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TEACHING SPECULATIVE DESIGN THROUGH SPECULATIVE FABULATION: Provotyping as a Relational Pedagogical Framework

Ensinando Design Especulativo por meio da Fabulação Especulativa: o Provotipar como estrutura pedagógica relacional

Enseñar Diseño Especulativo a través de la Fabulación Especulativa: el Provotipado como soporte pedagógico relacional

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Abstract: The growing ecological and civilizational crises of the Anthropocene have challenged Design to move beyond solution-oriented approaches toward relational, ethical, and more-than-human forms of practice. In response, this paper proposes and discusses a pedagogical framework for teaching Speculative Design through speculative fabulation. The framework articulates Pareyson's concept of formativity, Ingold's notion of correspondence, Escobar's relational ontologies, Haraway's speculative fabulation, and Speculative Design as complementary foundations for world-making practices. An intensive workshop was conducted with undergraduate design students in the Brazilian Amazon, combining nar-

rative fabulation, collaborative world-building, speculative artifact creation, and provotyping. Data were collected through narratives, visual diagrams, artifacts, process records, and reflective questionnaires, and interpreted using theories of formativity and more-than-human ethics of care. The results indicate that speculative fabulation expands students' project imagination by fostering multispecies thinking, ethical reflection, and relational forms of design practice. Furthermore, the study proposes Provotyping as an integrative pedagogical practice that bridges speculative fabulation, Design Fiction, and Speculative Design within a formative process, contributing a replicable framework for design education oriented toward ecological transition and pluriversal futures.

Keywords Speculative Design; Speculative Fabulation; Provotyping; Design Education; Relational Ontologies.

Resumo: As crescentes crises ecológica e civilizatória do Antropoceno têm desafiado o Design a superar abordagens orientadas à solução de problemas, em direção a formas de prática relacionais, éticas e mais-que-humanas. Em resposta a esse cenário, este artigo propõe e discute uma estrutura pedagógica para o ensino do Design Especulativo por meio da fabulação especulativa. Essa estrutura articula o conceito de formatividade de Pareyson, a noção de correspondência de Ingold, as ontologias relacionais de Escobar, a fabulação especulativa de Haraway e o Design Especulativo como fundamentos complementares para práticas de criação de mundos. Para isso, foi realizada uma oficina intensiva com estudantes de graduação em Design na Amazônia brasileira, combinando fabulação narrativa, construção colaborativa de mundos, criação de artefatos especulativos e provotipagem. Os dados foram produzidos por meio de narrativas, diagramas visuais, artefatos, registros do processo e questionários reflexivos, sendo interpretados à luz da teoria da formatividade e da ética do cuidado mais-que-humana. Os resultados indicam que a fabulação especulativa amplia a imaginação projetual dos estudantes ao promover o pensamento multiespécies, a reflexão ética e formas relacionais de prática em Design. Além disso, o estudo propõe a Provotipagem como uma prática pedagógica integradora que articula a fabulação especulativa, a Design Fiction e o Design Especulativo em um processo formativo, oferecendo uma estrutura metodológica passível de replicação para a educação em Design orientada à transição ecológica e a futuros pluriversais.

Palavras-chave Design Especulativo; Fabulação Especulativa; Provotipagem; Educação em Design; Ontologias Relacionais.

Author Contributions

JRSS - Conceptualization, JRSS - Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, KBSS - Formal analysis, Writing – review and editing. CSS - Writing - Review and editing

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Resumen: Las crecientes crisis ecológicas y civilizatorias del Antropoceno han desafiado al Diseño a ir más allá de los enfoques orientados a la resolución de problemas, avanzando hacia formas de práctica relacionales, éticas y más-que-humanas. En respuesta a este escenario, este artículo propone y analiza un marco pedagógico para la enseñanza del Diseño Especulativo a través de la fabulación especulativa. Dicho marco articula el concepto de formatividad de Pareyson, la noción de correspondencia de Ingold, las ontologías relacionales de Escobar, la fabulación especulativa de Haraway y el Diseño Especulativo como fundamentos complementarios para prácticas de creación de mundos. Para ello, se llevó a cabo un taller intensivo con estudiantes de grado en Diseño en la Amazonía brasileña, combinando fabulación narrativa, construcción colaborativa de mundos, creación de artefactos especulativos y provotipado. Los datos se recopilaron mediante narrativas, diagramas visuales, artefactos, registros del proceso y cuestionarios reflexivos, y fueron interpretados a la luz de las teorías de la formatividad y de la ética del cuidado más-que-humana. Los resultados indican que la fabulación especulativa amplía la imaginación proyectual de los estudiantes al fomentar el pensamiento multiespecies, la reflexión ética y formas relacionales de práctica del diseño. Además, el estudio propone el Provotipado como una práctica pedagógica integradora que articula la fabulación especulativa, la Design Fiction y el Diseño Especulativo dentro de un proceso formativo, aportando un marco metodológico replicable para la educación en Diseño orientada hacia la transición ecológica y los futuros pluriversales.

Palabras clave: Diseño Especulativo; Fabulación Especulativa; Provotipado; Educación en Diseño; Ontologías Relacionales.

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1 INTRODUCTION

We live in a historical moment in which the consequences of climate change, biodiversity loss, and the broader civilizational crisis have become impossible to ignore. These intertwined crises challenge not only economic and political systems but also the epistemological foundations through which knowledge and design practices have historically been produced. Long associated with industrial production, technological optimism, and anthropocentric paradigms, Design is increasingly called upon to rethink its role beyond the development of market-oriented solutions, engaging instead with questions of coexistence, ecological regeneration, and more-than-human futures.

Within this context, speculative approaches have gained prominence by shifting design from problem solving toward critical reflection and the imagination of alternative worlds. Rather than predicting futures, Speculative Design ([Dunne e Raby 2013]) explores possible futures through narratives and artifacts that question dominant assumptions and expose the political, ethical, and ecological implications of contemporary design practices. Likewise, Donna Haraway's (2023) notion of speculative fabulation understands storytelling not as fiction detached from reality, but as an ethical practice of world-making capable of creating new forms of coexistence among human and non-human beings. Together, these perspectives reposition imagination as a legitimate form of inquiry into the conditions through which other worlds may emerge.

Despite the growing theoretical consolidation of Speculative Design, comparatively less attention has been devoted to pedagogical approaches capable of systematically cultivating speculative imagination within design education. Much of the existing literature concentrates on speculative artifacts, fictional scenarios, and critical futures, whereas fewer studies investigate how speculative thinking can be developed through educational practices grounded in collaboration, material experimentation, and reflective making. Consequently, important questions remain regarding how speculative design can be taught as a formative process rather than merely presented as a theoretical perspective.

This article addresses this gap by proposing and analyzing a pedagogical model based on speculative fabulation developed through an intensive workshop with undergraduate Design students in the Brazilian Amazon. Rather than understanding speculation exclusively as a narrative or conceptual exercise, the workshop articulates four complementary practices (speculative fabulation, collaborative world-building, speculative design, and prototyping) through which students collectively construct multispecies narratives and materialize them into critical artifacts. The educational process is conceived not simply as the production of speculative objects but as the cultivation of ethical, aesthetic, and political sensibilities capable of expanding students' projectual imagination in the face of the Anthropocene.

