decision-making." *Psychology of Aesthetics, Creativity, and the Arts*. Advance online publication. https://doi.org/10.1037/aca0000839.

Lin, Yi, Johan Wagemans, and Hans Op de Beeck. 2026. "Rethinking neuroaesthetics: Toward a multidimensional and integrative science of aesthetic experience." *Neuron* 114 (8): 1338–1342. https://doi.org/10.1016/j.neuron.2026.01.017.

Liu, Felicia H. M., Helena Varkkey, Thomas E. L. Smith, et al. 2026. "Artivism for cleaner air? An exploration of the artistic representation of 'haze' in Southeast Asia." *Environmental Communication* 20 (3): 509–530. https://doi.org/10.1080/17524032.2025.2544561.

Liu, Ningning, Endale Tadesse, Min Zhang, Sabika Khalid, Weijun Li, and Chunhai Gao. 2026. "A review of event-related potential measuring aesthetic processing in visual aesthetic experience research." *Psychology of Aesthetics, Creativity, and the Arts* 20 (4): 847–859. https://doi.org/10.1037/aca0000707.

Lopes, Dominic McIver, and Davide Andrea Zappulli. 2026. "Pluralism about aesthetic value and agency in the Zhuangzi." *Dao* 25 (1): 71–88. https://doi.org/10.1007/s11712-025-10030-x.

Lustig, Allyza R., Allison R. Crimmins, Michael O. Snyder, Laura Tanner, and Ian van Coller. 2025. "Bringing art and science together to address climate change." *Climatic Change* 178 (3): 47. https://doi.org/10.1007/s10584-025-03861-3.

Mathie, Rosalie G. P., and Knut Omholt. 2026. "The way of the researcher: Integrating artistic self-expression as a reflexive partner in the study of sustainability education." *Environmental Education Research* 32 (6): 1740–1761. https://doi.org/10.1080/13504622.2025.2591393.

Meijers, Marijn H. C., Jeroen S. Lemmens, Yuyao Lu, et al. 2025. "Let's talk about climate change: How immersive media experiences stimulate climate conversations." *Journal of Environmental Psychology* 104: 102610. https://doi.org/10.1016/j.jenvp.2025.102610.

Mesa-Jurado, M. Azahara, Paula Novo, Rafael Calderón-Contreras, et al. 2025. "Meaningful transdisciplinary collaborations for sustainability: Local, artistic, and scientific knowledge." *Ecology and Society* 30 (4): 7. https://doi.org/10.5751/ES-16491-300407.

Mies, Annika, Tim Gruchmann, and Stefan Gold. 2026. "Conceptualising the socio-material context: An ethical enquiry into the contextual materialisation of paradoxes in transport logistics." *Journal of Business Ethics* 203 (1): 107–139. https://doi.org/10.1007/s10551-025-05994-y.

Murphy, Alice, Adrian Currie, and Kirsten Walsh. 2026. "Aesthetics and agency in experiments." *Australasian Journal of Philosophy*. Advance online publication. https://doi.org/10.1080/00048402.2026.2647963.

Naud, Aude, Oscar Navarro, Manon Chotard, et al. 2025. "Communicating the risk of erosion: The effects of map-based communication on risk perception and affect." *Climate Risk Management* 50: 100738. https://doi.org/10.1016/j.crm.2025.100738.

Poliseli, Luana. 2026. "Aesthetic sustainability: Relational understanding in conservation research environments." *European Journal for Philosophy of Science* 16 (2): 48. https://doi.org/10.1007/s13194-026-00747-8.

Richmond, Andrew. 2026. "What really lives in the swamp? Thought experiments and the illustration of scientific reasoning." *Philosophy of Science* 93 (2): 268–288. https://doi.org/10.1017/psa.2025.10106.

Schellekens, Elisabeth. 2026. "Aesthetic discovery and seeking to understand." *Philosophical Studies*. Advance online publication. https://doi.org/10.1007/s11098-026-02512-2.

Smith, Murray. 2025. "Reflective equilibrium, aesthetic appreciation, and aesthetic judgement." *Synthese* 205 (5): 178. https://doi.org/10.1007/s11229-025-04928-5.

Stadlbauer, Christina, Marjan De Mey, Katrien Schaubroeck, Nele Buyst, Varsha Paleri, and Kristien Hens. 2025. "Art–science collaborations in biotechnology research: A transdisciplinary approach." *Trends in Biotechnology* 43 (4): 735–737. https://doi.org/10.1016/j.tibtech.2025.01.009.

Stamkou, Eftychia, and Dacher Keltner. 2026. "Aesthetic revolution: How art shapes social worlds." *Social and Personality Psychology Compass* 20 (4): e70135. https://doi.org/10.1111/spc3.70135.

Terrone, Enrico. 2026. "The appreciation game: A monist ontology of works of art." *European Journal of Philosophy* 34 (2): 531–544. https://doi.org/10.1111/ejop.70070.

Tomasetig, Giulia, Angelo Maravita, Cosmo Laera, Stefano Pizzi, Eraldo Paulesu, and Lucia Maria Sacheli. 2026. "Aesthetic experience in the physical and immersive virtual space." *Virtual Reality* 30 (3): 123. https://doi.org/10.1007/s10055-026-01372-9.

Uebel, Michael, and Bilal Hamamra. 2026. "Authorship after generative AI: Distributed creativity and relational responsibility." *Philosophy & Technology* 39 (3): 152. https://doi.org/10.1007/s13347-026-01170-w.

van Eck, Christel W., and Toni G. L. A. van der Meer. 2025. "Narratives of hope and concern? Examining the impact of climate scientists' communication on credibility and engagement." *Public Understanding of Science* 34 (6): 734–751. https://doi.org/10.1177/09636625251314159.

Vessel, Edward A., and Hannah Ovadia. 2025. "The role of the default mode network in aesthetic appeal." *Current Opinion in Behavioral Sciences* 66: 101608. https://doi.org/10.1016/j.cobeha.2025.101608.