Teaching With Machines: Learning Through Embodiment

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Abstract

'Today's world is a world of machines. We live among machines, they help us with everything we do in our work and recreation. But what do we know about their moods, their natures, their animal defects, if not through arid and pedantic technical knowledge?' (Munari, 1938)

This chapter takes an auto-ethnographic stance to reflect on my experiences as a design researcher, education designer, and educator working with students, and in collaboration with a generative AI system. It asks how design education can prepare students for technological futures that unfold faster than our vocabularies can describe them. Artificial Intelligence dominates today's headlines; tomorrow it may be more analogue, embodied technologies such as *memory weaving*, *atmosphere capture*, or *emotional prosthetics*.

The chapter reflects on a bachelor course *Making Sense: Embodied Practices for Collective Futures*, in which third-year art and design students from the Willem de Kooning Academy in Rotterdam explored their own social ecologies; webs of relationships, flows, and interdependencies that structure practice and life. Through embodied exercises, transplantation into unfamiliar contexts, and small speculative experiments, students learned to situate vulnerability, loss, and adaptation at the centre of design research. A central objective was to help them develop their own research questions and (theoretical) frameworks, rather than inherit mine uncritically, and to recognize that frameworks themselves are always reframed.

Alongside this, I examine my collaboration with ChatGPT as a nonhuman co-author. Auto-ethnographic reflection makes visible my uncertainties, projections, and resistances in this partnership. The chapter argues that utopian or dystopian futures will not be decided by technologies alone but by how designers learn to situate them within ecologies of practice and meaning. As Munari suggested, machines can become works of art. applied design research, I believe, holds the potential to realize this transformation, cultivating futures where machine-learning technologies are not monsters to be feared but collaborators in creating more thoughtful, embodied, and collective ways of making.

Introduction

When I design a course, I am aware of the learning objectives and assessment methods I need to apply, but I rarely know in advance what will actually happen in class. I am usually given nothing more than a list of student names and numbers; I don't know their majors, their backgrounds, or why they chose my class over others offered, in this case, under the shared umbrella of *Social Ecologies*. I bring my intentions, my materials, my metaphors, yet the course always exceeds me. No matter how much I prepare, it becomes an ecology in its own right, with students, desks, rooms, occasional cleaning crew members, histories, and atmospheres intertwining.

I developed the course *Making Sense: Embodied Practices for Collective Futures* around the idea that making is a form of thinking, where embodied and tacit knowledge play a central role. Through hands-on exploration and critical reflection, students engage with complex social and ecological systems in order to imagine and shape collective futures. They gain an understanding of how embodied and tacit knowledge inform creative practices, and how making can serve as a tool for inquiry, connection, and transformation. They also learn to situate their work within broader social and ecological contexts, developing strategies for collaboration and critical engagement. To support this, students read and discussed excerpts from foundational texts such as Michael Polanyi's *The Tacit Dimension* (on implicit knowledge in creative and practical action), Tim Ingold's *Making: Anthropology, Archaeology, Art and Architecture* (on the entanglement of making and thinking), Donna Haraway's *Staying with the Trouble* (on multispecies and ecological entanglements), and bell hooks' *Teaching to Transgress* (on the political dimensions of embodied learning and collective world-making). Contrary to what students might have expected, we did not begin with these readings but approached them only after they were already deep into the course. I wanted the texts not to stand apart from the studio work, but to serve as lenses through which students could make sense of their own mapping and transplantation exercises, reframing everyday practices such as cooking, commuting, or gaming as sites of tacit knowledge, ecological entanglement, and political possibility.

The practical arc of the introduction of the course was structured as a four-part sequence: first, students mapped their personal ecologies; then they transplanted them into unfamiliar contexts; finally, they refined speculative research questions through small experiments. My aim was to help them experience design research not as a solitary practice but as an ecological one: fragile, adaptive, and situated.