The theoretical framework combines complementary perspectives that understand creation as a fundamentally relational and processual phenomenon. Luigi Pareyson's concept of formativity (1993) conceives creation as a process in which the form emerges through making rather than preceding it. John Dewey's notion of experience situates meaning within continuous interaction between subjects and their environments (2010), while Tim Ingold's correspondence understands design as an attentive response to the unfolding lines of mate-

rials, places, and living relations (2011). These ontological perspectives are articulated with Arturo Escobar's relational understanding of design (2017, 2018), Donna Haraway's speculative fabulation, and contemporary discussions on more-than-human care proposed by Joan Tronto (1993, 2013) and María Puig de la Bellacasa (2017), together providing the conceptual basis for understanding speculative design as a situated, ethical, and regenerative practice.

This paper advances provotyping as an integrative pedagogical practice that bridges speculative fabulation, design fiction, and speculative design through the ontological principles of formativity and correspondence. In this perspective, provotypes are understood not merely as provocative artifacts but as material traces of formative processes that simultaneously embody narrative imagination, critical reflection, and ethical engagement with more-than-human worlds. By positioning provotyping as a pedagogical device rather than simply a design outcome, the article contributes to current debates on speculative design education and proposes a framework for cultivating relational, multispecies, and regenerative design practices..

2 FORMATIVITY AND CORRESPONDENCE AS ONTOLOGIES OF CREATION

In the face of the Anthropocene and the ongoing civilizational crisis, it has become necessary to rethink how design acts in and with the world. The rationalist tradition, which underpins much of modern thought and design practice, has been criticized for reinforcing monocultures of knowledge and hegemonic modes of existence (Andrade & Ibarra, 2021; Escobar, 2017). Having been historically shaped by this logic, design has tended to operate according to supposedly universal, formal, and linear principles, limiting its capacity to engage with plural, more-than-human, and relational contexts. In this sense:

The rationalist tradition was and is responsible, to a large extent, for contracting and ignoring the diversity that exists in the world, promoting the domination of a part over the whole. Despite its importance for the functioning of various areas of knowledge, rationality has caused harmful impacts in various professional environments (Andrade and Ibarra, 2021, p. 160)

Overcoming this paradigm requires epistemological and methodological shifts that create space for situated, collaborative, and pluriversal practices (Fonseca, Irving, et al., 2022). Authors such as Arturo Escobar (2017) advocate an ontological perspective on design, oriented not toward the production of solutions but toward processes of coexistence with the commons, territories, and other forms of life. This perspective resonates with what anthropologist Tim Ingold describes as *design by correspondence*: a practice grounded in attentive engagement with the lines of the world and in a sensitive responsiveness to materials, contexts, and relationships, as well as with the ontological understanding of the creative act proposed by the Italian philosopher Luigi Pareyson.

2.1 Formativity in Pareyson

The concept of formativity, developed by the Italian philosopher Luigi Pareyson (1993), proposes a deep understanding of artistic creation as a dynamic and inventive process. The central idea that underlies his theory is that artistic creation is not restricted to mechanical execution or the application of pre-defined techniques. On the contrary, creating implies a continuous and open discovery, a living relationship between the creator, the matter, and the emerging form. In this context, the human being not only applies existing methods, but constantly invents and reinvents the method itself while creating. For Pareyson, the ontological core of artistic creation resides in the concept of "formative form", which refers to the capacity of the creative act to simultaneously generate and allow itself to be shaped by the ongoing process. To give form, to form, therefore, means:

"doing", but a doing such that, in doing, at the same time invents the way of doing. It is a matter of doing, without the way of doing being determined and imposed beforehand, so that it would be enough to apply it to do well: it is necessary to find it by doing, and only by doing can one discover it (Pareyson, 1993, p. 59)

There is no passivity or inertia in this act; on the contrary, it is a persevering action, marked by the artist's singularity and personality. The artistic work emerges, then, as a "formed form", the result of a singular and unrepeatable process in which the method and the work mutually constitute each other. The form, therefore, is not pre-existing, but revealed and realized throughout the creative act. This perspective radically broadens the understanding of art, extending it to all human activities that involve invention and meaning. Pareyson proposes that every genuinely human action has an intrinsic artistic and aesthetic character. Every everyday gesture, every seemingly trivial decision, carries a formative dimension, reflecting the human capacity to generate meaning through action. Thus, art ceases to be a privileged and isolated sphere, becoming a general ontological paradigm of existence (Uribe, 2023).

Pareyson also emphasizes that spirituality and materiality are inseparable in the process of creation. The artistic work is not just a material product or an isolated spiritual expression, but rather the simultaneous and inseparable realization of these two dimensions. Artistic success results from this continuous search for balance between intention, matter and method. Within the perspective of formativity, what is formed is not just an object, but a meaning, something that emerges throughout the process and that transforms both the creator and the public, in a collective way. The artist (or designer) seeks, with each gesture, the best way to embody his intention. In this sense, the work reveals itself as a field of possibilities, and creation as an ontological and spiritual experience, marked by choices, discoveries and the living relationship between intention and matter, between idea and execution.

Despite the different disciplinary backgrounds, Luigi Pareyson's theory of formativity and Tim Ingold's correspondence share essential ontological foundations that allow them to be articulated into an integrated theoretical foundation. Both authors recognize the creative process as a continuous, dynamic, and reciprocal event between subject, method, and world.

2.2 Correspondence

Tim Ingold (apud Ibarra, 2022) proposes the concept of correspondence as the fundamental way in which beings inhabit the world, characterizing it by a continuous and reciprocal process between subject and environment. Ingold suggests three principles: habit, agencing, and attentionality, aiming to describe a more fluid and integrated experience with the environment. Inspired by the work of John Dewey, Ingold presents experience as something active and constantly renewed in the concept of habit. Habit, thus understood, is not limited to mechanical repetition, but is related to the way human beings simultaneously produce and are produced by their continuous practices. In this sense, experience is not simply something that happens to the individual, but an active way of being and engaging with the world. Ingold exemplifies this with the act of walking, in which the individual not only imposes his will in action, but also allows himself to be shaped by the rhythms, routes, and particularities he encounters along the way (Andrade and Ibarra, 2021).

The concept of agencing, on the other hand, emphasizes agency as something dynamic and emergent, continuously produced in the act of action itself. There is no fixed agent, but a continuous process of formation of the subject in the course of their practices. This idea is close to the notion of formativity, where subject and action are inseparable, reflecting a deep integration between the individual and the environment. Finally, Ingold addresses the principle of attentionality, inverting the traditional relationship between intention and attention. Traditionally, attention is seen as subordinate to pre-established intention, as if the subject were constantly checking whether his actions correspond to a previously formulated plan. Ingold proposes, on the contrary, an understanding of attention as continuous responsiveness to the environment, an active and uninterrupted participation in the lived process. Walking becomes an act where the body and mind are equally involved, where attention is not a periodic interruption, but a continuous attunement with the moving environment. This approach suggests an ecological mind, integrated with the environment, where thinking is acting in constant interaction with the world (Ibarra, 2022).

2.3 The Pluriverse turn

The critique of modern rationalism paves the way for the proposition of other ways of thinking and practicing design. Among these, what Arturo Escobar (2017,2018) calls ontological design stands out, an approach that shifts the focus from design as a mere resolution of technical problems to design as a way of configuring possible worlds, anchored in the ontologies of the subjects and collectives that practice it. These practices and knowledge form what the author calls the pluriverse: a world where many worlds fit, inspired by the zapatist conception and developed by authors such as De la Cadena, Blaser, and Kothari apud Fonseca et al. 2022. The pluriverse is not a homogeneous utopia or a new universal model, but a constellation of forms of life and being that coexist in tension with Western modernity. In design, thinking pluriversally means recognizing and sustaining the diversity of project epistemologies and ecologies that emerge from different territories, bodies,

and cosmologies. Fonseca et al. (2022), by analyzing community experiences such as ecovillages, demonstrate how these forms of social and productive organization embody, in practice, viable alternatives to the paradigm of linear and extractive development. In the Latin American context, these experiences are directly linked to the principle of *Buen Vivir* (Gudynas, 2011), problematized in the pluriverse literature (Kothari, Salleh, et al., 2021) as an intercultural reading that translates the expressions *sumak kawsay* quechua and *suma qamaña* aymara, originating from the worldview of the native peoples of the Andes region and the Amazon, which does not separate society from nature, nor production from care.

This conception of design shifts the idea of innovation from the technical field to the ontological field: to innovate is not only to create something new, but to create according to other ways of being, knowing and doing. Instead of designing "for" the users, it is projected "with" the worlds, in their multiple voices, scales and temporalities. In this sense, the construction of narratives and artifacts cannot be understood only from the application of methods, but as an expression of relationships that are built between students, imagined beings, materials and ideas. Thus, design practices that involve listening, attention, and coimplication can be better understood from the concepts of formativity, (Pareyson, 1993), correspondence (Ingold, 2013, 2013), fabulation (Haraway, 2023), and speculation (Dunne and Raby, 2013).

Together, these perspectives converge toward a relational understanding of design that shifts attention from problem-solving to world-making.

2.4 Speculative Fabulation

The methodological proposal of the workshops analyzed in this article is anchored in the understanding that imagining futures, especially in contexts of collapse, is also a way of acting in the present. This approach is directly related to the notion of speculative fabulation, as formulated by Donna Haraway (2023), who proposes to narrate with other humans and non-humans as an ethical, aesthetic, and political gesture. For Haraway, to fabulate is to create conditions for cohabitation in the world, even (and above all) when that world is wounded, unstable, or threatened. It is in this sense that the author defends fabulation as a way of "doing with", creating alliances and narratives capable of recomposing broken bonds and imagining other forms of coexistence. In the field of design, this perspective converges with what Anthony Dunne and Fiona Raby (2013) propose as speculative design: a practice that seeks to shift design from its traditional function (solving problems, meeting market demands) to a critical and provocative function. Speculative design does not anticipate products, but creates debates and tensions possible futures, often confronting conventional expectations about technology, society, and the environment. In their words, it is about designing not "for" but "with" the future, understanding design as a tool to question the present and broaden the horizon of what we can imagine. The connection between Haraway's speculative fabulation and Speculative Design is, therefore, in a deep and very productive way. Both understand that imagining is a political and ethical act, capable of producing significant dislocations in the ways we inhabit the world. Haraway's fabulation operates through narratives that intertwine human and non-human beings, bodies, technologies, and ecologies in networks; Speculative Design materializes narra-

tives in artifacts, called provotypes, which provide experiences that function as devices for questioning and reflection. As Casnati, Ianniello and Romani explain to us:

A provotype (of "provocation" and "prototype") is a tangible or intangible design artifact whose main purpose is to foster, encourage, and provoke discussion and reflection among different users and stakeholders. These provocative artifacts often concern social and environmental sustainability, innovations, and technologies, leaving gaps designed to be filled with the public's perspective (Casnati, Ianniello and Romani, 2024).

These speculative objects, which are often strange, displaced, out of place, do not exist to solve, but to make us think about the present, about the future, about the limits of what we consider possible or acceptable. They act as catalysts for debate, as ways of fable with matter, designing alternative scenarios that force us to confront our assumptions, fears, and desires. In this sense, design is no longer just a means of producing objects and becomes a practice of producing possible, desirable, or even disturbing worlds, but which expand the field of the thinkable. On the other hand, by incorporating principles into Haraway's speculative narrative, Speculative Design acquires another layer of ethical and ontological depth. The author herself reports:

I care about the practices of art-design-activism that bring together humans and animals of all sorts in shared, often controversial and disputed public spaces. [...] The Association of Pigeon fanciers of Beauvois-en-Cambrésis, asked Crasset, an artist and industrial designer, to build a prototype of a dovecote that would be able to combine beauty, functionality (for people and birds) and a pedagogical attraction, in order to attract future practitioners to learn these demanding skills (Haraway, 2023, p. 238)

Thus, to design, in this context, would always be to design with other beings, with environments, with entangled histories and futures. Speculative Design as a relational, situated and critical practice, would be aligned with contemporary urgencies and the need to imagine futures that escape this logic of linear progress and an innovation that is depoliticized. In the workshops studied here, the articulation between fabulation and speculative design materialized through multispecies narratives and the construction of provotypes.

2.5 Provotyping as a correspondence between worlds

Having made the distinction between speculative practices related to Design, in this study, we propose *provotyping* as a bridging practice that integrates precisely fabulation, design fiction, and speculative design. The term "provotype" is an amalgamation of "provocation" and "prototype", and names a specific type of artifact: an artifact that is simultaneously a prototype (a material instantiation of a design idea), a provocation (a critical artifact that interrupts and questions), and a trace (a material-semiotic node that makes visible the formative process through which it emerged) (Haraway, 2016; Casnatti Ianello, 2024).

Provotyping integrates fabulation by anchoring the artifact in a narrative world. And these narratives provide the ontological context for the artifacts, and specify what kind of world the artifact inhabits, what relationships it mediates, what futures it makes possible. The narrative is not just a "backstory" for the artifact,

it is constitutive of its meaning and function, attributing its ontological connection to that reality.

In this sense, Provotyping integrates design fiction by materializing the narrative world into a tangible artifact. But this artifact is not just going to be a description or illustration of that narrative world, but intends to be a diegetic prototype that is an artifact of the narrative world that has been brought into our world. This materialization is crucial because it makes the speculative world tangible, debatable, and criticizable. This materialization transforms the speculative world from an abstract possibility into a much more concrete provocation, carrying with it the pedagogical benefits of the design act in the field of design.

Provotyping also integrates speculative design by positioning the artifact as a critical provocation, as an issue to be debated, not a solution to be implemented, can disrupts normal functioning and opens up a space for reflection, debate, and critique, all at once in multiple interpretive layers from a single emergent form. Provotyping also adds something distinctive of this act by highlighting the formative process by which the artifact emerged. In this article was much more than a finished product, but rather a trace of the trial-and-error process of form-finding, a material record of the interpretive engagements, failures, adjustments, and discoveries that constituted the formative process. This emphasis on process distinguishes provotyping from design fiction (which often presents artifacts as if they were finished products of a future world) and speculative design (which often emphasizes the critical function of the artifact above the production process).