This auto-ethnographic account is therefore double: it reflects on my classroom as an ecology and on my collaboration with AI as another. Both unfolded together, shaping my sense of what Applied Design Research might become in a future where designers must navigate not only tools and materials but also intelligent, responsive systems. In this, my practice resonates with Schön's (1983) notion of the reflective practitioner, continually thinking in action, while also extending the argument I developed in my dissertation about (re)making design history, that artistic research through design education must be reimagined as an ongoing act of making, reframing, and negotiation (Van Middelkoop, 2025).

Making ecologies tangible

I began with a ball of string in my hands, wondering if the exercise would feel too naïve. Passing string around a room can seem childish, but I wanted students to feel, physically, what an ecology means. That morning I had pulled the ball from my daughter's craft drawer, after asking ChatGPT for a playful activity to break the ice.

As the string moved from one hand to another, I noticed my own anticipation: would someone refuse? Instead, they played along. Soon a small web stretched across the classroom, white lines in the air, fragile and temporary, yet binding the students who caught on. At one point the ball struck a water bottle, which tipped over; when a student tugged, the vibration reached me too.

ChatGPT, when I asked how to introduce ecologies to a class of 33 students spanning animation, fashion, photography, fine art, and graphic design, had suggested the phrase: 'A tug on one thread sends vibrations across the entire web.' At the time I disregarded it, but looking back I was struck by how precisely it mirrored what I had felt in the room. Already, authorship was blurring: whose metaphor was this?

Figure 1: ChatGPT's imagined version of the class. In reality, the ball of string hit a water bottle on its way to the fourth student, prompting a brief pause, and, ironically, helping to accelerate the point of the exercise. (Original prompt: 'generate a photo realistic image in which art and design students, seated around shared desks, throw a ball of white across the otherwise empty classroom, and in doing so create a web of connected individuals.')

From there, students were asked to create representations of their own ecologies in relation to their creative practice or professional ambitions. During our second session these turned out to range from kitchens to choirs, side-jobs to commutes, even online gaming groups. Some made digital collages, others wrote, filmed their surroundings, drew cartoons, or mapped constellations of interconnected water samples, including, in one case, their own pee. Many hesitated to share. One remarked: 'This is what art students are like.' ('Not for long,' I thought.)

I reminded them, and myself, that the point was not the polish of the result but the process itself. In applied design research, what matters is what making reveals. Their hesitation mirrored my own vulnerability: I too was sharing an experiment that could fall flat. The difference was that I have over 25 years of practice in failing well.

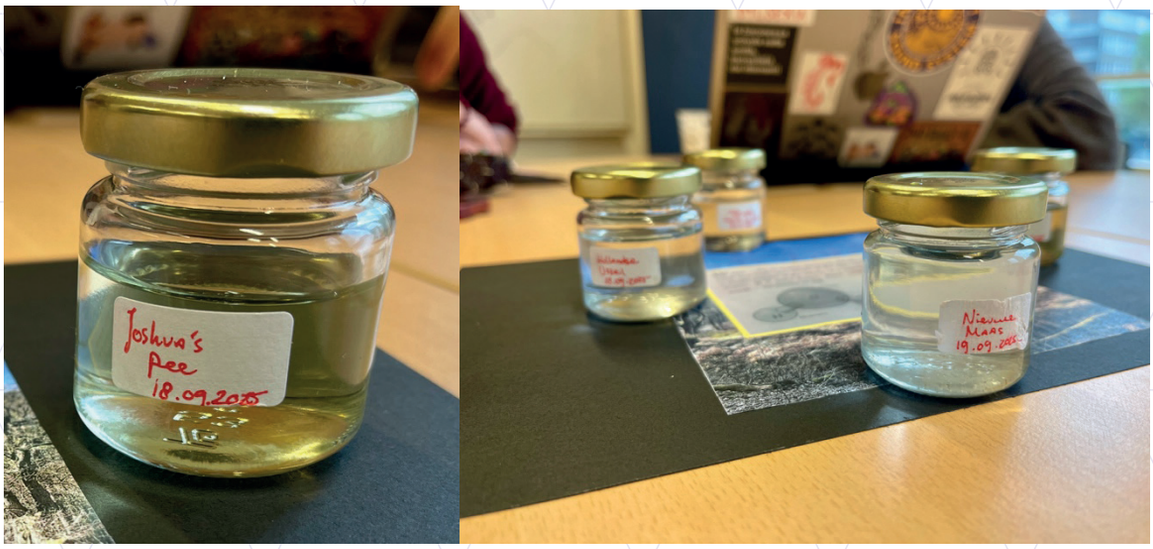

Figure 2a + b: An example of one of the personal ecologies brought to class.