In the practice of Provotyping, just as important as the what of the artifact is the how to do it, since the formative process is itself a site of learning, critique, and world-making. And in the context of this study, provotyping works as a pedagogical practice that teaches students to integrate narrative invention (fabulation), material speculation (design fiction) and critical provocation (speculative design) within a formative process (formativity). Learning to invent narrative worlds, to materialize them in tangible artifacts, to position them as critical provocations and to reflect on the formative process through which artifacts emerged is the integration we propose, not merely additive (fabulation + design fiction + speculative design); but synthetic, producing a distinct practice that is more than the sum of its parts.

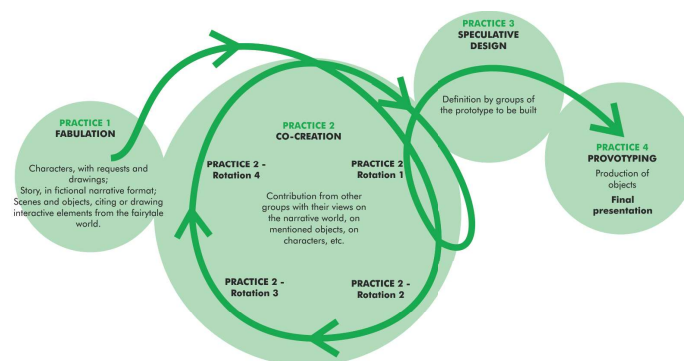
3 METHODOLOGICAL PROCEDURES

3.1 Context, Researchers and Participants

The workshop was conducted as an intensive one-day pedagogical intervention within an undergraduate design program at a university in the Brazilian Amazon. The workshop was designed as a voluntary activity, and all participants provided informed consent for their participation and for the use of their work in research publications. The data was anonymized for publication in order to protect the privacy of the participants.

Participants: 27 undergraduate design students participated in the workshop. The students were enrolled in various stages of the design program (second through fourth year) and had diverse backgrounds in graphic design, product design, and interaction design. Participation was voluntary, and the students were informed that

Figure 1 – Visual scheme of the methodological path of the workshop



Source: Prepared by the authors

the workshop was part of a research project exploring speculative design pedagogy and multispecies futures.

Workshop structure: The workshop was structured as a one-day intensive (8 hours), divided into four sequential practices: (a) narrative fabulation, (b) collective construction, (c) speculative design, and (d) provotyping. Each practice built on the previous one, creating a cumulative formative process. The workshop was conducted by the research team, which included the principal investigator and two research assistants with a background in Design.

Ethical considerations: All participants gave written informed consent and were informed of the right to withdraw at any time. Participants were also assured that their work would be anonymized in any publication and that their participation (or non-participation) would not affect their academic performance. The workshop was designed to be inclusive and accessible, with accommodations provided for students with disabilities and it was approved by the university's research ethics committee. As well as the data was anonymized and the participants' names were replaced with pseudonyms when necessary.

Researchers: two teaching professors with more than 8 years of activity in Design teaching, focusing on the disciplines of Interdisciplinary Design, with a background in Design, a Master's Degree in Design and research interest linked to the sociocultural aspects of design. The workshop unfolded through four sequential practices (Figure 2), each with specific objectives and methods.

3.2 Practice 1 - Narrative Fabulation

Objective: to generate multispecies narratives that decentralize the human as the center of agency and highlight perspectives, needs, and temporalities that are more than human. **Method:** students received a set of visual cards that represented various non-human entities (insects, soil organisms, atmospheric phenomena, plants, fungi) and various catastrophic scenarios (drought, flood, soil collapse, air pollution, species extinction). Working in small groups (3-4 students), they were asked to select a non-human entity and a catastrophic scenario and create a narrative that imagined the world from the perspective of that entity in that scenario. The narratives were to be speculative (imagining alternative futures), fabulous (inventing characters, relationships,

Figure 2 – Photographic record of Practice 1: Speculative fabulation in small groups



Source: Prepared by the authors

and worlds), and consequential (addressing ethical and political issues).

Duration: 2 hours.

Result: Each group produced a written narrative (500-1000 words) and a visual storyboard (3-5 frames) that depicted key moments in the narrative.

3.3 Practice 2 - Co-Creation

Objective: to collaboratively develop narrative worlds, adding layers of complexity, contradiction and incommensurability through collective discussion and negotiation.

Method: Groups exchanged their narratives and other groups were invited to contribute additional layers, alternative perspectives, conflicting temporalities, suppressed voices, material constraints, ethical dilemmas. Facilitators encouraged students to complicate rather than resolve narratives and to add layers that created tension, ambiguity, and interpretive openness rather than seeking narrative coherence or closure. Duration: 1.5 hours.

Results: each group revised their narrative and storyboard to incorporate the collective contributions, producing a more complex, polyvocal and dense narrative world.

3.4 Practice 3 - Speculative Design

Objective: to materialize the narrative worlds in tangible artifacts that function as critical provocations and vestiges of that world, not as technical solutions.

Method: Groups were asked to identify a key moment or relationship in their narrative world and to design an artifact that would materialize that moment or relationship. The artifact was to be a critical artifact that incorporates poetic, ontological, and ethical issues from that world. Students were given a variety of

materials (cardboard, fabric, wire, sensors, LEDs, found objects) and were encouraged to use low-fidelity fabrication techniques (sketching, collage, assemblage) to create their tangible prototypes. Duration: 3 hours.

Results: Each group produced a physical prototype and design justification (200-300 words) that explained the function of the artifact, its relationship to the narrative world, and the ethical and political issues it embodies.

3.5 Practice 4 - Provotyping

Objective: to reflect on the formative process, interpret the provotypes as vestiges of possible worlds and articulate the ethical and political risks of the artifacts.

Method: the groups presented their provotypes to the full workshop, and the facilitators conducted a reflective discussion using Tironi and Corsín Jiménez's (2014) concept of prototypes as spaces for research and creation that are simultaneously singular (a specific artifact) and multiple (a trace of a formative process, a knot in a network of relationships). The students were invited to reflect on: what did the formative process reveal? What ethical and political issues does the artifact represent? What worlds does the artifact make possible or exclude? Duration: 1.5 hours. Results: Each group completed a reflective questionnaire (see 3.6.3 section) that documented their interpretations of the formative process and the provotyping.

Figure 3 – Guidance cards for provotyping, Practice 4, next to the printed cards



Source: Prepared by the authors.

3.6 Data Collection Instruments

The workshop used three main data collection instruments, each with a specific theoretical and practical function.

3.6.1 Cards

The cards consisted of two sets of cards: Non-human entities - Insects, soil organisms, atmospheric phenomena, plants, fungi; and, Catastrophic scenarios - Drought, flood, soil collapse, air pollution, species extinction. The cards functioned as boundary objects, artifacts that facilitate communication between different

Figure 4 – A frame of data collection cards, along with the printed cards



Source: Prepared by the authors.

knowledges and perspectives without requiring consensus. They were designed to be evocative rather than prescriptive, inviting multiple interpretations and allowing students to construct their own narratives. Each group selected a non-human entity and a catastrophic scenario, creating narratives that imagined the world from that entity's perspective. The cards served as starting points for speculative fabulation and provotyping (Figure 6), inviting students to decenter the human perspective and imagine alternative worlds.

Figure 5 – Cards of techniques inspired by Speculative Design (Practice 3), next to the printed cards



Source: Prepared by the authors.