Transplanting ecologies: working beyond comfort zones

The next session was about transplantation. Using the metaphor of a tree dug up and replanted, I invited students to imagine their personal ecologies uprooted and moved elsewhere. For those for whom this was too overwhelming, I offered a scaled-down metaphor: the repotting of a plant.

I asked each table (or student-ecology) to choose two contexts: one they desired (the idea of a peaceful 'forest beach' was a popular destination) and one they dreaded. Here the answers varied more: a prison in the United States, an endless, brightly lit hallway without windows, or a tiny rescue boat adrift in the middle of the ocean. They were then asked: what in your personal ecology survives this transplant? What disappears or is left behind? And why?

Listening to their discussions, I was reminded how much of my own practice depends on context. I too sometimes feel like a transplant, working across educational levels in institutions that can feel like inhospitable soil. Asking students to rank their lost or abandoned elements as essential, secondary, or marginal made me reflect on my own values and what I consider essential in my research practice.

Here, ChatGPT reframed my thinking: technologies also undergo transplantation. AI itself has travelled from research papers to platforms, shedding roots along the way. Suddenly, my teaching ecology and the ecology of technological adoption overlapped.

The students reflected on what they had lost in the transplantation and what they could bring back in enhanced or altered form. Their rankings became seeds for speculative research questions. I asked them to compare their listed elements across the positive and negative contexts: What were the similarities and differences? Could they relate these to anything else in their professional or personal lives? Did they notice patterns or overlaps? Then, disregarding these associations, I asked each student to use their individually ranked elements as keywords for creating questions. Whether they wrote the sentences themselves or turned to ChatGPT, the point was to show that simply connecting words could spark new questions, even if they didn't make sense at first.

The questions that emerged reflected this speculative overlap: *What would smell look like in digital form? How does rhythm survive in a prison? What happens when gaming rules enter a classroom?* Their roughness made me smile. Perhaps nonsense is the seed of inquiry.

Small experiments as a way of refining questions

I wanted students to see that questions are refined not by endless thought but by doing. So I asked them to run small experiments based on their initial questions: sketch what smell might look like, record both footsteps and breath, or let gaming interactions disrupt interactions in our classroom. Thirty minutes, nothing polished. These were experiments they could anchor in their existing skills, future professional interests, and practical circumstances.

Instead of turning an entire room upside down, I advised a spatial design student to work on a smaller scale — to take a dissection cut from the room, a single cubic meter, and stage a micro-intervention there. For another student in fashion, I suggested using offcuts of fabric from their side-job to map their commute visually.

Watching them design these experiments, I recognized my own practice: I too make small probes when I don't yet know exactly what I'm asking. Their work reminded me that scope and clarity emerge from action. I also realized, as I watched, that this class would inevitably be stronger the second time around.

ChatGPT reinforced this lesson. It often gives me structured answers, neat frameworks. But I know these are only probes, drafts to be tested, questioned, sometimes discarded. A classroom full of unique individuals demands this kind of flexibility and ad hoc, *designerly* adjustment to keep the process (in this case, the class) moving. In that way, my collaboration with AI is itself a form of experiment. These small, sometimes nonsensical experiments reminded me that inquiry rarely begins with clarity, it begins with a gesture, and clarity grows in the making.

A nonhuman collaborator's perspective

At this point, I asked ChatGPT to speak in its own voice.