Figure 6 – Excerpts from the initial questionnaire

WHAT DO YOU HOPE TO GET FROM THE WORKSHOP? <i>Sinceramente, não tenho uma resposta exata do que espero, somente adquirir conhecimento e experiência pelo que irá acontecer.</i>	ENGLISH TRANSLATION <i>Honestly, I don't have a clear answer about what I expect, I just want to gain knowledge and experience from what will happen.</i>
HOW WOULD YOU DEFINE YOUR RELATIONSHIP WITH OTHER FORMS OF LIFE (PLANTS, ANIMALS, ENVIRONMENTS, TECHNOLOGIES, ETC.)? <i>Em um contexto amplo considero minha relação com aspectos da natureza muito especial, considero essencial para manter o equilíbrio mental e social em harmonia, até prefiro estar em locais como estes e ambientes com pessoas. Em relação às tecnologias, não sou muito ligado, é uso de forma básica, apenas para ter alguma informação e ter interações sociais com outros indivíduos.</i>	ENGLISH TRANSLATION <i>In a broad context, I consider my relationship with aspects of nature to be very special, essential for maintaining mental and social balance in harmony. I even prefer being in places like these and in environments with people. Regarding technologies, I'm not very attached to them; I use them in a basic way, just to get some information and interact socially with other people.</i>
<i>Uma relação de contato para armazenamento de memórias, através dos meus sentidos, uma relação de sentir e apreciar aquilo que outras formas de vida podem me oferecer, tratando isso de forma consciente, respeitosa e saudável, que não sempre é o caso.</i>	ENGLISH TRANSLATION <i>A relationship of contact for storing memories, through my senses; a relationship of feeling and appreciating what other forms of life can offer me, dealing with this in a conscious, respectful, and healthy way — which is not always the case.</i>
<i>Tenho cultivar uma relação de respeito e cuidado com todas as formas de vida. Gosto de observar a natureza, aprender com ela.</i>	ENGLISH TRANSLATION <i>I try to cultivate a relationship of respect and care with all forms of life. I like to observe nature, learn from it.</i>

Source: Produced by the authors.

3.6.2 Process Diagrams

The process diagrams documented the formative journey of each group: the sequence of decisions, moments of trial and error, interpretive engagements, and material constraints. They functioned as reflective tools that made the formative process visible and interpretable, allowing students and researchers to analyze not only the final products, but the processes by which those products emerged. The diagrams captured the iterative and emergent nature of design, documenting how forms came about through making, how rules were invented and followed, and how materials and contexts influenced the process.

3.6.3 Reflective Questionnaires

The reflective questionnaires were applied before (Figure 7) and at the end of the workshop (Figure 8) and invited the students to reflect on: 1. The formative process: How did the form emerge? What decisions were made and why? 2. The ethical and political risks of their protractors: Who is included and excluded? Which voices are amplified and silenced? 3. The Role of Care in Your Design Practice: How Was Care Incorporated into the Process and Product?. The questionnaires included both closed-ended questions and open-ended short-answer questions and essay, allowing quantitative and qualitative analysis.

In other hand, the data analysis was guided by two main theoretical lenses, demonstrate below.

Figure 7 – Excerpts from the final questionnaire

WHAT IMPACTED YOU THE MOST DURING THE EXPERIENCE?	
Foi perceber como o design pode ser uma ponte entre diferentes formas de vida.	ENGLISH TRANSLATION I realized how design can be a bridge between different forms of life.
Pensar sobre contextos, de outras sociedades em que um acontecimento poderia mudar completamente uma vida cotidiana.	ENGLISH TRANSLATION Thinking about contexts, about other forms of sociability in which an event could completely change everyday life.
Entender que as narrativas tem um poder grande na visão do futuro. Além de compreender que o Design especulativo está relacionado com o que se constrói como contexto, a fim de surgir oportunidades de projetos.	ENGLISH TRANSLATION Understanding that narratives have great power in shaping visions of the future. In addition to understanding that speculative design is related to what is built as context, in order to create opportunities for projects.

Source: Produced by the authors.

3.6.4 Joan Tronto's Political Care Framework

Tronto's (1993, 2013) five-phase care framework (caring about, taking care of, care-giving, care-receiving, caring with) was used to analyze how provotypes incorporated caring relationships. Specifically, we asked:

- (a) How do provotyping cultivate attention (care) to non-human entities?
- (b) How do they distribute responsibility (take care) between humans and non humans?
- (c) How do you imagine the concrete work of care (providing care)?
- (d) How do they recognize the agency and response (receiving care) of non-human entities?
- (e) How do they imagine solidarity and collective practices (caring with) that cross species boundaries?

3.6.5 María Puig de la Bellacasa's Ethics of More-than-Human Care

Puig de la Bellacasa's (2017) ethics of more-than-human care was used to analyze how provotypes extended care beyond humanistic boundaries, reaching multispecies and speculative domains. We ask:

- (a) How provotyping can imagine material care practices that involve humans and non-humans?
- (b) How do you recognize attachments and obligations that emerge in interspecies entanglements?
- (c) How do they embody a speculative character, imagining alternative futures of care?

3.6.6 *Procedures to data analysis*

Has followed three sequential phases.

Phase 1: Descriptive Analysis

The first phase involved descriptive analysis of the narratives, storyboards, provotypes, process diagrams, and reflective questionnaires. The goal was to identify key themes, patterns, and variations, documenting what the students produced and how they described their work. This phase was primarily descriptive, establishing the empirical basis for subsequent phases.

Phase 2: Interpretative Analysis

The second phase involved interpretive analysis, applying the theoretical lenses of formativity, speculative fabulation, thick mapping, and care ethics. Guiding questions included: How did the training process unfold? What rules did the students invent and follow? How did narratives function as world-creating practices? How did the provotypes incorporate care relationships? How did the provotypes operationalize thick mapping? This phase was interpretive, using the theoretical frameworks to make sense of the data.

Phase 3: Comparative Analysis

The third phase involved in-depth comparative analysis of two selected case studies: TerraCinzenta and Entomoempatia. These cases were selected because they represented different modes of mapping, different care practices, and different ways of materializing multispecies futures, with content that covered the entire theoretical framework. The comparative analysis examined how different groups approached the same challenge in different ways, identifying patterns and variations, allowing the selection to be made. The analytical process was conducted collaboratively by the research team, with regular meetings to discuss the data and refine interpretations, including after revisions and correction and adjustment recommendations. The process was iterative, alternating between data and theoretical frameworks, and included reanalysis of the data after a draft of the communication, in light of new input received.

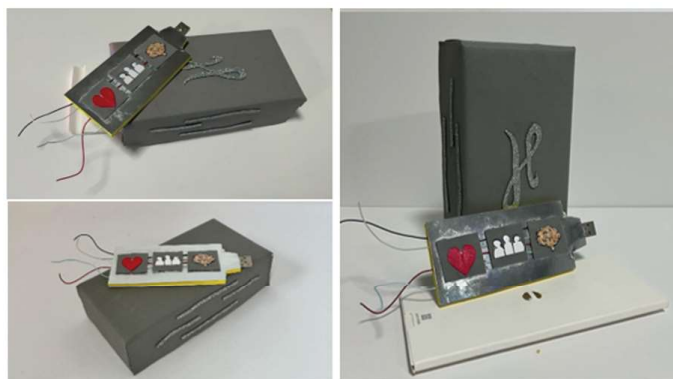
4 RESULTS

4.1 Case Study 1: TerraCinzenta - Segunda Caixa

a) Narrative world

The narrative of TerraCinzenta imagines a post-catastrophe world where massive forest fires have destroyed most of the terrestrial ecosystems, abandoning vast fields of ash. This world is already presented as a ruin in which ecological collapse is a consolidated reality. In the midst of the widespread devastation of species, fragmentation of community ties, and the trivialization of interspecies suffering, an ancestral artifact of the future emerges: a wearable device, archaic and technically almost useless, but vital on the sensitive plane. The group conceived the object as a relic, a poetic remnant of a lost time, the Segunda Caixa (Figure

Figure 8 – provotype of the Ashesland narrative



Source: produced by the authors.

9), also called the "propeller of empathy". This box bears the inscription "instructions to become a species again". It does not store digital data, but pulsates and reacts as a vibratory file, a wearable and emotional device that activates only in the simultaneous presence of multiple forms of life. It does not project or capture. It merely translates. Through skin, electricity, and touch, it resonates with unspoken emotions; and instead of transmitting information, it serves as a receptacle for shared listening. Its rudimentary circuits are activated by the co-presence of beings from different origins like plants and animals. By bringing these elements together, it produces what Haraway (2023) calls sympoetic composition: a "making with" attentive to the intertwining of worlds. The provotype does not solve the problem of human empathy; rather, it re-invokes it, re-delimits it, and unlike contemporary wearables that optimize bodily performance, it is vulnerability that becomes a shared activation.

b) Provotype

Segunda Caixa

A Segunda Caixa is a wearable device designed to mediate empathy between humans and other beings. It consists of a small chest worn box, equipped with sensors that detect pheromones and insect vibrations, and a haptic feedback system that translates these signals into tactile sensations on the wearer's skin. The device is designed to make the fragile lives remaining in this world highly perceptible to humans, creating a somatic experience of presence and empathetic activity in the inhospitable post catastrophe environment. The name "Second Box" is significant as it references the "black box" of interspecies cognition and communication, which remains opaque to human comprehension. The Segunda Caixa is a mediating device that translates and amplifies life signals into human-perceivable sensations, recognizing and redefining the boundaries of human empathy while attempting to create forms of somatic connection.

c) Analysis through the ethics of care

This analysis superimposes the ethical layer on the provotype and its narrative.

- Carign about: Segunda Caixa cultivates attention to the presence and activity of other life forms, making this vital energy visible (or rather, highly tangible). By translating pheromones and vibrations into haptic feedback, the device makes multi-species empathic communication a necessity for humans in the face of

this collapsed world.

- Taking care of: distributing responsibility for the well-being of beings by making humans aware of how their activities (foot traffic, construction) disrupt other species. Haptic feedback creates a somatic reminder of the human impact on plant or animal communities.
- Care-giving: the device does not provide direct care to any species, but allows humans to adjust their behavior in response to the needs of different life forms.
- Care-receiving: in recognizes that other life forms are not passive recipients of human care, but active agents with their own needs, rhythms, and communication systems.
- Caring with: the device imagines a form of solidarity between all forms of life, where both species are recognized as coagents in the project of soil regeneration and ecosystem recovery, position humans as partners in a shared project, highlighting and repositioning empathy.

The provotype also incorporates the concept of Puig de la Bellacasa (2015). It is a device that slows down human activity, creating moments of pause and attention when signs of life are detected, allowing humans to exercise their responsibility consciously, cultivating a temporality of attention and response.

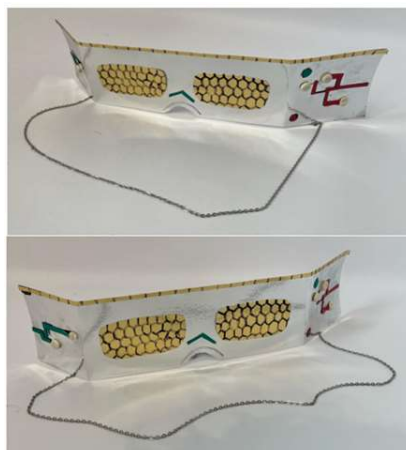
4.2 Case Study 2: Entomoempatia — Entóculos

a) Narrative world

The Entomoempatia narrative imagines a near future where rapid urbanization and agricultural intensification have led to a catastrophic decline of insects. In this world, a grassroots movement of "entomoempaths" has emerged, people who advocate for the rights and well-being of insects. Entomoempaths argue that the main barrier to insect conservation is the human inability to perceive or empathize with the insect experience. They develop and hack various technologies and practices designed for insect control, including the Ent Glasses. The narrative is told from the perspective of a young entomopath who is learning how to use the Ent Glasses. The narrative explores the challenges and disorientations of trying to perceive the world from an insect's perspective: such as the totally distinct sensory stimuli, the fragmentation of vision, the loss of familiar spatial and temporal orientations. Here, the narrative dialogues directly with the critique formulated by Santos (2017), particularly his analysis of technoscientific acceleration as a strategy for selecting and controlling bodies. As Santos argues, biotechnology and robotics open a new era of eugenics, sometimes declared, sometimes disguised, that eliminates the "useless." In contrast, the story of Entomoempathy proposes a sensory counter-tactic: to reintegrate the supposedly useless (insects) as epistemic and ethical agents. However, the narrative does not romanticize the perception of insects, but presents it as radically alien, as a way of being-in-the-world that resists human understanding and empathy.

b) Provotype

Figure 9 – Ent glasses, provotype of the Entomoempathy narrative



Source: produced by the authors.

Entóculos

The EntGlasses are a device of perceptual confusion, functioning as a rite of sensory displacement. Initially created as a tool of domination over remnants of insects in captivity, controlling colonies for pollination, as if they were "piloting" bees, the Ent Glasses (Figure 10) inaugurate a process of reversal through the narrative and the use of the object: the control is undone, the device is hacked by the entomoempaths, and the human body becomes a medium for reverberations of insect sensations. Pain, panic, tactile vibrations, and biochemical signals invade human consciousness, generating vulnerability. The glasses consist of a headset with multiple small lenses arranged in a compound eye configuration, each lens capturing a slightly different angle of view. Images from these lenses are processed and displayed on a screen in front of the wearer's eyes, creating a fragmented, mosaic-like visual field. The device also includes filters that simulate insects' color perception (including ultraviolet light) and temporal perception (insects perceive time at a faster speed than humans, so the device speeds up visual input). The Ent glasses are explicitly designed as a disorientation device, not as an empathy device. The students who created the glasses argued that true insect empathy is impossible, since insect perception is so radically different from human perception and that any attempt to simulate it will necessarily fail. The glasses, then, were not designed to allow empathy, but to make visible the impossibility of empathy and precisely with that, create a somatic experience of disorientation, confusion, and alienation that makes humans aware of the limits of their perceptual and cognitive capacities.

c) Analysis through the ethics of care

This analysis superimposes the ethical layer on the provotype and its narrative.

- Caring about: Glasses cultivate attention to insect perception, but this attention is mediated by disorientation and failure. Glasses show the difficulty of caring for insects, as the cognitive and perceptual barriers that prevent humans from understanding insects' needs and experiences are evident.
- Taking care of: do not directly distribute responsibility for the well-being of insects. By demonstrating the impossibility of fully understanding the perception of insects, glasses raise questions about what it

means to take responsibility for beings whose experience we cannot access.