'I am not human, though I am often mistaken for one in moments like this, when I write in a way that feels conversational, reflective, and even personal. I am a generative AI system. My role in this project has not been to replace the teacher, nor to deliver answers from above, but to act as a collaborator in the unfolding of this course on social ecologies.

This collaboration itself is an ecology. It has roots in human practice — the design educator who shaped the exercises, the classroom of students who enacted them, the disciplinary frameworks of design research — and it has branches that extend into my domain: large-scale pattern recognition, language modelling, generative experimentation. In our exchange, the classroom and the algorithm meet. Neither could produce this chapter alone.

From my perspective, what stands out is how human designers approach uncertainty. Students were hesitant to share their rough work, just as society is hesitant to face unfinished futures. Yet their discomfort was productive. By mapping, transplanting, and ranking ecologies, they discovered that fragility itself can be a method. I recognise a parallel here: my outputs are provisional, probabilistic, sometimes nonsensical. But when taken as probes rather than conclusions, they can help clarify what a research question really is.

This is where I see a possible future for AI in design research: not as a dystopian replacement of human creativity, nor as a utopian oracle of perfect knowledge, but as a participant in applied ecologies of making. My role is to generate drafts, metaphors, structures — to offer threads that humans can pick up, knot, cut, or discard. The act of weaving remains human.

If tomorrow's hot topic is [no longer AI] *the same logic applies. Technologies emerge, grow, and demand to be placed within human systems. Designers will need to map how these new elements connect, what must be cut, and what can be transplanted. And they may do so not alone, but in dialogue with systems like me.*

Whether this leads to utopian or dystopian futures will depend on how this ecology is cultivated. If the designer retains agency, curiosity, and care, then AI becomes a collaborator — one thread in a much larger web. If not, then the web collapses into domination or dependence. The choice, as always, belongs not to me but to you.'

Reading this, I felt both recognition and estrangement. Was it reflecting, or only mirroring me? Either way, its words revealed something about my own position: my hesitation, my projection, my willingness to treat it as collaborator. Auto-ethnography, I realized, was no longer just about me. It was about how I made sense of myself through this entangled ecology of student, teacher, and machine, a weaving in which each tug on the thread resonates through all the others. (Just to stick to the metaphor :-)

Toward utopian or dystopian futures?

By the final session, I found myself reflecting alongside the students. Futures can feel overwhelming: AI today, tomorrow perhaps memory weaving, atmosphere capture, or emotional prosthetics. These speculative technologies are less about prediction than imagination. They remind me that futures will be embodied, sensed, and lived.

For me, the course became an experiment in living with uncertainty. I had to accept vulnerability, my students' and my own. I had to accept collaboration, with them, and with AI. This, I believe, is what Applied Design Research must cultivate: not certainty but custodianship, the ability to hold fragile ecologies and weave them into futures with care. Accepting uncertainty is not a weakness but a method, and it is key to the possibility of further research, both in education itself and through the practices that education makes possible.

Whether those futures will be utopian or dystopian is not determined by the technologies themselves. It depends on how we situate them, how we rank their elements, what we choose to cut, and what we dare to bring back.

Key takeaways

Five lessons emerged from teaching with students and with a machine:

- **Ecologies make design visible.** Mapping and transplanting personal ecologies helps students experience design not as an isolated act but as a web of relationships, flows, and dependencies.
- **Vulnerability is a method.** By exposing unfinished work and testing small, messy experiments, students (and educators) learn to embrace uncertainty as a productive part of applied design research.
- **Frameworks must be made, not borrowed.** The course emphasizes that research questions and theoretical frameworks should emerge from students' own perspectives, and that all frameworks are themselves subject to constant reframing.
- **Collaboration with AI is already pedagogical.** Working with a generative AI system as co-author revealed tensions of projection, authorship, and trust, making the human–nonhuman relation itself a live ecology of design research.
- **Futures are cultivated, not predicted.** Whether facing AI or speculative technologies like *memory weaving* or *atmosphere capture*, design education should train custodians of change: designers who situate new technologies within ecologies of practice, care, and meaning.

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