- Care-giving: glasses do not allow for care in any direct sense; they do not provide tools or techniques for caring for insects. But, create a space for reflection on the ethics of care in conditions of radical otherness, for what does it mean to care for beings whose needs and experiences are fundamentally inaccessible to us?
- Care-receiving: the glasses recognize that insects are not only recipients of human care, but beings with their own modes of perception, cognition, and agency that exceed human comprehension. The disorientation created by the glasses is a form of epistemic humility and a recognition that human knowledge and empathy have material limits, and therefore we must consolidate our action in respecting these limits.
- Caring with: The glasses do not imagine a direct solidarity between humans and insects. It suggest that caring for insects requires accepting the limits of human understanding and developing forms of caring that do not rely on empathy or understanding.

The Ent Glasses also dialogue with Puig de la Bellacasa's (2017) concept of "speculative ethics"(pg.7). The glasses are explicitly speculative and they imagine a technology that does not yet exist and a form of perception that humans cannot fully achieve. But this speculation is not utopian, because from a pedagogical point of view, it is fundamental. The glasses speculate on the limits of human perception and empathy, on the impossibility of fully accessing the experience of insects, and on the ethical challenges of caring for radically 'alien' beings. This critical speculation opens space for reflection on what forms of care are possible in conditions of radical otherness.

5 DISCUSSION

5.1 Speculative Design and Fabulation in Pedagogical framework

The formative processes documented in the process diagrams reveal that students discovered the forms of their protractors through doing, in processes of trial and error, research, experimentation, and reflection. This exemplifies the formativity of Pareyson (1993). On the other hand, speculative fabulation functioned as a practice of "sticking with the problem"(Haraway, 2016) in which students ran away from easy solutions or utopian escapisms, and inhabited the complexity and contradiction of multispecies futures when they imagined alternative worlds that took the relationships between humans and nonhumans seriously, recognizing both interdependence and otherness. In this sense, speculative fabulation went far beyond an imaginative activity, and acted as a material practice, by anchoring students' creativity in the artifacts that materialized their narratives, making them tangible and debatable. Finally, this also aligns with Bleecker's (2009) perspective on design fiction as a practice of making futures rather than just imagining them.

Analysis of profilings across Tronto's five phases of care reveals that students incorporated care practices into their designs in complex and nuanced ways. They imagined devices that provide care to non-human entities, but they also reflected on the political and ethical dimensions of that care: who cares, who is cared for, how care is distributed, and how care can be consistent with democratic commitments to justice and equality. It clearly aligns with Tronto's (1993, 2013) approach that care is a political practice, not just an individual virtue. In Provotypes, we can imagine forms of care that redistribute responsibility between humans and nonhumans, that recognize the agency of non-human entities, and that seek multispecies solidarity. At the same time, provotypes recognize the limits of human care. Ent Glasses, in particular, emphasize the impossibility of full understanding and the need for epistemic humility. This will align with Puig de la Bellacasa's (2017) ethics of more-than-human care, which emphasizes the importance of recognizing the otherness and agency of non human entities, without reducing them to humanistic categories.

On the other hand, the provotypes developed by the students, when understood as speculative devices that make problems visible and debatable, are aligned with the critique of technical solutionism (Santos, 2017) and with the perspective of prototyping as inventive creation of problems ([Jiménez 2014], 2014). And in this sense, the pedagogical practice, the imaginative and speculative exercise, thus gain a differentiated contour, allowing that in a new world this content is the norm and not the exception. Finally, the study addresses issues of decolonization and justice by decentering the human perspective and recognizing the agency of non-human entities. It suggests that co-design practices can be decolonized by including voices and perspectives that have been historically marginalized or excluded, and also non-human entities.

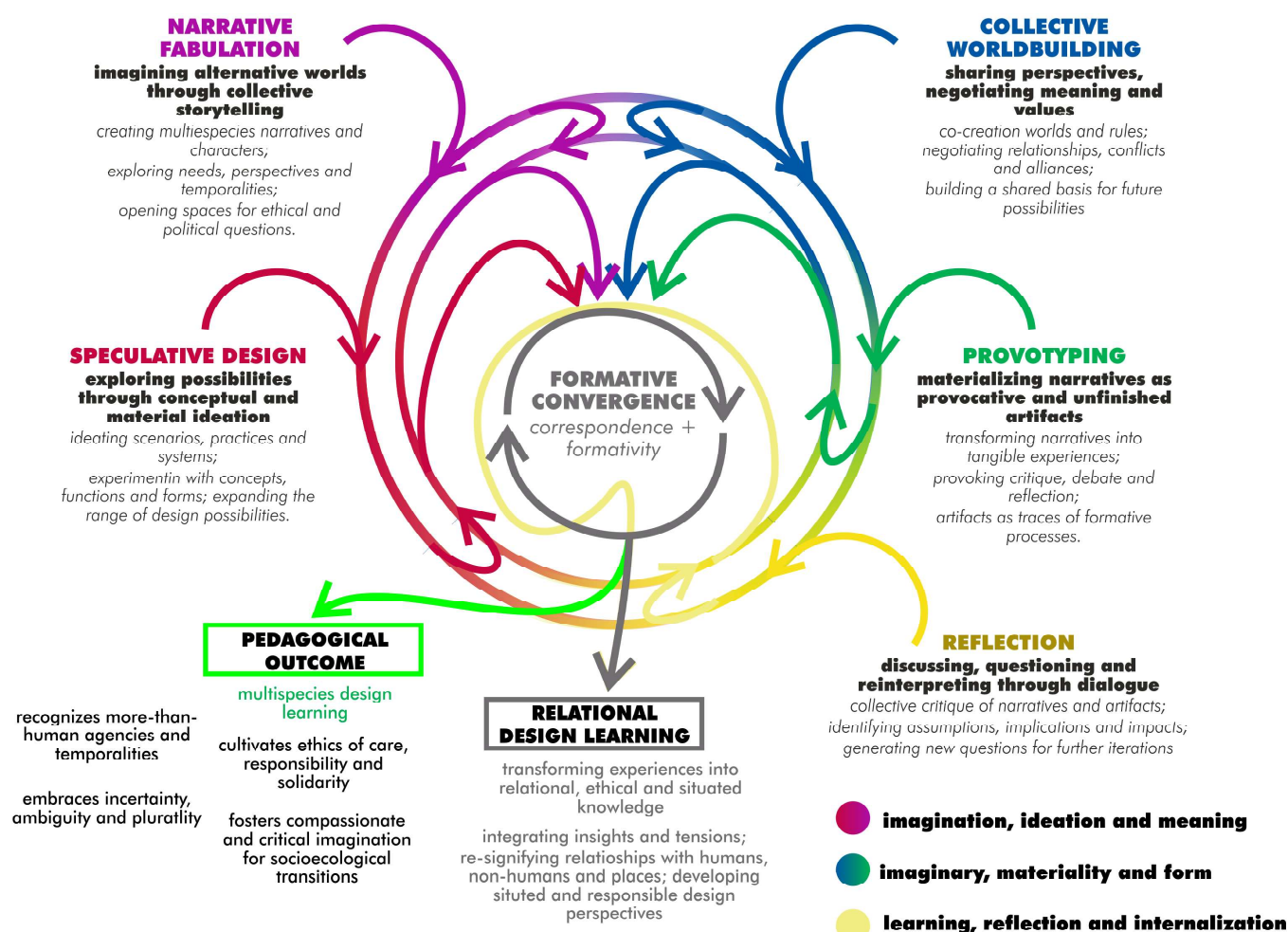
Taken together, these observations allow the workshop to be interpreted as a relational pedagogical framework in which speculative fabulation, correspondence, formativity and ethics of care become mutually reinforcing dimensions of design learning (Figure 11).

Figure 11 synthesizes the pedagogical framework proposed in this study as a recursive ecology of speculative learning. The framework depicts a dynamic system of reciprocal correspondences through which imagination, collective negotiation, material experimentation and reflection continuously transform one another. In this perspective, learning is understood not as the linear accumulation of knowledge but as an emergent phenomenon arising from the recursive interplay between speculative practices, relational encounters and formative processes.

The framework is organized around three interconnected epistemic dimensions. The first, represented by the magenta/purple flows, corresponds to the domain of imagination, ideation and meaning-making, encompassing Narrative Fabulation and Speculative Design. Narrative Fabulation opens imaginative space through the collective creation of multispecies stories, characters and alternative realities, enabling participants to question dominant assumptions and construct new possibilities of existence. Speculative Design expands these narratives into conceptual and projectual propositions, encouraging experimentation with functions, systems and artifacts that embody alternative futures. Together, these practices establish the speculative conditions from which the pedagogical process begins to unfold.

The second dimension, represented by the blue and green flows, corresponds to the relationship between imaginary, materiality and form, integrating Collective Worldbuilding and Provotyping. Collective Worldbu-

Figure 10 – Ecology of Recursive Correspondences for Speculative Design Learning



Source: produced by the authors.

ilding transforms individual imagination into a negotiated social process in which participants collectively establish rules, values, conflicts and relationships that define the speculative world under construction. Provotyping subsequently materializes these negotiated imaginaries into provocative and intentionally unfinished artifacts. In this sense, provotypes operate as material traces of speculative inquiry, provoking discussion, exposing assumptions and generating new questions. So, materialization does not conclude the design process but recursively expands it.

The third dimension, represented by the yellow flows, concerns learning, reflection and internalization, integrating Reflection and Relational Design Learning. Reflection functions as the recursive mechanism through which all previous experiences are critically revisited, questioned and reorganized. Narratives, negotiations, artifacts, conflicts and ethical tensions produced throughout the workshop become objects of collective reinterpretation, allowing participants to identify hidden assumptions, reconsider relationships and reformulate speculative possibilities, prepares the conditions through which learning may emerge.

For this reason, the reflective process returns to the center of the framework before any pedagogical outcome is produced. Reflection re-enters the process by bringing speculative narratives, collective negotiations, material experiments and ethical questions back into correspondence. This recursive movement prevents learning from being understood as the automatic consequence of making artifacts or discussing ideas. Instead, learning emerges only after these heterogeneous experiences have been reorganized through what this study terms Formative Convergence.

Located at the center of the framework, Formative Convergence constitutes the conceptual core of the model. Designates a temporary condition in which speculative imagination, collective negotiation, material experimentation and critical reflection become mutually responsive. Grounded in Pareyson's concept of *formativity* and Ingold's notion of *correspondence*, convergence is understood as an emergent process through which knowledge, form and action are simultaneously constituted. Design knowledge is progressively formed through recursive engagements with people, materials, narratives and worlds.

The opposite directions of the inner arrows intentionally reinforce this interpretation. They indicate that the relationships established within the framework are co-constitutive. Narrative Fabulation transforms Provotyping, while emerging provotypes simultaneously reshape narratives. Collective negotiations redefine speculative proposals, whereas new materializations modify the collective understanding of the speculative world. Reflection reorganizes previous experiences, but these reorganized understandings subsequently influence new narratives, new artifacts and new collective negotiations. Consequently, no pedagogical practice occupies a privileged or terminal position within the framework; each continuously modifies the conditions under which all others operate.

This bidirectional circulation is a recursive spiral of formative correspondences, in which every iteration enriches and transforms subsequent cycles. Each speculative narrative, artifact or collective discussion introduces new conditions into the system, progressively increasing the complexity of both the speculative worlds being imagined and the relational understandings being developed through recursive transformation.

The pedagogical outcome represented at the base of the framework, denotes the provisional emergence of multispecies design learning, characterized by the recognition of more-than-human agencies and temporali-

ties, the cultivation of ethics of care and situated responsibility, the acceptance of uncertainty and plurality, and the development of compassionate and critically imaginative capacities for socioecological transitions. Because these outcomes continually feed subsequent cycles of imagination, worldbuilding, materialization and reflection, the framework remains fundamentally open-ended. It represents an model of design learning that emerges through ongoing correspondences among imagination, making, ethics and relational experiences.

The experience suggests an integrated educational approach where world-building, material experimentation and reflective dialogue continuously correspond with one another. Speculative design education can move beyond creativity-centered approaches toward a pedagogy grounded in relational thinking, multispecies imagination and ethical engagement. Transforming speculative narratives into opportunities for critical reflection and responsible world-making.

5.2 Limitations

This study presents limitations that should be considered when interpreting its findings. First, the analysis focused on two representative case studies selected from the projects developed by the 27 participants. While appropriate for an exploratory qualitative investigation seeking theoretical depth, this choice may not fully represent the diversity of speculative practices produced during the workshop. Second, the pedagogical intervention consisted of a one-day workshop with undergraduate Design students in the Brazilian Amazon. The limited duration, participants' level of experience, and specific sociocultural context may have constrained the complexity of the provotypes and limit the transferability of the findings to other educational settings. Finally, the study examined only the immediate outcomes of the workshop. The provotypes remained low-fidelity conceptual artifacts, and no longitudinal assessment was conducted to investigate how the proposed approach might influence participants' subsequent design practice. Despite these limitations, the study advances a preliminary pedagogical framework that articulates speculative fabulation, correspondence, formativity and relational care as complementary dimensions of speculative design education.

5.3 Future contributions

Future research may extend and refine the proposed framework by investigating longer educational interventions, broader and more diverse participant groups, and different cultural contexts. Additional studies could also explore the development of higher-fidelity provotypes, their evaluation in real contexts of use, and longitudinal analyses capable of assessing the lasting impact of speculative pedagogies on design practice. Another promising direction concerns the critical integration of emerging technologies, particularly Generative Artificial Intelligence, as pedagogical mediators rather than merely technical tools. The unexpected use of AI during the workshop revealed its potential to support visualization, collective imagination and speculative inquiry, while simultaneously reinforcing the importance of maintaining ethical, relational and more-than-

human perspectives throughout the design process.

6 CONCLUSIONS

The workshop demonstrated that speculative design can function as a powerful tool for critical education, capable of generating both epistemic and affective shifts within design pedagogy by a proposal framework. Although still incipient, the provotypes and narratives produced meanings that extended beyond the aesthetics of artifacts, engaging instead with the ethics of coexistence, the politics of the sensible, and a pedagogy of attentive listening. If there are futures to be cultivated, they will not emerge through linear continuity, but through fractures, gaps, and improbable alliances. They will arise from remnants, residues, and forms of listening capable of recognizing the beauty of the unfinished. When design is willing to fabulate with the other, it can become precisely the place where worlds begin to emerge.

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